Mathematics

Teacher's Manual

Grade 5

Papua New Guinea
Department of Education

JICA

'FREE ISSUE
NOT FOR SALE'

Issued free to schools by the Department of Education

First Edition

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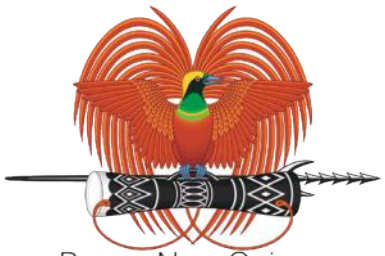
Mathematics Teacher's Manual

Grade 5



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Secretary's Message

Dear Teacher,

The Mathematics Teacher's Manual is produced for Grade 5 teachers to guide them to plan and teach the Mathematics lessons jointly with the National Grade 5 Mathematics Textbook. It is designed for quality teaching and learning to achieve the implemented curriculum outlined in the Mathematics Syllabus.

The Teacher's Manual provides suitable teaching and learning strategies, content, concepts and plans for teachers to promote and maintain standard lessons for daily, termly and yearly teaching and learning activities nationwide. It guides critical thinking and problem solving approaches in which the teacher can easily visualise the concept in the lesson flow that is expanded from the textbook. It addresses necessary areas of what to teach, how to teach and what to assess.

The Teacher's Manual is user friendly and reflects PNG contexts in daily situations to help students acquire knowledge, skills, attitudes and values set through the lesson objectives. It guides teachers to deliver lessons to promote enjoyment and love of mathematics.

Some teachers are confident in teaching Mathematics while others find it challenging. This Teacher's Manual introduces many new approaches for lessons with more mathematics teaching aids, full utilisation of the blackboard using students' ideas and prior knowledge. It will help you, the teacher to teach mathematics processes step by step with necessary information to a standard or higher level. Therefore, you can demonstrate and improve your lessons with new teaching approaches through careful reading and preparation of each lesson using this Teacher's Manual.

You are encouraged to use the Teacher's Manual and Textbook with other relevant resources to deliver the mathematics contents with enjoyment and for your students to have fun and love mathematics.

I commend this Teacher's Manual for Grade 5 Mathematics to be used with the National Textbook as an official teaching resource in all primary schools throughout Papua New Guinea.

Dr. Uke Kombra, PhD
Secretary for Education

How to use the Teacher's Manual

Introdudction

It is important to understand the composition of the National Textbook in order to use the Teacher's Manual effectively .The Teacher's Manual (TM) has been developed for teachers to teach learning contents to their students more effectively with the National Textbook (TB). The features of this Teacher's Manual and its contents correspond to the National Mathematics Textbook according to Grades 3, 4 & 5 Mathematics Syllabus. The standards outlined in the syllabus are reflected in this Teacher's Manual to help teachers plan and conduct lessons. The Preliminary pages of the Teacher's Manual consists of the following 6 sections: **Components of the Teacher's Manual, Lesson Presentation using Textbook and Teacher's Manual, How to Use the Blackboard Plan, How to Conduct Assessment, Attachments and Yearly Overview.** It is important for you to take time to read and understand how to use the Textbook and the Teacher's Manual.

1. Components of the Teacher's Manual

1.1 Composition of the National Textbook

The composition of the National Textbook consists of the following features.

1. Chapter Heading

Heading colour changes to assist teachers to recognise each teaching term.

2. Titles and Numbers

Each chapter consists of Chapter and Sub-chapter titles with numbers. All problems in the textbook have Tasks and Activities including their numbers. We call 1 as task 1 and 1 as activity 1.

3. Students' Ideas

Textbook uses students' ideas for students to think and reason mathematically. Basically, students learn using prior ideas to higher order thinking.

4. Brainstorming Activity

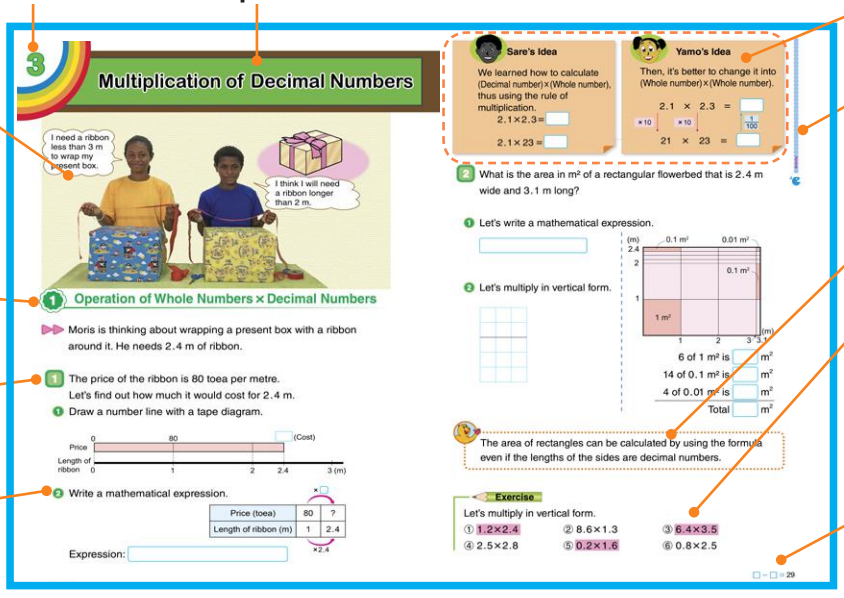
Some chapters have Ice breaking activity as the lead up activity for the chapter.

5. Fun with Mental Math!

□ × □ = 29

The students can enjoy by filling in the boxes with numbers where the answer equates to the page numbers.

Sample Textbook Page



Key Competencies acquired through the use of the Textbook

Experimental mathematical activities such as **measure**, **compare**, **divide**, **order**, **touch**, **pile up** and **throw** are contained in all grades. It is intended to develop the ability and skills to be able to solve various problems logically in daily life by considering many ways.

Mathematical Literacy

Activities for improving reading, expression and comprehension abilities and skills are contained in relating formulas, letters and graphs. In addition, the textbooks are designed in order to use acquired abilities and skills for future learning contents and daily life situations.

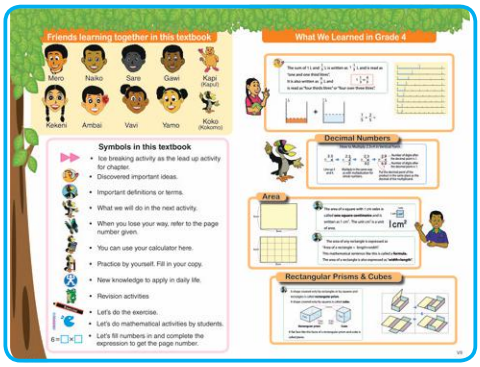
Structure of a Chapter in the Textbook

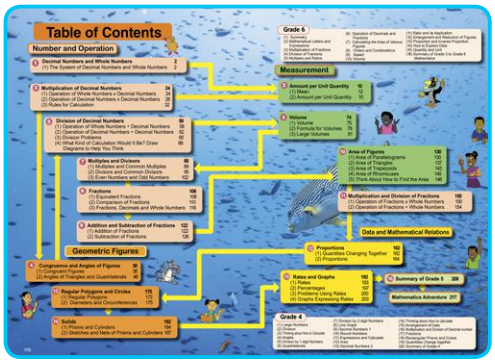
The structure in the Chapters consist of several Sub-chapters, Tasks, Activities, Exercises and ends with a set of Exercise and Problems.

Parts of the Textbook

Textbook Introduction Page

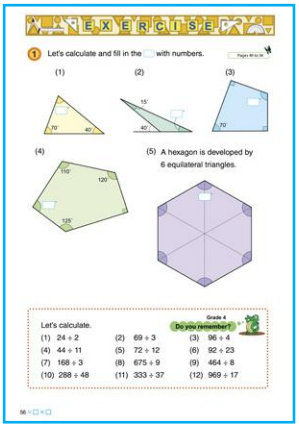
The introduction page consists of two pages which introduces very important information and icons allowing students and teachers to be familiar with what is expected to be encountered in the textbook. It also has chapters learned from previous grade outlined carefully in a table of contents. It promotes sequences of learning to help teachers to plan and program effectively.

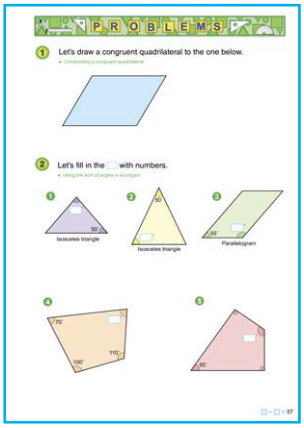




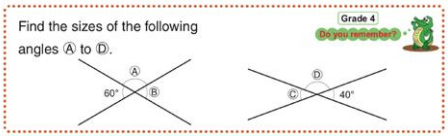
Exercise & Problems

At the end of each chapter, Exercises are set for students to consolidate what has been learned in a particular chapter. Page numbers indicating specific content found for each exercise is tagged beside each exercise.
The Problems are placed after each exercise in each chapter. The problems are more advanced in order to enhance students higher order thinking skills for each chapter. It also guides students to apply what they have learned.



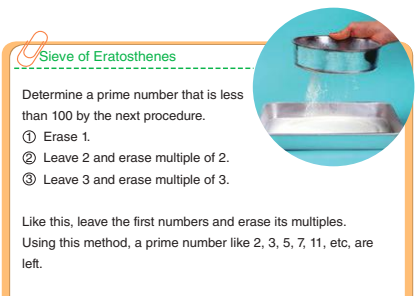


Revision "Do you remember?"



This section of the textbook is purposely for revision. Before moving on to the next chapter, these set of exercises will enable students to reflect to the contents covered in the past and relate to the new chapter. This also promotes consolidating of previous content.

Additional Information - Mathematics Extra



Additional information is placed in some units to relate the content covered to cultural and social aspects of life. It helps the students to think mathematically in solving daily life situations.

1.2 Main content of the Teacher's Manual

The layout of the Teacher's Manual has 9 components: **Lesson Information, Sub-Unit and Lesson Objectives, Prior Knowledge, Preparation, Assessment, Lesson Flow, Teacher's Note, Sample Blackboard Plan and Reduced Textbook page of the lesson**. The information given in each component will help in preparing and conducting lessons. Therefore, it is strongly recommended that the manual is read and understood before planning each lesson. Teachers should use Chapters and Sub-Chapters in the textbook and Units and Sub-units in the Teachers' Manuals.

Lesson Information

Basic information consists of **Unit Number, Unit Title, Sub-Unit or Topic and Lesson number** for each sub-unit. The **Textbook Page** and **Actual Lesson Number** is indicated for easier reference.

Sub-unit Objective

Each Unit consists of one or more sub-units and is indicated only at the beginning of each sub-unit. The sub-unit objectives explain specific Attitudes,Skills, Knowledge and Mathematical Thinking (ASK-MT) which should be achieved in this sub-unit.

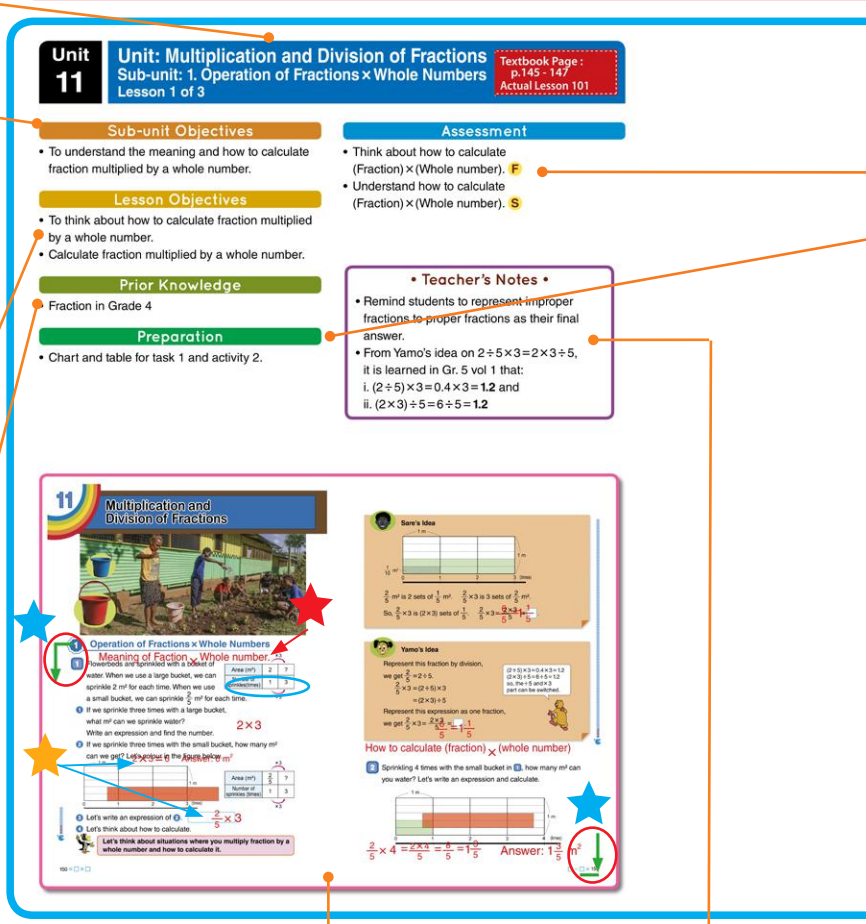
Lesson Objective

Objectives capture the ASK-MT of every lesson that should be achieved.

Prior Knowledge

Prior knowledge describes contents that students should have acquired before the new lesson. In the case where students are not ready to learn new concepts, the teacher can identify which contents to review and refer back to while teaching.

Sample Teacher's Manual Page



Reduced Textbook page of the lesson

Corresponding textbook page is shown at the bottom of the left page.
The following are written in the page.

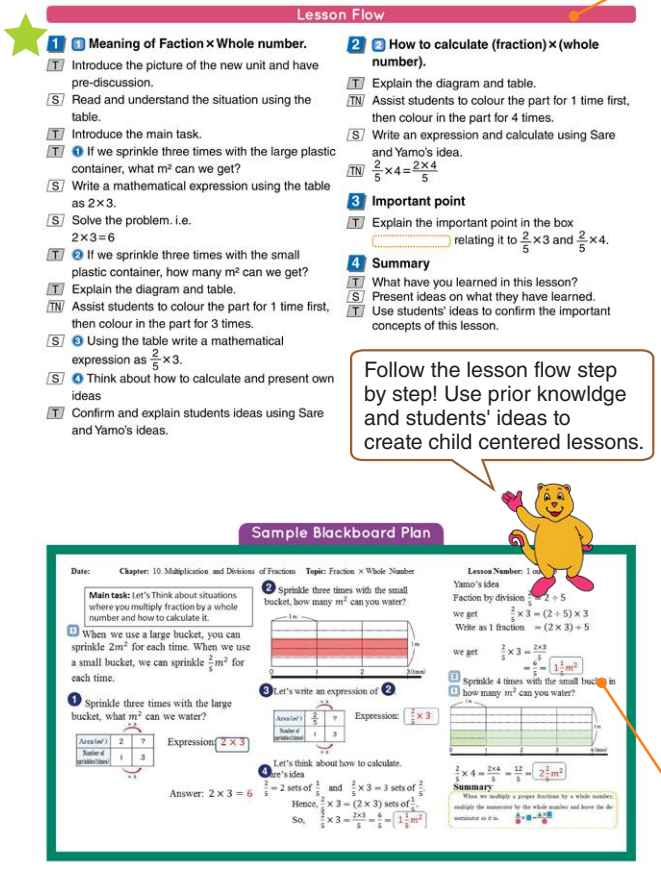
- **Lesson span** :Where the lesson begins and ends is indicated.
- Answers and solutions of the Tasks, Activities, Problems and Exercises.
- Teaching points such as; Purpose of the Tasks, Exercises and Problem types and characteristics of the problem, calculation and concepts.

Assessment

There are two types of assessments in this Teacher's Manual, 'Formative (F)' and 'Summative (S)'. The details are shown on page IX.

Preparation

The preparation specifies the materials or resources which are recommended for use in the lesson. Some materials may not be available or accessible in the local community. In such cases, teachers are encouraged to improvise or replace them with other relevant and available materials.



Lesson Flow

1 Meaning of Faction × Whole number.

T Introduce the picture of the new unit and have pre-discussion.
S Read and understand the situation using the table.
T Introduce the main task.
T ① If we sprinkle three times with the large plastic container, what m² can we get?
S Write a mathematical expression using the table as 2×3.
S Solve the problem. i.e. 2×3=6
T ② If we sprinkle three times with the small plastic container, how many m² can we get?
T Explain the diagram and table.
TN Assist students to colour the part for 1 time first, then colour in the part for 3 times.
S ③ Using the table write a mathematical expression as $\frac{2}{5}\times 3$.
S ④ Think about how to calculate and present own ideas
T Confirm and explain students ideas using Sare and Yamo's ideas.

2 How to calculate (fraction) × (whole number).

T Explain the diagram and table.
TN Assist students to colour the part for 1 time first, then colour in the part for 4 times.
S Write an expression and calculate using Sare and Yamo's idea.
TN $\frac{2}{5}\times 4=\frac{2\times 4}{5}$

3 Important point

T Explain the important point in the box ..... relating it to $\frac{2}{5}\times 3$ and $\frac{2}{5}\times 4$.

4 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Follow the lesson flow step by step! Use prior knowldge and students' ideas to create child centered lessons.

Sample Blackboard Plan

Date: Chapter: 10. Multiplication and Divisions of Fractions Topic: Fraction × Whole Number Lesson Number: 1 of 5

Main task: Let's Think about situations where you multiply fraction by a whole number and how to calculate it.

① When we use a large bucket, you can sprinkle $2m^2$ for each time. When we use a small bucket, we can sprinkle $\frac{2}{5}m^2$ for each time.

② Sprinkle three times with the small bucket, how many m^2 can you water?

③ Let's write an expression of ②

Expression: $\frac{2}{5}\times 3$

④ Let's think about how to calculate.

Sare's idea

$\frac{2}{5}=2$ sets of $\frac{1}{5}$ and $\frac{2}{5}\times 3=3$ sets of $\frac{2}{5}$

Hence, $\frac{2}{5}\times 3=(2\times 3)$ sets of $\frac{1}{5}$

So, $\frac{2}{5}\times 3=\frac{2\times 3}{5}=\frac{6}{5}=1\frac{1}{5}m^2$

① Sprinkle three times with the large bucket, what m^2 can we water?

Expression: 2×3

Answer: $2\times 3=6$

Yamo's idea

Faction by division $\frac{2}{5}\div 5$

we get $\frac{2}{5}\times 3=(2\div 5)\times 3$

Write as 1 fraction $=(2\times 3)\div 5$

we get $\frac{2}{5}\times 3=\frac{2\times 3}{5}=\frac{6}{5}=1\frac{1}{5}m^2$

① Sprinkle 4 times with the small bucket in how many m^2 can you water?

$\frac{2}{5}\times 4=\frac{2\times 4}{5}=\frac{12}{5}=2\frac{2}{5}m^2$

Summary

When we multiply a proper fractions by a whole number, multiply the numerator by the whole number and leave the denominator as it is.

$\frac{\triangle}{\square}\times\bigcirc=\frac{\triangle\times\bigcirc}{\square}$

Teacher's Notes

Contains supplementary information that is useful for teachers and enhances their content background knowledge as well.

Lesson flow

The lesson flow consists of several teaching points that will help in the understanding and visualisation of the lesson sequence. It is important to read this part in preparation for the lesson.

T : What the teacher should do and say during the lesson.

TN : Supplementary information or key ideas and points that should be considered when conducting the lesson.

S : Students' expected responses and what they are expected to do during the lesson.

T/S : Instruction for both teacher and students to carry out together.

1 The number in the square corresponds to the "Task" in the textbook.

1 The number in the circle corresponds to the Activity in the Textbook content of the lesson.

Important point to be emphasised during the lesson are indicated by the dotted boxes below;

Important Ideas

Important Definitions or Terms

Sample Blackboard Plan

Shows a plan of how the blackboard can be arranged and must be utilised as a guide. Refer to page VII for more details.

It is very important to read these information before conducting the lesson to understand the objective of the lesson.

1.3 Other Contents: Chapter Introduction Page

The Chapter Introduction page is found at the beginning of every Unit and consists of the Unit Objectives with specific numerical representations of the Content Standards and Performance Standards in the Syllabus, Teaching Overviews and Related Learning Contents.

1. Content Standard

The Content Standards outlines the expected content to be attained in this grade and is outlined in the syllabus, comprising of the facts, concepts and ideas that are important for the students.

The three digits such as 5.1.3 represents the grade level (5), strand (1), and the content standard (3).The expansion of the content standard is further outlined in the Unit Objective.

2. Unit Objective

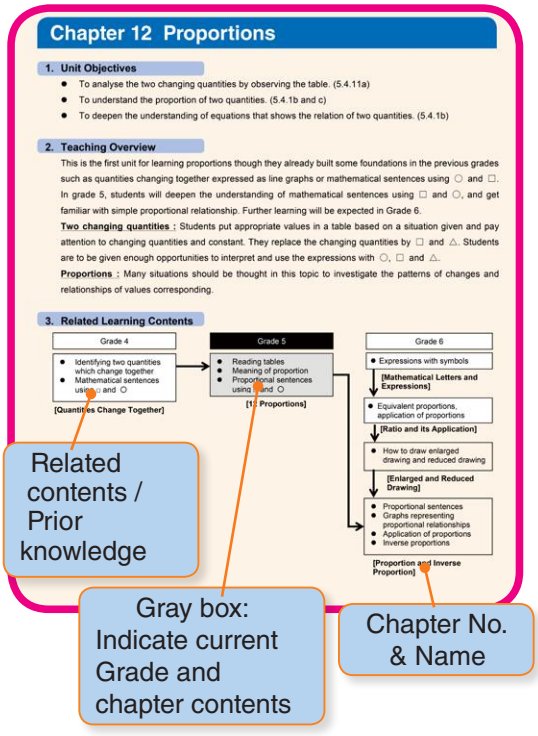
The Unit Objective outlines the key ASK-MT that students are expected to learn or acquire at the end of each unit. There may be one or more unit objectives for each unit depending on the unit depth and content.

3. Teaching Overview

The Teaching Overview outlines the main content areas to be covered in each unit with sub units briefly described to rationalise an overview of the unit. This section can also assist the teachers to be aware of the type of content expected in each unit and prepare in advance.

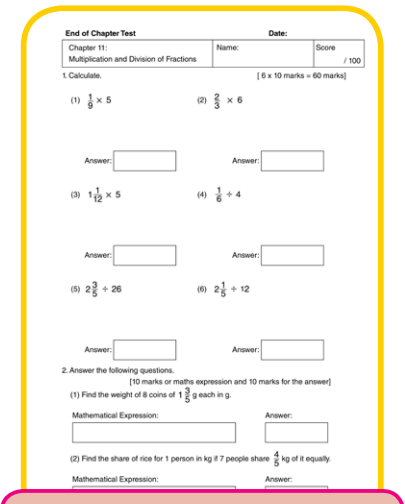
4. Related Learning Content

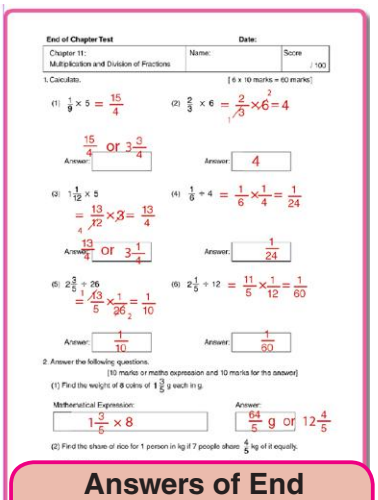
Related Learning Content outlines the content map of what the students have learned already, in-line with the current unit to be taught. The previous content covered will serve as the foundation for students to learn new concepts and contents. Furthermore, the current unit to be learned is also linked to the next learning area and grade level.



1.4 Other Contents: End of Chapter Test

At the end of each unit in the Teacher's Manual, there is an attached End of Chapter Test. The test is purposely conducted to measure how much content and mathematical concepts the students have understood and acquired for each Chapter. This will also help teachers and students to understand better and observe vital areas to be improved in both teaching and learning. The test should be conducted as **a separate lesson** to confirm students progress or as assessment. Answers to the end of chapter test is located before a page of End of Chapter Test as sample shown on left.


End of Chapter Test


Answers of End of Chapter Test

Please use the evaluation test in each chapter to confirm students' progress and challenge each step for delivering the best lessons!!

2. Lesson Presentation using Textbook and Teacher's Manual

In every lesson preparation, teachers should always consider what to do before, during and after the lesson. Both the Teacher's Manual and Textbook must be used to conduct a successful lesson.

2.1 Lesson Preparation

When preparing a mathematics lesson the following requirements should be considered;

1. Ensure to have both Textbook and Teacher's Manual and read and understand the lesson content.
2. Review previous lesson and understand the next day's lesson before delivering the current lesson.
3. Work out and be familiar with the answers to the activities and exercises in advance.
4. Study the lesson flow, relate to the blackboard plan and visualise how to use it.
5. Prepare teaching materials prior to the lesson.
6. Plan and prepare according to the recommended time.

2.2 Lesson Presentation

When you have prepared your lesson, you should now be ready to present your lesson. Consider the following points during the lesson.

1. Have only the Teacher's Manual during the presentation of the lesson.
2. Review students prior knowledge.
3. Present the task or problem situation from the textbook.
4. Encourage problem solving approach and facilitate group or general discussions.
5. Analyse and consider students' opinions or findings and always direct misconceptions back to the main concept.(Formative Assessment)
6. Encourage students to do homework for consolidation of skills.
   (Formative and Summative Assessment)
7. Assist students to master the skills in the lesson content through the exercises and problems.

(Formative and Summative Assessment)

8. Evaluate and summarise important points, concepts or ideas learned and predict what is expected to be learned in the next lesson.

Must Dos

- Strictly follow Teachers Manual with reference to the Textbook.
- Conduct experimental activities when necessary.
- Expansion of student ideas in the textbook.
- Involve students in outdoor exercises when required to.
- Encourage students to use mathematical tools or instruments appropriately for its purpose.
- Encourage more student interactions.
- Every lesson is important as concepts are linked from one lesson to the next lesson.

2.3 Lesson Evaluation

After the lesson, teachers should reflect on the lesson taught and evaluate students achievements and do self reflection.
These can be done through:

1. Marking of exercises or tasks done.
2. Observation checklists.
3. Review of blackboard plan.
4. Student responses during summary of the lesson.
5. Making adjustments based on the evaluation to improve teaching strategies may require re-teaching.

3. How to Use the Blackboard Plan

The Blackboard is an important tool for teachers to use daily. This Teacher's Manual introduces the strategy for enhancing the effective use of the blackboard to improve student learning. The whole blackboard should be utilised fully from left to right corresponding to the lesson flow.

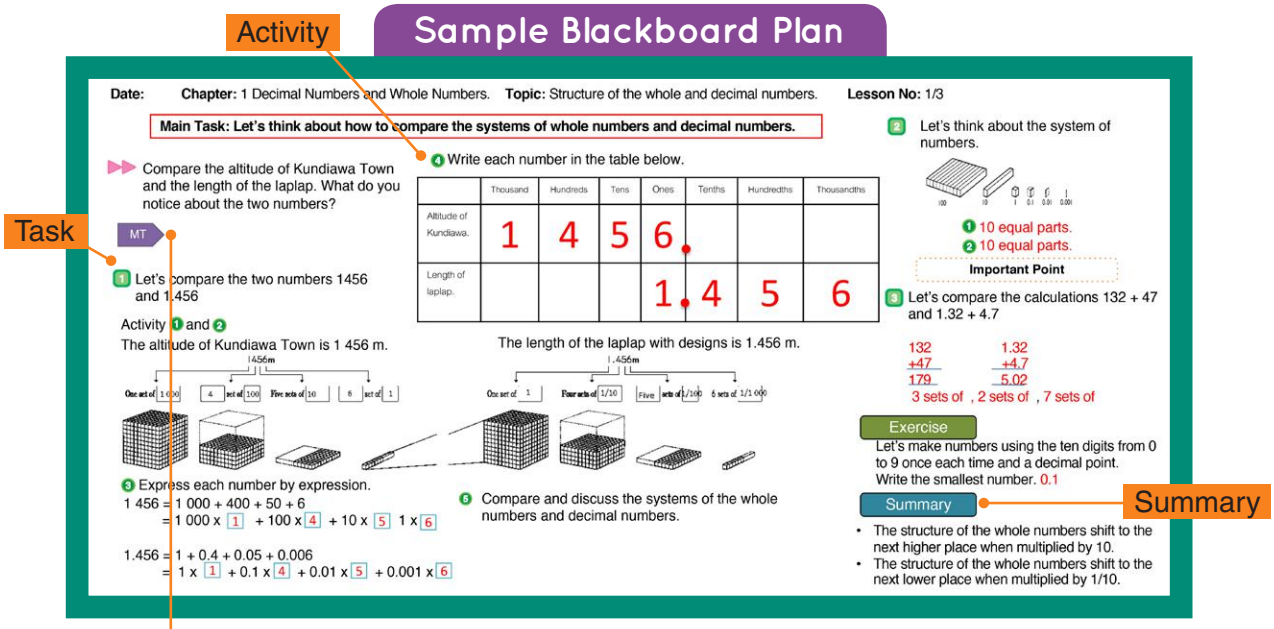
Use the blackboard according to the following steps.

1. Ensure that the whole blackboard is clean.
2. Write Date, Chapter, Topic and lesson number from the top left hand corner to the right.
3. Follow the sequence of the lesson working from left to right according to the blackboard plan including:
   a) Main Task Heading (MT)
   b) Review
   c) Student Ideas and textbook ideas
   d) Important points
   e) Tasks and activities (practices)
   f) Summary (All of the components will depend and correspond with the flow of the lesson.)

Points to consider.

1. Write in a very organised manner so the students can see connections and is visible from all parts of the room.
2. Check what you write as you write for students to copy it down in their exercise books to learn.
3. Encourage students to display their ideas on the blackboard by writing and explaining what they have learned and promote student centred learning.
4. Allow students sufficient time to copy what you wrote.
   (Students should copy only the important points, not necessary to copy all.)

At the end of the lesson, it is time for summary of the lesson. Teachers should summarise using whole blackboard to point out important points.



MT: Main Task mark

The Main Task is introduced as indicated on the Sample Blackboard Plan according to the lesson flow. In this sample blackboard plan, the teacher writes and explains the main task, then proceeds with 1 (Task 1) 1 and 2 (activities 1 and 2).

4. How to Conduct Assessment

Assessment is a fundamental aspect of students mathematical learning and performance. Results of assessment will benefit the students in setting goals, take high responsibility for their own learning and become more independent learners.
There are two main types of assessment used in this book which is in line with the syllabus assessment to assess the students.
They are:
1. Formative Assessment (Assessment For or As)
2. Summative Assessment (Assessment Of)
This should guide teachers to prepare assessment tasks and methods.
You will find summative S and formative F assessment indicated in every lesson so it is important for you to plan how you want to assess students' learning and performance.

F Formative assessment

Formative assessment examples in the Teacher's Manual:

- Observation checklists
- Correction of exercises
- Analysis of discussions
- Students' participation.

S Summative assessment

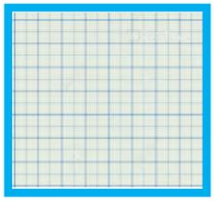
Summative assessment examples include:

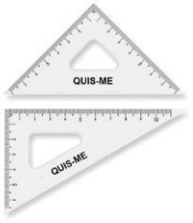
- Exercise and Problems
- End of Chapter Test
- Projects
- Homework and Assignments.

5. Attachments

The Teacher's Manual has four attached pages that the teacher can use when teaching lessons. The pages consist of a Mathematics game information, Contents Chart and dotted grids (5 mm^2 grid, 1 cm^2 grid, 1 cm^2) and triangle rulers and a protractor.

1. **Mathematics game information**
2. **Content Chart from Elementary Prep to Grade 8**
3. **5 mm^2 grid**
   The 5 mm^2 grid can be used for drawing graphs, sketching nets or solids and drawing various figures with 5 mm scale.
4. **1 cm^2 grid**
   The 1 cm^2 grid can be used for drawing graphs, sketching nets or solids and drawing with 1 cm scale.
5. **1 cm^2 dotted grid**
   The 1 cm^2 dotted grid can be used for drawing various lines, shapes or figures.
6. **Triangle rulers and protractor**
   The triangle rulers and protractor can be used to draw shapes and figures, measure and confirm lengths and angles.





These attachments can be photocopied and given to students when materials are not available in schools.

6. Yearly Overview

Yearly overview is an essential and systematic plan of the grade content. It is helpful in the preparation of the yearly program to effectively plan for teaching strategies. The strand is outlined and identifies each unit and topic into different strand groups. The units are in sequential order from the first to the last unit.

Strand	Unit #	Unit Name and Sub-unit Name	Lesson #	Page #
Number and Operation	1	**Decimal Numbers and Whole Numbers**		**2**
		1.The System of Decimal Numbers and Whole Numbers	1	2,3,4,5
			2	5,6
			3	7
		Exercise, Problems and Evaluation	4,5	8,9
Measurement	2	**Amount per Unit Quantity**		**10**
		1. Mean	6	10,11,12
			7	13
			8	14
		2. Amount per Unit Quantity	9	15,16
			10	17
			11	18
			12	19
			13	20,21
		Exercise, Problems and Evaluation	14,15	22,23
Number and Operation	3	**Multiplication of Decimal Numbers**		**24**
		1. Operation of Whole Numbers x Decimal Numbers	16	24,25,26
			17	26,27
		2. Operation of Decimal Numbers x Decimal Numbers	18	28
			19	29,30
			20	31
		3. Rules for Calculation	21	32
			22	33,34
		Exercise, Problems, Evaluation and Mathematics Extra	23,24	35,36,37
Geometric Figures	4	**Congruence and Angles of Figures**		**38**
		1. Congruent Figures	25	38,39,40
			26	40,41
			27	42,43
			28	44,45,46
			29	46
		Exercise	30	47
		2. Angles of Triangles and Quadrilaterals	31	48,49,50
			32	50
			33	51,52
			34	53,54,55
			35	55
		Exercise, Problems and Evaluation	36,37	56,57
Number and Operation	5	**Division of Decimal Numbers**		**58**
		1. Operation of Whole Numbers ÷ Decimal Numbers	38	58,59,60
			39	61
		2. Operation of Decimal Numbers ÷ Decimal Numbers	40	62,63
			41	64
		3. Division Problems	42	65
			43	66
			44	67
		4. What Kind of Calculation Would It Be? Draw Diagrams to Help You Think	45	68,69
		Exercise, Problems and Evaluation	46,47	70,71
		Comparing Lengths	48	72,73

Under each unit in the Overview, the topics for each lesson are also indicated. For all topics, the actual lesson numbers are given according to the student textbook. Column of Unit Names are highlighted by term colours such as term 1: green, term 2: orange, term 3: blue and tearm 4: Pink. Finally, page numbers are attached to each lesson to easily identify the lesson topics for planning.
Note: In the Yearly overview, the term 'unit' is used while the term 'chapter' is used in the textbook.

Strand	Unit #	Unit Name and Sub-unit Name	Lesson #	Page #
Measurement	6	**Volume**		**74**
		1. Volume	49	74,75
			50	76,77
		2. Formula for Volumes	51	78,79
			52	79,80
		3. Large Volumes	53	81
			54	82
			55	83
			55	83,84
			57	85
		Exercise, Problems and Evaluation	58,59	86,87
Number and Operation	7	**Multiples and Divisors**		**88**
		1. Multiples and Common Multiples	60	88,89,90
			61	91,92,93
			62	94
		2. Divisors and Common Divisors	63	95,96,97
			64	97,98
			65	99,100
			66	100,101
		3. Even Numbers and Odd Numbers	67	102
		Exercise, Problems, Evaluation and Mathematics Extra	68,69	103,104,105
Number and Operation	8	**Fractions**		**106**
		1. Equivalent Fractions	70	
		2. Comparison of Fractions	71	110,111
			72	112
			73	113
			74	114,115
		3. Fraction, Decimals and Whole Numbers	75	116,117
			76	117
			77	118
			78	119
			79	120
		Exercise and Evaluation	80,81	121
Number and Operation	9	**Addition and Subtraction of Fractions**		**122**
		1. Addition of Fractions	82	122,123,124
			83	125
		2. Subtraction of Fractions	84	126,127
			85	127,128
		Exercise and Evaluation	86,87	129
Measurement	10	**Area of Figures**		**130**
		1. Area of Parallelograms	88	130,131,132
			89	133,134
			90	135
			91	136
		2. Area of Triangles	92	137,138,139
			93	140
			94	141
			95	142
		3. Area of Trapezoids	96	143,144
		4. Area of Rhombuses	97	145
		5. Think About How to Find the Area	98	146
		Exercise, Problems, Evaluation and Mathematics Extra	99,100	147,148,149

Strand	Unit #	Unit Name and Sub-unit Name	Lesson #	Page #
Number and Operation	11	**Multiplication and Division of Fractions**		**150**
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			102	152
			103	153
		2. Operation of Fractions ÷ Whole Numbers	104	154,155
			105	156
			106	157
			107	158
		Exercise, Problems, Evaluation and Mathematics Extra	108,109	159,160,161
Data and Mathematical Relations	12	**Proportions**		**162**
		1. Quantities Changing Together	110	162,163
		2. Proportions	111	164,165
			112	166
			113	167
			114	168
		Exercise, Problems and Evaluation	115,116	169
Geometric Figures	13	**Regular Polygons and Circles**		**170**
		1. Regular Polygons	117	170,171,172
			118	173
			119	174
		2. Diameters and Circumferences	120	175
			121	176
			122	177,178
			123	178,179,180
		Exercise and Evaluation	124,125	181
Geometric Figures	14	**Solids**		**182**
		1. Prisms and Cylinders	126	182,183
			127	184,185
			128	185,186
		2. Sketches and Nets of Prisms and Cylinders	129	187
			130	188
			131	189
		Exercise, Problems and Evaluation	132,133	190,191
Data and Mathematical Relations	15	**Rates and Graphs**		**192**
		1. Rates	134	192,193,194
			135	194,195
			136	196
		2. Percentages	137	197,198
			138	198,199
		3. Problems Using Rates	139	200
			140	201
			141	202
		4. Graphs Expressing Rates	142	203,204
			143	205,206
		Exercise and Evaluation	144,145	207
Summary	16	**Summary of Grade 5**		**208**
		1. Applying Mathematics in Daily Life	146	208,209
		2. Numbers and Calculations	147	210,211
		3. Measurement	148	212,213
		4. Shapes and Figures	149	214,215
		5. Relationship among Quantities	150	216
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Chapter 1 Decimal Numbers and Whole Numbers

1. Content Standard

5.1.3 Use base 10 system representation to compare and convert whole number to decimal numbers.

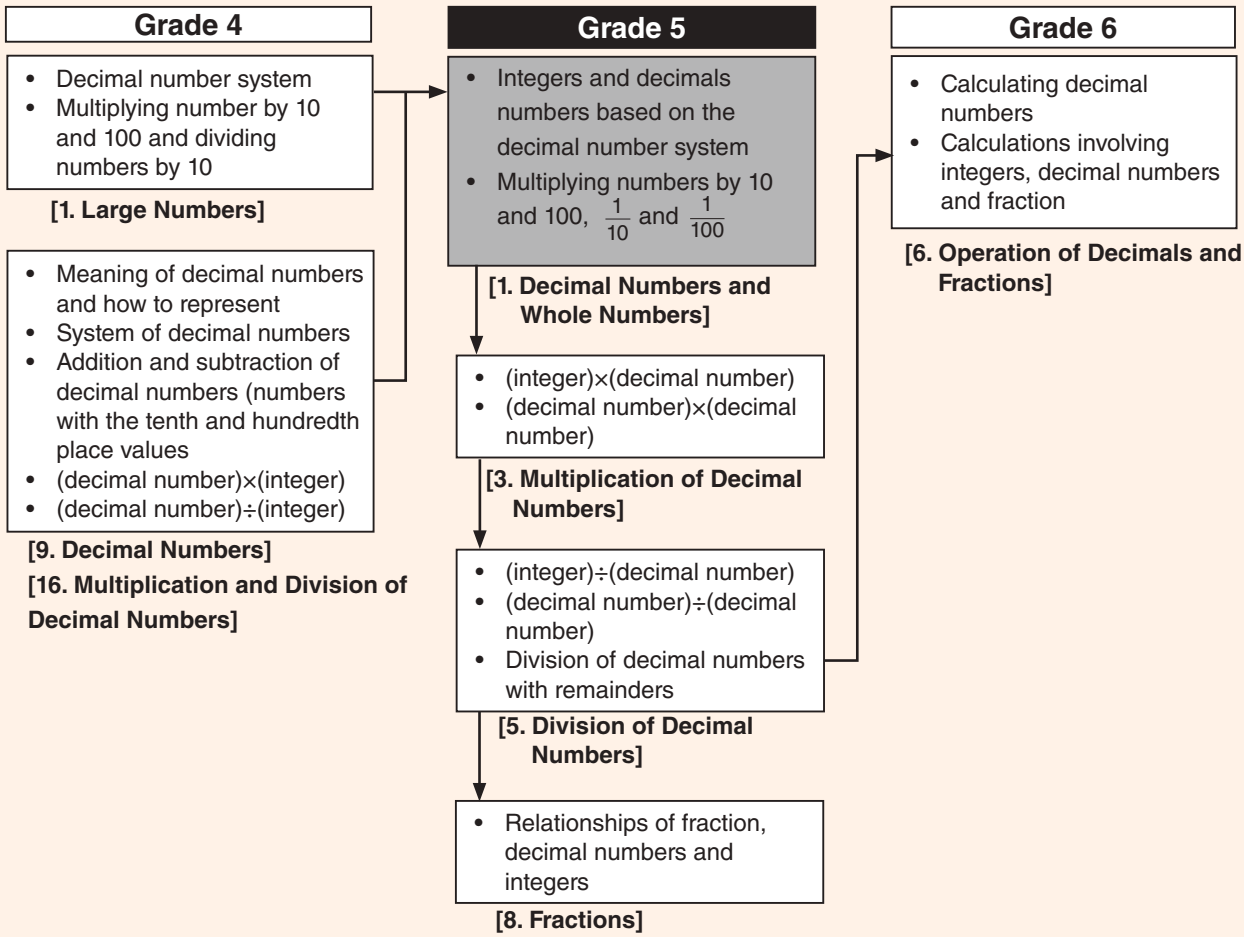
2. Unit Objectives

- To deepen the understanding about whole number and decimal number through considering decimal numeration sysytem.
- Multiply a number by 10 times, 100 times, $\frac{1}{10}$ or $\frac{1}{100}$.

3. Teaching Overview

Students learned large whole numbers and decimal numbers with up to thousandths in the previous grades. In this unit, they learn decimal numbers and whole numbers comprehensively in the same binary number system. Number place table will help students to understand how numbers slip off as they make the original number 10 and 100 times or tenths and hundredths though the arrangement of numbers does not change.

4. Related Learning Contents



Unit 1

Unit: Decimal Numbers and Whole Numbers
Sub-unit 1: The System of Decimal Numbers and Whole Numbers
Lesson 1 of 3

Textbook Pages : 002 to 005
Actual Lesson 001

Sub-unit Objective

- To deepen the understanding about the structure of whole numbers and decimal numbers.

Lesson Objectives

- To understand that a decimal and whole number have the same structure.
- To deepen understanding about the system of decimal numbers.

Prior Knowledge

- Decimal numbers up to hundredth place (Grade 4)

Preparation

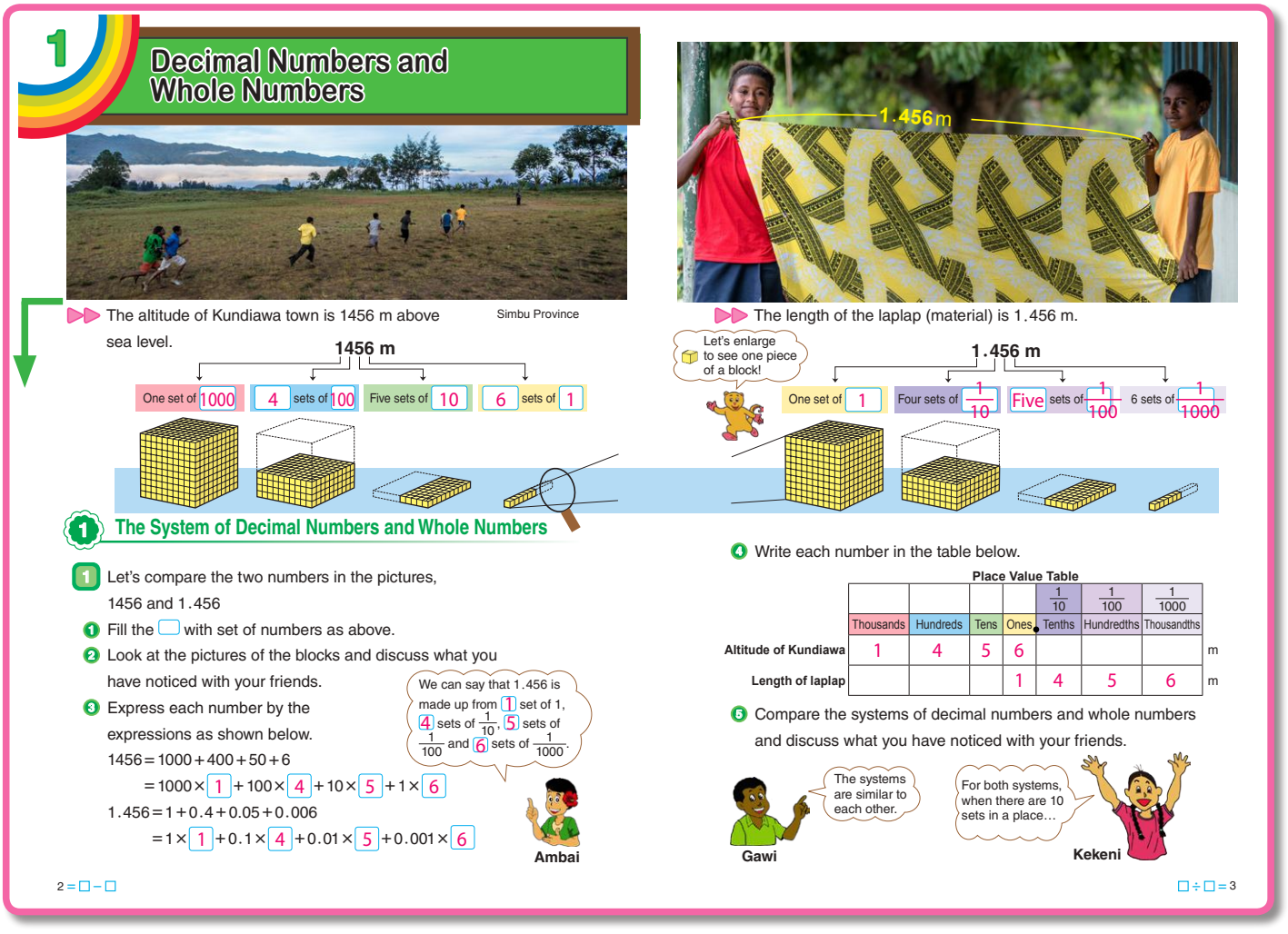
- Diagram of the structure of whole numbers and decimal numbers on pages 2 and 3

Assessment

- Enjoy comparing the structure of whole numbers and decimal numbers. F
- Demonstrate the understanding of the structure of decimal numbers by completing the tasks. S
- Solve the exercises correctly. S

Teacher's Notes

Notice that the cube diagram in the textbook is magnified. From ones place value on page 2 is further broken down to the thousandths place on page 3.
In fact, the size of the bigger block is reduced to a single cube and when seen through a magnifying lens, the emphasis is to visualise that the structure of the whole number and decimals is the same.



Lesson Flow

1 ① Comparing two numbers 1456 and 1.456

T ▶▶ Ask students to compare the altitude of Kundiawa town and the length of the laplap. What do you notice about the two numbers?
T Introduce the Main Task. (Refer to the BP)
S ① Fill in the boxes with sets of numbers for 1456 and 1.456
T ② Look at the picture of the blocks and discuss what they notice.
S The structure of blocks for whole numbers and decimal numbers are similar.
S ③ Express each number by filling in the boxes.

2 Write the whole and decimal number in the place value chart.

S ④ Fill in the place value chart with numbers.
1. The altitude of Kundiawa town.
2. The length of the laplap.

3 ⑤ Discuss the system of whole and decimal numbers.

T From the place value chart in ④, compare and discuss what you have noticed with your friends.
S There are 10 sets in a place value therefore, the systems are similar.

4 ② Think about the system of whole number and decimal number.

T Ask students to think about the system of numbers and explain what they think.
T/S ① For whole numbers;
a) How many numbers are needed in a place for it to shift to the next higher place? (10)
b) How many equal parts must a number be divided for it to shift to the next lower place? (10 equal parts)
T/S ② For decimal numbers;
a) How many numbers are needed in a place for it to shift to the next higher place?(10)
b) How many equal parts must a number be divided for it to shift to the next lower place? (10 equal parts)

5 Important Point

T/S Explain the important point in the box .

6 ③ Investigate the two calculations.

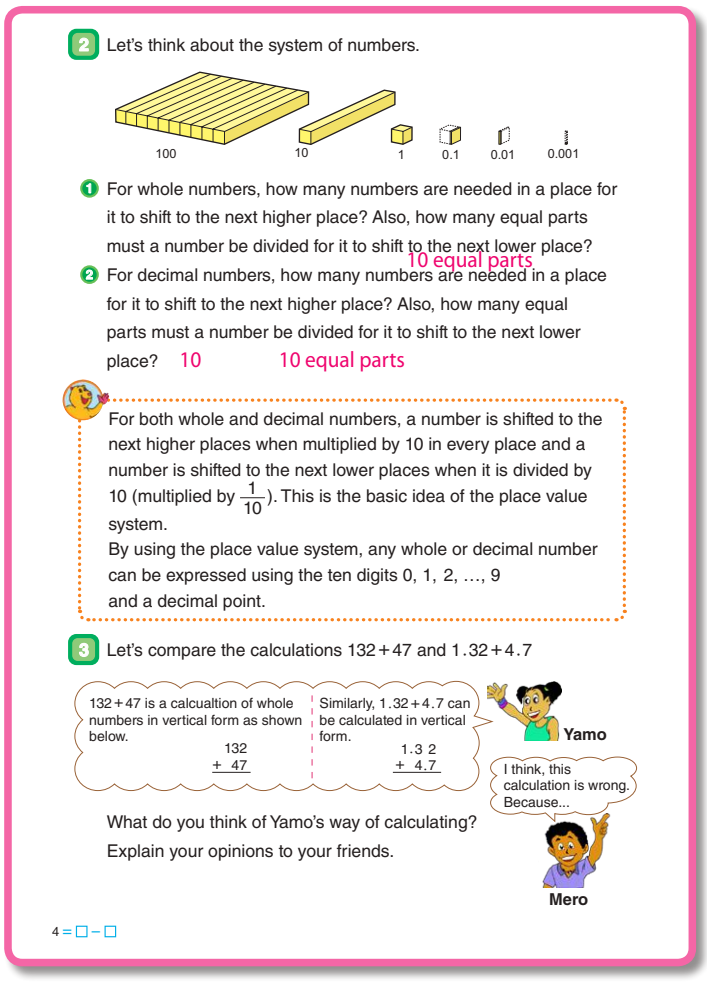
T Ask the students to do a comparison of the two ideas in the calculation of whole number and decimal number.
What do you think of Yamo's way of calculating?
S Explain their opinions to their friends.

7 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

8 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.



Page 5 of the textbook

Exercise

Let's make numbers using the ten digits from 0 to 9 once each time and a decimal point. 0.1
Write the smallest number. Write a number that is smaller than 1 and is nearest to 1. Ex 2. answer 0.9

Sample Blackboard Plan

Lesson 001 Sample Blackboard Plan is on page 7.

Unit 1

Unit: Decimal Numbers and Whole Numbers
Sub-unit 1: The System of Decimal Numbers and Whole Numbers
Lesson 2 of 3

Textbook Pages : 005 and 006
Actual Lesson 002

Lesson Objective

- To find that when we multiply a number by 10, 100, the decimal point and number moves to the right side.

Prior Knowledge

- The structure of decimal number and whole number.

Preparation

- Diagram of stickers and place value chart on pages 5 and 6.
- Place value chart for activity 3

Assessment

- Determine how the decimal point and number moves when multiplying a number by 10 or 100. F
- Solve the exercises correctly. S

Teacher's Notes

The meaning of multiplying decimal numbers is given in the table in 3 where each digit in the decimal number moves and not the decimal point.
The technique in application to calculate decimal numbers is given in 5 where we assume that the decimal point moves.

Exercise

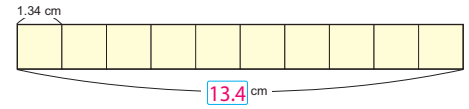
Let's make numbers using the ten digits from 0 to 9 once each time and a decimal point.
Write the smallest number. Write a number that is smaller than 1 and is nearest to 1.

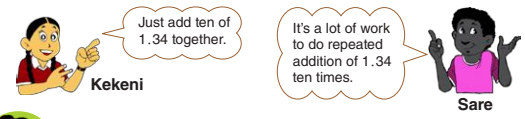
How to move the decimal point when multiplying by 10 or 100.

10 Times and 100 Times of a Number

4 Let's consider numbers multiplied by 10 and 100.

1 There are 10 stickers, each one is 1.34 cm wide and are lined up as shown below. How many centimetres (cm) is the total length?



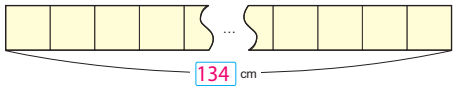


Vavi's Idea

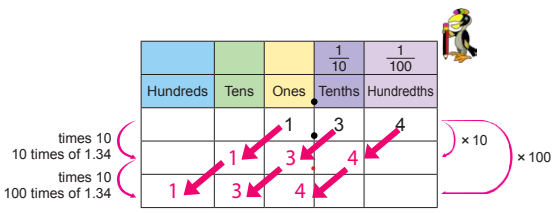
It is ten times of 1.34, so we can solve it by doing
1.34 × 10 = 13.4.

$$\begin{array}{r} 1.34 \\ \times\ \ 10 \\ \hline 13.4 \end{array}$$

2 There are 100 stickers, each one is 1.34 cm wide and are lined up. How many cm is the total length?

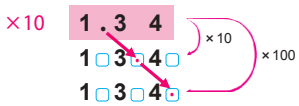


3 Write the total lengths when there are 10 stickers and 100 stickers in the table below.



4 What rules are there?

5 Write in the decimal points when 1.34 is multiplied by 10 and 100.



If a number is multiplied by 10, the decimal point moves 1 place to the right.
If a number is multiplied by 100, the decimal point moves to 2 places to the right.

Exercise

Let's answer the following questions.

① Write the numbers when 23.47 is multiplied by 10 and 100.
234.7 and 2347

② How many times of 8.72 are 87.2 and 872?
10 times and 100 times

□ ÷ □ = 5

6 = □ − □

Lesson Flow

1 Review the previous lesson.

2 ❹ ❶ Multiply 1.34 cm by 10.

T Introduce the Main Task. (Refer to the BP)
T Let's study numbers multiplied by 10.
S 10 stickers, each 1.34 cm in length are lined up as shown below.
S It's a lot of work to do addition of 1.34 ten times.
T How many centimetres is the total length?
S We can solve by multiplication using Vavi's idea.
S $1.34 \times 10 = 13.4$

3 ❷ Multiply 1.34 cm by 100.

T Let's study numbers multiplied by 100.
S It's a lot of work to do addition of 1.34 hundred times.
T How many centimetres is the total length?
S We can solve by multiplication using Vavi s idea.
S $1.34 \times 100 = 134$

4 ❸ When multiplying by 10 or 100, discuss what they notice and explain using the place value chart.

T Put up the place value chart and ask the students to fill in the blank spaces.
S Fill in the place value chart using Vavi's idea.
T ❹ Study the place value chart and share any rules discovered.
S 1. When multiplying by 10 each digits in the number moves one place higher.
2. When multiplying by 100 each digits in the number moves two places higher
T ❺ Write in the decimal points when 1.34 is multiplied by 10 and 100.
S 1. When multiplying by 10 the decimal point moves one place to the right.
2. When multiplying by 100 the decimal point moves two places to the right.

5 Important Point

T/S Explain the important point in the box .

6 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** 1 Decimal Numbers and Whole Numbers. **Topic:** Multiplying decimal number by 10 and 100. **Lesson No:** 2/3

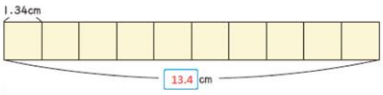
Main Task: Let's think about how to move the decimal point when multiplying by 10 and 100.

Review

MT

4 Let's consider numbers multiplied by 10 and 100.

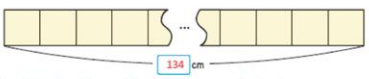
❶There are 10 stickers , each one is 1.34cm wide, are lined as shown below. How many cm is the total length?



It is a lot of work to add ten of 1.34 or do repeated addition of 1.34 ten times.
1.34 + 1.34 + 1.34 + 1.34 + 1.34 + 1.34 + 1.34 + 1.34 + 1.34 + 1.34

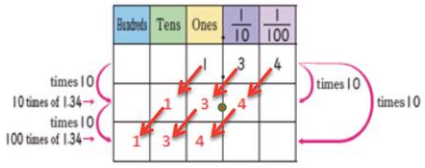
Vavi's Idea: It is ten times of 1.34, so we can solve it by doing
1.34 x 10 = ☐
1.34
x 10

❷ There are 100 stickers, each one is 1.34 cm wide, are lined up. How many cm is the total length?



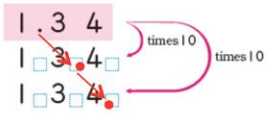
Using Vavi's idea.: It is 100 times of 1.34 so we can solve it by calculating 1.34 x 100 = 134

❸ Write the total lengths when there are 10 stickers and 100 stickers in the table.



❹ What rules are there?
Write down students responses.
Answer: When multiplying by 10 each digits in the number moves one place higher and multiplying by 100 each digit in the number moves two places higher.

❺ Write in the decimal points when 1.34 is multiplied by 10 and 100.



Important Point

Exercise

(1) Write the numbers when 23.47 is multiplied by 10 and 100.
23.47 x 10 =234.7
23.47 x 100 = 2 347

(2) How many times of 8.72 are 87.2 and 872?
10 times and 100 times.

Summary

The decimal point moves 1 place to the right when a number is multiplied by 10 and 2 places to the right when the number is multiplied by 100.

Unit 1

Unit: Decimal Numbers and Whole Numbers

Sub-unit 1: The System of Decimal Numbers and Whole Numbers

Lesson 3 of 3

Textbook Page : 007
Actual Lesson 003

Lesson Objective

- Understand that when multiplying by $\frac{1}{10}$ and $\frac{1}{100}$, the decimal point moves to the left side.

Prior Knowledge

- How to move the decimal point when multiplying by $\frac{1}{10}$ and $\frac{1}{100}$.

Preparation

- Place value chart for 1
- Chart for 3

Assessment

- Determine how the decimal point moves when multiplying a number by $\frac{1}{10}$, $\frac{1}{100}$. F
- Solve the exercises correctly. S

Teacher's Notes

For activity 1 and 2, let students give their responses and write them down on the blackboard.
Later the teacher can confirm their responses.

How to move the decimal point when multiplying by $\frac{1}{10}$ or $\frac{1}{100}$

$\frac{1}{10}$ and $\frac{1}{100}$ of a Number

5 Let's consider the numbers that are $\frac{1}{10}$ and $\frac{1}{100}$ of a number.

1 Calculate $\frac{1}{10}$ and $\frac{1}{100}$ of 296 and write the answers in the table below.

$\frac{1}{10}$ of 296 is as follows:
$\frac{1}{10}$ of 200 is 20
$\frac{1}{10}$ of 90 is 9
$\frac{1}{10}$ of 6 is 0.6
20 + 9 + 0.6 = 29.6
then, $\frac{1}{10}$ of 296 is 29.6

	Hundreds	Tens	Ones	$\frac{1}{10}$	$\frac{1}{100}$
$\frac{1}{10}$ of 296 → $\frac{1}{10}$	2	9	6		
$\frac{1}{100}$ of 296 → $\frac{1}{10}$		2	9	6	
			2	9	6

2 What rules are there? When multiplying by $\frac{1}{10}$, digits move one place to the left.

3 Write the decimal points of numbers that are $\frac{1}{10}$ and $\frac{1}{100}$ of 296 in the ☐ below.

2 9 6
2☐9☐6☐
2☐9☐6☐

$\frac{1}{10}$ of a number moves the decimal point 1 place to the left.
$\frac{1}{100}$ of a number moves the decimal point 2 places to the left.

Exercise

Let's answer the following questions.
① Write the numbers that are $\frac{1}{10}$ and $\frac{1}{100}$ of 30.84 3.084 and 0.3084
② What are 6.32 and 0.632 as a multiple of 63.2?

$\frac{1}{10}$ $\frac{1}{100}$

☐ ÷ ☐ = 7

Lesson Flow

1 Review the previous lesson.

T Introduce the Main Task. (Refer to the BP)

2 5 Considering the numbers that are $\frac{1}{10}$ and $\frac{1}{100}$ of 296.

T 1 Ask students to fill in the place value chart using the hint from the Kapul.

S Fill in the place value chart with the answers for $\frac{1}{10}$ of 296 and $\frac{1}{100}$ of 296.

T 2 From the place value chart in 1, what rules have you discovered?

S 1. When multiplying by $\frac{1}{10}$ each digit in the number moves one place lower than 1.
2. When multiplying by $\frac{1}{100}$ each digit in the number moves two places lower than 1.

T 3 Write in the decimal points of numbers that are $\frac{1}{10}$ and $\frac{1}{100}$ of 296 in the ☐.

S 1. When multiplying by $\frac{1}{10}$ the decimal point moves one place to the left.
2. When multiplying by $\frac{1}{100}$ the decimal point moves two places to the left.

3 Important Point

T/S Explain the important point in the box ⬚.

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

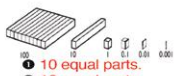
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 1)

Date: **Chapter:** 1 Decimal Numbers and Whole Numbers. **Topic:** Structure of the whole and decimal numbers. **Lesson No:** 1/3

Main Task: Let's think about how to compare the systems of whole numbers and decimal numbers.

2 Let's think about the system of numbers.



1 10 equal parts.
2 10 equal parts.

4 Write each number in the table below.

	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
Altitude of Kundiawa.	1	4	5	6		
Length of laplap.			1	4	5	6

Compare the altitude of Kundiawa Town and the length of the laplap. What do you notice about the two numbers?

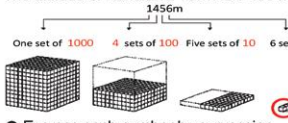
MT

Important Point

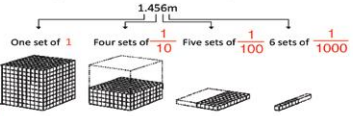
1 Let's compare the two numbers 1456 and 1.456

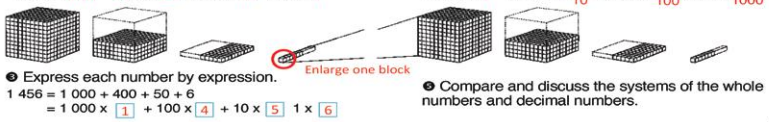
Activity 1 and 2

The altitude of Kundiawa Town is 1 456 m.



The length of the laplap with designs is 1.456 m.





3 Let's compare the calculations 132 + 47 and 1.32 + 4.7

(1) 132 + 47 = 179 (2) 1.32 + 4.7 (3) 1.32 + 4.7 = 6.02

The calculation cannot be done as in (2) because the numbers are not aligned in their correct place value. Use (3) because it is aligned correctly in their place value.

Exercise

Let's make numbers using the ten digits from 0 to 9 once each time and a decimal point. Write the smallest number. 0.1

Summary

- The structure of the whole numbers shift to the next higher place when multiplied by 10.
- The structure of the whole numbers shift to the next lower place when multiplied by 1/10.

2 Express each number by expression.

1 456 = 1 000 + 400 + 50 + 6
= 1 000 × 1 + 100 × 4 + 10 × 5 + 1 × 6

1.456 = 1 + 0.4 + 0.05 + 0.006
= 1 × 1 + 0.1 × 4 + 0.01 × 5 + 0.001 × 6

5 Compare and discuss the systems of the whole numbers and decimal numbers.

Sample Blackboard Plan (Lesson 3)

Date: **Chapter:** 1 Decimal Numbers and Whole Numbers. **Topic:** Multiplying decimal number by $\frac{1}{10}$ and $\frac{1}{100}$ **Lesson No:** 3/3

Main Task: Let's think about how to move the decimal point when multiplying by $\frac{1}{10}$ and $\frac{1}{100}$

Review

MT

5 Let's consider the numbers that are and

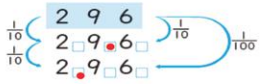
1 Calculate and 296 and write the answers in the table.

	Hundreds	Tens	Ones	$\frac{1}{10}$	$\frac{1}{100}$
	2	9	6		
$\frac{1}{10}$ of 296 →		2	9 • 6		
$\frac{1}{100}$ of 296 →			2 • 9	6	

2 Write down students responses.

Answer: When multiplying by each digits in the number moves one place lower and when multiplying by each digits in the number moves two places lower.

3 Write down the decimal points of the numbers that are and of 296 in the



Important Point

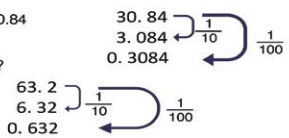
Exercise

(1) Write the numbers that are $\frac{1}{10}$ and $\frac{1}{100}$ of 30.84

3.084 and 0 3084

(2) What are 6.32 and 0.632 as a multiple of 63.2?

By $\frac{1}{10}$ and $\frac{1}{100}$ respectively.



Summary

The decimal point moves 1 place to the left when a number is multiplied by $\frac{1}{10}$ and 2 places to the left when the number is multiplied by $\frac{1}{100}$.

Unit 1

Unit: Decimal Numbers and Whole Numbers
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Pages : 008 and 009
Actual Lesson 004 and 005

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems 1, Problems 2 and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems 1 and 2 correctly. S

Teacher's Notes

This is the last lesson of Chapter 1. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

Structure of decimal numbers and whole numbers

1 Let's fill the ☐ with numbers. Page 2

① 86.1 = 10 ×8+ 1 ×6+ 0.1 ×1

② 0.0072 = 0.001 ×7+ 0.0001 ×2

2 Let's summarise the common features with both decimal numbers and whole numbers. Page 4

① For both whole numbers and decimal numbers, when there are 10 sets of a number, it is shifted one place higher. When a number is divided into 10 parts, it is shifted one place lower. Whole and decimal numbers are both, based on the place value system.

② Any whole or decimal number can be expressed by using the ten digits from 0 to 9 and a decimal point. Pages 6 and 7

3 Let's write numbers that are 10 times and 100 times of 36.05 and numbers that are $\frac{1}{10}$ and $\frac{1}{100}$ of 36.05

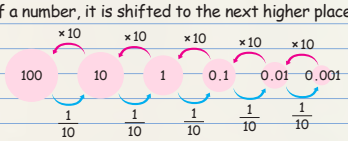
360.5 3605 3.605 0.3605

Summarise what you have learned on your exercise book.

1. Decimal numbers and whole numbers

(1) What I understood.

For both whole numbers and decimal numbers, when there are 10 sets of a number, it is shifted to the next higher place value.



(2) Some interesting facts.

A number that is 10 times or $\frac{1}{10}$ of a number can be made by moving a decimal point.

10 times 1.34 is 13.4 and $\frac{1}{10}$ of 1.34 is 0.134

Red and blue arrows are used to show what we've understood.

8 = ☐ − ☐

PROBLEMS 1

1 Express the following quantities by using the units written in the ( ).

● Changing denominations by using decimal numbers.

① 8695 g (kg) 8.695 kg ② 320 mL (L) 0.32 L ③ 3.67 km (m) 3670 m ④ 67.2 m (cm) 6720 cm

2 Let's answer the following questions.

● Understands numbers that are 10 times, 10 es, $\frac{1}{10}$, $\frac{1}{100}$ of a number.

① Times 0.825 by 10. 8.25 ② Times 5.67 by 100. 567

③ $\frac{1}{10}$ of 72.3 7.23 ④ $\frac{1}{100}$ of 45.2 0.452

3 Let's find given numbers.

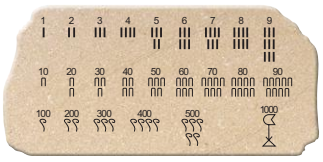
● Understands the relationship between decimal numbers and times 10, times 100, $\frac{1}{10}$ and $\frac{1}{100}$.

① When a given number was multiplied by 10 and further multiplied by 100, it became 307.4 0.3074

② When a given number was multiplied by 100 and further divided by $\frac{1}{10}$, it became 20.5 2.05

③ When a given number was divided by $\frac{1}{10}$ and further divided by $\frac{1}{100}$, it became 0.175 175

PROBLEMS 2



Egyptian numeral system

1 When 176 is expressed in Egyptian numerals, it is as written below.

● Able to investigate the system of whole numbers.

① Write as a whole number. 132

② Let's compare the way of Egyptian numeral to the way you have learned to express numbers and write them down.

③ Let's calculate $\begin{array}{r}176\\+244\end{array}$ in Egyptian numerals.

☐ ÷ ☐ = 9

Lesson Flow

1 ① Let's fill in the box with numbers.

T Ask students to complete activity ① and ② on the blackboard.
S Write their answers on the board, other students confirm.

2 Complete Exercise ② and ③

T Ask students to work individually to complete task 2 and 3.
S Work individually to complete task then share their ideas with their friends.
T Confirm answers with students

3 Solve the Problems 1

S Solve all the problems.
T Confirm students' answers.

3 Solve the Problems 2

S Solve all the problems.
T Confirm students' answers.
TN Collect students' books for marking if time does not allow.

4 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.
S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 1: Decimal Numbers and Whole Numbers	Name:	Score / 100

[10×10 marks=100 marks]

1. Fill in the words or numbers in the □ below.

(1) The 7 in 3.57 is on the place value of □. Answer: Hundredths

(2) The number of 10 times 0.24 is □. Answer: 2.4

2. Fill in the numbers in each □.

(1) 4651=4×1000+6×100+5×10+1×1

(2) 2.174=2×1+1×0.1+7×0.01+4×0.001

3. Find the numbers.

(1) 10 times 0.618 Answer: 6.18

(2) 100 times 10.25 Answer: 1025

(3) $\frac{1}{10}$ of 70.3 Answer: 7.03

4. You make a decimal number by inserting one digit number in the □ of 5.6 □ 7.

(1) What is the biggest decimal number? Answer: 5.697

(2) What is the smallest decimal number? Answer: 5.607

(3) Select all the numbers which are greater than 5.66 from the numbers below.
5.687 , 5.637 , 5.60

Answer: 5.687

10

End of Chapter Test **Date:**

Chapter 1: Decimal Numbers and Whole Numbers	Name:	Score / 100

[10×10 marks=100 marks]

1. Fill in the words or numbers in the □ below.

(1) The 7 in 3.57 is on the place value of □. Answer: ____

(2) The number of 10 times 0.24 is □. Answer: ____

2. Fill in the numbers in each □.

(1) 4651 = □ × 1000 + □ × 100 + □ × 10 + □ × 1

(2) 2.174 = 2 × □ + 1 × □ + 7 × □ + 4 × □

3. Find the numbers.

(1) 10 times 0.618 Answer: ____

(2) 100 times 10.25 Answer: ____

(3) $\frac{1}{10}$ of 70.3 Answer: ____

4. You make a decimal number by inserting one digit number in the □ of 5.6 □ 7.

(1) What is the biggest decimal number? Answer: ____

(2) What is the smallest decimal number? Answer: ____

(3) Select all the numbers which are greater than 5.66 from the numbers below.
5.687 , 5.637 , 5.60

Answer: ____

Chapter 2 Amount per Unit Quantity

1. Content Standard

5.4.1 Explore proportions in two changing quantities and explain the patterns by using the relation of direct proportionality.

2. Unit Objectives

- To understand how to express mean through working with quantity per unit.
- To think about the amount based on measurement of per unit quantity.

3. Teaching Overview

Mean :

Students are given actual situation that require leveling off data such as number of laps run by students for them to understand the concept of averaging.

The action of averaging is a way of finding ideal situations such as “what if everybody ran the same number of laps?” or “what if every cup holds the same amount of water?”

They deal with both discrete quantities for example something countable such as number of people or fruits, and continuous quantities such as lengths, volume, weight etc.

Discrete quantities were easy for students to understand in the previous grades and continuous quantities were not since they had to think of uncountable quantities such as some amount between 1 and 2 litres.

However, it will be rather difficult for students to think about the mean of discrete quantities in this unit than the mean of continuous quantities.

For instance, the mean of water in 3 containers can be expressed in a decimal value.

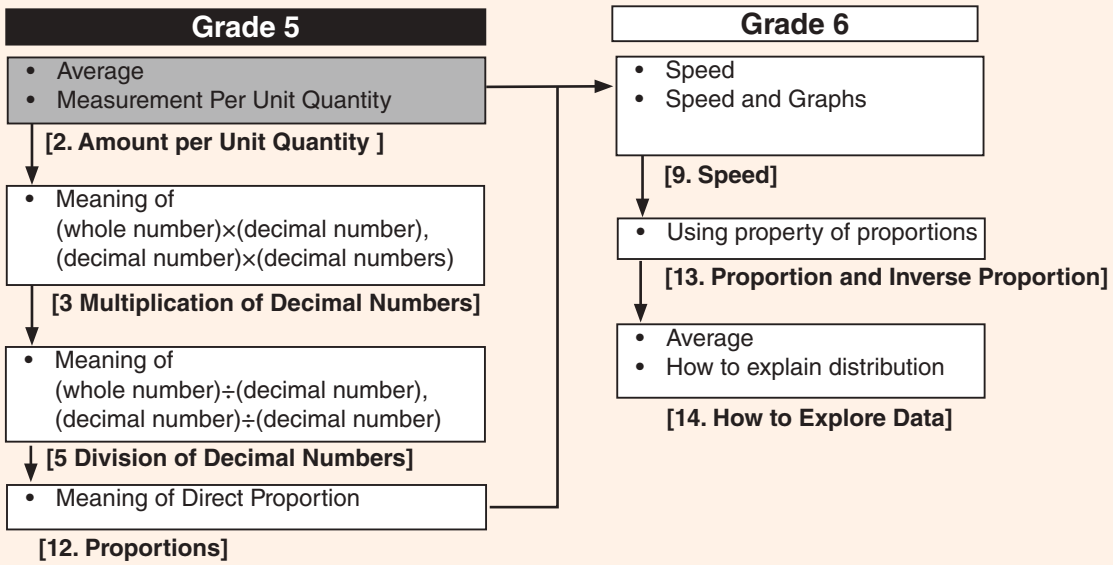
However, the mean of the number of bananas held by 3 children can be expressed as a decimal value like 2.4 bananas which is not realistic. Students should understand that mean can be expressed in decimal or fraction even though the objects are countable.

Amount per Unit Quantity :

This is a difficult concept for students since the measurement is called synthetic quantity. In the case of comparing degrees of congestions with different number of people within different areas, they need to make ideal situations such as “same area, different number of people” or “different areas, same number of people”.

Finally, they will find out the formula, number of people ÷ area.

4. Related Learning Contents



Unit 2

Unit: Amount per Unit Quantity
Sub-unit 1: Mean
Lesson 1 of 3

Textbook Pages : 010 to 012
Actual Lesson 006

Sub-unit Objectives

- To define the meaning of mean and how to use it.
- To find mean from various quantities.

Lesson Objective

- To understand how to balance a quantity.

Prior Knowledge

- Bar Graph

Preparation

- Table and Bar Graphs to be placed on the blackboard
- Grid papers to draw bar graph (Students can copy the graphs from the textbook)
- Paper Blocks

Assessment

- Apply the idea of balancing to compare two quantitites. F
- Explain averaging. S

Teacher's Notes

- In this lesson, we can balance the laps run by Sam and Yapi. When preparing graphs, make the squares for balancing be movable so it will be easy to show the idea of averaging when balancing.
- Key Phrases
  1) Sam ran 5 days making 40 laps
  2) Yapi ran 4 days making 36 laps
- The following are important mathematical terms that can be used in their discussions, **If** and **Then**.

Lesson Flow

1 Think about the laps run by two children.

T Ask the students to look at the pictures and have pre-discussion.

S Do pre-discussions using the pictures.

T/S ▶▶ Read and understand the situation and use the table to discuss.

T ① What can you interpret from the two tables?

S Possible responses.
Sam trained for 5 days and made 40 laps.
Yapi was sick on Friday so he ran for 4 days and made 36 laps.

T ▶▶ Who is more prepared for the sports carnival? Is it Sam or Yapi?

T/S Discuss the hints from the four friends and estimate which child is more prepared.

TN • If two students run the same number of days then we can compare.
• If they run the same laps then we can compare.

T Introduce the Main Task. (Refer to the BP)

2 Understanding the meaning of averaging.

T/S ① Read and understand the situation.

T ① How can we make the number of laps the same every day?

T/S Discuss and understand that we can easily compare when we have total number of laps (40) and same number of laps per day.

TN Bring some of the laps from the larger number of laps to smaller number.

S Manipulate the paper blocks to balance the graph.

S Draw bar graph to balance the graph for Sam.

T How many laps did Sam ran each day?

S 8 laps per day.

T ② How can we make the number of laps the same every day?

T/S Discuss and understand that we can easily compare when we have total number of laps (36) and same number of laps per day.

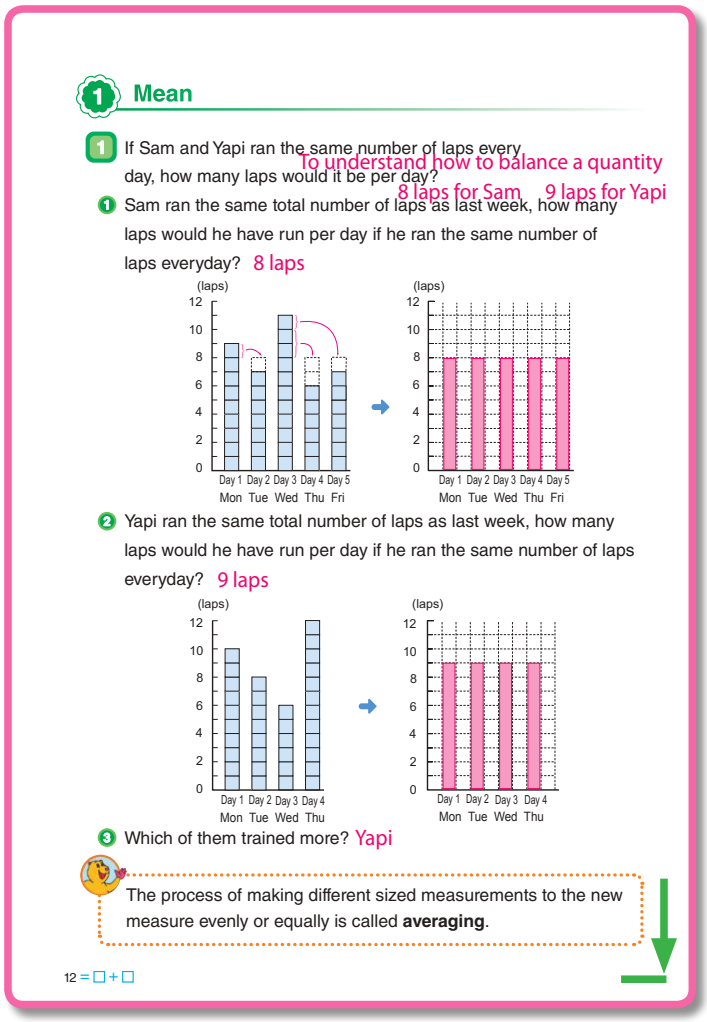
TN Bring some of the laps from the larger number of laps to smaller number.

S Use the graph and manipulate with the blocks.

S Draw bar graph to balance the graph for Yapi.

T How many laps did Yapi run each day?

S 9 laps per day.



3 Comparing their efforts, who trained more?

T ③ Which child trained more?

S Yapi

T Why do you say Yapi?

S After balancing we realise that Yapi ran more with a total of 9 laps each day.

4 Important Point

T/S Explain the important point in the box .

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Lesson 006 Sample Blackboard Plan is on page 15.

Unit 2

Unit: Amount per Unit Quantity
Sub-unit 1: Mean
Lesson 2 of 3

Textbook Page : 013
Actual Lesson 007

Lesson Objective

- To think about how to find the mean of some numbers or quantities.

Prior Knowledge

- Introduction to averaging

Preparation

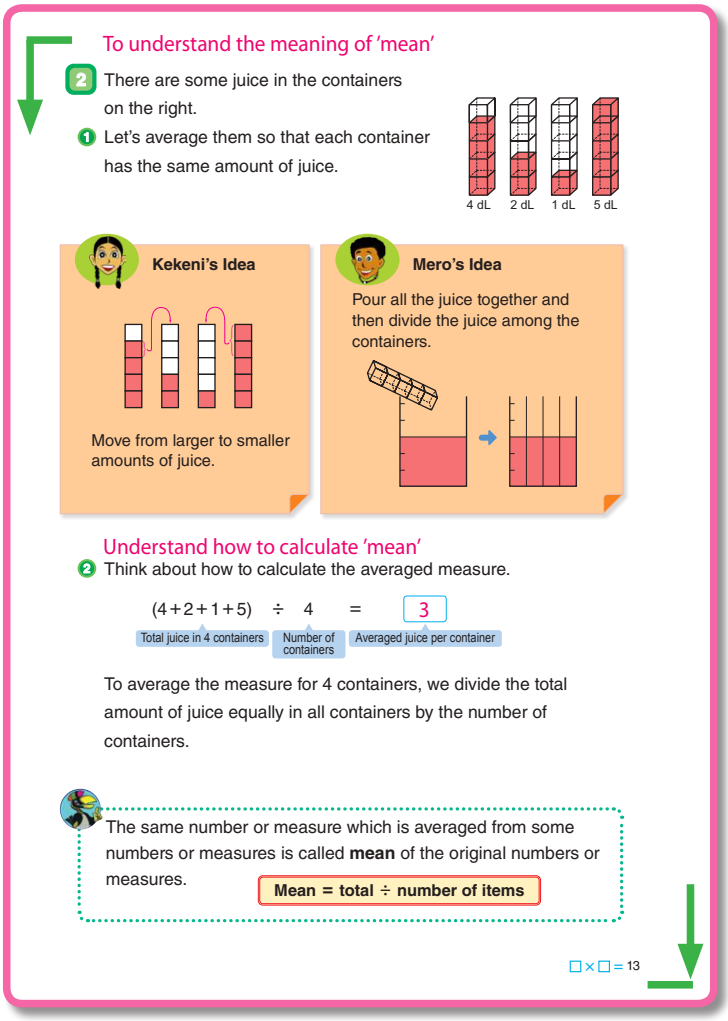
- Diagram of juice representation
- Diagram of Kekeni's and Mero's ideas

Assessment

- Think about how to find the mean measure. F
- Define mean and explain how to find mean. S

Teacher's Notes

- The definition of mean can be explained well using Mero's idea. Teacher use Mero's idea to explain mean. Pour all the juice together (4+2+1+5) and then divide the juice among 4 containers.
- Notice that when calculating the mean, brackets are used, so apply BODMAS in the calculation.
- Average is the process of making different sized measures to new measure evenly or equally.
- Mean is the same number of measure which is averaged from some numbers or measures.
- The concept of averaging is used in everyday life therefore, it is important for students to understand how averaging is done in this lesson.



Lesson Flow

1 Review the previous lesson.

2 Think about how to balance the amount of juice with various dL.

T/S ❷ Read and understand the situation.
T Ask students to observe the chart and think about ways to balance.
S Think of ways on how to balance the amounts of juice and present their ideas.
T Introduce the Main Task. (Refer to the BP)
T ❶ Let's average them so that each container has the same amount of juice.
TN Let students to observe Kekeni's and Mero's ideas while the teacher explains.
S Briefly explain Kekeni's and Mero's ideas to make conclusions on how to calculate the mean.
T Make emphasis on Kekeni's and Mero's ideas.

3 ❷ Discuss how to calculate the mean.

T Can we express how to find the mean in a mathematical sentence?
S Yes, by using Mero's idea, the mathematical sentence can be written as $(4+2+1+5)\div 4=3$

4 Important Point

T/S Explain the important point in the box .

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 6)

Date: **Chapter:** 2 Amount per Unit Quantity. **Topic:** Mean **Lesson No:** 1/3

MT: Let's think about how to balance a quantity using laps run by two children.

Pre-discussion and students' responses using the pictures and the tables.

Number of Laps Sam ran.

Days	Mon	Tue	Wed	Thu	Fri	Total
No. of laps	9	7	11	6	7	40

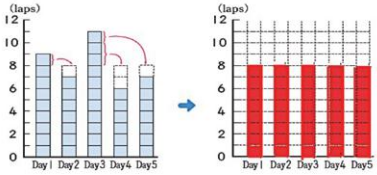
Number of Laps Yapi ran.

Days	Mon	Tue	Wed	Thu	Total
No. of laps	10	8	6	12	36

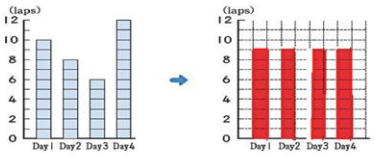
MT

❶ If Sam and Yapi had run the same number of laps every day, how many laps would it be per day?

❶ Sam ran the same total number of laps as last week, how many laps would he have run per day if he ran the same number of laps everyday? 8 laps



❷ Yapi ran the same total number of laps as last week, how many laps would he have run per day if he ran the same number of laps everyday? 9 laps



❸ Which of them trained more? Yapi because after balancing it is obvious he ran more with a total of 9 laps each day.

Important Point

Summary

To balance a quantity per unit, level all the data from the total quantity.

Sample Blackboard Plan (Lesson 7)

Date: **Chapter:** 2 Amount per Unit Quantity. **Topic:** Mean **Lesson No:** 2/3

MT: Let's think about how to average measure.

Review

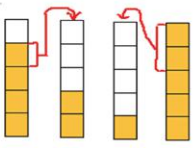
❷ There are some juice in the containers on the right.

❶ Let's average them so that each container has the same amount of juice.

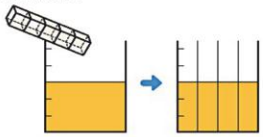
Write down students ideas using ideas from the previous lesson.

MT

Kekeni's Idea: Move from larger to smaller amounts of juice.



Mero's Idea: Pour all the juice together and then divide the juice among the containers.



❷ Think about how to calculate the averaged measure.

$(4+2+1+5)\div 4 = 3$

Total juice in 4 containers. Number of containers. Averaged juice per container.

To average the measure for 4 containers, we divide the total amount of juice equally in all containers by the number of containers.

Important Point

Summary

To find the mean of numbers or quantities:
- We move from larger to smaller amounts of quantity (juice) to make it even.
- We total the amounts (juice) and then divide by he total number of items (containers).

Mean = total ÷ number of items.

Unit 2

Unit: Amount per Unit Quantity
Sub-unit 1: Mean
Lesson 3 of 3

Textbook Page : 014
Actual Lesson 008

Lesson Objectives

- To understand that mean can be used to express measurement which cannot be averaged in reality.
- To understand that mean can be expressed in decimal numbers.

Prior Knowledge

- Averaging
- Definition of mean

Preparation

- Diagram representation 3
- Table for 4

Assessment

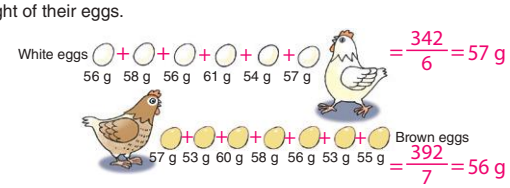
- Understand and explain that mean is applicable for measurements which cannot be averaged in reality. F
- Calculate mean for measurements which cannot be averaged in reality. S

Teacher's Notes

- Lesson Objective one refers to discrete quantity.
- The mean can be expressed in decimal when we are comparing two or more quantities.
- Calculators can be used to calculate the mean in this lesson.
- For task 4, explain the use of zero (the number of books Ken read) in the equation of mean that it is included in the 'number of items'.
- The answer in task 4 as 2.8 can be said as almost 3.

Calculating 'mean' to express measurement that cannot be averaged in reality

3 There were 2 chickens, one laid brown and the other laid white eggs. The weights are shown below.
Which of the eggs are heavier? Compare by calculating the mean weight of their eggs.



Even for things that cannot be averaged in real life, if the number and amount is known, the mean can be calculated.

Understanding the expression of 'mean' as a decimal number

4 The table below shows the number of books 5 students read in August. What is the mean number of books read by the 5 students? 2.8

Number of Books Read

Name	Boni	Yata	Ken	Sawa	Yaling
Number of books read	4	3	0	5	2

$= \frac{14}{5} = 2.8$

Even for things that are impossible to be expressed in decimal numbers, like number of books, the mean can be expressed in decimal numbers.

14 = □ + □

Lesson Flow

1 Review the previous lesson.

2 Calculating mean to express measurement that cannot be averaged in reality.

T Introduce the Main Task. (Refer to the blackboard plan)

T/S 3 Read and understand the situation.

T Compare by calculating the mean weight of white eggs and mean weight of yellow eggs.

S Compare the weight by calculating mean using: Mean = total ÷ number of items

S White eggs 56 + 58 + 56 + 61 + 54 + 57 = 342 ÷ 6 = 57 answer : 57 g
Brown eggs 57 + 53 + 60 + 58 + 56 + 53 + 55 = 392 ÷ 7 = 56 answer : 56 g
Therefore, white eggs are heavier.

T Confirm answers with students'.

3 Important Point

T/S Explain the important point in the box ( ).

4 Understanding the expression of mean as a decimal number.

T/S 4 Read and understand the situation.

T Study the table given in 4 and calculate the mean number of books read by 5 students.

S Use Mean = total ÷ number of items, 4 + 3 + 0 + 5 + 2 = 14 ÷ 5 = 2.8

TN Through the process of calculating, realise that the answer is between 2 – 3 books. Book cannot be divided though we can still use mean.

5 Important Point

T/S Explain the important point in the box ( ).

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

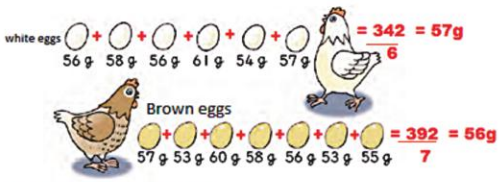
Date: **Chapter:** 2 Amount per Unit Quantity. **Topic:** Mean **Lesson No:** 3/3

MT: Let's think about how to average things in real life situations.

Review

MT

3 2 chickens laid white and brown eggs. Which of the eggs are heavier? Compare by calculating the mean weight of their eggs.



The white eggs are heavier.

Important Point

4 The table shows the number of books 5 students in Boni's group read in August. What is the mean number of books read by the 5 students ?

Number of Books Read.

Name	Boni	Yata	Ken	Sawa	Yaling
Number of books read.	4	3	0	5	2

What is the mean number of books read by 5 students?

$4 + 3 + 0 + 5 + 2 = \frac{14}{5} = 2.8$

We cannot say 2.8 books read , however we can say 2 to 3 books were read by each student.

Important Point

Summary

- Mean can be calculated even if they cannot be averaged in real life situation.
- Mean can be expressed in decimal numbers.

Unit 2

Unit: Amount per Unit Quantity
Sub-unit 2: Amount per Unit Quantity
Lesson 1 of 5

Textbook Page : 015 and 016
Actual Lesson 009

Sub-unit Objectives

- To recognise the relationships between multiplicands, multipliers and products based on the features of multiplication table and identify rules and patterns.
- To understand cummulative law of multiplication.

Lesson Objectives

- To understand that when comparing the crowd, the size of area and number of people are related.
- To understand that we can compare the quantity per area when we adjust number of people or area.

Prior Knowledge

- Averaging quantity
- Calculating mean

Preparation

- Task 1 information for Ⓐ, Ⓑ and Ⓒ
- Chart with blank Table for 1 and 2

Assessment

- Think about and explain how to compare crowdedness using pictures. F
- Compare using same measure; number of students and area. S

Teacher's Notes

To find the quantity per unit, we need to find the total quantity and divide. In the example of textbook page 15, we find the average number of students for a mat. This is the first time for students to learn measurement per unit, followed by population density (people/km²), speed (km/h) etc. Take enough time in the introduction or conclusion for students to understand this idea otherwise students might be left behind. In this case they should think and find the crowdedness with 2 quantities: number of students and number of mats.

2 Amount per Unit Quantity

1 Students are standing on the mats. Each mat is of the same size. Which one of Ⓐ, Ⓑ and Ⓒ is more crowded?

Ⓐ 2 mats, 12 students.
Ⓑ 3 mats, 12 students.
Ⓒ 3 mats, 15 students.

Ⓐ 2 mats, 12 students.

Ⓑ 3 mats, 12 students.

Ⓒ 3 mats, 15 students.

Let's think about how to compare crowdedness.

□ × □ = 15

1 Let's compare which one is more crowded?

Ⓐ or Ⓑ → Ⓐ

	Number of mats	Number of students
Ⓐ	2	12
Ⓑ	3	12
Ⓒ	3	15

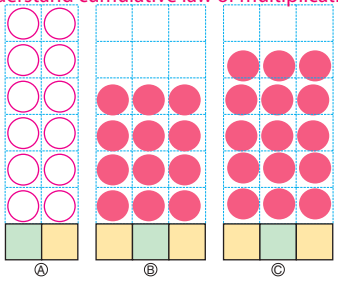
When the number of students are the same, the one with Less mats is more crowded.

Ⓑ or Ⓒ → Ⓒ

When the number of mats are the same, the one with More students is more crowded.

Compare Ⓐ or Ⓒ → Ⓐ

2 Let's find out how many students are on each of the mats.
To understand cumulative law of multiplication.



16 = □ + □

Lesson Flow

1 Review the previous lesson.

2 Discuss the pictures Ⓐ, Ⓑ and Ⓒ and identify which is more crowded.

T/S ❶ Read and understand the situation.

T Allow students to discuss and compare the crowdedness in Ⓐ, Ⓑ and Ⓒ.

S Possible responses;
Ⓐ 2 mats with 12 students is very crowded.
Ⓑ 3 mats with 12 students is less crowded.
Ⓒ 3 mats with 15 students is very crowded.

TN Confirm the answer in ❷.

T Introduce the Main Task. (Refer to the BP)

3 Think about how to compare the crowdedness of students.

TN Refer to the table to compare.

T ❶ Compare Ⓐ and Ⓑ, which is more crowded and why?

S Ⓐ is more crowded. When the number of students are the same the one with less mats is more crowded.

T Compare Ⓑ and Ⓒ, which is more crowded and why?

S Ⓒ is more crowded. When the number of mats are same, the mat with more students is more crowded.

T Compare Ⓐ and Ⓒ, which is more crowded and why?

S It is difficult to compare because both number of students and mats are different.

4 Find out the crowdedness of Ⓐ and Ⓒ using the unit idea.

T ❷ Find out how many students are on each mat.

TN Draw circles in each square as shown for Ⓐ and complete for Ⓑ and Ⓒ to compare Ⓐ and Ⓒ .

S Ⓐ is more crowded because 6 students can share one mat whereas in Ⓒ 5 students can share one mat.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** 2 Amount per Unit Quantity. **Topic:** Measurement per Unit Quantity. **Lesson No:** 1/5

Main Task: Let's think about how to compare the crowdedness.

Review

Children are standing on mats. Which one of A, B and C is more crowded?

A. 2 mats 12 students
B. 3 mats 12 students
C 3 mats 15 students
— Observe the pictures, discuss and describe the crowdedness using the text book.

MT

❶Which is more crowded?

	Mat	No. of Students
A	2	12
B	3	12
C	3	15

Compare A or B → A

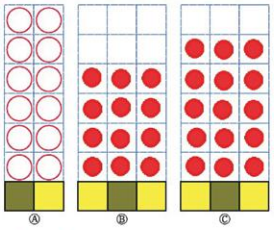
When the number of students are the same, the one with less mats is more crowded.

Compare B or C → C

When the number of mats are the same, the one with more students is more crowded.

Compare A or C → A

❷ Let's find out how many students are on each of the mats.



A: 6 students per mat.
B: 4 students per mat.
C: 5 students per mat.

Summary

- When comparing the number of students in a given area, we understand that the crowdedness of people and size of area are related.
- We can then say the number of people per area is the amount per unit quantity.

Unit 2

Unit: Amount per Unit Quantity
Sub-unit 2: Amount per Unit Quantity
Lesson 2 of 5

Textbook Page : 017
Actual Lesson 010

Lesson Objective

- To understand how to compare the crowdedness by using amount per unit quantity.

Prior Knowledge

- Averaging quantity
- Calculating mean

Preparation

- Chart of the important point

Assessment

- Compare the crowdedness through calculation using same unit. F
- Solve the exercises correctly. S

Teacher's Notes

- We introduce the unit of area in this lesson. The students should understand that the level of crowding can be measured by number of people per 1 m² or per 1 km².
- Ⓐ and Ⓑ - same number of students, different number of mats.
- Ⓑ and Ⓒ - same number of mats different number of students.
- Ⓐ and Ⓒ - different number of mats and students.

Understand how to compare crowding using per unit quantity

3 The area of 1 mat is 1 m².
How many students are there in per 1 m² ?

Ⓐ 12 ÷ 2 = 6
Ⓑ 12 ÷ 3 = 4
Ⓒ 15 ÷ 3 = 5

Number of students | Area (m²) | Number of students per 1 m²

The level of crowding is expressed by 2 measures, the number of students and the area.
Usually we compare the level of crowding by using the same unit, such as **1 m²** or **1 km²**.
When people are not grouped in an organised way, the number of people per 1 m² expresses the mean of crowding.

Exercise

① Two groups of children are playing in two different garden shelters. One group has 10 children playing in a 8 m² garden shelter and the other group has 13 children playing in a 10 m² garden shelter. Which garden shelter is more crowded?

10 ÷ 8 = 1.25
13 ÷ 10 = 1.3
10 m² garden shelter is more crowded

② There are two communities. Samuel's community with 7 km² and 1260 people and Robert's community with 10 km² and 1850 people. Which community is more populated?

1260 ÷ 7 = 180 1850 ÷ 10 = 185
Robert's community is more crowded

□ × □ = 17

Lesson Flow

1 Review the previous lesson

2 Understanding how to compare crowdedness using amount per unit quantity.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T How can we compare the number of students per 1 m²?
S Identify that area of 1 mat is equal to 1 m², 2 mats is equal to 2 m² and 3 mats is equal to 3 m².
T ❸ How can we find the number of students in per 1 m²?
S Explain that the mathematics sentences is the number of students divided by the area of mat.
A. is 12 ÷ 2 = 6 students per m².
B. is 12 ÷ 3 = 4 students per m².
C. Is 15 ÷ 3 = 5 students per m².
TN We are using: Number of students ÷ Area (m²) = Number of students per 1 m².

3 Important Point

T/S Explain the important point in the box .

4 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** 2 Amount per Unit Quantity. **Topic:** Measurement per Unit Quantity. **Lesson No:** 2/5

Main Task: Let's compare the crowding using per unit quantity.

Review

MT

❸ The area of 1 mat is 1m². How many students are there in per 1 m²?

Ⓐ 12 ÷ 2 = 6
Ⓑ 12 ÷ 3 = 4
Ⓒ 15 ÷ 3 = 5

Number of students | Area (m²) | Number of students per 1 m²

Important Point

Exercise

(1) Two groups of children are playing in two different garden shelters. One group has 10 children playing in a 8 m² garden shelter and the other group has 13 children playing in a 10 m² garden shelter. Which garden shelter is more crowded?
10 ÷ 8 = 1.25 13 ÷ 10 = 1.3
Answer: 10 m² garden shelter is more crowded.

(2) There are two communities. Samuel community with 7 km² and 1 260 people, Robert's community with 10 km² and 1 850 people. Which community is more populated?
Samuel's Community: 1 260 ÷ 7 = 180 people per 1km².
Robert's Community: 1 850 ÷ 10 = 185 people per 1km².
Answer: Robert's Community is more populated.

Summary

We can express the level of crowdedness by using the number of students in an area of 1 m² .
When the number of people are not organised , the number of people per unit quantity is the mean of crowding.

Unit 2

Unit: Amount per Unit Quantity
Sub-unit 2: Amount per Unit Quantity
Lesson 3 of 5

Textbook Page : 018
Actual Lesson 011

Lesson Objective

- To understand the meaning of population density and find population density.

Prior Knowledge

- Large numbers (Grade 3)
- Decimal Numbers and Whole Numbers (Grade 4)
- Working with two units, number of people and the area (1 m^2 and 1km^2)

Preparation

- Chart of task 2
- Chart of table for exercise
- Calculator

Assessment

- Compare population and landmass. F
- Explain the meaning of population density. S
- Calculate population density correctly. S

Teacher's Notes

- Students may use their prior knowledge on division with large numbers to work out their answers or they may use a calculator.
- 2 TN For students to visualise the area of the landmass in square km to compare and see which town is bigger before actual calculation.
- The focus is to understand the meaning of population density and to find the population density.
- Students may use calculators to calculate since the numbers are too large to divide with remainders.

Meaning and calculation of population density

2 The table on the right shows the population and the area of East Town and West Town.

Population and Area

	Population (people)	Area (km^2)
East Town	273 600	72
West Town	22 100	17

1 Let's calculate the number of people per 1 km^2. Which one is more crowded? 3 800 people/km^2
1 300 people/km^2

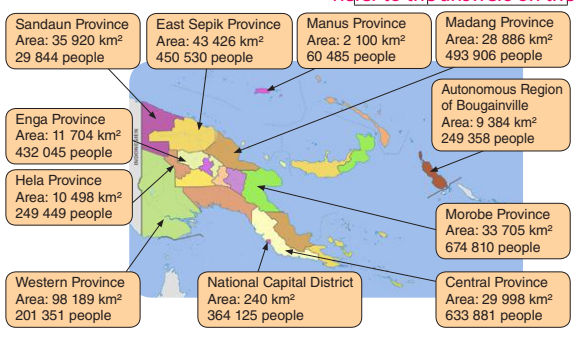
The population per **1 km²** is called **population density**. The crowdedness of the number of people living in a country or province is compared using population density.

Number of people ÷ Area (km^2) = Number of people per 1 km^2

2 Let's calculate the population density of each province and make a table. Round the first decimal place and give the answers in whole numbers. Find the relationship between population density and area?

Province	Population Density

Refer to the answers on the table



18 = □ + □

Province	Population	Area (km^2)	Population Density people/km^2
Sandaun	29 844	35 920	1
ESP	450 530	43 426	10
Manus	60 485	2 100	29
Madang	493 906	28 886	17
AROB	249 358	9 384	27
Morobe	674 810	33 705	20
Central	633 811	29 998	21
NCD	364 125	240	1 517
Western	201 351	98 189	2
Hela	249 449	10 498	24
Enga	432 045	11 704	37

Lesson Flow

1 Review the previous lesson.

2 Defining the meaning of population density.

T Introduce the Main Task. (Refer to the BP)

T/S 2 Read and understand the situation.

T Which town has the largest land mass, East town or West town?

TN Help students to identify that 72 km² is around 9 km × 9 km and 17 km² is around 4 km × 4 km.

S East town has the largest land mass of 72 km² compared to West town which is 17 km².

T Comparing East town and West town, which of them has the largest population (number of people).

S East town has the largest largest population of 273 600 people compared to West town with 22 100 people.

T 1 Let students calculate the number of people per 1 km².

S 1. East town 273 600 ÷ 72 = 3 800 people per km².
2. West town 22 100 ÷ 17 = 1 300 people per km².

T Which town is more crowded?

S East town is more crowded than West town.

3 Important Point

T/S Explain the important point in the box .

4 Calculating the population density for each province.

S 2 Calculate the population density given in the textbook by using calculators.

TN Draw the table and allow the students to fill in the table with the correct information.

T Confirm students answers by correcting the exercise with students in class.

5 Comparing the population density and the area.

T Find the relationship between the population density and area.

S The larger the land mass, the population density is smaller, the smaller the land mass, the population density is larger.

TN Refer to the Blackboard Plan.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** 2 Amount per Unit Quantity. **Topic:** Measurement per Unit Quantity. **Lesson No:** 3/5

MT: Let's compare and calculate population density.

Review

MT

2 The table shows the population and the area of East Town and West Town.

Population and Area

	Population (People)	Area (km²)
East Town	273 600	72
West Town	22 100	17

❶ Let's calculate the number of people per 1 km². Which one is more crowded?

East Town: 273 600 ÷ 72 = 3 800 people per 1km².
West Town: 22 100 ÷ 17 = 1 300 people per 1km².
Answer: East Town is more crowded.

Important Point

❷Let's calculate the population density of each province and make a table. Round the first decimal place and give the answers in whole numbers. Find the relationship between population density and area.

Province	Population	Area (km²)	Population Density. People /km²
Sandaun	29 844	35 920	1
ESP	450 530	43 426	10
Manus	60 485	2 100	29
Madang	493 906	28 886	17
AROB	249 358	9 384	27
Morobe	674 810	33 705	20
Central	633 811	29 998	21
NCD	364 125	240	1 517
Western	201 351	98 189	2
Hela	249 449	10 498	24
Enga	432 045	11 704	37

We should conclude from the table that:

a) Sandaun and Western Province have the lowest population density.
b) NCD has the highest population density.
c) Comparing the population density and the area, the larger the land mass the population density is smaller and the smaller the land mass the population density is big.

Summary

- The population per 1 km² is called the population density.
- The number of people ÷ area per km² = population density.

Unit 2

Unit: Amount per Unit Quantity
Sub-unit 2: Amount per Unit Quantity
Lesson 4 of 5

Textbook Page : 019
Actual Lesson 012

Lesson Objectives

- To understand the meaning of per unit quantity.
- To find the whole amount using the per unit quantity.

Prior Knowledge

- Population Density

Preparation

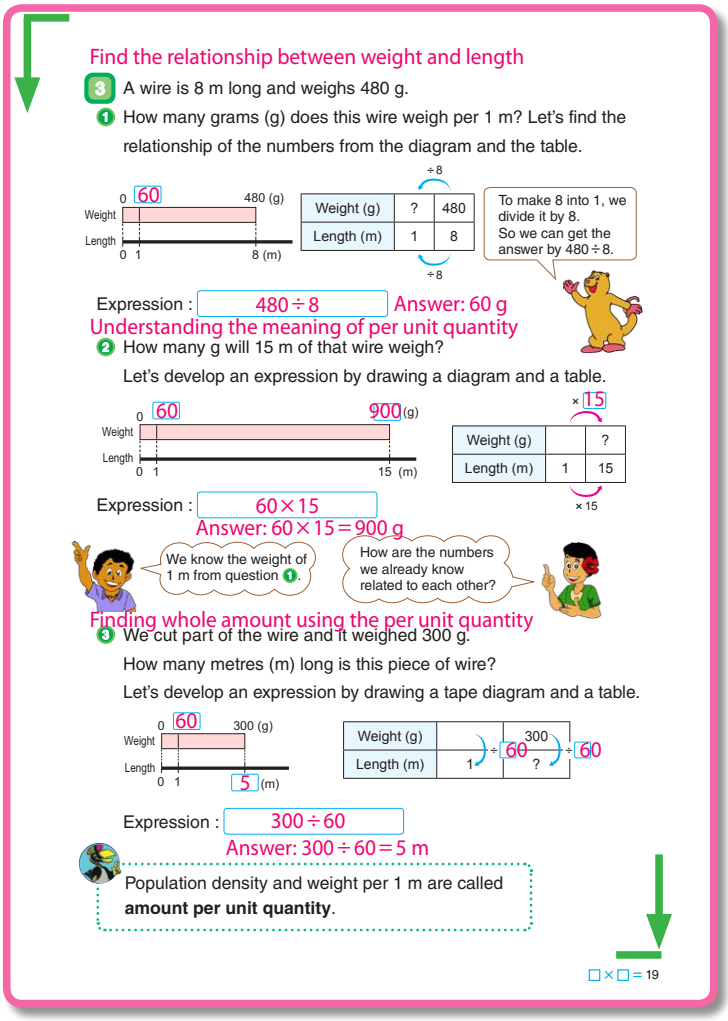
- Chart of task 3
- Tape diagrams and tables

Assessment

- Compare the length and the weight of a wire. F
- Identify that the relationship between density and weight per 1 m. S

Teacher's Notes

Students may use their knowledge on division to work out their answers.
The focus is to understand the meaning of **amount per unit quantity**.



Lesson Flow

1 Review the previous lesson.

2 Find the relationship between weight and length.

T Introduce the Main Task. (Refer to the Blackboard Plan)

T/S ❸ Read and understand the situation.

T ❶ How many grams does per 1 m of this wire weigh?

S Use the tape diagram and table to write a mathematical expression. (480 ÷ 8)

TN Assist the students to identify that, to get 1 m we divide 8 m by 8.
So we can get the answer by using the mathematical expression, 480 ÷ 8.

S 480 ÷ 8 = 60 g so the weight of the wire is 60 g/m.

T ❷ How many grams will 15 m of that wire weigh?

S Using the tape diagram and table, 1 m is 60 g so for 15 m the weight will be 15 × 60
Answer: 15 × 60 = 900 g.

T ❸ How many m long will the same piece of wire with a weight of 300 g?

S From ❷, 1 m is 60 g so 300 g wire will have the length of 300 ÷ 60.
Answer: 300 ÷ 60 = 5 m.

T Assist students to identify that, to find the whole amount, we use the amount per unit quantity in ❷.

3 Important Point

T/S Explain the important point in the box ⬚.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** 2 Amount per Unit Quantity. **Topic:** Measurement per Unit Quantity. **Lesson No:** 4/5

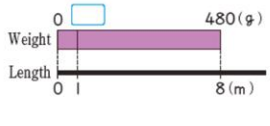
MT: Let's find the relationship between the weight and length and finding the whole amount using the per unit quantity.

Review

MT

❸ A wire that is 8 m long and weighs 480g.

❶ How many grams (g) does the wire weigh per 1m. Let's find the relationship of the numbers on the diagram and the table.



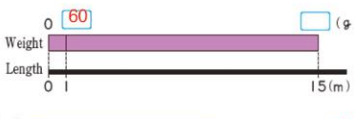
Weight (g)	?	480
Length (m)	1	8

÷8 ÷8

Expression: 480 ÷ 8

480 ÷ 8 = 60
Answer: 60 grams.

❷ How many grams will 15 m of that wire weigh?. Let's develop an expression by drawing a tape diagram and a table.



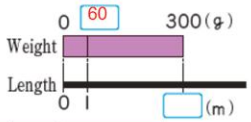
Weight (g)	60	?
Length (m)	1	15

×15 ×15

Expression: 60 x 15

60 x 15 = 900
Answer: 900 grams.

❸ We cut a piece of wire and it weighed 300g. How many metres long is this piece of wire? Let's develop an expression by drawing a tape diagram and a table.



Weight (g)	60	300
Length (m)	1	?

÷60 ÷60

Expression: 300 ÷ 60

300 ÷ 60 = 5
Answer: 5 metres.

Important Point

Summary

- Population density and weight per 1 m are called amount per unit quantity.
- First we understand the relationship between known amounts then we find the amount per unit quantity which will help to find the missing amount.

Unit 2

Unit: Amount per Unit Quantity
Sub-unit 2: Amount per Unit Quantity
Lesson 5 of 5

Textbook Page : 020 and 021
Actual Lesson 013

Lesson Objectives

- To apply per unit quantity to find the unknown amount.
- To find the amount per unit quantity in various situations.

Prior Knowledge

- Definition of amount per unit quantity

Preparation

- Chart of definition for amount per unit quantity on page 20 and 21
- Tape diagrams and tables for all tasks

Assessment

- Calculate and compare measures per unit quantity. F
- Solve the exercises correctly. S

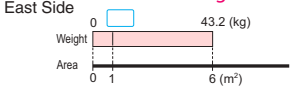
Teacher's Notes

Through these tasks in this lesson the students should be able to understand and apply the meaning of **amount per unit quantity**.
For 4 and 5 help the students to interpret the relationship between the known numbers and use them to find the amount per unit quantity.
We can find the amount of unknown quantity when we know the unit per quantity.
For 6 and 7 assist the students to find the known and the unknown numbers to fill in the table.

4 Ayleen's family grew sweet potatoes in their garden. They harvested 43.2 kg of sweet potatoes from a 6 m² at east side and 62.1 kg sweet potatoes from a 9 m² at west side. Which side of the garden is good harvest? Compare by using the number of sweet potatoes per 1 m².

East Side

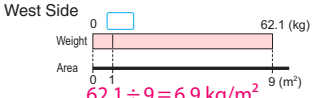
43.2 ÷ 6 = 7.2 kg/m²



Weight (kg)	?	43.2
Area (m²)	1	6

(÷6)

West Side



Weight (kg)	?	62.1
Area (m²)	1	9

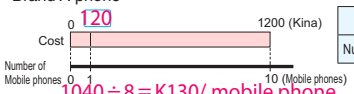
(÷9)

62.1 ÷ 9 = 6.9 kg/m²

5 There are two brands of mobile phones.
Brand A phone costs 1200 kina for 10 mobile phones.
Brand B phone costs 1040 kina for 8 mobile phones.
Which one is more expensive?
Compare the cost per mobile phone.

1200 ÷ 10 = K120/ mobile phone

Brand A phone

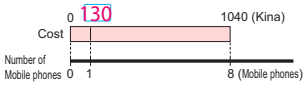


Costs (Kina)	?	1200
Number of Mobile phones	1	10

(÷10)

1040 ÷ 8 = K130/ mobile phone

Brand B phone



Costs (Kina)	?	1040
Number of Mobile phones	1	8

(÷8)

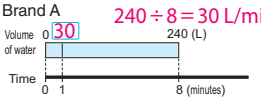
8 mobile phones at K1040 is more expensive

20 = □ + □

6 Brand A machine can pump 240 L of water in 8 minutes and Brand B machine can pump 300 L of water in 12 minutes.
Which machine pumps more water per minute?

Brand A

240 ÷ 8 = 30 L/min



Volume of water (L)	30	240
Time (min)	1	8

Brand B

300 ÷ 12 = 25 L/min

Volume of water (L)	25	300
Time (min)	1	12

7 Copier Ⓐ copies 300 sheets of paper in 4 minutes and copier Ⓑ copies 380 sheets of paper in 5 minutes.

Ⓐ 300 ÷ 4 = 75 papers/min

Number of sheets	75	300
Time (min)	1	4

1. Which copier is faster? Ⓑ
2. How many sheets of paper can copier Ⓐ copy in 7 minutes? 75 × 7 = 525 papers
3. How many minutes does it take for copier Ⓑ to copy 1140 sheets of paper? 1140 ÷ 76 = 15 minutes

Ⓑ 380 ÷ 5 = 76 papers/min

Number of sheets	76	380
Time (min)	1	5

Exercise

A small tractor ploughs 900 m² in 3 hours.
How many square metres (m²) can it plough in 8 hours?

900 ÷ 3 = 300 m²/hr
300 × 8 = 2400 m² Answer: 2400 m² in 8 hr

□ × □ = 21

Lesson Flow

1 Review the previous lesson.

2 Compare using the number of sweet potatoes per 1 m².

T 4 Introduce the Main Task. (Refer to the BP)
T/S Read and understand the situation.
S Write mathematical expressions.
T Assist students to see the relationship between weight and area and identify which side of the garden is better.
S Find the weight of sweet potatoes for 1 m² in the East side of the garden and fill in the box. (43.2 ÷ 6 = 7.2 kg per m²)
S Find the weight of sweet potatoes for 1 m² in the West side of the garden and fill in the box. (62.1 ÷ 9 = 6.9 kg per 1 m²)
T Which side of the garden is better?
S East side of the garden with 7.2 kg per m².
T Confirm students' answers.

3 Using unit per quantity to compare which mobile phone is more expensive.

T/S 5 Read and understand the situation.
S Write mathematical expressions.
S Find the cost of brand A and fill in the box. (1200 ÷ 10 to get 120 kina per mobile phone)
S The cost of brand B, (1040 ÷ 8 = 130 kina per mobile phone)
T Which brand is more expensive?
S Brand B is more expensive.
T Confirm students' answers.

4 Find the unit per quantity for time and volume.

T/S 6 Read and understand the situation.
S Write mathematical expressions.
S Find the volume of water for machine A and fill in the table. (240 ÷ 8 = 30 L per minute)
S Find the volume of water for machine B and fill in the table. (300 ÷ 12 = 25 L per minute)
T Which machine pumps more water per minute?
S Machine A.
T Confirm students' answers.

5 Compare the speed of two copiers.

T/S 7 Read and understand the situation.
S Write mathematical expressions.
T 1 Which copier is faster?
S Answer is B, 76 papers per minute (refer to board plan for calculation)
T 2 How many sheets of paper can copier A copy in 7 minutes?
S 75 papers per minute.
So for 7 minutes is 75 × 7 = 525 papers.
T 3 How many minutes does it take for copier B to copy 1140 sheets of paper?
S 76 papers per minute. So for 1140 papers, it will take 1140 ÷ 76 = 15 minutes.
T Confirm students' answers.

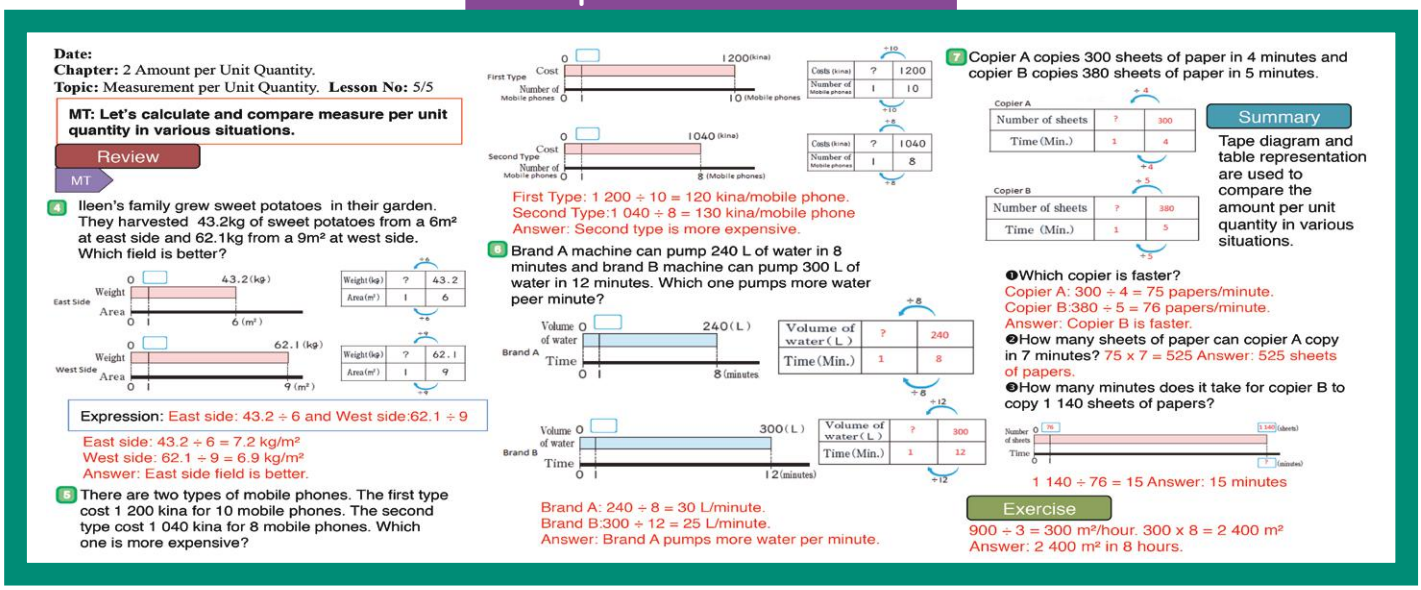
6 Complete the Exercise

S Solve the exercise.
T Confirm students' answers.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 2

Unit: Amount per Unit Quantity
Excercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Pages :
022 and 023
Actual Lesson 014 and 015

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 2. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

1. The table below shows the number of empty cans Anita collected in 5 days. What is the mean number of cans she collected per day? Page 14

Number of Empty Cans Collected

Days	Day 1	Day 2	Day 3	Day 4	Day 5
Number of cans	6	7	5	8	8

34 ÷ 5 = 6.8 cans/day

2. There are two schools with same size classrooms. Which school Ⓐ or Ⓑ is more crowded? Pages 15 to 17

1080 ÷ 6 = 180 students/class
1640 ÷ 8 = 205 students/class

Ⓐ 1080 students in 6 classes.
Ⓑ 1640 students in 8 classes.

Answer: School Ⓑ is more crowded

3. A shop sells colour paints. The black paint costs 600 kina for 12 tins and the white paint costs 440 kina for 8 tins. Which colour paint is more expensive? Page 19

600 ÷ 12 = K50/tin 440 ÷ 8 = K55/tin

Answer: White paint is more expensive

4. A 180 m² plantation produced 432 kg cocoa. How many kilograms (kg) of cocoa were harvested per 1 m²? 2.4 kg/m² Page 20

Grades 3 and 4 Do you remember?

Let's calculate.

① 52×27 1404	② 86×67 5762	③ 35×78 2730
④ 154×48 7392	⑤ 565×64 36 160	⑥ 927×32 29 664
⑦ 5.4×4 21.6	⑧ 6.2×9 55.8	⑨ 2.5×8 20

PROBLEMS

1. The population of a district in PNG is about 39 000 people and the area is about 50 km². Calculate the population density of this district.
Understanding how to calculate the population density.

780 people/km²

2. An optical fiber cable costs 480 kina per 4 m.
Understanding the meaning of measurements per unit.
① How much does 1 m of this cable cost? K120
② How much does 5 m of this cable cost? K600
③ A company IC Net bought the cable worth 1440 kina. How many metres did the company buy? 12 m

3. A printer can print 350 sheets of paper in 5 minutes.
Understanding the meaning of amount of work per unit.
① How many sheets of paper can it print in 1 minute? 70 sheets
② How many sheets of paper can it print in 8 minutes? 560 sheets
③ How many minutes will it take to print 2100 sheets of paper? 30 min

4. Anton's goal is to read 25 pages of a book per day. He read an average of 23 pages for 6 days from Sunday to Friday. To reach his goal over the 7 days from Sunday, how many pages must he read on Saturday? 25×7 − 23×6 = 175 − 138 = 37 pages
Understanding the relationship between mean, total and number of item.

5. The table below shows the duration of handstand and number of grade 5 students at Joyce's school. From this table, let's calculate the average duration of handstand per student in grade 5.
Understanding the meaning of mean and measurement per unit and applying it to solve problems.

Duration of Handstand and the Number of Grade 5 students

Duration of handstand (second)	0	1	2	3	4	5	6	7	8	9	10
Number of students	3	0	2	4	5	16	9	10	4	6	1

336 ÷ 60 = 5.6 second

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.
T Confirm students' answers.

2 Solve the Problems

S Solve all the problems.
T Confirm students' answers.
TN Collect students books for marking if time does not allow.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.
S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 2: Decimal Amount per Unit Quantity	Name:	Score / 100

[5×10 marks for maths expression and 5×10 marks for answer]

1. Mr. Pau's flowerbed of 15 m² has 120 seedlings and Ms. Koroi's flowerbed of 18 m² has 135 seedlings. Which flowerbed is more crowded?.

Mathematical Expression	Answer:
120 ÷ 15 = 8 135 ÷ 18 = 7.5	15 m^2 flowerbed

2. There are 2 cars, A and B. Car A travels 700 km with 35 Litres of petrol. Car B travels 800 km with 50 L of petrol. Which car can travel further if both cars use the same amount of petrol?

Mathematical Expression	Answer:
700 ÷ 35 = 20 800 ÷ 50 = 16	Car A

3. A car travels 150 km with 12 L of petrol. How many km can it travel with 60 L of petrol?

Mathematical Expression	Answer:
150 ÷ 12 = 12.5 12.5 × 60 = 750	750 km

4. Kila harvested 63 kg of potatoes from the 50 m² field at his garden. Asa harvested 108 kg of potatoes from the 80 m² field at his garden. Whose garden had a better harvest?

Mathematical Expression	Answer:
63 ÷ 50 = 1.26 108 ÷ 80 = 1.35	80m^2 field

5. Betty's results of 5 tests are 81, 95, 78, 86 and 85. What is her average test score?

Mathematical Expression	Answer:
(81 + 95 + 78 + 86 + 85) ÷ 5 = 85	85 marks

30

End of Chapter Test **Date:**

Chapter 2: Decimal Amount per Unit Quantity	Name:	Score / 100

[5×10 marks for maths expression and 5×10 marks for answer]

1. Mr. Pau's flowerbed of 15 m² has 120 seedlings and Ms. Koroi's flowerbed of 18 m² has 135 seedlings. Which flowerbed is more crowded?.

Mathematical Expression	Answer:

2. There are 2 cars, A and B. Car A travels 700 km with 35 Litres of petrol. Car B travels 800 km with 50 L of petrol. Which car can travel further if both cars use the same amount of petrol?

Mathematical Expression	Answer:

3. A car travels 150 km with 12 L of petrol. How many km can it travel with 60 L of petrol?

Mathematical Expression	Answer:

4. Kila harvested 63 kg of potatoes from the 50 m² field at his garden. Asa harvested 108 kg of potatoes from the 80 m² field at his garden. Whose garden had a better harvest?

Mathematical Expression	Answer:

5. Betty's results of 5 tests are 81, 95, 78, 86 and 85. What is her average test score?

Mathematical Expression	Answer:

Chapter 3 Multiplication of Decimal Numbers

1. Content Standard

5.1.4 Apply the process of multiplication to multiply decimal numbers by a decimal number and whole number by a decimal number.

2. Unit Objectives

- To understand the meanings of and how to calculate multiplication of decimal numbers.
- To solve the problem by applying the method of multiplying decimal numbers.
- To understand that commutative law, associative law and distributive law also apply in the calculation of decimal numbers.

3. Teaching Overview

Students learned decimal number × whole number in the previous grades.

They will learn operation of whole numbers × decimal numbers and operation of decimal numbers × decimal numbers in this unit.

Operation of Whole Numbers × Decimal Numbers :

Students find out that whole number multiplied by decimal number can be taught as the same as they solved whole number multiplied by whole number.

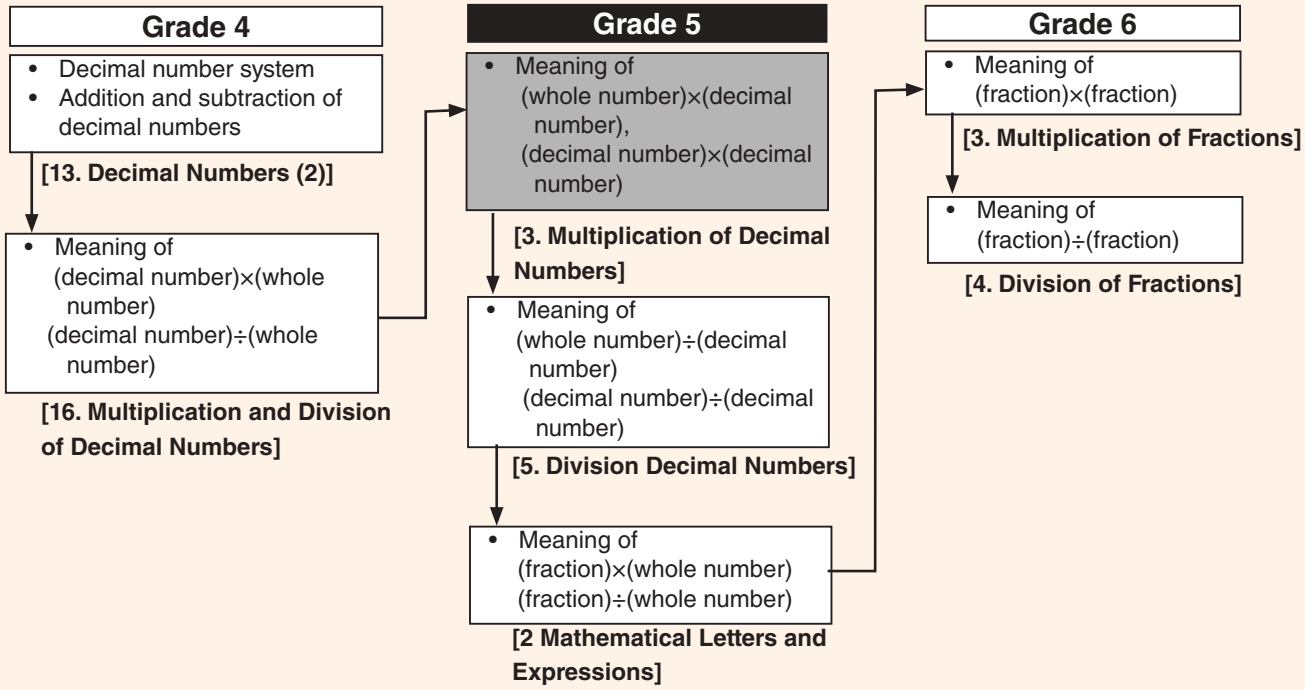
They can apply the rules of multiplication learned in the previous grades.

Decimal Number × Decimal Number :

They apply the learning of the previous sub-unit. In this sub-unit, one of the important learning points is to understand that if a number multiplied by a decimal number less than 0, the answer will be smaller than the first number.

Rules of Calculation : They find out the 3 calculation rules (commutative, associative and distributive laws) are also applied for multiplication of decimal numbers.

4. Related Learning Contents



Unit 3

Unit: Multiplication of Decimal Numbers
Sub-unit 1: Operation of Whole Numbers x Decimal Numbers
Lesson 1 of 2

Textbook Page : 024 to 026
Actual Lesson 016

Sub-unit Objectives

- To understand the meaning of multiplication of decimal number.
- To apply the calculation of multiplication of decimal numbers in vertical form.
- To apply the correct process of multiplying decimal numbers in vertical form.

Lesson Objective

- To think about how to calculate decimal number × decimal number.

Prior Knowledge

- Multiplication and Division of Decimal Numbers (Grade 4)

Preparation

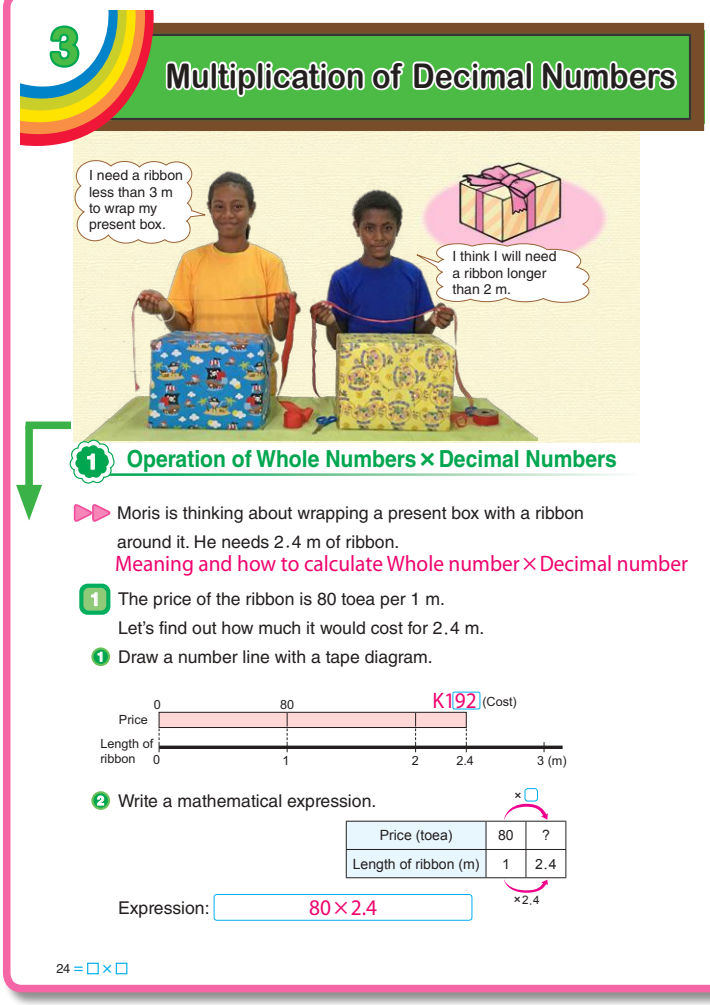
- Box and ribbons
- Prepare 6 pieces of 1 metre ribbon

Assessment

- Think about how to calculate whole number × decimal number. F
- Explain how to calculate whole number × decimal number. S

Teacher's Notes

How to convert toea and kina.
100 toea is one kina. Use idea of amount per unit quantity.
In the case where there is no ribbon, improvise with other materials, such as ropes, strings, etc...



Lesson Flow

1 ▶▶ Introduction

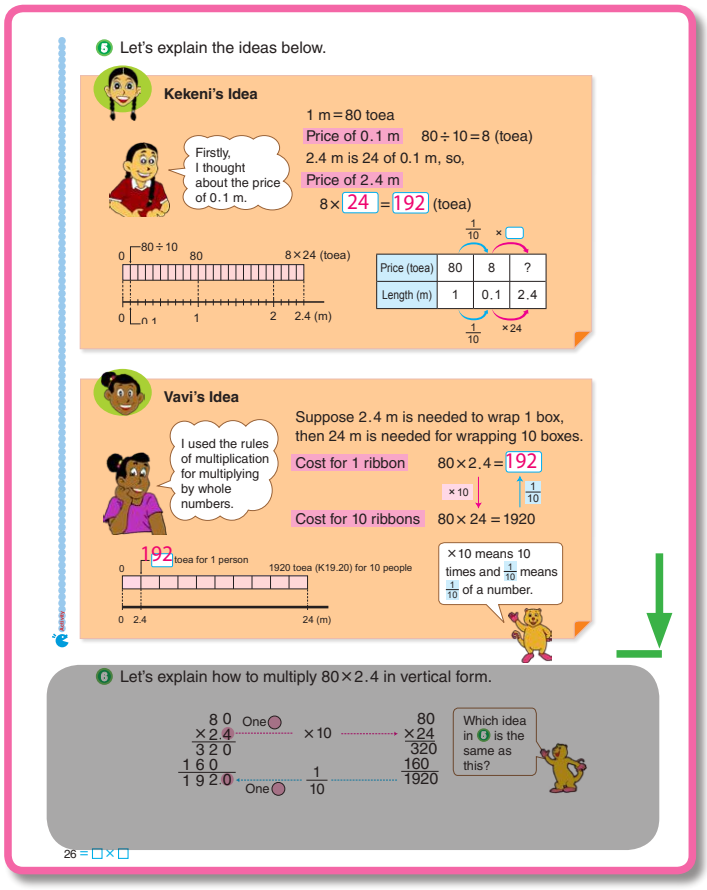
T Ask a student to demonstrate how to wrap a box with a 1 m ribbon around it in front of the class.
T Is the ribbon long enough to wrap the box?
S Give responses from their observation.

2 How to calculate whole number × decimal number.

T Introduce the Main Task. (Refer to the BP)
T/S ① Read and understand the situation.
T The price of the ribbon is 80 toea per metre. Let's find out how much 2.4 m will it.
S ① Draw a number line with a tape diagram.
T ② Write a mathematical expression.
S 80×2.4

3 Estimating how much the total cost will be.

T ③ Approximately, how much would the cost be?
TN Put up the three tapes of 1 m, 2 m and 3 m.
S Give various responses according to their own estimations corresponding to the tapes and the cost.
T Check students' estimations and relate to the speech bubbles.



4 Important Point

T/S Explain the important point in the box .

5 ④ Think about how to calculate.

T Let the students to think about and present their ideas.
S Present their ideas.

6 Explain Kekeni's and Vavi's Ideas.

T ⑤ Direct the students attention to look at how Kekeni's and Vavi's Ideas are expressed.
T Explain Kekeni's and Vavi's ideas.
S Kekeni's Idea:
Firstly, I thought about the price of 0.1 m.
According to the price of 0.1 m (80 ÷ 10 = 8 toea), therefore, 2.4 is 24 of 0.1 m.
So now the price of 2.4 is 8×24 = K1.92.
Another similar sample is from the table of information.
Vavi's Idea: I used the rules of multiplication to multiplying by whole numbers. If 2.4 is the amount for 1 ribbon, then the amount for 10 ribbons would be 24 m.
If the cost of 10 ribbons is 80×24 = 1920 (K19.20)
Then, the cost for 1 ribbon would be $\frac{1}{10}$ of 1920 = 192 (K1.92)
Another sample is shown on the number line.
S Understand and make meaning of the two ideas.
TN Interact with students through the explanations.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Lesson 016 Sample Blackboard Plan is on page 35.

Unit 3

Unit: Multiplication of Decimal Numbers
Sub-unit 1: Operation of Whole Numbers x Decimal Numbers
Lesson 2 of 2

Textbook Page : 026 and 027
Actual Lesson 017

Lesson Objective

- To understand how to calculate whole number × decimal number in vertical form.

Prior Knowledge

- Meaning of Whole Number × Decimal Number and how to calculate.

Preparation

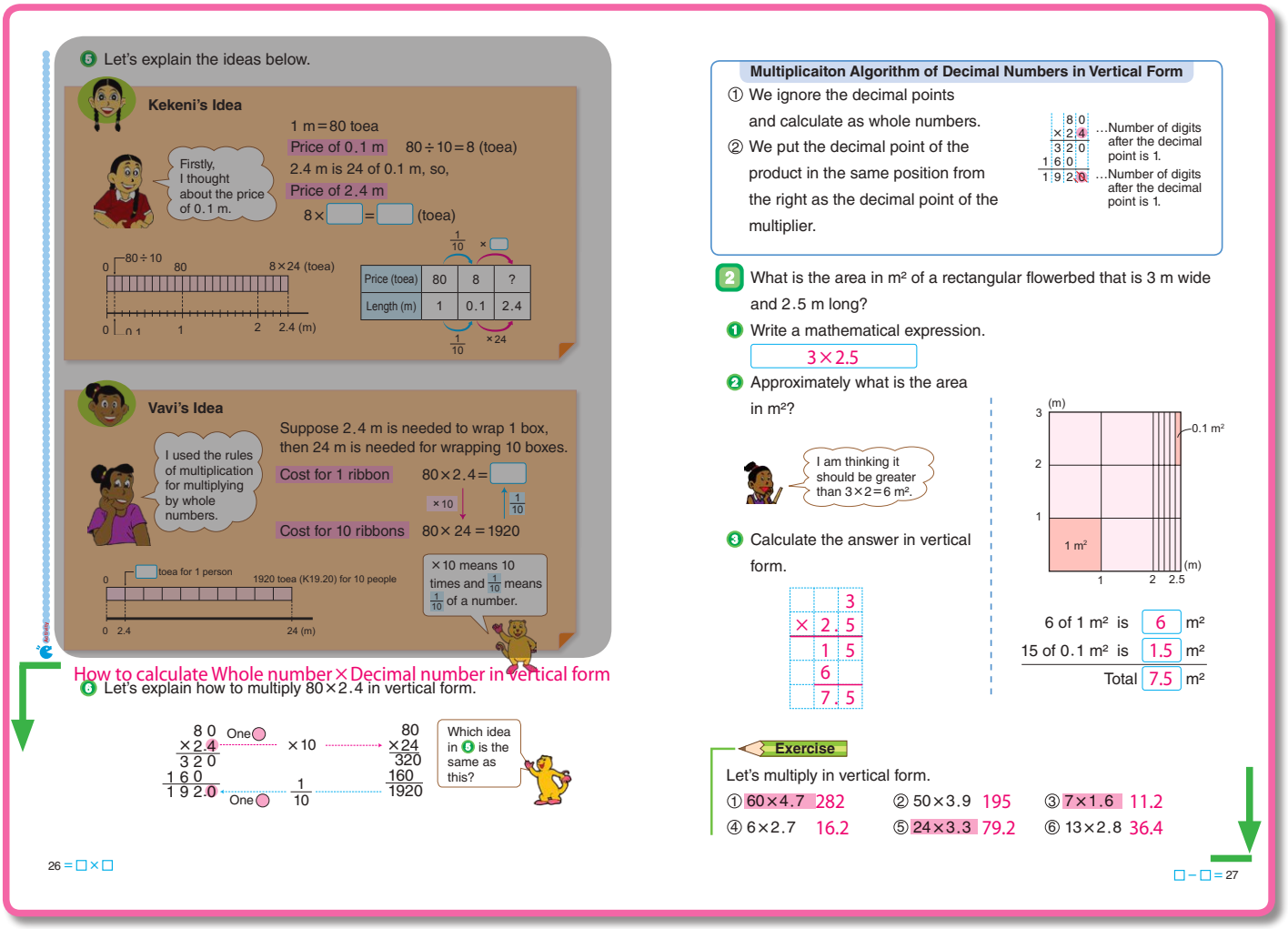
- Chart of How to multiply 80 × 2.4 in vertical form
- Chart showing the diagram interpretation of unit idea for Task 2 ②.

Assessment

- Think about how to calculate whole number × decimal number in vertical form. F
- Explain how to calculate whole number × decimal number in vertical form. S
- Solve the exercise correctly. S

Teacher's Notes

When converting decimal numbers to whole numbers for easier calculations, always write the products as original decimal numbers. Explain and present the problem in vertical form.To change the decimal number to a whole number, we multiply by 10 because there is one number after the decimal point, when calculations are done the result or answer is the product.
The decimal point should be placed on the number of places from the left to the right. In this case it is one place after the decimal point.
The product is 192.0



Multiplicaiton Algorithm of Decimal Numbers in Vertical Form

① We ignore the decimal points and calculate as whole numbers.
② We put the decimal point of the product in the same position from the right as the decimal point of the multiplier.

8 0
× 2 4
3 2 0
1 6 0
1 9 2.0
...Number of digits after the decimal point is 1.
...Number of digits after the decimal point is 1.

2 What is the area in m² of a rectangular flowerbed that is 3 m wide and 2.5 m long?

1 Write a mathematical expression.
3 × 2.5

2 Approximately what is the area in m²?

I am thinking it should be greater than 3 × 2 = 6 m².

3 Calculate the answer in vertical form.

3
× 2.5
1 5
6
7.5

6 of 1 m² is 6 m²
15 of 0.1 m² is 1.5 m²
Total 7.5 m²

Exercise

Let's multiply in vertical form.

① 60 × 4.7 282
② 50 × 3.9 195
③ 7 × 1.6 11.2
④ 6 × 2.7 16.2
⑤ 24 × 3.3 79.2
⑥ 13 × 2.8 36.4

26 = ☐ × ☐

☐ − ☐ = 27

Lesson Flow

1 Review the previous lesson.

2 ⑥ Let's explain how to multiply whole number × decimal number in vertical form

S Explain in their own words how to multiply 80×2.4 in vertical form.
TN Refer to Teacher's Notes for explanation.
T Introduce the Main Task. (Refer to the BP)

3 How to multiply 80×2.4 in vertical form.

S Explain in their own understanding on how to calculate 80×2.4 in vertical form.
T Refer students to the textbook and confirm how to multiply in vertical form.

4 Calculate 3×2.5 in vertical form.

T/S ② Read and understand the given situation
T ① Write a mathematical expression.
S 3×2.5
T ② Approximately what is the area in m² ?
S Estimate that the area should be greater than 3×2=6 m².
T ③ Ask students to calculate the answer in vertical form.
S Carefully think through the calculation process in vertical form and fill in the boxes.
TN Refer to board plan for answers.
T/S Explain the diagram representation and confirm with the vertical calculation.

5 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 16)

Date: **Chapter:** 3 Multiplication of Decimal Numbers. **Topic:** Calculating of Whole Numbers x Decimal Numbers

MT: Let's think about how to calculate whole numbers x decimal numbers.

Introduction:

MT

The price of the ribbon is 80 toea per meter. Let's find out how much would it cost for 2.4m

❶ Draw a number line with a tape diagram.

❷Write a mathematical expression.

Price (Cost)	80	?
Length of ribbon (m)	1	2.4

80 x 2.4

Expression: 80 x 2.4

❸ Approximately, how much would be the cost?
Students responses and estimations based on the speech bubbles.

Important Point

❹ Let's think about how to calculate.
Students present their ideas .

❺ Let's explain the ideas in the textbook.

Refer to the text book for the explanations.

Summary

Even when the multiplier is a decimal number, the expression will be the same as multiplication of whole numbers.

Sample Blackboard Plan (Lesson 17)

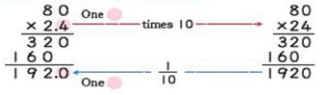
Date: **Chapter:** 3 Multiplication of Decimal Numbers. **Topic:** Calculating Whole Numbers x Decimal Numbers **Lesson No:** 2/2

MT: Let's think about how to calculate whole numbers x decimal numbers in vertical form.

Review

MT

❻Let's explain how to multiply 80 x 2.4 in vertical form.
Write down students ideas.

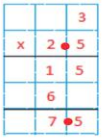


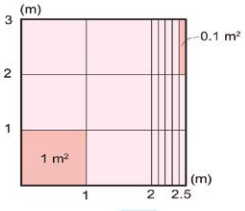
Multiplicaiton Algorithm of Decimal Numbers in Vertical Form

① We ignore the decimal points and calculate as whole numbers.
② We put the decimal point of the product in the same position from the right as the decimal point of the multiplier.

80 ×24 320 160 192.0
...Number of digits after the decimal point is 1.
...Number of digits after the decimal point is 1.

② What is the area in m², of a rectangle flower bed that is 3m wide and 2.5m long?
❶ Write a mathematical expression. 3 x 2.5
❷ Approximately what is the area in m²?
The estimation area should be greater than 3 x 2 = 6 m².
❸ Calculate the answer in vertical form.





6 of 1 m² is 6 m²
15 of 0.1 m² is 1.5 m²
Total 7.5 m²

Exercise

Let's multiply in vertical form.

① 60×4.7 ② 50×3.9 ③ 7×1.6
④ 6×2.7 ⑤ 24×3.3 ⑥ 13×2.8

Summary

When multiplying whole numbers with decimal numbers in vertical form:
1. We ignore the decimal point and multiply as whole numbers.
2. Then put the decimal point of the product in the same position from the right as the decimal point of the multiplier.

Unit 3

Unit: Multiplication of Decimal Numbers
Sub-unit 2: Operation of Decimal Numbers × Decimal Numbers
Lesson 1 of 3

Textbook Page : 028
Actual Lesson 018

Sub-unit Objectives

- To think about how to calculate decimal number × decimal number.
- To understand how to calculate decimal number × decimal number in vertical from.

Lesson Objective

- To think about how to calculate decimal number × decimal number.

Prior Knowledge

- How to calculate Whole number × Decimal Number in vertical form
- Calculating Whole numbers × Decimal Numbers

Preparation

- A chart of the number line and the table of information

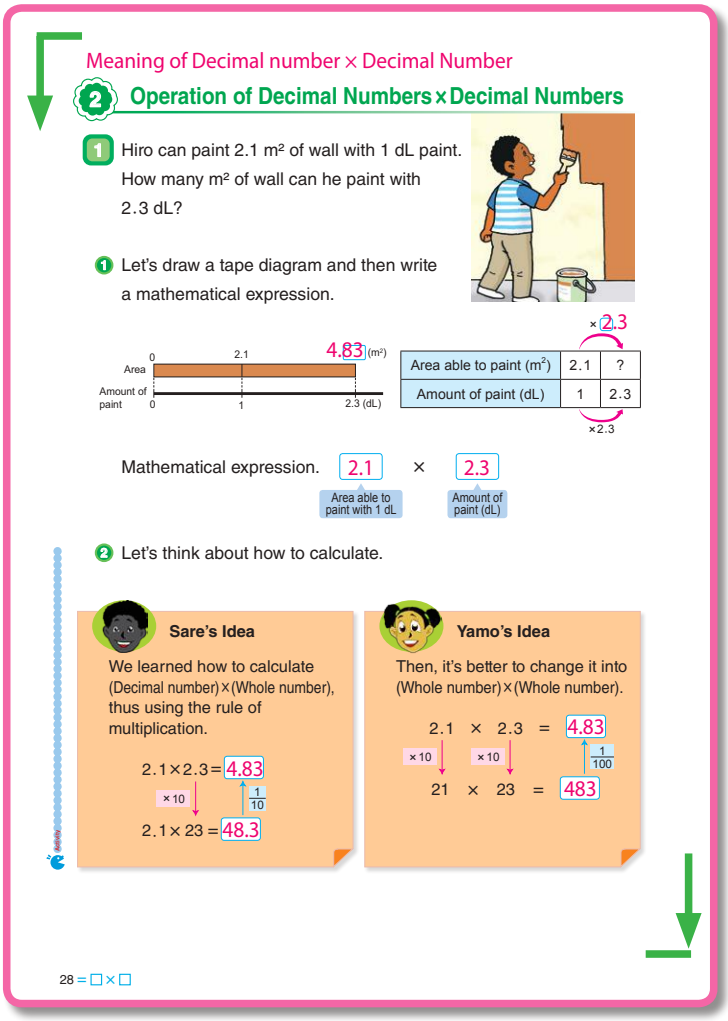
Assessment

- Think about how to multiply decimal number × decimal number. F
- Explain how to calculate decimal number × decimal number. S

Teacher's Notes

In this problem, both Sare's and Yamo's ideas include the rule of multiplication.

- If multiplicand is multiplied by 10, the product should be multiplied by $\frac{1}{10}$.
- If both multiplicand and multiplier are multiplied by 10, the product is multiplied by $\frac{1}{100}$.



Lesson Flow

1 Review the previous lesson.

2 Making meaning of decimal number × decimal number

T Introduce the Main Task. (Refer to the Blackboard Plan)
T/S ❶ Read and understand the given situation.
T ❶ Assist the students to understand the given situation and draw a diagram, then, make a mathematical expression.
T If 1 dL can paint 2.1 m^2, how many m^2 of wall will be painted with 2.3 dL?
S Using their prior knowledge, draw a line diagram similar to the drawing in the textbook.
S Mathematical expression: 2.1 × 2.3

3 To think about how to calculate 2.1 × 2.3 using prior knowledge.

T Discuss in their groups or in pairs about how to calculate 2.1 × 2.3
S Present their ideas and explain.

4 ❷ Let's think about how to calculate 2.1 × 2.3

S Think about and explain Sare's and Yamo's ideas.
T Emphasise the ideas above with explanations to clarify any misconceptions.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** 3 Multiplication of Decimal Numbers. **Topic:** Operation of Decimal Numbers x Decimal Numbers **Lesson No:** 1/3

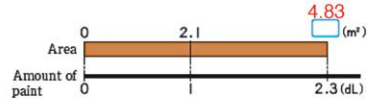
MT: Let's think about how to calculate decimal numbers x decimal numbers.

Review

MT

❶ We can paint 2.1m² of wall with 1 dL paint. How many m² of wall will we paint with 2.3 dL?

❶ Let's draw a tape diagram then write a mathematical expression.



		×2.3
Area able to paint (m²)	2.1	?
Amount of paint (dL)	1	2.3

×2.3

Mathematical Expression.

2.1 (Area able to paint with 1dL.) × 2.3 (Amount of paint.)

❷ Let's think about how to calculate.
Write down students' ideas.

Refer to the textbook and explain the two ideas.
Asa's Idea: Prior knowledge Decimal Number x whole Number using rule of multiplication.

2.1 x 2.3 = 4.83
x 10
2.1 x 23 = 48.3

Raka's Idea: Change the two decimal numbers to Whole Number x Whole Number

2.1 x 2.3 = 4.83
x 10 x 10
21 x 23 = 48.3

Summary

When calculating decimal numbers by decimal numbers ;

1. We can apply the rule of multiplication.
2. We can change to whole numbers x whole numbers then multiply the product by 1/10 or 1/100 to move the decimal point of the product.

Unit 3

Unit: Multiplication of Decimal Numbers

Sub-unit: 2. Operation of Decimal Numbers × Decimal Numbers

Lesson 2 of 3

Textbook Page : 029 and 030
Actual Lesson 019

Lesson Objective

- To understand how to calculate decimal number × decimal number in vertical form.

Prior Knowledge

- The product of the right end number becomes 0
- Calculating Decimal Number × Decimal Number

Preparation

- A chart expressing the unit idea in a diagram

Assessment

- Explain decimal number × decimal number in vertical form. F
- Solve the exercise correctly. S

Teacher's Notes

- In task 2 2, the calculation is done in vertical form applying the prior knowledge about the unit idea (diagram of the rectangular flowerbed).
- Assist the students to visualise the area using the unit idea to understand how the decimal point is arranged and calculated.

How to multiply Decimal number × Decimal number in vertical form

3 Let's explain how to multiply 2.1×2.3 in vertical form.

2.1 (One) ×10 → 21
×2.3 (One) ×10 → ×23
63 → 63
42 → 42
4.83 (Two) ×1/100 → 483

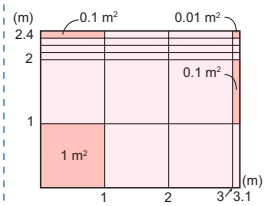
2 What is the area in m² of a rectangular flowerbed that is 2.4 m wide and 3.1 m long?

1 Let's write a mathematical expression.

2.4×3.1

2 Let's multiply in vertical form.

	2	.	4
×	3	.	1
	2		4
7	2		
7	.	4	4



6 of 1 m² is 6 m²
14 of 0.1 m² is 1.4 m²
4 of 0.01 m² is 0.04 m²
Total 7.44 m²

The area of rectangles can be calculated by using the formula even if the lengths of the sides are decimal numbers.

Exercise

Let's multiply in vertical form.

① 1.2×2.4 2.88 ② 8.6×1.3 11.18 ③ 6.4×3.5 22.4
④ 2.5×2.8 7 ⑤ 0.2×1.6 0.32 ⑥ 0.8×2.5 2

Calculating Decimal number × Decimal number in vertical form

3 Let's think about how to multiply 5.26×4.8 in vertical form.

5.26 (Two) ×100 → 526
×4.8 (One) ×10 → ×4.8
4208 → 4208
+2104 → +2104
25.248 (Three) ×1/1000 → 25248

When multiplying in vertical form, place the decimal point on the product by adding the number of digits after the decimal point of the multiplicand and the multiplier and count from the right end of the product.

The product where the right of the decimal point becomes zero (0)

4 Let's think about how to multiply 4.36×7.5

		4	.	3	6		×100	→		4	3	6	
	×		7	.	5		×10	→	×		7	5	
		2	1	8	0					2	1	8	0
3	0	5	2						3	0	5	2	
3	2	7	0	0			×1/1000	→	3	2	7	0	0

5 The position of decimal point in the product.
Let's put decimal points on the products for the following calculations.

① 5.6 × 4.3 = 24.08
② 3.27 × 1.2 = 3.924
③ 1.48 × 2.5 = 3.700

Exercise

Let's multiply in vertical form.

① 3.14×2.6 8.164 ② 4.08×3.2 13.056 ③ 7.24×7.5 54.3
④ 1.4×4.87 6.818 ⑤ 4.8×2.87 13.776 ⑥ 8.2×2.25 18.45

□ − □ = 29 30 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Explain how to multiply 2.1 × 2.3

T 1 3 Explain how to multiply 2.1 × 2.3 in vertical form while students follow through using the textbook.

TN One decimal place number × one decimal place number gives a total of two decimal places number as the product.

T Introduce the Main Task. (Refer to the BP)

3 Explain how to calculate 2.4 × 3.1

S 2 1 Read and understand the situation and write a mathematical expression as 2.4 × 3.1

T 2 Let's multiply 2.4 × 3.1 in vertical form.

S Calculate 2.4 × 3.1 in vertical form.

T Explains the area diagram representation.

S Correspond with the explanation to fill in the box for the diagram representation.

T Confirm answers in relation to the diagram representation and vertical calculation.

4 Important Point

T/S Explain the important point in the box ⬚.

5 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

6 Think about how to multiply 5.26 × 4.8 in vertical form.

T 3 Let's think about how to multiply 5.26 × 4.8

S Explain how to multiply 5.26 × 4.8 in vertical form using the textbook.

TN Two decimal place number × one decimal place number gives a total of three decimal place number as the product.

7 Important Point

T/S Explain the important point in the box ⬚.

8 4 Think about how to multiply 4.36 × 7.5 in vertical form when the product of the right end becomes 0.

T Refer to 3 as an example to complete 4.

TN Emphasise on the answer where zeros (0) at the end of the product of the decimal numbers are insignificant.

S Fill in the boxes.

9 To think about the position of decimal points.

T 5 Let's put decimal points on the products for the following calculations.

S 1.) 5.6 × 4.3 = 24.08 2.) 3.27 × 1.2 = 3.924
3.) 1.48 × 2.5 = 3. 700

10 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

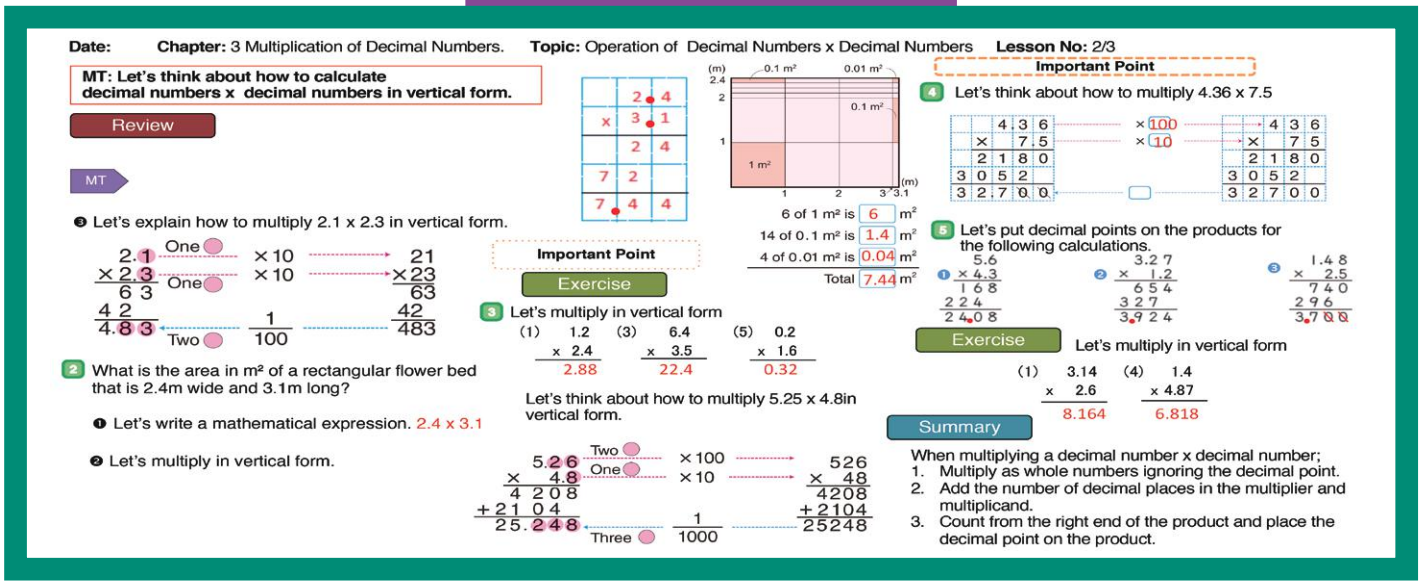
11 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 3

Unit: Multiplication of Decimal Numbers

Sub-unit 2: Operation of Decimal Numbers × Decimal Numbers

Lesson 3 of 3

Textbook Page : 031
Actual Lesson 020

Lesson Objective

- To understand the relationship between the product and the multiplicand.

Prior Knowledge

- Calculating Decimal Number × Decimal Number in vertical form

Preparation

- A chart of a Tape diagram (Number Line) and Table of Information for task 6

Assessment

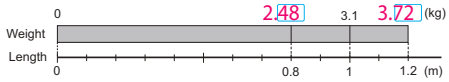
- Explain the relationship between the product and the multiplicand. F S
- Solve the exercises correctly. S

Teacher's Notes

- When the multiplier is more than 1, the product is more than the multiplicand.
  25 × 6 = 150
  multiplicand multiplier product
- When the multiplier is a decimal number less than 1, the product is less than the multiplicand.
  25 × 0.6 = 15
  multiplicand multiplier product
- When the multiplier is more than 1, the product is more than the multiplicand.
  0.25 × 6 = 1.5
  multiplicand multiplier product
- When the multipler is a decimal number less than 1, the product is less than the multiplicand.
  0.25 × 0.6 = 0.15
  multiplicand multiplier product

Multiplication of Decimal Numbers Smaller than 1

6 There is a metal bar that weighs 3.1 kg per metre.
What is the weight of 1.2 m and 0.8 m of this bar respectively?



Weight (kg)	?	3.1	?
Length (m)	0.8	1	1.2

×0.8 ×1.2

	3	1
×	1	2
2	4	8

1 Let's find the weight of 1.2 m metal bar. 3.1 × 1.2 = 3.72 Answer: 3.72 kg
2 Let's find the weight of 0.8 m metal bar. 3.1 × 0.8 = 2.48 Answer: 2.48 kg
3 Let's compare the sizes of the products and the multiplicands.
When the multiplier decreases, the product decreases.

When the multiplier is a decimal number smaller than 1, the product becomes smaller than the multiplicand.
If the multiplier is a decimal number larger than 1, Multiplicand < Product.
If the multiplier is a decimal number less than 1, Multiplicand > Product.

Comparing product and multiplicand.

7 Put decimal points on the products and compare the products and the multiplicands.

1
$\begin{array}{r} 25 \\ \times\ 6 \\ \hline 150 \end{array}$ $\begin{array}{r} 2\,5 \\ \times\ 0.6 \\ \hline 1\,5.0 \end{array}$

2
$\begin{array}{r} 0.2\,5 \\ \times\ 6 \\ \hline 1.5\,0 \end{array}$ $\begin{array}{r} 0.2\,5 \\ \times\ 0.6 \\ \hline 0.1\,5\,0 \end{array}$

Exercise

Let's multiply in vertical form.

① 4.2×0.7 2.94 ② 6.8×0.4 2.72 ③ 0.8×0.3 0.24
④ 2.17×0.6 1.302 ⑤ 0.14×0.5 0.07 ⑥ 0.07×0.2 0.014

□ − □ = 31

Lesson Flow

1 Review the previous lesson.

2 Find the relationship between the length and the weight.

T/S Read and understand the situation.
T Introduce the Main Task. (Refer to the BP)
T 6 Ask students to interpret the tape diagram and the table.
S Interpret the tape diagram and the table and fill in the boxes.
T 1 Let's find the weight of 1.2 m metal.
S Write the mathematical expression as 3.1×1.2 and calculate in vertical form.
TN Having the idea that 3.1 kg=1 m.
Then, 3.1×1.2=3.72 Answer: 3.72 kg
T 2 Let's find the weight of 0.8 m metal.
S Write the mathematical expression as 3.1×0.8 and calculate in vertical form.
S So 3.1×0.8=2.48 Answer: 2.48 kg

3 3 Compare the size of the product and the multiplicand.

T Let's compare the size and understand the relationship between the product and the multiplicand.
S Explain the relationship between the product and the multiplicand.(Refer to the Teacher's Notes)

4 Important Point

T/S Explain the important point in the box .

5 7 Positions of the decimal points and comparing.

S Complete 1 and 2 and compare the products and the multiplicands.
TN 1 a.) 25×6=150
When the multiplier is more than 1,
the product is more than the multiplicand.
b.) 25×0.6=15.0 Answer: 15
When the multiplier is a decimal number and its less than 1, the product is less than the multiplicand.
TN 2 a.) 0.25×6=1.50 Answer: 1.5
When the multiplier is more than 1, the product is more than the multiplicand.
b.) 0.25×0.6=0.150 Answer: 0.15
When the multiplier is a decimal number and its less than 1, the product is less than the multiplicand.

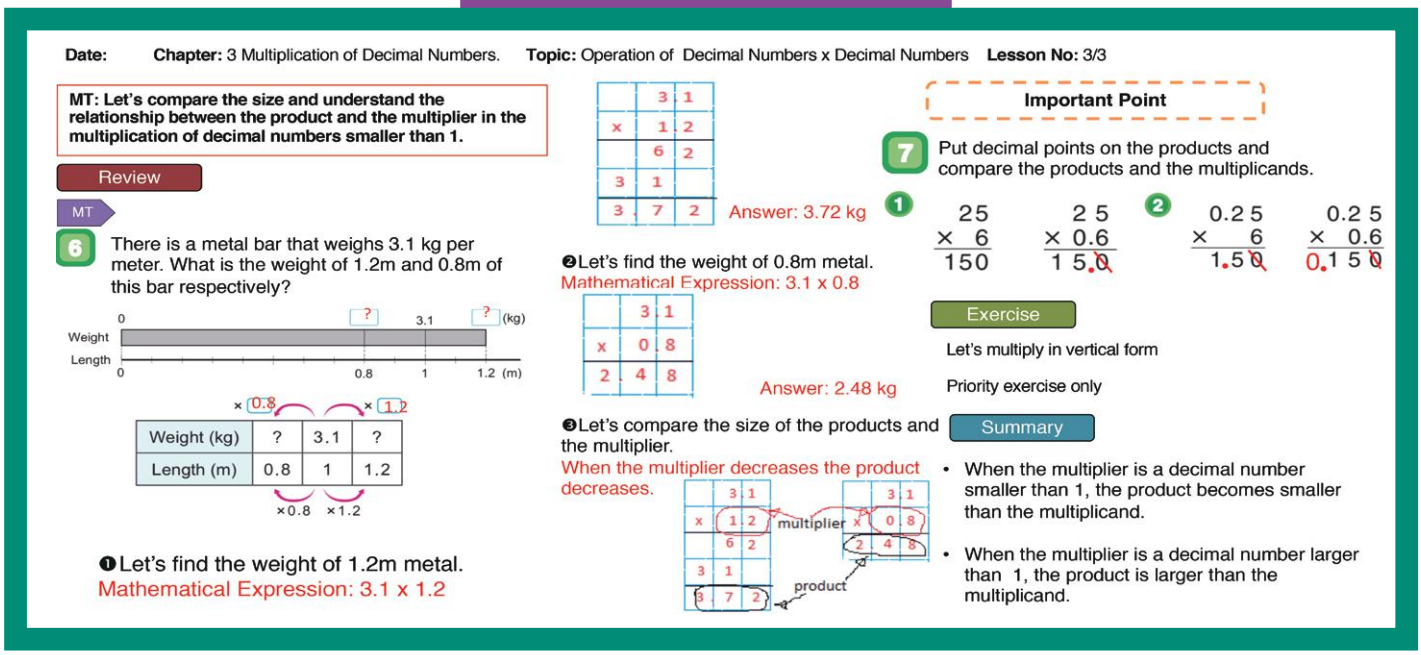
6 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 3

Unit: Multiplication of Decimal Numbers
Sub-unit 3: Rules for Calculation
Lesson 1 of 2

Textbook Page : 032
Actual Lesson 021

Sub-unit Objective

- To understand that commutative law and associative law can be applied in decimal numbers.

Lesson Objective

- To understand and apply commutative law and the associative law in calculating decimal numbers.

Prior Knowledge

- Multiplication of decimal numbers smaller than 1
- Commutative and Associative laws (Grades 3 and 4)

Preparation

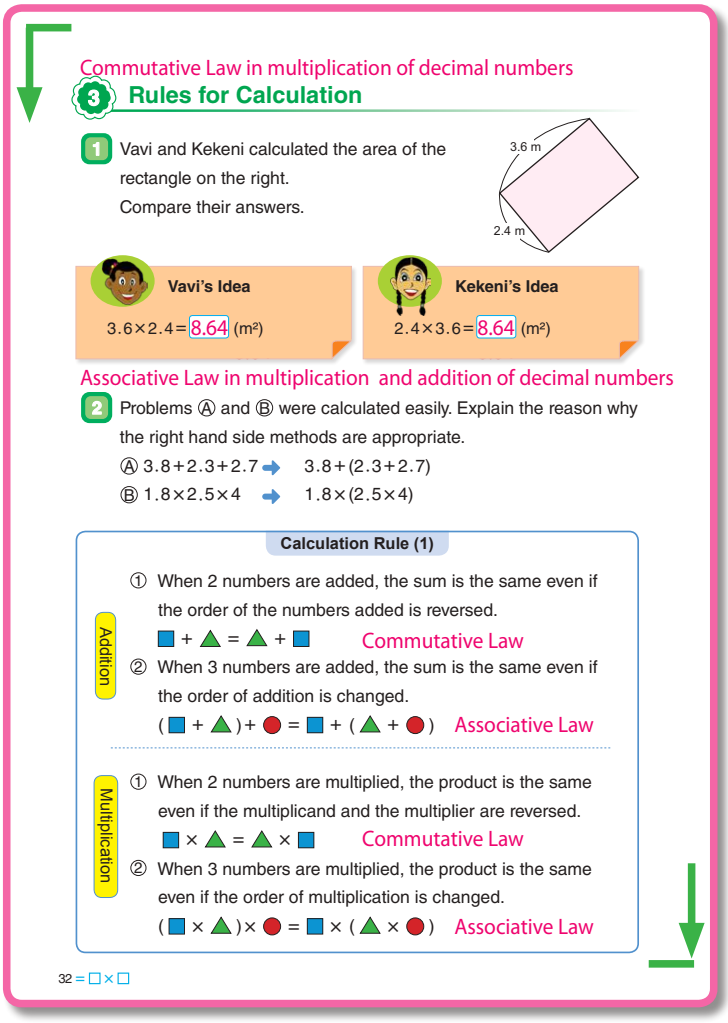
- A diagram of a rectangle drawn in Task 1
- Chart of Calculation Rule (1)

Assessment

- Understand and apply commutative law and the associative law in calculating with decimal numbers. F S

Teacher's Notes

- In this lesson, students do not have to know the term "commutative" and "associative" laws but instead learn the process of applying the rules such as;
- Commutative law is when 2 numbers are multiplied or added even when their order is reversed, the product or sum is the same.
- Associative law is when 3 numbers are multiplied or added, the order of calculation does not change the product or sum.



Commutative Law in multiplication of decimal numbers

3 Rules for Calculation

1 Vavi and Kekeni calculated the area of the rectangle on the right. Compare their answers.

Vavi's Idea: 3.6×2.4=8.64 (m²)

Kekeni's Idea: 2.4×3.6=8.64 (m²)

Associative Law in multiplication and addition of decimal numbers

2 Problems Ⓐ and Ⓑ were calculated easily. Explain the reason why the right hand side methods are appropriate.

Ⓐ 3.8+2.3+2.7 → 3.8+(2.3+2.7)

Ⓑ 1.8×2.5×4 → 1.8×(2.5×4)

Calculation Rule (1)

Addition

① When 2 numbers are added, the sum is the same even if the order of the numbers added is reversed.
■ + ▲ = ▲ + ■ Commutative Law

② When 3 numbers are added, the sum is the same even if the order of addition is changed.
(■ + ▲) + ● = ■ + (▲ + ●) Associative Law

Multiplication

① When 2 numbers are multiplied, the product is the same even if the multiplicand and the multiplier are reversed.
■ × ▲ = ▲ × ■ Commutative Law

② When 3 numbers are multiplied, the product is the same even if the order of multiplication is changed.
(■ × ▲) × ● = ■ × (▲ × ●) Associative Law

32 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Think about how to calculate the area of the rectangle.

T/S 1 Read and understand the situation.
T Introduce the Main Task. (Refer to the Blackboard Plan)
T Ask the students to find the area of the rectangle.
S Think about how to calculate the area of the rectangle and present their ideas.
T Compare students' ideas with Vavi's and Kekeni's ideas.
TN Vavi's Idea: $3.6 \times 2.4 = 8.64$ Answer: 8.64 m²
Kekeni's Idea: $2.4 \times 3.6 = 8.64$ Answer: 8.64 m²
T What did you notice from these two orders of calculations?
S Even when changing the order of calculation, the answer is still the same.

3 Think about how to use the rules of calculation in multiplication and addition.

T/S 2 Read and understand the situation.
T What do you think about the calculation on the right hand side for Ⓐ and Ⓑ?
S In both Ⓐ and Ⓑ, the order of calculation is changed so that the answer in the bracket becomes a whole number as 5 and 10 respectively and makes the calculation more easier.

4 Calculation rule (1)

T Ask students to discuss and explain the calculation rule from the textbook or chart.
S Discuss and explain their ideas to their friends.
T Confirms the understanding of the calculation rule 1.
TN Students need to understand that the calculation rules apply to decimal numbers as well.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

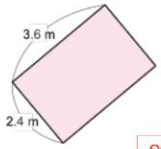
Date: **Chapter:** 3 Multiplication of Decimal Numbers. **Topic:** Rules for Calculation. **Lesson No:** 1/2

MT: Let's think about how to find an effective way for easier calculations.

Review

MT

1 Vavi and Kekeni calculated the area of the rectangle on the right. Compare their answers.



Students' Ideas.

Vavi's Idea $3.6 \times 2.4 =$ 8.64 (m²)
Kekeni's Idea $2.4 \times 3.6 =$ 8.64 m²

Even changing the order of calculation the answer is still the same.

2 Problems Ⓐ and Ⓑ were calculated easily . Explain the reason why the right hand side methods are appropriate.

Ⓐ $3.8+2.3+2.7 \rightarrow 3.8+(2.3+2.7)$
Ⓑ $1.8 \times 2.5 \times 4 \rightarrow 1.8 \times (2.5 \times 4)$

In both A and B the order of calculation is changed so that the operation in the brackets becomes a whole number as 5 and 10 respectively which makes the calculation easier.

Calculation Rule (1)

Addition
① When 2 numbers are added, the sum is the same even if the order of the numbers added is reversed.
■ + ▲ = ▲ + ■
② When 3 numbers are added, the sum is the same even if the order of addition is changed.
(■ + ▲) + ● = ■ + (▲ + ●)

Multiplication
① When 2 numbers are multiplied, the product is the same even if the multiplicand and the multiplier are reversed.
■ × ▲ = ▲ × ■
② When 3 numbers are multiplied, the product is the same even if the order of multiplication is changed.
(■ × ▲) × ● = ■ × (▲ × ●)

Summary

The order of calculation for addition and multiplication with decimal numbers does not change the sum or product.

Unit 3

Unit: Multiplication of Decimal Numbers
Sub-unit 3: Rules for Calculation
Lesson 2 of 2

Textbook Page : 033 and 034
Actual Lesson 022

Lesson Objective

- To understand that distributive law can be applied in the calculation of decimal numbers.

Prior Knowledge

- Multiplication of decimal numbers
- Distributive law in whole numbers (Grade 4)

Preparation

- Diagram representation of 3, 4 and 5
- Chart of Calculation Rule (2)

Assessment

- Make mathematical expression by observing the figure. F
- Calculate using distributive law. F S
- Solve the exercise correctly. S

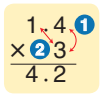
Teacher's Notes

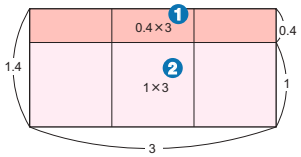
- In this lesson, students do not have to know the term "distributive" laws but instead learn the process of applying the rules.
- When using operations of addition and multiplication or subtraction and multiplication with brackets, expand the operation in the brackets before calculation.
- Consider the correct order of operations when calculating.

Distributive Law 2 in the case of multiplication of decimal number

3 The answer to 1.4×3 can be calculated by thinking as follows.
Let's explain the method by using this diagram.

$1.4\times3=(1+0.4)\times3$
$=1\times3+0.4\times3$

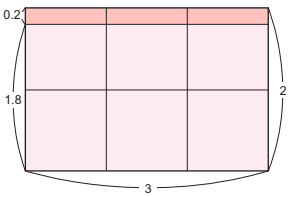




Distributive Law 2 in the case of multiplication of decimal number

4 The answer to 1.8×3 can be calculated by thinking as follows.
Let's explain the method by using this diagram.

$1.8\times3=(2-0.2)\times3$
$=2\times3-0.2\times3$



Distributive Law

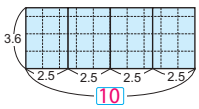
Calculation Rule (2)

$(\square+\triangle)\times\bigcirc=\square\times\bigcirc+\triangle\times\bigcirc$
$(\square-\triangle)\times\bigcirc=\square\times\bigcirc-\triangle\times\bigcirc$

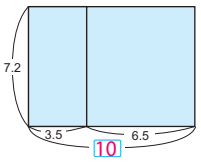
$\square-\square=33$

5 Let's explain how the calculation rules are used for easier calculations.

① $3.6\times2.5\times4$
$=3.6\times(\boxed{2.5}\times\boxed{4})$
$=3.6\times\boxed{10}$
$=\boxed{36}$



② $7.2\times3.5+7.2\times6.5$
$=7.2\times(\boxed{3.5}+\boxed{6.5})$
$=7.2\times\boxed{10}$
$=\boxed{72}$



It is useful to remember the multiplications that have products such as 1 and 10.
$0.25\times4=\mathbf{1}$ $1.25\times8=\mathbf{10}$ $2.5\times4=\mathbf{10}$

Exercise

Let's calculate using the calculation rules. Write down how you calculated.

① $6.9\times4\times2.5$
$6.9\times(4\times2.5)=6.9\times10=69$

② $3.8\times4.8+3.8\times5.2$
$3.8\times(4.8+5.2)=3.8\times10=38$

③ $0.5\times4.3\times4$
$=4.3\times(0.5\times4)$
$=4.3\times2$
$=8.6$

④ $3.6\times1.4+6.4\times1.4$
$=1.4\times(3.6+6.4)$
$=1.4\times10$
$=14$

$34=\square\times\square$

Lesson Flow

1 Review the previous lesson.

2 Think about how to calculate 1.4×3

T/S 3 Read and understand the situation.
T Introduce the Main Task. (Refer to the BP)
T Ask students to explain the mathematical sentence by observing the figure.
S 1.4 is divided by 2 parts, 1 and 0.4. Calculated separately, 1×3 and 0.4×3
S When calculating the area separately, the whole area is 4.2

3 Think about how to calculate 1.8×3

T/S 4 Read and understand the situation.
T Ask students to explain mathematical sentences by observing the figure.
S 1.8=2−0.2 so 1.8×3=(2−0.2)×3
S When subtracting small area (0.2×3) from the large area (2×3), we can find the area (1.8×3)

4 Calculation rule (2).

T/S Based on tasks 3 and 4, explain that calculation rule (2) can be applied in the calculation of decimal numbers.

5 5 Explain how calculation rule (2) is used.

S ① 2.5×4=10, so when calculating 2.5×4 first, the whole calculation become easier.
S ② 3.5+6.5=10, so when calculating 3.5+6.5 first, the whole calculation becomes easier.

6 Important Point

T/S Explain the important point in the box .

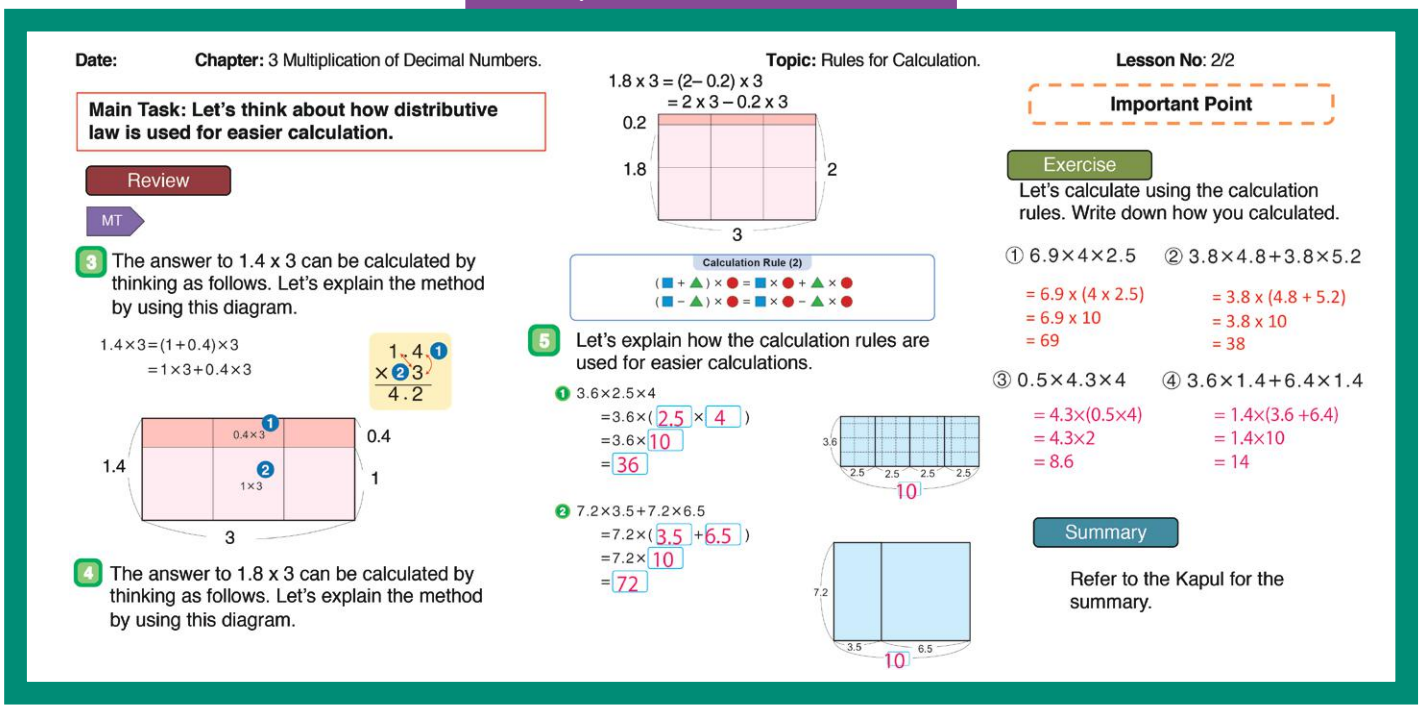
7 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

8 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 3

Unit: Multiplication of Decimal Numbers
Exercise, Problems, Evaluation and Math Extras
Lesson 1 and 2 of 2

Textbook Page :
035 to 037
Actual Lesson 023 and 024

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

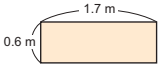
This is the last lesson of Chapter 3. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

1 Let's multiply in vertical form. Pages 29 to 33

① 50×4.3 215 ② 6×1.8 10.8 ③ 26×3.2 83.2 ④ 3×1.4 4.2
⑤ 31×5.2 161.2 ⑥ 62×0.7 43.4 ⑦ 0.6×0.8 0.48 ⑧ 3.5×0.9 3.15
⑨ 1.5×3.4 5.1 ⑩ 0.3×0.25 0.075 ⑪ 1.26×2.3 2.898 ⑫ 4.36×1.5 6.54

2 Let's find the area of the rectangle. Pages 33 and 34



0.6×1.7=1.02
Answer: 1.02 m²

3 There is a wire that weighs 4.5 g per 1 m. Page 31

Let's find the weight of 8.6 m and the weight of 0.8 m of this wire.
4.5×8.6=38.7 Answer: 38.7g 4.5×0.8=3.6 Answer: 3.6g

4 Let's fill the ☐ with equal or inequality signs. Page 31

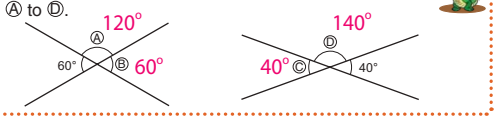
① 3.5×3.5 [>] 3.5 ② 3.5×0.1 [<] 3.5
③ 3.5×0.9 [<] 3.5 ④ 3.5×1 [=] 3.5

5 Choose numbers from the ☐ below and make problems for multiplications of decimal numbers.
Exchange your problems with your friends and solve. Page 34

1.5	7	0.8	30	2.3	5

Grade 4 Do you remember?

Find the sizes of the following angles Ⓐ to Ⓓ.



□−□=35

PROBLEMS

1 Summarize how to calculate with decimal numbers.
● Understanding how to calculate with decimal numbers.

To calculate 2.3×1.6 first multiply 2.3 by [10] and multiply 1.6 by [10], then calculate [23]×[16] and then the answer is [1/100] of 368.

2 Let's multiply in vertical form.
● Multiplying decimal numbers in vertical form.

① 28×1.3 36.4 ② 19×1.2 22.8 ③ 3.2×1.8 5.76
④ 0.4×0.6 0.24 ⑤ 3.5×0.7 2.45 ⑥ 7.6×0.5 3.8
⑦ 2.87×4.3 12.341 ⑧ 1.08×2.1 2.268 ⑨ 0.07×0.8 0.056

3 There is a copper wire that costs 90 kina per 1 m.
● Estimating the product with multiplier should be larger or smaller than 1.

① How much will it cost for 3.2 m?
② How much will it cost for 0.6 m?
3.2×90=288 Answer: 288 kina
0.6×90=54 Answer: 54 kina

4 Let's calculate in easier ways. Show how you calculated.
● Using the calculation rules.

① 0.5×5.2×8
5.2×(8×0.5)
=5.2×4=20.8

② 2.8×15
(3−0.2)×15
=45−3
=42

5 Let's put decimal points on the products for the following calculations.
● Using operations of decimal numbers × decimal numbers

①
$$\begin{array}{r} 0.1\,5 \\ \times\ 2.8 \\ \hline 1\,2\,0 \\ 3\,0 \\ \hline 0.4\,2\,0 \end{array}$$

②
$$\begin{array}{r} 6.4\,3 \\ \times\ 2.4 \\ \hline 2\,5\,7\,2 \\ 1\,2\,8\,6 \\ \hline 1\,5.4\,3\,2 \end{array}$$

36=□×□

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN 2 Area of rectangle
3 Word problems of decimal number
4 Comparison of decimal numbers
5 Making word problems of decimal numbers

2 Solve the Problems

S Solve all the problems.

T Confirm students' answers.

TN 1 Explain how to multiply decimal number by decimal number.
2 Multiplication of decimal number in vertical form.
3 Understand the relation between product and 2nd number in the operation.
4 Apply commutative law and distributive law.
5 Explain the structure of multiplication of decimal number.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

S Complete the Evaluation Test.

Mathematics Practices in Papua New Guinea

Topic 1: Counting to ten in three counting systems in PNG

Today in our modern society, we have the number system and standard units of measurement for mathematical practices and applications in daily life.
For example, we use digits from 0 to 9 to count and express quantities.
For measuring we use rulers, tape measures, scales and many more.
These systems are world wide and adopted from the western societies. Do you think in PNG, our ancestors used mathematical practices and applications?
Yes, traditionally, our ancestors used various ways of counting and expressing quantities in their vernacular. They also used various oblects and methods to measure. We have been practicing mathematical applications in our daily lives.
Let's discover counting systems from the Wuvulu Island (East Sepik Province), Motuan villages (Central Province) and Unggai area (Eastern Highlands Province).

1. The Wuvulu counting system

Number	Word
1	eai
2	guai
3	olumanu
4	obao
5	eipana
6	eipana ma eai
7	eipana ma guai
8	eipana ma olumanu
9	eipana ma obao
10	hefua

The word 'pana' (number 5) represents one hand therefore every number that succeeds 5 is one hand and that number. e.g. The number 6 exceeds 5 by 1 so that means that it is one hand and one. Hence, it is true to say that Wuvulu counting system uses base 5 which corresponds to one hand.

2. Motu counting system

Number	Word
1	ta
2	rua
3	toi
4	hani
5	ima
6	taura toi
7	taura hani
8	taura hanita
9	hitu
10	gwauta

In the Motuan culture, the counting system is base 10 but every ten has a name of its own. It depends on what you are counting.
For example, counting fish, coconuts, and shell money is different from counting money, stones, heads and sticks. The 'rabu' is the word for 10 when counting shell money or coconuts and 'ituri' is the word for 10 when counting fish.

3. Unggai counting system

Number	Word
1	mako
2	lowe
3	loweki mako
4	loweki loweki
5	ade mako
6	ade makoki mako
7	ade makoki lowe
8	ade makoki loweki mako
9	ade makoki loweki loweki
10	ade lowe

The base used in Unggai usually changes after every 5 count. The word for 5, 'ade' means one whole hand. Ade lowe (10) means two hands. Further counting uses feet.
For example, the expression for 15 is 'ade loweki ika mako', meaning two hands and one foot. 20 can be expressed in two ways; either 'ade loweki ika lowe' (2 hands and 2 feet), or 'we mako' ('we' means 'person'), that is to say, 2 hands and 2 feet make one whole person.

Ethnomathematical Lessons for PNG by Mathematics students of UPNG-Goroka campus, 1993

□ − □ = 37

48

End of Chapter Test **Date:**

Chapter 3: Multiplication of Decimal Numbers	Name:	Score / 100

1. Calculate. [10 marks for each question]

(1) 63×2.4

```
   6 3
 × 2.4
 2 5 2
1 2 6
1 5 1.2
```

Answer: 151.2

(2) 85×4.02

```
     8 5
 × 4.0 2
   1 7 0
3 4 0 0
3 4 1.7 0
```

Answer: 341.7

(3) 40×0.37

```
   4 0
 × 0.3 7
   2 8 0
1 2 0
1 4.8 0
```

Answer: 14.8

(4) 7.3×8.2

```
   7.3
 × 8.2
   1 4 6
5 8 4
5 9.8 6
```

Answer: 59.86

2. The following calculations show the processes of making the calculations easy. Fill numbers in the □. [20 marks for each question]

(1) 2.5×7.6×4
=(2.5 ×4)× 7.6
= 10 ×7.6
= 76

(2) 7.5×4.6+7.5×2.4
=7.5×(4.6 + 2.4)
=7.5×7
=52.5

3. Answer the following questions. [10 marks for maths expression and 10 marks for answer]

(1) What is the area of a rectangle with length is 4.5 m and width is 8.02 m?

Mathematical Expressions: 4.5×8.02

Answer: 36.09 m²

End of Chapter Test **Date:**

Chapter 3: Multiplication of Decimal Numbers	Name:	Score / 100

1. Calculate.

[10 marks for each question]

(1) 63×2.4

Answer: ☐

(2) 85×4.02

Answer: ☐

(3) 40×0.37

Answer: ☐

(4) 7.3×8.2

Answer: ☐

2. The following calculations show the processes of making the calculations easy.
Fill numbers in the ☐.

[20 marks for each question]

(1) $2.5 \times 7.6 \times 4$

$= (\square \times 4) \times \square$

$= \square \times 7.6$

$= \square$

(2) $7.5 \times 4.6 + 7.5 \times 2.4$

$= 7.5 \times (\square + \square)$

$= 7.5 \times 7$

$= \square$

3. Answer the following questions.

[10 marks for maths expression and 10 marks for answer]

(1) What is the area of a rectangle with length is 4.5 m and width is 8.02 m?

Mathematical Expressions:

☐

Answer:

☐

Chapter 4 Congruence and Angles of Figures

1. Content Standard

5.3.1 Investigate and understand the properties of congruent triangles and quadrilaterals.

2. Unit Objectives

- To deepen students' understanding of plane geometrical figures through observing and composing figures.
- To understand congruence of geometrical figures.

3. Teaching Overview

Students already learned that figures are categorised by their elements.

They also learned that they can draw specific figures by paying attention to the features of each element. In this unit, students observe figures by the perspective of congruency.

Congruent Figures :

Students understand that two congruent figures can fit exactly on top of each other.

They learn that congruent figures can be identified by minimum conditions.

They also learn that they can draw congruent figures by the minimum conditions given.

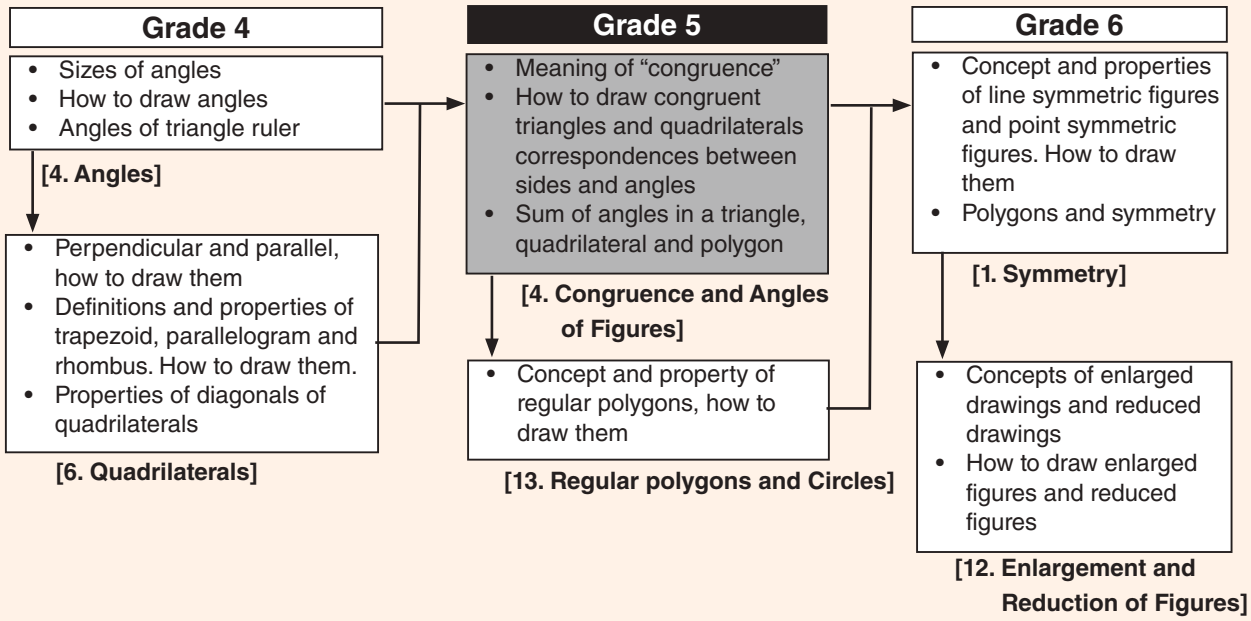
Note that they should be given enough opportunity for constructions.

Angles of Triangles and Quadrilaterals :

First, students focus on the interior angles of a triangle and their sum.

Then they expand the knowledge on the sum of interior angles of quadrilaterals and other polygons.

4. Related Learning Contents



Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 1:Congruent Figures
Lesson 1 of 5

Textbook Page :
038 to 040
Actual Lesson 025

Sub-unit Objectives

- To understand the meaning of congruence.
- To understand how to draw a congruent triangle and a congruent quadrilateral.
- To understand the term corresponding.

Lesson Objectives

- To understand and define the meaning of congruent.
- To think about the properties that determine congruency of plane figures.

Prior Knowledge

- Rectangles, squares and right triangles (Grade 3)
- Perpendicular lines, parallel lines and quadrilaterals (Grade 4)
- Angles (Grade 4)

Preparation

- Protractor, compass and 1 cm grid sheets.

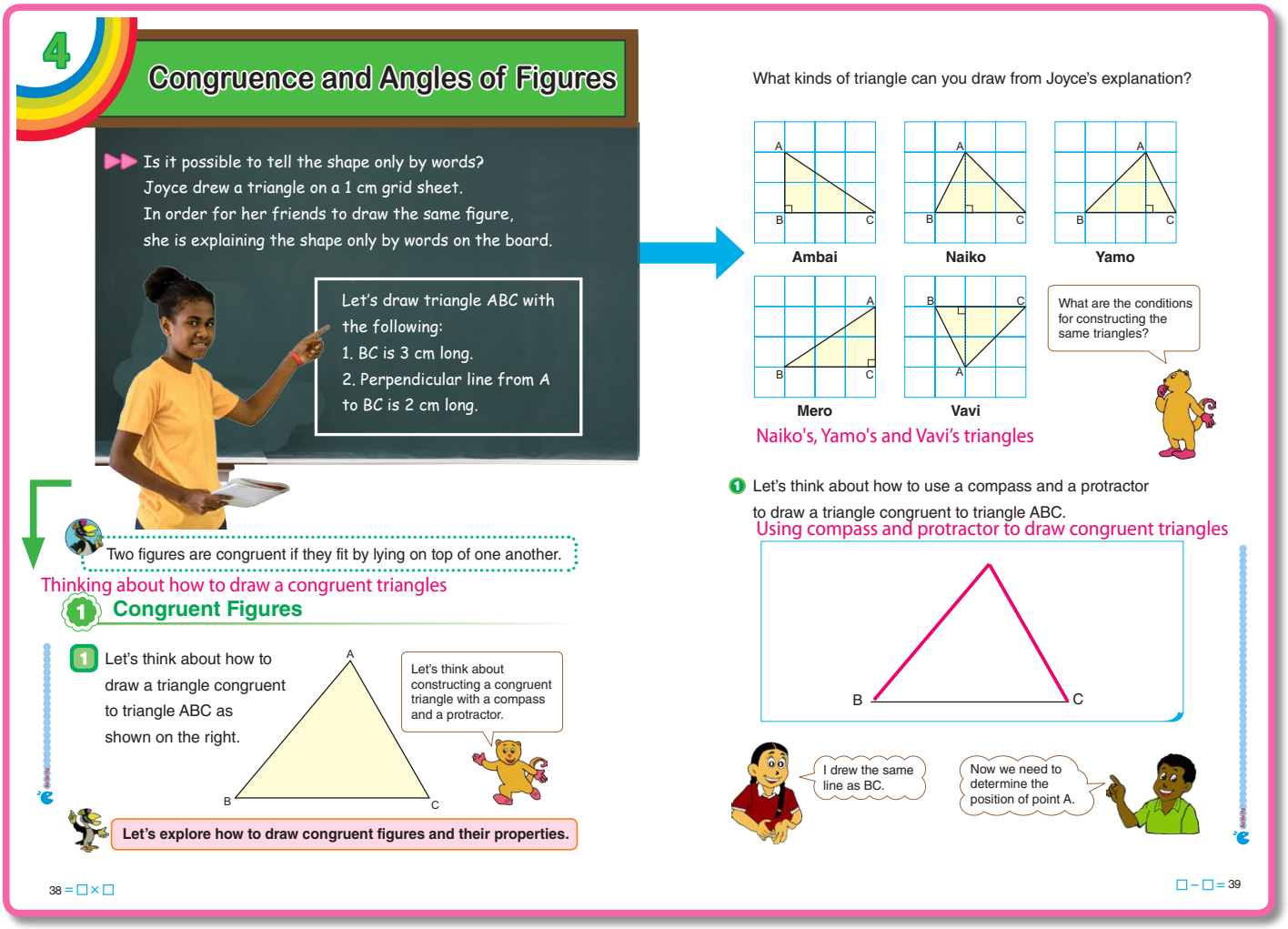
Assessment

- Draw a congruent triangle by using a compass and a protractor. F
- Explain the meaning of congruent. S

Teacher's Notes

When two geometrical figures overlap each other and have the same shape and size, they are congruent. The corresponding side lengths and corresponding angle sizes are the same.

Students should be able to determine and verify the properties of geometrical figures through activities such as finding, drawing and constructing congruent geometrical figures.



Lesson Flow

1 Understand the term congruence and its meaning.

T Introduce the Main Task. (Refer to the BP)

S ▶▶ Discuss the situation on the blackboard and draw a triangle using the given instructions on the 1 cm grid paper.

S Compare the triangles drawn with other members of the class and the examples on page 38.

T Can the same triangle be drawn using the same instructions?

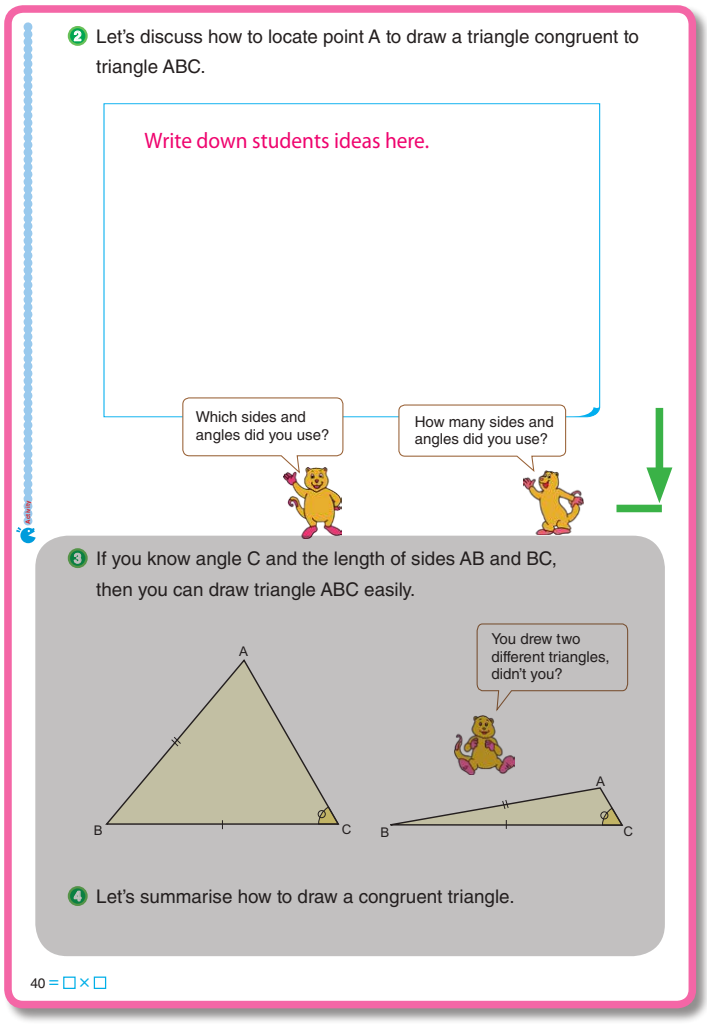
S Explain that some triangles are exactly the same but not all triangles are exactly alike.

T Select two triangles that are exactly alike and inform the students that these triangles are congruent.

S Explain the term congruent based on their observation of the 2 triangles shown.

2 Important Point

T/S Explain the important point in the box ⬚.



3 1 Think about how to draw a triangle congruent to triangle ABC shown.

T How can we draw a triangle congruent to triangle ABC?

S Explain in groups how to draw a triangle congruent to ABC.

TN Ask students' to think about how to use the compass and protractor to construct the triangle.

S 1 Investigate and think about using a protractor and compass to determine the exact position of point A, when points B and C are given.

4 Discuss how to locate point A.

S 2 Discuss and identify how point A can be located using a protractor or compass.

T Which sides and angles and how many sides and angles did you use?

S Share ideas with the class on how to draw triangles congruent to triangle ABC.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Lesson 025 Sample Blackboard Plan is on page 53.

Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 1: Congruent Figures
Lesson 2 of 5

Textbook Page : 040 and 041
Actual Lesson 026

Lesson Objective

- To understand how to draw congruent triangles.

Prior Knowledge

- Perpendicular lines, parallel lines and quadrilaterals (Grade 4)
- Angles (Grade 4)
- How to draw congruent triangle

Preparation

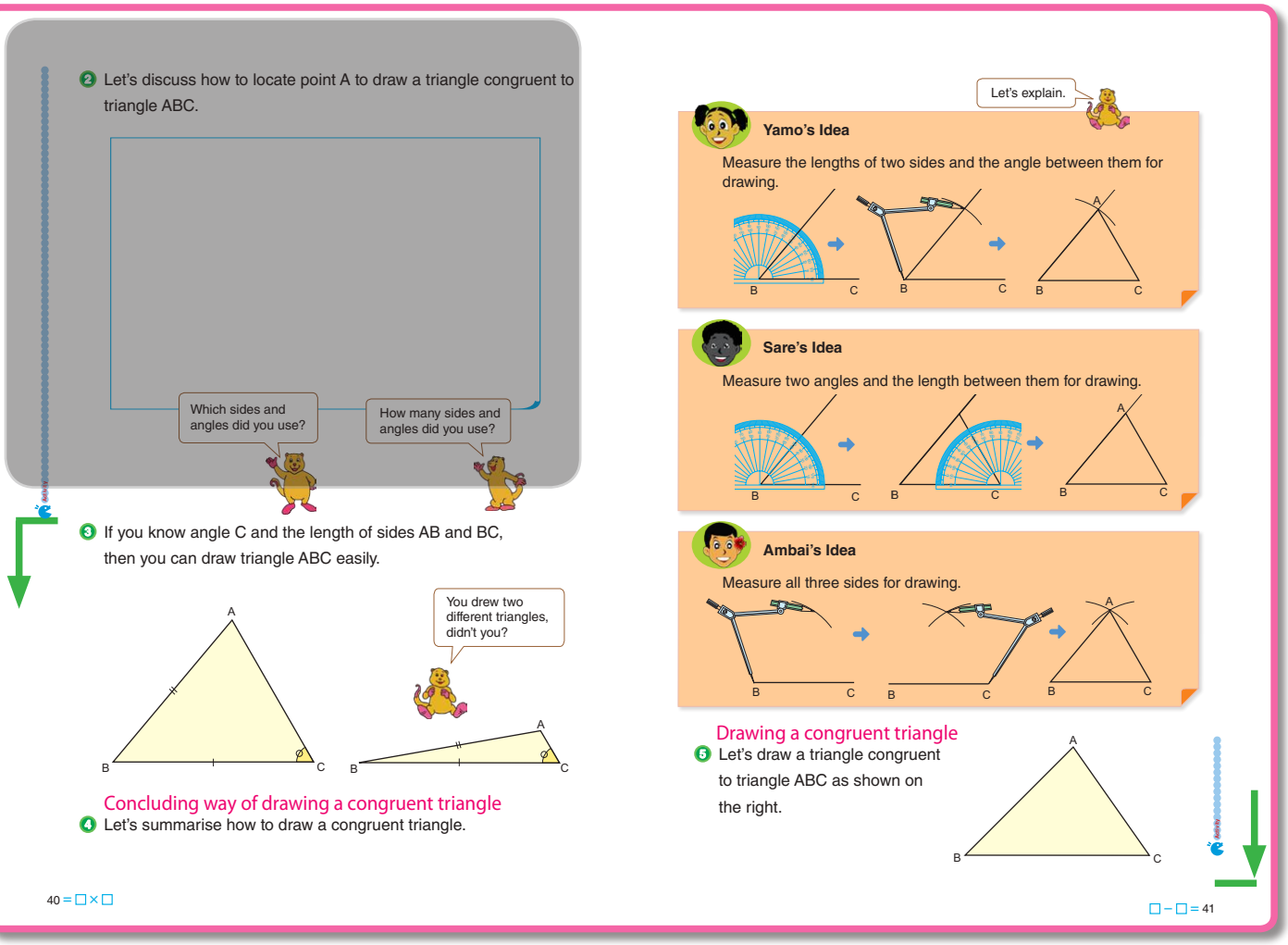
- Protractor and compass

Assessment

- Investigate and explain how to draw a triangle congruent to triangle ABC. F
- Draw a congruent triangle by using the properties of the side lengths and angles. F S

Teacher's Notes

When drawing a congruent triangle, consider the ideas discussed in Yamo's, Sare's and Ambai's ideas to get a better understanding of how to draw congruent triangles using a protractor and compass.
These ideas highlight the importance of having exactly the same corresponding side lengths and angles.



Lesson Flow

1 Review the previous lesson.

2 ③ Compare two different triangles where 2 side lengths and 1 angle is given.

T Introduce the Main Task. (Refer to the BP)
TS Discuss and confirm that knowing 2 sides (AB) and (BC), and 1 angle (C) is not enough to determine the congruency of triangles.
T Why aren't these triangles congruent?
S Explain that side (AC) of both triangles are different in length.

3 Summarise how to draw a congruent triangle.

S ④ Discuss some specific ways of drawing congruent triangles.
S Practice drawing congruent triangles using compasses and protractors using Yamo's, Sare's and Ambai's ideas.

TN Remind the students to use the compass and protractor correctly when constructing triangles.

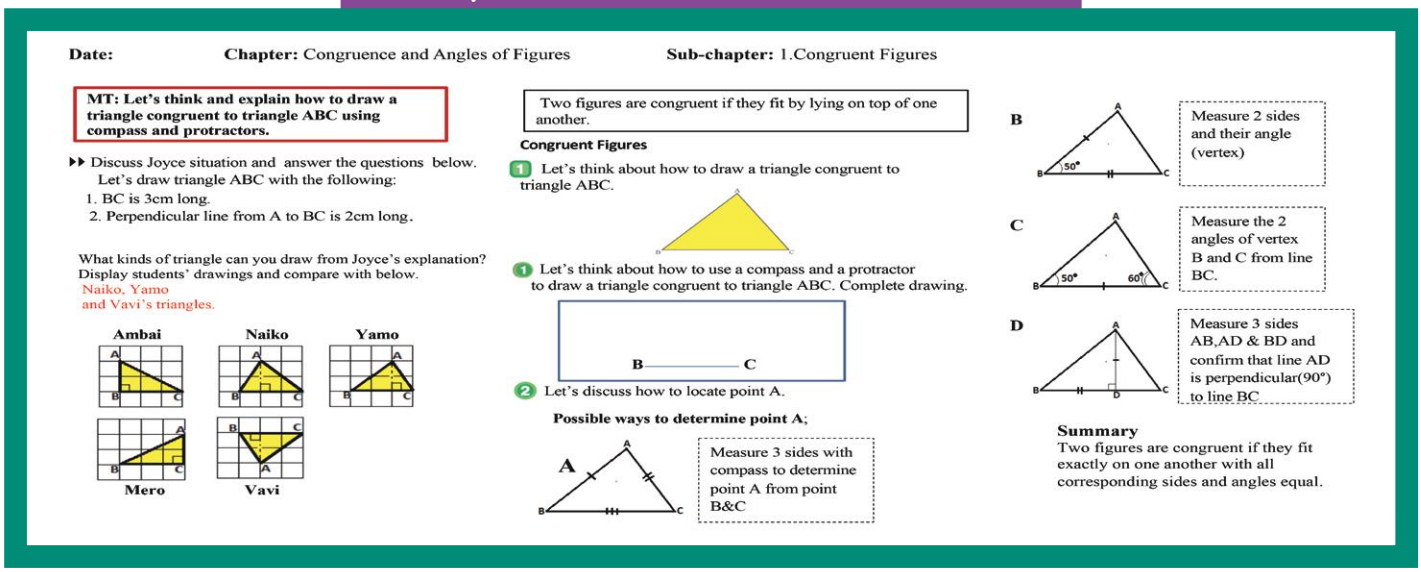
4 Draw a triangle congruent to triangle ABC.

S ⑤ Draw triangles congruent to triangle ABC using the three ideas to get a better understanding of how to draw congruent triangles in various ways.
T Allow the students to present their drawings and briefly explain how they drew their congruent triangles.

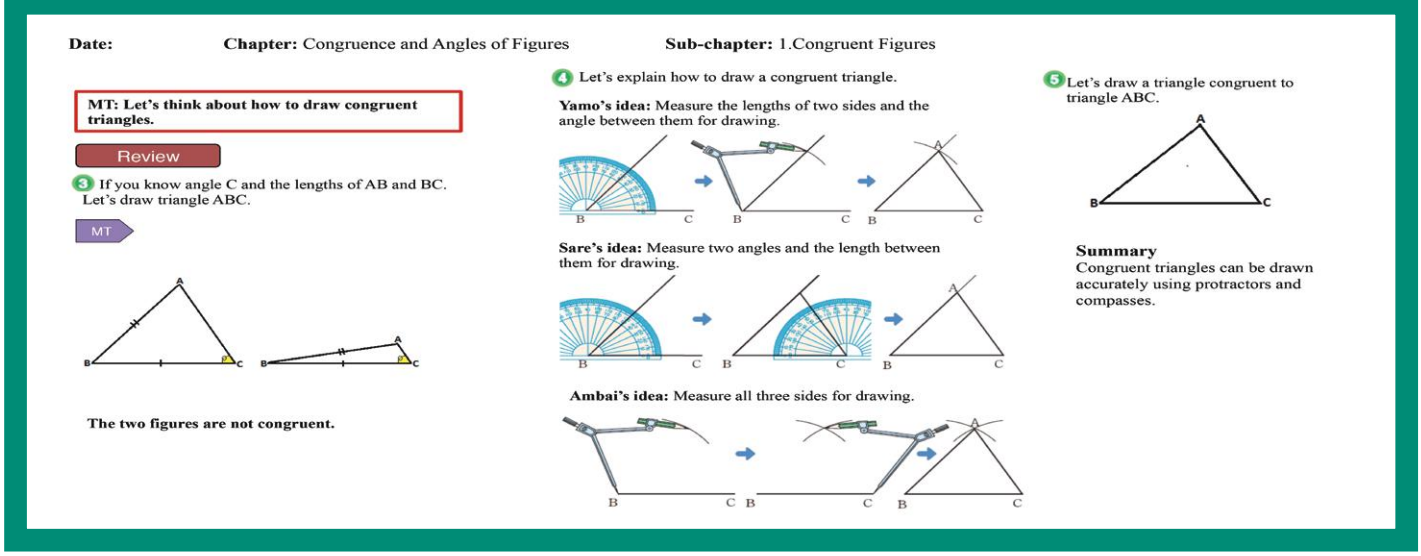
5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 25)



Sample Black Board Plan (Lesson 26)



Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 1: Congruent Figures
Lesson 3 of 5

Textbook Page : 042 and 043
Actual Lesson 027

Lesson Objectives

- To understand the meaning of the term correspond.
- To understand the characteristics of edges and angles in congruent figures.

Prior Knowledge

- Perpendicular lines, parallel lines and quadrilaterals (Grade 4)
- Angles (Grade 4)
- How to draw congruent triangles

Preparation

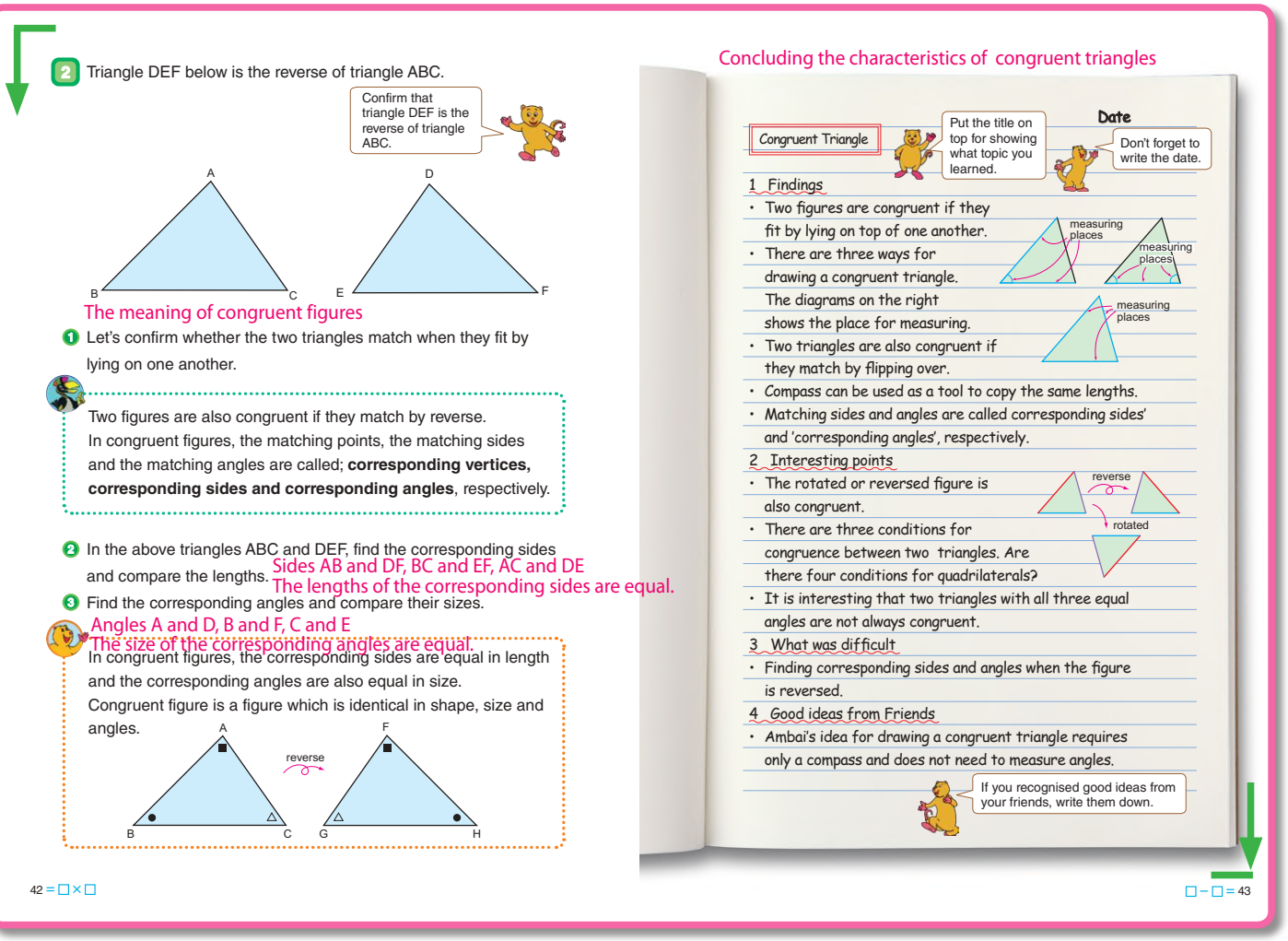
- Protractor, compass and ruler

Assessment

- Compare and measure the length and size of corresponding sides and angles in congruent triangles. F
- Understand the characteristics of congruent figures. S

Teacher's Notes

- When two matching geometrical figures overlap each other having the same shape and size, they are congruent.
  The corresponding side lengths and corresponding angle sizes are the same.
- Students should be able to determine and verify the properties of geometrical figures through activities such as finding, drawing and constructing congruent geometrical figures.



Lesson Flow

1 Review the previous lesson.

2 ② Investigate triangle ABC and DEF to confirm that one is the reverse of the other.

T Introduce the Main Task. (Refer to the Blackboard Plan)
S ① Do the activity by tracing Triangle ABC and placing it over triangle DEF.
T Are they congruent?
S Recognise that the triangles fit exactly on top of each other.
T Confirm through demonstration.

3 Important Point

T/S Explain the important point in the box ⬚.

4 ② Identify and compare the lengths of corresponding sides in triangle ABC and DEF.

S Measure and compare the lengths of corresponding sides and briefly explain.
T Confirm that corresponding sides are equal in length.

5 ③ Identify and compare the sizes of corresponding angles in triangle ABC and DEF.

S Measure and compare the sizes of corresponding angles and briefly explain.
T Confirm that corresponding angles are equal in size.

6 Important Point

T/S Explain the important point in the box ⬚.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

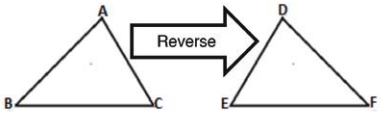
Date: **Chapter:** Congruence and Angles of Figures **Sub-chapter:** 1.Congruent Figures

MT: Let's compare corresponding vertices, sides and angles in congruent triangles.

Review

MT

② Triangle DEF is the reverse of triangle ABC.



① Let's confirm whether the two triangles match when they fit by lying on one another.

Important Point

② In the above figures; triangle ABC is congruent to triangle DEF. Name the corresponding sides and compare the lengths of the corresponding sides.

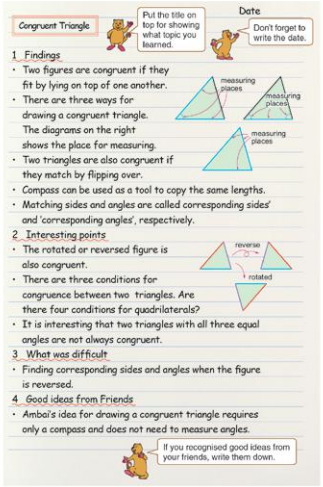
Corresponding sides:
i. BC and EF
ii. AB and DF
iii. AC and DE

When comparing all the corresponding sides the lengths of the corresponding sides are equal.

③ Name the corresponding angles and compare their sizes.
Corresponding angles:
i. A and D
ii. B and F
iii. C and E

When comparing all the corresponding angles the size of the corresponding angles are equal.

Important Point



Summary
Two congruent triangles have matching points, sides and angles called corresponding vertices, sides and angles.

Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 1: Congruent Figures
Lesson 4 of 5

Textbook Page :
044 to 046
Actual Lesson 028

Lesson Objective

- To understand how to draw a congruent quadrilateral.

Prior Knowledge

- Perpendicular lines, parallel lines and quadrilaterals (Grade 4)
- Angles (Grade 4)
- Drawing congruent triangles

Preparation

- Protractor, compass and ruler

Assessment

- Investigate and explain how to draw a quadrilateral congruent to quadrilateral ABCD. F S
- Draw a congruent quadrilateral by using the properties of the side lengths and angles. F S

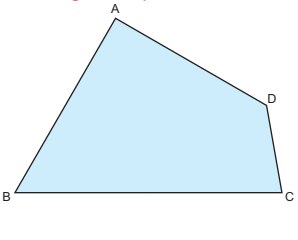
Teacher's Notes

Students should be able to determine and verify the properties of geometrical figures through activities such as finding, drawing and constructing congruent geometrical figures. In this lesson, students will be able to build on what they have learned on drawing congruent triangles from lesson #2 by using a compass, protractor and ruler to draw figures.

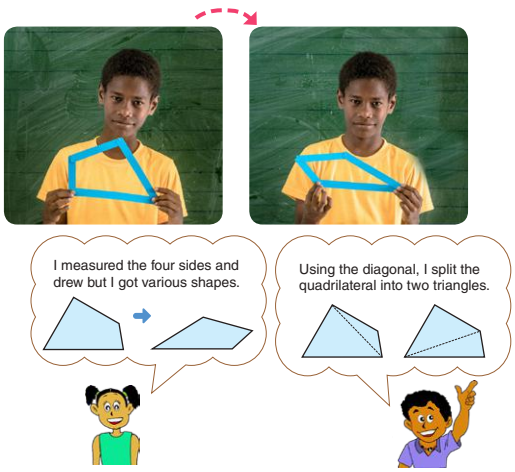
Congruent Quadrilaterals

Thinking about how to draw a congruent quadrilateral

3 Let's think about how to draw a quadrilateral which is congruent to quadrilateral ABCD as shown on the right.



1 If you measure four sides of the quadrilateral for drawing, can you draw a congruent quadrilateral? Can't draw

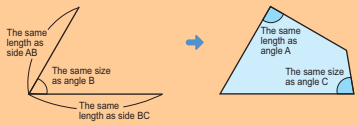


Concluding the way on how to draw a congruent quadrilateral

2 Let's discuss how to draw a congruent quadrilateral with your friends. How can we locate the fourth point?

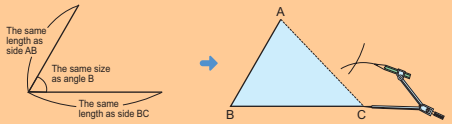
Mero's Idea

Measure angles A and C and determine point D.



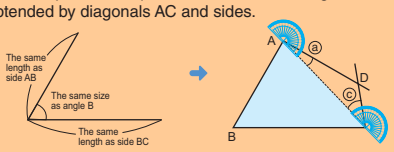
Kekeni's Idea

Use Ambai's idea (page 41) for drawing a congruent triangle to determine point D on quadrilateral. Measure sides AD and CD.



Naiko's Idea

Use Sare's idea (page 41) for drawing a congruent triangle to determine point D on quadrilateral. Measure angles which are subtended by diagonals AC and sides.



3 Use the ideas above to draw a congruent quadrilateral for quadrilateral ABCD.

44 = □ × □

□ − □ = 45

Lesson Flow

1 Review the previous lesson.

2 Investigate quadrilateral ABCD and discuss how to draw a quadrilateral congruent to ABCD.

T Introduce the Main Task. (Refer to the BP)
TS 3 Read and understand the situation.
S 1 Measure the four sides of quadrilateral ABCD and draw a quadrilateral congruent to ABCD using the length of sides.
T Are they congruent?
S Find out that drawing using the side lengths will not result in a quadrilateral congruent to ABCD like triangles.

3 Discuss how to draw congruent quadrilaterals.

T 2 Discuss how you can draw a quadrilateral congruent to ABCD.
S Discuss the possibility of dividing the quadrilaterals into 2 triangles or using angles.

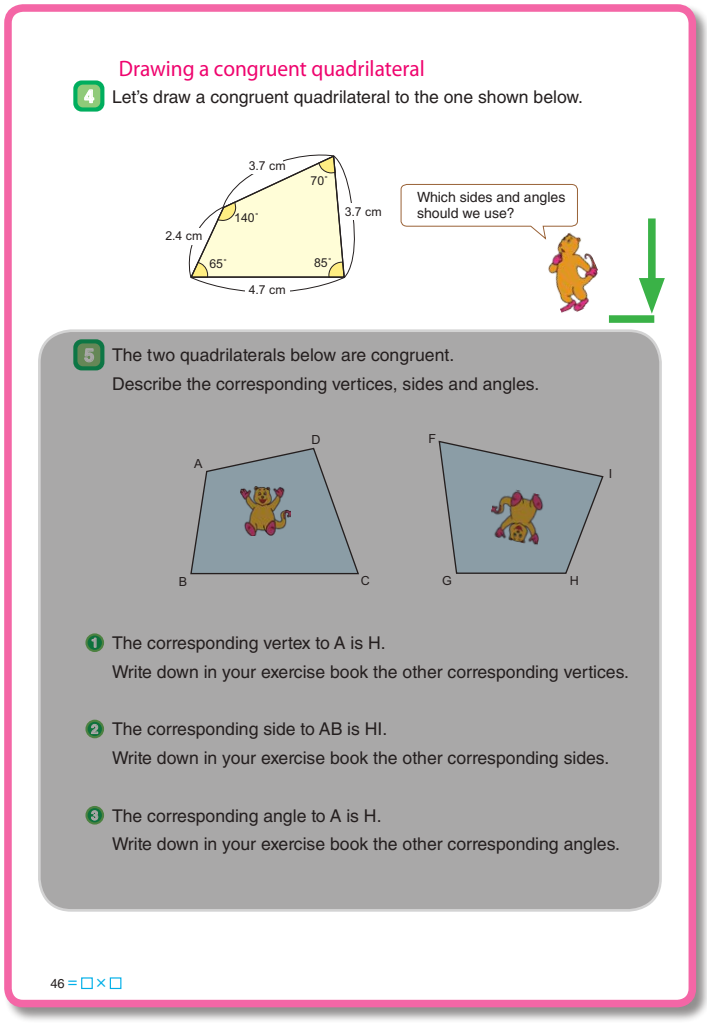
TS Explain how the three ideas are used to draw congruent quadrilaterals.
I. Mero's Idea:
Measure angles A and C and extend the lines to determine point D.
II. Kekeni's Idea:
Split the quadrilateral into 2 triangles and use a compass to determine point D from points A and C.
III. Naiko's Idea:
Split the quadrilateral into 2 triangles and measure the angle from diagonal AC to determine point D.
T Ask the students to try out the ideas discussed to draw a quadrilateral congruent to ABCD.
S 3 Draw a congruent quadrilateral using the ideas discussed.

4 Draw a congruent quadrilateral.

S 4 Draw a quadrilateral congruent to the one in the textbook by applying the ideas learned.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.



Sample Blackboard Plan

Lesson 028 Sample Blackboard Plan is on page 59.

Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 1: Congruent Figures
Lesson 5 of 5

Textbook Page : 046
Actual Lesson 029

Lesson Objective

- To identify and confirm that pairs of vertices, sides and angles in congruent quadrilaterals correspond to each other.

Prior Knowledge

- Perpendicular lines, parallel lines and quadrilaterals (Grade 4)
- Angles (Grade 4)
- Drawing congruent triangles and quadrirateral

Preparation

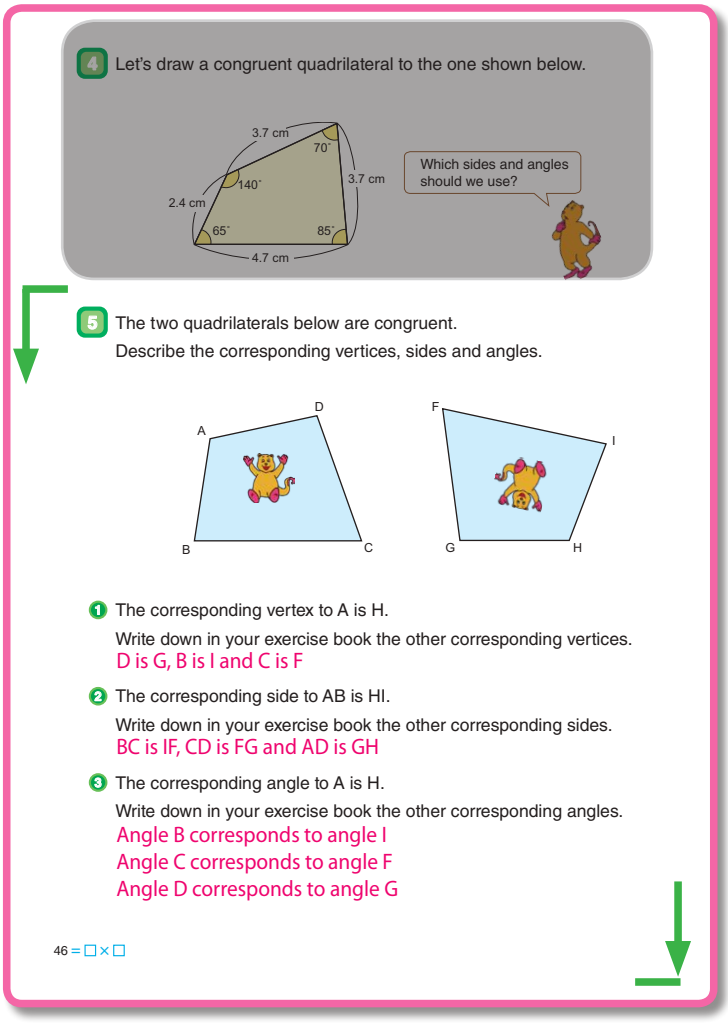
- Protractor, compass and ruler

Assessment

- Investigate and identify corresponding vertices, sides and angles in congruent figures. F
- Identify congruent quadrilateral by using their properties. S

Teacher's Notes

Students should be able to determine and verify the properties of congruent figures through activities of investigating congruency by comparing corresponding vertices, sides and angles.
In congruent figures, all corresponding vertices, side lengths and angles are equal either in length or size.



4 Let's draw a congruent quadrilateral to the one shown below.

5 The two quadrilaterals below are congruent.
Describe the corresponding vertices, sides and angles.

1 The corresponding vertex to A is H.
Write down in your exercise book the other corresponding vertices.
D is G, B is I and C is F

2 The corresponding side to AB is HI.
Write down in your exercise book the other corresponding sides.
BC is IF, CD is FG and AD is GH

3 The corresponding angle to A is H.
Write down in your exercise book the other corresponding angles.
Angle B corresponds to angle I
Angle C corresponds to angle F
Angle D corresponds to angle G

46 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Investigate quadrilateral ABCD and FGHI and identify the properties that make them congruent.

TS 5 Read and understand the situation.
T Introduce the Main Task. (Refer to the BP)
T 1 Allow the students to identify the corresponding vertices on both quadrilaterals.
S D is G, B is I and C is F.

3 2 Investigate and identify the corresponding sides of quadrilateral ABCD and FGHI.

T Allow the students to identify the corresponding sides of both quadrilaterals.
S BC is IF, CD is FG and AD is GH.

4 3 Investigate and identify the corresponding angles of quadrilateral ABCD and FGHI.

T Allow the students to identify the corresponding angles of both quadrilaterals.
S Angle B corresponds to Angle I, Angle C corresponds to Angle F and Angle D corresponds to Angle G.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 28)

Date: **Chapter:** Congruence and Angles of Figures **Sub-chapter:** 1.Congruent Figures

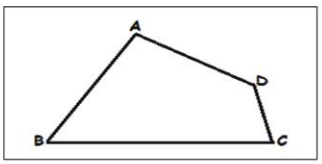
MT: Let's think about and explain how to draw a congruent triangle.

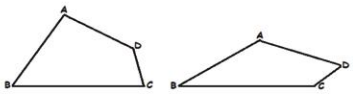
Review

MT

3 Let's think about how to draw a quadrilateral which is congruent to quadrilateral to ABCD as shown.

1 If you measure four sides of the quadrilateral for drawing, can you draw a congruent quadrilateral?



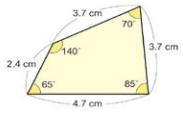


Lengths of sides will be the same but not congruent to ABCD.
(Individual drawings will vary.)

2 How can we locate the forth point (D)?
Refer to the three ideas in the text book for explanation.

3 Use the three ideas to draw a congruent quadrilateral to quadrilateral ABCD.
Individual drawings using the three ideas.

4 Draw the congruent quadrilateral to the one shown in the text book.



Summary
Congruent quadrilaterals can be drawn using;
- side, angle, side
- angle, angle, angle
- side, side, side
- angle, side, angle

Sample Blackboard Plan (Lesson 29)

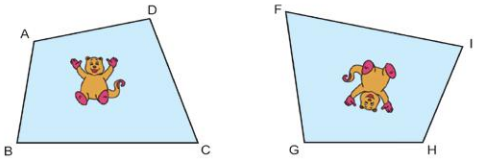
Date: **Chapter:** Congruence and Angles of Figures **Sub-chapter:** 1.Congruent Figures

MT: Let's investigate congruent Quadrilaterals by identifying their corresponding vertices, sides and angles.

Review

MT

5 The two quadrilaterals are congruent.. Describe the corresponding vertices, sides and angles.



1 The corresponding vertex to A is H.

Other corresponding Vertices.
Vertex B and I
Vertex C and F
Vertex D and G

2 The corresponding side to AB is HI.

Other corresponding Sides.
Side BC and FI
Side CD and FG
Side AD and GH

3 The corresponding angle to A is H.

Other corresponding Angles.
Angle B and I
Angle C and F
Angle D and G

SUMMARY
We can say that two quadrilaterals are congruent when their pair of corresponding vertices, sides and angles are equal in size or length.

Unit 4

Unit: Congruence and Angles of Figures
Exercise
Lesson 1 of 1

Textbook Page : 047
Actual Lesson 030

Lesson Objective

- To confirm what students learned about congruence figures.

Prior Knowledge

- All the contents covered in sub-unit 1

Preparation

- Enlarged diagrams of figures given in the Exercise

Assessment

- Solve the exercises correctly. F S

Teacher's Notes

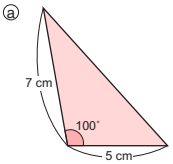
- Refer students' to the sub-unit 1 content of this unit as their reference to complete the exercises.

EXERCISE

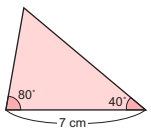
1 Let's draw a congruent triangle with the following conditions. Pages 39 and 40

① A triangle with sides 4 cm, 7 cm and 8 cm.
② A triangle with sides 5 cm, 8 cm and an angle of 75° between them.
③ A triangle with angles 45°, 60° and a side with 6 cm between them.
④ Triangles ⓐ and ⓑ

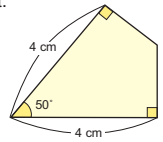
ⓐ



ⓑ



2 Let's draw a congruent quadrilateral to the one on the right. Pages 44 and 45



Grade 4 Do you remember?

Let's calculate.

① 120 + 60 180	② 243 + 29 272	③ 684 + 55 739
④ 254 + 523 777	⑤ 675 + 167 842	⑥ 493 + 728 1221
⑦ 180 − 70 110	⑧ 383 − 47 336	⑨ 742 − 68 674
⑩ 947 − 816 131	⑪ 657 − 219 438	⑫ 526 − 338 188

□ − □ = 47

① Draw a 4 cm line as the base. Use a ruler to measure 7 cm on a compass and make an arc from one end of the base.
Measure 8 cm on the compass and make another arc from the other end of the base.
Draw 2 lines from the base to where the 2 arcs cross each other to form a triangle.
② Draw a 5 cm line and measure 75° with a protractor to form a vertex.
From the 75° vertex, extend a line that is 8 cm long.
Connect these two lines a third connect these two lines with a third line to form a triangle.
③ Draw a 6 cm line as the base. Measure 45° with a protractor from one end of the line and measure 60° with a protractor from the other end, extend the lines.
The point where these two lines meet is the third vertex for the triangle.
④ Draw triangles same as below to apply one of the above method.
Draw same as below.

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN 1 Make sure the students fully understand each of the properties given from (1) to (4) before drawing the congruent of the triangles mentioned.

TN 2 Guide the students in drawing the congruent of the figure.
The students can use rulers, protractors and compass for this exercise.

Sample Blackboard Plan (Lesson 31)

Date: **Chapter:** Congruence and Angles of Figures **Sub-chapter:** 2. Angles of Triangles and Quadrilaterals.

MT: Let's investigate the angles in triangles..

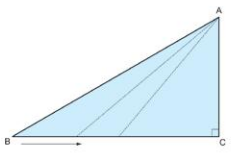
Review

1 Let's explore the sum of two angles excluding the right angle.

MT

The sum of the two angles are:
A. $45° + 45° = 90°$
B. $30° + 60° = 90°$

In the right triangle we are going to move vertex B toward C.



1 How does the value of angle B change?
Vertex B will increase in angle size.

2 How does the value of angle A change?
Vertex A will decrease in angle size.

3 Is there any relationship between the in angle B and angle A?
As vertex B increases, A decreases in angle size.

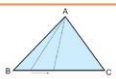
4 Look at the change in the sum of angle A and angle B.

Angle A (degrees)	60	50	40	30	20	10
Angle B (degrees)	30	40	50	60	70	80
Sum (degrees)	90	90	90	90	90	90

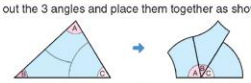
From the table above, what did you find about the sum of the three angles in the right triangle?
The sum is always equal to 180°

2 Look at the sum of the 3 angles of a triangle in various ways.

① Draw a triangle and measure the angles with a protractor.
The sum of the 3 angles is 180°.

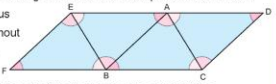


② Cut out the 3 angles and place them together as shown below.



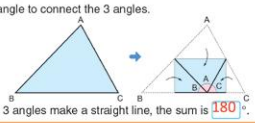
Since the 3 angles together make a straight line, the sum of these angles is 180°.

③ Put together triangles with the same shape and size to make a continuous pattern without any gaps.



Since 3 angles at points A and B make a straight line, their sums are 180°.

④ Fold a triangle to connect the 3 angles.



Since the 3 angles make a straight line, the sum is 180°.

Summary
In any triangles, sum of the three angles is 180 °.

Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 2: Angles of Triangles and Quadrilaterals
Lesson 1 of 5

Textbook Page : 048 to 050
Actual Lesson 031

Sub-unit Objectives

- To understand that the sum of the three angles in any triangle as 180°.
- To find the sum of interior angles in other polygons based on the sum of interior angles of a triangle.

Lesson Objective

- To understand that the sum of 3 angles in any triangle is180° regardless of their shapes and sizes.

Prior Knowledge

- Quadrilaterals and triangles.
- Perpendicular lines, parallel lines and quadrilaterals.
- Angles. (Grade 4)

Preparation

- Protractor, compass and ruler, papers for 2.

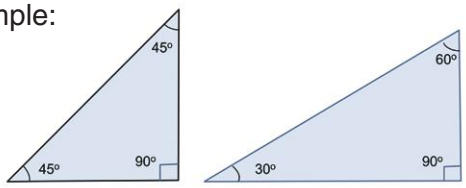
Assessment

- Investigate the angle sum of various types of triangles. F
- Explain various ways to show that the angle sum of triangles are 180°. S

Teacher's Notes

The angle sum of a triangle is 180°.

Example:



The angle sum of the set squares will be

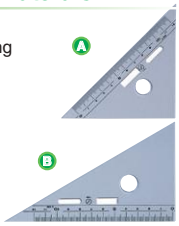
(A) 45 + 45 + 90° = 180°

(B) 30 + 60 + 90° = 180°

2 Angles of Triangles and Quadrilaterals

1 Understanding the angles in a triangle

Let's explore the sum of two angles excluding the right angle.

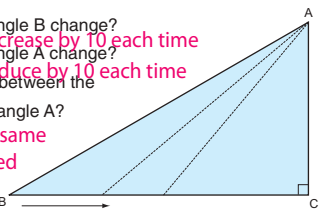


The sum of the two angles are;

A 90 °

B 90 °

In the right triangle below, we are going to move vertex B toward C.



1. How does the value of angle B change? increase by 10 each time
2. How does the value of angle A change? reduce by 10 each time
3. Is there any relationship between the changes in angle B and angle A? Angle B increases the same amount of that reduced in angle A. (10°)
4. Look at the change in the sum of angle A and angle B.

Angle A (degrees)	60	50	40	30	20	10
Angle B (degrees)	30	40	50	60	70	80
Sum (degrees)	90	90	90	90	90	90

From the above table, what did you find about the sum of the three angles in a right triangle? Always 180°

Let's explore the sum of three angles in a triangle.

48 = □ × □

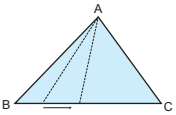
Total sum of angles in a triangle

Angles of Triangles

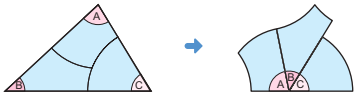
A straight angle is 180°, isn't it?

2 Look at the sum of the 3 angles of a triangle in various ways.

① Draw a triangle and measure the angles with a protractor.
The sum of the 3 angles is 180 °.

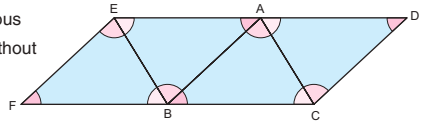


② Cut out the 3 angles and place them together as shown below.



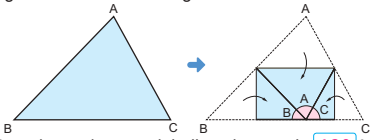
Since the 3 angles together make a straight line, the sum of these angles is 180 °.

③ Put together triangles with the same shape and size to make a continuous pattern without any gaps.



Since 3 angles at points A and B make a straight line, their sums are 180 °.

④ Fold a triangle to connect the 3 angles.



Since the 3 angles make a straight line, the sum is 180 °.

□ − □ = 49

Lesson Flow

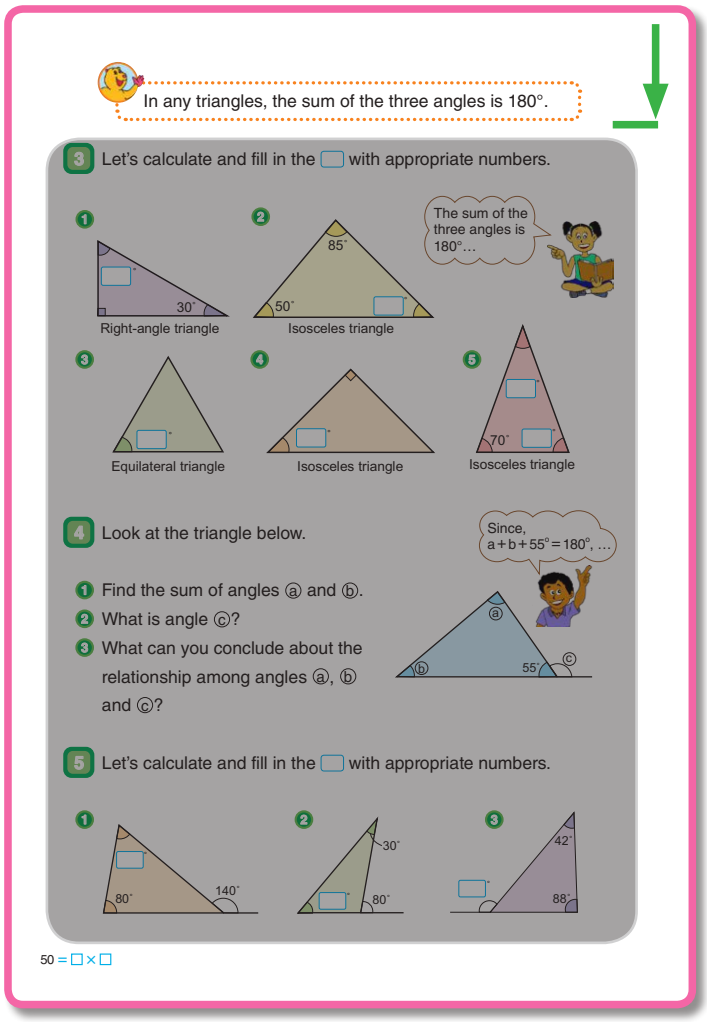
1 Review the previous lesson.

2 1 Explore the 2 angles of a right triangle that are not 90°.

T Introduce the Main Task. (Refer to the BP)
T Ask the students' to use a protractor to measure the angles in a triangle.
S Use a protractor to measure the angles of the 2 different set squares (triangle rulers) excluding the right angle.
T What is the sum of the 2 angles that are not right angles?
S Give Answers as (A) 45+45=90° and
(B) 30+60=90°.

3 1 1 to 4 Measure the angles of various triangles formed and analyse the results.

T What will change when we move vertex B towards vertex C in triangle (C)?
S 1 Angle B will increase in size.
S 2 Angle A will decrease in size.



S 3 As vertex B increases, angle A decreases in size.
TN Students should notice that the angle of vertex B will increase in size while the angle of vertex A will reduce in size.
S 4 Complete the table and confirm the changes in the angle sum for vertex B and A.
T What did we find from the results on the table?
S Confirm that the sum of the 2 angles will always be 90°.

4 Discuss about the interior angle sum of triangles using the results from 1.

T/S Discuss from the findings, the angle sum of a triangle.
S Explain that the sum of the 2 angles (90°) plus the right angle (90°) will be 180°.

5 2 Discuss the four methods 1 to 4 to determine that the angle sum of a triangle is 180°.

S Explain each method.
(1) Measure the 3 angles with a protractor to get the angle sum 180°.
(2) Cut out and place the 3 angles to give a straight angle which is 180°
(3) Put together the vertex of congruent triangles. The 3 angles FEB will come together forming a straight angle to give the sum of 180°.
(4) Fold the triangle to connect the 3 angles to form a straight angle with a sum of 180°.

6 Important Point

T/S Explain the important point in the box .

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Lesson 031 Sample Blackboard Plan is on page 61.

Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 2: Angles of Triangles and Quadrilaterals
Lesson 2 of 5

Textbook Page : 050
Actual Lesson 032

Lesson Objective

- To calculate angles using the sum of 3 angles (180°) in a triangle.

Prior Knowledge

- Quadrilaterals and triangles
- Perpendicular lines, parallel lines and quadrilaterals
- Angles (Grade 4)

Preparation

- Triangles of all the tasks

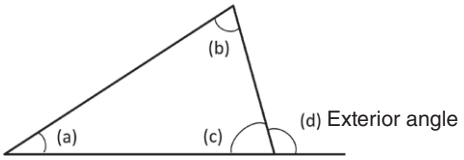
Assessment

- Find the unknown angles using the angle sum of 180° and other properties. F
- Demonstrate that the sum of two interior angles opposite an exterior angle in a triangle are equal. F

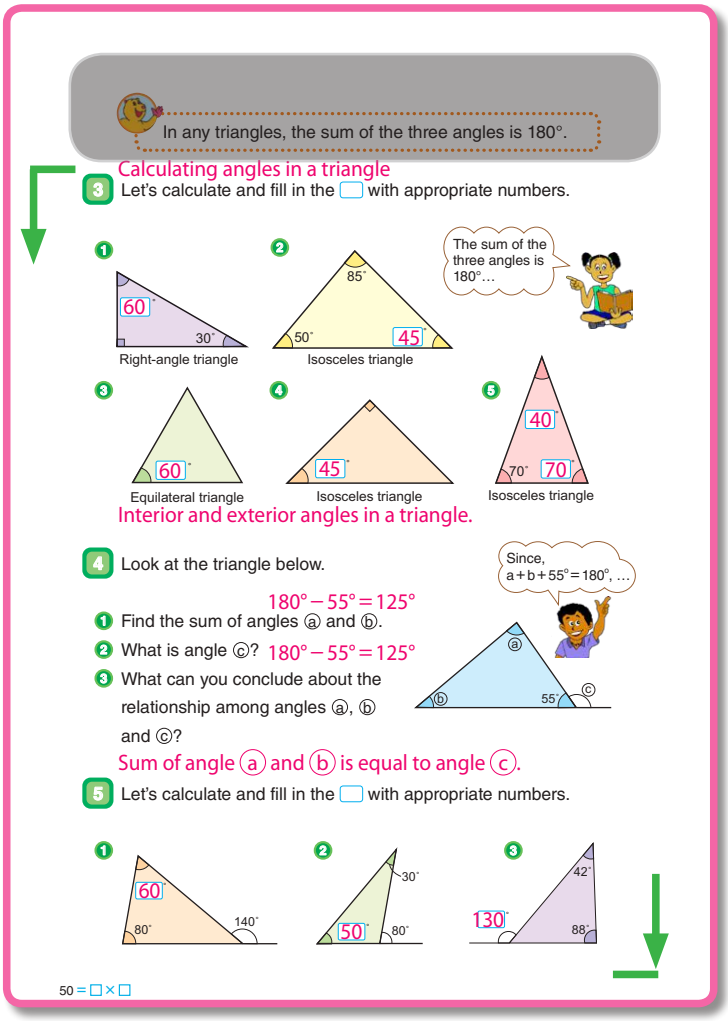
Teacher's Notes

Relationship of interior and exterior angles of a triangle.

The sum of the two angles (a) and (b) which are opposite to angle (c) are equal in size to that of the exterior angle (d).



i. (a) + (b) + (c) = 180°
ii. (c) + (d) = 180°
iii. (a) + (b) = (d)



Lesson Flow

1 Review the previous lesson.

2 3 Calculate unknown angles of a triangle.

T Introduce the Main Task. (Refer to the BP)

T Allow the students to discuss and demonstrate how they can calculate and find the unknown angles in a triangle.

S Explain by demonstrating the use of the angle sum of 180° to calculate 1.

S Complete activity 2 to 5 to find angles using the angle sum of 180° and other properties of triangles.

T Confirm students' answers.

3 4 Investigate the relationship of interior and exterior angles of a triangle.

S 1 Calculate the sum of angle (a) and (b) since (a) + (b) + 55 = 180°.
Sum of angle (a) and (b) is 180° − 55° = 125°

S 2 Calculate angle (c) as 125° since 55° + 125° = 180° on a straight line.

S 3 Conclude that angle (c) has the same angle size as the sum of angle (a) and (b).

T Confirm students' answers.

TN The sum of two interior angles (a) and (b) is equal to the exterior angle (c).

4 5 Calculate the interior and exterior angles of triangles 1 to 3.

T Ask the students to complete the task using what they have learned.

S Calculate to find the unknown angles in 1 to 3.

T Confirm students' answers.

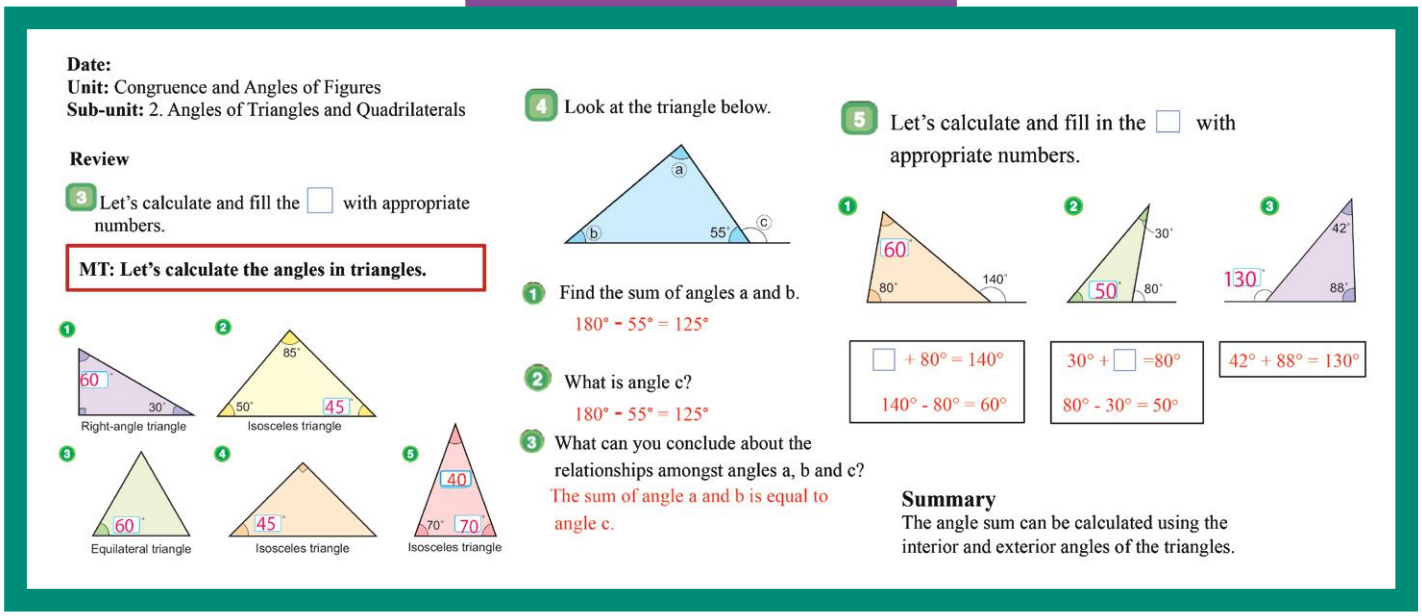
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 2: Angles of Triangles and Quadrilaterals
Lesson 3 of 5

Textbook Page : 051 and 052
Actual Lesson 033

Lesson Objective

- To understand the sum of interior angles of a quadrilateral is 360°.

Prior Knowledge

- Quadrilaterals and triangles
- Angle sum of Triangles
- Angles (Grade 4)

Preparation

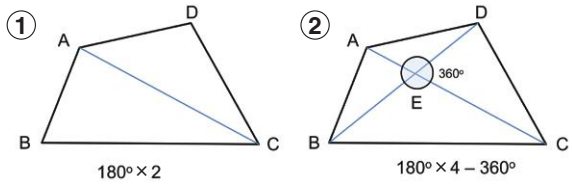
- Protractor and ruler

Assessment

- Investigate the angle sum of various quadrilaterals. F
- Explain various ways to show that the angle sum of quadrilaterals are 360°. S

Teacher's Notes

The Angle sum of Quadrilaterals.

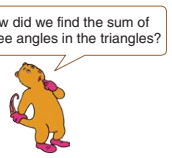


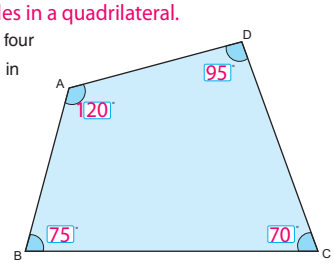
① Divide a quadrilateral into 2 triangles along a diagonal and based on the fact that the sum of 3 angles of a triangle is 180°. When we multiply 180° by 2, we get 360°.
② Add point E to the inside of the quadrilateral, then divide the quadrilateral into 4 triangles by connecting point E with each of the vertex.
Get the sum of all angles by multiplying 180° by 4 and subtract 360° which is the sum of the angles around point E.

Angles of Quadrilaterals

Finding total sum of angles in a quadrilateral.

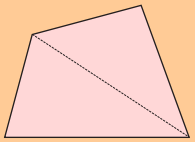
6 Let's explore the sum of four angles in a quadrilateral in various ways.





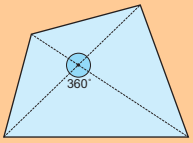
1 Measure the four angles with a protractor.
2 Let's calculate through dividing the quadrilateral by diagonals.

Vavi's Idea



Divide by a diagonal. There are two triangles inscribed. Therefore,
180 °×2=360 °.

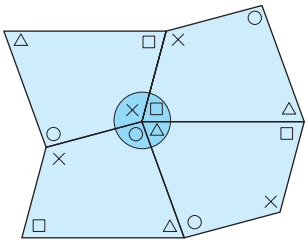
Mero's Idea

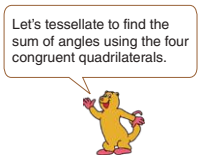


Divide a quadrilateral into four by diagonals.
There are four triangles inscribed, 180 °×4=720 °
subtract the extra
360 °, so 360 °.

3 Let's think about and discuss other ways of finding the sum of angles in a quadrilateral.

4 Let's explore the sum of quadrilaterals through tessellation.



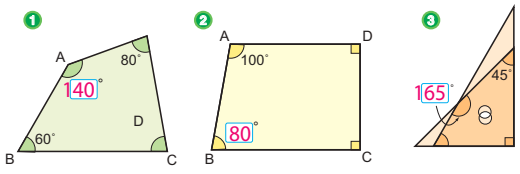


5 Share your findings with your friends.

What have you learned?

In any quadrilateral, the sum of 4 angles is 360°.

7 Let's fill in the ☐ by calculations.



☐ − ☐ = 51

52 = ☐ × ☐

Lesson Flow

1 Review the previous lesson.

2 ⑥ Investigate the sum of 4 angles in a quadrilateral.

T Introduce the Main Task. (Refer to the BP)

S ① Use a protractor to measure the 4 angles of the quadrilateral.

T What is the sum of the 4 angles?

S Calculate the angle sum to 360°.
120° + 75° + 70° + 95° = 360°

3 ② Calculate by dividing the quadrilateral using diagonal lines.

T Remind the students that when the quadrilaterals are divided by diagonal lines, triangles are formed. Allow the students to use this idea to calculate Vavi's and Mero's ideas.

S Vavi's Idea:
Divide the quadrilateral with 1 diagonal line to make 2 triangles inscribed, therefore
180° × 2 = 360°.
Mero's Idea:
Divide the quadrilateral with 2 diagonals to make 4 triangles inscribed, therefore
180° × 4 = 720° − 360° to get 360°.

T Confirm students' answers.

4 Discuss other ways for finding the angle sum of quadrilaterals.

T ③ Allow students to find other ways using Vavi's and Mero's ideas.

S Draw 2 diagonals to form 3 triangles and calculate 180° × 3 = 540° − 180° to get 360°.

S ④ Explore the sum through tessellating congruent quadrilaterals.

S ⑤ Share ideas with friends about what was found when tessellating.

TN Students should use the same idea of tessellation by manipulating the four congruent quadrilaterals to investigate the angle sum of quadrilaterals.
In this case, where the 4 angles meet at one point in the centre, they form a 360° angle.

5 Important Point

T/S Explain the important point in the box .

6 ⑦ Complete the activity by calculating the unknown angles.

S Calculate the unknown angles for the quadrilaterals ① to ③.

T Confirm students' calculations.

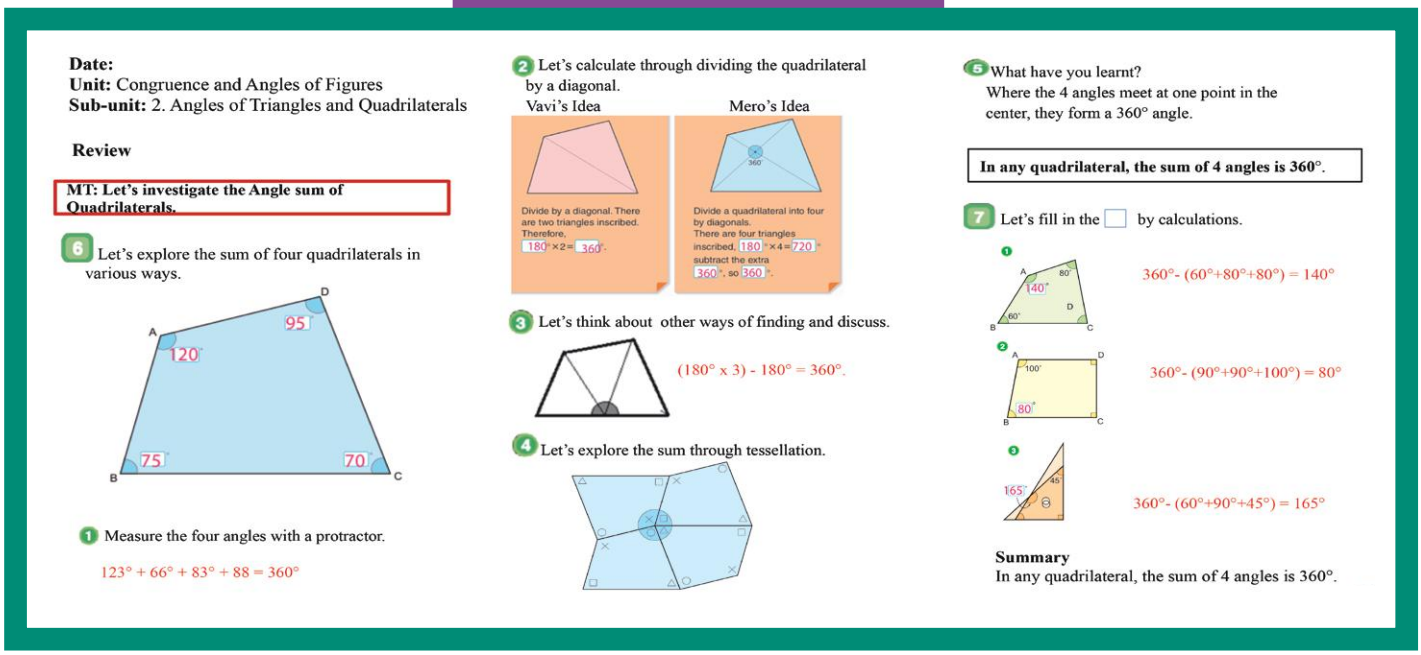
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 2: Angles of Triangles and Quadrilaterals
Lesson 4 of 5

Textbook Page : 053 to 055
Actual Lesson 034

Lesson Objective

- To think about how to find the sum of interior angles of polygons.

Prior Knowledge

- Quadrilaterals and triangles
- Angle sum of Triangles
- Angles (Grade 4)

Preparation

- Protractor and ruler

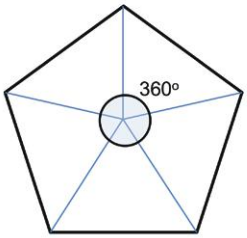
Assessment

- Think about how to find the angle sum of polygons. F
- Calculate how to find angle sum of polygons. S

Teacher's Notes

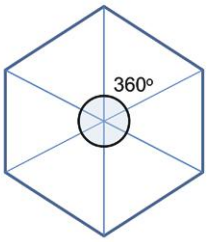
The angle sum of polygons can be calculated when triangles are inscribed within a polygon. Divide the polygon into triangles by connecting each of the vertex at a point to form 360°.
Get the sum of all angles by multiplying 180° by the number of triangles and subtract 360° which is the sum of the angles around the point.
The same idea will be expanded in Gr.6 using pronumerals.

Pentagon



$180^\circ \times 5 - 360^\circ = 540^\circ$

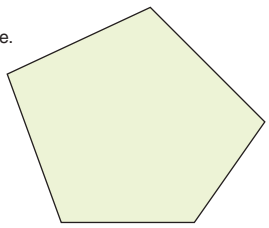
Hexagon



$180^\circ \times 6 - 360^\circ = 720^\circ$

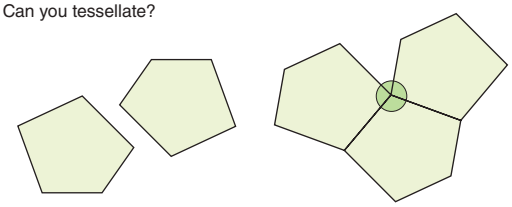
Angles of Polygons

A pentagon is a five sided figure.



8 Let's explore how to find the sum of 5 angles in a pentagon.

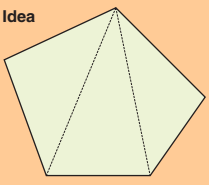
1 Can you tessellate?



For tessellation of figures, the sum of angles which meet at one vertex is 360°. In the case of a pentagon, it cannot be tessellated.

2 Let's divide a pentagon into triangles.

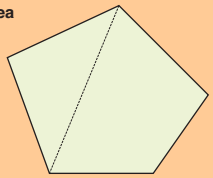
Yamo's Idea



If I draw diagonals from a vertex…

Draw diagonals and divide it into 3 triangles.
Therefore, 180° × 3 = 540°.

Mero's Idea



If I draw a diagonal…

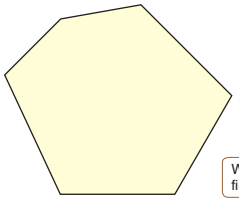
Divide a pentagon into a triangle and a quadrilateral.
Therefore, 180° + 360° = 540°.

3 Let's think about other ways of finding the sum of angles and discuss.

In any pentagon, the sum of 5 angles is 540°.

9 A hexagon is a six sided figure.
Let's explore how to find the sum of 6 angles in a hexagon.

1. $360^\circ + 360^\circ = 720$
(by using one diagonal in making two quadrilaterals)
2. $180^\circ \times 4 = 720^\circ$
(by making 3 diagonals in producing 4 triangles.



Write down how you find the sum.

In any hexagon, the sum of 6 angles is 720°.

□ − □ = 53　　54 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Investigate how to find the sum of angles in a pentagon.

T Introduce the Main Task. (Refer to the BP)

T 8 Allow the students to discuss how to find the sum of 5 angles of a pentagon and ask them if they are able to tessellate pentagons like quadrilaterals.

S 1 Discover that pentagons cannot be tessellated.

T Confirm with students that pentagons cannot be tessellated. For tessellation of figures, the sum of angles which t one vertex is 360°.

3 Important Point

T/S Explain the important point in the box ( ).

4 Compare the 2 ideas of how to find the angle sum of pentagons.

T 2 Remind the students to use the angle sum of triangles and quadrilaterals to calculate.

S Yamo's Idea:
Divide the pentagon with 2 diagonal lines to make 3 triangles and calculate,
$180° \times 3 = 540°$.
Mero's idea:
Divide the pentagon into a triangle and quadrilateral and calculate the sum,
$180° + 360° = 540°$.

5 Discuss other ways for finding the angle sum of quadrilaterals.

T What are other ways to calculate the angle sum of the pentagon?

S 3 Draw 5 triangles inscribed in the pentagon with vertices joining in the centre to form an angle sum of 360° and calculate. (refer to angle sum of quadrilaterals) $180° \times 5 - 360° = 540°$.

6 Important Point

T/S Explain the important point in the box ( ).

7 Discuss how to find the sum of 6 angles in a hexagon.

T 9 Give hints to the students to use the same ideas of how to find the angle sum of pentagons.

S Idea 1: Divide the hexagon with 3 diagonal lines to make 4 triangles and calculate,
$180° \times 4 = 720°$.
Divide the hexagon into a triangle and pentagon and calculate the sum,
$180° + 540° = 720°$.
Idea 2: Draw 6 triangles inscribed in the pentagon with vertices joining in the centre to form an angle of 360° and calculate. (refer to angle sum of quadrilaterals)
$180° \times 6 - 360° = 720°$.

8 Important Point

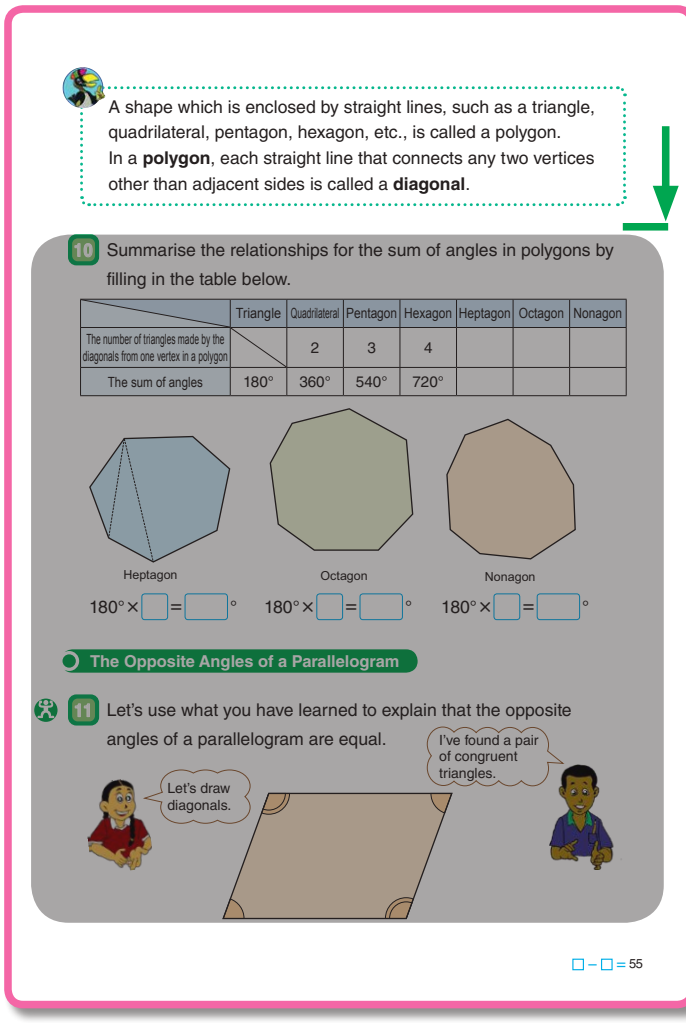
T/S Explain the important point in the box ( ). and ( ).

9 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.



Sample Blackboard Plan

Lesson 034 Sample Blackboard Plan is on page 71.

Unit 4

Unit: Congruence and Angles of Figures
Sub-unit 2: Angles of Triangles and Quadrilaterals
Lesson 5 of 5

Textbook Page : 055
Actual Lesson 035

Lesson Objectives

- To find the relationship of the sum of angles in polygons.
- To think about the characteristics of a parallelogram.

Prior Knowledge

- Quadrilaterals and triangles
- Angle sum of Triangles
- Angles (Grade 4)

Preparation

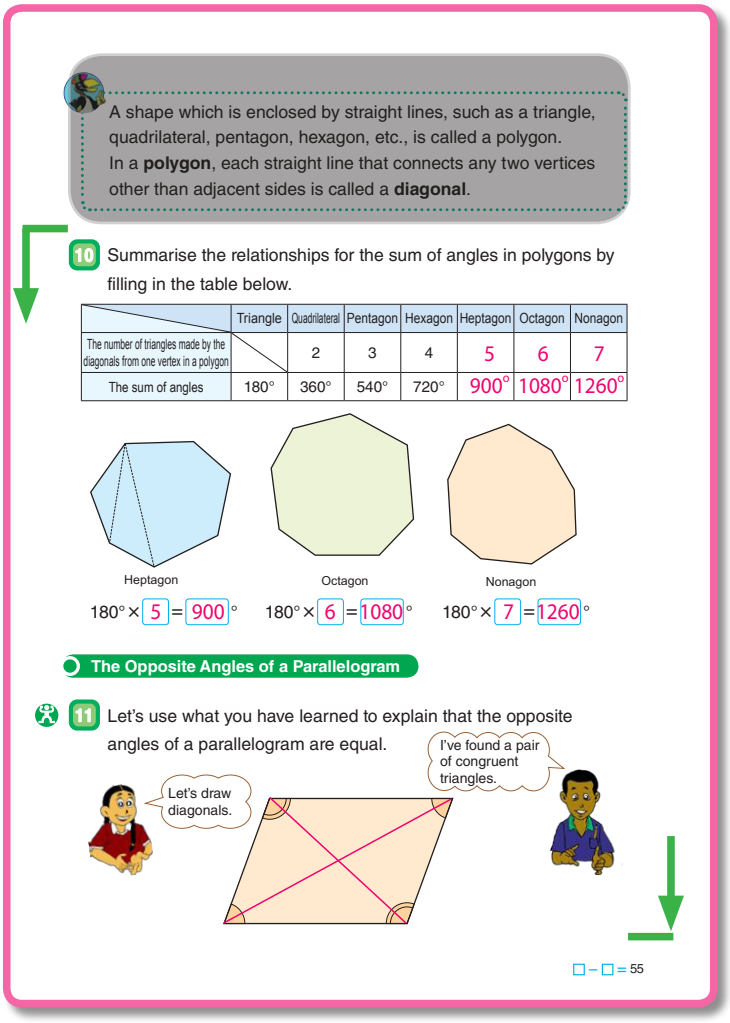
- Table in task 10 and the polygons
- Parallelogram in task 11

Assessment

- Calculate the angle sum of other polygons using the number of triangles formed. F
- Describe the angle properties of a parallelogram based on congruence. S F

Teacher's Notes

Students will realise that the number of triangles will increase in polygons according to the number of sides and therefore the sum of angles increases as well.



A shape which is enclosed by straight lines, such as a triangle, quadrilateral, pentagon, hexagon, etc., is called a polygon.
In a **polygon**, each straight line that connects any two vertices other than adjacent sides is called a **diagonal**.

10 Summarise the relationships for the sum of angles in polygons by filling in the table below.

	Triangle	Quadrilateral	Pentagon	Hexagon	Heptagon	Octagon	Nonagon
The number of triangles made by the diagonals from one vertex in a polygon		2	3	4	5	6	7
The sum of angles	180°	360°	540°	720°	900°	1080°	1260°

Heptagon: 180° × 5 = 900°
Octagon: 180° × 6 = 1080°
Nonagon: 180° × 7 = 1260°

The Opposite Angles of a Parallelogram

11 Let's use what you have learned to explain that the opposite angles of a parallelogram are equal.

Let's draw diagonals.
I've found a pair of congruent triangles.

□ – □ = 55

Lesson Flow

1 Review the previous lesson.

T Introduce the Main Task. (Refer to the BP)
T Briefly review the previous lesson concepts on the angle sum of Pentagons and Hexagons.
How many triangles were formed from one vertex in a pentagon and a hexagon?
S Pentagon-3 triangles, Hexagon- 4 triangles

2 Find the relationship of the sum of angles in polygons.

T 10 Ask students to explain how they calculated the angles using this information.
S Explain that the number of triangles times 180° equals the sum of angles.
T Ask the students to complete the table in the textbook.
S Complete the table by identifying the number of triangles before calculating the angle sum for Heptagon, Octagon and Nonagon.

Lesson Flow

3 Discuss the properties of opposite angles in a parallelogram.

T 11 Ask students to discuss and explain why opposite angles in a parallelogram are equal.

S When a diagonal line is drawn to make two congruent triangles, the corresponding opposite angles are equal.

TN Students should base their explanation on the fact that when a diagonal is drawn to make triangles, the 2 triangles are congruent. According to what they have learned previously, corresponding angles in congruent figures are equal.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

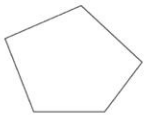
Sample Blackboard Plan (Lesson 34)

Date:
Unit: Congruence and Angles of Figures
Sub-unit: 2. Angles of Triangles and Quadrilaterals

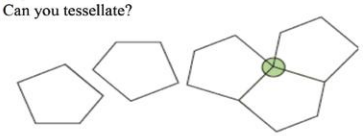
Review

MT: Let's calculate the interior sum of a Pentagon and Hexagon.

8 Let's explore how to find the sum of five angles in a pentagon.



1 Can you tessellate?



Pentagons cannot be tessellated. For tessellation of figures the sum of angles which meet at one vertex is 360°.

In case of a pentagon, it cannot be tessellated. For tessellation of figures, the sum of angles which meet at one vertex is 360°.

2 Let's divide a pentagon into triangles.

Yamo's Idea

180° x 3 = 540°

Mero's Idea

180° + 360° = 540°

3 Let's think about other ways of finding and discuss.

(180° x 5) - 360° = 540°

In any pentagon, the sum of 5 angles is 540° .

9 Let's explore how to find the sum of six angles in a hexagon.

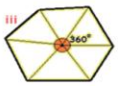
i

180° x 4 = 720°

ii

180° + 540° = 720°

iii



(180° x 6) - 360° = 720°

In any pentagon, the sum of 6 angles is 720° .

A shape which is surrounded by straight lines, such as Triangle, Quadrilateral, Pentagon, Hexagon, etc., is called a polygon. In a polygon, each straight line that connects any two vertices other than adjacent sides is called a diagonal.

Summary
We can find angle sum of polygons by ;
- dividing the polygon into triangles and multiplying the number of triangles by 180°.
- subtracting 360o from (180o x the number triangles) inscribed in the polygon.

Sample Blackboard Plan (Lesson 35)

Date:
Unit: Congruence and Angles of Figures
Sub-unit: 2. Angles of Triangles and Quadrilaterals

Review

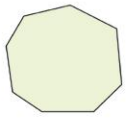
MT: Let's think about the relationship of the sum of angles in polygons.

10 Summaries the relationship for the sum of angles in polygons by filling in the table.

	Triangle	Quadrilateral	Pentagon	Hexagon	Heptagon	Octagon	Nonagon
The number of triangles made by the diagonals from one vertex in a polygon		2	3	4	5	6	7
The sum of angles	180°	360°	540°	720°	900°	1080°	1260°

Heptagon

180° × 5 = 900°



Octagon

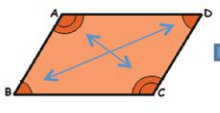
180° × 6 = 1080°

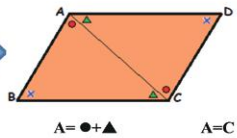
Nonagon

180° × 7 = 1260°

The Opposite Angles of a Parallelogram

11 Let's explain that the opposite angles of a parallelogram are equal.





Corresponding angles in congruent figures are equal.

A= ●+▲ A=C
C= ▲+● therefore B=D

When a diagonal is drawn, we have two congruent triangles.

Corresponding angles in congruent figures are equal.

Summary
As the number of triangles increases by polygon, the angle sum increases by 180 °.
Corresponding angles in congruent figures are equal.

Unit 4

Unit: Congruence and Angles of Figures
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 056 and 057
Actual Lesson 036 and 037

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

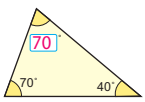
Teacher's Notes

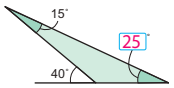
This is the last lesson of Chapter 4.

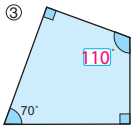
Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

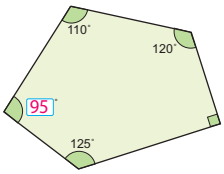
EXERCISE

1 Let's calculate and fill in the ☐ with numbers. Pages 49 to 54

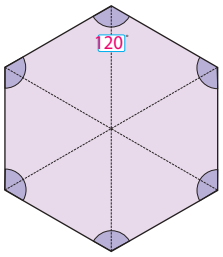
① 

② 

③ 

④ 

⑤ A hexagon is developed by 6 equilateral triangles.



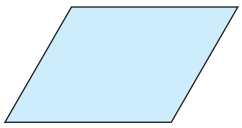
Let's calculate. Grade 4 Do you remember?

① 24 ÷ 2 12	② 69 ÷ 3 23	③ 96 ÷ 4 24
④ 44 ÷ 11 4	⑤ 72 ÷ 12 6	⑥ 92 ÷ 23 4
⑦ 168 ÷ 3 56	⑧ 675 ÷ 9 75	⑨ 464 ÷ 8 58
⑩ 288 ÷ 48 6	⑪ 333 ÷ 37 9	⑫ 969 ÷ 17 57

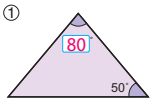
56 = ☐ × ☐

PROBLEMS

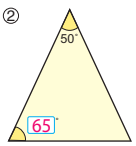
1 Let's draw a congruent quadrilateral to the one below.
● Constructing a congruent quadrilateral.



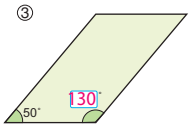
2 Let's fill in the ☐ with numbers.
● Using the sum of angles in a polygon.

① 

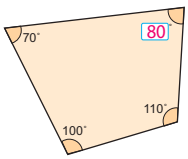
Isosceles triangle

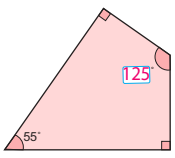
② 

Isosceles triangle

③ 

Parallelogram

④ 

⑤ 

☐ − ☐ = 57

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.
T Confirm students' answers.
TN ① Calculate by filling in the box ☐.

2 Solve the Problems

S Solve all the problems.
T Confirm students' answers.
TN ① Constructing a congruent triangle.
② Using the sum of angles in a polygon.

3 Complete the Evaluation Test

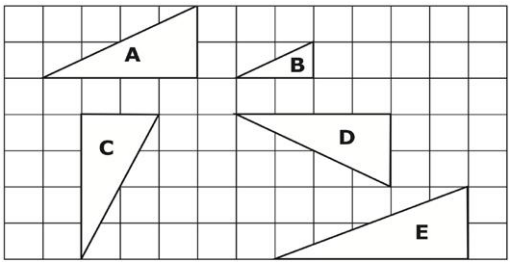
TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.
S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 4: Congruence and Angles of Figures	Name:	Score / 100

1. Find all the congruent triangles with A.

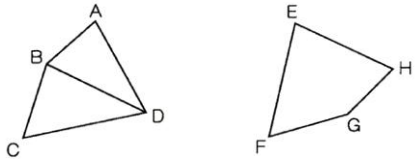
[20 marks for the set of right answers]



Answer: A, C and D

2. The two quadrilaterals shown below are congruent. Answer the following questions.

[4×20 marks = 80 marks]



① Which vertex corresponds to Vertex D? Answer: Vertex E

② Which side corresponds to Side BC? Answer: Side GH

③ Which angle corresponds to Angle G? Answer: Angle B

④ Which diagonal corresponds to Diagonal BD? Answer: Diagonal GE

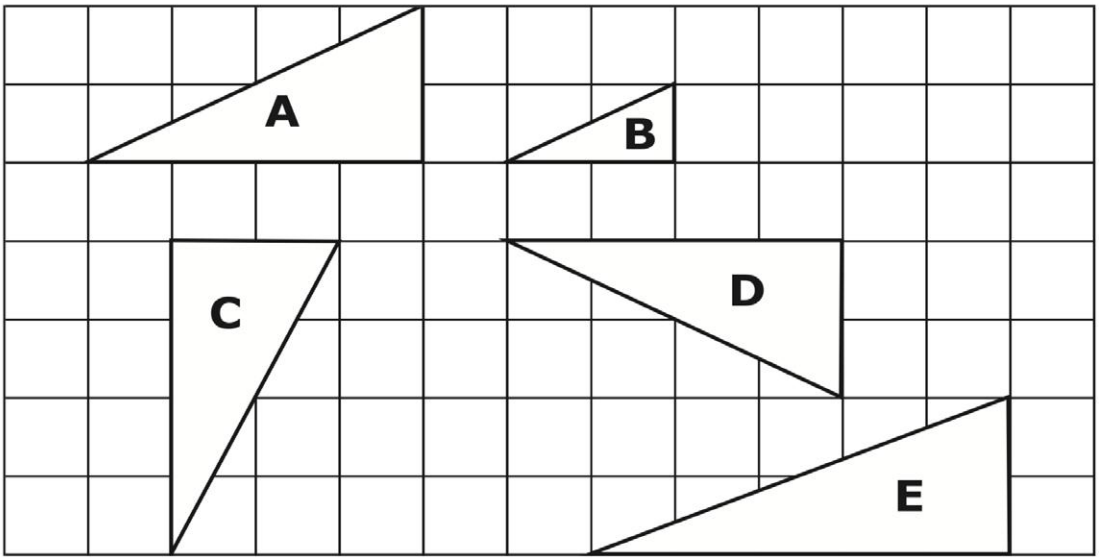
74

End of Chapter Test **Date:**

Chapter 4: Congruence and Angles of Figures	Name:	Score / 100

1. Find all the congruent triangles with A.

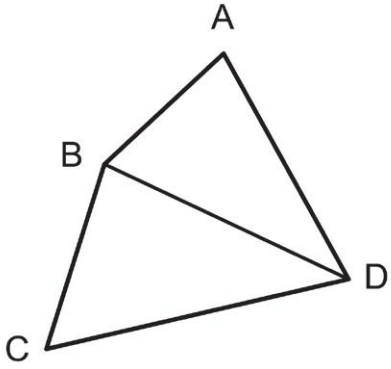
[20 marks for the set of right answers]

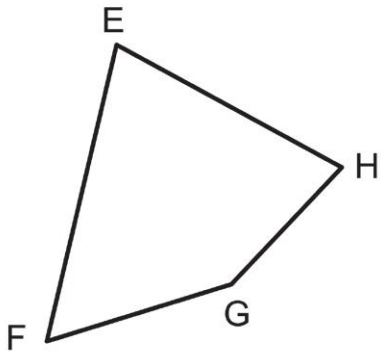


Answer:

2. The two quadrilaterals shown below are congruent. Answer the following questions.

[4×20 marks=80 marks]





① Which vertex corresponds to Vertex D? Answer:

② Which side corresponds to Side BC? Answer:

③ Which angle corresponds to Angle G? Answer:

④ Which diagonal corresponds to Diagonal BD? Answer:

Chapter 5 Division of Decimal Numbers

1. Content Standard

5.1.5 Apply the process of division to divide a decimal number by decimal number and a whole number by a decimal number.

2. Unit Objectives

- To understand the meaning of division of decimal numbers and use it correctly.
- To understand the meaning of division when the divisor is a decimal number.
- To think about how to calculate division of decimal numbers and be able to calculate it.

3. Teaching Overview

Students already learned division of decimal number divided by whole number. In this unit, they will learn division of dividing by decimal numbers.

Operation of Whole Numbers and Decimal Numbers ÷ Decimal Numbers :

They learn that they can calculate them by thinking the same way as divisions dividing by whole numbers. They will notice that they can find the answers by moving decimal points which means applying rules of divisions learned before.

They should also pay attention to the relationship between the quotient and the divisor.

If quotient is smaller than 1, the quotient will be bigger than the dividend.

Division Problems :

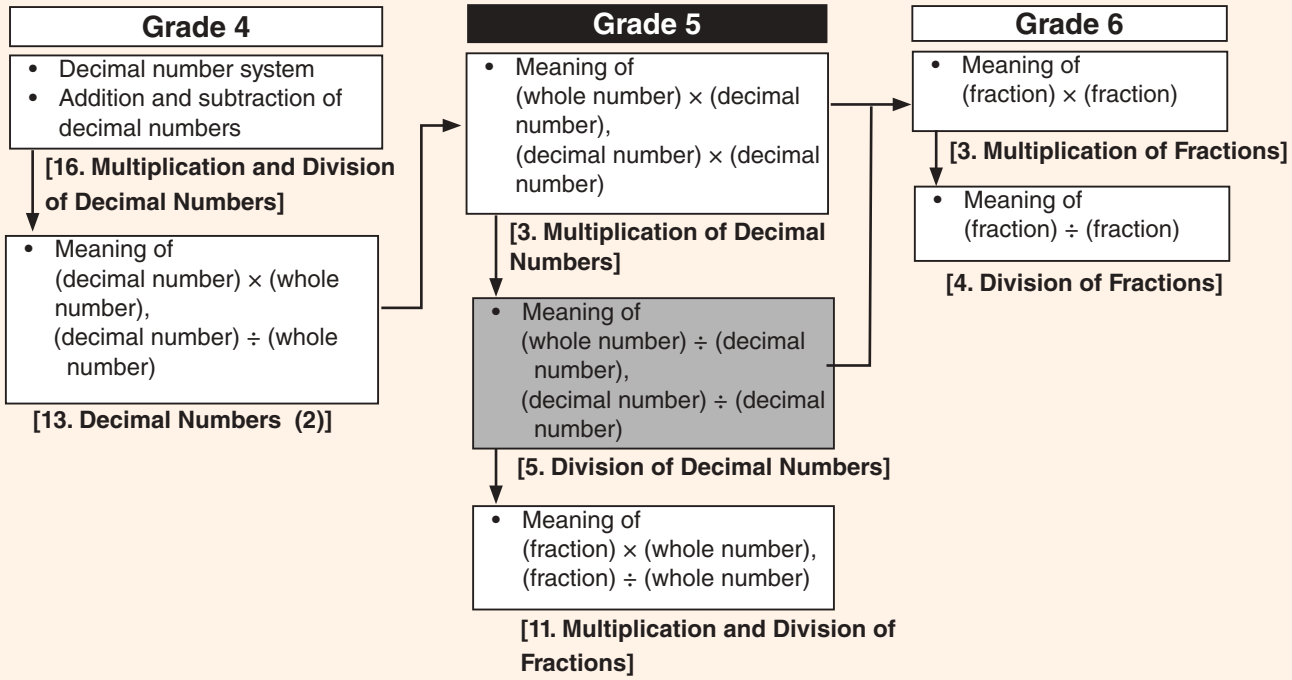
In this topic, students learn how to estimate result of calculation, meaning of remainder, the reason for rounding the quotient, etc.

What Kind of Calculation Would It Be? :

Students learn how to decide the appropriate mathematical expression.

Activities making mathematical stories will develop the skill of making decision on expressions.

4. Related Learning Contents



Unit 5

Unit: Division of Decimal Numbers
Sub-unit 1: Operation of Whole Numbers ÷ Decimal Numbers
Lesson 1 of 2

Textbook Page : 058 to 060
Actual Lesson 038

Sub-unit Objectives

- To understand the meaning of whole number ÷ decimal number and make a mathematical expression.
- To think about how to calculate whole number ÷ decimal number.
- To think about how to calculate whole number ÷ decimal number in vertical form.

Lesson Objectives

- To understand the meaning of whole number ÷ decimal number and make a mathematical expression.
- To think about how to calculate whole number ÷ decimal number.

Prior Knowledge

- Rules of Division
- Multiplication of Decimal Number
- Calculating Whole Numbers × Decimal Numbers
- Calculating Decimal Number × Decimal Number
- Rules for Calculation

Assessment

- Divide a whole number by a decimal number if the divisor is a decimal number. F
- Demonstrate the understanding of the meaning of whole number ÷ decimal number. S

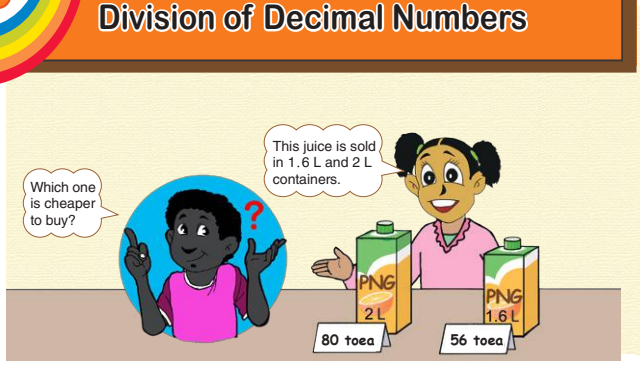
Preparation

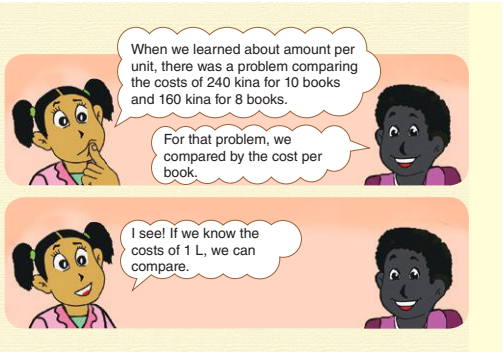
- Tape diagram of 1 and Mero's and Kekeni's idea on chart

Teacher's Notes

- Ideas of two students here are to find out which one is cheaper by knowing the cost of 1L according to the situation.
- Remind students that both Mero and Kekeni are trying to find the answer of 56÷1.6.
- Mero's thinking is based on the cost of 0.1 L, which makes the division of a whole number possible.
- Kekeni used the idea on the rule of division and then calculated by making the divisor into a whole number.

5 Division of Decimal Numbers

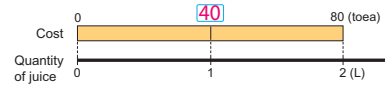




1 Operation of Whole Numbers ÷ Decimal Numbers

1 Jane and Betu went to the supermarket to buy juice.

1 How much is the cost of 1 L in the 2 L container?



Ⓐ Write a mathematical expression.

80 ÷ 2

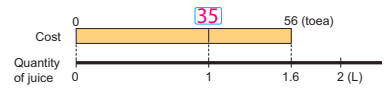
Cost (Kina)	?	80
Quantity of juice (L)	1	2

÷2 ÷2

Ⓑ Let's calculate the mathematical expression in Ⓐ

80 ÷ 2 = 40

2 How much is the cost of 1 L for the 1.6 L container?



Ⓐ Write a mathematical expression.

56 ÷ 1.6

Cost (toea)	?	56
Quantity of juice (L)	1	1.6

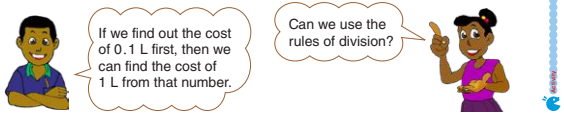
÷1.6 ÷1.6

Ⓑ Approximately how much would the cost be?

Around 56 ÷ 2 = 28 or 60 ÷ 2 = 30

As shown with the quantity of juice, when the divisor is a decimal number instead of a whole number, the expression is the same as for division of whole numbers and means to calculate the quantity per unit.

Ⓒ Let's think about how to calculate 56 ÷ 1.6



58 = □ × □

□ − □ = 59

Lesson Flow

1 Think about how to find which juice container is cheaper.

T Ask the students to look at the pictures and have pre-discussion by posing questions.
S Do pre-discusions using the pictures.
TN Comparision may be difficult because the cost and the quantity are not the same.
T Introduce the Main Task. (Refer to the BP)
T/S 1 Read and understand the situation.
S Discuss and compare the situation about finding which juice container is cheaper.

2 Finding the cost of 1 L in the 2 L juice container.

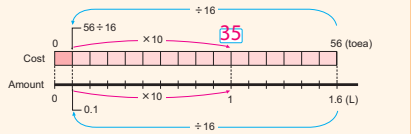
T 1 How much is the cost of 1 L in the 2 L container?
TN Use the tape diagram and the table of information to write the mathematical expression.
T Ⓐ Write a mathematical expression.
S Expression: 80 ÷ 2.
T Ⓑ Confirm with students that they can find the answer by calculating 80 ÷ 2.
S 80 ÷ 2 = 40. So the cost for 1 L of juice is 40 toea.

Ⓓ Let's explain the ideas below.

Mero's Idea

My idea uses the cost of 0.1 L to calculate.

Cost of 1.6 L is 56 toea.
1.6 L is 16 sets of 0.1 L so,
Cost of 0.1 L is 56 ÷ 16 = 3.5 (toea)
10 times of 0.1 L is the cost of 1 L, so
Cost of 1 L is 3.5 × 10 = 35 (toea)



Kekeni's Idea

If I use the rules of division…

If I buy juice 10 times of 1.6 L, the price will also become 10 times more. However, the cost per 1 L is the same.

Cost of 1 L when I buy 1.6 L of juice: 56 ÷ 1.6 = 35 (toea)
×10 ×10
Cost of 1 L when I buy 16 L of juice: 560 ÷ 16 = 35 (toea)

Ⓔ Which idea corresponds to each of the two tables shown below? Discuss what the two ideas have in common.

①

Cost (toea)	3.5	35	56
Quantity (L)	0.1	1	1.6

÷16 ×10 ×10 ÷16

②

Cost (toea)	35	56	560
Quantity (L)	1	1.6	16

÷16 ×10 ÷16 ×10

60 = □ × □

3 Finding the cost of 1 L in the 1.6 L juice container.

T 2 How much is the cost of 1 L for the 1.6 L container?
TN Apply the similar method used in 1.
S Ⓐ Write a mathematical expression using the tape diagram and table of information. (56 ÷ 1.6)
T Approximately how much will the cost be?
S Ⓑ By estimation 60 ÷ 2 = 30, so around 30 toea.
TN Students can find out which is cheaper if they compare each juice container by 1 L.

4 Important Point

T/S Explain the important point in the box .

5 Think about how to calculate 56 ÷ 1.6

T Ⓒ Ask students on how to calculate 56 ÷ 1.6 and present their ideas.
S Present and explain their ideas.

6 Explain Mero's and Kekeni's ideas on how to calculate 56 ÷ 1.6

S Explain Mero's and Kekeni's ideas.
TN Ⓓ Mero's Idea: His thinking is based on the cost of 0.1 L, which makes the division of a whole number possible.
Kekeni's Idea: She used the idea on the rule of division and then calculated by making the divisor into a whole number.
T Ⓔ Which idea corresponds to the two tables below on page 60?
S Table 1 corresponds to Mero's idea and table 2 corresponds to Kekeni's idea.
S In both ideas, the decimal numbers are changed to whole number to make calculation easier.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Lesson 038 Sample Blackboard Plan is on page 79.

Unit 5

Unit: Division of Decimal Numbers

Sub-unit 1: Operation of Whole Numbers ÷ Decimal Numbers

Lesson 2 of 2

Textbook Page : 061
Actual Lesson 039

Lesson Objective

- To think about how to divide whole number ÷ decimal number in vertical form.

Prior Knowledge

- How to calculate Whole Number ÷ Decimal Number (Previous lesson)
- The idea per unit
- The rules of division

Preparation

- Chart on vertical calculation in Ⓕ
- Chart for important point
- Diagram for task 2

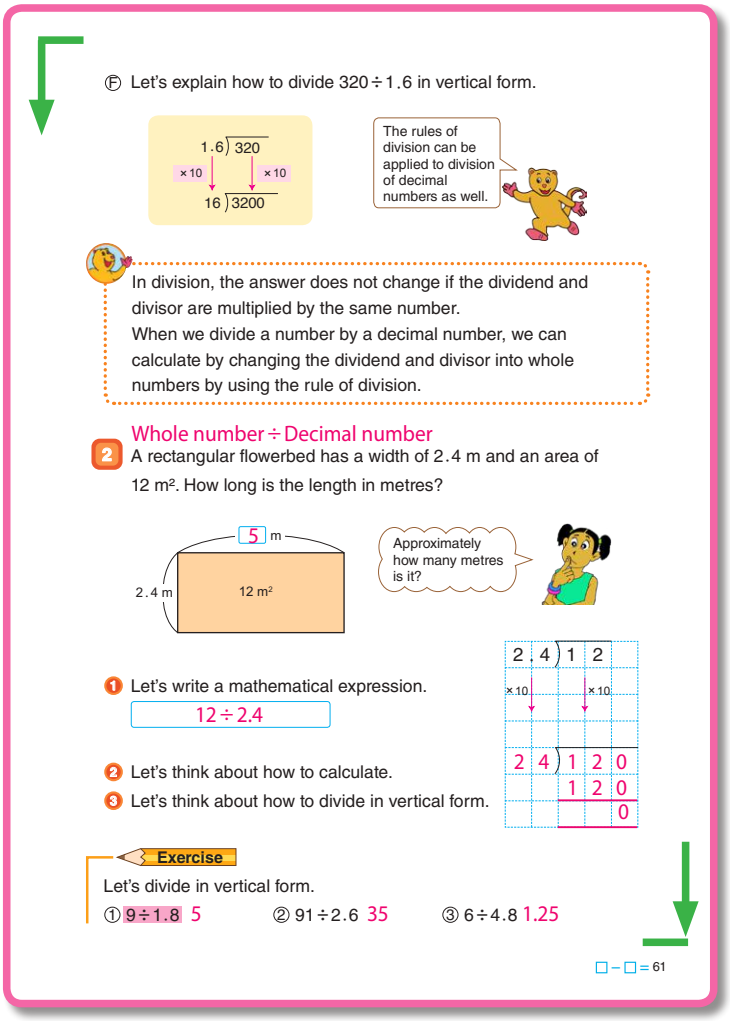
Assessment

- Think about how to calculate whole number ÷ decimal number in vertical form. F
- Explain how to calculate whole number ÷ decimal number in vertical form. S
- Solve the exercises correctly. S

Teacher's Notes

Supplementary Exercise

1.) 9 ÷ 1.5 = [6]
2.) 8 ÷ 1.6 = [5]
3.) 10 ÷ 2.5 = [4]
4.) 30 ÷ 2.6 = [15]
5.) 27 ÷ 1.8 = [15]
6.) 72 ÷ 4.5 = [16]
7.) 98 ÷ 2.8 = [35]
8.) 42 ÷ 1.4 = [30]



Lesson Flow

1 Review the previous lesson.

2 Think about how to divide 320 ÷ 1.6 in vertical form.

T Introduce the Main Task. (Refer to the BP)
T Ⓕ Explain how to divide 320 ÷ 1.6 in vertical form.
TN Divide the whole number by a decimal number. Change the divisor and the dividend into whole numbers. In this case, multiply the divisor and the dividend by 10.
S Apply the rules of division to divide 320 ÷ 1.6

3 Important Point

T/S Explain the important point in the box ( ).

4 Solve 12 ÷ 2.4 in vertical form by using the rules of division.

T/S 2 Read and understand the situation.
T 1 Explain the situation of this task and let students write the mathematical expression to get the answer for the □.

Lesson Flow

S Mathematical Expression: 12 ÷ 2.4
T ❷ Let's think about how to calculate 12 ÷ 2.4
S Present their ideas with friends.

5 Think about how to divide in vertical form.

T ❸ Ask students to calculate in vertical form.
S
- Use the rule of division to change the decimal number into a whole number.
- Multiply the divisor and the dividend with 10 to make the divisor become 24 and dividend become 120.
  Then divide 120 ÷ 24 in vertical form.

6 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 38)

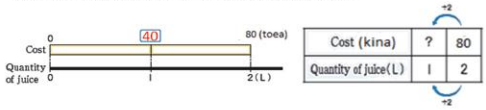
Date: **Chapter:** Division of Decimal Numbers **Topic 1:** Operation of Whole Numbers ÷ Decimal Numbers **Lesson Number:** 1 of 2

MT: Let's think and investigate which juice is cheaper?

MT: Introduce the main task here.

[1] Jane and Betu went to the supermarket to buy juice.

❶ How much is the cost of 1L in the 2L container?

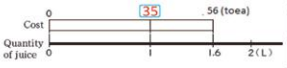


Cost (kina)	?	80
Quantity of juice(L)	1	2

A. Write a mathematical Expression. 80 ÷ 2

B. Let's calculate. 80 ÷ 2 = 40 Answer: 40 toea

❷ How much is the cost of 1 L for the 1.6 L container?



Cost(toea)	?	56
Quantity of juice(L)	1	1.6

A. Write a mathematical Expression. 56 ÷ 1.6

B. Approximately how much the cost be?
Around: 56 ÷ 2 = 28 Answer: 28 toea or
Around 60 ÷ 2 = 30 Answer: 30 toea.

Important Point.

C. Let's think about how to calculate 56 ÷ 1.6

Children's Ideas

D. Let's explain the ideas.
Explain Mero's and Kekeni's Ideas in the text book.

E. Which ideas corresponds to each of the two tables. Discuss what the two tables have in common.

① (×10, +16)

Cost(toea)	3.5	35	56
Quantity(L)	0.1	1	1.6

(×10, +16)

② (+16, ×10)

Cost(toea)	35	56	560
Quantity(L)	1	1.6	16

(+16, ×10)

Table 1 corresponds to Mero's idea and table 2 corresponds to Kekeni's idea.
The two tables have in common is changing decimal numbers to whole numbers using the rule of division.

Summary

- We can find the answer using the rule of division even when the divisor is a decimal number.
- We can apply the unit idea when dividing with decimals.

Sample Blackboard Plan (Lesson 39)

Date: **Unit:** Division of Decimal Numbers **Topic 1:** Operation of Whole Numbers ÷ Decimal Numbers **Lesson Number:** 2 of 2

MT: Let's explain how to divide in vertical form.

Review.

MT: Introduce the main task here.

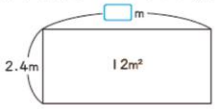
F. Let's explain how to divide 320 ÷ 1.6 in vertical form.

1.6)320
×10 ↓ ×10 ↓
16)3200

The rule of division can be applied to division of decimal numbers as well.

Important Point.

2 There is a rectangular flower bed that has a width of 2.4 m long and has an area of 12m². How long is the length in meter

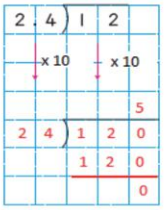


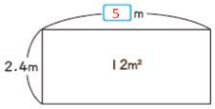
❶ Write a mathematical Expression. 12 ÷ 2.4

❷ Let's think about how to calculate.

Write down student's ideas.

❸ Let's think about how to divide in vertical form.





Exercise: Let's divide in vertical form.

(1) 9 ÷ 1.8 = 5

(2) 91 ÷ 2.6 = 35

(3) 6 ÷ 4.8 = 1.25

Calculate in vertical form.

Summary

We can apply the rule of division when dividing with decimals in vertical form.

Unit 5: Unit: Division of Decimal Numbers

Sub-unit 2: Operation of Decimal Numbers ÷ Decimal Numbers

Lesson 1 of 2

Textbook Page : 062 and 063
Actual Lesson 040

Sub-unit Objectives

- To think about how to calculate decimal number ÷ decimal number.
- To understand and apply the steps on how to calculate decimal number ÷ decimal number in vertical form.
- To understand the relationship of the size between quotient and dividend.

Lesson Objectives

- To understand the meaning of decimal number ÷ decimal number.
- To understand how to calculate decimal number ÷ decimal number in vertical form.

Prior Knowledge

- Calculating Whole Number ÷ Decimal Number in vertical form
- How to calculate Whole Number ÷ Decimal Number
- Rules of division

Preparation

- Chart of tape diagram for task 1

Assessment

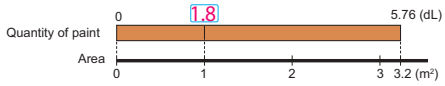
- Determine the meaning of decimal number ÷ decimal number. F
- Demonstrate the understanding on how to calculate decimal number ÷ decimal number in vertical form. S
- Solve the exercises correctly. S

Teacher's Notes

The point which is different from the division of a decimal number is that students don't have to put back the number again after getting the answer of calculation with the whole numbers. In short, it is using Naiko's idea of $a \div b = (a \times 10) \div (b \times 10)$.

2 Operation of Decimal Numbers ÷ Decimal Numbers

1 We used 5.76 dL of paint to paint a 3.2 m² wall.
How many decilitre (dL) of paint will we use to paint a 1 m² wall?



1 Let's write a mathematical expression.
5.76 ÷ 3.2

Quantity of paint (dL)	?	5.76
Area (m²)	1	3.2

÷3.2 ÷3.2

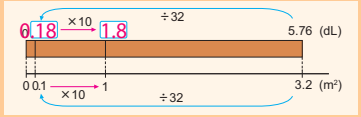
2 Approximately how many dL will we use? 6 ÷ 3 = 2 2 dL

3 Let's think about how to calculate.

How can we change it to division of whole numbers?

Naiko's Idea

Paint needed for 0.1 m² is 5.76 ÷ 32 = 0.18 (dL).
Paint needed for 1 m² will be 10 times of that, so 0.18 × 10 = 1.8 (dL).



Yamo's Idea

I will apply the rules of division to change the divisor into a whole number.

5.76 ÷ 3.2 = 1.8
×10 ×10
57.6 ÷ 32 = 1.8

4 Let's think about how to divide in vertical form.

			1	8
	3	2	5	7	6
			3	2	
			2	5	6
			2	5	6
					0

How to Divide Decimal Numbers in Vertical Form

① Multiply the divisor by 10, 100 or more to make it a whole number and move the decimal point to the right accordingly.
② Multiply the dividend by the same amount as the divisor and move the decimal point to the right accordingly.
③ The decimal point of the answer comes at the same place as where the decimal point of the dividend has been moved to.
④ Then, calculate as if this is the division of whole numbers.

			1	8
3	2	5	7	6
		3	2	
		2	5	6
		2	5	6
				0

2 There is a rectangular flowerbed that has an area of 8.4 m² and the length of 2.8 m.
How many metres is the width?

				3
2	8	8	4	
		8	4	
				0

1 Let's write a mathematical expression.
8.4 ÷ 2.8

2 Let's calculate ① in vertical form and find the answer.
Width is 3 cm

Exercise

Let's divide in vertical form.

① 9.52 ÷ 3.4 2.8 ② 9.88 ÷ 2.6 3.8 ③ 7.05 ÷ 1.5 4.7
④ 8.5 ÷ 1.7 5 ⑤ 7.6 ÷ 1.9 4 ⑥ 9.2 ÷ 2.3 4

62 = □ × □

□ − □ = 63

Lesson Flow

1 Review the previous lesson.

2 Estimating the value of 5.76 ÷ 3.2

T Introduce the Main Task. (Refer to the BP)
T/S ❶ Read and understand the situation.
S ❶ Write a mathematical expression. (5.76 ÷ 3.2)
TN Let the students understand how to calculate division when both the divisor and dividend are decimal numbers.
T ❷ Let's estimate the quantity of paint needed for 1 m² by looking at the information on the number line and table.
S Paint needed for 1 m² will be around (6 ÷ 3 = 2) 2 dL.

3 ❸ Think about how to calculate 5.76 ÷ 3.2

T Let's compare Naiko's and Yamo's ideas. How can we change it to division of whole numbers?
S Discuss and present their ideas of how to calculate 5.76 ÷ 3.2
TN Naiko's Idea in calculating 5.76 ÷ 3.2 is expressing how to calculate by dividing (decimal number) ÷ (decimal number). Yamo's Idea in calculating 5.76 ÷ 3.2 uses the rules of division to divide.

4 How to divide decimal numbers in vertical form.

T ❹ Ask students to think about how to divide 5.76 ÷ 3.2 in vertical form.
S Discuss how to divide.
T Explain how to divide decimal numbers in vertical form in the box ☐.

5 Think about how to calculate 8.4 ÷ 2.8

T/S ❷ Read and understand the situation.
S ❶ Write a mathematical expression. (8.4 ÷ 2.8)
S ❷ Divide 8.4 ÷ 2.8 in vertical form.
T Confirm the students calculation.

6 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.
TN Do the supplementary problems below if time allows for remedial purposes.
1.) 7.5 ÷ 1.5 2.) 9.6 ÷ 1.6 3.) 9.6 ÷ 1.2
4.) 8.4 ÷ 1.4 5.) 8.5 ÷ 1

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

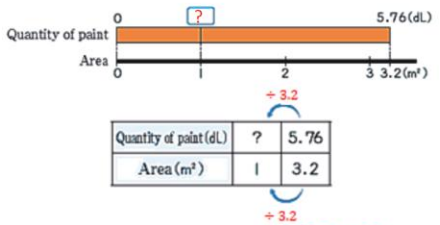
Date: **Unit:** Division of Decimal Numbers **Topic 2:** Operation of Decimal Numbers ÷ Decimal Numbers **Lesson Number:** 1 of 2

MT: Let's think and explain how to divide Decimal Number ÷ Decimal Number in vertical form.

Review.

MT: Introduce the main task here.

❶ We used 5.7dL of paint to paint a 3.2m² wall. How many dL of paint will we use to paint a 1m² wall?

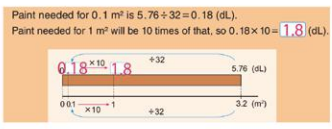


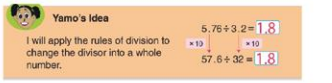
❶ Write a mathematical Expression. 5.76 ÷ 3.2

❷ Approximately how many dL will we use?
6 ÷ 3 = 2 Answer: 2 dL

❸ Let's think about how to calculate.

Naiko's Idea.





❹ Let's think about how to divide in vertical form.

$$\begin{array}{r} 1.8 \\ 3.2\overline{)5.76} \\ 32 \\ \hline 256 \\ 256 \\ \hline 0 \end{array}$$

How to divide decimal number in decimal form

❷ There is a rectangular flower bed that has an area of 8.4m² and the length of 2.8m. How many meters is the width?

❶ Write a mathematical expression. 8.4 ÷ 2.8
❷ Let's divide in vertical form.

$$\begin{array}{r} 3 \\ 2.8\overline{)8.4} \\ 8\,4 \\ \hline 0 \end{array}$$

Answer: The width is 3 m.

Exercise: Let's divide in vertical form.

(1) 9.52 ÷ 3.4 = 2.8 (4) 8.5 ÷ 1.7 = 5
(2) 9.88 ÷ 2.6 = 3.8 (5) 7.6 ÷ 1.9 = 4
(3) 7.05 ÷ 1.5 = 4.7 (6) 9.2 ÷ 2.3 = 4
Calculate in vertical form.

Summary
To divide decimal numbers in vertical form,;
change divisors to whole numbers
multiply dividend by same amount as divisor
place the decimal point of answer where the decimal point of dividend has been moved then calculate.

Unit 5

Unit: Division of Decimal Numbers
Sub-unit 2: Operation of Decimal Numbers ÷ Decimal Numbers
Lesson 2 of 2

Textbook Page : 064
Actual Lesson 041

Lesson Objectives

- To understand where to place zero (0) when doing continuous calculation with division.
- To understand and apply the calculation on division of decimal number ÷ decimal number.

Prior Knowledge

- Calculating decimal Number ÷ decimal Number in vertical form
- How to calculate Decimal Number÷Decimal Number
- The rules of division
- Continuous division

Preparation

- Tape diagram and table

Assessment

- Think about where to place zero (0) when doing continuous calculation with division. F
- Solve the exercises correctly. S

Teacher's Notes

Supplementary Exercise

Let's do the following divisions in vertical form.

① 3.4 ÷ 2.5 [1.36]
② 4.62 ÷ 4.4 [1.05]
③ 5.33 ÷ 2.6 [2.05]
④ 1.68 ÷ 3.5 [0.48]

Calculating decimal number÷decimal number

3 A metal bar is 1.5 m and weighs 4.8 kg.
How many kilograms (kg) will 1 m of this bar weigh?

① Let's write a mathematical expression.
4.8 ÷ 1.5

② Let's think about how to calculate.

Ⓐ By what number should we multiply the divisor and the dividend? 10

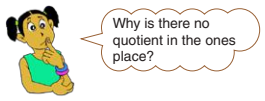
Weight (kg)	?	4.8
Length (m)	1	1.5

×1.5 ×1.5

Ⓑ Think of 48 as 48.0 to continue with the division.

```
    3.2
1.5)4.8.0
   4 5
   3 0
   3 0
     0
```

4 Let's think about how to divide 3.23 ÷ 3.8 in vertical form.




```
    0.8 5
3.8)3.2.3
   3 0 4
   1 9 0
   1 9 0
       0
```

3.2 is not divisible by 3.8 so no quotient in the ones place

Exercise

1 Let's divide in vertical form.
① 36.9 ÷ 1.8 20.5 ② 3.06 ÷ 4.5 0.68 ③ 0.49 ÷ 3.5 0.14

2 There is a rectangular flowerbed that has an area of 36.1 m^2.
How many m is the width if the length is 3.8 m?
36.1 ÷ 3.8 = 9.5 Answer: 9.5 m

64 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Think about how to calculate 4.8 ÷ 1.5

T Introduce the Main Task. (Refer to the BP)
T/S 3 Read and understand the situation.
T Ask the students to use the tape diagram and the table to write the mathematical expression.
S 1 Write a mathematical expression as 4.8 ÷ 1.5

3 2 Calculate 4.8 ÷ 1.5 in vertcial form.

T/S Ⓐ Discuss the number that should be multiplied with the divisor and the dividend.
S 10
S Ⓑ Consider 48 as 48.0 and continue with the division in vertical form and fill in the box ☐.
T Confirm the vertical calculation.

4 4 Think about how to calculate 3.23 ÷ 3.8

T Let's think about how to divide 3.23 ÷ 3.8 in vertical form.
T When there is no quotient in the ones place, we continue to calculate by adding 0 to solve the problem.
S Identify and express ideas after solving the problem.

5 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Division of Decimal Numbers **Topic 2:** Operation of Decimal Numbers ÷ Decimal Numbers **Lesson Number:** 2 of 2

MT: Let's Divide Decimal Number ÷ Decimal Number in vertical form.

Review.

MT: Introduce the main task here.

3 A metal bar is 1.5m and weighs 4.8kg. How many kg will 1m of this bar weigh?

Weight (kg)	?	4.8
Length (m)	1	1.5

+1.5 +1.5

❶ Write a mathematical Expression. 4.8 ÷ 1.5
❷ Let's think about how to calculate.
A. By what number should we multiply the divisor and the dividend? 10
B. Think of 48 as 48.0 to continue with the division.

```
    3.2
1.5)4.8.0
  4 5
    3 0
    3 0
      0
```

Answer: 3.2

4 Let's think about how to divide 3.23 ÷ 3.8 in vertical form.

Why is there no quotient in the ones place?

```
      0.8 5
3.8)3.2.3 0
    3 0 4
      1 9 0
      1 9 0
          0
```

3.2 is not divisible by 3.8 therefore there is no quotient in the ones place.

Exercise:

1. Let's divide in vertical form.

(1) 36.9 ÷ 1.8 = 20.5 (2) 3.06 ÷ 4.5 = 0.68

(3) 0.49 ÷ 3.5 = 0.14

Calculate in vertical form.

2. There is a rectangular flower bed that has an area of 36.1 m². How many meters is the width if the length is 3.8 m?
36.1 ÷ 3.8 = 9.5 Answer: 9.5 m

Summary
When there is no quotient in the ones place, we continue to calculate by adding 0 to complete the calculation.

Unit 5

Unit: Division of Decimal Numbers
Sub-unit 3: Division Problems
Lesson 1 of 2

Textbook Page : 065
Actual Lesson 042

Sub-unit Objectives

- To understand how to calculate and confirm the answers of the divisions with remainders.
- To understand how to find the quotient by rounding.

Lesson Objective

- To understand how to calculate and confirm the answers of the divisions with remainders.

Prior Knowledge

- Dividing by Decimal Numbers Smaller than 1

Preparation

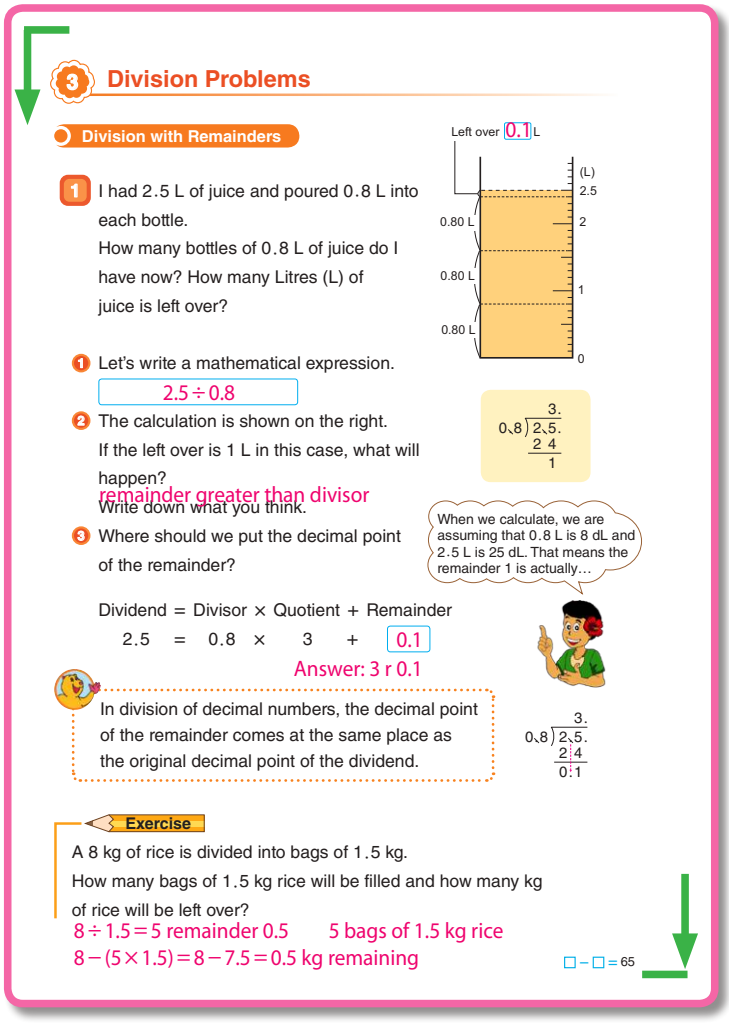
- Diagram on 1

Assessment

- Think about how to calculate and confirm the answers of the divisions with remainders. F
- Solve the exercises correctly. S

Teacher's Notes

Note that in the division of vertical form, the remainder is 0.1 and not 1.
The simplest formula to prove in 3 is by using:
Remainder = Dividend − (Divisor × Quotient)



3 Division Problems

Division with Remainders

1 I had 2.5 L of juice and poured 0.8 L into each bottle.
How many bottles of 0.8 L of juice do I have now? How many Litres (L) of juice is left over?

1 Let's write a mathematical expression.
2.5 ÷ 0.8

2 The calculation is shown on the right.
If the left over is 1 L in this case, what will happen?
Write down what you think.
remainder greater than divisor

3 Where should we put the decimal point of the remainder?

Dividend = Divisor × Quotient + Remainder
2.5 = 0.8 × 3 + 0.1
Answer: 3 r 0.1

In division of decimal numbers, the decimal point of the remainder comes at the same place as the original decimal point of the dividend.

Exercise

A 8 kg of rice is divided into bags of 1.5 kg.
How many bags of 1.5 kg rice will be filled and how many kg of rice will be left over?
8 ÷ 1.5 = 5 remainder 0.5 5 bags of 1.5 kg rice
8 − (5 × 1.5) = 8 − 7.5 = 0.5 kg remaining

□ − □ = 65

Lesson Flow

1 Review the previous lesson.

T Solve 4.5 ÷ 0.5 and link to this lesson.

2 Solving division with the remainder 1 to be 0.1

T/S ❶ Read and understand the situation.
T Introduce the Main Task. (Refer to the BP)
T Explain that the situation is similar to the review question but for this case it is different. There was 2.5 L of juice of which are poured into 0.8 L of bottles.
How many L of juice is left?
S ❶ Write a mathematical expression: 2.5 ÷ 0.8
S ❷ Think about how to explain the calculation of 2.5÷0.8 and what happens if the left over is 1 L.
T What will happen if the remainder is 1 L? Explain your answer.
S If remainder is 1 L, it will be greater than the divisor.
TN When we calculate, we are assuming that 0.8 L is 8 dL and 2.5 L is 25 dL by multiplying both the divisor and the dividend with 10.
T ❸ Where should we put the decimal point of the remainder?
S Solve the calculation problem.
TN Use the checking to method confirm where the decimal point of the remainder should be placed.
Dividend = Divisor × Quotient + Remainder
2.5 = 0.8 × 3 + 0.1

3 Important Point

T/S Explain the important point in the box .

4 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

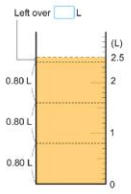
Date: **Unit:** Division of Decimal Numbers **Topic 3:** Division Problems **Lesson Number:** 1 of 3

MT: Let's think about how to calculate and confirm the answer of the division with remainders.

Review.

MT: Introduce the main task here.

❶ I have 2.5 L of juice and poured 0.8 into each bottle. How many bottles of 0.8 L of juice is left over?



❶ Let's write an expression and calculate it.
Expression: 2.5 ÷ 0.8

❷ The calculation is shown on the right. If the left over is 1L in this case, what will happen? Write down what you think.
The remainder greater than the divisor. It has to be smaller than the divisor.

$$0.8\overline{)2.5}\quad 3.\ \text{remainder } 1$$

❸ Where should we put the decimal point of the remainder?
Put the decimal point before 1 and it will be read as 0.1

$$0.8\overline{)2.5.}\quad 3.\ \text{remainder } 0.1$$

Answer: 3 bottles of 0.8 L and 0.1 L juice is left over.

Dividend = Divisor × Quotient + Remainder
2.5 = 0.8 × 3 + 0.1

Important Point.

Exercise:
There is a 8kg of rice which is divided into bags of 1.5kg. How many bags of 1.5 kg rice will be filled and how many kg of rice will be left over?

8 ÷ 1.5 = 5 remainder 0.5
Answer: 5 bags of 1.5 kg rice and 0.5 kg remaining or left over.

Dividend = Divisor × Quotient + Remainder
8 = 1.5 × 5 + 0.5

Summary
- The remainder should always than the divisor.
- Place the decimal point of the remainder at the same place of the decimal point of the dividend.

Unit 5

Unit: Division of Decimal Numbers
Sub-unit 3: Division Problems
Lesson 2 of 2

Textbook Page : 066
Actual Lesson 043

Lesson Objective

- To understand how to find the quotient by rounding.

Prior Knowledge

- Division with Remainder
- Adding 0 to continue the calculation

Preparation

- Chart of calculation of long division in 2

Assessment

- Think about how to find the quotient by rounding. F
- Solve the exercises correctly. S

Teacher's Notes

The term 'not divisible' in the summary means that when the remainder is continous, we have to round the quotient.

2 I weighed a 2.4 m long metal bar and it weighed 2.84 kg. How many kg does 1 m of this bar weigh?

1. Let's write an expression.
   2.84 ÷ 2.4
2. The calculation carried out is shown on the right. What will be the answer?
3. Round the quotient to the thousandths place and give the answer to the nearest hundredth. 1.18 kg

```
      1.183
2.4 ) 2.84
      24
       44
       24
       200
       192
         80
         72
          8
```

When a remainder is not divisible by the divisor or when the numbers become too long, the quotient is rounded.

Exercise

1 For answering the quotient at the nearest hundredths place, round the quotient to the thousandths place.

① 2.8 ÷ 1.7 1.65 ② 5 ÷ 2.1 2.38 ③ 9.4 ÷ 3 3.13
④ 61.5 ÷ 8.7 7.07 ⑤ 0.58 ÷ 2.3 0.25 ⑥ 19.2 ÷ 0.49 39.18

2 A 0.3 m wire weighs 1.6 g. Approximately, how many g does 1 m of this wire weighs? For answering the quotient at the nearest tenths place, round the quotient to the hundredths place.

1.6 ÷ 0.3 = 5.33
Answer: 5.3 g

66 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Rounding the quotient when the remainder is not divisible.

T/S ❷ Read and understand the given situation.
T Introduce the Main Task. (Refer to the Blackboard Plan)
T Ask students to write a mathematical expression.
S ❶ Write a mathematical expression as 2.84÷2.4
T ❷ Explain the calculation 2.84÷2.4 in the vertical form.
S Observe the calculation process.
T What will be the answer?
T/S Discuss the answers together.

3 Think about how to round the quotient to the nearest place value.

TN The quotient is continuous 1.183333.....therefore, we need to round the quotient.
T ❸ Let students round the quotient to the thousandths place and give the answer to the nearest hundredths.
S The quotient is 1.183.... so we round off to 1.18
S The answer is 1.18 kg when rounded to the nearest hundredths.

4 Important Point

T/S Explain the important point in the box .

5 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Division of Decimal Numbers **Topic 3:** Division Problems **Lesson Number:** 2 of 3

MT: Let's think about how to round the quotient when the remainder is not divisible by the divisor.

Write down what students think will be the answer.

Review.

MT: Introduce the main task here.

❷ I weighed a 2.4m long metal bar and it was 2.84kg. How many kg does 1m of this bar weigh?

		÷2.4
Weight (kg)	?	2.84
Length (m)	1	2.4
		÷2.4

❶ Let's write an expression and calculate it.
Expression: 2.84 ÷ 2.4

❷ The calculation is shown on the right. What will be the answer?

```
      1.1 8 3
2.4 ) 2.8.4
      2 4
      4 4
      2 4
      2 0 0
      1 9 2
        8 0
        7 2
          8
```

❸ Round the quotient to the thousandths place and give the answer to the nearest hundredth.
2.84 ÷ 2.4 = 1.1 83333333.....
Answer: 1.18 kg

When a remainder is not divisible by the divisor or when the numbers become too long, the quotient is rounded.

2. A 0·3 m wire weighs 1·6 g. Approximately, how many g does 1 m of this wire weighs?
For answering the quotient at the nearest tenths place, round the quotient to the hundredths place.

1.6 ÷ 0.3 = 5.33333
Answer: 5.33 g

		÷0.3
Weight (kg)	?	1.6
Length (m)	1	0.3
		÷0.3

Summary
We round the quotient when a remainder is not divisible by the divisor or when the number become too long.

Exercise:

1. For answering the quotient at the nearest hundredth point, round the quotient to the thousandth place.

① 2.8÷1.7 1.6470 =1.65
② 5÷2.1 2.3809 =2.38
③ 9.4÷3 3.1333 = 3.13
④ 61.5÷8.7 7.068 =7.07
⑤ 0.58÷2.3 0.2521 =0.25
⑥ 19.2÷0.49 39.183 =39.18

Unit 5

Unit: Division of Decimal Numbers
Sub-unit 3: Division Problems
Lesson 1 of 1

Textbook Page : 067
Actual Lesson 044

Lesson Objective

- To think about the relationship between the quotient and the dividend when dividing by decimal numbers smaller than 1.

Prior Knowledge

- How to divide Decimal Numbers in Vertical Form
- Adding 0 to continue the calculation

Preparation

- Chart of tape diagrams for task 3

Assessment

- Think about the relationship between the quotient and the dividend. F
- Think about how to divide decimal numbers smaller than 1 and notice the change in the quotient and the dividend. F
- Solve the exercises correctly. S

Teacher's Notes

Supplementary Problems

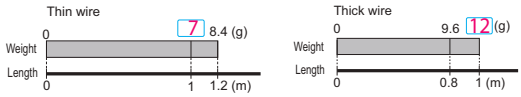
1. Which expressions give the quotients bigger than 24?

a) 24 ÷ 2.5 b) 24 ÷ 0.1 c) 24 ÷ 0.8
d) 24 ÷ 1.2 e) 24 ÷ 1.05 f) 24 ÷ 0.96

Answer: [b, c, f]

Dividing by Decimal Numbers Smaller than 1

3 There is a thin wire that is 1.2 m long which weighs 8.4 g and a thick wire that is 0.8 m long and weighs 9.6 g.
Let's find the weight of 1 m for each wire.



1. How many g does 1 m of the thin wire weigh? Write an expression and calculate it. 8.4 ÷ 1.2 = 7 7 g
2. How many g does 1 m of the thick wire weigh? Write an expression and calculate it. 9.6 ÷ 0.8 = 12 12 g
3. Let's compare the quotients and dividends of each of them.
4. Let's calculate 9.6 ÷ □ by putting numbers into the □ apart from 0.8 Let's talk about what you noticed.

9.6 ÷ 1 = 9.6 9.6 ÷ 0.6 = 16 9.6 ÷ 0.2 = 48
9.6 ÷ 0.9 = 10.66 9.6 ÷ 0.5 = 19.2 9.6 ÷ 0.1 = 96
9.6 ÷ 0.8 = 12 9.6 ÷ 0.4 = 24
9.6 ÷ 0.7 = 13.7 9.6 ÷ 0.3 = 32

When a number is divided by a number smaller than 1, the quotient becomes larger than the dividend.

Exercise

Let's divide in vertical form.

① 4.9 ÷ 0.7 7 ② 3.2 ÷ 0.4 8 ③ 1.5 ÷ 0.3 5
④ 0.9 ÷ 0.6 1.5 ⑤ 0.4 ÷ 0.5 0.8 ⑥ 0.2 ÷ 0.8 0.25

□ – □ = 67

Lesson Flow

1 Review the previous lesson.

2 Dividing by decimal numbers smaller than 1.

T/S ❸ Read and understand the given situation.

T Introduce the Main Task. (Refer to the Blackboard Plan)

T Ask the students to use the tape diagram to write the mathematical expressions.

S ❶ Write the mathematical expression of the thin wire and calculate.
Expression: 8.4 ÷ 1.2 Answer: 8.4 ÷ 1.2 = 7

S ❷ Write the mathematical expression of the thick wire and calculate.
Expression: 9.6 ÷ 0.8 Answer: 9.6 ÷ 0.8 = 12

T/S Confirm calculations using the rule of division and fill in the boxes in the tape diagrams.

T ❸ Let's compare the quotients and the dividends in ❶ and ❷ .

S In ❶ the quotient (7) is less than the dividend (8.4)
In ❷ the quotient (12) is greater than the dividend (9.6)

3 Understand the relationship amongst the divisor, dividend and quotient.

S ❹ Calculate and fill in the box ☐.

T Discuss what you noticed amongst the divisors, dividends and the quotients.

S The quotient becomes larger than the dividend as the divisor decreases.

4 Important Point

T/S Explain the important point in the box ☐.

5 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

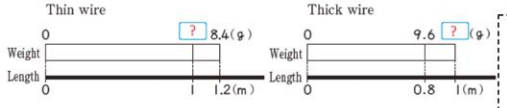
Date: **Unit:** Division of Decimal Numbers **Topic 3:** Division Problems **Lesson Number:** 3 of 3

MT: Let's divide decimal numbers smaller than 1 and find the relationship between the quotient and the dividend.

Review.

MT: Introduce the main task here.

❸ There is a thin wire that is 1.2 m and 8.4 g and a thick wire that is 0.8 m and 9.6 g. Let's find the weight of 1m for each wire.



❶ How many g does 1 m of the thin wire weigh? Write an expression and calculate it. Expression: 8.4 ÷ 1.2
8.4 ÷ 1.2 = 7 Answer: 7g

❷ How many g does 1 m of the thick wire weigh? Write an expression and calculate it. Expression: 9.6 ÷ 0.8
9.6 ÷ 0.8 = 12 Answer: 12 g.

❸ Let's compare the quotient and dividend for each of them.
In ❶ the quotient is less than the dividend.
In ❷ the quotient is greater than the dividend.

❹ Let's calculate 9.6 ÷ ☐ by putting numbers into the ☐ apart from 0.8 Let's talk about what you noticed.

9.6 ÷ 1 = 9.6	9.6 ÷ 0.6 = 16	9.6 ÷ 0.2 = 48
9.6 ÷ 0.9 = 10.66	9.6 ÷ 0.5 = 19.2	9.6 ÷ 0.1 = 96
9.6 ÷ 0.8 = 12	9.6 ÷ 0.4 = 24	
9.6 ÷ 0.7 = 13.71	9.6 ÷ 0.3 = 32	

Write down what the students have noticed.

Important Point.

Exercise:

Let's divide in vertical form.

(1) 4.9 ÷ 0.7 = 7
(2) 3.2 ÷ 0.4 = 8
(3) 1.5 ÷ 0.3 = 5
(4) 0.9 ÷ 0.6 = 1.5
(5) 0.4 ÷ 0.5 = 0.8
(6) 0.2 ÷ 0.8 = 0.25

Calculate in vertical form.

Summary
When a number is divided by a number smaller than 1, the quotient becomes larger than the dividend.

Unit 5: Unit: Division of Decimal Numbers

Sub-unit 4: What kind of Calculation Would It Be? Draw Diagrams to Help You Think

Lesson 1 of 1

Textbook Page : 068 and 069
Actual Lesson 045

Sub-unit Objectives

- To understand the relationship between multiplication and division and decide which operation to be used.
- To deepen understanding through creating multiplication and division problems.

Lesson Objectives

- To understand word problems of multiplication and division of decimal numbers and identify which operation to use.
- To create multiplication and division word problems using samples.

Prior Knowledge

- Previous lesson
- Amount per unit quantity

Preparation

- Tape diagrams and tables for 1, 2 and 3

Assessment

- Think about the relationship between multiplication and division of different problems. F
- Think about which operation to use and solve the problems. F
- Create multiplication and division word problems. S

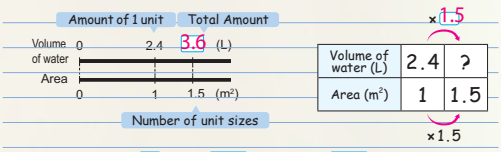
Teacher's Notes

It is important to use the tape diagram and the table for each task to enhance students ability in solving multiplication and division problems.

4 What Kind of Calculation Would It Be? Draw Diagrams to Help You Think

1 Minie watered a 1 m² flowerbed with 2.4 L of water.
How many L of water will she use to water a 1.5 m² flowerbed?

Estimation : Water needed for 1.5 m² will probably be more than the water for 1 m².



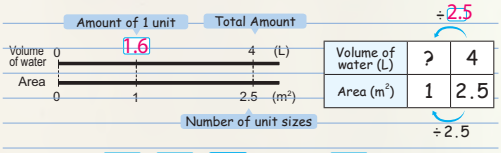
Volume of water (L)	2.4	?
Area (m²)	1	1.5

×1.5 ×1.5

Expression : 2.4 × 1.5 = 3.6 Answer 3.6 L

2 Jack used 4 L of water to water 2.5 m².
How many L will he use to water 1 m²?

Approach : We want to know the amount of 1 unit size, so we use division.



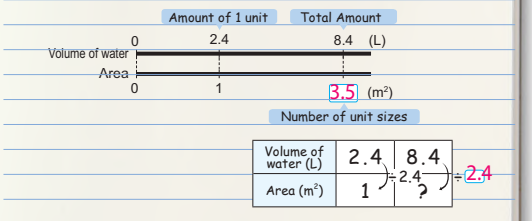
Volume of water (L)	?	4
Area (m²)	1	2.5

÷2.5 ÷2.5

Expression : 4 ÷ 2.5 = 1.6 Answer 1.6 L

3 Lyn used 2.4 L of water to water 1 m² flowerbed.
How many m² can she water with 8.4 L?

Approach : Use the amount of 1 unit size to calculate the number of unit sizes.



Volume of water (L)	2.4	8.4
Area (m²)	1	?

÷2.4 ÷2.4

Expression : 8.4 ÷ 2.4 = 3.5 Answer 3.5 m²

4 Ben wrote the following questions.

There is a solar panel that weighs 2.5 kg for 1 m².
The weight of 3.8 m² of this panel is 9.5 kg.
Let's fill in the ☐ with an appropriate number.

1. Fill in the ☐. 2.5 × 3.8 = 9.5
2. Let's make a multiplication problem by changing the numbers and words.
3. Let's make a division problem by changing the numbers and words.

68 = □ × □

□ − □ = 69

Lesson Flow

1 Review the previous lesson.

2 Using multiplication as an operation to solve the problem.

T Introduce the Main Task. (Refer to the BP)
T/S ❶ Read and understand the situation.
T Which operation is used in this situation and write a mathematical expression.
S Use the tape diagram and table to identify the operation. Write a mathematical expression and calculate.
Expression: 2.4 × 1.5
Answer: 2.4 × 1.5 = 3.6 L
T Confirm the calculation using the tape diagram and the table of information.

3 Using division as an operation to solve the problem.

T/S ❷ Read and understand the situation.
T Which operation is used in this situation and write a mathematical expression.
S Use the tape diagram and table to identify the operation. Write a mathematical expression and calculate.
Expression: 4 ÷ 2.5
Answer: 4 ÷ 2.5 = 1. 6 L
T Confirm the calculation using the tape diagram and the table of information.

4 Using division as an operation to solve the problem.

T/S ❸ Read and understand the situation.
T Which operation is used in this situation and write a mathematical expression.
S Use the tape diagram and table to identify the operation. Write a mathematical expression and calculate.
Expression: 8.4 ÷ 2.4
Answer: 8.4 ÷ 2.4 = 3.5 m²
T Confirm the calculation using the tape diagram and the table of information.

5 Make multiplication and division word problems.

T/S ❹ Read and understand the situation.
S ❶ Fill in the box ☐ for the situation.
S ❷ Make multiplication word problems by changing the numbers and words.
S ❸ Make division word problems by changing the numbers and words.
T Confirm the activities ❶, ❷ and ❸.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Division of Decimal Numbers **Topic 4:** What kind of Calculation would it be? **Lesson Number:** 1 of 1

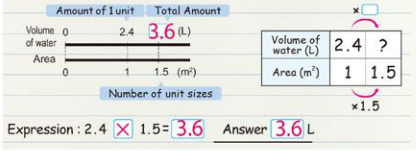
MT: Let's think about what kind of calculation would it be?

Review.

MT: Introduce the main task here.

❶ I watered a 1m² flower bed with 2.4 L of water. How many L of water will I use to water a 1.5m² flower bed?

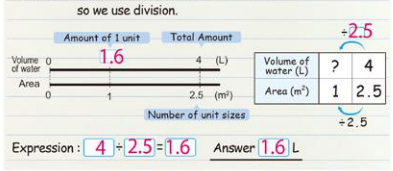
Estimation : Water needed for 1.5 m² will probably be more than the water for 1 m².



Expression : 2.4 × 1.5 = 3.6 Answer 3.6 L

❷ I used 4 L of water to water 2.5m². How many L will I use to water 1 m²?

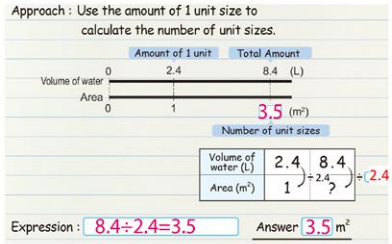
Approach : We want to know the amount of 1 unit size, so we use division.



Expression : 4 ÷ 2.5 = 1.6 Answer 1.6 L

❸ I used 2.4 L of water to water 1 m². How many m² can I water with 8.4 L?

Approach : Use the amount of 1 unit size to calculate the number of unit sizes.



Expression : 8.4 ÷ 2.4 = 3.5 Answer 3.5 m²

❹ Ben made the following question.

There is a solar panel that weighs 2.5 kg for 1 m².
The weight of 3.8 m² of this panel is 9.5 kg.
Let's fill in the ☐ with an appropriate number.

❶ Fill in the ☐ 2.5 x 3.8 = 9.5

❷ Let's make a multiplication problem by changing the numbers and words.
There is an apple basket that weighs 3.4kg for 1 basket. The weight of 2 and a half basket is 8.5kg

❸ Let's make a division problem by changing the numbers and words.
There is a plastic container that can water 3.6 m² of flower garden in 3 sprinkles. In one sprinkle it can water 1.2 m²

Summary

- Use of tape diagrams and tables can help to identify the types of operations to use in solving problems.
- We can make multiplication and division word problems

Unit 5

Unit: Division of Decimal Numbers
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page :
070 and 071
Actual Lesson 046 and 047

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 5. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

1 Let's divide in vertical form. Pages 58 to 69

① 12÷1.5 8 ② 36÷1.8 20 ③ 40÷1.6 25
④ 7.2÷2.4 3 ⑤ 9.8÷1.4 7 ⑥ 8.1÷2.7 3
⑦ 7.2÷0.9 8 ⑧ 8.4÷0.6 14 ⑨ 0.3÷0.8 0.375
⑩ 9.1÷3.5 2.6 ⑪ 5.4÷1.2 4.5 ⑫ 2.2÷5.5 0.4
⑬ 0.87÷0.6 1.45 ⑭ 14.8÷1.6 9.25 ⑮ 0.12÷0.48 0.25

2 Let's find the quotient within whole numbers and give also the remainders. Pages 65 and 66

① 9.8÷0.6 16 r 0.2 ② 6.23÷0.23 27 r 0.02 ③ 9.72÷1.6 6 r 0.12

3 I poured 3.4 L of juice into cups of 0.8 L each. How many cups of 0.8 L juice will I have and how many L of juice will be left over? Pages 58, 59 and 65
4 cups of 0.8 L juice and 0.2 L will be left

4 For answering the quotient to the nearest hundredths place, round the quotient to the thousandths place. Page 66

① 0.84÷1.8 0.47 0.467 ② 5.18÷2.4 2.16 2.158 ③ 8.07÷0.96 8.41 8.406

5 There is a wire 0.7 m long that weights 5.8 g.
About how many g will 1 m of this wire weigh?
To answer the quotient at the nearest tenths place, round the quotient to the hundredths place. 8.3 g Page 67

Grade 4 Do you remember?

Let's find the area of the following figures.

① 12 cm, 12 cm
② 27 cm, 13 cm
③ 3.5 m, 2.4 m, 2.5 m, 2.6 m

144 cm² 351 cm² 24 m²

PROBLEMS

1 Let's divide in vertical form.
● Dividing decimal numbers by decimal numbers.

① 39.1÷1.7 23 ② 6.5÷2.6 2.5 ③ 29.4÷0.3 98
④ 4.23÷1.8 2.35 ⑤ 0.99÷1.2 0.825 ⑥ 0.15÷0.08 1.875

2 There is a rectangular flowerbed that is 17.1 m² and the length is 3.8 m.
What is the width in metres? 4.5 m
● Calculating the length of sides from the area.

3 We distributed 3 L of milk into 0.18 L per cup.
How many cups can we fill? How many litres of milk will be left over? 16 cups of 0.18 L juice and 0.12 L will be left.
● Calculating the decimal number with remainder.

4 4.5 L of paint weighed 3.6 kg.
What are the meanings of the following expressions?
● Considering relationship between the dividend and the divisor.

① 4.5÷3.6 ② 3.6÷4.5 (1) amount of paint per 1 kg. (2) weight of paint per 1 L.

5 Which is greater?
Let's fill in the □ with inequality signs.
● Understanding the relationship between the divisor and the quotient.

① 125÷0.8 > 125 ② 125÷1.2 < 125

6 Let's explain how to calculate 6.21÷2.3
Why did you calculate like that?
Let's write the reasons which you used.
● Using calculation rules to explain.

$$2.3\overline{)6.21}\quad \begin{array}{r}2.7\\ 46\\ \hline 161\\ 161\\ \hline 0\end{array}$$

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN 1 Division in vertical form.
2 Find the quotient within the whole numbers with its remainder.
3 Division word problem.
4 Rounding in division problems.
5 Word problem involving division.

2 Solve the Problems

S Solve all the problems.

T Confirm students' answers.

TN 1 Dividing decimal numbers by decimal numbers.
2 Calculating the length of sides from the area.
3 Calculating the decimal numbers with the remainder.
4 Considering the relationship between the dividend and the divisor.
5 Understanding the relationship between the divisor and the quotient.
6 Using calculation rule to explain.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 5: Division of Decimal Numbers	Name:	Score / 100

1. Calculate.

[2×10 marks=20 marks]

(1) 72÷0.8 (2) 38.5÷0.7

Answer: 90 Answer: 55

2. Calculate and find the quotient in integer and remainder.

[2×10 marks=20 marks]

(1) 6.4÷1.2 (2) 10.2÷2.5

Answer: 5 remainder 0.4 Answer: 4 remainder 0.2

3. Calculate and find the quotient with 1 decimal place by rounding.

[2×10 marks=20 marks]

(1) 67.3÷9.3 (2) 10.8÷3.2

Answer: 7.2 Answer: 3.4

4. Which expressions give greater answer than 59? Find all expressions without calculating and the reasons.

[2×10 marks=20 marks]

(a) 59÷1.7 (b) 59÷1.07

(c) 59÷0.9 (d) 59÷0.99

Answer: (c) and (d) Reason: Divisor is less than 1

5. The length of a rope is 37.6 m.
How many ropes of 0.6 m will be cut and how long will remain?

[10 marks for maths expression and 10 marks for answer]

Answer: 37.6÷0.6

Reason: 62 ropes and 0.4 m remaining

96

Unit 5

Unit: Division of Decimal Numbers
Sub-unit: Comparing Lengths
Lesson 1 of 1

Textbook Page : 072 and 073
Actual Lesson 048

Sub-unit Objective

- Comparing heights by division and multiplication.

Lesson Objective

- Compare the heights by division and multiplication.

Prior Knowledge

- Topics covered in the previous lessons

Preparation

- Chart of diagram of the cassavas
- Tables and bar graphs for 1 and 2

Assessment

- Derive mathematical expressions correctly using the tables and the bar graphs. F
- Compare the height of cassava and solve the mathematical expressions. S

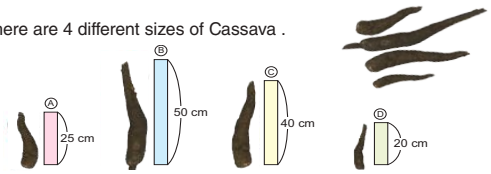
Teacher's Notes

This sub unit is focused on the application of the contents learned in this unit.

Calculation of multiples

Comparing Lengths

1 There are 4 different sizes of Cassava .



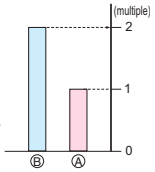
1 By how many times is the length of Ⓐ compared to Ⓑ?

50 ÷ 25 = 2

Length of Ⓑ / Length of Ⓐ / Multiple

	Ⓐ	Ⓑ
cm	25	50
Multiples	1	?

(÷25, ÷25)

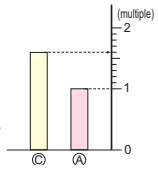


2 By how many times is the length of Ⓐ compared to Ⓒ ?
When Ⓒ is measured with Ⓐ there is a remainder.
Thus, we need to express the answer as decimal number by dividing the length between 1 and 2 into 10 equal parts.

40 ÷ 25 = 1.6

	Ⓐ	Ⓒ
cm	25	40
Multiples	1	?

(÷25, ÷25)

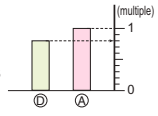


3 By how many times is the length Ⓐ to Ⓓ?
Since Ⓓ is shorter than Ⓐ, this multiple will be a number that is shorter than 1.

20 ÷ 25 = 0.8

	Ⓐ	Ⓓ
cm	25	20
Multiples	1	?

(÷25, ÷25)



72 = □ × □

2 We are going to draw pictures of cassava based on cassava Ⓒ.

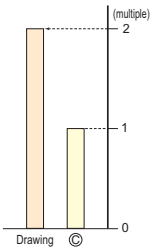
1 If we draw a cassava twice the height of Ⓒ, what will be the length of the new cassava?

40 × 2 = 80

Length of Ⓒ / Multiple / Length of drawing

cm	40	?
Multiples	1	2

(×2, ×2)

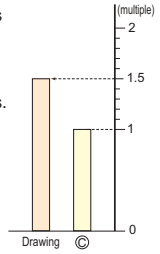


2 To make the drawing of the cassava 1.5 times the length of Ⓒ, how many cm should it be?
The length of 1.5 times is when the length between 1 and 2 is divided into 10 equal parts.

40 × 1.5 = 60

cm	40	?
Multiples	1	1.5

(×1.5, ×1.5)

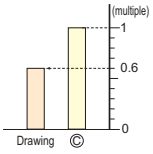


3 To make the drawing of the cassava 0.6 times the length of Ⓒ, how many cm should it be? The length multiplied by 0.6 will become smaller than when it is multiplied by 1, so it will be smaller than the original length.

40 × 0.6 = 24

cm	40	?
Multiples	1	0.6

(×0.6, ×0.6)



□ − □ = 73

Lesson Flow

1 Comparison by division.

T Introduce the Main Task. (Refer to the BP).
TS Read and understand the situation.
S 1 Observe the height of each cassava and make comparison between the heights.
T 1 By how many times is the length of Ⓐ compared to Ⓑ?
S Use the table and the graph by comparison, 50÷25=2. So height of Ⓑ is 2 times than the height of Ⓐ.

2 Comparison by continuous division in vertical form.

T 2 By how many times is the height of Ⓒ to Ⓐ ?
TN When Ⓒ is measured with Ⓐ, there is a remainder so we need to express the remainder as a decimal number by dividing the height between 1 and 2 into 10 equal parts.
S Use the table to find the mathematical expression. 40÷25
S Solve the mathematical expression.
40÷25=1.6. So height of Ⓒ is 1.6 times the height of Ⓐ.
T 3 By how many times is the height Ⓓ to Ⓐ?
TN Since Ⓓ is shorter than Ⓐ, this multiple will be a number that is less than 1.
S Use the table to find the mathematical expression.
20÷25
S Solve the mathematical expression.
20÷25=0.8 So height of Ⓓ is shorter than Ⓐ by 0.8 times.

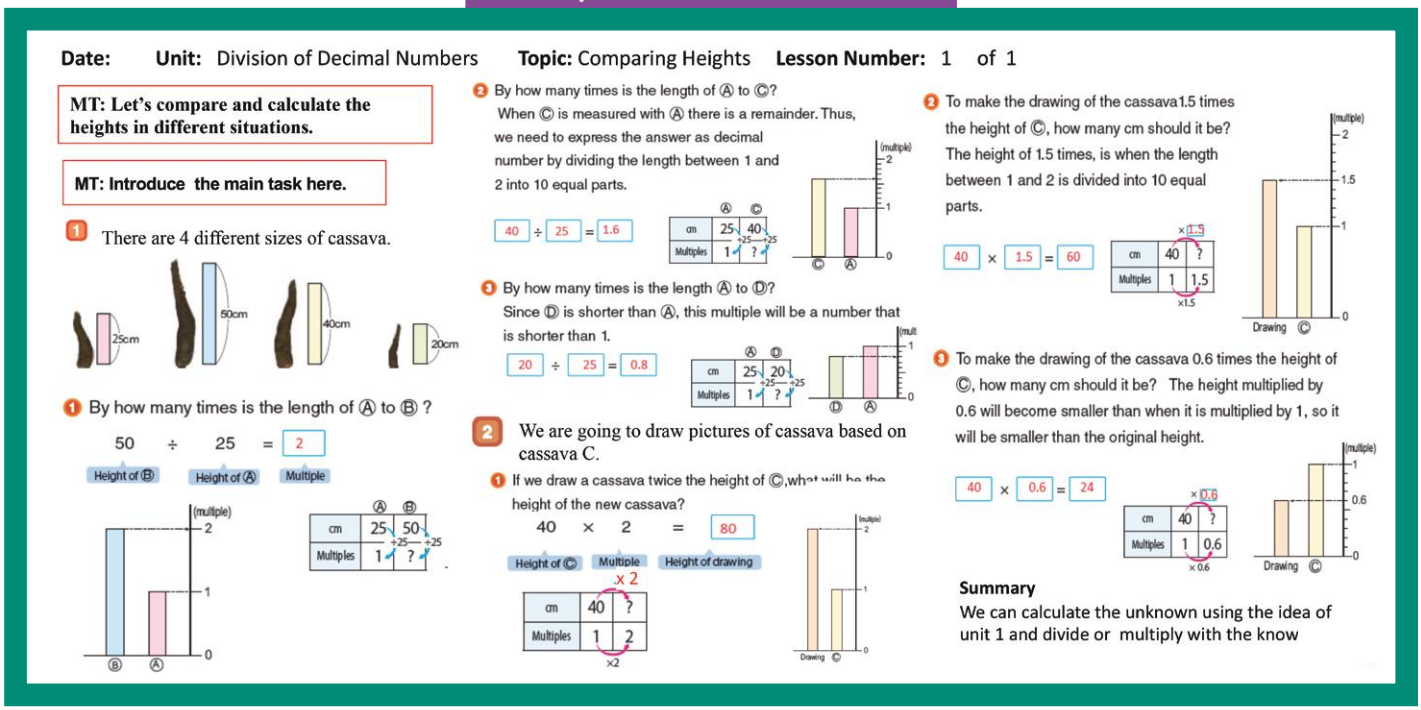
3 Drawing pictures of cassava based on cassava Ⓒ.

T 1 If we draw a cassava twice the height of Ⓒ, what will be the height of the new cassava?
S 40×2=80
Answer: 80 cm.
T 2 To make the drawing of cassava 1.5 times the height of Ⓒ, how many cm should it be?
TN The height of 1.5 times is when the height between 1 and 2 is divided into 10 equal parts.
S 40×1.5=60
Answer: 60 cm.
T 3 To make the drawing of cassava 0.6 times the height of Ⓒ, how many cm should it be?
TN The height multiplied by 0.6 will become smaller than when it is multiplied by 1, so it will be smaller than the original height.
S 40×0.6=24
Answer: 24 cm

4 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



End of Chapter Test **Date:**

Chapter 5: Division of Decimal Numbers	Name:	Score / 100

1. Calculate.

[2×10 marks=20 marks]

(1) 72÷0.8

Answer:

(2) 38.5÷0.7

Answer:

2. Calculate and find the quotient in integer and remainder.

[2×10 marks=20 marks]

(1) 6.4÷1.2

Answer:

(2) 10.2÷2.5

Answer:

3. Calculate and find the quotient with 1 decimal place by rounding.

[2×10 marks=20 marks]

(1) 67.3÷9.3

Answer:

(2) 10.8÷3.2

Answer:

4. Which expressions give greater answer than 59? Find all expressions without calculating and the reasons.

[2×10 marks=20 marks]

(a) 59÷1.7

(b) 59÷1.07

(c) 59÷0.9

(d) 59÷0.99

Answer:

Reason:

5. The length of a rope is 37.6 m.
How many ropes of 0.6 m will be cut and how long will remain?

[10 marks for maths expression and 10 marks for answer]

Answer:

Reason:

Chapter 6 Volume

1. Content Standard

5.2.2 Understand the units of volume and develop the formula of volume and measure.

2. Unit Objectives

- To get the interest about volume around us and find their volume.
- To enjoy finding the volume of objects around us for understanding the concept of volume.
  To understand how to find the volume of a rectangular prism and cube and combined shape.
- To understand the meaning of formula for finding the volume of rectangular prism and cube.

3. Teaching Overview

Students already have the concept of some quantities such as length, weight and area.
They also have the foundation of volume in Grade 2 through measuring activities.
They learn volume with universal unit of 1 cm^3 in this unit.

Volume :

Students understand the volume by comparing the sizes of several boxes.
When 1 cm^3 is introduced, they will know that volume can be compared by the numbers of the universal unit.

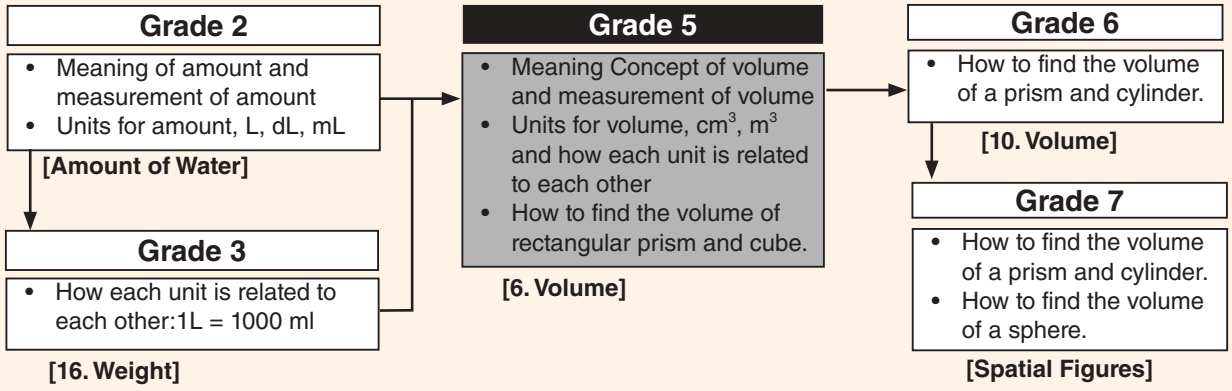
Formula for volumes :

Students should understand why the formula is true and understand the conservation of volume by making boxes of 200 cm^3.

Large Volumes :

Students should be able to explain how large volumes with m^3 are when 1 m^3 is introduced.

4. Related Learning Contents



Unit 6

Unit: Volume
Sub-unit 1: Volume
Lesson 1 of 2

Textbook Page :
074 and 075
Actual Lesson 049

Sub-unit Objectives

- To understand how to compare the 3 dimensional shape.
- To understand the meaning of volume and unit cm^3.

Lesson Objective

- To think about how to compare larger or smaller 3 dimensional shapes.

Prior Knowledge

- Draw nets and make rectangular prisms and cubes on square paper

Preparation

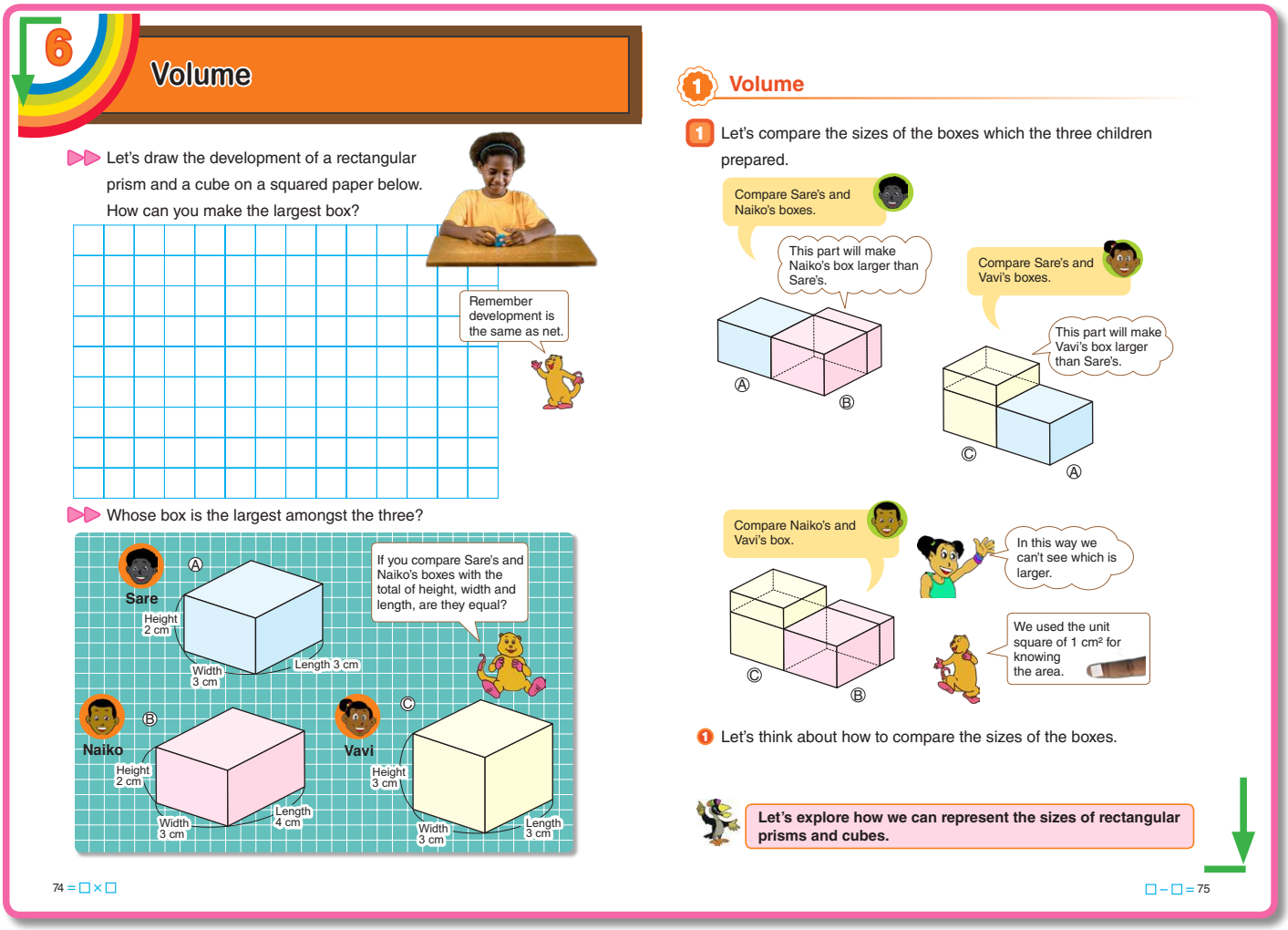
- Square grid paper (see attachement page) to make box, ruler, scissors, glue and sticky tape
- Three boxes Ⓐ, Ⓑ and Ⓒ

Assessment

- Think about ways on how to compare the volume of boxes. F
- Enjoy comparing the size of boxes using direct comparison. F
- Enjoy comparing the volume of boxes. F S

Teacher's Notes

- Direct comparison is comparing two objects through direct observation of size, length, weight, etc...
- Arbitrary units - normally it is using any objects that are around to help get approximate results.



Lesson Flow

1 To make the largest box

T ▶▶ Let's draw the development (net) of a rectangular prism and a cube on a squared paper below. How can you make the largest box?

S Draw the net, cut and fold to make the shape of the three boxes for Sare, Naiko and Vavi using square gird of 9 cm × 14 cm.

TN Prepare three sample boxes prior to the lesson.

T ▶▶ Whose box is the largest amongst the three?

S Respond based on their observation.

T Introduce the Main Task. (Refer to the BP)

2 Compare the sizes of boxes Ⓐ, Ⓑ and Ⓒ

T 1 Let's compare the sizes of the boxes which the three students prepared.

S Compare box Ⓐ and box Ⓑ and discuss which is bigger.

S Compare box Ⓒ and box Ⓐ and discuss which is bigger.

S Compare box Ⓒ and box Ⓑ and discuss which is bigger.

3 Think about ways on how to compare the sizes of boxes Ⓑ and Ⓒ.

T 1 Let's think about how to compare sizes of the boxes.

TN Using direct comparison, students can see that the side length of box Ⓒ is smaller than box Ⓑ. However, we cannot compare easily because we cannot see which is larger. They look almost the same size so how can we easily compare the sizes of the boxes.

S Discuss and share ideas on how to compare box Ⓑ and Ⓒ easily.

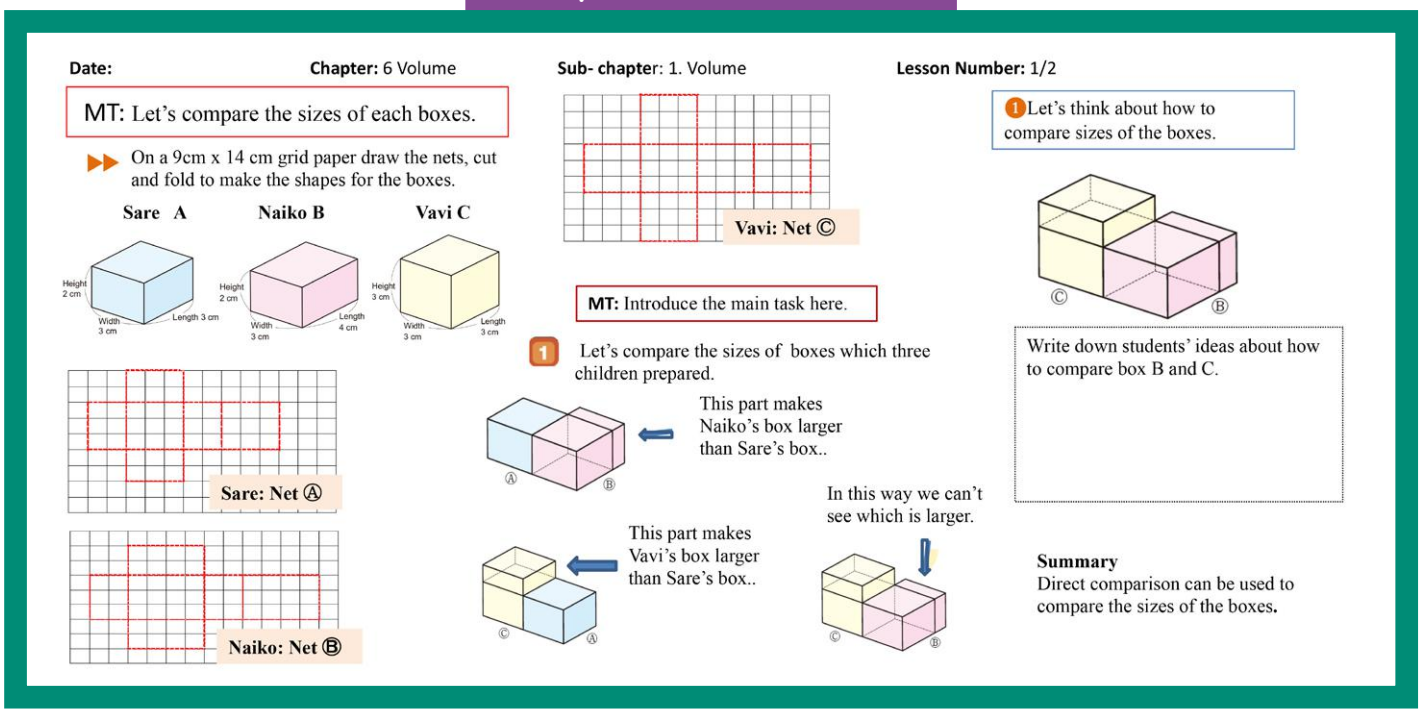
4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 6

Unit: Volume
Sub-unit 1: Volume
Lesson 2 of 2

Textbook Page :
076 and 077
Actual Lesson 050

Lesson Objectives

- To understand the meaning of volume by using 1 cm³ (1 cm cubic block).
- To understand the unit of 1 cm³.

Prior Knowledge

- Draw net and make rectangular prisms and cubes on square paper
- Compare the volume of rectangular prism directly

Preparation

- 1 cm cubic block
- Box Ⓑ and Ⓒ from the previous lesson

Assessment

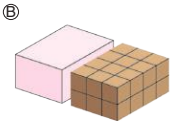
- Compare the volume of prisms using 1 cm³ blocks correctly. F
- Understand the meaning of volume and the unit of 1 cm³. S

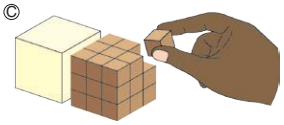
Teacher's Notes

Different solids can be made from 12 cubes of 1 cm cube however, the volume remains the same.

---

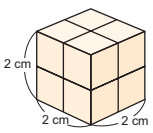
2 We made the same solids by using 1 cm cubic blocks. Let's compare the number of cubes needed to make Naiko and Vavi's boxes.

Ⓑ 

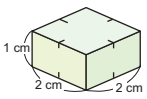
Ⓒ 

Ⓑ needs 24 boxes.
Ⓒ needs 27 boxes.
Ⓑ needs 3 more boxes.

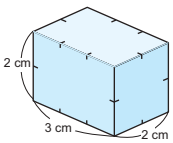
2 How many 1 cm cubes are needed for the following rectangular prism and cube?

1 

8 cubes

2 

4 cubes

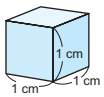
3 

12 cubes

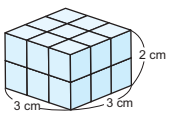
The size of a solid represented by a number of units is called **volume**.

1 cm cube is used as a unit for volume. We represent volume by counting the number of cube units.

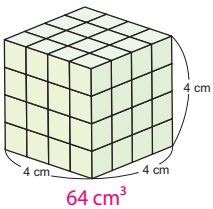
The volume of a cube with 1 cm sides is called **1 cubic centimetre** and is written as 1 cm³.
Cubic centimetre (cm³) is a unit of volume.



3 Let's find the volume of the following rectangular prism and the cube.

1 

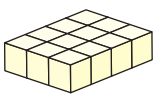
18 cm³

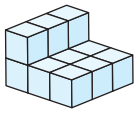
2 

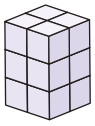
64 cm³

Same Volume

Use 12 cubes of 1 cm³ and make different shapes.

Ⓐ 

Ⓑ 

Ⓒ 

76 = □ × □

□ − □ = 77

Lesson Flow

1 Review the previous lesson.

2 ❷ Using 1 cm³ block to make the same rectangular prism (Ⓑ) and cube (Ⓒ).

T Introduce the Main Task. (Refer to the BP)

T Using direct comparison we still could not compare box Ⓑ and box Ⓒ easily. We need arbitrary unit in order to compare. The arbitrary unit to make comparison easier is 1 cm³ block.

S Compare box Ⓑ and Ⓒ using 1 cm³ blocks and find the number of 1 cm³ blocks needed for each box and fill in the box ☐.

3 ❷ Understand the meaning of volume.

T Ask the students to read the task and observe the solid shapes ❶, ❷ and ❸.

S Observe the solid shapes ❶, ❷ and ❸ to find how many 1 cm³ blocks are needed for the solid shapes respectively.

S ❶ 8 of 1 cm cubic blocks ❷ 4 of 1 cm³ blocks and ❸ 12 of 1 cm³ blocks.

4 Important Point

T/S Explain the important point in the box ⋯⋯.

5 Find the volume of rectangular prism and cube by using 1 cm³.

S ❸ Read the task and count the number of 1 cubic centimetre as a unit for volume that makes the rectangular prism and cube in ❶ and ❷.

S ❶ 18 cm³ and ❷ 64 cm³.

T Confirm each volume for ❶ and ❷ by showing the number of 1 cm³ that each shape has.

6 Using 12 cubes, make various solids with same volume.

TN Different shapes can be made from 12 cubes of 1 cm³ however the volume remains the same.

T Ask students to make any solids using 12 cubes of 1 cm³.
Shapes Ⓐ, Ⓑ and Ⓒ are examples.

S Make various shapes.

T What happens to the volume when the shape is changed?

S Identify that the volume remains the same even though the shape changes.

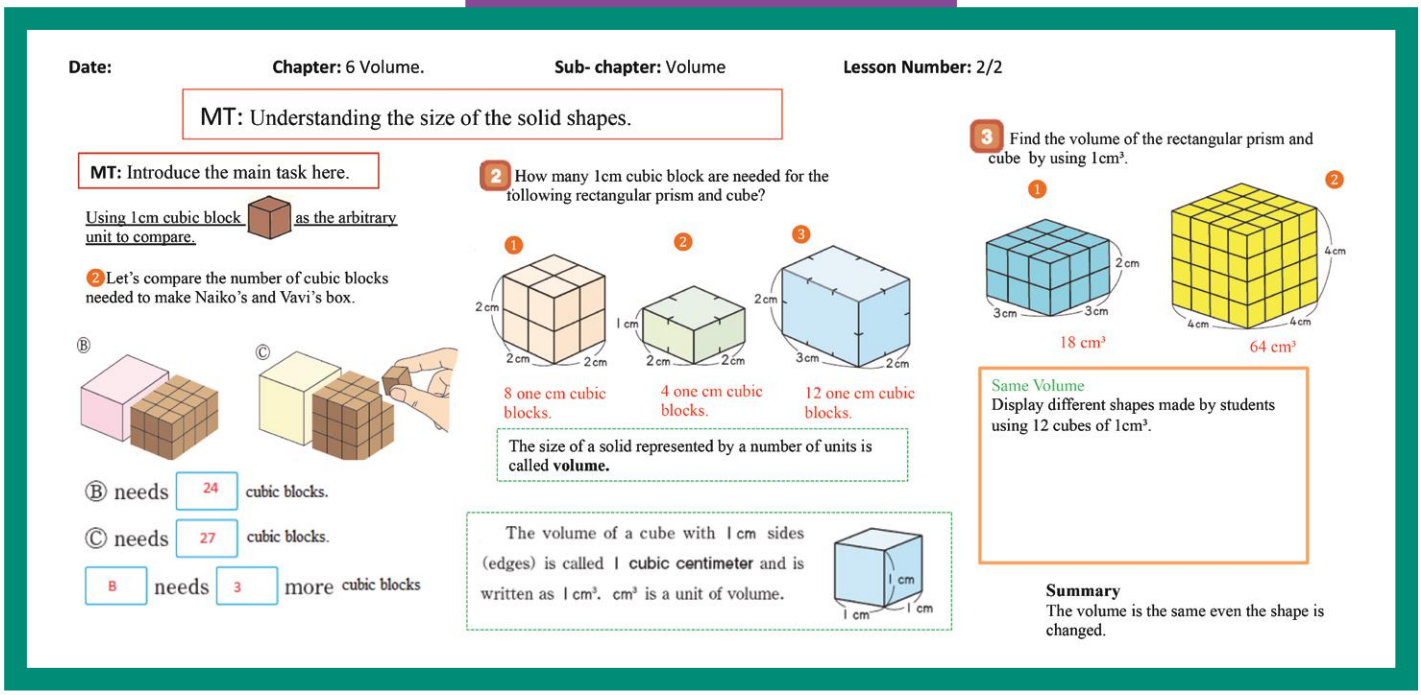
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 6

Unit: Volume
Sub-unit 2: Formula for Volumes
Lesson 1 of 2

Textbook Page :
078 and 079
Actual Lesson 051

Sub-unit Objectives

- To understand the formula for finding the volume of rectangular prisms and cubes.
- To understand that there are various shapes which have the same volume.

Lesson Objective

- To understand the formula for finding the volume of rectangular prisms.

Prior Knowledge

- How to show the volume
- Unit of volume

Preparation

- Chart diagram for 1 and 2

Assessment

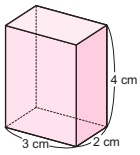
- Think about how to find the volume of rectangular prism. F
- Understand the formula for calculating the volume of a rectangular prism. S

Teacher's Notes

In order for the students to understand the formula to calculate the volume of rectangular prisms, firstly, use the diagram to explain using the cubes.
Later they will realise the formula in the important point.

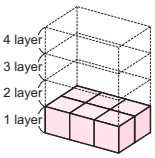
2 Formula for Volumes

1 Let's think about how to find the volume of the rectangular prism on the right.



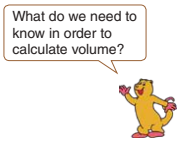
1 How many 1 cm³ cubes are on the bottom layer?
2×3=6 Answer: 6 1cm cubes

2 How many layers are there?
4 layers



3 How many 1 cm³ cubes are there and what is its volume?

3 × 2 × 4 = 24
Number of length | Number of width | Number of height | Total number



The number of cubes used in length is equal to length, the number of cubes used in width is equal to width and the number of cubes used in height is equal to height respectively.

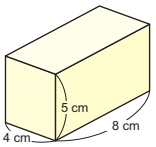
3 × 2 × 4 = 24 (cm³)
Length | Width | Height | Volume

78 = □×□

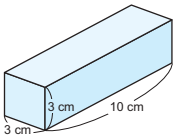
The volume of a rectangular prism is expressed in the following formula using length, width and height.

Volume of rectangular prism = length × width × height

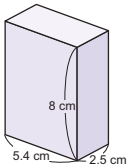
2 Let's find the volume of the following prisms below.

1


8×4×5=160
Answer: 160 cm³

2


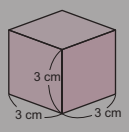
10×3×3=90
Answer: 90 cm³

3


2.5×5.4×8=108
Answer: 108 cm³

3 Let's find the volume of this cube.

1 How many 1 cm³ cubes are there in this cube?
2 What is the volume?



Since the size of length, width and height of cube are equal, its formula is the following:

Volume of cube = side × side × side

□−□=79

Lesson Flow

1 Review the previous lesson.

2 ① Think about how to find the volume of rectangular prism.

T Introduce the Main Task. (Refer to the Blackboard Plan)
S Read the task, observe the rectangular prism and think about how to find its volume.
T In our previous lesson we found how many 1 cm³ as a unit of volume that made up a rectangular prism or cube by counting the number of 1 cm³.
T Let's observe the rectangular prism and find how many 1 cm³ are on the bottom layer?
S ① By observing the bottom or 1st layer of the triangular prism. 3×2=6.
Answer: 6 of one cubic centimetre cubes.
S ② By observing the triangular prism and identify that there are 4 layers.
T To answer ③ and find the volume what do we need to know in order to calculate the volume?
S We need to know the number of length×number of width×number of layers that is the height=total number. 3×2×4=24.
S Read and understand "the number of cubes used in length is equal to the length, the number of cubes used in width is equal to width and the number of cubes used in height is equal to height respectively. 3 (length)×2 (width)×4 (height)=24 cm³ (volume)".

3 Important Point

T/S Explain the important point in the box .

4 ② Apply the formula to find the volume.

S Calculate ①, ② and ③ by applying the formula for volume.
T Confirm students' answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

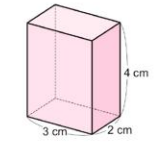
Date: **Chapter:** 6 Volume. **Sub- chapter:** 2. Formula for Volume. **Lesson Number:** 1/2

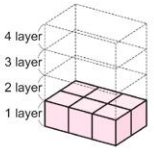
MT: Let's find the volume of a rectangular prism.

MT: Introduce the main task here.

② Formula for Volumes

① Let's think about how to find the volume of this rectangular prism.





① How many 1cm cubes are on the bottom layer?
2 x 3 = 6 Answer: 6 1cm cubes.

② How many layers are there? Answer: 4 layers.

③ How many 1cm³ cubes are there? What is the volume?

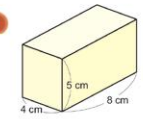
3 × 2 × 4 = 24
Number of length | Number of width | Number of height | Total number

3 × 2 × 4 = 24 (cm³)
Length | Width | Height | Volume

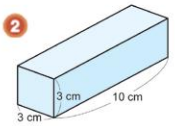
The volume of rectangular prism is expressed in the following formula, using length, width and height.

Volume of rectangular prism = length x width x height.

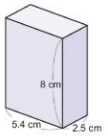
② Let's find the volume of the prisms by using the formula.

① 

V= Length x width x height
= 8 x 4 x 5
= 160 Answer: 160 cm³

② 

V= Length x width x height
= 10 x 3 x 3
= 90 Answer: 90 cm³

③ 

V= Length x width x height
= 5.4 x 2.5 x 8
= 108 Answer: 108 cm³

Summary
The volume of a rectangular prism can be calculated using this formula:
Volume of rectangular prism = length x width x height

Unit 6

Unit: Volume
Sub-unit 2: Formula for Volumes
Lesson 2 of 2

Textbook Page : 079 and 080
Actual Lesson 052

Lesson Objective

- To understand the formula for finding the volume of a cube.

Prior Knowledge

- Formula for finding the volume of rectangular prism

Preparation

- Diagrams for 3, Exercise and 4
- Square papers, scissors, sticky tape , glue and rulers

Assessment

- Think about how to find the formula for finding the volume of a cubes. F
- Find the volume of rectangular prism and cube using the formula. S
- Solve the exercises correctly. S

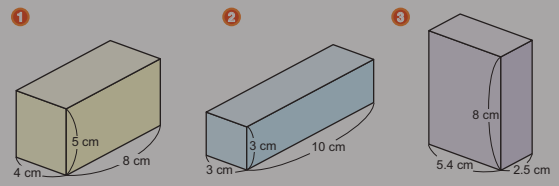
Teacher's Notes

Use arbitratry unit (1 cm³) to find the volume of the cube in 3.
Later the students can use the formula given in the important point.

The volume of a rectangular prism is expressed in the following formula using length, width and height.

Volume of rectangular prism = length × width × height

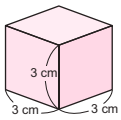
2 Let's find the volume of the following prisms below.



3 Let's find the volume of this cube.

1 How many 1 cm³ cubes are there in this cube? 3×3×3=27
Answer: 27 1cm cubes

2 What is the volume?
Volume is 27 cm³



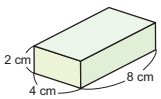
Since the size of length, width and height of cube are equal, its formula is the following:

Volume of cube = side × side × side

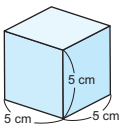
□ − □ = 79

Exercise

1 Let's find the volumes of the rectangular prism and the cube below.



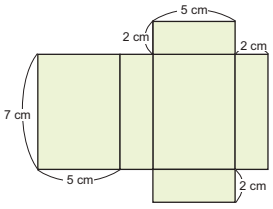
8×4×2=64
Answer: 64 cm³



5×5×5=125
Answer: 125 cm³

2 Let's find the volumes of rectangular prisms and cubes from your surroundings.

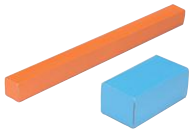
4 Fold the development below and find the volume.

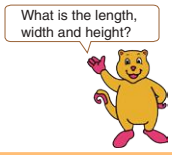


7×5×2=70
Answer: 70 cm³

Let's Make a Box of 200 cm³

Make several boxes which have a volume of 200 cm³.





80 = □ × □

Lesson Flow

1 Review the previous lesson.

2 3 Finding the volume of a cube

T Introduce the Main Task. (Refer to the BP)

T ① How many 1 cm³ are there in the cube given?

S 3×3×3=27.
There are 27 of 1 cm cubes.

T ② What is the volume?

S Volume is 27 cm³.

3 Important Point

T/S Explain the important point in the box ( ).

4 Complete the Exercise

T Guide students on how to find the volume of rectangular prism.

S Explain ① and ② by applying the previous knowledge.
(Formula for finding rectangular prism and cube)

T Get the students to find the volumes of rectangular prisms and cubes from their surroundings.

S Find the volume of rectangular prisms and cubes from the surroundings.

5 Apply the formula for finding the volume.

T 4 Ask the students to fold the development of the net given and find the volume.

TN The position and the measurements can be switched however the volume remains the same.

S Fold the development and switch the position and measurements.
Find the length, the width and the height to calculate the volume. The volume will be 70 cm³.

6 Let's make a box of 200 cm³.

S Find the length, width and height to make the box of 200 cm³.

S Share their ideas on net development and display their boxes.

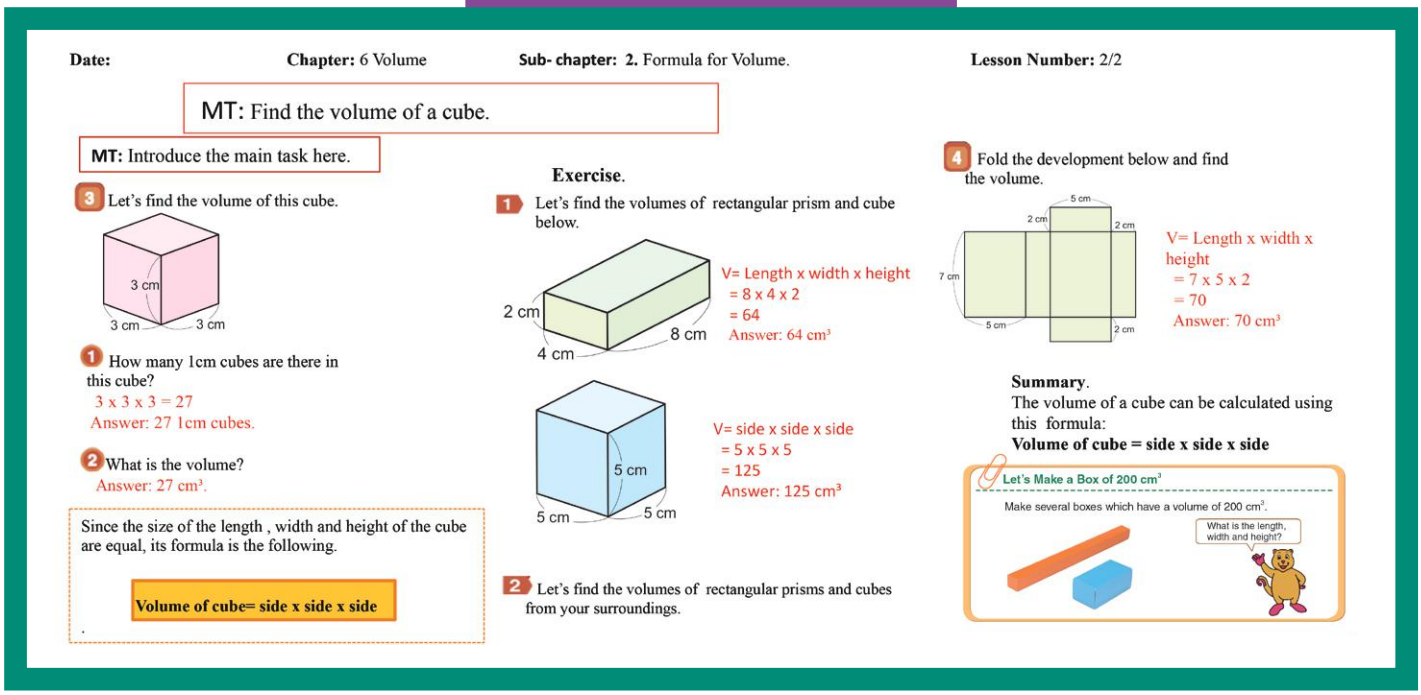
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 6

Unit: Volume
Sub-unit 3: Large Volumes
Lesson 1 of 5

Textbook Page : 081
Actual Lesson 053

Sub-unit Objectives

- To understand the relationship between cm^3 and m^3.
- To understand the relationship between capacity and volume.
- To understand how to find the volume and capacity of combined shapes.

Lesson Objectives

- To understand the unit m^3.
- To understand the relationship between cubic centimetre and metre.
- To get the sense of large volume.

Prior Knowledge

- Drawing nets of rectangular prisms and cubes in cm
- Unit of volume
- Formula for finding volume of rectangular prism and cube

Preparation

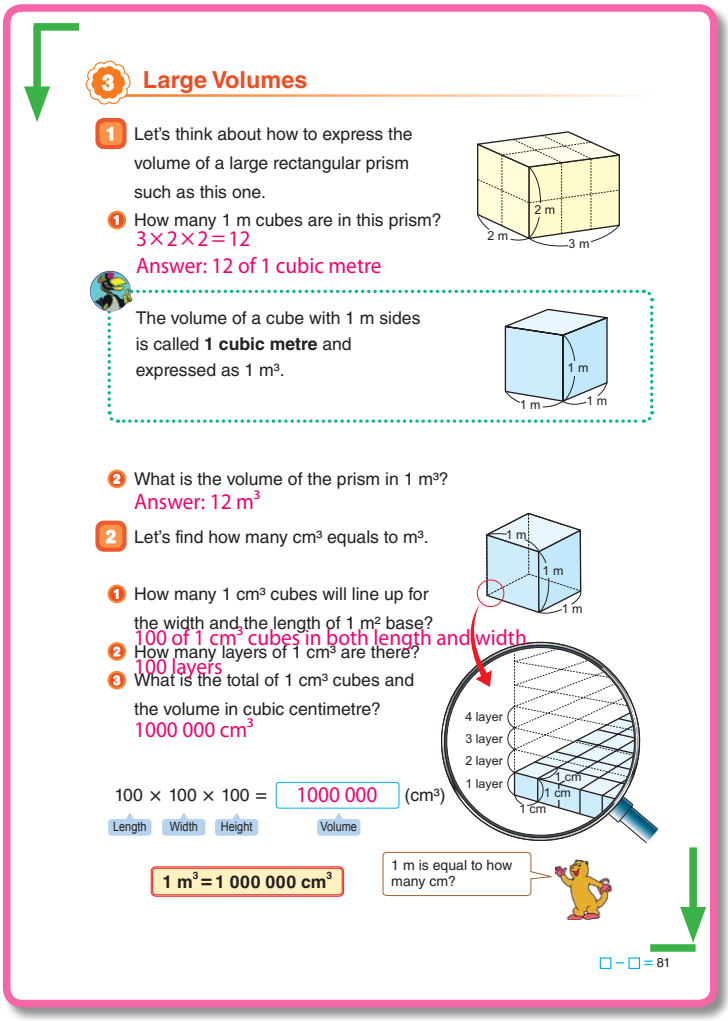
- Diagrams for 1 and 2
- Chart for the Important point

Assessment

- Think about the relationship between 1 m^3 and 1 cm^3. F
- Understand 1 m^3 as a unit of volume. S
- Find the volume of shapes. S

Teacher's Notes

Use the conversion of 1 m = 100 cm to help students to identify the length, width and height in cm.



Lesson Flow

1 Review the previous lesson.

2 ❶ Think about how to express the volume of a large rectangular prism.

TN The volume can be expressed using the formula for rectangular prism focused on the larger volume from cubic centimetre (smaller volume) to cubic metre (larger volume).

S Read the task and observe the large rectangular prism and think about how to express its volume.

S Write the answer for ❶. 3×2×2=12.
Answer: 12 of 1 m³.

3 Important Point

T/S Explain the important point in the box ⬚.

4 ❷ Finding the volume of prism in m³.

S The volume of the prism in m³ is 12 m³.

T Introduce the Main Task. (Refer to the BP)

5 ❷ Find how many cubic centimetres is equal to 1 cubic metre.

T Ask the students to observe the magnified diagram representation and think about how many cubic centimetres will make up 1 cubic metre.

TN Assist the students to understand that cubic centimetre is smaller volume that will make the larger volume cubic metre.

S Observe the magnified diagram representation and discuss to make sense of larger volume.

S Observe the magnified diagram representation and answer ❶ as 100 of 1 cm³.

TN For ❶ explain the relationship 1 m = 100 cm therefore for the length and width the measurement is 1 m respectively then it is 100 cm for the length and 100 cm for the width.

S Answer ❷ as 100 layers.

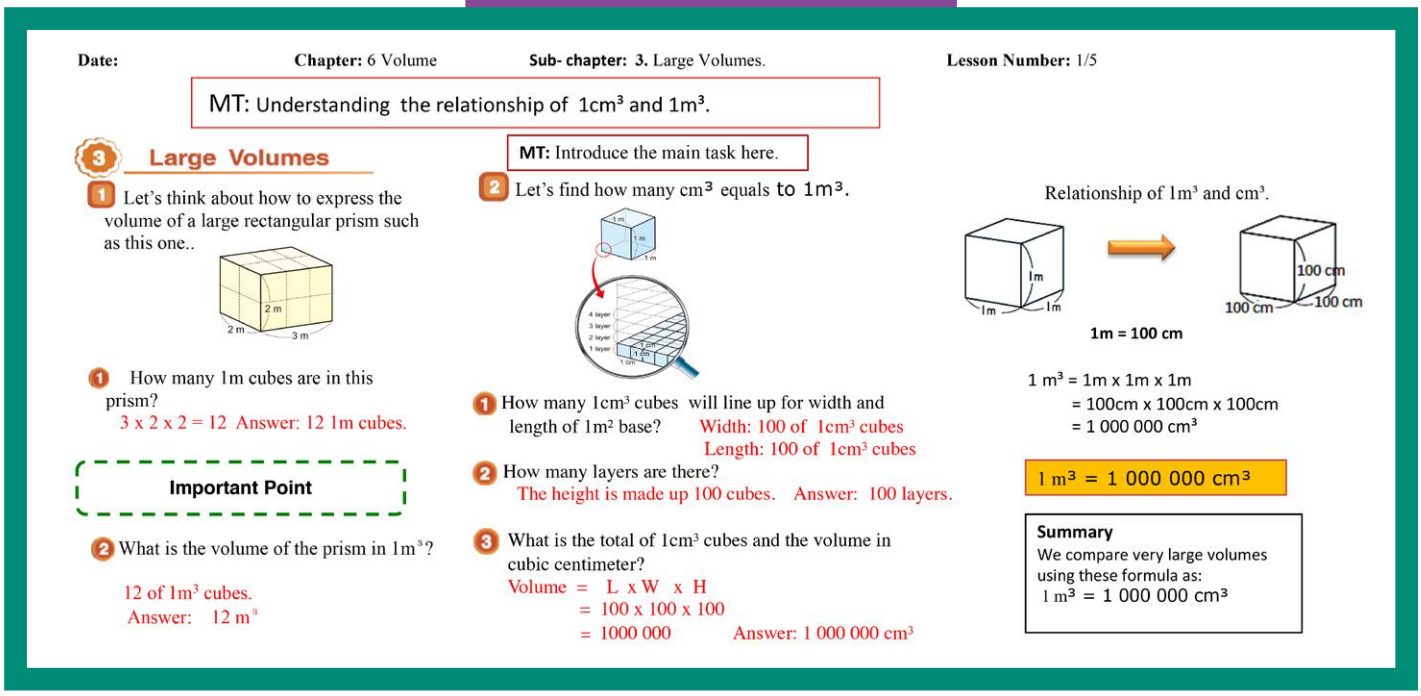
S Write the answer to ❸ by applying the formula for volume to calculate and fill in the box ⬚.

6 Summary

T Explain the relationship of 1 m³ and cm3 as prepared in the blackboard plan.

S Understand 1 m³ = 1 000 000 cm³ and realise that 1 cubic metre is very large compared to 1 cm³.
They feel the sense of larger volume.

Sample Blackboard Plan



Unit 6

Unit: Volume
Sub-unit 3: Large Volumes
Lesson 2 of 5

Textbook Page : 082
Actual Lesson 054

Lesson Objective

- Find the volume of prism of which the sides are expressed in both metres (m) and centimetres (cm).

Prior Knowledge

- Unit of m^3
- Relationship between cubic metre and cubic centimetre

Preparation

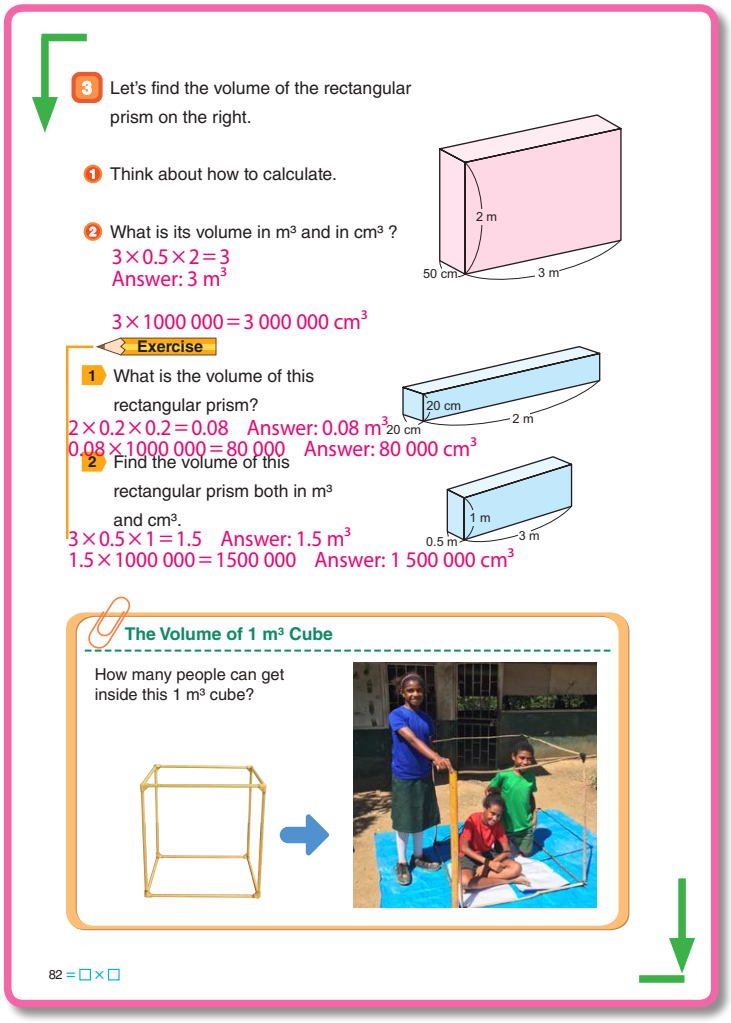
- Diagrams for 3 and Exercise

Assessment

- Think about how to find the volume of prisms with sides expressed in both metres (m) and centimetres (cm). F
- Solve the exercises correctly. S

Teacher's Notes

In task 3, remember to do conversion for all given measurements to a common unit before calculating.



3 Let's find the volume of the rectangular prism on the right.

1 Think about how to calculate.

2 What is its volume in m^3 and in cm^3 ?

$3 \times 0.5 \times 2 = 3$
Answer: 3 m^3

$3 \times 1000\,000 = 3\,000\,000$ cm^3

Exercise

1 What is the volume of this rectangular prism?

$2 \times 0.2 \times 0.2 = 0.08$ Answer: 0.08 m^3
$0.08 \times 1000\,000 = 80\,000$ Answer: 80 000 cm^3

2 Find the volume of this rectangular prism both in m^3 and cm^3.

$3 \times 0.5 \times 1 = 1.5$ Answer: 1.5 m^3
$1.5 \times 1000\,000 = 1500\,000$ Answer: 1 500 000 cm^3

The Volume of 1 m^3 Cube

How many people can get inside this 1 m^3 cube?

Lesson Flow

1 Review the previous lesson.

2 3 Find the volume of a rectangular prism of which sides are expressed in metre and centimetre.

T Introduce the Main Task. (Refer to the BP)
T ① Unit of length and width are different. How can we find the volume?
S Recognise that they cannot multiply directly because of the different units of sides of the prism.
S Change m to cm or vice versa to use the same unit for length, width and height.
T How many metres is 50 cm?
S Convert 50 cm to 0.5 m by dividing 50 by 100.
T ② What is its volume in m^3 and cm^3?
S Convert 2 metres and 3 metres to centimetres so that 2 m is equal to 200 cm and 3 m is equal to 300 cm.
S Calculate: $300 \times 50 \times 200 = 3\,000\,000\ cm^3$
S Convert 50 cm to metres so that 50 cm is 0.5 m and calculate $0.5 \times 3 \times 2$
Answer: $3\ m^3$
TN Students can also convert 3 000 000 cm to $3\ m^3$ by dividing with 1 000 000 to get $3\ m^3$.

3 Complete the Exercise.

S ① Calculate the volume of the rectangular prism by using either m^3 or cm^3.
S ② Calculate the volume of the rectangular prism using both cm^3 and m^3.
T Confirm students' answers.

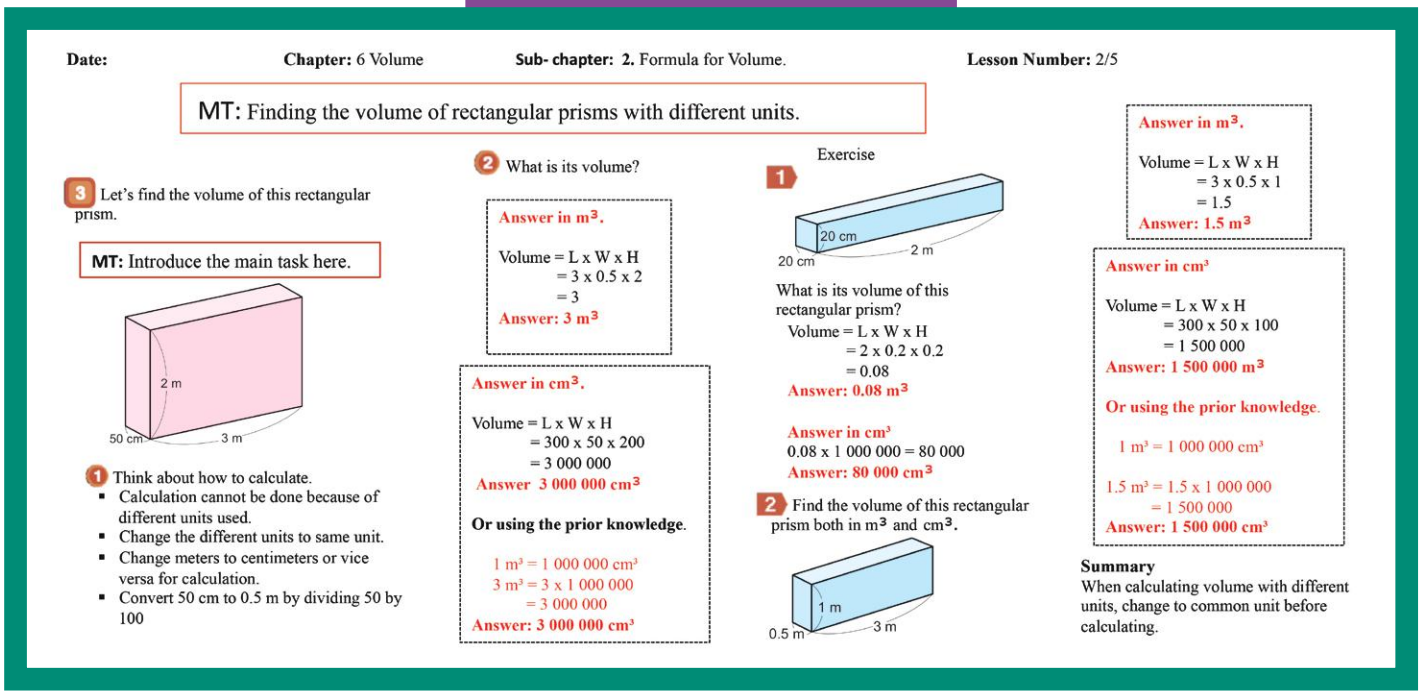
4 The sense of volume of one cubic metre ($1m^3$).

T How many people can get inside this 1 m^3 cube?
TN This activity improves students sense of the smaller volume compared to the larger volume.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 6

Unit: Volume
Sub-unit 3: Large Volumes
Lesson 3 of 5

Textbook Page : 083
Actual Lesson 055

Lesson Objective

- To understand the relationship of centimetres (cm^3), cubic metres (m^3), millilitres (mL) and litres (L).

Prior Knowledge

- Unit of centimetres (cm^3) and cubic metres (m^3)
- How to find the volume which has different units of measurement

Preparation

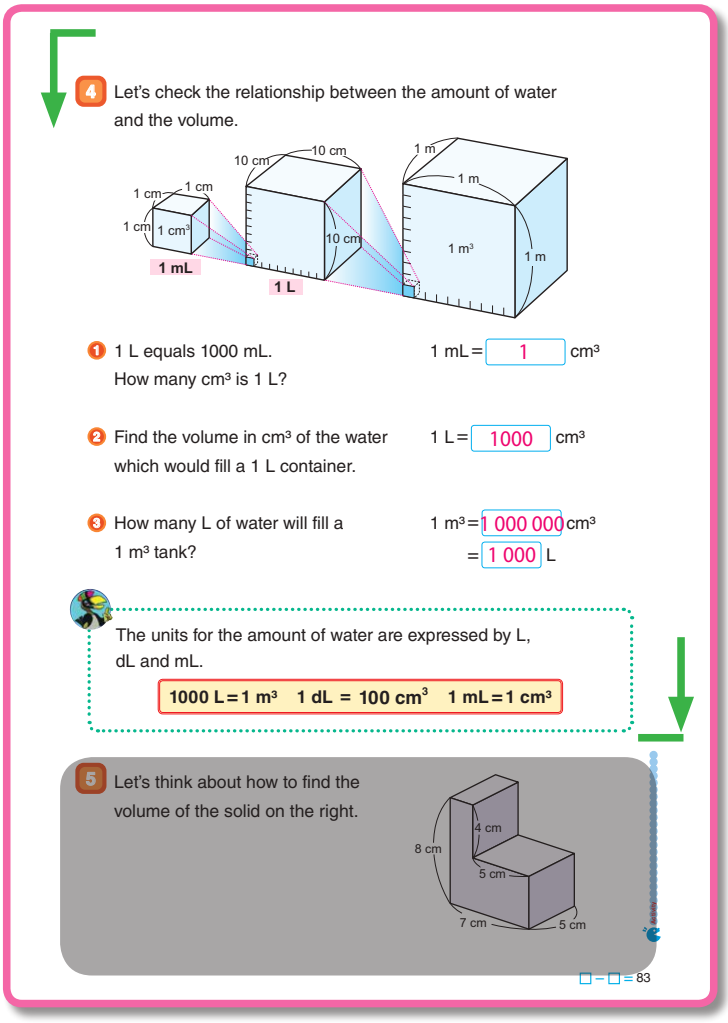
- Diagram for 4

Assessment

- Enjoy finding the relationship between the amount of water and the volume. F S

Teacher's Notes

Be careful in explaining the diagrams in task 4 because the colour of the small box must be clearly identified.
Make sure that the magnified box is clearly identified and explained well to help students visualise the relationship from a smaller unit of volume to a larger unit of a volume.



Lesson Flow

1 Review the previous lesson.

2 4 1 Understand the relationship of mL, L, cm³ and m³.

T Introduce the Main Task. (Refer to the Blackboard Plan)

S Read the task and observe the diagram in order to make meaning of the relationship between the amount of water and the volume.

T Explain the relationship of mL, L, cm³ and m³ as in the blackboard plan.

S Understand and make meaning of the relationship of mL, L, cm³ and m³ explained by the teacher.

TN For 1, 2 and 3, ask students to make reference to the relationship of mL, L, cm³ and m³ to confirm their answers.

T 1 Refer to the explanation of the relationship of mL, L, cm³ and m³ and think about how many cm³ is equal to 1 mL.

S Write the answer to 1 by filling in the box ☐. (1)

3 Understand the relationship between the 1 Litre (L) and cubic centimetres (cm³)

S Write the answer to 2 by filling in the box ☐. (1 000)

4 Understand the relationship between the Litre (L) and 1 cubic metre (1 m³).

S Write the answer to 3 by filling in the box ☐. (1 000 000), (1 000)

5 Important Point

T/S Explain the important point in the box ☐.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

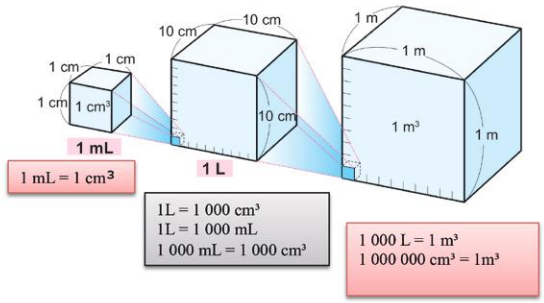
Date: **Chapter:** 6 Volume **Sub- chapter:** 2. Formula for Volume. **Lesson Number:** 3/5

MT: Understanding the relationship between mL, L, cm³ and m³.

4 Let's check the relationship between the amount of water and the volume.

MT: Introduce the main task here.

Relationship between mL, L, cm³ and m³.



1 1 L equals 1 000 mL. How many cm³ is 1 mL?

1 mL = 1 cm³

2 Find the volume, in cm³, of water which would fill 1L container.

1 L = 1 000 cm³

3 How many L of water will fill 1m³ tank?

1 m³ = 1 000 000 cm³

= 1 000 L

The units for the amount of water are expressed by L, dL and mL.

1 000 L = 1 m³ **1 mL = 1 cm³**

Summary

We can see the relationship between mL, L, cm³ and m³.

1 ml = 1 cm³

1 L = 1 000 cm³

1 m³ = 1 000 000 cm³ or 1 000 L

Unit 6

Unit: Volume
Sub-unit 3: Large Volumes
Lesson 4 of 5

Textbook Page :
083 and 084
Actual Lesson 056

Lesson Objective

- To think about how to find the volume of combined solid shapes.

Prior Knowledge

- How to find the volume (Formula for finding volume)

Preparation

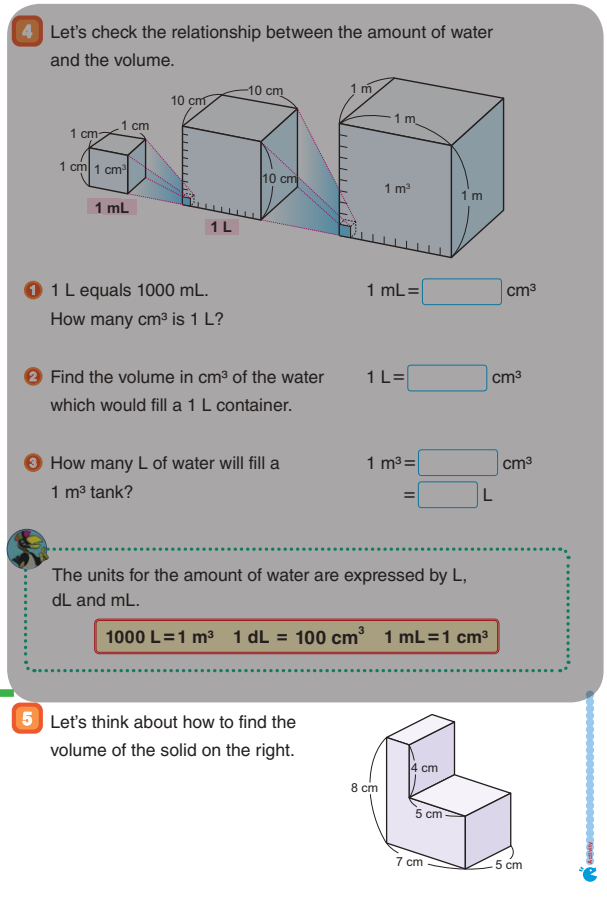
- Diagrams for 5 and 6
- Chart of student ideas and exercises

Assessment

- Think about how to find the volume of combined solid shapes. S
- Find the volume of combined solid shapes. F

Teacher's Notes

Guide students to solve task 5 by themselves because that is where they will think of ways on how to find the volume of combined solid shapes.



4 Let's check the relationship between the amount of water and the volume.

1 mL 1 L

1 1 L equals 1000 mL. How many cm³ is 1 L? 1 mL = ☐ cm³

2 Find the volume in cm³ of the water which would fill a 1 L container. 1 L = ☐ cm³

3 How many L of water will fill a 1 m³ tank? 1 m³ = ☐ cm³ = ☐ L

The units for the amount of water are expressed by L, dL and mL.

1000 L = 1 m³ 1 dL = 100 cm³ 1 mL = 1 cm³

5 Let's think about how to find the volume of the solid on the right.

8 cm 4 cm 5 cm 7 cm 5 cm

□ − □ = 83

Gawi's Idea

5 cm 2 cm 8 cm 5 cm 5 cm 4 cm

$5 \times 2 \times 8 + 5 \times 5 \times 4 = 180$ cm³

Ambai's Idea

5 cm 8 cm 5 cm 8 cm 7 cm 2 cm

$5 \times (7 + 2) \times 8 \div 2 = 180$ cm³

1 Write down expressions and answers by using their ideas.

2 Discuss with your friends about other ideas.

Exercise

Let's find the volume of these solids below.

① 10 cm 10 cm 20 cm 40 cm 30 cm 30 cm 30 cm

② 3 cm 3 cm 4 cm 3 cm 10 cm 4 cm

$4 \times 10 \times 4 - 3 \times 3 \times 3 = 133$
Answer: 133 cm³

$30 \times 10 \times 30 + 30 \times 10 \times 20 + 30 \times 10 \times 40 = 27\,000$cm³

6 We made an elephant by using a cubic and rectangular prism clay below. Find the volume of the elephant.

5 cm 2 cm 2 cm 6 cm 6 cm 6 cm

$2 \times 2 \times 5 + 6 \times 6 \times 6 = 236$ Answe: 236 cm³

84 = □ × □

Lesson Flow

1 Review the previous lesson.

2 5 Thinking about how to find the volume of a combined shape.

T Introduce the Main Task. (Refer to the BP)

T Ask the students to observe the combined solid shape and think about how to calculate its volume.

S Observe the combined solid shape and think about how to calculate its volume.

TN Give time for discussion and allow students to express their ideas.
Write their ideas on the blackboard.

3 Understanding Mero's and Ambai's Ideas

T Explain the two ideas.
Mero's Idea:
The combined solid shape is divided into 2 solid shapes to calculate their areas separately.
Then add up the two areas to find the total area.
Ambai's Idea:
The shape is combined with the other same half of the shape to make a complete rectangular prism then the area is calculated and divided by 2 to get the final area.

4 1 Write down expressions and answers using the two ideas.

S Use explanations done by the teacher on the two ideas and write the expressions and find the volume of the combined solid shape.

S 2 Discuss with friends about other ideas and present to the class.

T Confirm students' ideas presented.

5 Complete the Exercise

S Calculate the volume of the solid shapes in ① and ②.

T Confirm students' answers.

6 6 Calculate the volume of an elephant.

S Observe the diagram and calculate the volume of the elephant by finding the area of the two solid figure when combined.

TN When the two solids figures are combined they make up the volume of the elephant (solid A + solid B = the volume of the elephant.).
Even the shape changes the volume remains the same.

7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

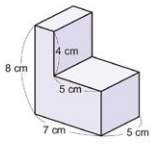
Sample Blackboard Plan

Date: **Chapter:** 6 Volume **Sub- chapter:** **2.** Formula for Volume. **Lesson Number:** 4/5

MT: How to find the volume of a combined shapes.

5 Let's think about how to find the volume of such a solid shape.

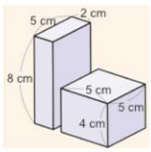
MT: Introduce the main task here.



Students' Ideas.

1 & 2
Write down expressions and answers by using their ideas.

GAWI'S IDEA.

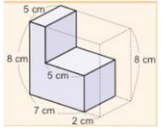


- The combined shape is divided into 2 shapes.
- Calculate its area separately and finally add up the total area for each shape.

= (5 x 2 x 8) + (5 x 5 x 4)
= 80 + 100
= 180 Answer: 180 cm³

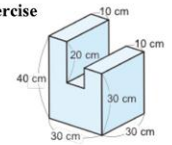
AMBAI'S IDEA.

- The shape is combined with the other same half of the shape to make a complete rectangular prism, the area is then calculated and divided by 2 to get the final area.

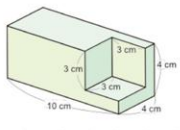


= 9 x 8 x 5 ÷ 2
= 360 ÷ 2
= 180
Answer: 180 cm³

Exercise

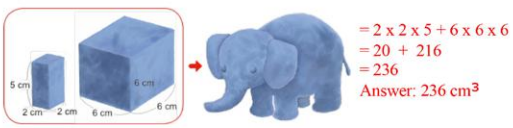
① 

= 30 x 10 x 30 + 30 x 10 x 20 + 30 x 10 x 40
= 27 000
Answer: 27 000 cm³

② 

= 4 x 10 x 4 - 3 x 3 x 3
= 160 - 27
= 133
Answer: 133 cm³

6 Find the volume of the elephant.



= 2 x 2 x 5 + 6 x 6 x 6
= 20 + 216
= 236
Answer: 236 cm³

Summary
When calculating a combined shape:
1. Calculate its areas separately and finally add up the total area for each shape.
2. Even the combined solid changes, the volume remains the same.

Unit 6

Unit: Volume
Sub-unit 3: Large Volumes
Lesson 5 of 5

Textbook Page : 085
Actual Lesson 057

Lesson Objective

- To understand how the volume of uneven shapes or irregular shapes such as rocks can be calculated by putting the objects in water.

Prior Knowledge

- To think about how to find the volume of combined solid shapes

Preparation

- Rocks or stones, yam, sweet potato, water, ruler and 1 transparent container

Assessment

- Investigate the volume of uneven or irregular shapes using containers to measure the volume easily. F
- Think about how to find the volume of uneven or irregular shapes using containers. S

Teacher's Notes

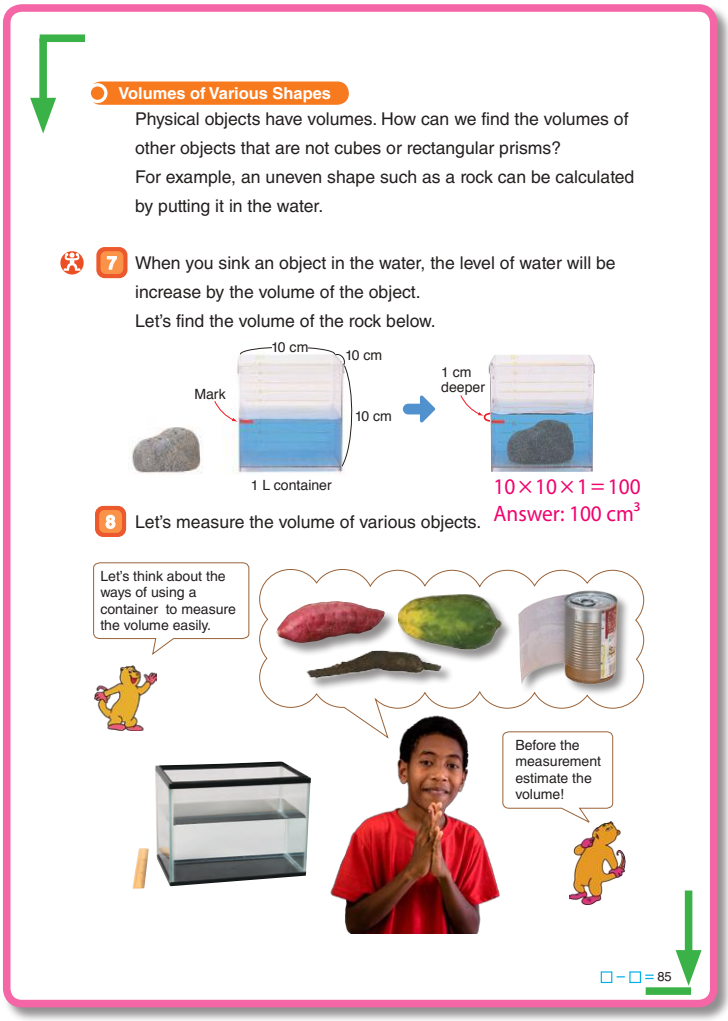
1. How to find the volume of objects using 1 L container.

If the teacher is able to prepare 1 L container (10 cm × 10 cm × 10 cm), ensure the container is placed on an even surface.
Students will put a mark on water level on the container before placing the object into the container.
Then Students put objective into container and put a mark on the new water level.
Students find the difference of water level (cm) and calculate the volume of object.

2. How to find the volume of objects using any large or small fixed containers.

Step 1: Measure the surface area of the container
Step 2: Measure the initial depth of the water in the container
Step 3: Place the object into the container
Step 4: Measure the final depth of the in the container with the object placed inside
Step 5: Find the depth difference (final depth − initial depth) and calculate the volume of the object

To calculate the volume of the object:
Volume of objec = surface area × depth difference (final depth − initial depth)



Lesson Flow

1 Review the previous lesson.

2 7 Think about how to find the volume of shapes that are not cubes or rectangular prisms.

T Introduce the Main Task. (Refer to the Blackboard Plan)

T Without opening the textbook show a rock or stone to the students and ask them on how to find its volume.

S Discuss and share ideas on how they can measure the volume of the stone or rock.

S Turn to page 85 of the textbook and read the paragraph on Volumes of Various Shapes.

S Estimate the volume of the rock before submerging it into the water.

T Explain the task and how to find the volume of the rock when submerged in the water.

1. Take note of the water level before submerging the object into the water and record it.
2. Put the stone in the water and observe carefully.
3. Measure the water level after the stone was put in the water and record it.
4. Do subtraction: Water Level After − Water Level Before = Increased Depth (How much Deeper)
5. Apply the formula and calculate. Volume = side × side × height (Increased depth)

S Use the steps to calculate for the volume of the stone.

Water level before: 4 cm Water level after: 5 cm (5 cm − 4 cm = 1 cm)

Volume = side × side × height (Increased depth)
= 10 cm × 10 cm × 1 cm
= 100 cm^3 (volume of the stone)

3 8 Investigate the volume of various object.

S Estimate the volume of various objects individually before submerging in the water.

T/S Find the volume of various objects using the steps above.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** 6 Volume **Sub- chapter:** 2. Formula for Volume. **Lesson Number:** 5/5

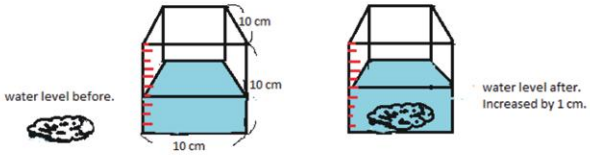
MT: Investigating the volume of various objects and shapes.

MT: Introduce the main task here.

Volumes of Various Shapes

Physical objects have volumes.
How can we find the volume other than the cube or rectangle prism?
As an example, uneven shape such as rock can be calculated by putting in water.

7 When you sink an object in water, its height will increase by the volume of an object. Let's find the volume of the rock below.



Estimated volume of the stone: _____ cm^3

Calculation of the volume of the stone.

Volume = side x side x height (increased depth)
= 10 x 10 x 1
= 100 Answer: 100 cm^3 (volume of the stone.)

8 Let's measure the volume of the various objects.

Display the volume calculation of the various objects on the board.
Follow the steps and calculation done for the stone for other objects.

Summary
To understand how the volume of uneven shapes or irregular shapes such as a rock can be calculated by putting the object in water.

Unit 6

Unit: Volume
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 086 and 087
Actual Lesson 058 and 059

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

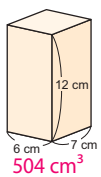
Teacher's Notes

This is the last lesson of Chapter 6. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

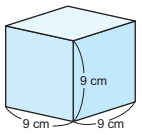
EXERCISE

1 Let's find the volume of the rectangular prism and the cube below.

Pages 72, 78 and 79

① 

504 cm^3

② 

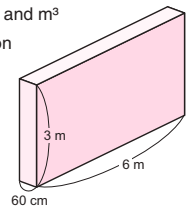
729 cm^3

2 What is the volume in cm^3 and m^3 for the rectangular prism on the right?

10 800 000 cm^3

10.8 m^3

Pages 81 and 82



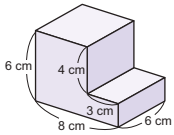
3 What is the volume of 400 L water in cm^3 and m^3?

Page 83

400 000 cm^3 0.4 m^3

4 Let's find the volume of the object on the right.

Pages 84 and 85



216 cm^3

Let's calculate. Grade 5 Do you remember?

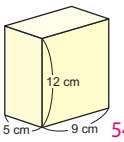
① 30×1.2 36 ② 5.4×1.2 6.48 ③ 2.13×5.4 11.502 ④ 0.12×0.5 0.06

⑤ 9÷1.5 6 ⑥ 4.5÷2.5 1.8 ⑦ 6.12÷7.2 0.85 ⑧ 1.61÷0.7 2.3

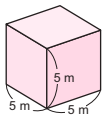
PROBLEMS

1 Let's find the volume of the following rectangular prism and cube.

● Using the formula.

① 

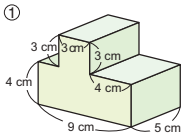
540 cm^3

② 

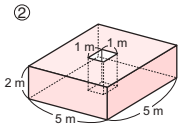
125 m^3

2 Let's find the volumes below.

● Considering the ways.

① 

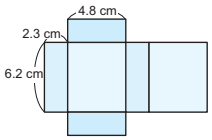
225 cm^3

② 

48 m^3

3 Let's find the volume of a prism which could be made by the development on the right.

● Calculating the volume from its development.



68.448 cm^3

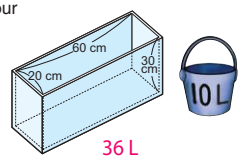
4 Let's fill the rectangular prism tank below with water. How many times do you need to pour water with a 10 L bucket?

● Representing the volume of water by various units.

$60 \times 20 \times 30 = 36000$

36000 $cm^3 = 36$ L

Answer: 4 times



36 L

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN 1 Finding volume of prism and cube.
2 and 3 Expressing same volume with different units.
4 Finding the volume of a complex shape.

2 Solve the Problems

S Solve all the problems.

T Confirm students' answers.

TN 1 Finding volume using formula.
2 Finding the volume in considering different ways.
3 Calculating the volume from its development or net.
4 Representing the volume of water by various units.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

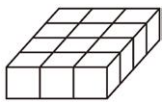
S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 6: Volume	Name:	Score / 100

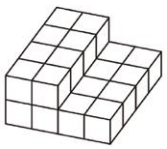
1. The solids below are made up of cubes of 1 cm³ each. Find the volume of each solid.
[2×20 marks = 40 marks]

(1)



Answer: 12 cm^3

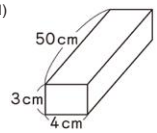
(2)



Answer: 24 cm^3

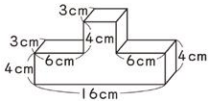
2. Find the volume of each figure.
[4×15 marks = 60 marks]

(1)



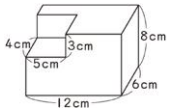
Answer: 600 cm^3

(2)



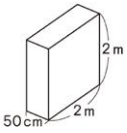
Answer: 240 cm^3

(3)



Answer: 516 cm^3

(4)



Answer: 2 m^3 or 2 000 000 cm^3

118

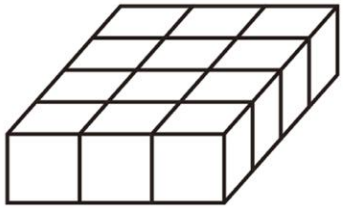
End of Chapter Test **Date:**

Chapter 6: Volume	Name:	Score / 100

1. The solids below are made up of cubes of 1 cm^3 each. Find the volume of each solid.

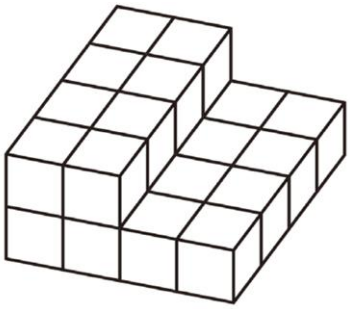
[2 × 20 marks = 40 marks]

(1)



Answer:

(2)

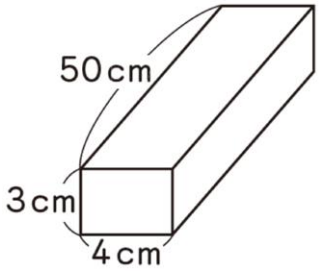


Answer:

2. Find the volume of each figure.

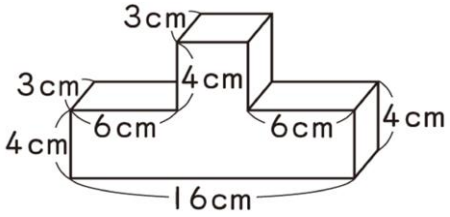
[4 × 15 marks = 60 marks]

(1)



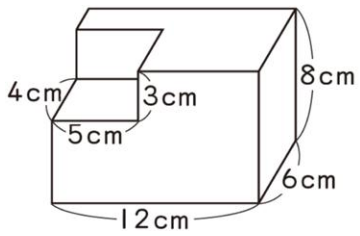
Answer:

(2)



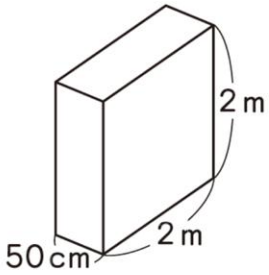
Answer:

(3)



Answer:

(4)



Answer:

Chapter 7 Multiples and Divisors

1. Content Standard

5.1.8 Understand the properties of numbers and apply such properties to identify the component of numbers.

2. Unit Objectives

- Apply components of multiples and common multiples for finding the number patterns.
- To understand that whole numbers are classified into even numbers and odd numbers if we decide on a perspective.
- To understand and apply components of multiples and divisors for finding number patterns.
- Explain the relationship between multiples and divisors using the idea of prime numbers.

3. Teaching Overview

In this unit, students will understand whole numbers as elements of sets for which are multiples or divisors of certain numbers.

Students have some experiences of composing and decomposing numbers already. The learning in this unit will be utilised in the calculation of fractions.

Multiples and Common Multiples :

Teachers encourage students to enjoy playing with multiples and common multiples by finding some patterns. They will find some patterns that pay attention to numbers on a specific number place. They can also enjoy finding a pattern of design when they paint some multiples and common multiples using specific colours of a number table.

They notice that multiples and common multiples are infinite. Some examples of utilisation in real life situations should be emphasised.

Divisors and Common Divisors :

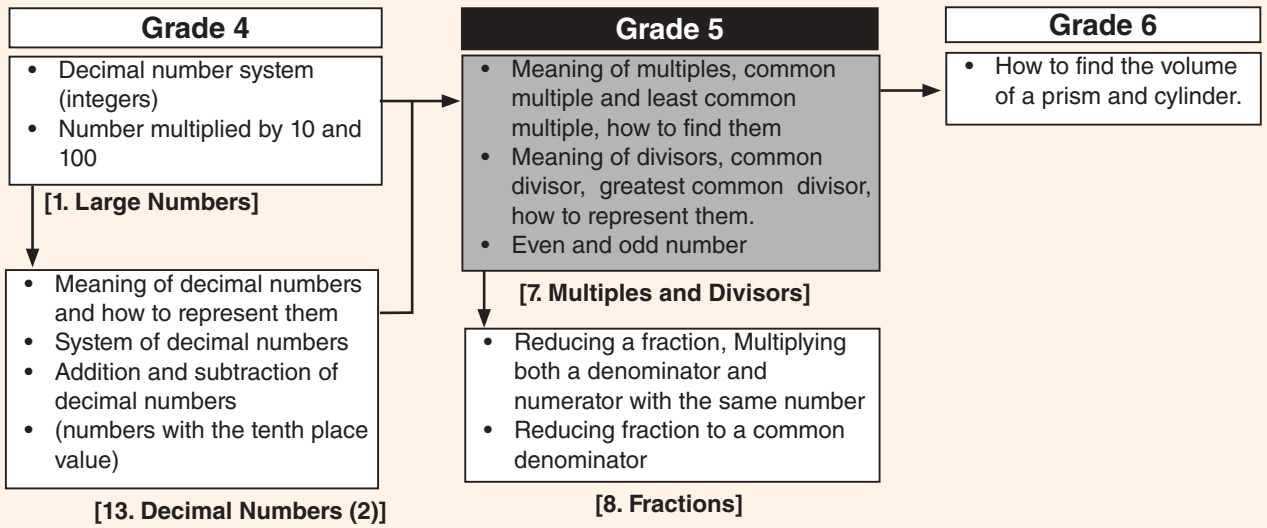
Divisors and Common divisors will be used in canceling fractions, study of square root, etc.

They are finite. Teachers should not impart how to find it, however students are supposed to be encouraged to find out divisors and common divisors by their motive, own initiative, independently and through motivational activities.

Even Numbers and Odd Numbers :

Students understand the meaning of even and odd numbers such as even numbers are divisible by 2 and odd numbers have 1 as the remainder when divided by 2. They also look for some examples of using even and odd numbers in their daily lives.

4. Related Learning Contents



Unit 7

Unit: Multiples and Divisors
Sub-unit 1: Multiples and Common Multiples
Lesson 1 of 3

Textbook Page :
088 to 090
Actual Lesson 060

Sub-unit Objectives

- To understand multiples, common multiples and least common multiple and identify them.
- To understand the meaning of the least common multiple and use it for various situations.
- To deepen the understanding about rules for multiples by looking at how multiples are lined up.

Lesson Objectives

- To understand the meaning of multiples.
- To notice that multiples exist to infinite.

Prior Knowledge

- Multiplication table

Preparation

- Chart for the number lines in 1 and 2, 1 m ruler, table

Assessment

- Enjoy the 'Clap number game' considering multiples of 3. F
- Demonstrate the understanding of the meaning of multiples. S
- Solve the exercises correctly. S

Teacher's Notes

Multiples are the numbers that we get after multiplying a same number by any integer.

7 Multiples and Divisors

Let's think about number groups. First, decide the "clap number".

For example, let's decide 3 as "clap number".

Make a circle and say the number in the order from one. When the count numbers is 3, each person claps, every 3rd person claps by saying the "clap number".

Until which number can you continue?

I considered how many students skipped the clap.

I considered to add 3 for every third student that claps.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

88 = □ × □

Let's enjoy "Clap Number" game

1 Multiples and Common Multiples

Multiples

1 When the "clap number" is 3, let's consider which numbers will be clapped.

1 Write numbers in the table on the right and put colours on the number which will be clapped.
2 Put colours on the numbers line below, too.
Let's discuss what the groups of coloured numbers are.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

□ − □ = 89

Lesson Flow

1 Play the "clap number" game.

T Explain the rule for "clap number" game and play the game making 3 a clap number.

TN Rule for the clap number game:
- Call a number from 1.
- When it comes to 3, clap your hand calling the number.
- Do the same for every third number.

S Understand that the number to be clapped after 3 is 6 then 9, 12 15 etc...

TN Adjust the speed for counting numbers according to the students pace.

T Introduce the Main Task. (Refer to the BP)

2 1 Investigate what kind of numbers they clapped.

T If the clap number is 3, what kind of number will we clap?

S It is using the three times table.

S 1 2 Write number table in the exercise book and circle on the numbers to clap.

T Let's present the rules for the numbers to clap.

S It is the number added by 3 each time. It is using the three times table.

3 Important Point

T/S Explain the important point in the box .

4 2 Investigate multiples of 2.

T Let students to play the number game to investigate the multiples of 2.

S Put circles on the number line for the numbers clapped and explain the rules for the multiples of 2.

S They are from the two times table.
They are the numbers added by 2 each time.

5 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

6 Summary

T What have you learned in this lesson?

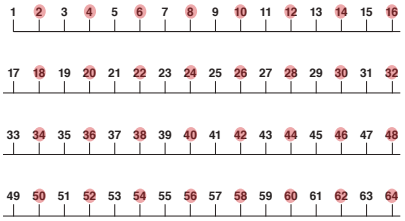
S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Page 90 of the textbook

Multiples of 3 are whole numbers multiplied by 3 like
3×1, 3×2, 3×3, … .
3×0=0, but 0 is not a multiple of 3.

2 Clap by multiples of 2. Investigating the multiples of 2
Let's find the relationship of the numbers clapped.
Circle the clapped numbers on the number line below.



Exercise

1 Stack the boxes of cookies with a height of 5 cm.
① What is the total height of 6 boxes? 5×6=30 Answer: 30 cm
② Which multiple gives the total height? Multiple of 5

2 Let's write the first 5 numbers of the following multiples.
① Multiples of 8 8, 16, 24, 32, 40
② Multiples of 9 9, 18, 27, 36, 45

90 = □×□

Sample Blackboard Plan

Date: Chapter:7 Multiples and Divisors Sub- chapter:1. Multiples and Common Multiples Lesson Number: 1/3

MT: To investigate and understand the meaning of multiples.

Make a circle and say in the order from one, a person who becomes 3 claps by saying the "clap number".

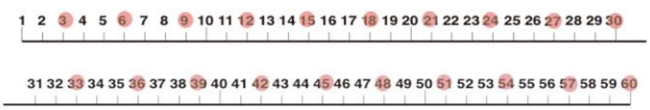
MT: Introduce the main task here.

1 Investigate what kind of numbers you clapped.

1

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60

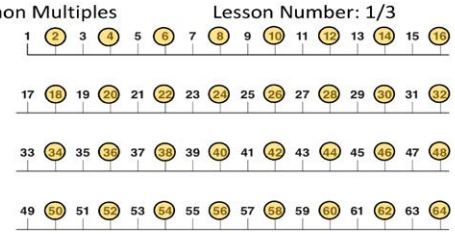
2 Put colour on the number line.



What did you notice from the clap game?
- I Know how many children skip the clap.
- Adding by 3.
- The number that is coloured can be divided by 3.
- Multiple of 3.

Multiple of 3 are whole numbers multiplied by 3 like 3x1, 3x2, 3x3, ...
0 of 3x0 is not a multiple of 3.

2 Investigating multiples of 2.
Circle the clapped numbers on the line. (Page90)



What did you notice about the number line above.
- These numbers identified are found in the 2 times table.
- There is only one number t hat is not circle.

Exercise
Complete exercise 1 and 2.

Summary
Playing the clap number game Is a tool used for enjoyment to easily find the multiples of a number.

Unit 7

Unit: Multiples and Divisors
Sub-unit 1: Multiples and Common Multiples
Lesson 2 of 3

Textbook Page : 091 to 093
Actual Lesson 061

Lesson Objectives

- To understand the meaning of common multiples and how to find them.
- To understand the meaning of the least common multiple and how to find it.

Prior Knowledge

- Multiplication table

Preparation

- Table of multiples of 2, 3, 4 and 5.
- Chart showing Mero's, Yamo's, Sare's and Vavi's Ideas

Assessment

- Enjoy the 'Clap number game' considering multiples of 2 and 3. F
- Demonstrate the understanding of the meaning of common multiples and least common multiple. S

Teacher's Notes

In playing the clap game, the students should be reminded of the main focus on the idea of identifying common multiples.

How Multiples Make Patterns in Numbers

Circle the multiples of 2 in the table below.
How do the multiples of 2 line up?
Let's check the multiples of other numbers.

Multiples of 2

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Multiples of 3

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Multiples of 4

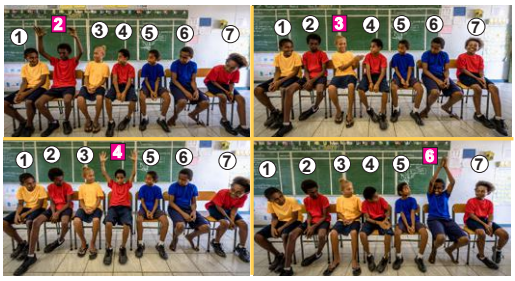
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

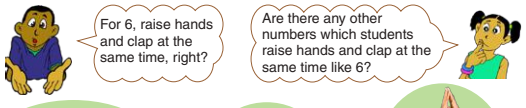
Multiples of 5

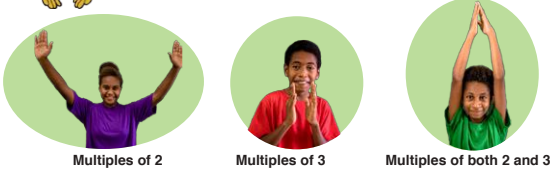
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Common Multiples

3 Let's play "clap number game" by raising hands at the multiples of 2 and clapping at the multiples of 3.







1 2 3 4 5 6 7 8 9 10 11 12 13 14 …

1 Let's find numbers that are multiples of both 2 and 3.

A number that is a multiple of both 2 and 3 is called a **common multiple** of 2 and 3. The smallest of all common multiples is called the **least common multiple**.

2 What is the number of the least common multiple of 2 and 3? 6

□ − □ = 91

92 = □ × □

Lesson Flow

1 Review the previous lesson.

2 How multiples make patterns in numbers.

S Circle the multiples of 2, 3 and others in the tables.

3 ③ Play "clap number" game

T What rule was used in the clap game in yesterday's lesson?
S Clap once for every multiple.
T ① We are going to do clap number game again. We have a new rule today, raise both hands for the multiples of 2 and clap hands for the multiples of 3. Let's see if you can do this well.
S Play the game several times and notice that the multiples of 2 and 3 are 6, 12, 18. 24, ..., etc.
T Introduce the Main Task. (Refer to the BP)

4 Important Point

T/S Explain the important point in the box .

5 Find the least common multiple for 2 and 3

S ② For 6, raise both hands and clap at the same time.
S When overlapping multiples of 2 and 3, raise hands and clap at the same time.

6 ④ Find the common multiples of 3 and 4.

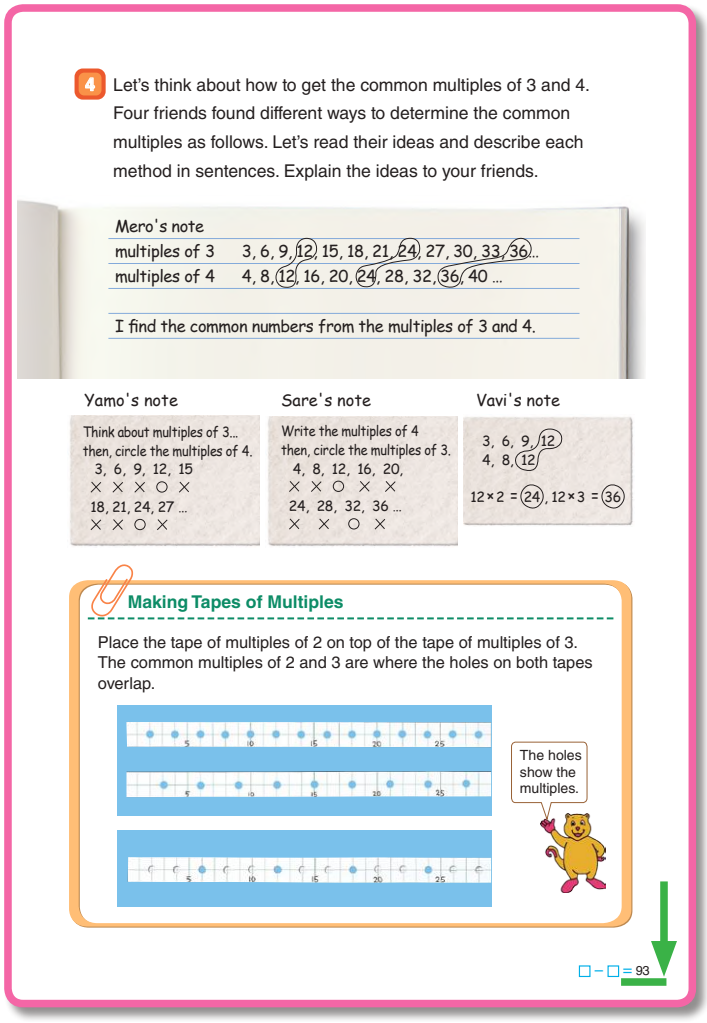
S Think about the common multiple based on four friends' ideas.
T What are the common multiples of 3 and 4? Let's explain how the four friends found the common multiples.
S Mero circled the same numbers among the multiples of 3 and 4.
S Yamo used the multiples of 3, Sare used the multiples of 4 and Vavi found the least common multiple, 12 and then found the multiples of 12.
T Confirm students' ideas.

7 Making tapes of Multiples

TN Students may complete the activity if time permits or do it as homework.

8 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.



Sample Blackboard Plan

Lesson 061 Sample Blackboard Plan is on page 125.

Unit 7

Unit: Multiples and Divisors
Sub-unit 1: Multiples and Common Multiples
Lesson 3 of 3

Textbook Page : 094
Actual Lesson 062

Lesson Objectives

- To understand how to solve problems which require the least common multiple.
- To think about the concrete situations of using the least common multiple and deepen their understanding about common multiples and the least common multiple.

Prior Knowledge

- Common multiples and least common multiple (Previous lesson)

Preparation

- Diagram for 5

Assessment

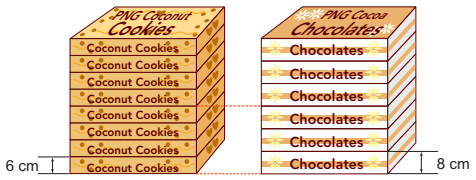
- Solve the problem using multiple and least common multiple. F
- Solve the exercises correctly. S

Teacher's Notes

For this lesson, use the picture of cookies and chocolates to get the idea of identifying multiples and common multiples.
As the number of boxes increase, the common multiples can be easily identified.

The least common multiple of 3 and 4 is 12. All common multiples of 3 and 4 are multiples of 12.

5 Stacked are boxes of cookies with a height of 6 cm each and chocolate boxes with a height of 8 cm each.



1. The total height of the boxes of cookies are multiples of which number? Multiple of 6.
2. The total height of the chocolate boxes are multiples of which number? Multiple of 8.
3. What will be the least height that the cookie boxes and chocolate boxes be equal? How many boxes are in each stack?
   6×4×24 Answer: 24 cm. 4 cookie boxes and 3 chocolate boxes
4. Write the first 3 numbers where the height of both stacks are equal.
   24 cm, 48 cm, 72 cm

Exercise

1. Write the first 4 common multiples for each of the following groups of numbers. Find the least common multiples.
   ① (5, 2) 10, 20, 30, 40 LCM×10
   ② (3, 9) 9, 18, 27, 36 LCM×9
   ③ (4, 6) 12, 24, 36, 48 LCM×12
2. Stack boxes with heights of 6 cm and 9 cm. What is the smallest number where the total heights of the two stacks are equal?
   6 cm box: 6, 12, 18
   9 cm box: 9, 18, 27 Answer: 18 cm

94 = □ × □

Lesson Flow

1 Review previous lesson

2 Important Point

T/S Explain the important point in the box .

T Introduce the Main Task. (Refer to the BP)

3 Think about the heights of cookie and chocolate boxes.

T/S 5 Read and understand the situation.
T 1 The total height of boxes of cookies is the multiples of which number?
S The multiples of 6.
T 2 The total height of chocolate boxes is the multiples of which number?
S The multiples of 8.
T 3 What will be the least height of the cookie boxes and chocolate boxes be equal?
S 24 cm high.

Lesson Flow

T How many boxes are there in each stack?

S 1. Cookies: $\frac{24}{6}=4$
Answer: 4 boxes of cookies
2. Chocolates: $\frac{24}{8}=3$
Answer: 3 boxes of chocolates.

4 ④ Find the common height of the 2 boxes.

T Let's find the first three heights where the height of both stacks are equal.

S 24 cm, 48 cm and 72 cm high.

5 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 61)

Date: Chapter:7 Multiples and Multiples Sub- chapter:1. Multiples and Common Multiples Lesson Number: 2/3

MT: To understand the meaning of common and least common multiple and how to find it.

3 Let's play "clap number" by raising hands at the multiples of 2 and clapping at the multiples of 3.
Rules
- Start by calling a number from 1 onwards.
- Hands up for the multiples of 2.
- Clap your hands for the multiples of 3.
- When both multiples of 2 and 3, hands up and clap your hands at the same time.

1 Let's find numbers that are multiples of 2 and 3.
Multiples of 2: 2, 4, 6, 8, 10, 12, 14, 16, 18 .....

Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24 .....

MT: Introduce the main task here.

A number that is a multiple of both 2 and 3 is called a **common multiple** of 2 and 3. The smallest of all common multiples is called the **least common multiple**.

Think about multiples of 3... then, circle the multiples of 4.
3, 6, 9, 12, 15
× × × ○ ×
18, 21, 24, 27 ...
× × ○ ×

Write the multiples of 4 then, circle the multiples of 3.
4, 8, 12, 16, 20,
× × ○ × ×
24, 28, 32, 36 ...
× × ○ ×

3, 6, 9, (12)
4, 8, (12)
12×2 = (24), 12×3 = (36)

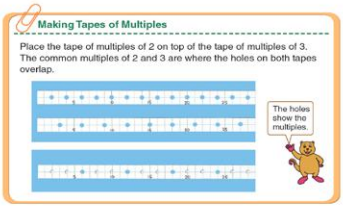
2 The least common multiple (LCM) of 2 and 3? 6

4 Let's find the common multiples of 3 and 4.
Mero's idea
I found the common numbers from multiples of 3 and 4 and circled it.

Mero's note
multiples of 3 3, 6, 9, (12), 15, 18, 21, (24), 27, 30, 33, (36) ...
multiples of 4 4, 8, (12), 16, 20, (24), 28, 32, (36), 40 ...
I find the common numbers from the multiples of 3 and 4.

Vavi's idea
I found the first common multiples of 3 and 4 which is 12,the first multiple, then 12 x 2 = 24, the second multiple and then next.

Summary
A number that appears in both 2 and 3 is called a common multiple.
The number smallest of all the multiples is called the least common multiple.



Sample Blackboard Plan (Lesson 62)

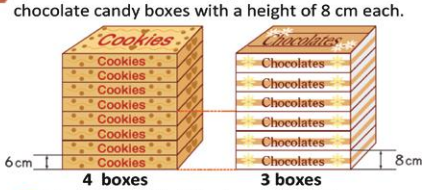
Date: Chapter:7 Multiples and Divisors. Sub- chapter:2. Multiples and Common Multiples. Lesson Number: 3/3

MT: To understand how to find the least common multiple using concrete situations.

The least common multiple of 3 and 4 is 12. All common multiples of 3 and 4 are multiples of 12.

MT: Introduce the main task here.

5 Boxes of cookies with a height of 6cm each and chocolate candy boxes with a height of 8 cm each.



1 The total height of the boxes of cookies are multiples of which number? The multiple of 6

2 The total height of the chocolate boxes and multiples of which number? The multiple of 8.

3 At what height will the total heightof the cookie boxes and chocolate boxes be equal?
6 x 4 = 24
How many boxes are in each stacks
4 cookies and 3 chocolate boxes.

4 Write the first 3 numbers where the height of both stacks are equal.

For the cookie boxes 6 : 24, 48, 72
4 stacks, 8 stacks, 12 stacks

For the chocolate boxes 8: 24, 48, 72
3 stacks, 6 stacks, 9 stacks

Exercise
Complete exercise 1 and 2.

Summary
The smallest common multiple of 6 and 8 is 24.
All common multiples of 6 and 8 are multiples of 24.

Unit 7

Unit: Multiples and Divisors
Sub-unit 2: Divisors and Common Divisors
Lesson 1 of 4

Textbook Page : 095 to 097
Actual Lesson 063

Sub-unit Objectives

- To understand divisors, common divisors and the highest common divisor and how to find it.
- To find the highest common divisor according to the various concrete situations.

Lesson Objective

- To understand the meaning of divisors and find them.

Prior Knowledge

- Common multiples and least common multiples

Preparation

- Square papers of 1 cm², 2 cm², 3 cm², 4 cm², 6 cm², 9 cm², 18 cm²

Assessment

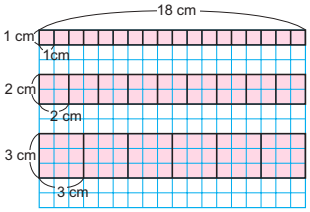
- Investigate and explain the meaning of divisor through activity. F
- Demonstrate the understanding of the meaning of divisor. S

Teacher's Notes

Prepare at least a square such as square of 5 cm² to show that there are some squares that cannot fit exactly in the 12 cm and 18 cm square length.

Page 97 of the textbook

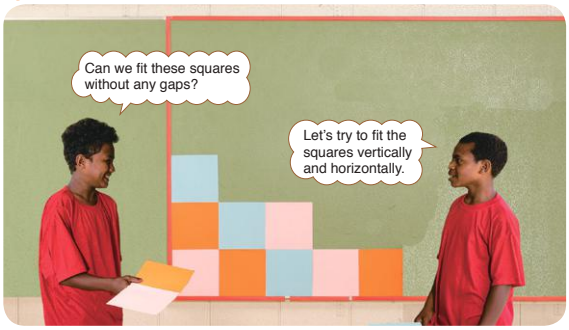
The lengths of the sides of the squares when lined up horizontally over a 18 cm length without any gaps are 1 cm, 2 cm, 3 cm, 6 cm, 9 cm and 18 cm.



18 cm is included because we think only horizontally.

1, 2, 3, 6, 9, 18 .....Divisors of 18

2 Divisors and Common Divisors

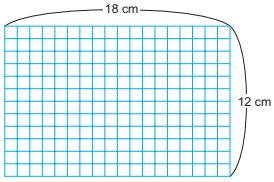


We want to put squares in this frame so there are no gaps.

Let's find out which squares can fit in the frame without any gaps.

Divisor

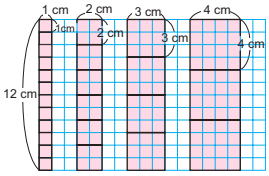
1 Place squares of the same size in a 12 cm × 18 cm rectangle.
How long is each side of the square?



Think of the length of the sides of the squares when the squares are lined up vertically without any gaps.

1 How many cm is each side of the squares when they are lined up vertically over a 12 cm length without any gaps?
1 cm, 2 cm, 3 cm, 4 cm, 6 cm, 12cm

The lengths of the sides of the squares when lined up vertically over a 12 cm length without any gaps are 1 cm, 2 cm, 3 cm, 4 cm, 6 cm and 12 cm.



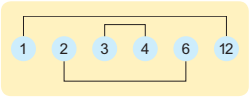
2 Divide 12 by 1, 2, 3, 4, 6 and 12 one by one to confirm that there are no gaps. Are they divisible by 12?

Yes, the numbers are divisible by 12

The whole numbers by which 12 can be divided with no remainder are called **divisors** of 12.

1, 2, 3, 4, 6, 12 .....Divisors of 12

3 What can you find when divisors of 12 are grouped as shown below? multiplying in each group gives us 12.



1 × 12 = 12
2 × 6 = 12
3 × 4 = 12

Any number is divisible by 1 and itself.

Think about the length of the sides of the squares when the squares are lined up horizontally without any gaps.

4 How many cm is each side of the squares when they are lined up horizontally over a 18 cm length without any gaps?
1 cm, 2 cm, 3 cm, 6 cm, 9 cm, 18 cm

□ − □ = 95

96 = □ × □

Lesson Flow

1 ① Investigate and understand the meaning of divisors.

T Can we place squares without any gaps in a rectangle from the frame?

S 1. I think we cannot because the sizes of the length and the width are different.
2. I think we can if we think carefully on how to place them.

T What length of the side of squares can be placed without any gaps?

S It seems we can place squares with the side of 1 cm or 2 cm in length but there seem to be more.

T Introduce the Main Task. (Refer to the BP)

2 ① Think of squares that can be lined up vertically without any gaps.

T Ask the students to place squares vertically on a 12 cm chart to see how many can fit without any gaps.
(1 cm², 2 cm², 3 cm², 4 cm², 6 cm² and 12 cm² squares).

T How many cm is each side of the squares when they are lined up vertically over a 12 cm length without any gaps?

TN This activity should be done by the students before leading them to the next page for confirmation.

S The side lenghts of the squares are: 1 cm, 2 cm, 3 cm, 4 cm, 6 cm and 12 cm.

T Confirm by lining the squares vertically on a 12 cm chart on page 96.

T ② Are the side lengths of the squares divisible by 12?

S All the numbers are divisible by 12 without any remainder.

3 Important Point

T/S Explain the important point in the box ⬚.

4 Finding divisors of 12

T ③ How can we find the divisor of 12 without missing any number.

S It is good to find the pair of two numbers for multiplication like 1 and 12 of 1×12, 2 and 6 of 2×6.

5 Think of squares that can be lined up horizontally without any gaps.

T Ask students to place squares horizontally on a 18 cm chart to see how many can fit without any gaps.
(1 cm², 2 cm², 3 cm², 6 cm², 9 cm² and 18 cm² squares).

T ④ How many cm is each side of the squares when they are lined up horizontally over a 18 cm length without any gaps?

S The side lenghts of the squares are: 1 cm, 2 cm, 3 cm, 6 cm, 9 cm and 18 cm.

T Confirm by lining the squares horizontally on a 18 cm chart on page 97.

TN 1, 2, 3, 6, 9 and 18 are divisors of 18.

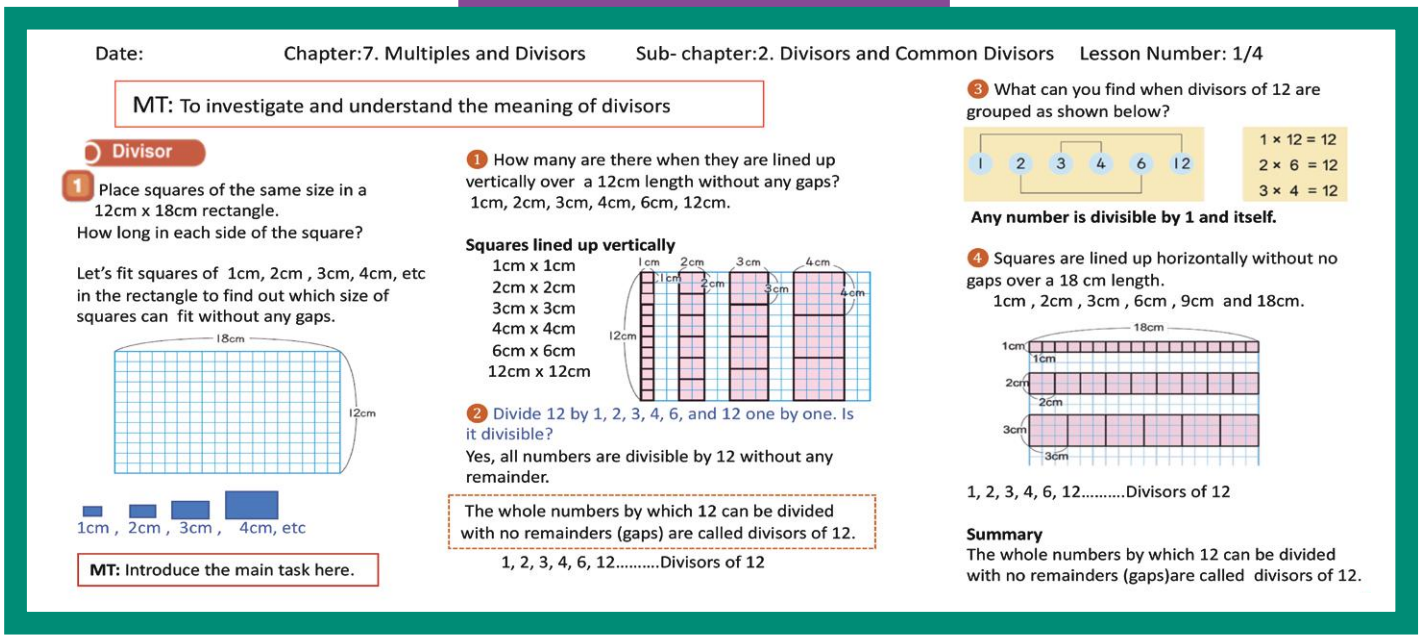
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 7

Unit: Multiples and Divisors
Sub-unit 2: Divisors and Common Divisors
Lesson 2 of 4

Textbook Page : 097 and 098
Actual Lesson 064

Lesson Objective

- To understand the meaning of common divisors and the greatest common divisor and how to find them.

Prior Knowledge

- Divisor

Preparation

- Chart of numbers in 5
- Chart of Important Point

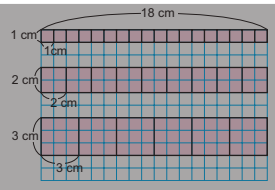
Assessment

- Think about the meaning and how to find common divisors and greatest common divisors. F
- Solve the exercises correctly. S

Teacher's Notes

Pairing of numbers can be used to confirm common divisors.
We get squares when the width and height are equal.

The lengths of the sides of the squares when lined up horizontally over a 18 cm length without any gaps are 1 cm, 2 cm, 3 cm, 6 cm, 9 cm and 18 cm.



18 cm is included because we think only horizontally.

1, 2, 3, 6, 9, 18 .....Divisors of 18

Common Divisors

5 How many cm can the sides of the squares be, when lined up vertically and horizontally without any gaps?

Height..... 1 2 3 4 6 12 (cm)
Width..... 1 2 3 6 9 18 (cm)
1 cm, 2 cm, 3 cm and 6 cm.

We get squares when the width and height are equal.

The numbers that are divisors of both 12 and 18 are called **common divisors** of 12 and 18. The largest of all common divisors is called **greatest common divisor**.

6 The common divisors of 12 and 18 are 1, 2, 3 and 6.
What is the greatest common divisor of 12 and 18?
6

Exercise

1 Find all the divisors of 6, 8 and 36 respectively.
For 6: 1, 2, 3, 6 For 8: 1, 2, 4, 8
For 36: 1, 2, 3, 4, 6, 8, 9, 12, 18, 36

2 Write all the common divisors of 8 and 36.
1, 2, 4

□ − □ = 97

2 Let's think about how to find the common divisors of 18 and 24.
Two friends calculated common divisors in different ways in their exercise books but did not complete.
Complete their ideas by considering their thinking.

Divisors of 18, 1, 2, 3, 6, 9, 18
Divisors of 24, 1, 2, 3, 4, 6, 8, 12, 24
Common divisors: 1, 2, 3 and 6

Divisors of 18 1, 2, 3, 6, 9, 18
24÷1=24, 24÷2=12, 24÷3=8, 24÷6=4,
X 24÷9=2 r 6, 24÷18=1 r 6
'x' means wrong. not a common divisor

3 Let's find all the common divisors and then find the greatest common divisors.

1 (8, 16) 1, 2, 4, 8
2 (15, 20) 1, 5
3 (12, 42) 1, 2, 3, 6
4 (13, 9) 1

There are some pairs of numbers like 4, that have only 1 as a common divisor.

Exercise

1 We want to divide 8 pencils and 12 exercise books equally amongst the students.
What should be the appropriate number of students for distribution? For 8: 1, 2, 4, 8
For 12: 1, 2, 3, 4, 6, 12
Answer: 1, 2, 4 children

98 = □ × □

Lesson Flow

1 Review the previous lesson.

S We studied divisors of 12 and 18.
T Today let's find squares which can be placed vertically as well as horizontally.
T Introduce the Main Task. (Refer to the BP)

2 Investigate and understand the meaning of common divisors.

T ❺ How many cm can the sides of the squares be, when lined up vertically and horizontally without any gaps?
S Squares with the side length of 1 cm, 2 cm, 3 cm and 6 cm can be placed without any gaps.

3 Important Point

T/S Explain the important point in the box .

4 Find the greatest common divisor

T ❻ What is the greatest common divisor of 12 and 18?
S The greatest common divisor is the greatest number among the common divisors, so it is 6.

5 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

6 ❷ Find the common divisors of 18 and 24.

T Study the two students' ideas and complete their thinking in your exercise books.
S 1. Pair the common divisors of 18 and 24 then identify the greatest common divisor which is 6.
2. Divide all the divisors of 18 into 24 and realise that 1, 2, 3, and 6 are divisible while 9 and 18 have remainders, therefore 9 and 18 are not common divisors.
T Confirm that divisors that are common are divisible and divisors that are not common are not divisible.

7 ❸ Find the greatest common divisor.

T Ask the students to complete ❶ to ❹.
S Complete the activities by finding all the common divisors and the greatest common divisor.
TN In activity ❹, 1 is the only common divisor.

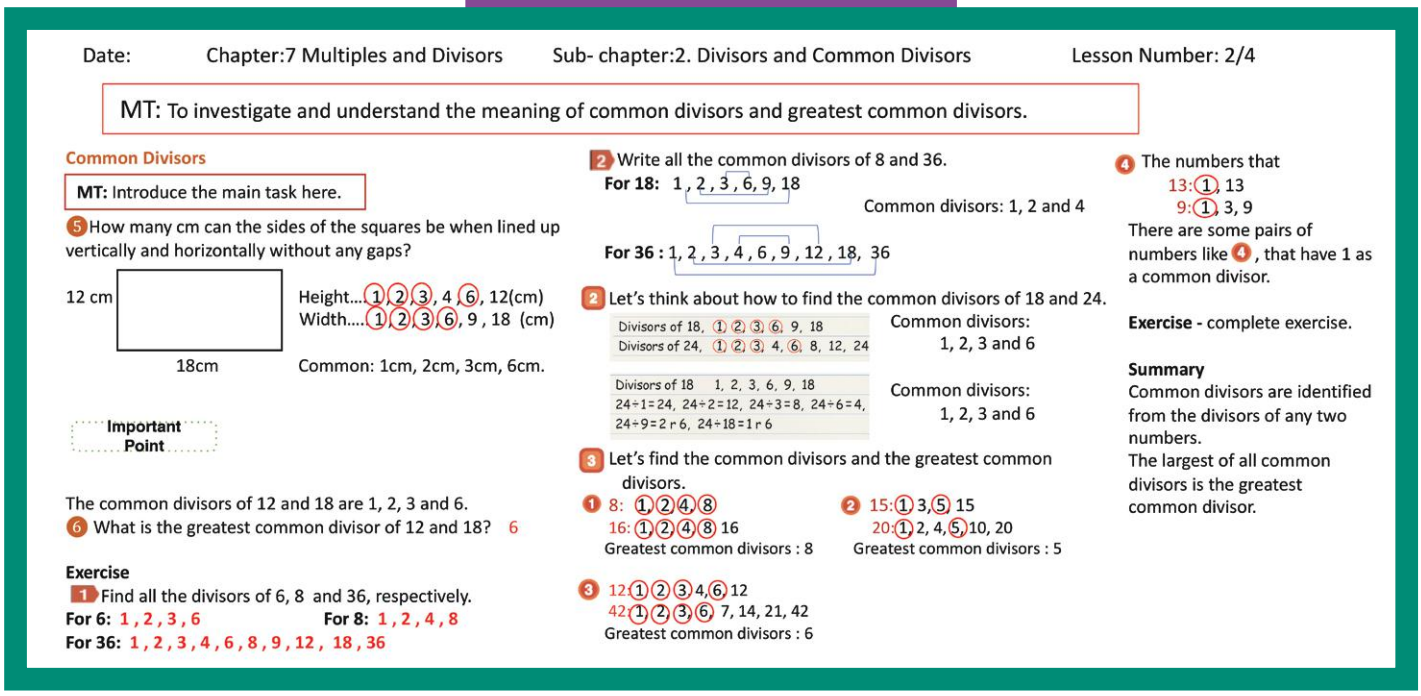
8 Complete the Exercise

S Solve the exercise.
T Confirm students' answers.

9 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 7

Unit: Multiples and Divisors
Sub-unit 2: Divisors and Common Divisors
Lesson 3 of 4

Textbook Page : 099 and 100
Actual Lesson 065

Lesson Objectives

- To understand the relationship between multiples and divisors.
- To investigate about prime numbers.

Prior Knowledge

- Multiples and least common multiples
- Divisors and greatest common divisors

Preparation

- Square cards

Assessment

- Investigate the relationship between multiples and divisors. F
- Investigate prime numbers. S
- Explain the meaning of prime numbers. S

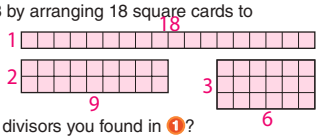
Teacher's Notes

1 is not a prime number because it is always the divisor as stated in the definition.

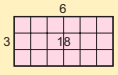
The Relationship between Multiples and Divisors

4 Let's think about the divisors of 18.

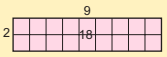
1. Find the divisors of 18 by arranging 18 square cards to make rectangles.



2. Is 18 a multiple of the divisors you found in 1?



- 3 and 6 are divisors of 18.
- 18 is a multiple of 3 and 6.



- 2 and 9 are divisors of 18.
- 18 is a multiple of 2 and 9.

Prime Numbers

Some numbers like 2, 3, 5 and 7 are divisible only by 1 and itself.
Find such numbers amongst the following numbers.
Divide by 2, 3, 4… in order to find them.

2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39	40	41

A number that can be divided only by one and itself is called a **prime number**. One is not a prime number.

Using Prime Numbers

5 Let's represent whole numbers by a product form of prime number.

1. Express 6 by a product form of a prime number.
2. Express 30 by a product form of a prime number.

$30 = 5 \times 6$
$= 5 \times 3 \times 2$

Let's find divisors of 6.

3. Determine divisors of 30 by using the expression in 2.

2, 3 and 5 are easily found as divisors.

Divisor of 30 is the product of the combination of prime numbers.

6 Let's determine the greatest common divisor of 24 and 36 by using a prime number.

$24 = 4 \times 6$
$= 2 \times 2 \times 2 \times 3$

$36 = 6 \times 6$
$= 2 \times 3 \times 2 \times 3$
$= 2 \times 2 \times 3 \times 3$

When the multiples representations of prime numbers products are compared, it is common to, $2 \times 2 \times 3 = 12$.
Then, the greatest common divisor is 12.

$24 = 2 \times 2 \times 2 \times 3$
$36 = 2 \times 2 \times 3 \times 3$

Using multiple representation of prime number products, let's find the numbers that should be multiplied to get the same products?
$24 \times \square = 2 \times 2 \times 2 \times 3 \times \square$
$36 \times \square = 2 \times 2 \times 3 \times 3 \times \square$

7 Let's discuss how to determine the least common multiple of 24 and 36 by using a prime number.

$\square - \square = 99$

$100 = \square \times \square$

Lesson Flow

1 Review the previous lesson.

2 4 Investigate and understand the relationship between divisors and multiples.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T 1 Let's find divisors of 18 by arranging squared cards to a rectangle.
S Think by arranging cards.
S Divisors of 18 are 1, 2, 3, 6, 9, and 18.

3 2 Think about how to find the multiples of divisors.

T Is 18 a multiple of the divisors you found in 1?
S They are all divisors of 18 because they are 1×18, 2×9, and 3×6.
T What kind of rules are there between multiples and divisors?
S If we multiply the pairs for finding the divisors like 1 and 18, 2 and 9, all the answers are 18.
S All the divisors of 18 are multiples of 18.

4 Investigate and understand prime numbers .

T/S Read and understand the meaning of having only 1 and the number itself as divisors by using 2, 3, and 5.
T Let's find the numbers that can be divided only by 1 and itself.
S They are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, and 41.

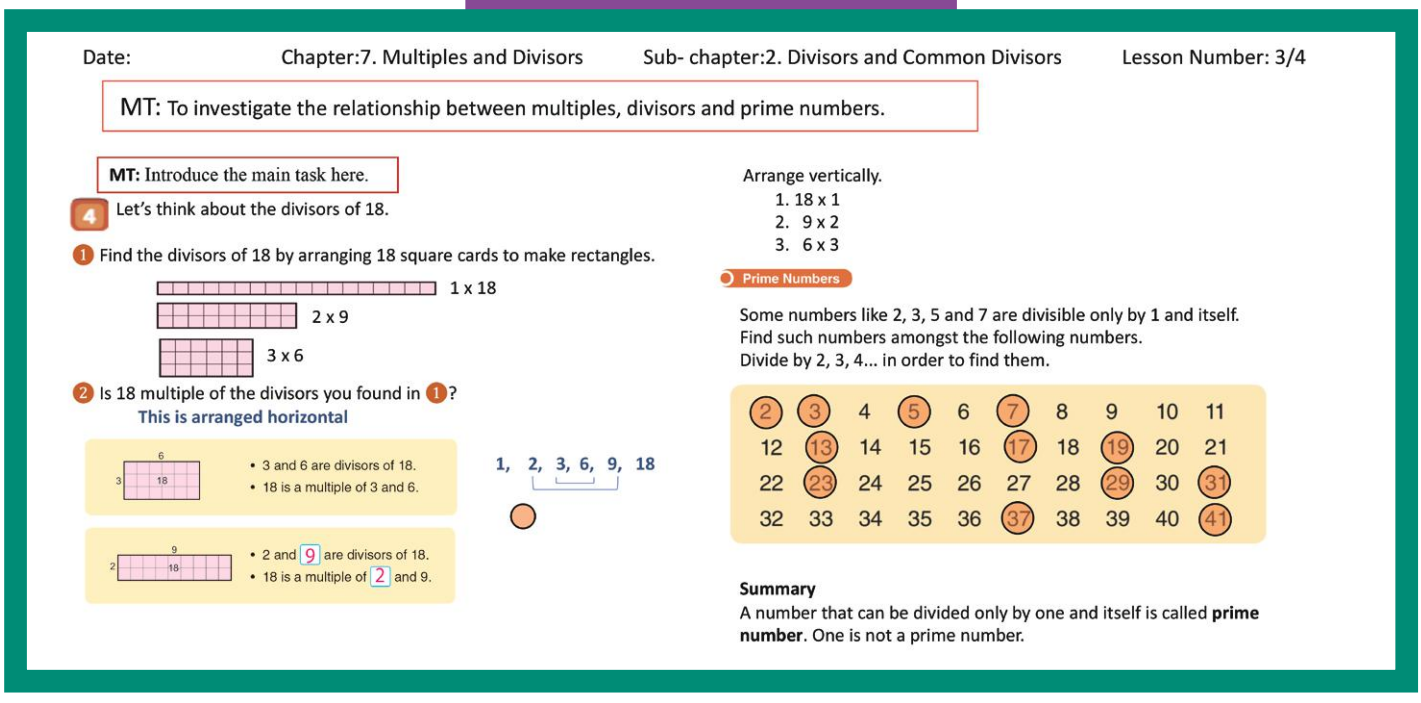
5 Important Point

T/S Explain the important point in the box .

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 7

Unit: Multiples and Divisors
Sub-unit 2: Divisors and Common Divisors
Lesson 4 of 4

Textbook Page : 100 and 101
Actual Lesson 066

Lesson Objectives

- To represent whole numbers as a product of prime numbers.
- To find the greatest common divisor and the least common multiple.

Prior Knowledge

- Multiple and least common multiple
- Divisor and greatest common divisor
- Prime number

Preparation

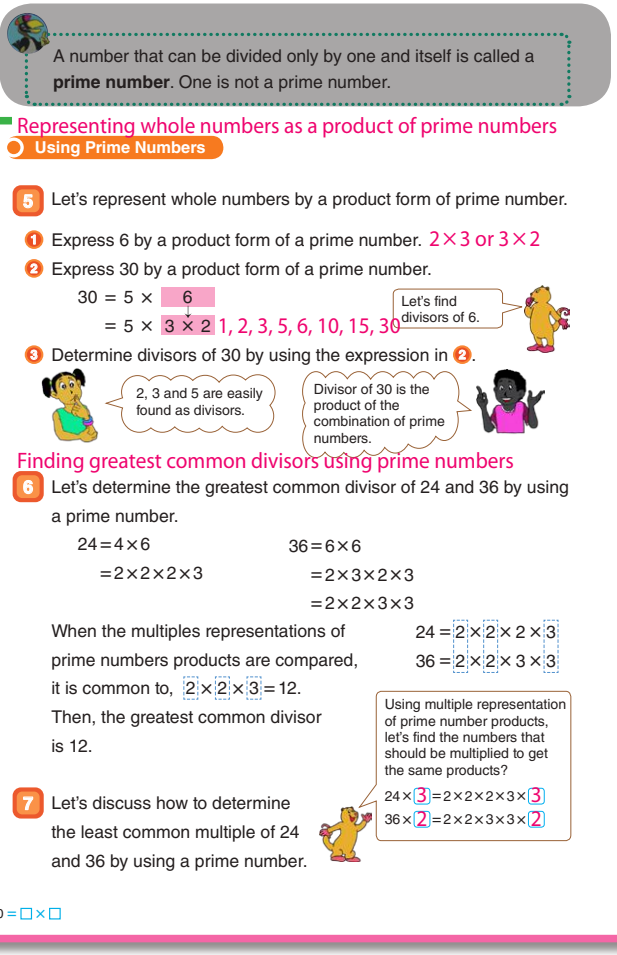
- Chart of Kapul call out in task 7

Assessment

- Apply prime numbers to find the greatest common divisor and the least common multiple. F
- Find the greatest common divisor and the least common multiple by using prime numbers. S

Teacher's Notes

- Sieve of Eratosthenes is a process of straining numbers leaving prime numbers.
- To find the least common multiple of 24 and 36, multiply 24 by 3 and 36 by 2 to get 72 as the least common multiple.



A number that can be divided only by one and itself is called a **prime number**. One is not a prime number.

Representing whole numbers as a product of prime numbers

Using Prime Numbers

5 Let's represent whole numbers by a product form of prime number.

1 Express 6 by a product form of a prime number. 2×3 or 3×2

2 Express 30 by a product form of a prime number.

$30 = 5 \times 6$
$= 5 \times 3 \times 2$ 1, 2, 3, 5, 6, 10, 15, 30

Let's find divisors of 6.

3 Determine divisors of 30 by using the expression in 2.

2, 3 and 5 are easily found as divisors.

Divisor of 30 is the product of the combination of prime numbers.

Finding greatest common divisors using prime numbers

6 Let's determine the greatest common divisor of 24 and 36 by using a prime number.

$24 = 4 \times 6$
$= 2\times2\times2\times3$

$36 = 6 \times 6$
$= 2\times3\times2\times3$
$= 2\times2\times3\times3$

When the multiples representations of prime numbers products are compared, it is common to, $2\times2\times3 = 12$.
Then, the greatest common divisor is 12.

$24 = 2\times2\times2\times3$
$36 = 2\times2\times3\times3$

Using multiple representation of prime number products, let's find the numbers that should be multiplied to get the same products?

$24\times3 = 2\times2\times2\times3\times3$
$36\times2 = 2\times2\times3\times3\times2$

7 Let's discuss how to determine the least common multiple of 24 and 36 by using a prime number.

100 = □ × □

Sieve of Eratosthenes

Determine a prime number that is less than 100 by the next procedure.

① Erase 1.
② Leave 2 and erase multiple of 2.
③ Leave 3 and erase multiple of 3.

Leave the first numbers and erase its multiples.
Using this method, a prime number like 2, 3, 5, 7, 11, etc, are left.

Using this method, find a prime number until 100.

~~1~~	2	3	~~4~~	5	~~6~~	7	~~8~~	~~9~~	~~10~~
11	~~12~~	13	~~14~~	~~15~~	~~16~~	17	~~18~~	19	~~20~~
21	~~22~~	23	~~24~~	~~25~~	~~26~~	~~27~~	~~28~~	~~29~~	~~30~~
31	~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	37	~~38~~	~~39~~	~~40~~
41	~~42~~	43	~~44~~	~~45~~	~~46~~	47	~~48~~	~~49~~	~~50~~
51	~~52~~	~~53~~	~~54~~	~~55~~	~~56~~	~~57~~	~~58~~	~~59~~	~~60~~
61	~~62~~	63	~~64~~	~~65~~	~~66~~	67	~~68~~	~~69~~	~~70~~
71	~~72~~	~~73~~	~~74~~	~~75~~	~~76~~	~~77~~	~~78~~	~~79~~	~~80~~
81	~~82~~	~~83~~	~~84~~	~~85~~	~~86~~	~~87~~	~~88~~	~~89~~	~~90~~
91	~~92~~	~~93~~	~~94~~	~~95~~	~~96~~	~~97~~	~~98~~	~~99~~	~~100~~

How many prime numbers are there?

Sieve of Eratosthenes is a method that was discovered by a mathematician named Eratosthenes in ancient Greece.
He was born in BC (Before Christ) 276 and died BC 194.

□ − □ = 101

Lesson Flow

1 Review the previous lesson.

2 5 Represent whole numbers by a product form of prime numbers.

T Introduce the Main Task. (Refer to the BP)
T 1 Express 6 as a product form of a prime number.
S 3×2
T 2 What about 30?
S 5×6=5×3×2

3 Think about how to find divisors of 30.

T 3 Determine divisors of 30 by using the expression in 2.
S 30=5×3×2
TN 2, 3, 5 can be found easily from 2×3 abd 5×3. 6 and 15 can be found from 6×5 and 15×3. Remember 1×30=30 so 1 can be a divisor of 30. So, the divisors of 30 are 1, 2, 3, 5, 6, 15 and 30.

4 6 Think about how to find the greatest common divisor of 24 and 36 by using a prime number.

T Show 24 as a product form of prime numbers?
S 24=2×2×2×3
T Show 36 as a product form of prime numbers?
S 36=2×2×3×3
T Which number is common for both 24 and 36?
S 2×2×3
S Greatest common divisor is 2×2×3=12.

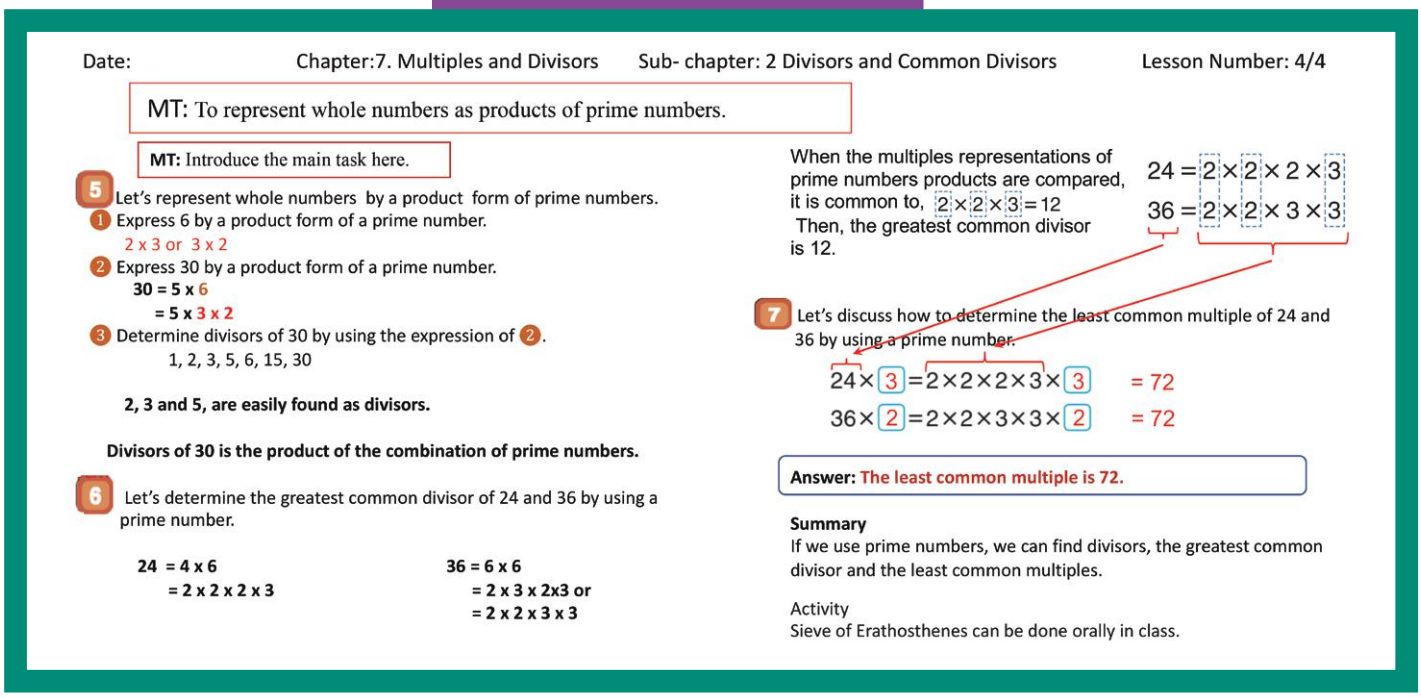
5 Think about how to find the least common multiple of 24 and 36 by using a prime number.

T 7 How can we find the least common multiple using the product form of prime numbers?
S 24×3=2×2×2×3×3
36×2=2×2×3×3×2.
To find the least common multiple of 24 and 36, multiply 24 by 3 and 36 by 2 to get 72 as the least common multiple.
T Let students know that prime numbers are useful in finding divisors, greatest common divisors and least common multiples.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 7

Unit: Multiples and Divisors
Sub-unit 3: Even Numbers and Odd Numbers
Lesson 1 of 1

Textbook Page : 102
Actual Lesson 067

Sub-unit Objective

- To understand the meaning and characteristics of even and odd numbers.

Lesson Objective

- To understand that whole numbers can be divided into even and odd numbers and know the meaning and characteristics of them.

Prior Knowledge

- Whole numbers, divisors and Prime numbers

Preparation

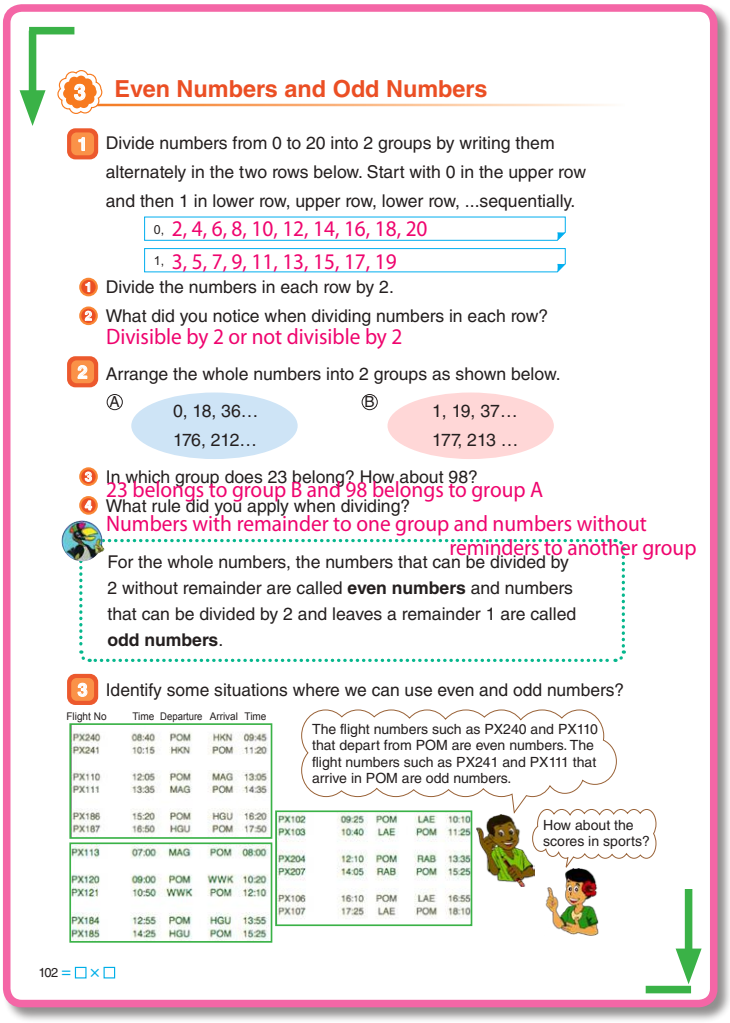
- Chart of important point
- Chart of tasks 1 and 2

Assessment

- Identify the characteristics of even and odd numbers when dividing by 2. F
- Investigate where even and odd numbers are used in our surroundings. F
- Demonstrate the understanding of the characteristics of even and odd number. S

Teacher's Notes

- Since odd numbers and even numbers are used in various places around us, searching for "even numbers" and "odd numbers" in our daily lives can be given as a homework.



3 Even Numbers and Odd Numbers

1 Divide numbers from 0 to 20 into 2 groups by writing them alternately in the two rows below. Start with 0 in the upper row and then 1 in lower row, upper row, lower row, ...sequentially.

0. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

1. 3, 5, 7, 9, 11, 13, 15, 17, 19

1 Divide the numbers in each row by 2.

2 What did you notice when dividing numbers in each row?

Divisible by 2 or not divisible by 2

2 Arrange the whole numbers into 2 groups as shown below.

Ⓐ 0, 18, 36… 176, 212…

Ⓑ 1, 19, 37… 177, 213 …

3 In which group does 23 belong? How about 98?

23 belongs to group B and 98 belongs to group A

4 What rule did you apply when dividing?

Numbers with remainder to one group and numbers without reminders to another group

For the whole numbers, the numbers that can be divided by 2 without remainder are called **even numbers** and numbers that can be divided by 2 and leaves a remainder 1 are called **odd numbers**.

3 Identify some situations where we can use even and odd numbers?

Flight No	Time	Departure	Arrival	Time
PX240	08:40	POM	HKN	09:45
PX241	10:15	HKN	POM	11:20
PX110	12:05	POM	MAG	13:05
PX111	13:35	MAG	POM	14:35
PX186	15:20	POM	HGU	16:20
PX187	16:50	HGU	POM	17:50
PX113	07:00	MAG	POM	08:00
PX120	09:00	POM	WWK	10:20
PX121	10:50	WWK	POM	12:10
PX184	12:55	POM	HGU	13:55
PX185	14:25	HGU	POM	15:25

PX102	09:25	POM	LAE	10:10
PX103	10:40	LAE	POM	11:25
PX204	12:10	POM	RAB	13:35
PX207	14:05	RAB	POM	15:25
PX106	16:10	POM	LAE	16:55
PX107	17:25	LAE	POM	18:10

The flight numbers such as PX240 and PX110 that depart from POM are even numbers. The flight numbers such as PX241 and PX111 that arrive in POM are odd numbers.

How about the scores in sports?

102 = □ × □

Lesson Flow

1 Divide the numbers from 0 to 20 into even and odd numbers.

T Introduce the Main Task. (Refer to the BP)
T/S 1 Read and understand the situation.
S Fill in the rows with numbers into two groups.
S 1 Investigate by dividing the numbers in each row by 2.
T 2 What did you notice when dividing numbers in each row?
S Numbers divided by 2 on the upper row have no remainder whereas in the lower row, they have remainder of 1.

2 Dividing the whole numbers into two groups.

T/S 2 Arrange the whole numbers into two groups as shown in Ⓐ and Ⓑ.
T 3 Which group does 23 and 98 belong to, Ⓐ or Ⓑ?
S 23 belongs to group Ⓑ and 98 belongs to group Ⓐ.
T 4 What rule did you apply for dividing the two numbers into two groups?
S Grouping is done according to dividing by 2 with remainders and without remainders.

3 Important Point

T/S Explain the important point in the box .

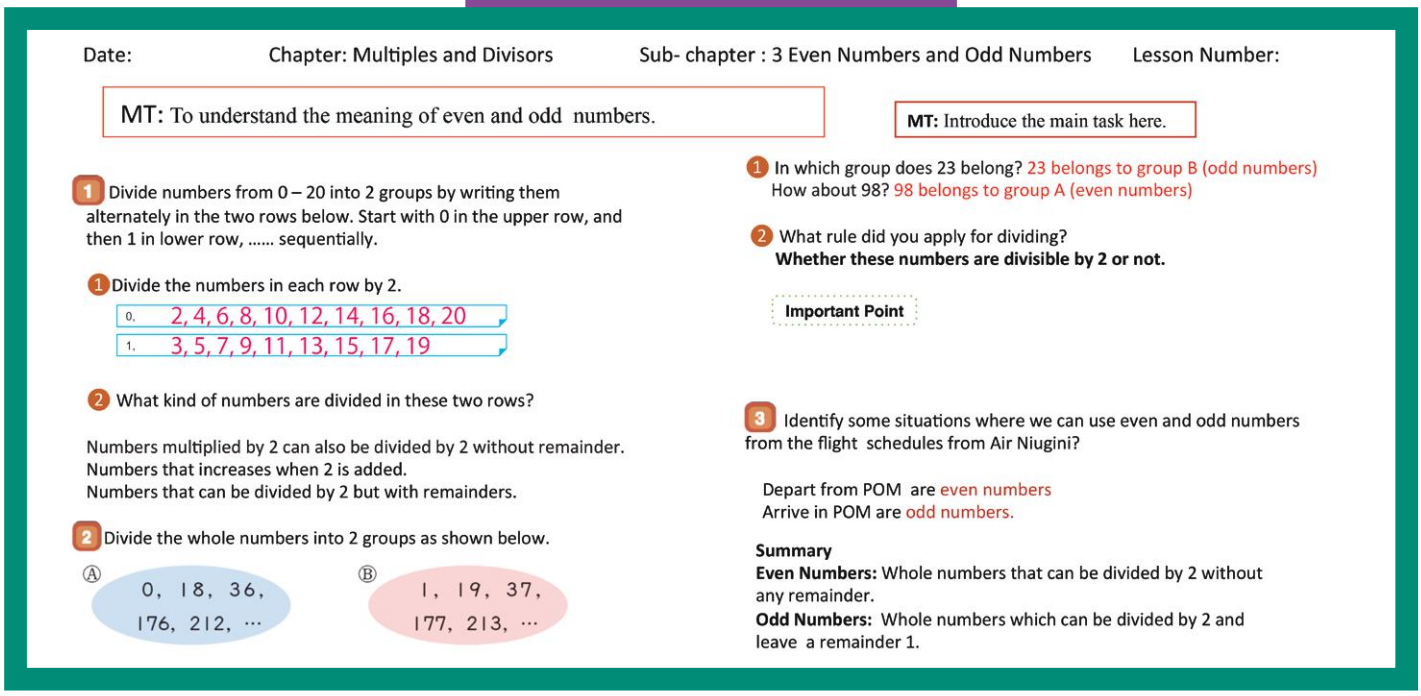
4 3 Think about how even and odd numbers are used in our surroundings.

T/S Discuss the flight schedule to identify even and odd numbers.
T In what other places or situations are even and odd numbers used?
S Possible responses: scores in sports games, temperature, rise and fall of sea levels, etc...

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 7

Unit: Multiples and Divisors
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 103 and 104
Actual Lesson 068 and 069

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 7. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

1 Let's think about numbers up to 50. Pages 88 and 98

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

① Make a list of the multiples of 3. 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48
② Make a list of the multiples of 7. 7, 14, 21, 28, 35, 42, 49
③ Make a list of the common multiples of 3 and 7. 21, 42
④ Make a list of the divisors of 28. 1, 2, 4, 7, 14, 28
⑤ Make a list of the divisors of 32. 1, 2, 4, 8, 16, 32
⑥ Make a list of the common divisors of 28 and 32. 1, 2, 4

2 Let's write the first 3 common multiples of the following pairs of numbers. Then, find the least common multiples. Pages 92 to 94

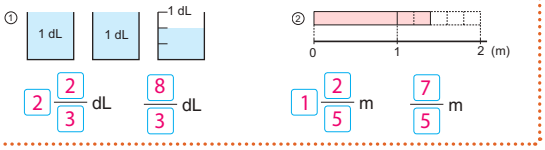
① (3, 6) 6, 12, 18 LCM: 6
② (8, 10) 40, 80, 120 LCM: 40
③ (3, 5) 15, 30, 45 LCM: 15

3 Let's find all the common divisors of the following pairs of numbers. Then, find the greatest common divisors. Pages 95 to 98

① (6, 12) 1, 2, 3, 6 GCD: 6
② (18, 20) 1, 2 GCD: 2
③ (32, 42) 1, 2 GCD: 2

Grade 4 Do you remember?

Express the next volume and length by a mixed fraction and an improper fraction.



$2\frac{2}{3}$ dL $\frac{8}{3}$ dL $1\frac{2}{5}$ m $\frac{7}{5}$ m

□ − □ = 103

PROBLEMS

1 Let's write 3 multiples of the following numbers from the smallest to largest. Find all the divisors for them.
● Finding multiples and divisors.

① 16 16, 32, 48 1, 2, 3, 4, 8, 16
② 13 13, 26, 39 1, 13
③ 24 24, 48, 72 1, 2, 3, 4, 6, 8, 12, 24

2 Let's write 3 common multiples of the following pairs of numbers from the smallest to the largest. Find the least common multiple for them.
● Finding common multiples and least common multiples.

① (3, 7) 21, 42, 63 LCM: 21
② (12, 18) 36, 72, 108 LCM: 36
③ (10, 20) 20, 40, 60 LCM: 20

3 Let's write all the common divisors of the following pairs of numbers.
Find the highest common divisor for them.
● Finding common divisors and the greatest common divisors.

① (9, 15) 1, 3 GCD: 3
② (4, 11) 1 GCD: 1
③ (12, 24) 1, 2, 3, 4, 6, 12 GCD: 12

4 PMV bus A departs every 12 minutes and bus B departs every 8 minutes at 4 mile bus stop. Bus A and B both departed at 9 am. What is the next time that bus A and B will depart at the same time?
● Solving problems by using common multiples or common divisors.
9 : 24 am

5 Start with a sheet of graph paper that is 30 cm wide and 12 cm long. Cut out squares of the same size so that no paper is left over. How many cm is each side of the biggest square? How many of these squares can be cut out?
● Solving problems by using common multiples or common divisors.
10 sets of 6 cm side squares

6 Let's find the prime number that is bigger than 50 and closest to 50.
● Understanding some numbers can be divided by only 1 and itself.
53 (can be divided by only 1 and itself)

104 = □ × □

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.
T Confirm students' answers.
TN 1 Identifying multiples and divisors
2 Finding common multiples and least common multiples.
3 Finding common divisors and greatest common divisors.

2 Solve the Problems

S Solve all the problems.
T Confirm students' answers.
TN 1 Finding multiples and divisors.
2 Finding common multiples and least common multiples.
3 Finding common divisors and the greatest common divisors.
4 and 5 Solving problems by using common multiples or common divisors
6 Understanding that some numbers can be divided by only 1 and itself.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.
S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 7: Multiples and Divisors	Name:	Score / 100

1. Answer the following questions.

[4×20 marks=80 marks]

(1) List 3 consecutive multiples of 8 from the smallest.

Answer: 16, 24 and 32

(2) List 3 consecutive common multiples of 4 and 6 from the smallest.

Answer: 12, 24 and 36

(3) List all the divisors of 36.

Answer: 1, 2, 3, 4, 6, 9, 12, 18 and 36

(4) List all the common divisors of 18 and 24 from the smallest.

Answer: 1, 2, 3 and 6

2. Answer the following questions.

[2×10 marks=20 marks]

(1) For making a smallest square with the rectangular papers of 5 cm length and 8 cm width only, find the side of the smallest square.

Answer: 40 cm

(2) What is the multiple of 7 nearest to 100?

Answer: 98

138

End of Chapter Test **Date:**

Chapter 7: Multiples and Divisors	Name:	Score / 100

1. Answer the following questions.

[4×20 marks=80 marks]

(1) List 3 consecutive multiples of 8 from the smallest.

Answer:

(2) List 3 consecutive common multiples of 4 and 6 from the smallest.

Answer:

(3) List all the divisors of 36.

Answer:

(4) List all the common divisors of 18 and 24 from the smallest.

Answer:

2. Answer the following questions.

[2×10 marks=20 marks]

(1) For making a smallest square with the rectangular papers of 5 cm length and 8 cm width only, find the side of the smallest square.

Answer:

(2) What is the multiple of 7 nearest to 100?

Answer:

Chapter 8 Fractions

1. Content Standard

5.1.1 Apply the process of addition and subtraction to add and subtract the fractions with different denominators.

2. Unit Objectives

- To deepen the understanding about fractions.
- To change whole number or decimal number to fraction and vice versa.
- To recognise that when multiplying or dividing both numerator and denominator by the same number the amount of fraction doesn't change.
- To recognise that the quotient of division of whole number can be expressed as a fraction.
- To understand how to compare the fraction with different denominators.

3. Teaching Overview

In this unit, students will expand their conception of fractions with the introduction of equivalent fractions.

Equivalent Fractions :

There are infinite expressions of a fraction and that is by changing the denominator and the numerator of a fraction. Students will then know that there are always equivalent fractions for any fractions.

Comparison of Fractions :

They will know that they can compare fractions by making the same denominators.

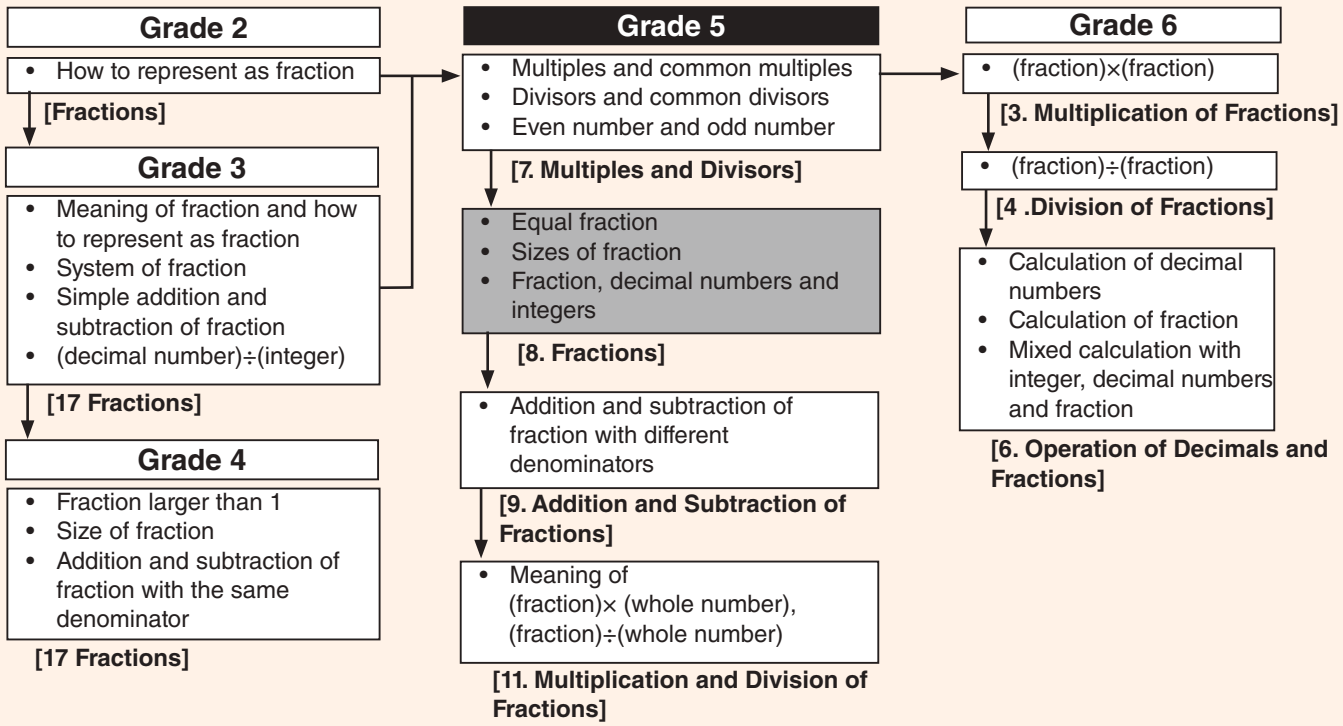
As they experience making denominators bigger by making its equivalent fractions, they also acquire the skill of canceling unconsciously.

Fractions, Decimals and Whole Numbers :

They will learn that the result of a division can be expressed as a fraction.

Through doing many divisions, they will also find the relationship among fraction, decimal, and whole number and their correspondences.

4. Related Learning Contents



Unit 8

Unit: Fractions
Sub-unit 1: Equivalent Fractions
Lesson 1 of 1

Textbook Page : 106 to 109
Actual Lesson 070

Sub-unit Objectives

- To understand that even the denominator or numerator are different, the same amount of fraction can be made.
- To understand that when multiplying or dividing both numerator and denominator by the same number the amount of fraction doesn't change.

Lesson Objectives

- To express a unit fraction as various fractions.
- To investigate the fractions which have the same amount of quantity.

Prior Knowledge

- Equivalent fractions using number lines (Grade 4)
- Fraction unit idea (Grade 4)
- Fractions equal to $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{3}{4}$ (Grade 4)

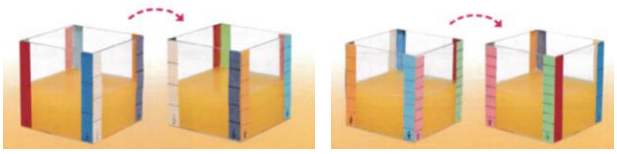
Preparation

- Fraction measuring container (Prepare fraction measuring container as seen in the textbook), juice (use water or other liquids if juice is not available)

Assessment

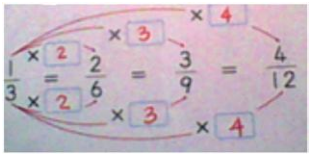
- Think about how same amount of juice can be represented in various fractions. F
- Compare and find the equivalent fraction using unit fraction idea. F S

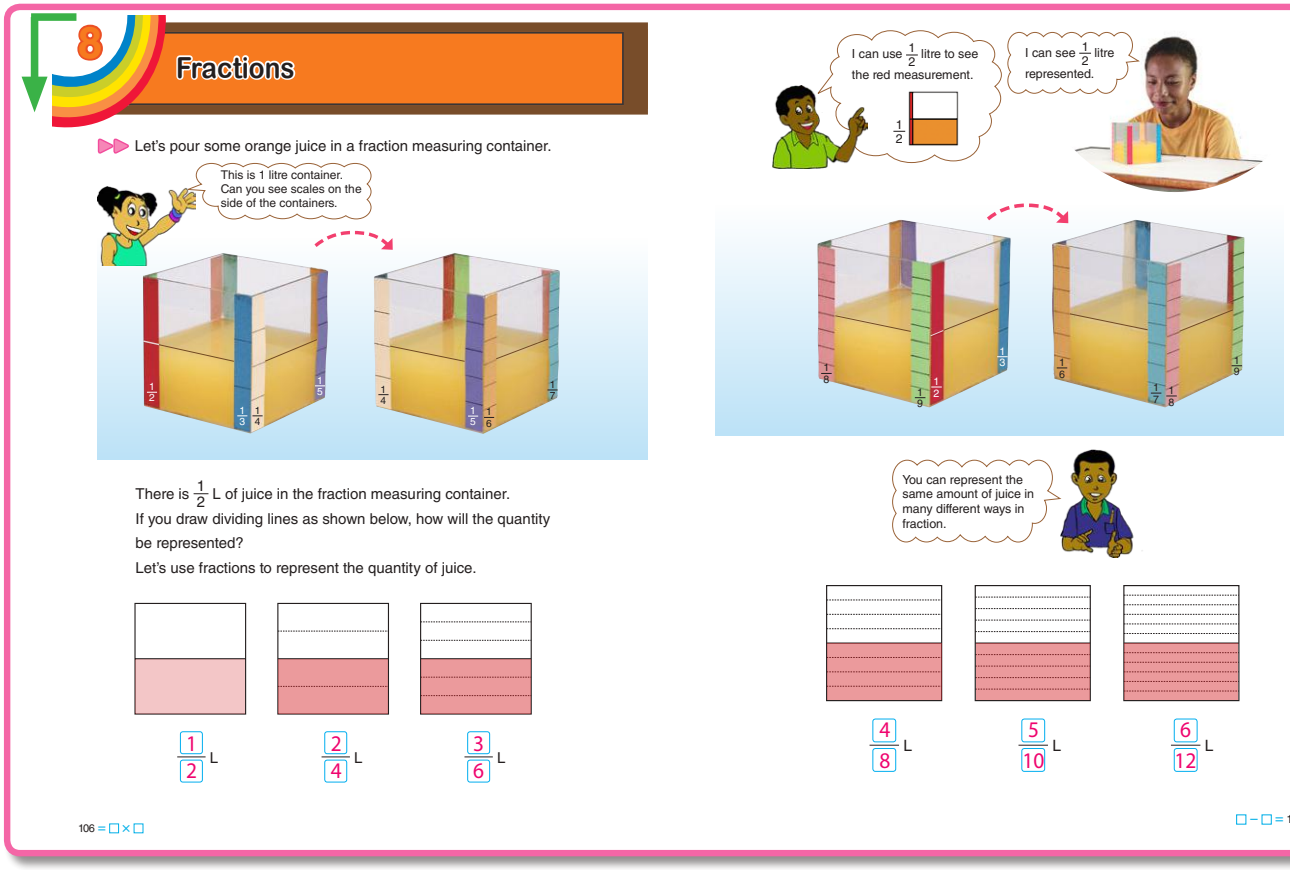
Teacher's Notes



Students should know that the amount of juice as $\frac{1}{2}$ L does not change. The unit fraction changes to different fractions with the same amount of juice. This leads to the clear understanding of making equivalent fraction for $\frac{1}{2}$ L.

- Making equivalent fractions, the numerator and the denominator are multiplied by the same number.





Lesson Flow

1 Think about equal fraction when using the juice in the measuring container.

T Introduce the Main Task. (Refer to the BP)
T/S Read and understand the situation.
T Ask the students to observe the 1 L juice in the fraction measuring container and discuss about what they can see.
S Express that the juice measure $\frac{1}{2}$ L can also be measured using other fraction containers.
TN Appreciate students' responses and their reasons to what they have observed.
T Confirm students' responses.
T Ask students to shade the portion and write the fraction in Litres.
S Represent the quantity of juice in fraction. ($\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$, $\frac{5}{10}$ and $\frac{6}{12}$)

2 ① Explore equivalence of fractions using the number line.

T/S Use the number line to explore the equivalence of fractions.

3 ① Find the fractions which are equivalent to $\frac{1}{2}$ and $\frac{1}{3}$.

T Let the students use the equivalence of fractions on the number lines for ① and ②.
S Write the equivalent fractions for $\frac{1}{2}$ and $\frac{1}{3}$ by filling in the box □.

4 ③ ④ Find how many times the numerator and the denominator are multiplied by a number of the fraction $\frac{1}{2}$ and $\frac{1}{3}$.

S Find and write the numbers which are multiplied to each denominator and the numerator of the fraction $\frac{1}{2}$ and $\frac{1}{3}$.

5 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

6 Summary

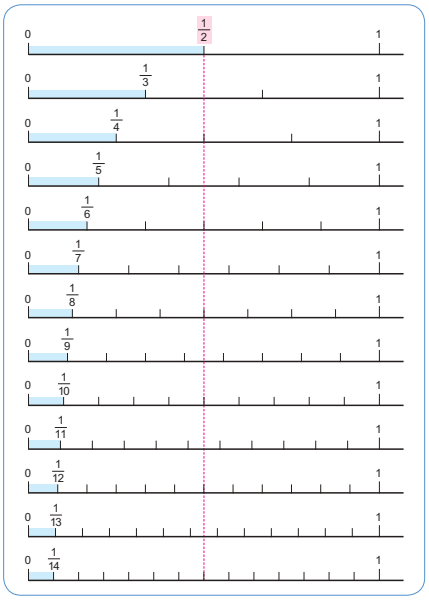
T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Lesson 070 Sample Blackboard Plan is on page 153.

① Equivalent Fractions

① Let's explore the equivalence of fractions by using the number line.



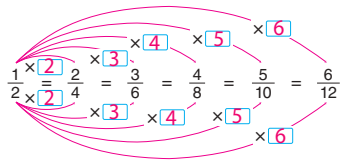
① Let's find fractions, which are equivalent to $\frac{1}{2}$.

$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{6}{12} = \frac{7}{14}$

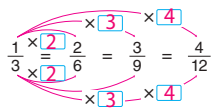
② Let's find fractions, which are equivalent to $\frac{1}{3}$.

$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$

③ What numbers are multiplied to each denominator and numerator of the fraction $\frac{1}{2}$ in problem ①?

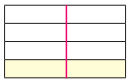


④ What numbers are multiplied to each denominator and numerator of the fraction $\frac{1}{3}$ in problem ②?



Exercise
Let's develop 4 fractions which are equivalent to $\frac{1}{4}$.

(ex.)



Unit 8: Unit: Fractions
Sub-unit 2: Comparison of Fractions
Lesson 1 of 4

Textbook Page : 110 and 111
Actual Lesson 071

Sub-unit Objectives

- To understand how to compare fractions with different denominators.
- To understand how to make equivalent fractions.
- To understand how to reduce fractions.

Lesson Objectives

- Compare fractions with different denominators by changing their representations using the same denominator.
- To identify and understand the meaning of equivalent fraction.

Prior Knowledge

- Making equivalent fractions by multiplying the numerator and denominator with the same number

Preparation

- Chart of diagram representation for 1

Assessment

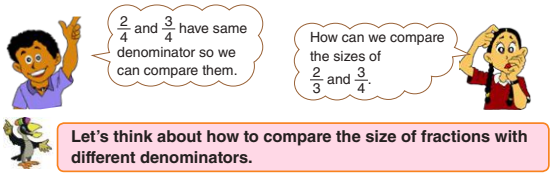
- Think about how to compare fractions with different denominators by changing their representations using the same denominator. F
- Understand the meaning of equivalent fractions. S

Teacher's Notes

This lesson focuses on "How to compare factions with different denominators."
Firstly, treat individual fraction to find the equivalent fraction by multiplying or dividing the numerator and the denominator with the same number.
$\frac{4}{3}=\frac{4}{6}$, $\frac{6}{9}$ and $\frac{8}{12}$
$\frac{3}{4}=\frac{6}{8}$ and $\frac{9}{12}$.
Secondly, make comparisons to identify the same denominator from the equivalent fractions made.
$\frac{2}{3}=\frac{4}{6}$, $\frac{6}{9}$ and $\frac{8}{12}$
$\frac{3}{4}=\frac{6}{8}$ and $\frac{9}{12}$.
Thirdly, change the fractions to the same denominator and compare.
$\frac{2}{3}=\frac{8}{12}$ < less or smaller than $\frac{3}{4}=\frac{9}{12}$.

2 Comparision of Fractions

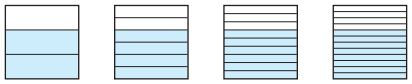
Let's compare the sizes of $\frac{2}{4}$, $\frac{2}{3}$ and $\frac{3}{4}$.



Let's think about how to compare the size of fractions with different denominators.

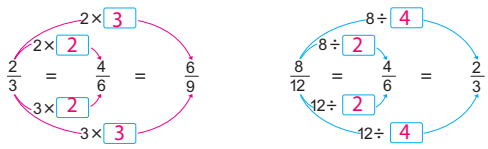
1 Let's think about how to compare $\frac{2}{3}$ and $\frac{3}{4}$.

1 Let's represent $\frac{2}{3}$ using various fractions.



Ⓐ Let's represent $\frac{2}{3}$ by $\frac{1}{6}$, $\frac{1}{9}$ and $\frac{1}{12}$ as the units. $\frac{4}{6}$, $\frac{6}{9}$, $\frac{8}{12}$

Ⓑ What is the relationship between denominators and numerators of equivalent fractions?



The size of fractions does not change even if the numerator and denominator are multiplied or divided by the same number.

$\frac{▲}{●}=\frac{▲\times■}{●\times■}=\frac{▲\div■}{●\div■}$

110 = □ × □

Page 111 of the textbook

2 Let's represent $\frac{3}{4}$ by $\frac{1}{8}$, $\frac{1}{12}$ and $\frac{1}{16}$ as the units.

$\frac{3}{4}=\frac{3\times 3}{4\times 3}=\frac{9}{12}$

The same fraction can be represented in many ways by changing the units.

3 Let's compare $\frac{2}{3}$ and $\frac{3}{4}$ by changing their representation using the same denominator.

$\frac{2}{3}=\frac{8}{12}$, $\frac{3}{4}=\frac{9}{12}$ therefore, $\frac{2}{3}$ < $\frac{3}{4}$

Lesson Flow

1 Review the previous lesson.

2 Compare the sizes of $\frac{2}{4}$, $\frac{2}{3}$ and $\frac{3}{4}$.

T Which of these fractions can be compared easily?
S Express that $\frac{2}{4}$ and $\frac{3}{4}$ can be compared.
T Explain why they can be compared easily?
S $\frac{2}{4}$ and $\frac{3}{4}$ have the same denominator so we can compare them and realise that $\frac{2}{3}$ and $\frac{3}{4}$ are difficult to compare because they have different denominators.
T How can we compare $\frac{2}{3}$ and $\frac{3}{4}$?
S Present their ideas.
T Introduce the Main Task. (Refer to the BP)

3 ① Think about how to compare the size of fractions with different denominators.

T Emphasise that since $\frac{2}{3}$ and $\frac{3}{4}$ have different denominators, how can we compare them?
S ① Observe the representation of $\frac{2}{3}$ in various fractions using the fraction unit of $\frac{1}{6}$, $\frac{1}{9}$ and $\frac{1}{12}$.
T Let's represent $\frac{2}{3}$ by units of $\frac{1}{6}$, $\frac{1}{9}$ and $\frac{1}{12}$. (Refer to diagram)
S Ⓐ Identify $\frac{2}{3}$ by fraction unit of $\frac{1}{6}$ is $\frac{4}{6}$, $\frac{1}{9}$ is $\frac{6}{9}$ and $\frac{1}{12}$ is $\frac{8}{12}$.
TN The quantity remains the same however the fraction (numerator and denominator) changes to make other equal fractions which are equivalent fractions to $\frac{2}{3}$.

4 ① Ⓑ Finding the relationship between the numerator and denominator of the equivalent fractions.

S Write the correct answers by filling in the box ☐ to find the relationship between the denominators and numerators of equivalent fractions.

5 Important Point

T/S Explain the important point in the box ☐.

6 ② Represent $\frac{3}{4}$ by using unit fraction of $\frac{1}{8}$, $\frac{1}{12}$ and $\frac{1}{16}$.

S Write the correct answers by filling in the box ☐ by multiplying the numerator and the denominator with the same number.

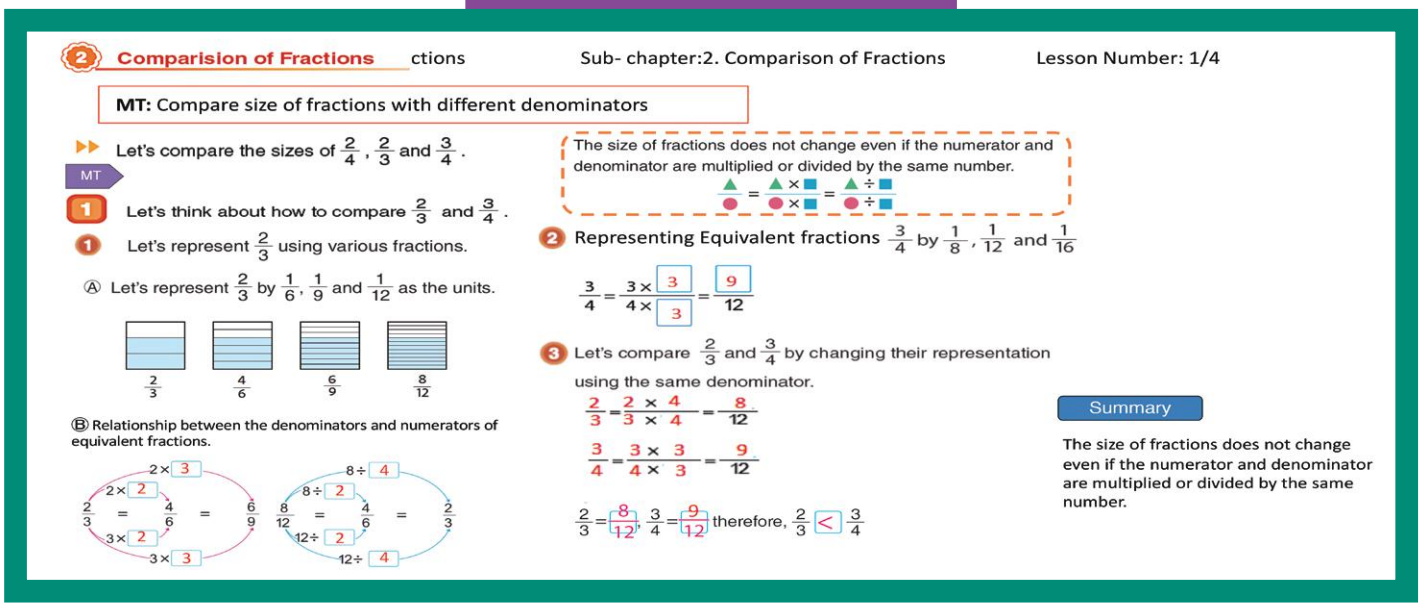
7 ③ Comparing $\frac{2}{3}$ and $\frac{3}{4}$ by changing their representations using the same denominator.

T Ask the students to look back when finding the equivalent fractions for $\frac{2}{3}$ and $\frac{3}{4}$.
S Identify the equivalent fractions for $\frac{2}{3}$ and $\frac{3}{4}$.
$\frac{2}{3}=\frac{8}{12}$
$\frac{3}{4}=\frac{9}{12}$ and therefore, $\frac{2}{3}<\frac{3}{4}$.
T What is the same denominator to find the equivalent fraction for $\frac{2}{3}$ and $\frac{3}{4}$?
TN In order to find the same denominator, we use the idea of finding the least common multiple.
S Find the same denominator as 12 and compare the two fractions by filling in the box ☐.

8 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 8

Unit: Fractions
Sub-unit 2: Comparison of Fractions
Lesson 2 of 4

Textbook Page : 112
Actual Lesson 072

Lesson Objective

- Convert the fractions with different denominators to a common denominator and understand the meaning of equivalent fractions.

Prior Knowledge

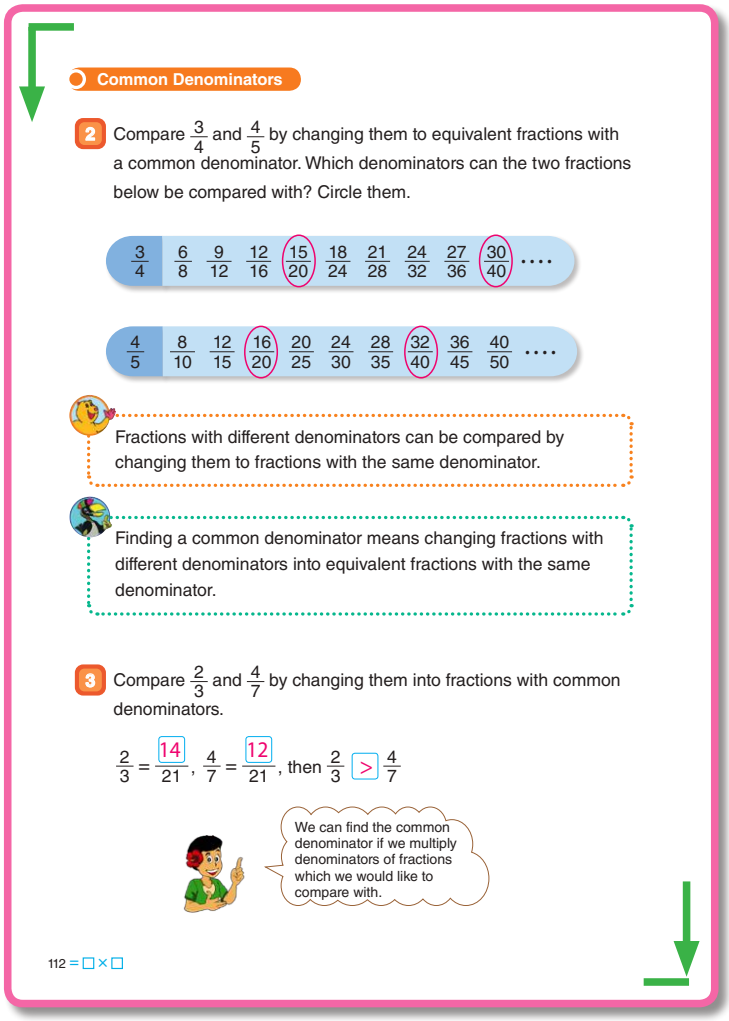
- The size of fractions does not change even if the numerator and the denominator are multiplied or divided by the same number.
- Comparing the fractions with different denominators when converting the different denominators to the same denominator.

Preparation

- Chart of equivalent fractions

Assessment

- Think about how to compare the fractions with different denominators to same denominators to make equivalent fraction and compare. F S



Common Denominators

2 Compare $\frac{3}{4}$ and $\frac{4}{5}$ by changing them to equivalent fractions with a common denominator. Which denominators can the two fractions below be compared with? Circle them.

$\frac{3}{4}$ $\frac{6}{8}$ $\frac{9}{12}$ $\frac{12}{16}$ $\frac{15}{20}$ $\frac{18}{24}$ $\frac{21}{28}$ $\frac{24}{32}$ $\frac{27}{36}$ $\frac{30}{40}$ ....

$\frac{4}{5}$ $\frac{8}{10}$ $\frac{12}{15}$ $\frac{16}{20}$ $\frac{20}{25}$ $\frac{24}{30}$ $\frac{28}{35}$ $\frac{32}{40}$ $\frac{36}{45}$ $\frac{40}{50}$ ....

Fractions with different denominators can be compared by changing them to fractions with the same denominator.

Finding a common denominator means changing fractions with different denominators into equivalent fractions with the same denominator.

3 Compare $\frac{2}{3}$ and $\frac{4}{7}$ by changing them into fractions with common denominators.

$\frac{2}{3} = \frac{14}{21}$, $\frac{4}{7} = \frac{12}{21}$, then $\frac{2}{3} > \frac{4}{7}$

We can find the common denominator if we multiply denominators of fractions which we would like to compare with.

112 = □×□

Teacher's Notes

In this lesson the main idea is to find the common denominator for the fractions with different denominators and make comparison. The fractions with different denominators can be compared when the different denominators are made the same.

1. Change the given fractions to equivalent fractions to find the common denominator.

$\frac{3}{4}$ $\frac{6}{8}$ $\frac{9}{12}$ $\frac{12}{16}$ $\frac{15}{20}$ $\frac{18}{24}$ $\frac{21}{28}$ $\frac{24}{32}$ $\frac{27}{36}$ $\frac{30}{40}$ ....

$\frac{4}{5}$ $\frac{8}{10}$ $\frac{12}{15}$ $\frac{16}{20}$ $\frac{20}{25}$ $\frac{24}{30}$ $\frac{28}{35}$ $\frac{32}{40}$ $\frac{36}{45}$ $\frac{40}{50}$ ....

The common denominators are 20 and 40. Comparing using 20 and 40 as common denominators $\frac{3}{4}$ is smaller than $\frac{4}{5}$.

2. To find the common denominator the denominators of fractions to be compared are multiplied.
$\frac{2}{3}$ and $\frac{4}{7}$ (3×7 or $7\times3=21$ becomes the common denominator.)

The common denominator is 21 therefore $\frac{2}{3}$ is greater than $\frac{4}{7}$

$\frac{4\times3=12}{7\times3=21}$

$\frac{2\times7=14}{3\times7=21}$

The numerators and denominators are multiplied by the same number to make equivalent fractions.

Lesson Flow

1 Review the previous lesson.

2 (2) Think about how to compare $\frac{3}{4}$ and $\frac{4}{5}$.

T Introduce the Main Task. (Refer to the BP)

T/S Read and understand the situation.

T How can we compare $\frac{3}{4}$ and $\frac{4}{5}$?

S By changing the representations using the same denominator from previous lesson.

T Confirm students' responses.

TN Students realise and understand that to compare $\frac{3}{4}$ and $\frac{4}{5}$, the fractions have to be changed to equivalent fractions with a common denominator.

T Ask students to observe the equivalent fraction for $\frac{3}{4}$ and $\frac{4}{5}$ and circle the denominators that can be used to compare the two fractions.

S $\frac{5}{4}\ \frac{15}{20}, \frac{30}{40}$

$\frac{5}{4}\ \frac{16}{20}, \frac{32}{40}$

TN There are two fractions with common denominators, however, we can compare using the first fractions with a common denominator.

3 Important Points.

T/S Explain the important points in the boxes ☐ and ☐.

4 (3) Compare $\frac{2}{3}$ and $\frac{4}{7}$ by changing them into fractions to common denominators.

S Fill in the box ☐ with equivalent fraction for $\frac{2}{3}$ and $\frac{4}{7}$ by multiplying the denominators then compare with the inequality sign.

$\frac{2}{3} \xrightarrow{\times 7} \frac{\square}{21}$ $\frac{4}{7} \xrightarrow{\times 3} \frac{\square}{21}$ → Compare $\frac{2}{3} \square \frac{4}{7}$

TN We can find the common denominator of $\frac{2}{3}$ and $\frac{4}{7}$ by multiplying the denominators of both fractions that are compared.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: Chapter:8 Fractions Sub- chapter:2. Comparison of Fractions Lesson Number: 2/4

MT: Compare fractions with different denominators by converting them to fractions with common denominators.

Review

MT

2 Compare $\frac{3}{4}$ and $\frac{4}{5}$ by changing them to equivalent fractions with a common denominator.

Fraction as same amount of $\frac{3}{4}$

$\frac{3}{4}\ \frac{6}{8}\ \frac{9}{12}\ \frac{12}{16}\ \frac{15}{20}\ \frac{18}{24}\ \frac{21}{28}\ \frac{24}{32}\ \frac{27}{36}\ \frac{30}{40}$ ....

Next will be $\frac{45}{60}, \frac{60}{80}$ ...

Fraction as same amount of $\frac{4}{5}$

$\frac{4}{5}\ \frac{8}{10}\ \frac{12}{15}\ \frac{16}{20}\ \frac{20}{25}\ \frac{24}{30}\ \frac{28}{35}\ \frac{32}{40}\ \frac{36}{45}\ \frac{40}{50}$ ....

Next will be $\frac{48}{60}, \frac{64}{80}$ ...

Fractions with different denominators can be compared by changing them to fractions with the same denominator.

Finding a common denominator means changing fractions with different denominators into equivalent fractions with the same denominator.

3 Compare $\frac{2}{3}$ and $\frac{4}{7}$ by changing them into fractions with common denominators.

$\frac{2}{3} = \frac{14}{21}$, $\frac{4}{7} = \frac{12}{21}$, then, $\frac{2}{3} > \frac{4}{7}$

Summary

Fractions with different denominators can be compared by changing them to fractions with common denominators and then calculate.

Unit 8: Unit: Fractions

Sub-unit 2: Comparison of Fractions

Lesson 3 of 4

Textbook Page : 113
Actual Lesson 073

Lesson Objectives

- Identify and find the least common multiples as common denominators in equivalent fractions to compare sizes of given fractions.
- Identify how to compare mixed fractions and improper fractions using a common denominator.

Prior Knowledge

- Comparing the fractions with different denominators when converting the different denominators to the same denominator.
- Finding a common denominator means changing fractions with different denominators into equivalent fractions with the same denominator.

Preparation

- Chart of Mero's and Yamo's Ideas

Assessment

- Think about how to find the least common multiples as common denominators. F
- Compare mixed fractions and improper fractions using a common denominator. F S

Teacher's Notes

To find the common denominator for two fractions that are compared, one idea discussed in this lesson is to multiply the two denominators to get a common denominator as shown below:

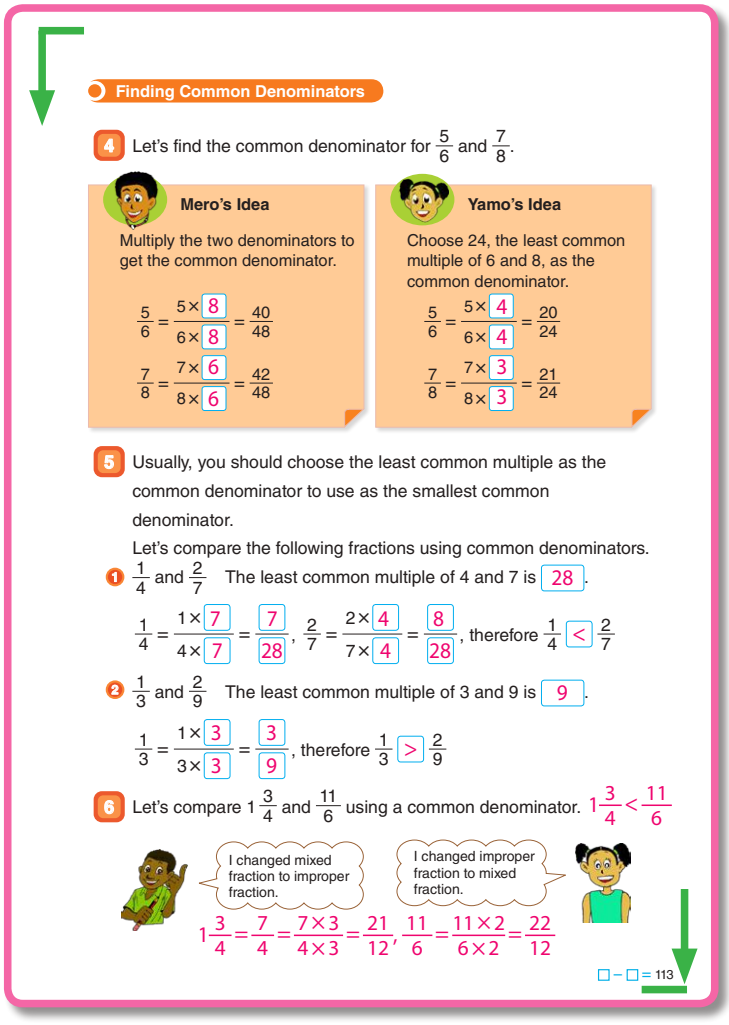
$$\frac{4}{5}=\frac{4\times\square}{5\times\square}=\frac{18}{30}$$

$$\frac{2}{3}=\frac{2\times\square}{3\times\square}=\frac{10}{30}$$

The other idea is to choose the least common multiple of 5 and 3 as the common denominator.

$$\frac{4}{5}=\frac{4\times\square}{5\times\square}=\frac{12}{15}$$

$$\frac{2}{3}=\frac{2\times\square}{3\times\square}=\frac{10}{15}$$



Finding Common Denominators

4 Let's find the common denominator for $\frac{5}{6}$ and $\frac{7}{8}$.

Mero's Idea

Multiply the two denominators to get the common denominator.

$\frac{5}{6}=\frac{5\times 8}{6\times 8}=\frac{40}{48}$

$\frac{7}{8}=\frac{7\times 6}{8\times 6}=\frac{42}{48}$

Yamo's Idea

Choose 24, the least common multiple of 6 and 8, as the common denominator.

$\frac{5}{6}=\frac{5\times 4}{6\times 4}=\frac{20}{24}$

$\frac{7}{8}=\frac{7\times 3}{8\times 3}=\frac{21}{24}$

5 Usually, you should choose the least common multiple as the common denominator to use as the smallest common denominator.

Let's compare the following fractions using common denominators.

1 $\frac{1}{4}$ and $\frac{2}{7}$ The least common multiple of 4 and 7 is 28.

$\frac{1}{4}=\frac{1\times 7}{4\times 7}=\frac{7}{28}$, $\frac{2}{7}=\frac{2\times 4}{7\times 4}=\frac{8}{28}$, therefore $\frac{1}{4}<\frac{2}{7}$

2 $\frac{1}{3}$ and $\frac{2}{9}$ The least common multiple of 3 and 9 is 9.

$\frac{1}{3}=\frac{1\times 3}{3\times 3}=\frac{3}{9}$, therefore $\frac{1}{3}>\frac{2}{9}$

6 Let's compare $1\frac{3}{4}$ and $\frac{11}{6}$ using a common denominator. $1\frac{3}{4}<\frac{11}{6}$

I changed mixed fraction to improper fraction.

I changed improper fraction to mixed fraction.

$1\frac{3}{4}=\frac{7}{4}=\frac{7\times 3}{4\times 3}=\frac{21}{12}$, $\frac{11}{6}=\frac{11\times 2}{6\times 2}=\frac{22}{12}$

□ – □ = 113

Lesson Flow

1 Review the previous lesson.

2 4 Find the common denominator for $\frac{5}{6}$ and $\frac{7}{8}$.

T Introduce the Main Task. (Refer to the BP)

TN In the other lessons, fractions with different denominators were converted into equivalent fractions with the same denominator to compare.

T Ask students to find the common denominator for $\frac{5}{6}$ and $\frac{7}{8}$.

S Present their ideas with reasons.

T Let the students discuss and explain the ideas used by Mero and Yamo.

S Observe the two ideas and fill in the box ☐ and share their explanations.

TN Mero's Idea - He multiplied the two denominators to get the common denominator.
6×8 and 8×6 and both gives the common denominator 48.
Yamo's Idea - She chose the least common multiple of 6 & 8 as the common denominator which is 24.

S Identify the least common multiple which is usually used as the lowest common denominator to compare fractions with different denominators.

3 5 Find the common denominator for fractions in 1 and 2.

S Compare the following fractions using common denominators for 1 and 2.

S Complete the two activities.

T Confirm students' answers.

4 6 Compare mixed fraction and improper fraction using a common denominator.

T Compare $1\frac{3}{4}$ and $\frac{11}{6}$ using a common denominator.

TN Use the hints in the bubbles to find the common denominator.

S Change the fractions to either mixed fractions or improper fractions to find the common denominators for both fractions.

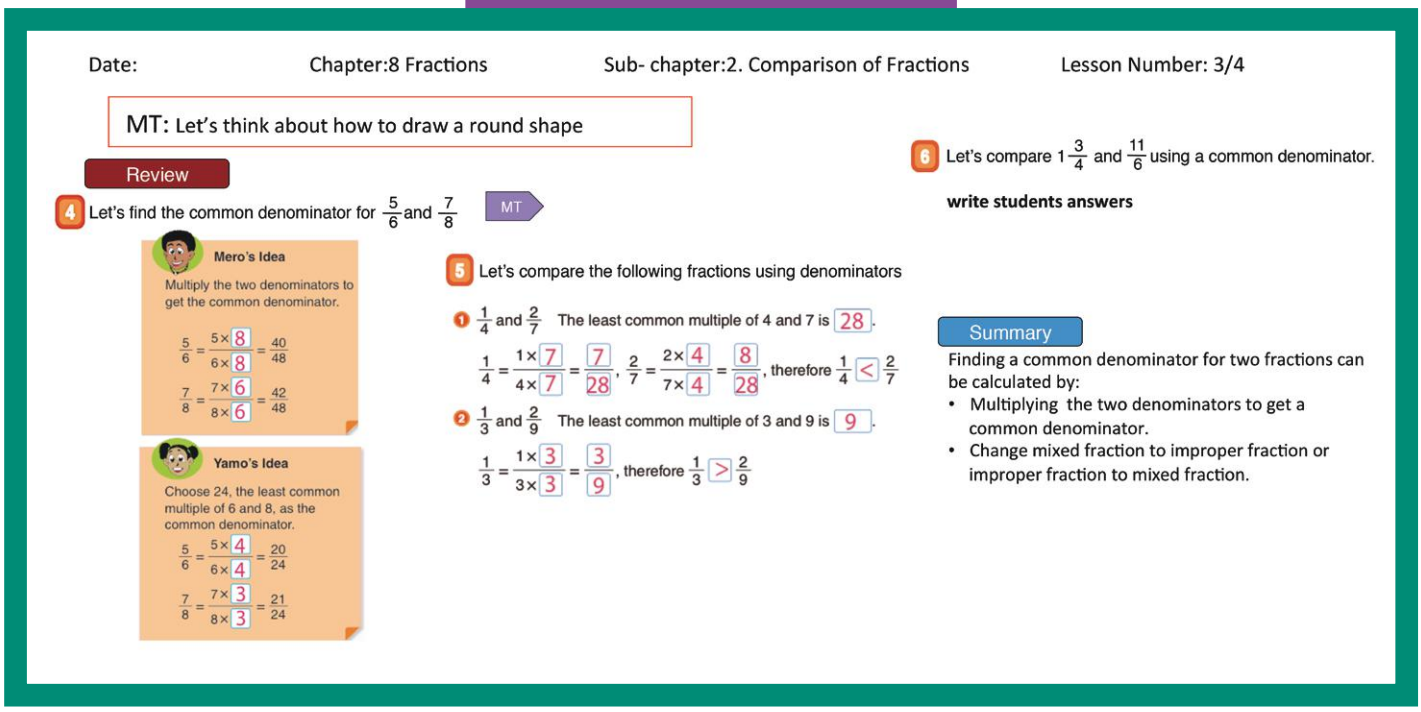
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 8: Unit: Fractions
Sub-unit 2: Comparison of Fractions
Lesson 4 of 4

Textbook Page : 114 and 115
Actual Lesson 074

Lesson Objectives

- Define and understand the meaning of reduction of fractions and how to reduce fraction.
- Reduce given fractions by finding and using the Greatest Common Divisor.

Prior Knowledge

- Meaning of making equivalent fraction and comparing fractions using equivalent fractions.
- How to find the common denominator using least common multiple or multiplying the two denominators in given fractions.

Preparation

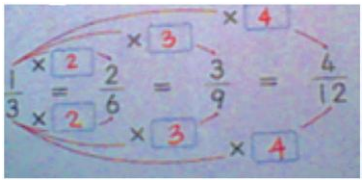
- Chart of Important Point

Assessment

- Define and understand the meaning of reduction of fraction. F
- Explain how to reduce the fractions using the Greatest Common Divisor. F S
- Solve the exercise correctly. S

Teacher's Notes

To find Equivalent fractions with the common denominator for comparison, the numerator and denominator are multiplied with the same number that increases the numerators and denominators making them become bigger fractions.

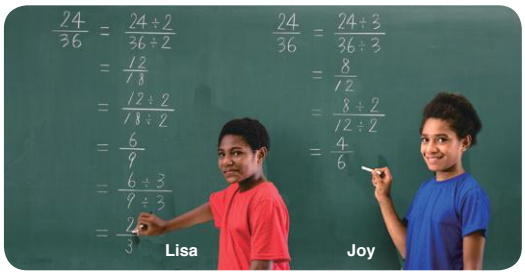


In Reduction of Fraction the numerator and denominator are divided by a number bigger, so the numerator or denominator can be divided with the same common factor by making the denominator as small as possible.

$$\frac{24}{36} \overset{\div 2}{=} \frac{12}{18} \overset{\div 2}{=} \frac{6}{9} \overset{\div 3}{=} \frac{2}{3}$$

Reducing Fractions

7 Lisa and Joy are looking for fractions that are equivalent to $\frac{24}{36}$ and with denominators and numerators smaller than 36 and 24.



1 What rule of fraction are they using?
Common denominators and Least common multiples
2 Lisa and Joy got different fractions. Explain their reasons.

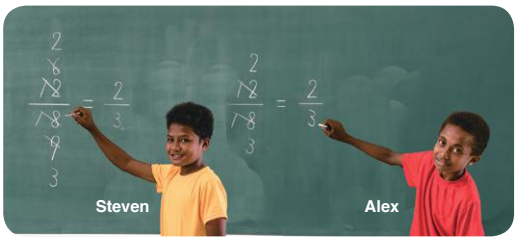
Because

It is a word used to explain, by stating the conclusion first and then explaining why by showing a reason.
" ○○○ is because △△△ ".
For example: We reduce fractions **because** it makes calculation easier.

Reducing a fraction means dividing the numerator and denominator by a common divisor to make a simpler fraction.

When we reduce a fraction, we usually divide until we get the smallest numerator and denominator.

8 Steven and Alex reduced $\frac{12}{18}$. Let's explain their ideas.



1 What are the similarities in their ideas?
Idea of common divisors
2 What are the differences between their ideas?
Steven divides with greatest common divisor
Alex divides with least common divisor

When you reduce a fraction, use the greatest common divisor to reduce the denominator and numerator, just like Alex did in 8.

Exercise

1 Let's reduce these fractions to a common denominator and fill in the □ with inequality signs.

① $\frac{2}{3} < \frac{4}{5}$ ② $\frac{1}{2} > \frac{3}{8}$ ③ $\frac{5}{6} < \frac{8}{9}$ ④ $\frac{7}{12} < \frac{5}{8}$

2 Let's reduce these fractions.

① $\frac{8}{10} \frac{4}{5}$ ② $\frac{3}{21} \frac{1}{7}$ ③ $\frac{16}{20} \frac{4}{5}$ ④ $\frac{18}{24} \frac{3}{4}$

114 = □ × □

□ − □ = 115

Lesson Flow

1 Review the previous lesson.

2 ⑦ Think about how to reduce the fraction $\frac{24}{36}$

T/S Read and understand the situation.

T Ask the students to think of how to get $\frac{24}{36}$ back to a smaller numerator and denominator by referring to Lisa's and Joy's blackboard work.

S Observe Lisa and Joy's blackboard work and discuss ❶ and ❷.

Possible answers:

❶ They are dividing by the same number in which the amount doesn't change.

❷ They have different fractions because Lisa is dividing by 2, then by 2 and by 3 while Joy is dividing by 3 and then by 2.

T Pose guided questions for students to identify that to get bigger fraction down to smaller fraction division operation is applied and so the numerator or denominator can be divided with the same common number by making the denominator as small as possible.It is called reducing of fractions.

T Introduce the Main Task. (Refer to the BP)

3 Important Point

T/S Explain the important point in the box ⬚.

4 ⑧ Think about how to reduce the fraction $\frac{12}{18}$

T Ask students to observe Steven's and Alex's board presentations and discuss what they can find from the two presentations by answering ❶ and ❷.

S Possible answers are: the similarity is they are dividing the same number to get $\frac{2}{3}$ and the difference is Steven is doing two calculations ÷ by 2 and then ÷ by 3 while Alex is doing only one calculation ÷ by 6.

5 Important Point

T/S Explain the important point in the box ⬚.

6 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: Chapter:8 Fractions Sub- chapter:2. Comparison of Fractions Lesson Number: 4/4

MT: To understand the meaning of reducing a fraction and how to reduce it.

Review

⑦ How to get equivalent fractions of $\frac{24}{36}$ with denominators and numerators smaller than 36 and 24.

❶ What rule of fraction are Joy and Lisa using?

❷ Lisa and Joy got different fractions. Explain their reasons.

MT

Reducing a fraction means dividing the numerator and denominator by a common divisor to make a simpler fraction.

⑧ Steven and Alex reduced $\frac{12}{18}$. Let's explain their ideas in.

÷ by 2 and then ÷ by 3

÷ by greatest common divisor 6

When you reduce a fraction, use the greatest common divisor to reduce the denominator and numerator, just like Alex did in ❷.

Exercise

1 Let's reduce these fractions to a common denominator and fill in the ☐ with inequality signs.

① $\frac{2}{3}$ < $\frac{4}{5}$ ② $\frac{1}{2}$ > $\frac{3}{8}$ ③ $\frac{5}{6}$ < $\frac{8}{9}$ ④ $\frac{7}{12}$ < $\frac{5}{8}$

2 Let's reduce these fractions.

① $\frac{8}{10}$ $\frac{4}{5}$ ② $\frac{3}{21}$ $\frac{1}{7}$ ③ $\frac{16}{20}$ $\frac{4}{5}$ ④ $\frac{18}{24}$ $\frac{3}{4}$

Summary

When reducing a fraction to make it simpler , use the greatest common divisor to divide the numerator and denominator to reduce it .

Unit 8

Unit: Fraction
Sub-unit 3: Fractions, Decimals and Whole Numbers
Lesson 1 of 5

Textbook Page : 116 and 117
Actual Lesson 075

Sub-unit Objectives

- To think about how to express quotient by not using the whole number and the decimal number.
- To understand the relationship among fractions, decimal numbers and whole numbers.
- To change fractions to decimals, fraction to whole numbers and vice versa.

Lesson Objective

- To think about how to express the amount when 2 L is divided into 3 students. (2 ÷ 3)

Prior Knowledge

- Division of whole numbers and decimal numbers (Grade 4)

Preparation

- 2 L milk or other available liquid of 2 L

Assessment

- Think about how to express the quotient of 2 ÷ 3. F
- Understand how to express the quotient of 2 ÷ 3. S

Teacher's Notes

Refer to Page 151

1 Fractions, Decimals and Whole Numbers

Quotients and Fractions

1 When we divide 2 L milk amongst ☐ students equally, how many litres of milk will each student receive?

2 ÷ ☐

1 Enter the numbers from 1 to 5 in the ☐ and calculate the answers.

2 ÷ 1 = 2, 2 ÷ 2 = 1, 2 ÷ 3 = 0.66..., 2 ÷ 4 = 0.5, 2 ÷ 5 = 0.4

2 Divide the above expressions into 3 groups based on the answers.

Ⓐ Answers that are whole numbers.
(2 ÷ 1 2 ÷ 2)

Ⓑ Answers that are expressed exactly as decimal numbers.
(2 ÷ 4 2 ÷ 5)

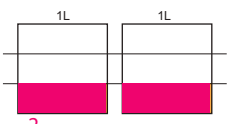
Ⓒ Answers that are not expressed exactly as decimal numbers.
(2 ÷ 3)

2 ÷ 3 is 0.666..., so this cannot be expressed exactly as a decimal number because there is no end.

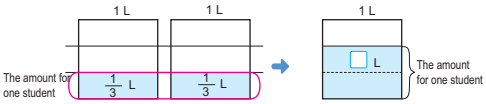
3 When 2 L is divided equally amongst 3 students.

Ⓐ Colour the part for one student in the diagram.

Ⓑ How many L will each student receive? $\frac{2}{3}$ L



Let's see how to express the quotient of a division problem when it cannot be expressed exactly as a decimal number.



The amount for one student when 1 L is divided into 3 equal parts… $\frac{1}{3}$ L.

The amount for one student when 2 L is divided into 3 equal parts… $\frac{2}{3}$ L.

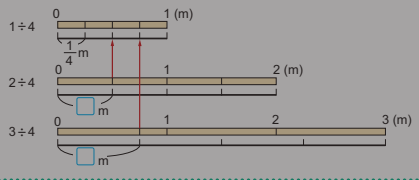
I used $\frac{1}{3}$ L from the first 1 L container and $\frac{1}{3}$ L from the second 1 L container to fill up the empty container.

$2 \div 3 = \frac{2}{3}$

2 Let's find the length of one section when 1 m, 2 m and 3 m string is divided into 4 equal parts?

1 Let's write mathematical expressions for 1 m, 2 m and 3 m strings.

2 Let's find the answers based on a 1 m string?



The quotient of a division problem in which a whole number is divided by another whole number can be expressed as a fraction. ● ÷ ■ = $\frac{●}{■}$

The quotient can be expressed precisely as a fraction.

Exercise

Let's represent the quotient using a fraction.

① 1 ÷ 6 ② 5 ÷ 8 ③ 4 ÷ 3 ④ 9 ÷ 7

116 = □ × □

□ − □ = 117

Lesson Flow

1 ① Think about how many L each student will receive when 2 L is divided among several students.

T Ask the students to have a look at the 2 L of milk or any form of liquid however it must be 2 L and pose the question to the students.
How many litres will each student receive when this 2 L of milk or any form of liquid is divided equally among 1 student, 2 students, 3 students, 4 students and 5 students?

S Think of the question and think about the answer.

T Ask the students to turn to page 114 and read ①
Ask the students to do ① and ②.

S Think about the situation and use the textbook to calculate and answers for ① and ②.

2 How to express 2÷3

T Have students to understand that 2÷3 is 0.6666(recurring)

S Understand that 2÷3 is a decimal quotient that is recurring.

T ③ Ask the students to do Ⓐ and Ⓑ.

S Answer by Ⓐ - colouring 1 part for 1 child.
Ⓑ - identify that 1 child will get $\frac{2}{3}$ L.

T Introduce the Main Task. (Refer to the BP)

3 How to express the quotient of a division problem when it cannot be expressed exactly as a decimal number.

T Move on to page 117 and explain the diagram representation.

S Fill in the box ☐, identify and express the quotient of the division problem 2÷3 to show that it cannot be expressed exactly as a decimal number.

4 Summary

TN Similar to previous lesson summary flow

• Teacher's Notes •

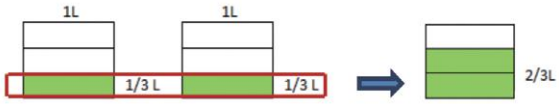
2÷1=2, 2÷2=1 } Whole Number answers

2÷4=0.5, 2÷5=0.4 } Exactly Decimal Number answers

2÷3=0.666.... → Not Exactly Decimal Number answers because there is no end (recurring).

How to express the quotient of a division problem when it cannot be expressed exactly as a decimal number.

2÷3



From 1 L it is known per student will receive $\frac{1}{3}$ L so adding another 1 L makes it 2 L.
2 L÷3 is equal to $\frac{2}{3}$ L per student.

Sample Blackboard Plan

Date: Chapter:8 Fractions Sub- chapter:3. Fractions, Decimals and Whole Numbers Lesson Number: 1/5

MT: Expressing the quotient of when it cannot be expressed exactly as a decimal number.

Review

MT

① When we divide 2 of 1 L milk among ☐ students equally, how many litres will each child receive?
2 ÷ ☐

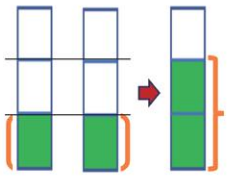
Let's solve activity ① and ② together.

① 2÷1=2, 2÷2= 1, 2÷3= 0.666.... , 2÷4= 0.5, 2÷5= 0.4

② Answers that are whole numbers :
2÷1 and 2÷2
Answers expressed exactly as decimal numbers:
2÷4 and 2÷5
Answers not expressed exactly as decimal numbers:
2÷3

③ When 2 L is divided equally among 3 children.

Ⓐ Colour the part for one child in the diagram.



Ⓑ How many litres will each child receive ?

The amount for one child when 1L is divided into 3 equal parts is $\frac{1}{3}$ L
The amount for one child when 2L is divided into 3 equal parts is $\frac{2}{3}$ L
2 ÷ 3 = $\frac{2}{3}$

Summary

When the quotients (answers) cannot be expressed as decimal number it can be as a fraction.

Unit 8

Unit: Fraction
Sub-unit 3: Fractions, Decimals and Whole Numbers
Lesson 2 of 5

Textbook Page : 117
Actual Lesson 076

Lesson Objective

- To identify and understand that the quotient of division of whole numbers is always expressed as a fraction.

Prior Knowledge

- How to express the quotient of a division problem when it cannot be expressed exactly as a decimal number.
- Divided 2 L÷3 is $\frac{2}{3}$ L $2\div3=\frac{2}{3}$

Preparation

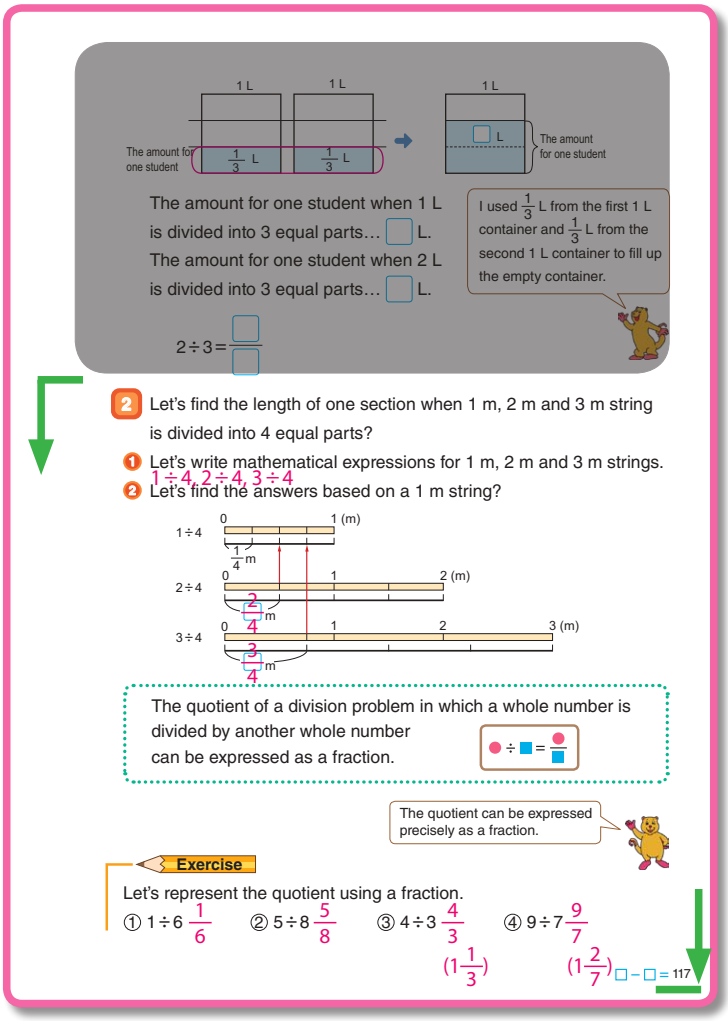
- Tape diagram for 2 2

Assessment

- Understand that the quotient of division problems can be expressed as a fraction. F S
- Solve the exercise correctly. S

Teacher's Notes

In this lesson, the answers to 1÷4, 2÷4 and 3÷4 can also be expressed exactly as decimal numbers. However, the focus is on the length of one section for the tape diagram therefore, answers should be expressed as fraction.
Encourage the students to write answers in fractions and not decimal numbers.



Lesson Flow

1 Review previous lesson.

2 2 Think about how to express one section when 3 m is divided into 4 equal parts.

T Revise 2÷3 by posing questions to students to check their understanding and mathematical thinking.
S Respond to teacher's questions.
T Read the question in 2 How many metres.
S Think about how to express one section when 3 m is divided into 4 equal parts and write a mathematical expression 1.
T Introduce the Main Task. (Refer to the BP)

3 2 Use the tape diagram to express 3÷4 as a fraction.

T Ask the students to use the tape diagram and discuss with friends to find and fill in the box □.

Lesson Flow

S Use the tape diagram to find the length of one section in the expression 3 ÷ 4 and fill in the box ☐.

T Allow the students to present their ideas and answers.

T Introduce the Main Task. (Refer to the BP)

4 Important Point

T/S Explain the important point in the box ☐.

5 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 70)

Date: Chapter: 8 Fractions Sub- chapter: 1. Equivalent Fractions. Lesson Number: 1/1

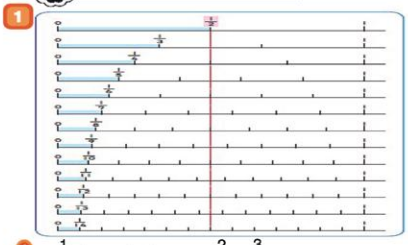
MT: To investigate and express a unit fraction as various fractions using diagram representations.

1 Equivalent Fractions

MT

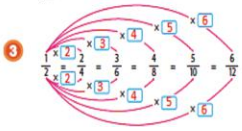
Let's pour some orange juice in a fraction measuring container.
There is $\frac{1}{2}$ L of juice in a fraction measuring container.

Let's use fractions to represent the quantity of juice .
- $\frac{1}{2}$ L in many different ways.
- $\frac{2}{4}$ L, $\frac{3}{6}$ L, $\frac{4}{8}$ L, $\frac{5}{10}$ L....
- The same amount of juice can be represented in many different ways in fractions.

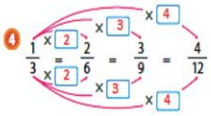


1 $\frac{1}{2}$ is equivalent to, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$, $\frac{5}{10}$, ...

2 $\frac{1}{3}$ is equivalent to, $\frac{2}{6}$, $\frac{3}{9}$, $\frac{4}{12}$

3 

2 times, 3 times, 4 times, etc.

4 

2 times, 3 times, 4 times, etc.

Exercise

Solve the exercise

Summary

- To make equivalent fractions the numerator and the denominator are multiplied by the same number.
- In equivalent fractions the amount does not change it remains the same while the fraction changes.

Sample Blackboard Plan (Lesson76)

Date: Chapter:8 Fractions Sub- chapter:3. Fractions, Decimals and Whole Numbers Lesson Number: 2/5

MT: To understand that division of whole numbers can be expressed as a fraction.

Review

2 Let's Find the length of one section when 1 m, 2 m and 3 m string is divided into 4 equal parts

1 Expression: 3 ÷ 4

1 m ..... 1÷4 = $\frac{1}{4}$ m

2 m..... 2 ÷4 = $\frac{2}{4}$ m

What is the length for one section?

3 m ..... 3 ÷ 4 = $\frac{3}{4}$ m

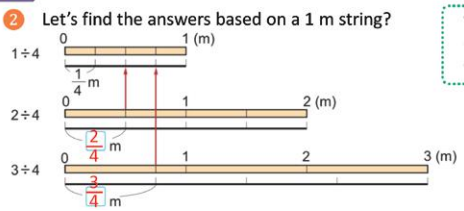
$1 \div 4 = \frac{1}{4}$

$2 \div 4 = \frac{2}{4}$

$3 \div 4 = \frac{3}{4}$

MT

2 Let's find the answers based on a 1 m string?



The quotient of a division problem in which a whole number is divided by another whole number can be expressed as a fraction. ●÷■=●/■

Exercise

Let's represent the quotient using a fraction.

① 1÷6 $\frac{1}{6}$ ② 5÷8 $\frac{5}{8}$ ③ 4÷3 $\frac{4}{3}$ ④ 9÷7 $\frac{9}{7}$

Summary

Division problem of whole number divided by a whole number can be expressed as a fraction.

Unit 8: Unit: Fraction

Sub-unit 3: Fractions, Decimals and Whole Numbers

Lesson 3 of 5

Textbook Page : 118
Actual Lesson 077

Lesson Objective

- Change or convert fractions to decimal numbers or whole numbers.

Prior Knowledge

- Quotient of division of whole numbers is always expressed as a fraction.
- How to express quotients as whole numbers, exactly as decimal numbers and not expressed exactly as decimal numbers.

Preparation

- Number lines for avtivity 3 2

Assessment

- Think about how to convert fractions to decimal numbers or whole numbers. F
- Change or convert fractions to decimal numbers or whole numbers. S

Teacher's Notes

3 Quotient in fraction or decimal.

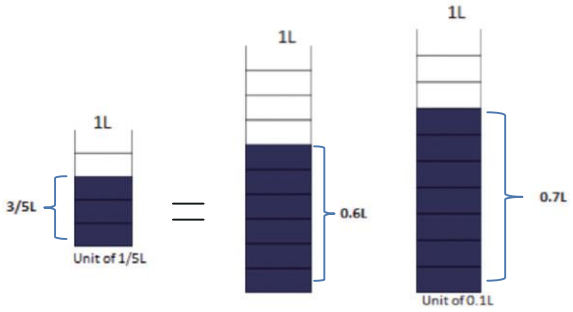
Quotient is in fraction.

$2 \div 5 = \frac{2}{5}$

Quotient is in decimal.

$2 \div 5 = 0.4$

4 Comparison of fraction and decimal.



$\frac{3}{5}$ L is equal to 0.6 L. Comparing 0.6 L and 0.7 L
0.6 L < 0.7 L therefore $\frac{3}{5}$ L < 0.7

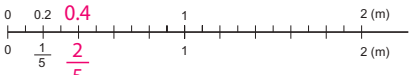
Fractions, Decimals and Whole Numbers

3 If we divide a 2 m tape into 5 equal sections, how many metres long will be each section?

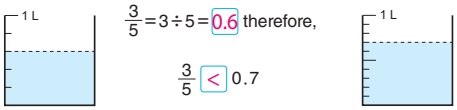
1 Let's express the answer as a fraction and as a decimal number.

$2 \div 5 = \frac{2}{5}$ $2 \div 5 = 0.4$

2 Let's write this fraction and decimal number on the number line.



4 Which is larger $\frac{3}{5}$ L or 0.7 L?



$\frac{3}{5} = 3 \div 5 = 0.6$ therefore,

$\frac{3}{5} < 0.7$

To represent a fraction as a decimal number or whole number, we divide the numerator by the denominator.

5 Let's express these fractions as decimal numbers or whole numbers.

1 $\frac{3}{10} = 0.3$ 2 $\frac{29}{100} = 0.29$

3 $\frac{12}{4} = 12 \div 4 = 3$ 4 $1\frac{3}{5} = \frac{8}{5} = 8 \div 5 = 1.6$

118 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ③ Think about dividing 2 m into 5 equal sections.

T Introduce the Main Task. (Refer to the BP)
T Ask the students to think about how to divide 2 m into 5 equal sections.
S Think about how to divide 2 m into 5 equal sections and complete ① and ②.
T Confirm students' answers.

3 ④ Compare $\frac{3}{5}$ L and 0.7 L

T Ask the students to compare the fraction $\frac{3}{5}$ L and the decimal 0.7 L by observing the diagram representation and filling in the box ☐.
S Observe the diagram and fill in the box ☐.
T To confirm the answer observe the diagram representation in the unit of $\frac{1}{5}$ L and the unit of 0.1 L and explain to the students. (Refer to teacher's notes)

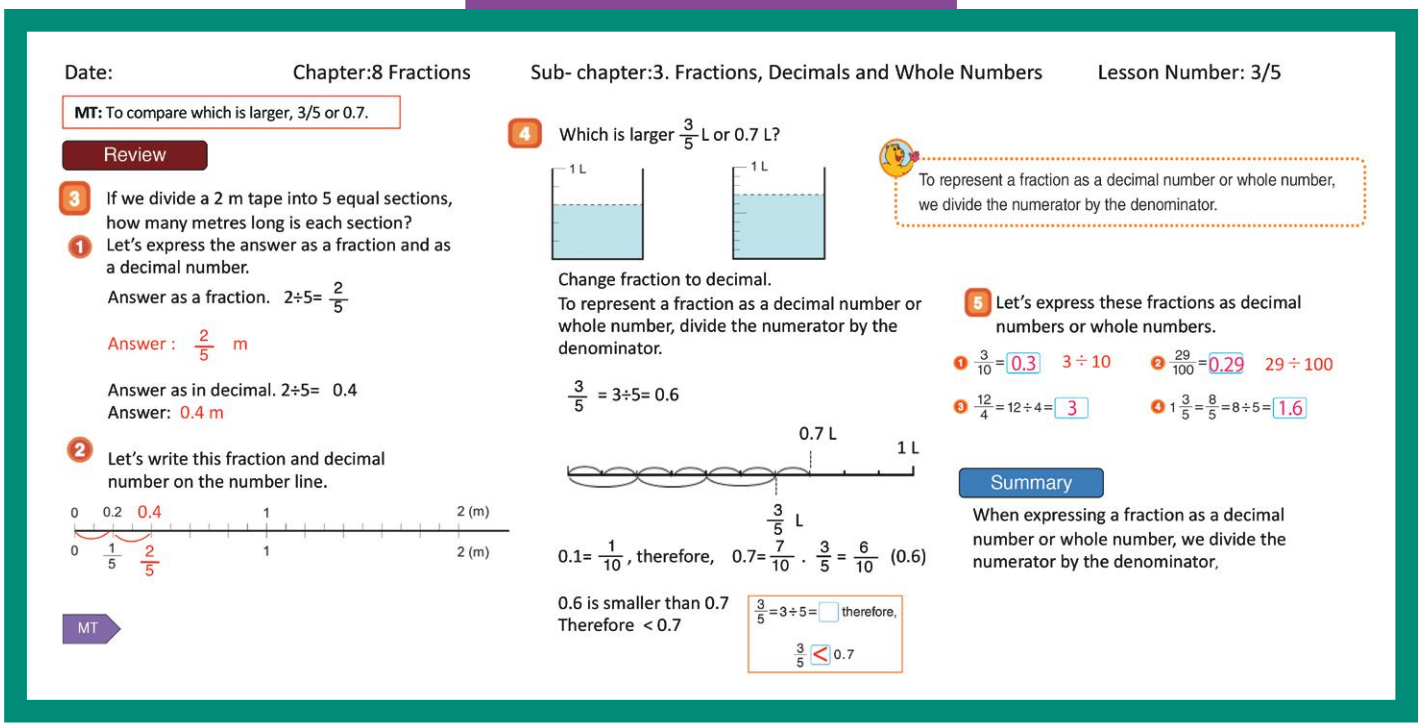
4 ⑤ Express fractions as decimal numbers or whole numbers.

S Complete ①, ②, ③ and ④ by expressing the fractions as decimal numbers or whole numbers.
T Check and assist those in need. Give ample time and ask volunteers to share their ideas and answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 8: Unit: Fraction

Sub-unit 3: Fractions, Decimals and Whole Numbers

Lesson 4 of 5

Textbook Page : 119
Actual Lesson 078

Lesson Objective

- To express whole numbers and decimal numbers as fractions or vice versa.

Prior Knowledge

- How to express quotient in fraction or decimal.
- How to express fractions as decimal numbers or whole numbers.

Preparation

- Chart of enlarged number line

Assessment

- Think about how to express whole numbers and decimal numbers as fractions or vice versa. F
- Convert whole numbers and decimal numbers to fractions or vice versa correctly. F
- Solve the exercise correctly. S

Teacher's Notes

$\frac{1}{10}$ as the unit → is sets of 0.1

$\frac{1}{100}$ as the unit → is sets of 0.01

1.7 is 17 sets of 0.1 or
17 sets of $\frac{1}{10}$ or $\frac{17}{10}$

0.19 is 19 sets of 0.01 or
19 sets of $\frac{1}{100}$ $\frac{19}{100}$

6 Let's express 2 and 5 as fractions.

$2 = 2 \div 1 = \frac{2}{1}$ $\quad 5 = 5 \div 1 = \frac{5}{1}$

$2 = 4 \div 2 = \frac{4}{2}$ $\quad 5 = 10 \div 2 = \frac{10}{2}$

$2 = 8 \div 4 = \frac{8}{4}$ $\quad 5 = 30 \div 6 = \frac{30}{6}$

Whole numbers can be expressed as fractions no matter what number you choose for the denominator.

7 Let's express the decimal numbers 0.19 and 1.7 as fractions.

1 Since 0.19 is 19 sets of 0.01,

we can think of this as 19 sets of $\frac{1}{100}$ and get $\frac{19}{100}$.

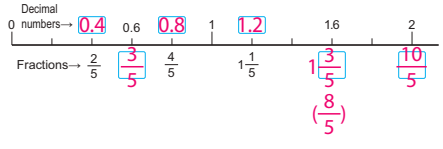
2 Since 1.7 is 17 sets of 0.1,

we can think of this as 17 sets of $\frac{1}{10}$ and get $\frac{17}{10}$. $(1\frac{7}{10})$

Decimal numbers can be expressed as fractions if we choose $\frac{1}{10}$ and $\frac{1}{100}$ as the units.

Exercise

Fill in the ☐ with decimals and fractions.



☐ − ☐ = 119

Lesson Flow

1 Review the previous lesson.

2 6 Think about how to express 2 and 5 as fractions.

T Introduce the Main Task. (Refer to the BP)

S Think about how to express 2 and 5 as fractions by filling in the box ☐ and share their answers.

3 Important Point

T/S Explain the important point in the box ⬚.

4 7 Expressing the decimal numbers 0.19 and 1.7 as fractions.

S Express 0.19 and 1.7 as fractions using sets of 0.01 and 0.1 by filling in the box ☐.

5 Important Point

T/S Explain the important point in the box ⬚.

6 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: Chapter: 8 Fraction Sub- chapter: Fractions, Decimals and Whole Numbers Lesson Number: 4/5

MT: Let's express decimal numbers as fractions .

Review

MT

6 Let's express 2 and 5 as fractions

$2=2\div1=\frac{2}{1}$ $5=5\div1=\frac{5}{1}$

$2=4\div2=\frac{4}{2}$ $5=10\div2=\frac{10}{2}$

$2=8\div 4=\frac{8}{4}$ $5=30\div 6=\frac{30}{6}$

Whole numbers can be expressed as fractions no matter what number you choose for the denominator.

7 Let's express the decimal numbers 0.19 and 1.7 as fractions.

1 0.19 is 19 sets of 0.01
19 sets of is

2 1.7 is 17 sets of 0.1
17 sets of is = 1

Decimal numbers can be expressed as fractions if we choose $\frac{1}{10}$ and $\frac{1}{100}$ as the units.

Exercise

Fill in the ☐ with decimals and fractions.

Decimal numbers →	0	0.4	0.6	0.8	1	1.2	1.6	2
Fractions →		$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$		$1\frac{1}{5}$	$1\frac{3}{5}$	$\frac{2}{1}$

Summary

Whole numbers and decimal numbers can be expressed as fractions or vice versa.

Unit 8

Unit: Fraction
Sub-unit 3: Fractions, Decimals and Whole Numbers
Lesson 5 of 5

Textbook Page : 120
Actual Lesson 079

Lesson Objectives

- To categorise fractions in three groups as whole numbers, actual decimal numbers and other decimal numbers.
- Recognise, identify and represent fractions using the number line.

Prior Knowledge

- Express fraction as decimal number or whole number.
- Express whole number and decimal number as fraction.

Preparation

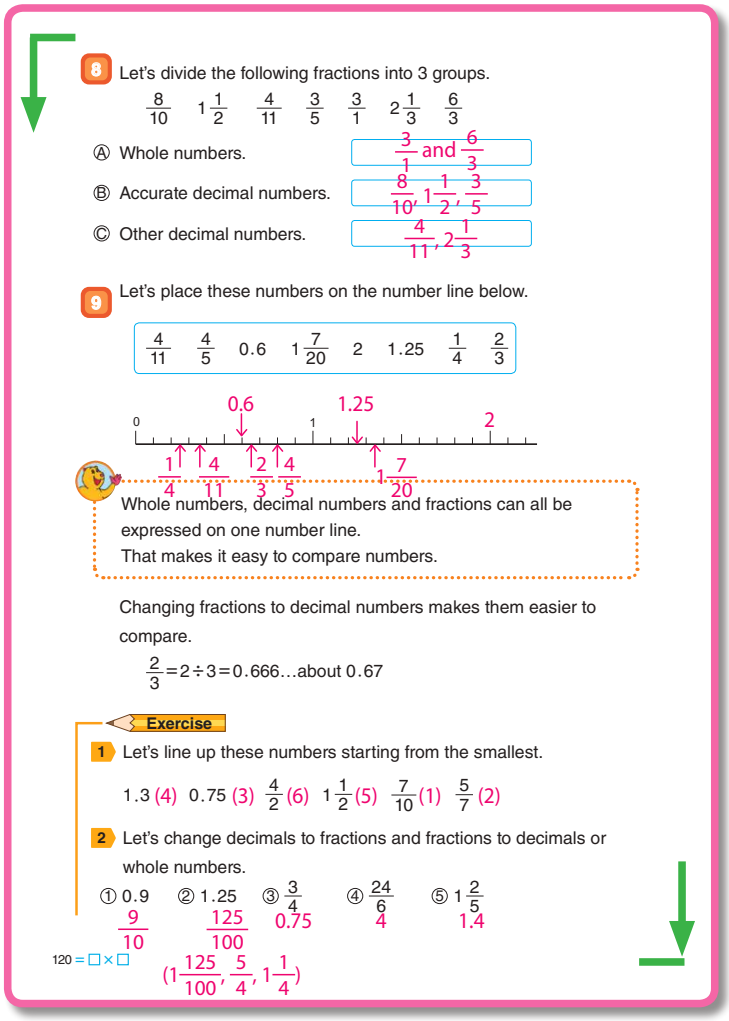
- Number line for 9

Assessment

- Categorise fraction in three groups as whole number, actual decimal number and other decimal number. F S
- Identify and represent fraction using the number line. F S
- Solve the exercise correctly. S

Teacher's Notes

Emphasise to students that any number such as whole numbers, fractions and decimal numbers can all be represented in a same number line.



8 Let's divide the following fractions into 3 groups.

$\frac{8}{10}$ $1\frac{1}{2}$ $\frac{4}{11}$ $\frac{3}{5}$ $\frac{3}{1}$ $2\frac{1}{3}$ $\frac{6}{3}$

Ⓐ Whole numbers. $\frac{3}{1}$ and $\frac{6}{3}$

Ⓑ Accurate decimal numbers. $\frac{8}{10}$, $1\frac{1}{2}$, $\frac{3}{5}$

Ⓒ Other decimal numbers. $\frac{4}{11}$, $2\frac{1}{3}$

9 Let's place these numbers on the number line below.

$\frac{4}{11}$ $\frac{4}{5}$ 0.6 $1\frac{7}{20}$ 2 1.25 $\frac{1}{4}$ $\frac{2}{3}$

0 1 2 0.6 1.25

$\frac{1}{4}$ $\frac{4}{11}$ $\frac{2}{3}$ $\frac{4}{5}$ $1\frac{7}{20}$

Whole numbers, decimal numbers and fractions can all be expressed on one number line.
That makes it easy to compare numbers.

Changing fractions to decimal numbers makes them easier to compare.

$\frac{2}{3}=2\div3=0.666\ldots$about 0.67

Exercise

1 Let's line up these numbers starting from the smallest.

1.3 (4) 0.75 (3) $\frac{4}{2}$ (6) $1\frac{1}{2}$ (5) $\frac{7}{10}$ (1) $\frac{5}{7}$ (2)

2 Let's change decimals to fractions and fractions to decimals or whole numbers.

① 0.9 $\frac{9}{10}$ ② 1.25 $\frac{125}{100}$ ③ $\frac{3}{4}$ 0.75 ④ $\frac{24}{6}$ 4 ⑤ $1\frac{2}{5}$ 1.4

120 = □ × □ ($1\frac{125}{100}$, $\frac{5}{4}$, $1\frac{1}{4}$)

Lesson Flow

1 Review the previous lesson.

2 8 Divide the fractions into three (3) groups.

T Introduce the Main Task. (Refer to the Blackboard Plan)

S Observe the different fractions and categorise the given fractions into 3 groups as whole numbers, actual decimal numbers or other decimal numbers by filling in the box ☐ for Ⓐ, Ⓑ and Ⓒ.

3 9 Representation of fractions, decimal numbers and whole numbers on the number line.

S Use the number line to place the fractions, decimal numbers and whole numbers correctly with an ↓ and present their answers.

T Confirm students' answers.

4 Important Point

T/S Explain the important point in the box ⬚.

5 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

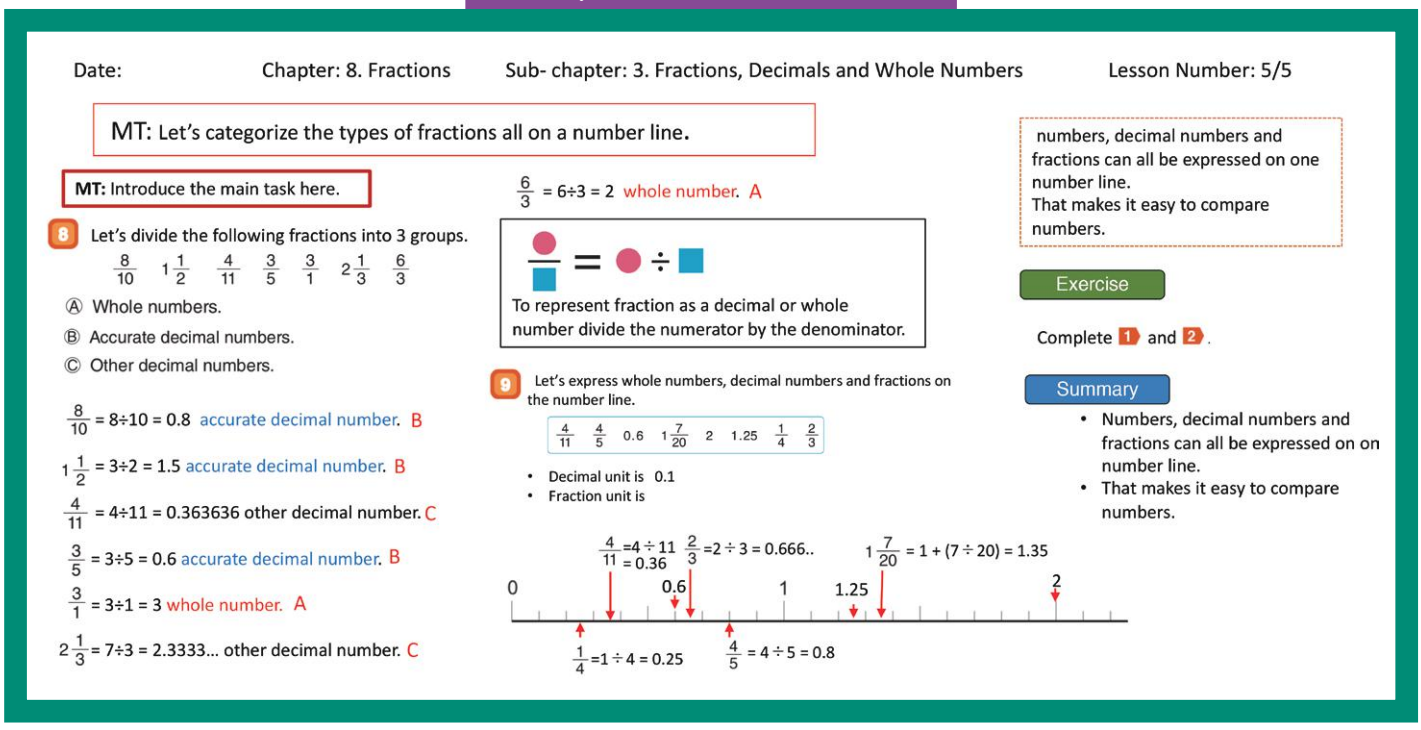
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 8

Unit: Fraction
Exercise and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 121
Actual Lesson 080 and 081

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

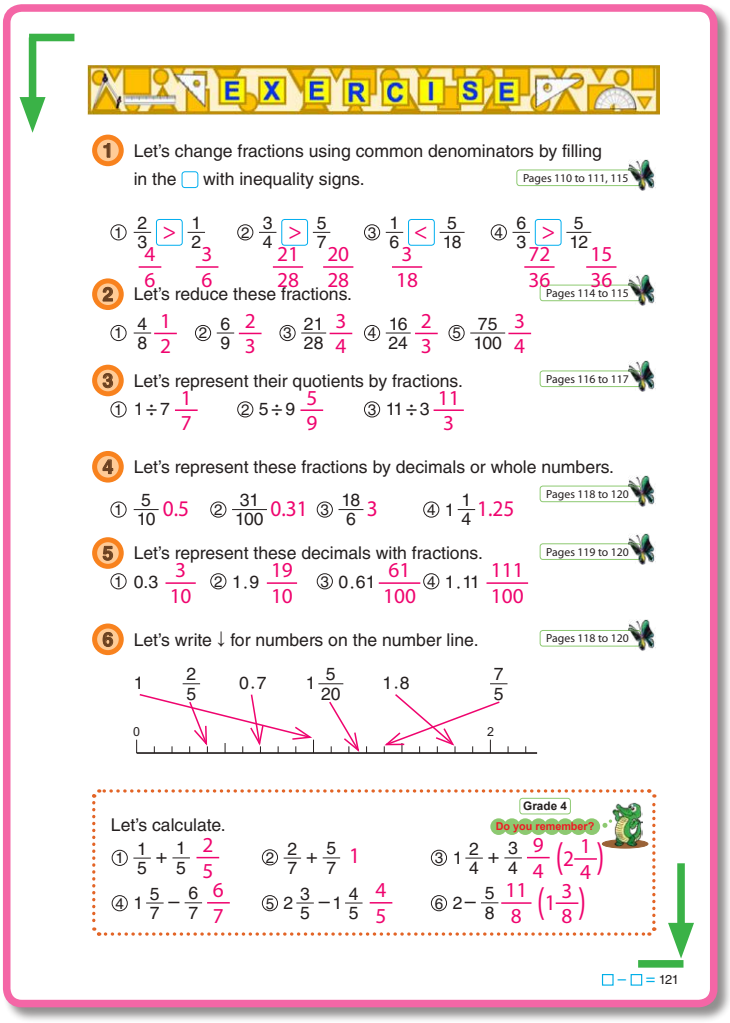
- Copies of evaluation test for each student

Assessment

- Complete the Exercise correctly. S

Teacher's Notes

This is the last lesson of Chapter 8. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

1 Let's change fractions using common denominators by filling in the ☐ with inequality signs. Pages 110 to 111, 115

① $\frac{2}{3}$ (>) $\frac{1}{2}$ → $\frac{4}{6}$ $\frac{3}{6}$ ② $\frac{3}{4}$ (>) $\frac{5}{7}$ → $\frac{21}{28}$ $\frac{20}{28}$ ③ $\frac{1}{6}$ (<) $\frac{5}{18}$ → $\frac{3}{18}$ ④ $\frac{6}{3}$ (>) $\frac{5}{12}$ → $\frac{72}{36}$ $\frac{15}{36}$

2 Let's reduce these fractions. Pages 114 to 115

① $\frac{4}{8}$ $\frac{1}{2}$ ② $\frac{6}{9}$ $\frac{2}{3}$ ③ $\frac{21}{28}$ $\frac{3}{4}$ ④ $\frac{16}{24}$ $\frac{2}{3}$ ⑤ $\frac{75}{100}$ $\frac{3}{4}$

3 Let's represent their quotients by fractions. Pages 116 to 117

① $1 \div 7$ $\frac{1}{7}$ ② $5 \div 9$ $\frac{5}{9}$ ③ $11 \div 3$ $\frac{11}{3}$

4 Let's represent these fractions by decimals or whole numbers. Pages 118 to 120

① $\frac{5}{10}$ 0.5 ② $\frac{31}{100}$ 0.31 ③ $\frac{18}{6}$ 3 ④ $1\frac{1}{4}$ 1.25

5 Let's represent these decimals with fractions. Pages 119 to 120

① 0.3 $\frac{3}{10}$ ② 1.9 $\frac{19}{10}$ ③ 0.61 $\frac{61}{100}$ ④ 1.11 $\frac{111}{100}$

6 Let's write ↓ for numbers on the number line. Pages 118 to 120

Grade 4 Do you remember?

Let's calculate.

① $\frac{1}{5}+\frac{1}{5}$ $\frac{2}{5}$ ② $\frac{2}{7}+\frac{5}{7}$ 1 ③ $1\frac{2}{4}+\frac{3}{4}$ $\frac{9}{4}$ $\left(2\frac{1}{4}\right)$

④ $1\frac{5}{7}-\frac{6}{7}$ $\frac{6}{7}$ ⑤ $2\frac{3}{5}-1\frac{4}{5}$ $\frac{4}{5}$ ⑥ $2-\frac{5}{8}$ $\frac{11}{8}$ $\left(1\frac{3}{8}\right)$

☐ − ☐ = 121

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

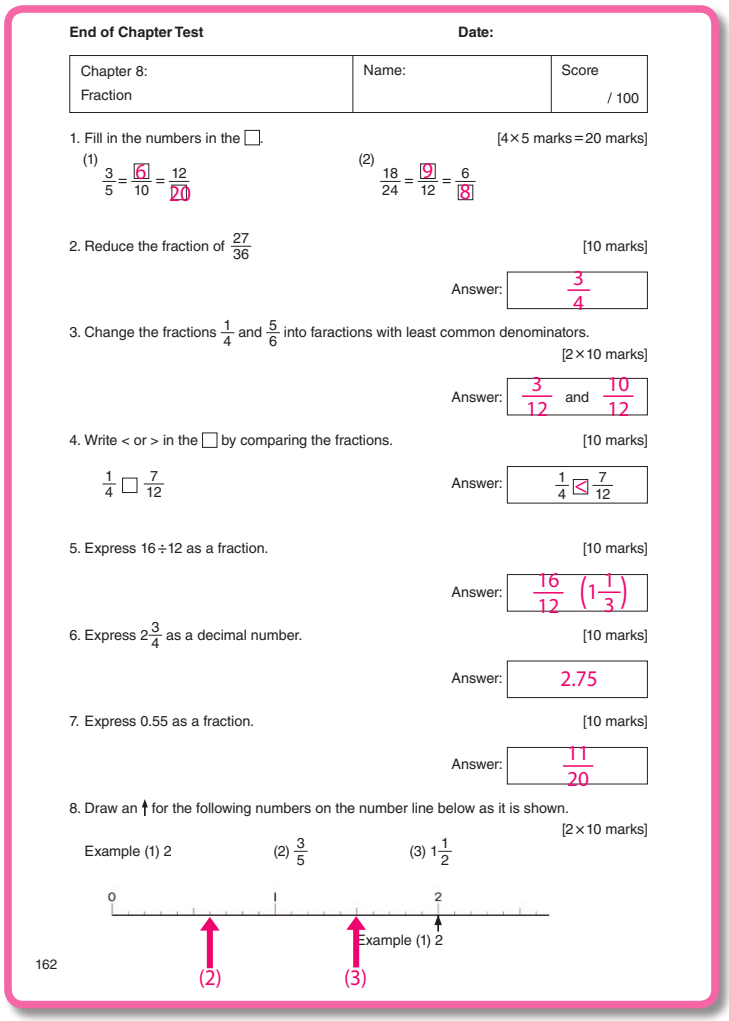
T Confirm students' answers.

TN 1 Changing fractions using common denominators.
2 Reducing fractions.
3 Representing quotients by fractions.
4 Representing fractions by decimals or whole numbers.
5 Represent decimals by fractions.
6 Identifying fractions and decimals on the number line.

2 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 8: Fraction	Name:	Score / 100

1. Fill in the numbers in the □. [4×5 marks=20 marks]

(1) $\frac{3}{5}=\frac{\boxed{6}}{10}=\frac{12}{\boxed{20}}$ (2) $\frac{18}{24}=\frac{\boxed{9}}{12}=\frac{6}{\boxed{8}}$

2. Reduce the fraction of $\frac{27}{36}$ [10 marks]

Answer: $\frac{3}{4}$

3. Change the fractions $\frac{1}{4}$ and $\frac{5}{6}$ into faractions with least common denominators. [2×10 marks]

Answer: $\frac{3}{12}$ and $\frac{10}{12}$

4. Write < or > in the □ by comparing the fractions. [10 marks]

$\frac{1}{4}$ □ $\frac{7}{12}$ Answer: $\frac{1}{4}\boxed{<}\frac{7}{12}$

5. Express 16÷12 as a fraction. [10 marks]

Answer: $\frac{16}{12}\left(1\frac{1}{3}\right)$

6. Express $2\frac{3}{4}$ as a decimal number. [10 marks]

Answer: 2.75

7. Express 0.55 as a fraction. [10 marks]

Answer: $\frac{11}{20}$

8. Draw an ↑ for the following numbers on the number line below as it is shown. [2×10 marks]

Example (1) 2 (2) $\frac{3}{5}$ (3) $1\frac{1}{2}$

0 1 2

Example (1) 2

(2) (3)

162

End of Chapter Test **Date:**

Chapter 8: Fraction	Name:	Score / 100

1. Fill in the numbers in the □. [4×5 marks=20 marks]

(1) $\frac{3}{5}=\frac{\square}{10}=\frac{12}{\square}$

(2) $\frac{18}{24}=\frac{\square}{12}=\frac{6}{\square}$

2. Reduce the fraction of $\frac{27}{36}$ [10 marks]

Answer:

3. Change the fractions $\frac{1}{4}$ and $\frac{5}{6}$ into fractions with least common denominators. [2×10 marks]

Answer: and

4. Write < or > in the □ by comparing the fractions. [10 marks]

$\frac{1}{4} \square \frac{7}{12}$

Answer: $\frac{1}{4} \square \frac{7}{12}$

5. Express 16÷12 as a fraction. [10 marks]

Answer:

6. Express $2\frac{3}{4}$ as a decimal number. [10 marks]

Answer:

7. Express 0.55 as a fraction. [10 marks]

Answer:

8. Draw an ↑ for the following numbers on the number line below as it is shown. [2×10 marks]

Example (1) 2 (2) $\frac{3}{5}$ (3) $1\frac{1}{2}$

Example (1) 2

Chapter 9 Addition and Subtraction of Fractions

1. Content Standard

5.1.1 Apply the process of addition and subtraction to add and subtract the fractions with different denominators.

2. Unit Objectives

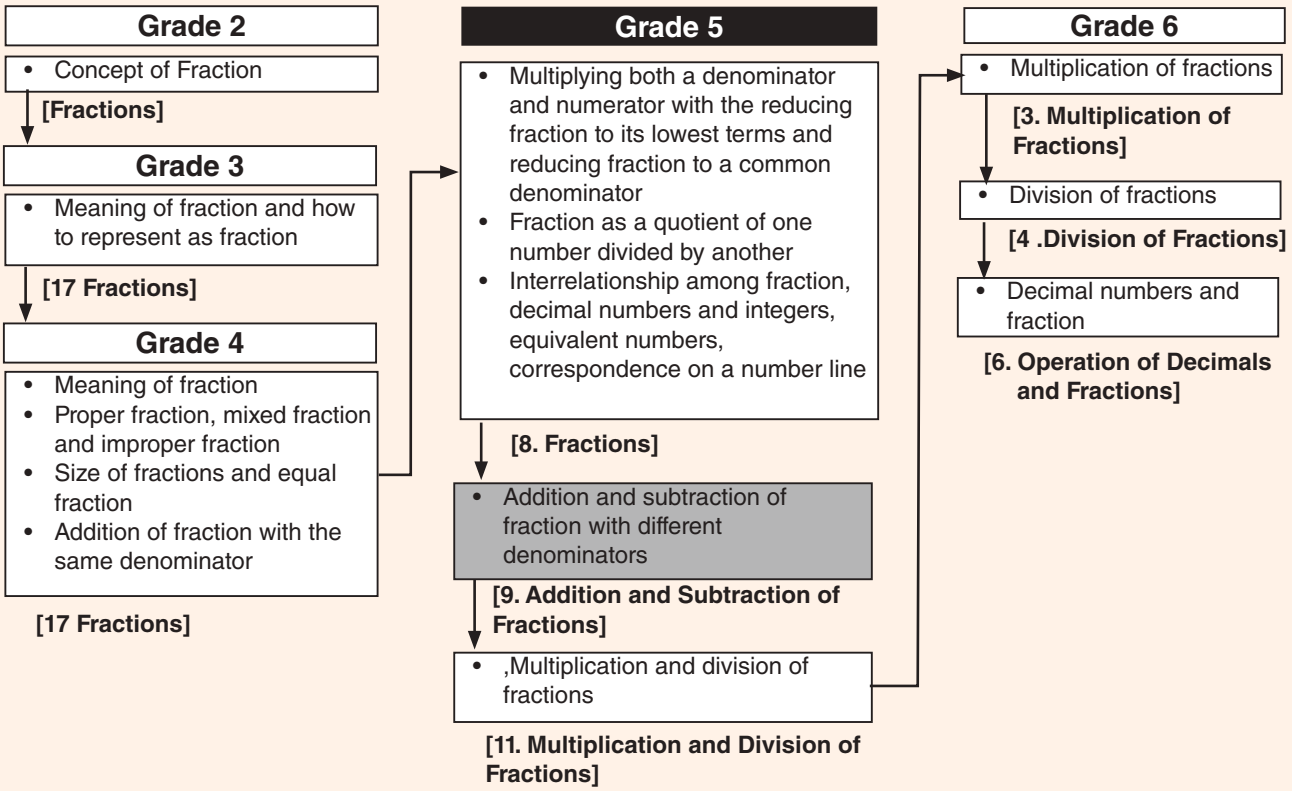
- To expand students understanding on fractions.
- To think about how to calculate addition and subtraction of fractions with different denominators.
- To master the calculation of fractions with different denominators.

3. Teaching Overview

Students learn addition and subtraction of fractions with different denominators. They will see that addition and subtraction of fractions with different denominators can also be taught based on the common unit fraction. Even though they are given improper or mixed fractions in the calculation, they can think as how many unit fractions should be added or subtracted.

It might look complicated for the students, but they know how to solve it based on their experiences. Finally, they will find out that it is easy to add or subtract several types of fractions by making the denominators common.

4. Related Learning Contents



Unit 9

Unit: Addition and Subtraction of Fractions
Sub-unit 1: Addition of Fractions
Lesson 1 of 2

Textbook Page : 122 to 124
Actual Lesson 082

Sub-unit Objective

- To understand the meaning of addition of fractions and how to calculate fractions with different denominators.

Lesson Objectives

- To confirm how to calculate addition of fractions with the same denominator.
- To think about how to calculate addition of fractions with different denominator.

Prior Knowledge

- Addition and subtraction of fractions with the same denominators

Preparation

- Diagram for tasks 1 and 2
- Papers to fold and divide the parts

Assessment

- Identify method(s) of representing fractions with different denominators to same denominators. F
- Simplify fraction to its simplest form. F
- Calculate the addition of fractions with the same and different denominators. S

Teacher's Notes

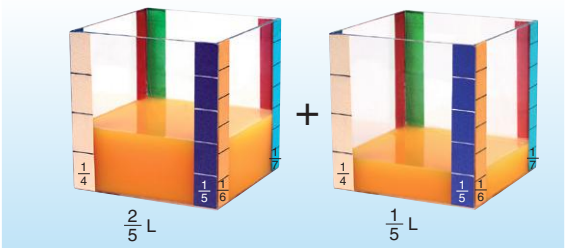
- We can add fractions with different denominators by making the denominators the same.
- When reducing fractions to simplest form, we divide both the numerator and the denominator by the same number.

Addition and Subtraction of Fractions

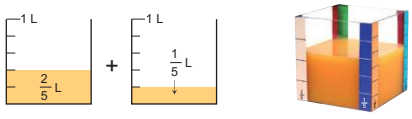
1 Addition of Fractions

Addition of fractions with the same denominator

1 There are $\frac{2}{5}$ L and $\frac{1}{5}$ L of orange juice in the containers.
How many litres are there altogether?



1 Let's write a mathematical expression.



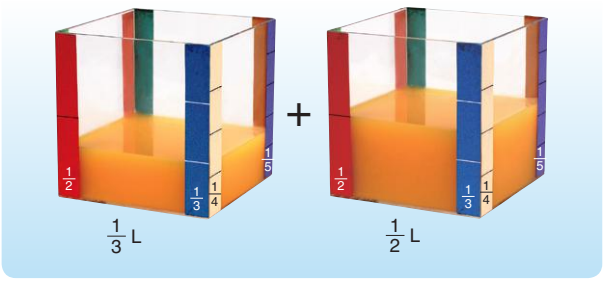
Expression: $\frac{2}{5}+\frac{1}{5}$

2 Let's calculate.

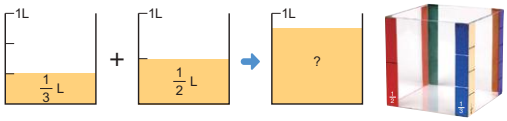
122 = □ × □

Addition of fractions with different denominators

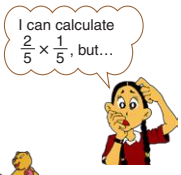
2 There are $\frac{1}{3}$ L and $\frac{1}{2}$ L of orange juice in the containers.
How many litres are there altogether?



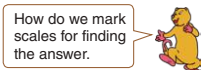
1 Write the mathematical expression.



Expression: $\frac{1}{3}+\frac{1}{2}$



2 Let's think about how to calculate.



Let's think about how to add and subtract fractions with different denominators.

□ − □ = 123

Lesson Flow

1 Addition of fractions with same denominators

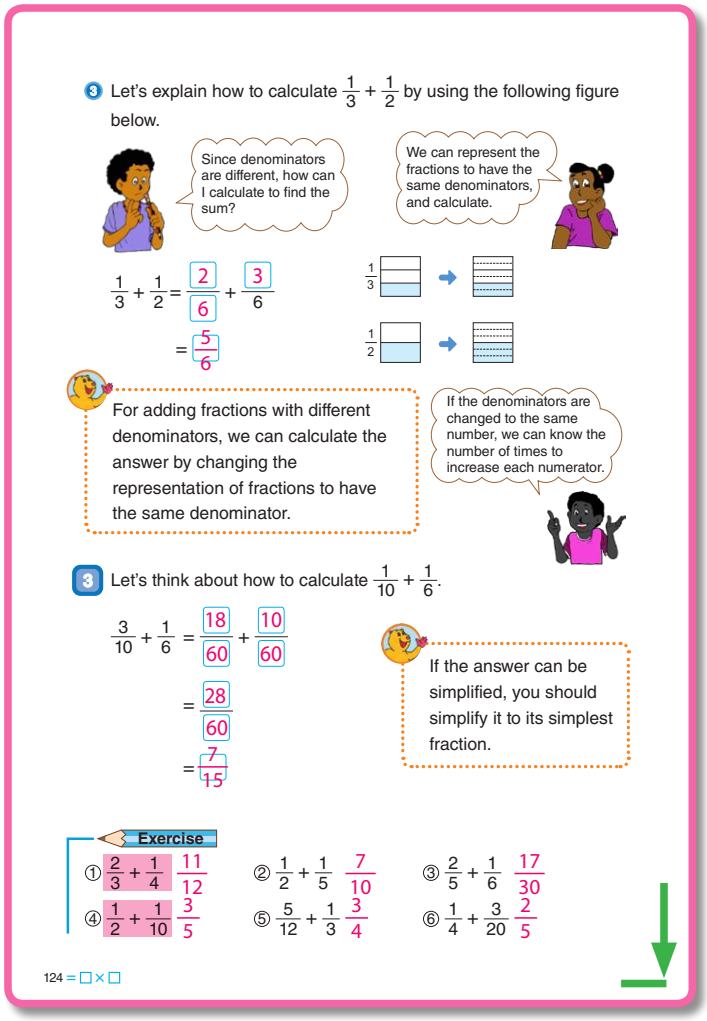
T/S ① Read and understand the situation and make meaning of $\frac{2}{5}$ and $\frac{1}{5}$ using the pictures.
S ① Write a mathematical expression. ($\frac{2}{5}+\frac{1}{5}$)
S ② Calculate the problem using prior knowledge.
T Confirm students' answers on the board.
T Introduce the Main Task. (Refer to the BP)

2 Addition of fractions with different denominators

T/S ② Read and understand the situation and make meaning of $\frac{1}{3}$ and $\frac{1}{2}$ using the pictures.
S ① Write a mathematical expression. ($\frac{1}{3}+\frac{1}{2}$)
T ② Let's think about how to calculate.
S Think of ways on how to calculate $\frac{1}{3}+\frac{1}{2}$ and share ideas with friends.

3 ③ How to add fractions with different denominators

T Let's explain how to calculate $\frac{1}{3}+\frac{1}{2}$.



S It's difficult to calculate since the denominators are not the same.
TN Use the speech bubbles to confirm that it's difficult to calculate.
T Show and explain how to get a same denominator for $\frac{1}{3}$ and $\frac{1}{2}$ using papers.
T/S Two papers divided into three parts and two parts respectively can be further divided into six equal parts, making a same denominator of 6.
S Change the representation of the fractions $\frac{1}{3}$ and $\frac{1}{2}$ to same denominator as $\frac{2}{6}$ and $\frac{3}{6}$ respectively and solve the problem.

4 Important Point

T/S Explain the important point in the box ⬚.

5 Simplifying fractions to their simplest form.

T ③ Let's think about how to calculate $\frac{3}{10}+\frac{1}{6}$ and simplify it by filling in the box □.
S Identify that the answer $\frac{14}{30}$ can be simplified by dividing two on the numerator and denominator to simplify it to $\frac{7}{15}$ as the final answer.

6 Important Point

T/S Explain the important point in the box ⬚.

7 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

8 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Lesson 082 Sample Blackboard Plan is on page 167.

Unit 9

Unit: Addition and Subtraction of Fractions
Sub-unit 1: Addition of Fractions
Lesson 2 of 2

Textbook Page : 125
Actual Lesson 083

Lesson Objectives

- To understand how to calculate addition of proper fractions with different denominators when the answer is a mixed fraction.
- To understand how to calculate addition of mixed fraction with different denominators.

Prior Knowledge

- Addition and subtraction of fractions with the same denominators

Preparation

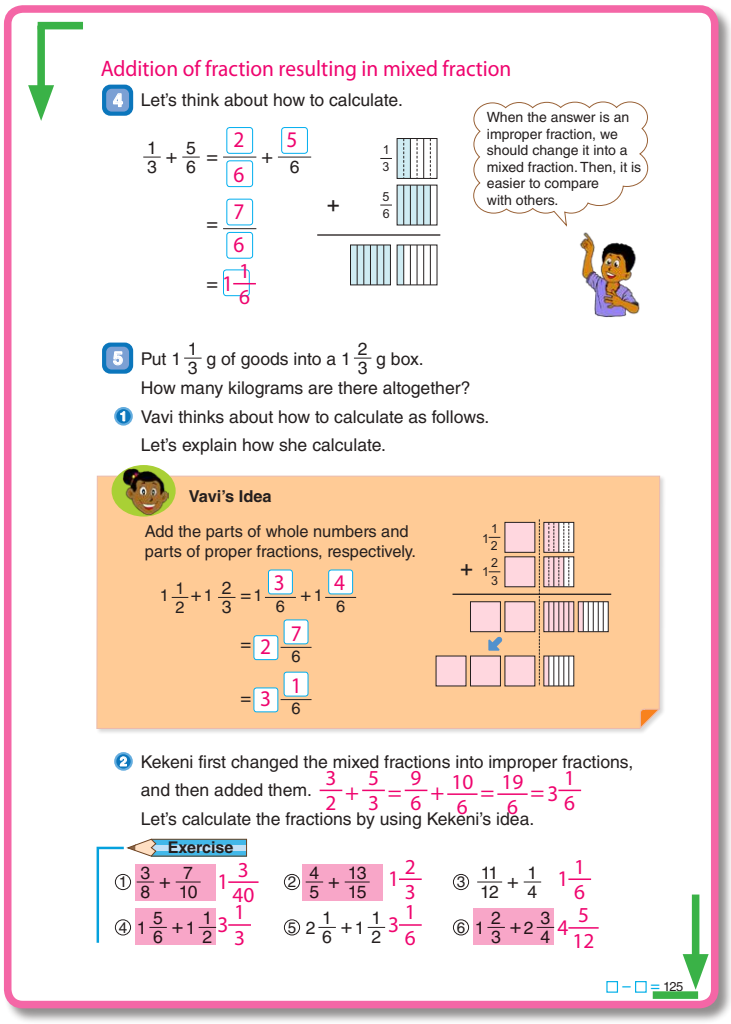
- Chart of diagram for tasks 4 and 5

Assessment

- To demonstrate the understanding of adding proper fractions with different denominators when the answer is a mixed fraction. F S
- Add mixed fractions with different denominators. F
- Solve the exercises correctly. S

Teacher's Notes

- Simplify final answers of fractions to their simplest form where necessary.
- It is important to use the diagram representations to help students visualise the carrying over to make mixed fractions.



Addition of fraction resulting in mixed fraction

4 Let's think about how to calculate.

$\frac{1}{3}+\frac{5}{6}=\frac{2}{6}+\frac{5}{6}=\frac{7}{6}=1\frac{1}{6}$

When the answer is an improper fraction, we should change it into a mixed fraction. Then, it is easier to compare with others.

5 Put $1\frac{1}{3}$ g of goods into a $1\frac{2}{3}$ g box.
How many kilograms are there altogether?

1 Vavi thinks about how to calculate as follows.
Let's explain how she calculate.

Vavi's Idea

Add the parts of whole numbers and parts of proper fractions, respectively.

$1\frac{1}{2}+1\frac{2}{3}=1\frac{3}{6}+1\frac{4}{6}=2\frac{7}{6}=3\frac{1}{6}$

2 Kekeni first changed the mixed fractions into improper fractions, and then added them. $\frac{3}{2}+\frac{5}{3}=\frac{9}{6}+\frac{10}{6}=\frac{19}{6}=3\frac{1}{6}$
Let's calculate the fractions by using Kekeni's idea.

Exercise

① $\frac{3}{8}+\frac{7}{10}$ $1\frac{3}{40}$ ② $\frac{4}{5}+\frac{13}{15}$ $1\frac{2}{3}$ ③ $\frac{11}{12}+\frac{1}{4}$ $1\frac{1}{6}$
④ $1\frac{5}{6}+1\frac{1}{2}$ $3\frac{1}{3}$ ⑤ $2\frac{1}{6}+1\frac{1}{2}$ $3\frac{1}{6}$ ⑥ $1\frac{2}{3}+2\frac{3}{4}$ $4\frac{5}{12}$

□−□=125

Lesson Flow

1 Review the previous lesson.

2 4 Addition of fractions with different denominators when the answer is a mixed fraction.

T Introduce the Main Task. (Refer to the BP)
T Let's think about how to calculate $\frac{1}{3}+\frac{5}{6}$?
T Show the diagram representation of $\frac{1}{3}+\frac{5}{6}$ vertically.
S Think about how to add $\frac{1}{3}+\frac{5}{6}$ using the diagram representation and find the answer.
S Present their ideas.
T Use the diagram representation to confirm the calculation vetically as $\frac{1}{3}+\frac{5}{6}=\frac{2}{6}+\frac{5}{6}=\frac{7}{6}$
T Explain the speech bubble. $\frac{7}{6}=1\frac{1}{6}$

3 5 Addition of mixed fractions with different denominators.

T/S Read and understand the situation.
S Write a mathematical expression i.e. $1\frac{1}{2}+1\frac{2}{3}$
S 1 Think about how to calculate $1\frac{1}{2}+1\frac{2}{3}$ using Vavi's Idea

Lesson Flow

TN Students should calculate using Vavi's idea as shown with the diagram representation:
1. Add whole numbers first in the mixed fraction.
2. Represent the proper fraction parts to same denominator and add.
3. Change improper fraction to mixed fraction and add whole numbers.

T ② Kekeni first changed mixed fractions to improper fractions and then she added them.

T Using Kekeni's idea, let us calculate $1\frac{1}{2}+1\frac{2}{3}$.

S Calculate using Kekeni's idea as follows:
1. Change mixed fractions to improper fractions.
2. Find the common demonimator and calculate.
3. Write the final answer in mixed fraction.

T Checks and confirms calculation.

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

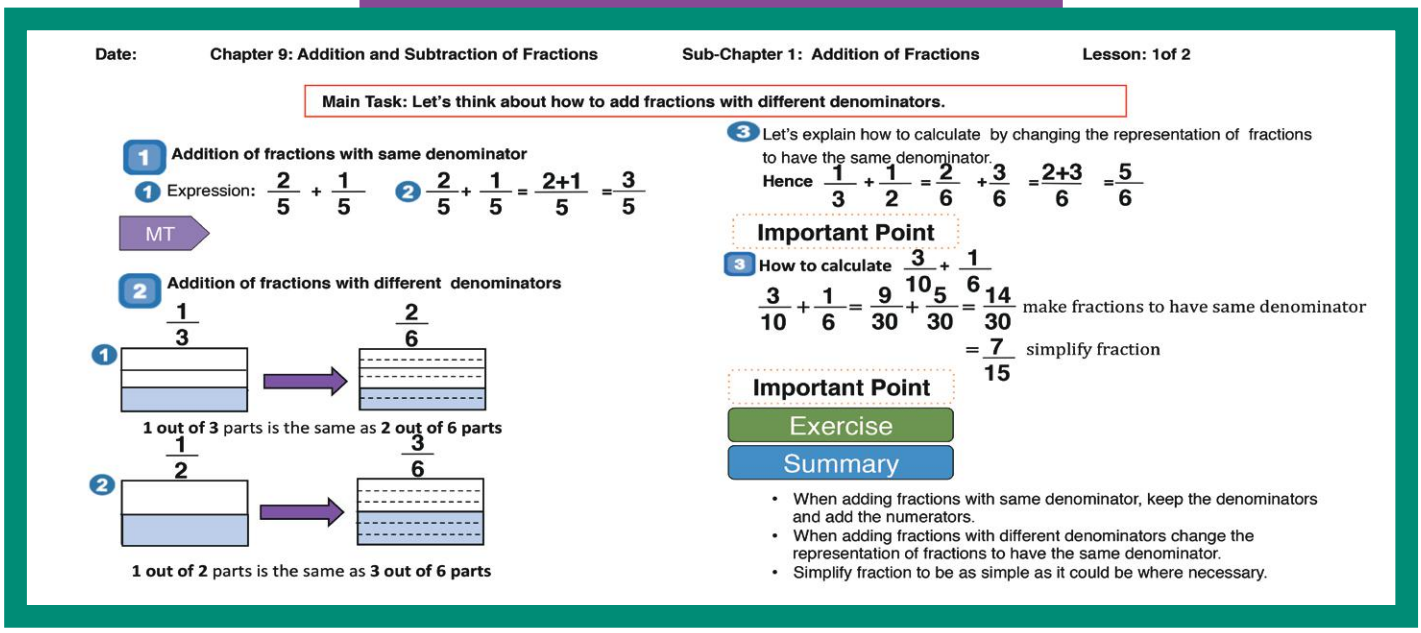
5 Summary

T What have you learned in this lesson?

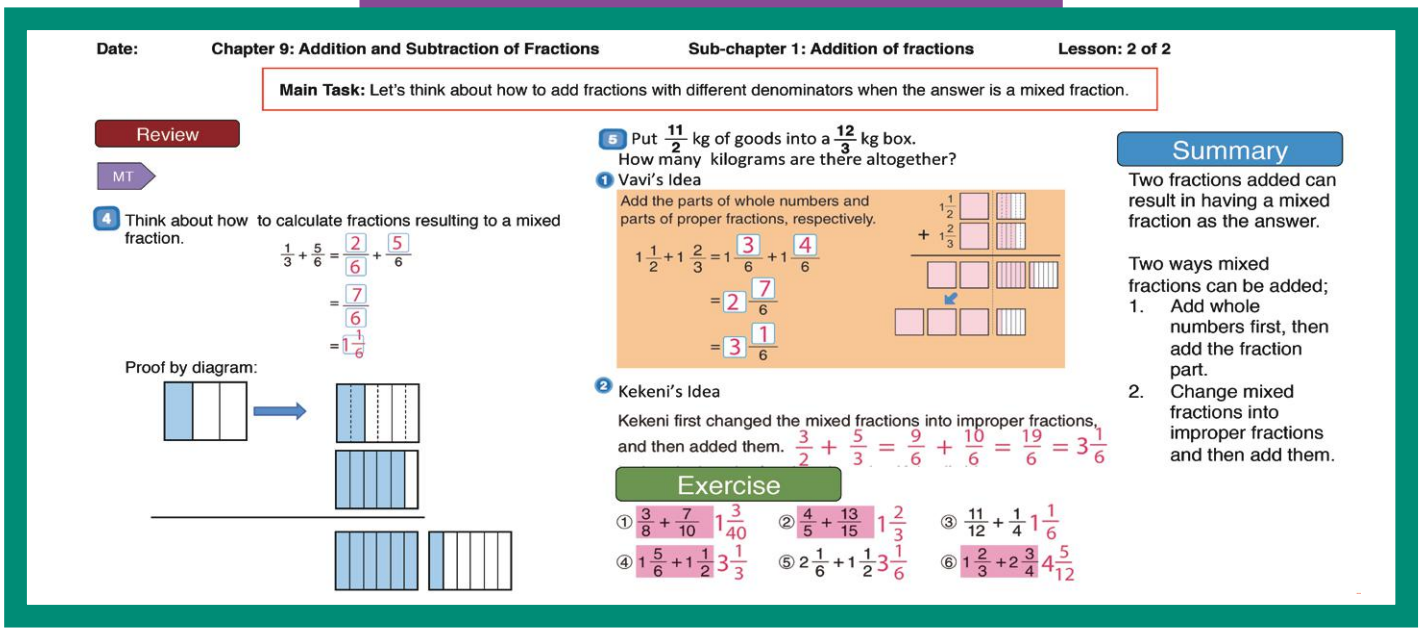
S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 82)



Sample Blackboard Plan (Lesson 83)



Unit 9

Unit: Addition and Subtraction of Fractions
Sub-unit 2: Subtraction of Fractions
Lesson 1 of 2

Textbook Page : 126 and 127
Actual Lesson 084

Sub-unit Objective

- To understand the meaning and how to calculate subtraction of fractions with different denominators.

Lesson Objectives

- To think about how to calculate subtraction of fractions with different denominators.
- To master the calculation of subtraction of fractions with different denominators.

Prior Knowledge

- Subtraction of fractions with the same denominator

Preparation

- Bottles of juice or milk (if not available use other forms of liquids)
- Measuring cup

Assessment

- Demonstrate the understanding on how to subtract fractions with different denominators. F
- Subtract fractions with different denominators confidently. S
- Solve the exercises correctly. S

Teacher's Notes

- Reducing of fraction means breaking down of an existing fraction to smaller parts.
- Simplification or simplify means to express a fraction in its simple form. E.g. $\frac{2}{4}=\frac{1}{2}$
- As in addition, we can subtract the numerators for fractions with same denominators.
- For 2, fill in the box and explain how $\frac{5}{6}$ and $\frac{3}{10}$ are reduced to become $\frac{25}{30}$ and $\frac{9}{30}$ respectively.

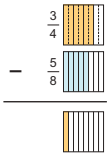
1 Subtraction of Fractions

Subtraction of fraction with same denominator

1 There are $\frac{3}{4}$ L of juice and $\frac{5}{8}$ L of milk.
What is the difference in Litres between the juice and milk.

1 Find equivalent fractions and compare the volumes and then write an expression.

$\frac{3}{4}=\frac{6}{8}$ and then, $\frac{3}{4}$ − $\frac{5}{8}$



2 Let's think about how to calculate.

$\frac{3}{4}-\frac{5}{8}=\frac{6}{8}-\frac{5}{8}$

$=\frac{1}{8}$

We should change them to fractions with the same denominators.

To subtract fractions with different denominators, we can calculate by changing the representation of fractions to have the same denominator.

Subtraction of fraction resulting in reduced fraction

2 Let's think about how to calculate $\frac{5}{6}-\frac{3}{10}$.

$\frac{5}{6}-\frac{3}{10}=\frac{25}{30}-\frac{9}{30}$

$=\frac{16}{30}$

$=\frac{8}{15}$

How is it different from 1?

In 1, we subtract straight and get the answer, but in 2, we subtract having reduced fraction, then we simplify.

126 = □ × □

Exercise

① $\frac{6}{7}-\frac{3}{4}$ $\frac{3}{28}$　② $\frac{5}{8}-\frac{1}{4}$ $\frac{3}{8}$　③ $\frac{2}{3}-\frac{1}{6}$ $\frac{2}{2}$

④ $\frac{3}{4}-\frac{7}{10}$ $\frac{1}{20}$　⑤ $\frac{2}{5}-\frac{1}{15}$ $\frac{1}{3}$　⑥ $\frac{7}{15}-\frac{3}{10}$ $\frac{1}{6}$

3 Let's think about how to calculate $\frac{7}{5}-\frac{5}{6}$.

$\frac{7}{5}-\frac{5}{6}=\frac{42}{30}-\frac{25}{30}$

$=\frac{17}{30}$

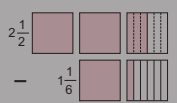
We can calculate "improper fractions minus proper fractions" in the same way.

4 Let's think about how to calculate $2\frac{1}{2}-1\frac{1}{6}$.

$2\frac{1}{2}-1\frac{1}{6}=2\frac{\square}{\square}-1\frac{1}{6}$

$=\square\frac{\square}{\square}$

$=\square$



5 Yamo has $2\frac{1}{2}$ L of juice. In a week she drank $1\frac{5}{6}$ L.
How much juice is left?

1 Write an expression.

2 Let's calculate.

I should change to improper fractions. What do you think?

Even if you reduced to mixed fractions, you cannot subtract $\frac{5}{6}$ from $\frac{3}{6}$.

□ − □ = 127

Lesson Flow

1 Review the previous lesson.

2 1 Subtraction of fractions with different denominators.

T Introduce the Main Task. (Refer to the BP).
T/S Read and understand the situation.
T 1 Find equivalent fractions and compare the volumes and then write an expression.
TN Use the diagram representation to guide the students.
S Fill in the blank squares and explain that 3 of 4 parts is reduced and becomes 6 of 8 parts i.e. $\frac{3}{4}=\frac{6}{8}$. Therefore, the expression is $\frac{3}{4}-\frac{5}{8}$.
T 2 Think about how to calculate $\frac{3}{4}-\frac{5}{8}$.
S Refer to Kapul and fill in the box with the new expression as $\frac{3}{4}-\frac{5}{8}=\frac{6}{8}-\frac{5}{8}=\frac{1}{8}$.
T Confirm students' answers.

3 Important Point

T/S Explain the important point in the box .

4 Subtraction of fractions with different denominators resulting in reduced fractions.

T 2 Ask the students to think about how to calculate $\frac{5}{6}-\frac{3}{10}$.
TN Use the same approach as task 1. $\frac{5}{6}-\frac{3}{10}=\frac{25}{30}-\frac{9}{30}=\frac{16}{30}=\frac{8}{15}$. (Refer to TN)
T What is the difference between 1 and 2?
S In 1, the answer is in simple form however in 2 the answer is not in simple form so it is further simplified by dividing the numerator and denominator by a common number 4.

5 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

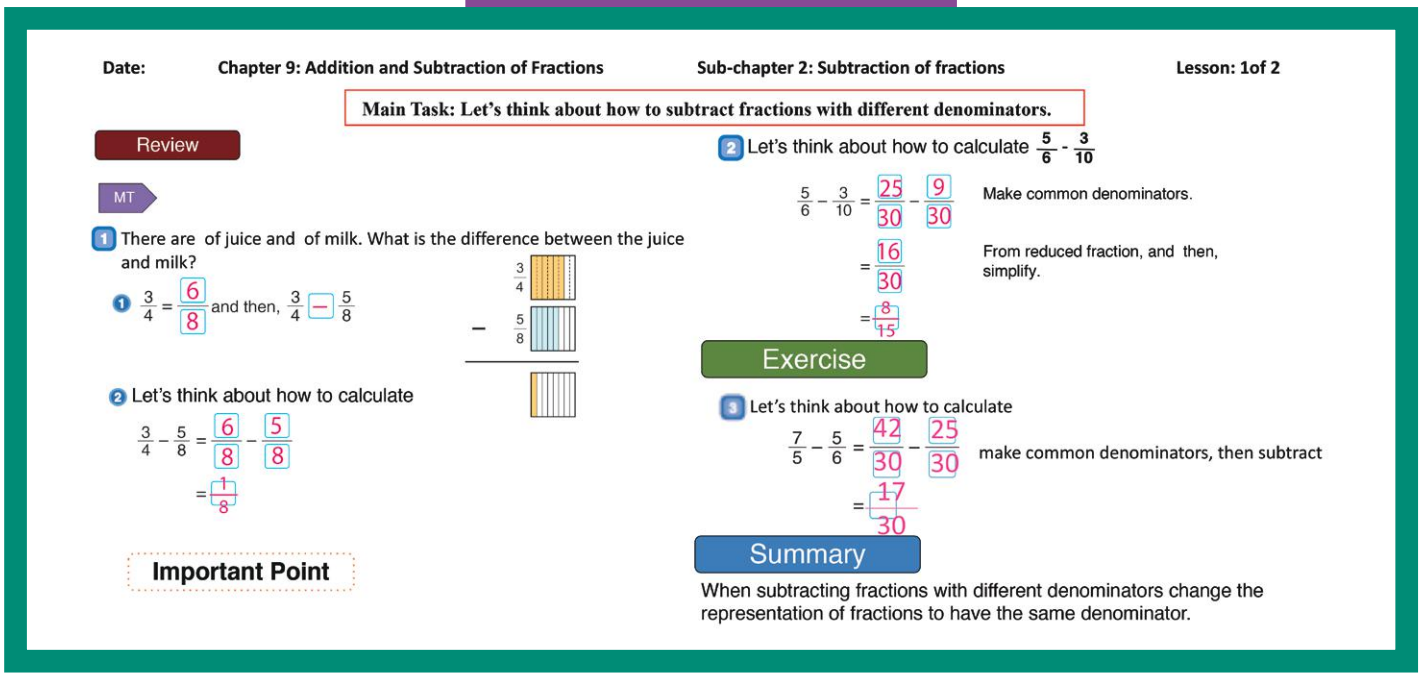
6 Subtracting proper fraction from improper fraction.

T 3 Ask students to think about how to calculate $\frac{7}{5}-\frac{5}{6}$.
S Fill in the box by using the same approach in 1 and 2. $\frac{7}{5}-\frac{5}{6}=\frac{42}{30}-\frac{25}{30}=\frac{17}{30}$.
TN Improper or proper fractions, we can still subtract by reducing the fractions.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 9

Unit: Addition and Subtraction of Fractions
Sub-unit 2: Subtraction of Fractions
Lesson 2 of 2

Textbook Page : 127 and 128
Actual Lesson 085

Lesson Objectives

- To think about how to subtract mixed fraction with different denominators.
- Subtract mixed fractions with different denominators.

Prior Knowledge

- Subtraction of fractions with the same denominator

Preparation

- Chart of vertical calculation and diagram representation for 4
- Chart for Mero's and Ambai's ideas in 5

Assessment

- Think about how to subtract mixed fractions with different denominators. F
- Calculate the mixed fractions with different denominators. F
- Solve the exercises correctly. S

Teacher's Notes

Borrowing 1 from 2, $2\frac{3}{6} = 1 + \frac{6}{6} + \frac{3}{6}$

$= 1\frac{9}{6}$

Exercise

① $\frac{6}{7} - \frac{3}{4}$ ② $\frac{5}{8} - \frac{1}{4}$ ③ $\frac{2}{3} - \frac{1}{6}$

④ $\frac{3}{4} - \frac{7}{10}$ ⑤ $\frac{2}{5} - \frac{1}{15}$ ⑥ $\frac{7}{15} - \frac{3}{10}$

3 Let's think about how to calculate $\frac{7}{5} - \frac{5}{6}$.

$\frac{7}{5} - \frac{5}{6} = \frac{\square}{\square} - \frac{\square}{\square}$

$= \square$

We can calculate "improper fractions minus proper fractions" in the same way.

Subtraction of mixed fractions with different denominators

4 Let's think about how to calculate $2\frac{1}{2} - 1\frac{1}{6}$.

$2\frac{1}{2} - 1\frac{1}{6} = 2\frac{3}{6} - 1\frac{1}{6}$

$= 1\frac{2}{6}$

$= 1\frac{1}{3}$

How to subtract mixed fractions with different denominators

5 Yamo has $2\frac{1}{2}$ L of juice. In a week she drank $1\frac{5}{6}$ L.
How much juice is left?

1 Write an expression. $2\frac{1}{2} - 1\frac{5}{6}$

2 Let's calculate.

I should change to improper fractions. What do you think?

Even if you reduced to mixed fractions, you cannot subtract $\frac{5}{6}$ from $\frac{3}{6}$.

Mero's Idea

Change mixed fractions into improper fractions.

$2\frac{1}{2} = \frac{5}{2}$, $1\frac{5}{6} = \frac{11}{6}$

Then, $2\frac{1}{2} - 1\frac{5}{6} = \frac{5}{2} - \frac{11}{6} = \frac{15}{6} - \frac{11}{6} = \frac{4}{6}$

Now simplify it, $\frac{4}{6} = \frac{2}{3}$

Ambai's Idea

Calculate the parts of whole numbers and proper fractions, respectively.

$2\frac{1}{2} - 1\frac{5}{6} = 2\frac{3}{6} - 1\frac{5}{6}$

We cannot subtract $\frac{5}{6}$ from $\frac{3}{6}$,

Borrow 1 from 2. $2\frac{3}{6} = 1\frac{9}{6}$

$1\frac{9}{6} - 1\frac{5}{6} = \frac{4}{6} = \frac{2}{3}$

Exercise

① $4\frac{7}{8} - 1\frac{1}{7}$ $3\frac{41}{56}$ ② $7\frac{3}{4} - 2\frac{1}{6}$ $5\frac{7}{12}$ ③ $5\frac{2}{3} - 2\frac{1}{6}$ $3\frac{1}{2}$

④ $5\frac{1}{3} - 2\frac{3}{4}$ $2\frac{7}{12}$ ⑤ $5\frac{1}{6} - 3\frac{9}{10}$ $1\frac{4}{15}$ ⑥ $7\frac{1}{4} - 6\frac{11}{12}$ $1\frac{1}{3}$

□ − □ = 127 128 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Subtraction of mixed fractions with different denominators.

T (4) Allow the students to think about how to calculate $2\frac{1}{2}-1\frac{1}{6}$.

S Use the diagram representation and vertical calculation to calculate $2\frac{1}{2}-1\frac{1}{6}$ by filling in the box.

$2\frac{1}{2}-1\frac{1}{6}=2\frac{3}{6}-1\frac{1}{6}=1\frac{2}{6}=1\frac{1}{3}$

T Confirm the calculation by corresponding the diagram representation with the vertical calculation.

T Introduce the Main Task.
(Refer to the BP).

3 (5) Methods on how to subtract mixed fractions with different denominators.

S (1) Read and understand the situation and write a mathematical expression.
$(2\frac{1}{2}-1\frac{5}{6})$

S (2) Think about how to calculate $2\frac{1}{2}-1\frac{5}{6}$ and fill in the boxes in Mero's and Ambai's Ideas.

TN Mero's Idea:
i) Change mixed fractions to improper fractions.
ii) Represent improper fractions with a common denominator.
iii) Subtract using improper fractions.
iv) Simplify fraction.
Ambai's Idea:
i) Represent proper fraction parts with common denominator.
ii) Calculate the parts of whole numbers and proper fractions respectively.
iii) $\frac{5}{6}$ cannot be subtracted from $\frac{3}{6}$ so borrow 1 from 2. Hence $2\frac{3}{6}=1\frac{9}{6}$.
(Refer to TN)
iv) Subtract and simplify fraction.

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

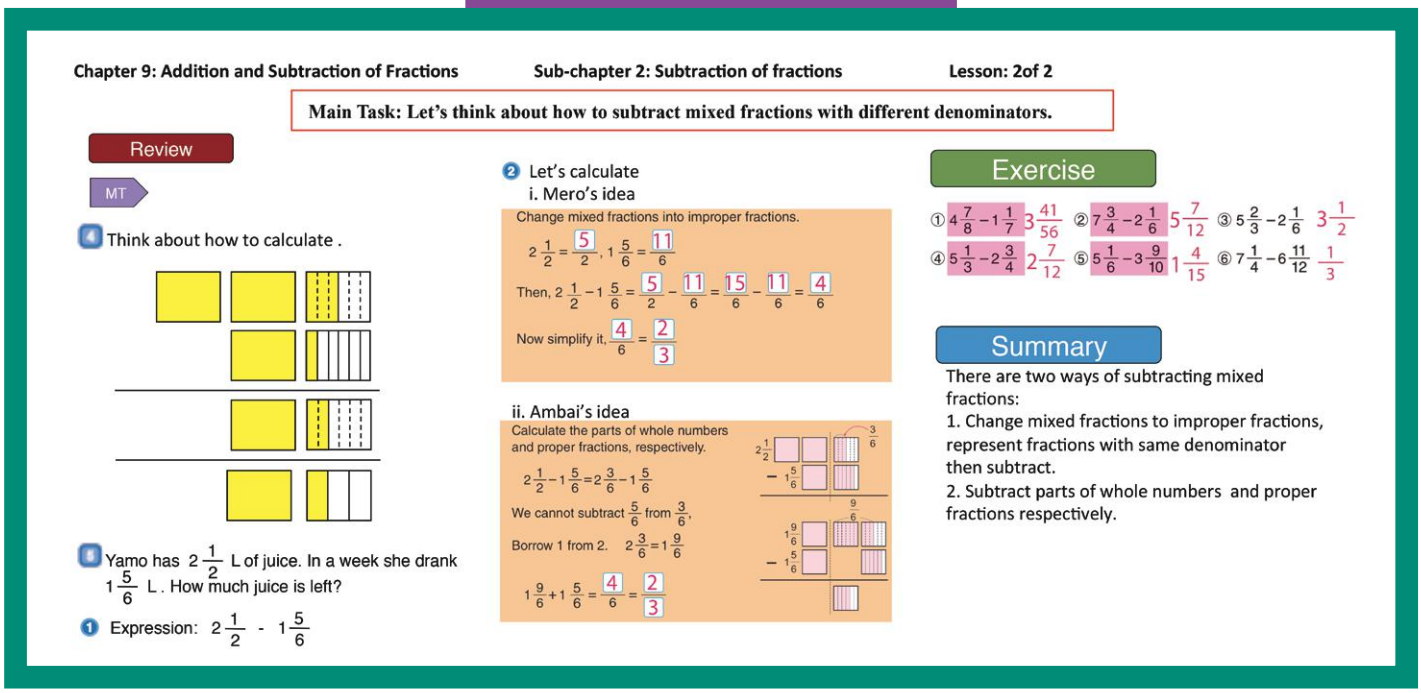
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 9

Unit: Addition and Subtraction of Fractions
Exercise and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 129
Actual Lesson 086 and 087

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise and the Evaluation Test confidently.

Prior Knowledge

- All the contents learned in this unit

Preparation

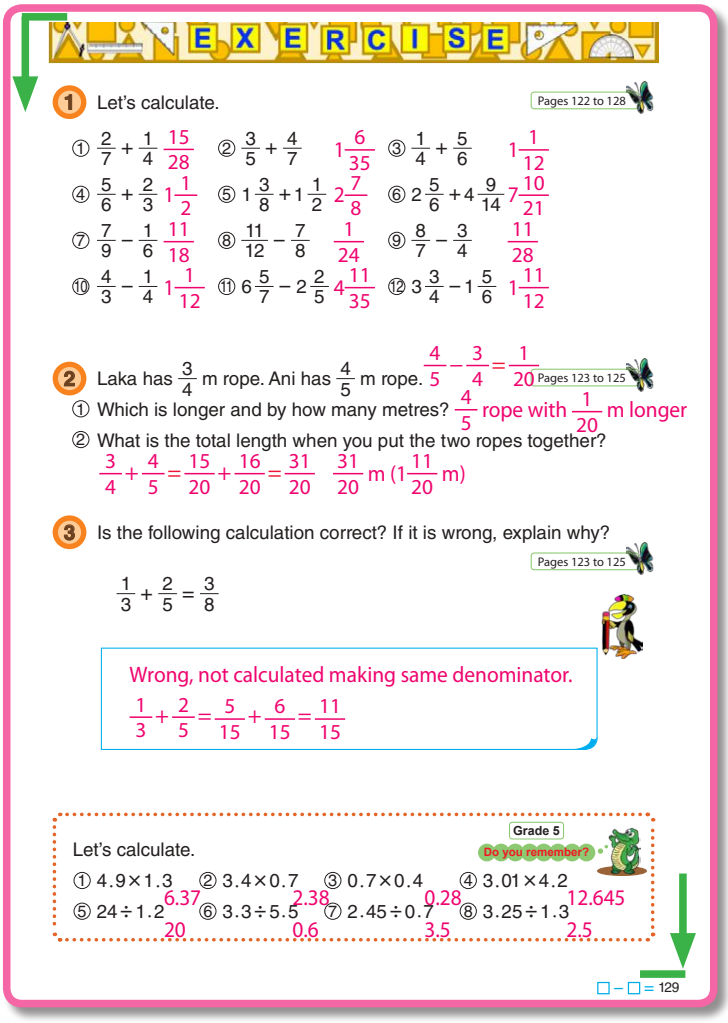
- Evaluation test copy for each student

Assessment

- Complete the Exercise correctly. S

Teacher's Notes

This is the last lesson of Chapter 9. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

1 Let's calculate. Pages 122 to 128

① $\frac{2}{7}+\frac{1}{4}=\frac{15}{28}$ ② $\frac{3}{5}+\frac{4}{7}=1\frac{6}{35}$ ③ $\frac{1}{4}+\frac{5}{6}=1\frac{1}{12}$

④ $\frac{5}{6}+\frac{2}{3}=1\frac{1}{2}$ ⑤ $1\frac{3}{8}+1\frac{1}{2}=2\frac{7}{8}$ ⑥ $2\frac{5}{6}+4\frac{9}{14}=7\frac{10}{21}$

⑦ $\frac{7}{9}-\frac{1}{6}=\frac{11}{18}$ ⑧ $\frac{11}{12}-\frac{7}{8}=\frac{1}{24}$ ⑨ $\frac{8}{7}-\frac{3}{4}=\frac{11}{28}$

⑩ $\frac{4}{3}-\frac{1}{4}=1\frac{1}{12}$ ⑪ $6\frac{5}{7}-2\frac{2}{5}=4\frac{11}{35}$ ⑫ $3\frac{3}{4}-1\frac{5}{6}=1\frac{11}{12}$

2 Laka has $\frac{3}{4}$ m rope. Ani has $\frac{4}{5}$ m rope. $\frac{4}{5}-\frac{3}{4}=\frac{1}{20}$ Pages 123 to 125

① Which is longer and by how many metres? $\frac{4}{5}$ rope with $\frac{1}{20}$ m longer

② What is the total length when you put the two ropes together?

$\frac{3}{4}+\frac{4}{5}=\frac{15}{20}+\frac{16}{20}=\frac{31}{20}$ $\frac{31}{20}$ m ($1\frac{11}{20}$ m)

3 Is the following calculation correct? If it is wrong, explain why? Pages 123 to 125

$\frac{1}{3}+\frac{2}{5}=\frac{3}{8}$

Wrong, not calculated making same denominator.

$\frac{1}{3}+\frac{2}{5}=\frac{5}{15}+\frac{6}{15}=\frac{11}{15}$

Let's calculate. Grade 5 Do you remember?

① 4.9×1.3 ② 3.4×0.7 ③ 0.7×0.4 ④ 3.01×4.2

⑤ 24÷1.2 20 ⑥ 3.3÷5.5 0.6 ⑦ 2.45÷0.7 3.5 ⑧ 3.25÷1.3 2.5

6.37 2.38 0.28 12.645

□ – □ = 129

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN 1 Calculating addition and subtraction of fractions and mixed fractions.
2 Word problem involving calculations of fractions.
3 Identifying the correct processes in calculating with fractions.

2 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 9: Addition and Subtraction of Fractions	Name:	Score / 100

1. Calculate. [6×10 marks = 60 marks]

(1) $\frac{1}{9}+\frac{5}{6}=\frac{2}{18}+\frac{15}{18}=\frac{17}{18}$

Answer: $\frac{17}{18}$

(2) $\frac{2}{7}+\frac{16}{21}=\frac{6}{21}+\frac{16}{21}=\frac{22}{21}$

Answer: $\frac{22}{21}$ or $1\frac{1}{21}$

(3) $3\frac{1}{6}+\frac{1}{4}=3\frac{2}{12}+\frac{3}{12}=3\frac{5}{12}$

Answer: $3\frac{5}{12}$

(4) $\frac{11}{12}-\frac{5}{6}=\frac{11}{12}-\frac{10}{12}=\frac{1}{12}$

Answer: $\frac{1}{12}$

(5) $\frac{3}{5}-\frac{1}{3}=\frac{9}{15}-\frac{5}{15}=\frac{4}{15}$

Answer: $\frac{4}{15}$

(6) $5\frac{1}{6}-1\frac{2}{7}=4\frac{49}{42}-1\frac{12}{42}=3\frac{37}{42}$

Answer: $3\frac{37}{42}$

2. There is a flower garden of $7\frac{2}{5}$ m² and a vegetable garden of $8\frac{3}{4}$ m² at Petty's school.
[20 marks or maths expression and 20 marks for the answer]

Which garden is bigger and by how much in m²?

$7\frac{2}{5}=7\frac{8}{20}$, $8\frac{3}{4}=8\frac{15}{20}$

$7\frac{2}{5}<8\frac{3}{4}$

Mathematical Expression: $8\frac{3}{4}-7\frac{2}{5}$

Answer: A vegetable garden is $1\frac{7}{20}$ m² bigger.

174

End of Chapter Test **Date:**

Chapter 9: Addition and Subtraction of Fractions	Name:	Score / 100

1. Calculate.

[6 × 10 marks = 60 marks]

(1) $\frac{1}{9}+\frac{5}{6}$

Answer:

(2) $\frac{2}{7}+\frac{16}{21}$

Answer:

(3) $3\frac{1}{6}+\frac{1}{4}$

Answer:

(4) $\frac{11}{12}-\frac{5}{6}$

Answer:

(5) $\frac{3}{5}-\frac{1}{3}$

Answer:

(6) $5\frac{1}{6}-1\frac{2}{7}$

Answer:

2. There is a flower garden of $7\frac{2}{5}$ m² and a vegetable garden of $8\frac{3}{4}$ m² at Petty's school.

[20 marks or maths expression and 20 marks for the answer]

Which garden is bigger and by how much in m²?

Mathematical Expression:

Answer:

Chapter 10 Area of Figures

1. Content Standard

5.2.1 Develop the formula to calculate areas of parallelogram, triangle, trapezium, rhombus and understand their transformation.

2. Unit Objectives

- To deepen understanding on how to find out the area of various plane figures.
- To think about how to find the area of triangle, parallelogram, rhombus and trapezoid.
- To master calculation for finding the areas of various shapes.

3. Teaching Overview

Students know that area can be known by being familiar with squares of 1cm^2. In this unit, students will change their concept of knowing area from paving to utilizing known formula. In other words, students will transform the shape of a figure to another shape by maintaining its area. This utilisation will develop students' ability of mathematical thinking. They should understand the meaning of each formula and be able to explain why the formula is completed by referring to their experiences of transformations.

Area of Parallelograms :

They find the area of parallelogram by transforming the shape of a rectangle to a parallelogram since they already know the area of a rectangle. The misconception of finding the area of a parallelogram as base × another side would be avoided if they experience the transformation of the shape from a rectangle to a parallelogram.

Area of Triangles :

They will know the area of triangles based on the area of a rectangle and a parallelogram. Encourage students to find more ideas of transformations from known shapes. They should discuss more on the meaning of "÷2".

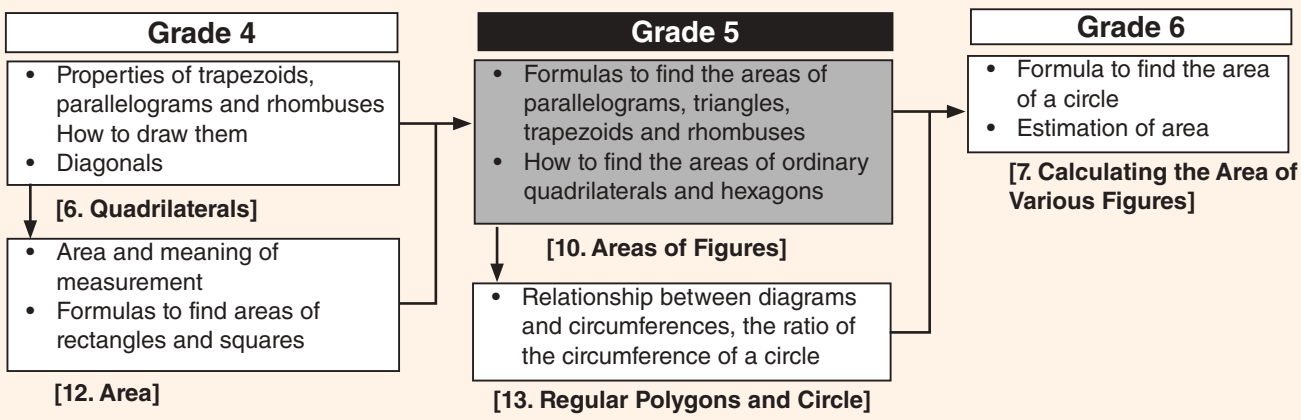
Area of Trapezoids and Rhombuses :

They can utilise the idea of transformation to parallelograms and triangles. They will also be able to find the differences which are the utilisation of diagonals and the existence of upper bottom. Students need to interpret the meaning of formulas. Corresponding each part of shape and formula using the same colours of chalks will help students to understand the meaning.

Thinking about How to Find the Area :

They can separately think about the area of known shapes. The ways of separations will be varied and they should be recognised as long as they are correct.

4. Related Learning Contents



Unit 10

Unit: Area of Figures
Sub-unit 1: Area of Parallelograms
Lesson 1 of 4

Textbook Page : 130 to 132
Actual Lesson 088

Sub-unit Objectives

- To understand the meaning of the formula for finding area of parallelogram.
- To find the area of parallelogram using the formula.

Lesson Objective

- To get the area of parallelogram compared to area of rectangle by applying equivalency transformation and transforming it into a rectangle.

Prior Knowledge

- Quadrilaterals (Grade 4)
- Area of Rectangles and Squares (Grade 4)

Preparation

- Movable frame using hard paper and paper clips
- Shape ⓐ, ⓑ and ⓒ on grid paper in 1 for each students

Assessment

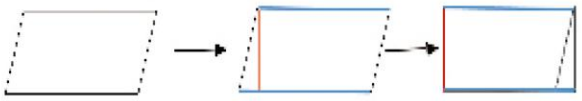
- Apply the prior knowledge on the area of rectangle to find the area of parallelogram. F
- Understand the relationship between a parallelogram and a rectangle. S

Teacher's Notes

It is important to assist the students to see that the sides of parallelogram can be seen as lower base or upper base, overlap or relate rectangle with parallelogram to indicate which side or part of diagram are applicable like Length and Width.

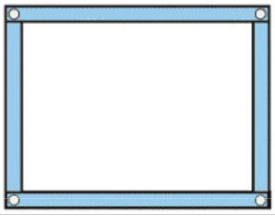
Equivalency Transformation is a transformation of figures without changing their original size or area such as illustrated below:

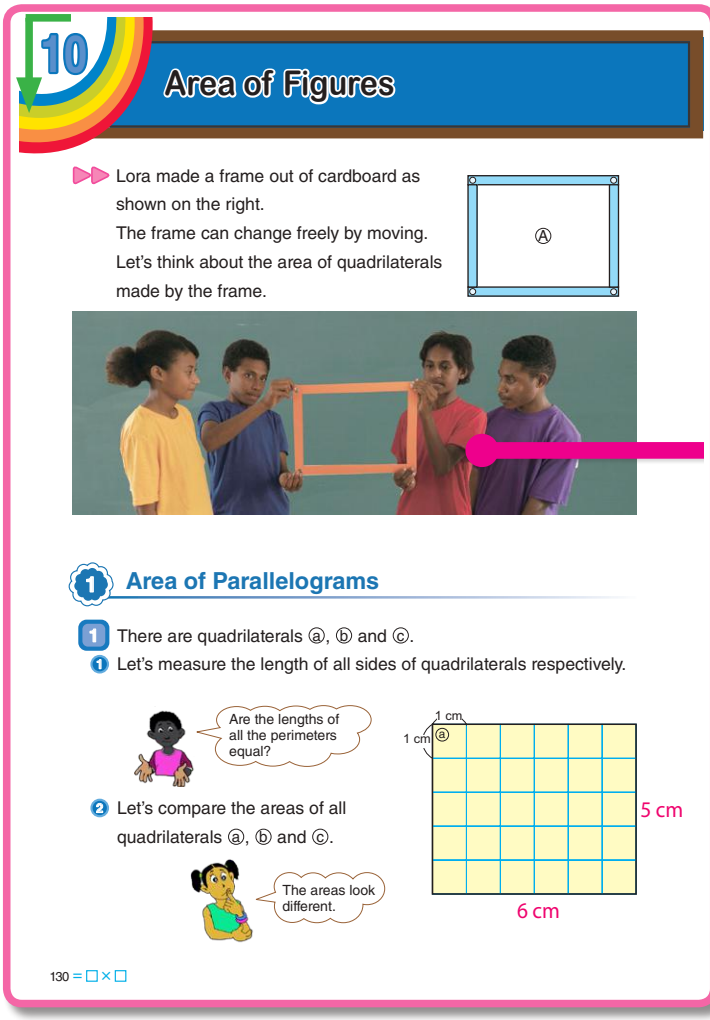
① Parallelogram ② Cut out a Triangle ③ Paste to make rectangle

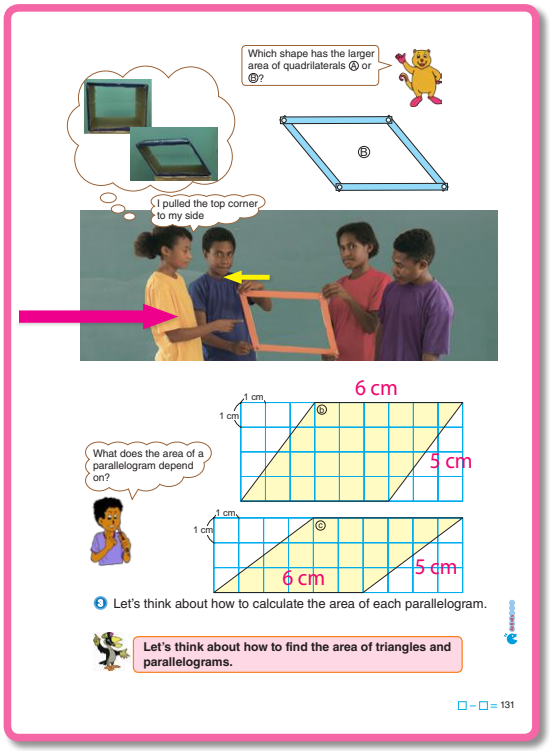


① Parallelogram ② Cut out from anywhere ③ Paste to form rectangle

Making the movable frame using strips of hard paper and 4 paper clips







Lesson Flow

1 Transforming rectangles into various Parallelograms.

T Introduce figures using the frame that can move freely.

S Identify different parallelogram that can be formed, apart from the rectangle.

T Put up the shapes ⓐ, ⓑ and ⓒ. "Compare the lengths and area, what can you notice about the three shapes?"

S Observe the shapes ⓐ, ⓑ and ⓒ and discuss with friends about the differences found in the shape in terms of perimeter and area.

2 ① Predict the size of a parallelogram and a rectangle with the same length of perimeter.

T ① "Are the lengths of all sides of the three parallelograms the same?"

S By observing the sides students predict their answer. Notice that it is the same.

T ② "How about comparing the areas of the quadrilaterals?"

S "Find the area of the rectangle by using area formula (Area = L × W)."

S The area formula for rectangle cannot be applied to parallelogram.

3 ③ Think about how to find the area of parallelogram.

T Introduce the Main Task. (Refer to the BP)

T Ask students to explain how to get the area of a parallelogram, focusing on one of them.

S Use diagram to show how to get the area by cutting the triangle part and pasting it on the other side of parallelogram to make a rectangle.

T Confirm students' ideas and ask them why they used the idea of cutting.

S Possible responses.

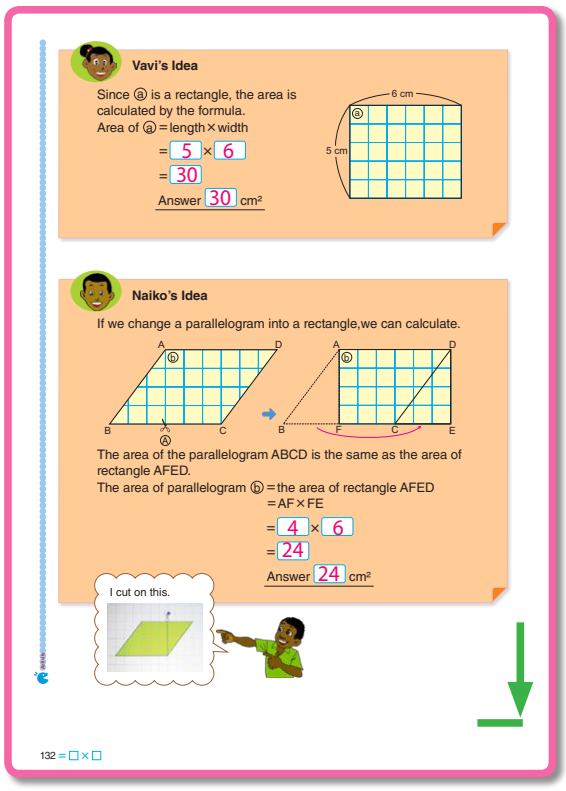
- Change the parallelogram to a known shape for easier calculation.
- Transform the parallelogram to a rectangle and use L × W to find the area of parallelogram.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.



Sample Blackboard Plan

Lesson 088 Sample Blackboard Plan is on page 179.

Unit 10

Unit: Area of Figures
Sub-unit 1: Area of Parallelograms
Lesson 2 of 4

Textbook Page : 133 and 134
Actual Lesson 089

Lesson Objectives

- To think about the necessary lengths to find out the area of parallelogram.
- To know the terms 'base' and 'height' and develop the formula of parallelogram.
- To measure the necessary length and find the area of parallelogram.

Prior Knowledge

- Equivalency transformation
- Previous lesson

Preparation

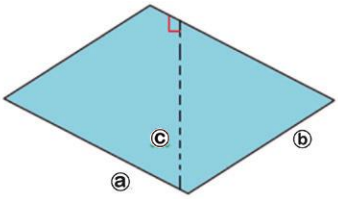
- Parallelogram drawn on the grid lines for 4 and 5

Assessment

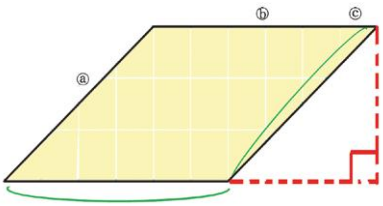
- Identify the required lengths to develop the formula for parallelogram. F
- Measure the lengths without using grids and find the area of parallelogram by applying its formula. S

Teacher's Notes

How to find the base and height is very important since students tend to be confused.
Example:
Some students choose ⓐ as base and ⓑ as height when correct answer is when ⓐ is the base then ⓒ is the height. The perpendicular length to the base is the height.
Stress to students that the height should be a perpendicular line to the base.

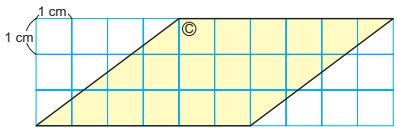


The correct answer is when ⓐ is the base and ⓒ is the height, so therefore ⓒ is perpendicular to ⓐ.

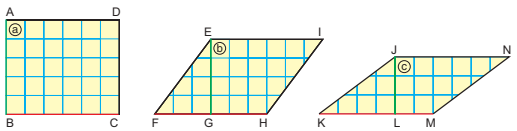


4 Check the lengths of the parallelogram used in ⓒ to find the height and the area.

Length: 6 cm, Width: 3 cm, Area = 6 × 3 = 18 cm²



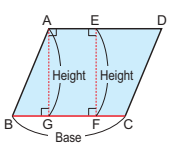
5 Which lengths do you use to find the area of quadrilaterals ⓐ, ⓑ and ⓒ?



AB and BC　FH and EG　KM and JL

Remember! Perpendicular line intersected at right angle (90°).

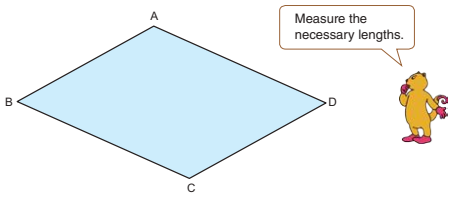
Mark one side of a parallelogram the **base**.
Lines AG, EF and other lines, which are perpendicular to base BC, are all the same length.
The length of these line are called **height** against the base BC.



The area of parallelogram = base × height

□ – □ = 133

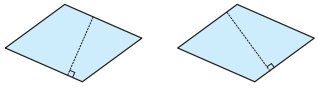
2 Let's find the area of the parallelogram below.



1 When side BC is the base, find the area by measuring the height.
Area = 6 × 4 = 24 (cm²)

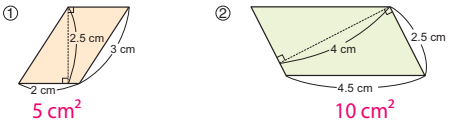
2 When side CD is the base, find the area by measuring the height.
Area = 5 × 4.8 = 24 (cm²)

The height depends on the base.



Exercise

Let's find the area of the following parallelograms.



5 cm²　10 cm²

134 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ④ Find the length needed to calculate the area of parallelogram ⓒ.

T Check the lengths of the parallelogram used in ⓒ to find the height and then find the area.
S Work individually to find the lengths which are needed to find the area of parallelogram ⓒ
S Share their answers with others.
T Check and confirm students' answers.
T Introduce the Main Task. (Refer to the BP)

3 ⑤ Construct a formula for the area of parallelogram.

T Using the diagrams ⓐ, ⓑ and ⓒ, ask students to find the lengths needed to calculate the area of parallelogram.
S Discuss and identify the required lengths to find the area.
TN Height (green) and the base (red) are the required lenghts.

4 Important Point

T/S Explain the important point in the box .

5 ② Find the area of parallelogram without using the grid.

T Let's find the area of the parallelogram.
S Measure the required lengths and use the formula to calculate the area of parallelogram.
TN ① When side BC is the base;
Area = 6 × 4 = (24 cm²)
② When side CD is the base, find the area by measuring the height; Area = 5 × 4.8 = 24 (cm²).
T Check and confirm students' answers.

6 Important Point

T/S Explain the important point in the box .

7 Complete the Exercise

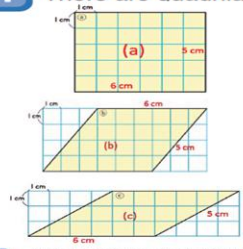
S Solve the selected exercises.
T Confirm students' answers.

Sample Blackboard Plan (Lesson 88)

Date: **Chapter:** 10 Area of Figures **Su-chapter 1:** Area of Parallelograms **Lesson:** 1 of 4

Main Task: Let's think about how to find the area of Parallelogram.

1 There are quadrilaterals ⓐ, ⓑ and ⓒ.



A
P = 5 x 2 + 6 x 2 = 22
A = 6 x 5 = 30

B
P = 22
A = 6 x 5 = 30

C
P = 22
A = 6 x 5 = 30

① Are the lengths of all sides of the three quadrilaterals the same? Yes

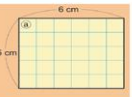
② Compare the areas of all the three quadrilaterals. The area of rectangle is found using the area formula. To find the area of the two parallelograms area formula for rectangle cannot not be applied.

MT

③ How can we find the area of Parallelogram?

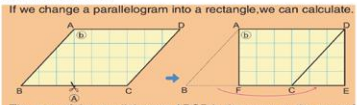
Vavi's Idea.

Since ⓐ is a rectangle, the area is calculated by the formula.
Area of ⓐ = length × width
= 5 × 6
= 30
Answer 30 cm²



Naiko's Idea.

If we change a parallelogram into a rectangle,we can calculate.



The area of the parallelogram ABCD is the same as the area of rectangle AFED.
The area of parallelogram ⓑ = the area of rectangle AFED
= AF × FE
= 4 × 6
= 24
Answer 24 cm²

Summary

The area of a parallelogram can be calculated by changing the parallelogram into a rectangle and apply the area formula for rectangle.

Sample Blackboard Plan (Lesson 89)

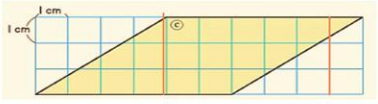
Date: **Chapter:** Area of Figures **Sub – Chapter:** Area of Parallelograms **Lesson:** 2 of 4

Main Task: Let's use the required lengths to create the formula for the parallelogram.

Review

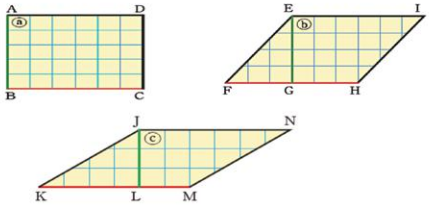
④ Check lengths and Find the area for this Parallelogram.

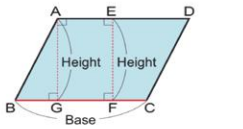
Length: 6 cm,
Width: 3 cm,
Area: 6x3= 18 cm² .



MT

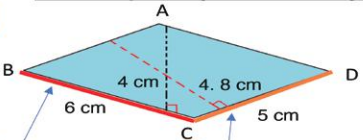
⑤ Which Lengths are needed to find the area of Quadrilaterals?





The area of parallelogram = base × height

②



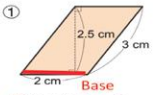
① BC is the base.
Area = B x H
= 6 x 4
= 24
Answer: 24 cm²

② CD is the base
Area = B x H
= 5 x 4.8
= 24
Answer: 24 cm²

Important Point

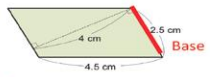
Exercise

①



① 2 x 2.5 = 5
Answer: 5 cm²

②



② 2. 5 x 4 = 10
Answer: 10 cm²

Summary

The area of a parallelogram = base x height.

Unit 10

Unit: Area of Figures
Sub-unit 1: Area of Parallelograms
Lesson 3 of 4

Textbook Page : 135
Actual Lesson 090

Lesson Objectives

- To think about how to find the perpendicular height of a parallelogram.
- Find the area of the parallelogram using the base and the perpendicular height.

Prior Knowledge

- Formula for area of parallelogram

Preparation

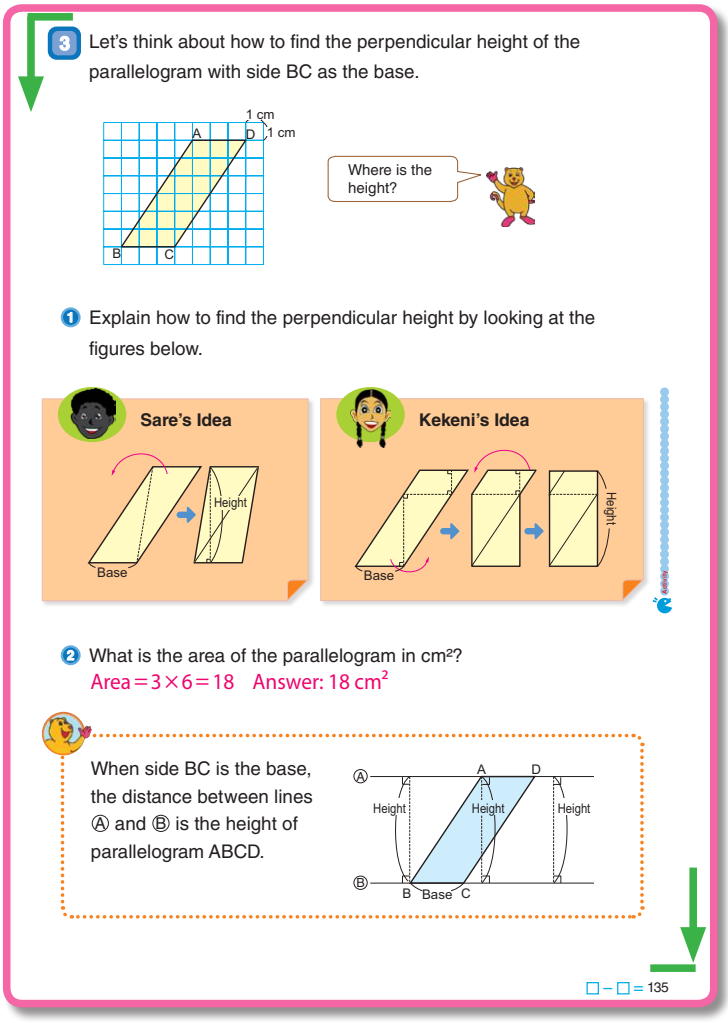
- Grid paper
- Chart showing Sare's and Kekeni's Ideas

Assessment

- Find the perpendicular height of a parallelogram. F
- Find the area of a parallelogram using the base and the perpendicular height. S F

Teacher's Notes

- Use grid papers for easier method in finding the perpendicular height of the parallelogram in 3.
- The height of the parallelogram can be located anywhere between the top and bottom bases.



Lesson Flow

1 Review the previous lesson.

2 3 Find the perpendicular height of parallelogram.

T Introduce the Main Task.
(Refer to the Blackboard Plan)

T Refer to the diagram in the textbook.
"Where is the height?"

S Use grid papers to express idea on how to find the height and share with friends.

3 Find out the height and calculate the area.

TN Let students to compare their ideas with Sare's and Kekeni's Ideas.

T 1 Ask students to study the ideas of the students in the textbook.

T Explain and display the idea in the textbook on the board.
Find a perpendicular line between upper and lower bases.
Make a parallelogram or rectangle by applying equivalency transformation using Sare's and Kekeni's ideas.

S Height is the line connecting the lower base and upper base.

S Height should be perpendicular to the base.

T Confirm students' ideas to find the height by cutting or folding the parallelogram to known shapes.

T Ask students to complete activity 2.

S 2 Area = 3 × 6 = 18
Answer: 18 cm²

4 Important Point

T/S Explain the important point in the box .

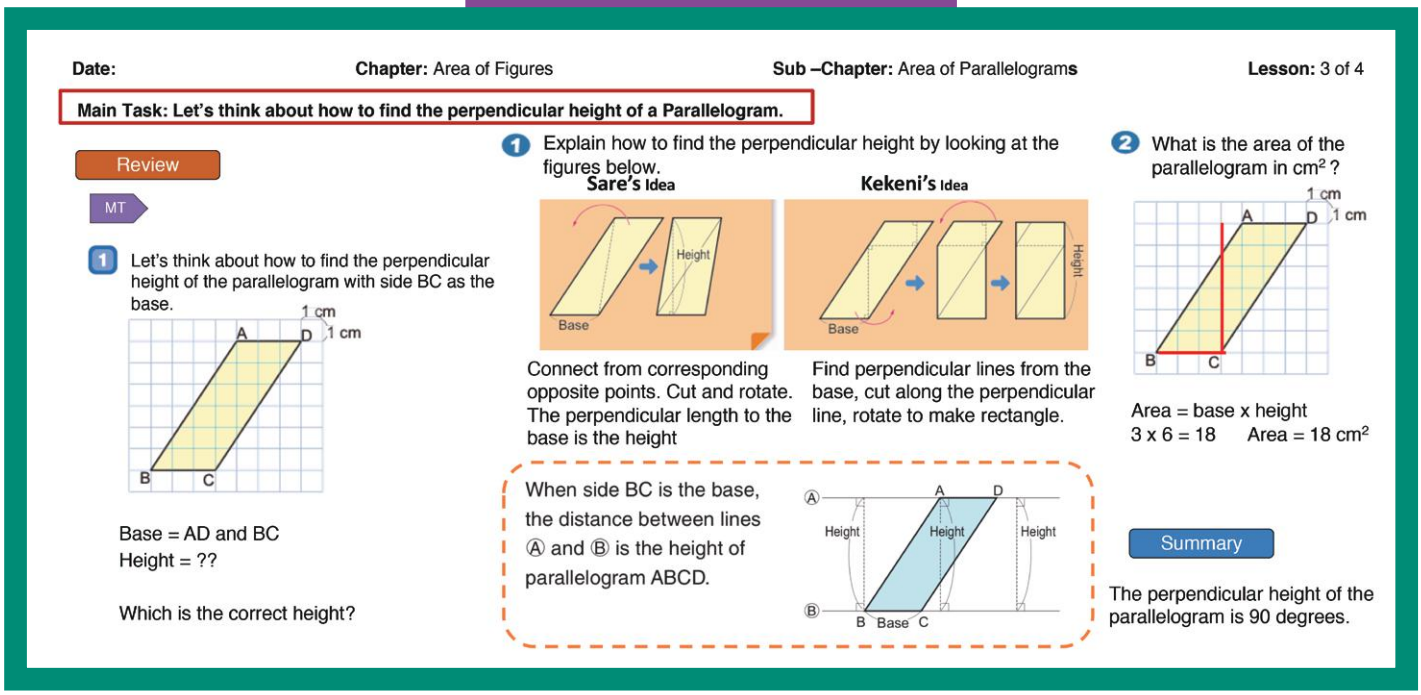
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 10

Unit: Area of Figures
Sub-unit 1: Area of Parallelograms
Lesson 4 of 4

Textbook Page : 136
Actual Lesson 091

Lesson Objectives

- To think about the relationship between area, height and base of parallelogram.
- To find the base from the area and height of the parallelogram.

Prior Knowledge

- How to find the various types of parallelogram using formula

Preparation

- Prepare diagram on grid paper for 4.

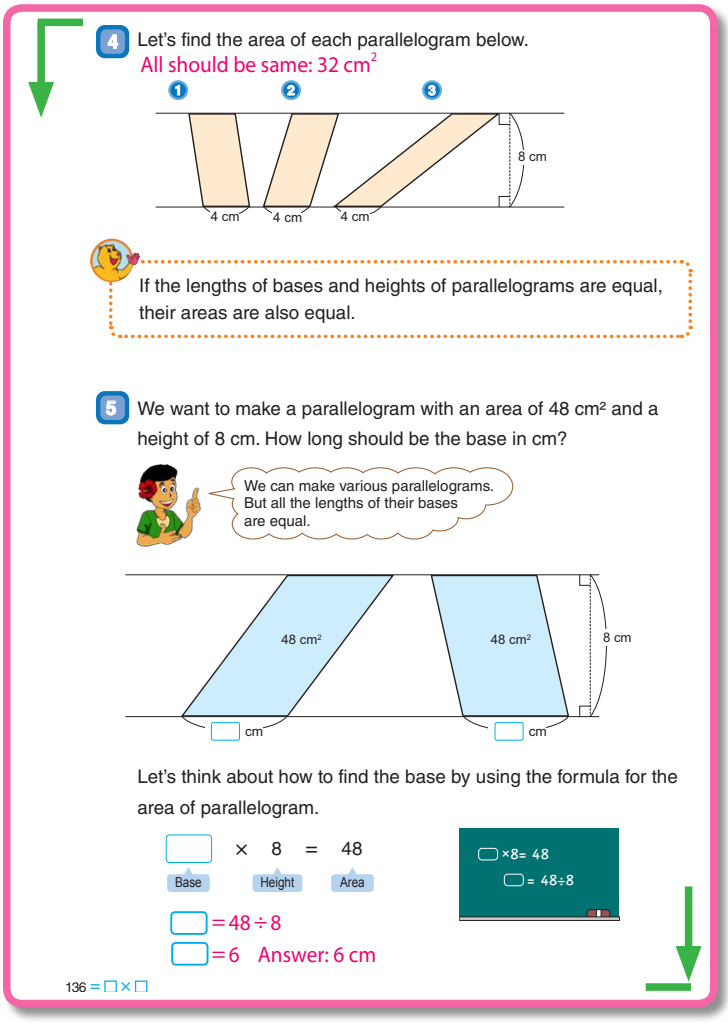
Assessment

- Understand and explain the relationship between area, height and base of parallelogram. F
- Find the base from the area and the height of parallelogram. S

Teacher's Notes

The key points in this lesson is to:

- Confirm whether students can find the area of parallelograms when their bases and heights are the same.
- Correctly apply the area formula to find out the base or the height, based on this understanding.



Lesson Flow

1 ❹ Predict the size of area whether it is larger or smaller.

T Introduce the Main Task. (Refer to the BP)
T Direct the students attention to task 4 on the blackboard and ask them to predict which parallelogram has a larger area and explain the reason why they think so.
TN Possible student responses:
- ❶ looks similar to ❷, because of the base and height are the same.
- ❶ looks larger than ❸, because of the space inside ❶ looks wider.

S Present ideas on the blackboard.

2 Find the area of the parallelograms.

T Find the area for parallelograms ❶, ❷ and ❸.
S Work individually to find the areas of parallelograms.
T Ask students to share their answers in pairs. "What do you notice?"
S Discuss and share their answers in pairs.

3 Important Point

T/S Explain the important point in the box ⬚.

4 ❺ Find the length of base using the area and length of height.

T We want to make a parallelogram with an area of 48 cm² and a height of 8 cm.
How long should be the base in cm?
S Discuss in pairs on how to find the base.
T Ask few students to share their answers to the class using the blackboard.
S Share their answers with the class using the blackboard for explanation.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

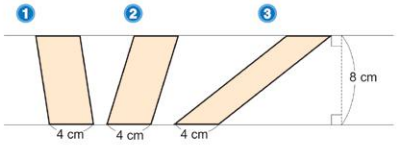
Date: **Chapter:** Area of Figures **Sub-chapter:** Area of Parallelograms **Lesson:** 4 of 4

Main Task: Let's find the relationship between the base, height and area of the parallelogram.

Review

MT

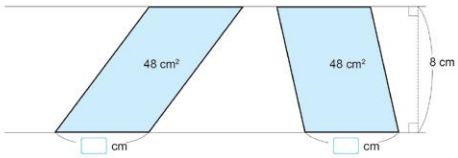
❹ Let's find the area of each parallelogram below.



Which area is larger?
Area ❶, ❷ and ❸ are the same. Thus, if the length of bases and heights of parallelogram are equal, the area of these parallelograms are equal.

Important Point

❺ How long should be the base in cm?



Area = B x H
48 = B x 8
thus answer: 6cm

We know
(6 x 8 = 48 and 48 ÷ 8 = 6)

B x H = Area
B x 8 = 48
B = 48 ÷ 8
B = 6

Summary

When the lengths of bases and heights of parallelograms are equal then their areas are also equal.

Unit 10

Unit: Area of Figures
Sub-unit 2: Area of Triangles
Lesson 1 of 4

Textbook Page :
137 to 139
Actual Lesson 092

Sub-unit Objectives

- To understand how to calculate the area of triangle and the meaning of the formula.
- To calculate the area of triangle by applying the area formula for triangle.

Lesson Objectives

- To think about how to find the area of a triangle by applying the equivalency transformation or multiple transformation.
- To calculate the area of triangle by applying the area formula for triangle.

Prior Knowledge

- Area of Parallelograms
- Finding the area using the formula for the area of different parallelograms and rectangles

Preparation

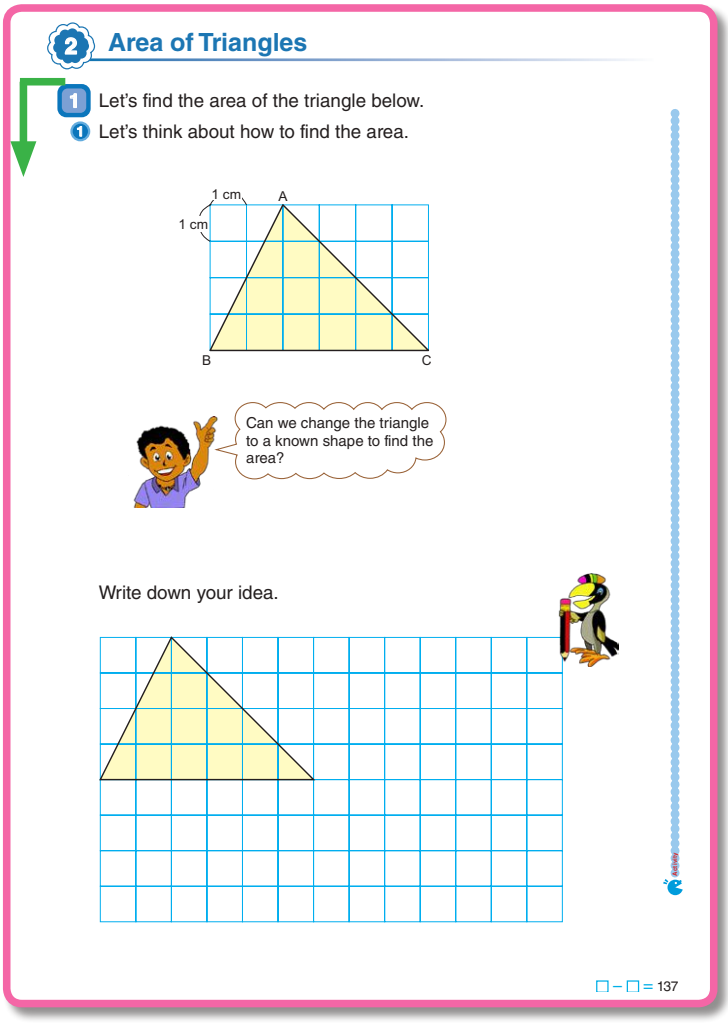
- Grid papers, Enlarge drawing of a triangle on a chart and different ideas presented on charts

Assessment

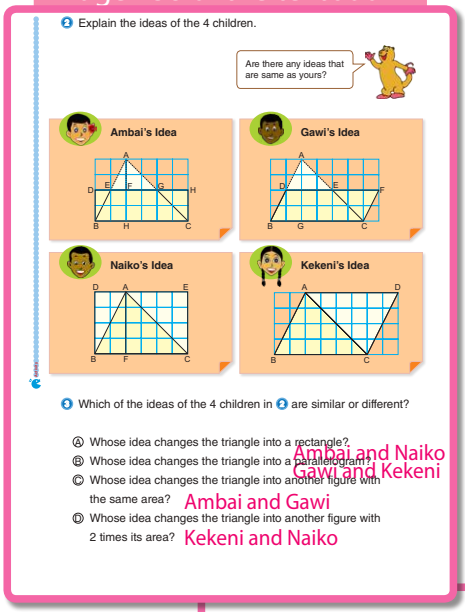
- Think about how to find the area of a triangle based on equivalency and multiple transformation. F
- Explain how to find the area of a triangle. S

Teacher's Notes

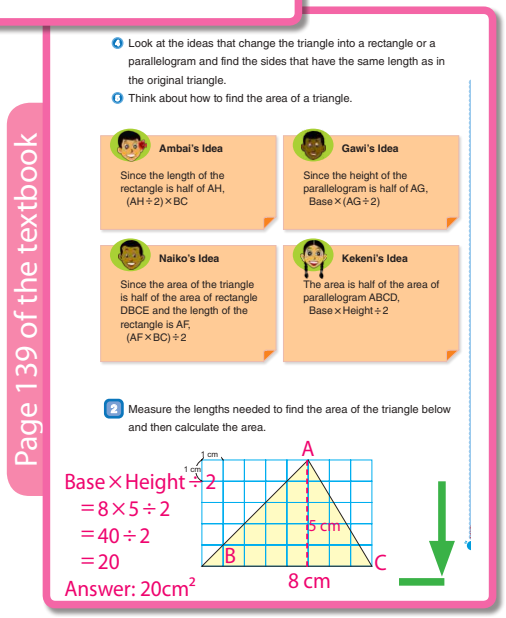
Multiple Transformation is to combine another same figure to the original figure in which the area formula is known.
Students have already understood Equivalency transformation to find the area of parallelogram. It's important for teachers to let them understand and explain how to apply it for the area of triangle.



Page 138 of the textbook



Page 139 of the textbook



Lesson Flow

1 Review the previous lesson.

2 1 Let's find the area of the triangle.

T 1 Let's try to think about how to find the area of a triangle.
S Think about how to find the area of the triangle.
T Can we change the triangle to a known shape?
S Discuss and write down own ideas and share.
T Introduce the Main Task. (Refer to the BP)

3 How to find the area of a triangle.

T 2 Explain the ideas of 4 students.

1. **Ambai's Idea: Equivalency Transformation**

TN Draw a small rectangle (BCDEFGH) on top of the original triangle. Then, find the length of the rectangle which is going to be half of AH (the line running down from A to H) 2 small right triangles out of rectangle are the same as those inside of the rectangle. Therefore, the area of triangle is the same as that of the rectangle.

2. **Gawi's Idea: Equivalency transformation**

TN A small parallelogram (BCDEFG) is drawn. Use the length of the parallelogram with the height of the parallelogram which is the line in the middle that is half of AG (the height of the triangle). One small triangle out of the parallelogram is equal to the triangle inside of the parallelogram. Then, the area of triangle is the same as that of the parallelogram.

3. **Naiko's Idea: Multiple transformation**- refer to teacher's notes for explanation.

TN A big rectangle is drawn on top of the triangle. The area of the two small right triangles is half of the area of the 2 small rectangle. Since the area of each small triangle is the half of the each small rectangle.

4. **Kekeni's Idea: Multiple transformation**

TN Draw a triangle as the opposite side of the original triangle with the same shape and size so that a big parallelogram is formed. Therefore, the area of the triangle is half of the area of parallelogram ABCD.

T 3 Which of the 4 children's ideas are similar or different?
S Ⓐ which one changes the triangle into a rectangle? Ambai's and Naiko's ideas.
S Ⓑ which one changes the triangle into a parallelogram? Gawi's and Kekeni's ideas.
S Ⓒ which one changes the triangle into other figure with the same area? Ambai's and Gawi's ideas.
S Ⓓ which one changes the triangle into other figure with the 2 times area? Naiko's and Kekeni's ideas.
T 4 Look at the ideas that change the triangle into a rectangle or a parallelogram, find the sides that have the same lenght as in the original triangle.
S All sides are changed but the base remains the same.

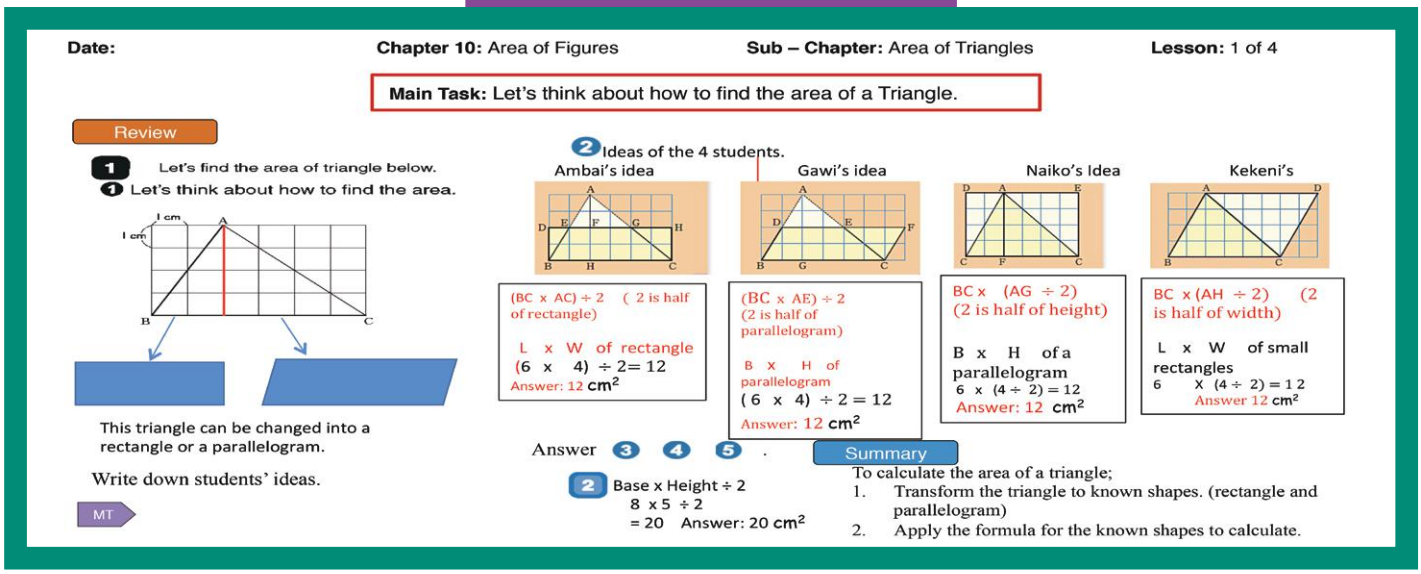
4 5 Think about how to find the area of a triangle.

T Calculate the area based on each students' ideas.
TN Explain the blackboard plan and display the explanations below the diagrams.

5 2 Find the lengths required to calculate the area.

T Let students find out the lengths required to calculate the area of a triangle.
S Base (8 cm), and height (5 cm) are used to calculate the area of the triangle.
$8 \times 5 \div 2 = 20$ cm²

Sample Blackboard Plan



Unit 10

Unit: Area of Figures
Sub-unit 2: Area of Triangles
Lesson 2 of 4

Textbook Page : 140
Actual Lesson 093

Lesson Objectives

- To understand the relationship between the base of the triangle and the height and make a formula of the triangle.
- To measure the required length of the triangle and find the area.
- To use the area formula for triangle to find the area of a triangle.

Prior Knowledge

- Finding the area of a Triangle

Preparation

- Grid paper, Enlarge drawing of a triangle on a chart for 3

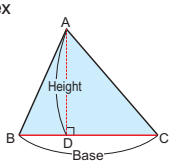
Assessment

- Identify and understand the relationship between the base and the height of a triangle and derive the formula. F
- Calculate the area of a triangle using the formula. S
- Complete the Exercise correctly. S

Teacher's Notes

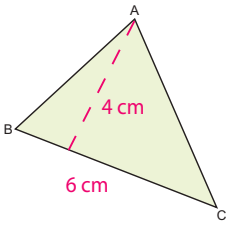
- Ensure the students use rulers to measure the heights of the triangles when each of the three sides are bases.
- The area of the triangle will be the same even though the base and the height are measured from three different lengths.

Draw a perpendicular line AD from the vertex A to the opposite side BC of the triangle. Side BC is called the base and line AD is called the **height** of the triangle.



Area of triangle = (base × height) ÷ 2

3 Let's find the area of the triangle below by measuring the necessary lengths.



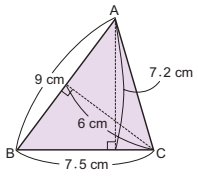
When each of the 3 sides is the base, what are the heights of the triangles, respectively?

Area = 6 × 4 ÷ 2 = 12
Answer: 12 cm²

Exercise

Let's find the area of triangle, as follows:
① when side BC is the base.
② when side AB is the base.

① 7.5 × 7.2 ÷ 2 = 27 cm²
② 9 × 6 ÷ 2 = 27 cm²



140 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Constructing the formular for triangle using the required lengths.

TN Using the ideas from the previous lesson, students will construct the formular for triangles using the required lengths. The required lengths are base, height and then ÷ 2.

T/S Identify the required lengths to construct the formula for triangle through discussion.

3 Important Point

T/S Explain the important point in the box .

4 3 Apply the area formula for triangle.

T Introduce the Main Task. (Refer to the BP)

T Let's find the area of the triangle by measuring the required lengths.

S Use the formula for triangle to calculate the area.

1. Base BC: $6 \times 4 \div 2 = 12$
Answer is 12 cm²
2. Base AC: $5.7 \times 4.2 \div 2 = 11.97$
Answer is 11.97 cm²
3. Base AB: $4.5 \times 5.4 \div 2 = 12.15$
Answer is 12.15 cm²

$(12 + 11.97 + 12.15) \div 3 = 12.04$
Area is approximately 12 cm².

TN When the base changes, the height also changes but the area remains the same.

5 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

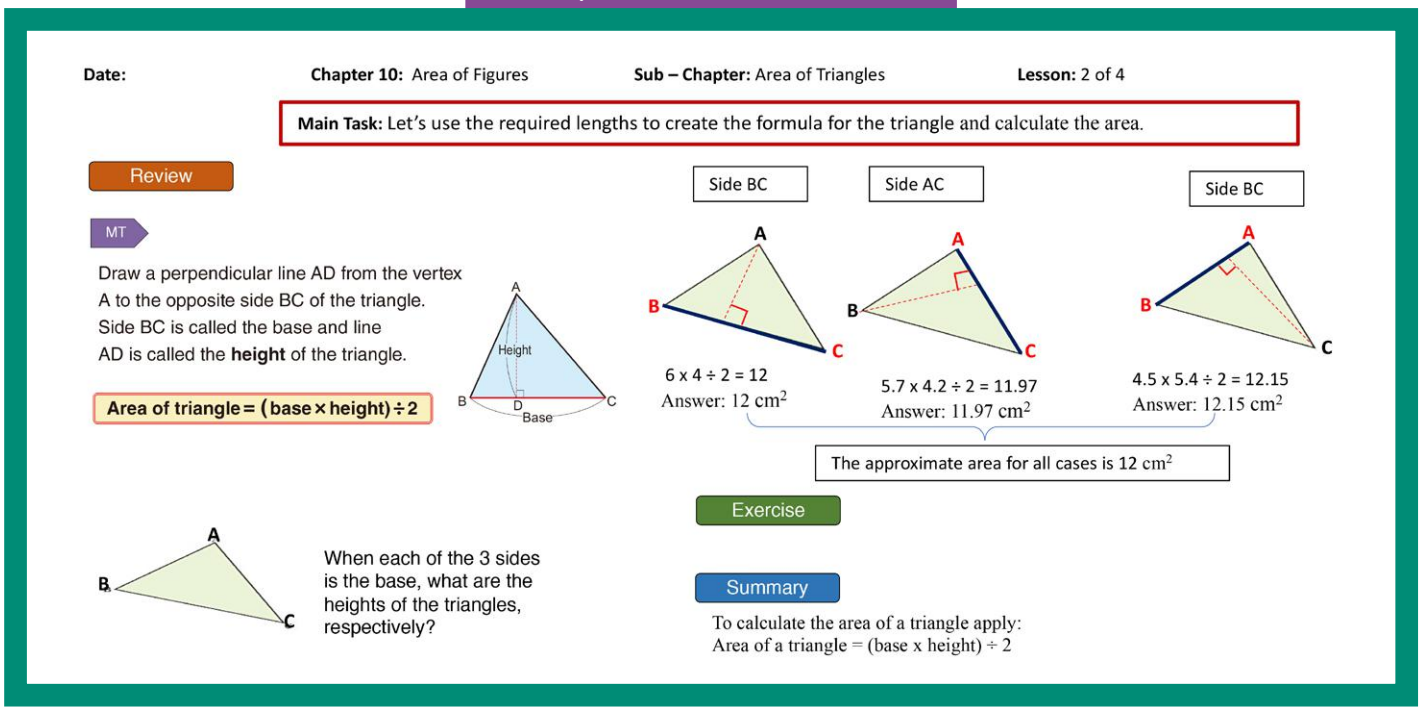
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 10

Unit: Area of Figures
Sub-unit 2: Area of Triangles
Lesson 3 of 4

Textbook Page : 141
Actual Lesson 094

Lesson Objectives

- To understanding how to find the height outside of a triangle.
- To find the area of triangle whose height is located on the outside of the triangle.

Prior Knowledge

- Using the formula to find the heights of each sides of the triangle

Preparation

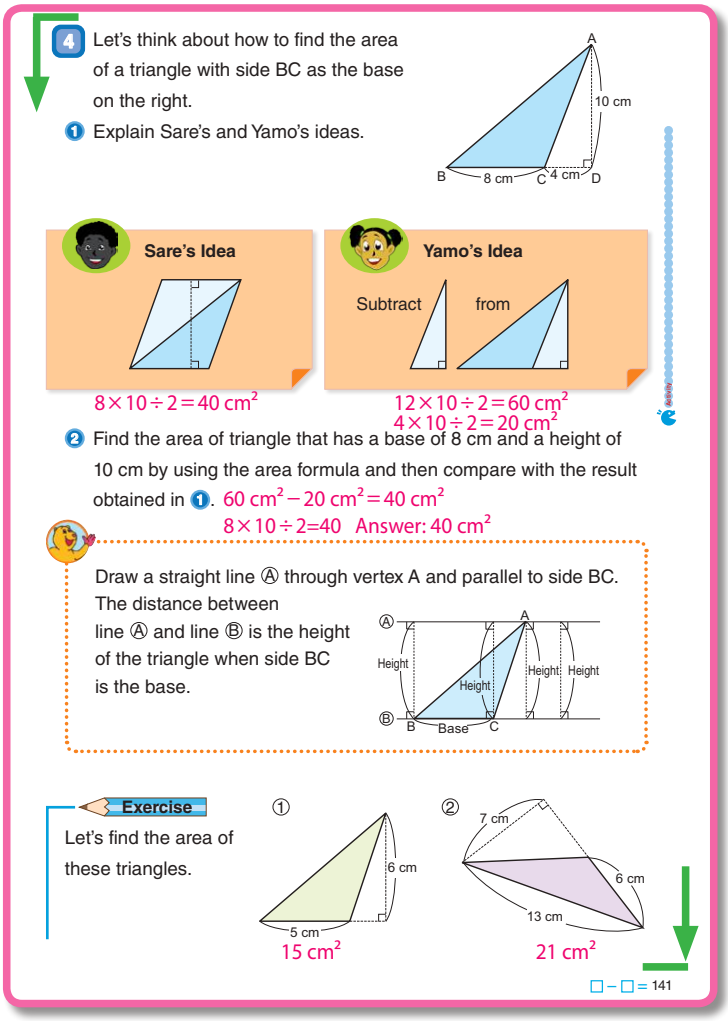
- Charts of 4

Assessment

- Understand and explain the height of the triangle. F
- Calculate the area of a triangle using the outside height. S
- Complete the Exercise correctly. S

Teacher's Notes

The 2 right angle triangles were identified by a perpendicular line, therefore, we used its formula (B×H÷2) to solve the problem. Based on the idea of transformation, the small triangle was subtracted from the bigger triangle to find the area of the triangle.



Lesson Flow

1 Review the previous lesson.

2 Think about how to find the area of a triangle.

T/S ④ Read and understand the situation.
T Introduce the Main Task. (Refer to the BP)
T ① Explain Sare's and Yamo's ideas to confirm the height as 10 cm.
TN • **Sare's Idea**
I drew a parallelogram and used a ruler to confirm the height of the triangle inside the parallelogram and calculated its area.
• **Yamo's Idea**
1. Adding a smaller triangle to the original triangle to form a right triangle
2. Use a ruler to find the height outside the original triangle and calculate the area of the right triangle.
3. Subtract the area of the smaller triangle from the area of the right triangle.
TN The height remains the same whether drawn inside or outside of the triangle.

3 ② Using the formula to find the area of a triangle.

T Find the area of triangle that has a base of 8 cm and a height of 10 cm.
S Calculate the area of the triangle using the formula, Area = B × H ÷ 2.
S Compare the answers obtained in ①.

4 Important Point

T/S Explain the important point in the box .

5 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

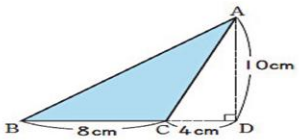
Date: **Chapter:** Area of Figures **Sub – Chapter:** Area of Triangles **Lesson:** 3 of 4

Main Task: Let's find the area of these triangles using the area formula for the triangle..

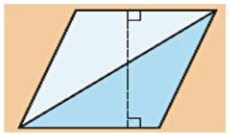
Review

MT

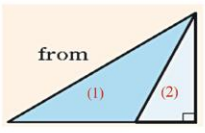
④ Let's think about how to find the area of a triangle with side BC as the base below.



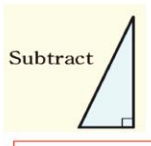
① Explain Sare and Yamo's ideas.



8 x 10 ÷ 2 = 40 cm²



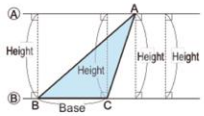
(1) 12 x 10 ÷ 2 = 60 cm²
(2) 4 x 10 ÷ 2 = 20 cm²



60 cm² - 20 cm² = 40 cm²

② 8 x 10 ÷ 2 = 40 Answer 40cm²

Draw a straight line Ⓐ through vertex A and parallel to side BC. The distance between line Ⓐ and line Ⓑ is the height of the triangle when side BC is the base.



Exercise

Summary
The extension of straight line drawn through vertex A and the base BC does not change the height of the triangle.

Unit 10

Unit: Area of Figures
Sub-unit 2: Area of Triangles
Lesson 4 of 4

Textbook Page : 142
Actual Lesson 095

Lesson Objectives

- To think about the area of triangles with the same base and height.
- To find the height of triangle from its area and base.

Prior Knowledge

- Area of triangle
- Finding the area of triangle with the given base and the height

Preparation

- Grid paper, enlarged drawing of a triangle on a chart

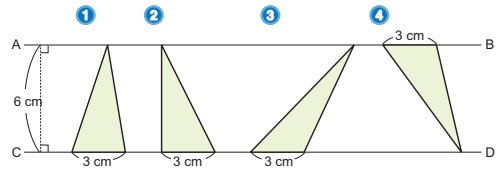
Assessment

- Understand the relationships between area, height and base of the triangle. F
- Calculate the height of a triangle with the given base and the area. S F
- Complete the Exercise correctly. S

Teacher's Notes

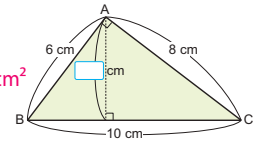
Students have a habit of understand that if there are different triangles their areas are also different even though their base and height are the same.
Another confusion is that they cannot find out which side or length is base or height, if the triangle shape is rotated.
Teachers need to guide students repeatedly and thoroughly about what is height or base, even though we rotate the triangle or change its shape (example done in 5).

5 In the figure below, straight lines AB and CD are parallel.
Let's find the area of each triangles below. All are 9 cm²



If the lengths of bases and heights of triangles are equal, their areas are equal.

6 The figure on the right is a right angle triangle.
1. Let's find the area. 6×8÷2=24 cm²
2. When side BC is the base, calculate the height of the triangle.

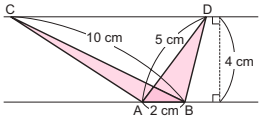


10 × □ ÷ 2 = Area
Base Height

10×□÷2= Area
10×□ = Area × 2
□ = Area × 2 ÷ 10

□=24×2÷10=4.8 cm

Exercise
Let's find the area of these triangles when sides AD and BC are the base, respectively.
AD: 5×8÷2=20 cm²
BC: 10×4÷2=20 cm²



142 = □×□

Lesson Flow

1 Review the previous lesson.

2 5 Find the area of triangles with the same base and height.

T Introduce the Main Task. (Refer to the BP)
T Let's find the area of each triangle below.
S Discuss in groups and share their ideas with friends.
TN Calculate 1 to 4.
All give the same answer as $3 \times 6 \div 2 = 9$
Answer is 9 cm².
S The areas are the same, because the height is 6 cm and the base is 3 cm for all triangles from 1 to 4.

3 Important Point

T/S Explain the important point in the box .

4 6 Find the height of a triangle by using the base and the area.

T 1 Let's find the area in cm².
S Using the formula of a triangle.
The base AB is 6 cm and the height AC is 8 cm.
The area is $6 \times 8 \div 2 = 24$
Answer is 24 cm²
T 2 When side BC is the base, calculate the height of the triangle.
S Use the area formula of triangle to find the height of the triangle when the base is BC.
TN 1. We know the area is 24 cm and the base is BC, which is 10 cm.
2. We know the formula is $B \times H =$ area, we can substitute the area and the base,
which is $10 \times \square \div 2 = 24$. $24 \times 2 \div 10 = 4.8$
Answer: 4.8 cm
T What do you understand through this task?
S "If we know the base and the area of a triangle, we can find its height.

5 Complete the Exercise

S Solve the exercise.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

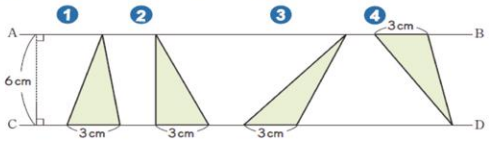
Date: **Chapter:** Area of Figures **Sub – Chapter:** Area of Triangles **Lesson:** 4 of 4

Main Task: To find the area of a triangle whose height is outside of the triangle.

Review

MT

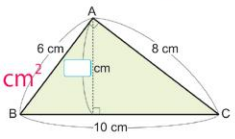
5 Find out the area of 1 to 4.



1 $3 \times 6 \div 2 = 9$
2 $3 \times 6 \div 2 = 9$
3 $3 \times 6 \div 2 = 9$
4 $3 \times 6 \div 2 = 9$
The area for 1 to 4 is the same with 9 cm².

Important Point

6 The figure on the right is a right angle triangle.
1 Let's find the area. $6 \times 8 \div 2 = 24$ cm²
2 When side BC is the base, calculate the height of the triangle.



10 × □ ÷ 2 = Area
Base Height

□ = $24 \times 2 \div 10 = 4.8$ cm

$10 \times \square \div 2 =$ Area
$10 \times \square =$ Area $\times 2$
$\square =$ Area $\times 2 \div 10$

Exercise

Summary

- When the lengths of bases and heights of triangles are equal, their areas are equal.
- If we know the base and the area we can find the height.

Unit 10

Unit: Area of Figures
Sub-unit 3: Area of Trapezoids
Lesson 1 of 1

Textbook Page : 143 and 144
Actual Lesson 096

Sub-unit Objectives

- To understand the meaning of the area formula for trapezoid.
- To calculate the area of trapezoid using its formula.

Lesson Objectives

- Identify that to calculate the area of trapezoid, three lengths are used. (Upper base, lower base and height).
- To develop a formula to find the area of trapezoid.

Prior Knowledge

- Area of parallelogram and triangle

Preparation

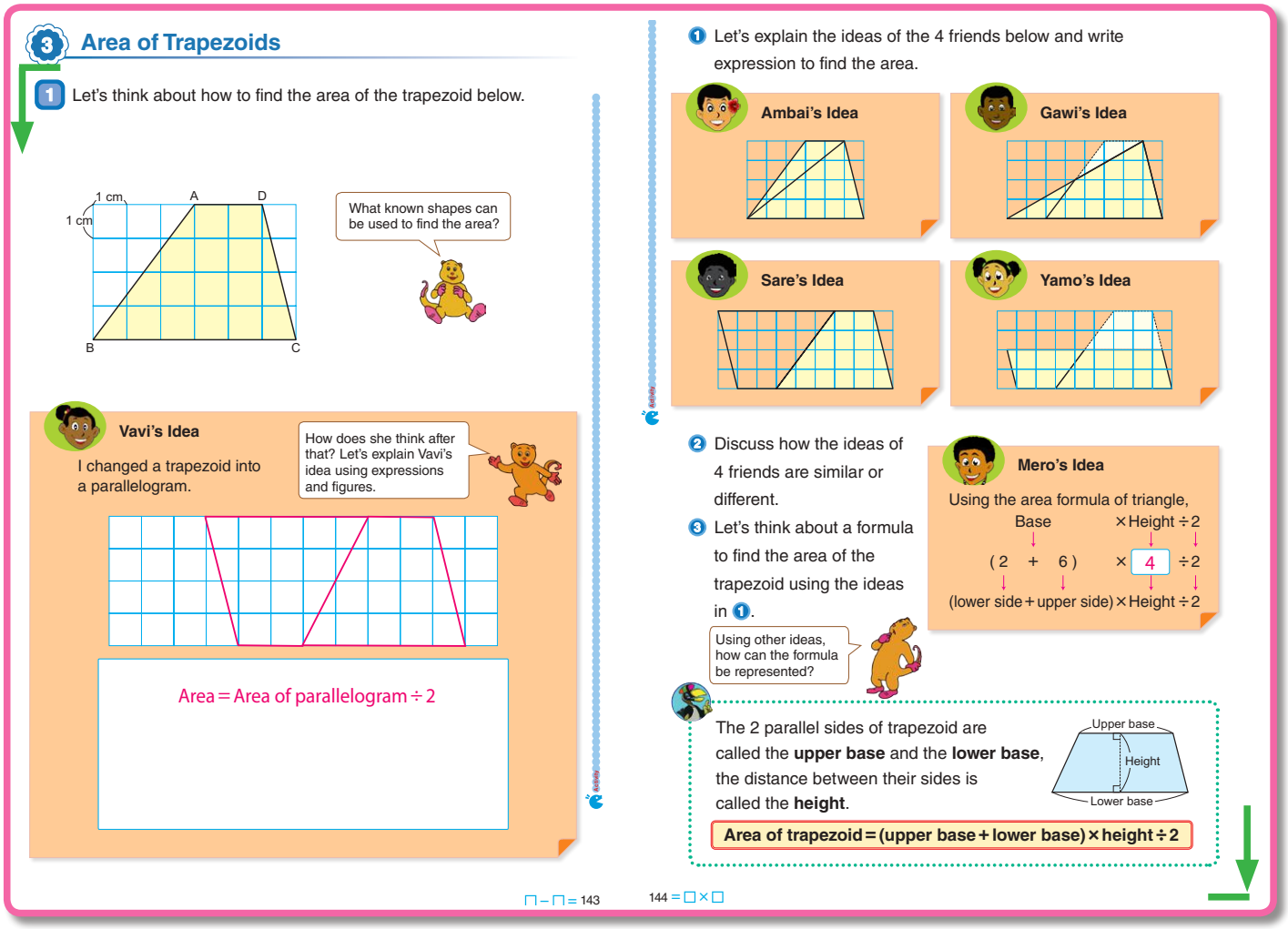
- Grid papers and scissors
- Chart of the important point

Assessment

- Identify that three lengths (Upper base, lower base and height) are used to calculate the area of trapezoid. F
- Derive the area formula for trapezoid. F
- Apply the area formula for trapezoid. S

Teacher's Notes

The importance of this lesson is to understand how we can apply the area of parallelogram and triangle and locate the 3 lengths of sides as upper base, lower base and height are used to calculate the area of trapezoid.
It is necessary to highlight these three lengths during the lesson; e.g. marking them with colours or underlines.



Lesson Flow

1 Review the previous lesson.

2 ① Think about how to find the area of a trapezoid.

T Which known shapes can a trapezoid be transformed into to find its area?
S Observe the trapezoid and transform it to known shapes.
T Complete Vavi's idea using expressions and figures.
S Present their transformation.
T Introduce the Main Task. (Refer to the BP)

3 ① Let's explain the ideas of 4 students and write expressions to find the area.

T ① Refer to board plan for the explanation of the 4 students' ideas.
S Write mathematical expressions for each ideas.
S ② Compare the ideas and discuss how the 4 ideas of the students are different or similar.
TN 1. Ambai and Gawi used the formula for triangle to find the area of trapeziod.
2. Sare and Yamo used the formula for parallelogram to find the area of trapezoid.

4 ③ Form the area formula for trapezoid.

T Let students understand that when Gawi used the formula for triangle, the base is: lower side (2) + upper side (6) that totals up to only one base (8) then multiplied by the height (4) ÷ 2.
T Ask students to confirm whether the others ideas are similar with Gawi's idea or formula.
S Check and conclude that they are all the same and this is the area formula for trapezoid.

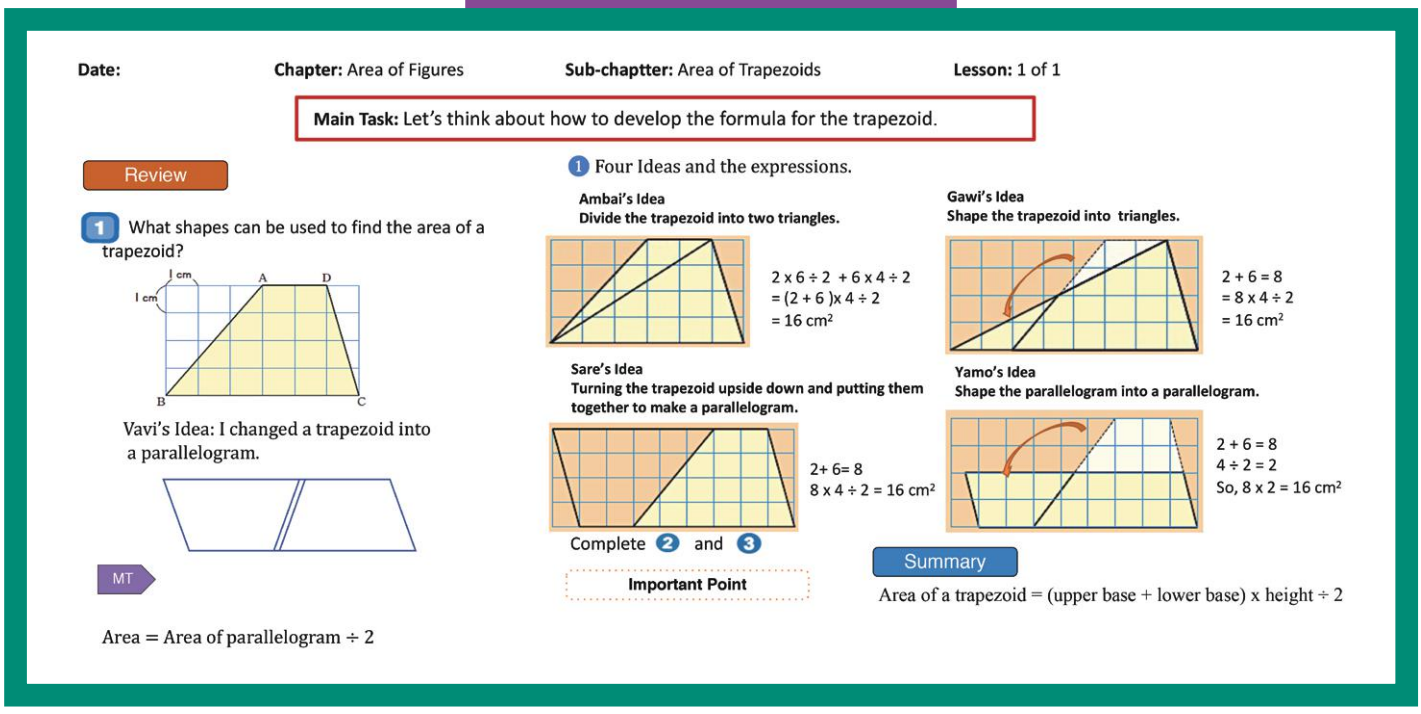
5 Important Point

T/S Explain the important point in the box .

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 10

Unit: Area of Figures
Sub-unit 4: Area of Rhombuses
Lesson 1 of 1

Textbook Page : 145
Actual Lesson 097

Sub-unit Objectives

- To understand the meaning of the formula for area of rhombus.
- To find the area of rhombus by applying the formula.

Lesson Objectives

- To identify that if we find the length of diagonals we can calculate the area of rhombus.
- To develop a formula to find the area of rhombus.

Prior Knowledge

- The area of triangle and its formula
- The area of rectangle and its formula

Preparation

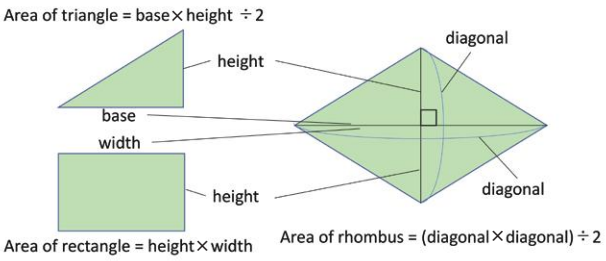
- Enlarged drawing of 1 and 2, rulers for students

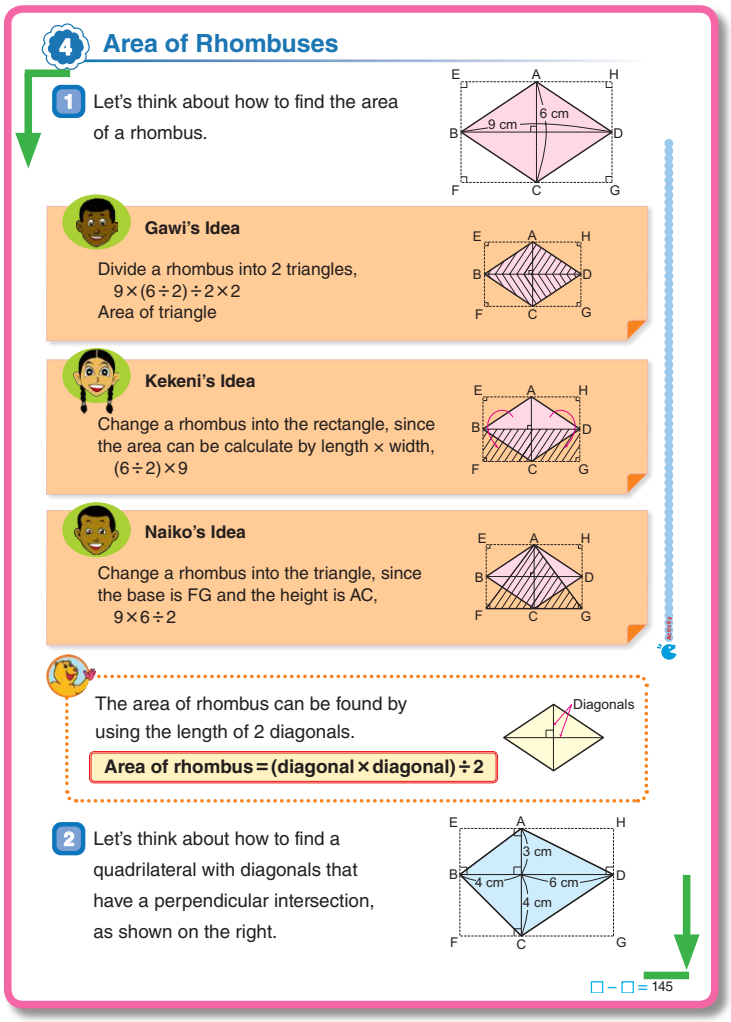
Assessment

- Think about how to develop a formula to find the area of rhombus. F
- Apply the formula of rhombus for the quadrilateral with diagonals crossing perpendicularly. S

Teacher's Notes

In Rectangle, the blue line is the length and the red line is the width.
The length and the width of the rectangle are multiplied together to find the area.
In Triangle, the red line is the base and the blue line is the height.
The base and the height of the triangle are multiplied than divided by 2 to get its area.
From rectangle and triangle to rhombus the red and blue lines are diagonals.
The lengths of the two diagonals are multiplied then divided by 2 because the area is double.
This becomes the formula for Rhombus:
Area = Diagonal × Diagonal ÷ 2





Lesson Flow

1 Review the previous lesson.

2 (1) Think about the way of finding out the area of rhombus.

T Review the formula and the area of triangle and the rectangle and let students to observe the rhombus and think about how to find its area.

S Review and observe the rhombus and think about how to find the area of a rhombus applying the ideas of rectangle and triangle.

T Introduce the Main Task. (Refer to the BP)

3 Find the area of rhombus.

S Think of own ways on how to find the area of rhombus and present their ideas

T Let students read and discuss in groups the three ideas and ask them to explain.

S Analyse in groups the ideas and identify how these ideas are used to find the area of a rhombus.

T Confim the students ideas with Gawi's, Kekeni's and Naiko's ideas.

4 Construct the area formula for rhombus.

T Ask the students to compare the three ideas and find out common features.

S Common features are:
(1) all the ideas calculate 9×6÷2
(2) AC and BD are the diagonals.
(3) Multiplying diagonals and ÷2

S Develop the formula for rhombus from summary of students' ideas.

5 Important Point

T/S Explain the important point in the box .

6 (2) Find the area of the quadrilateral with diagonals that have perpendicular intersection.

S Use the formula for rhombus and calculate the quadrilateral with diagonals that have perpendicular intersection.

T Check and confirm the answer with the students.

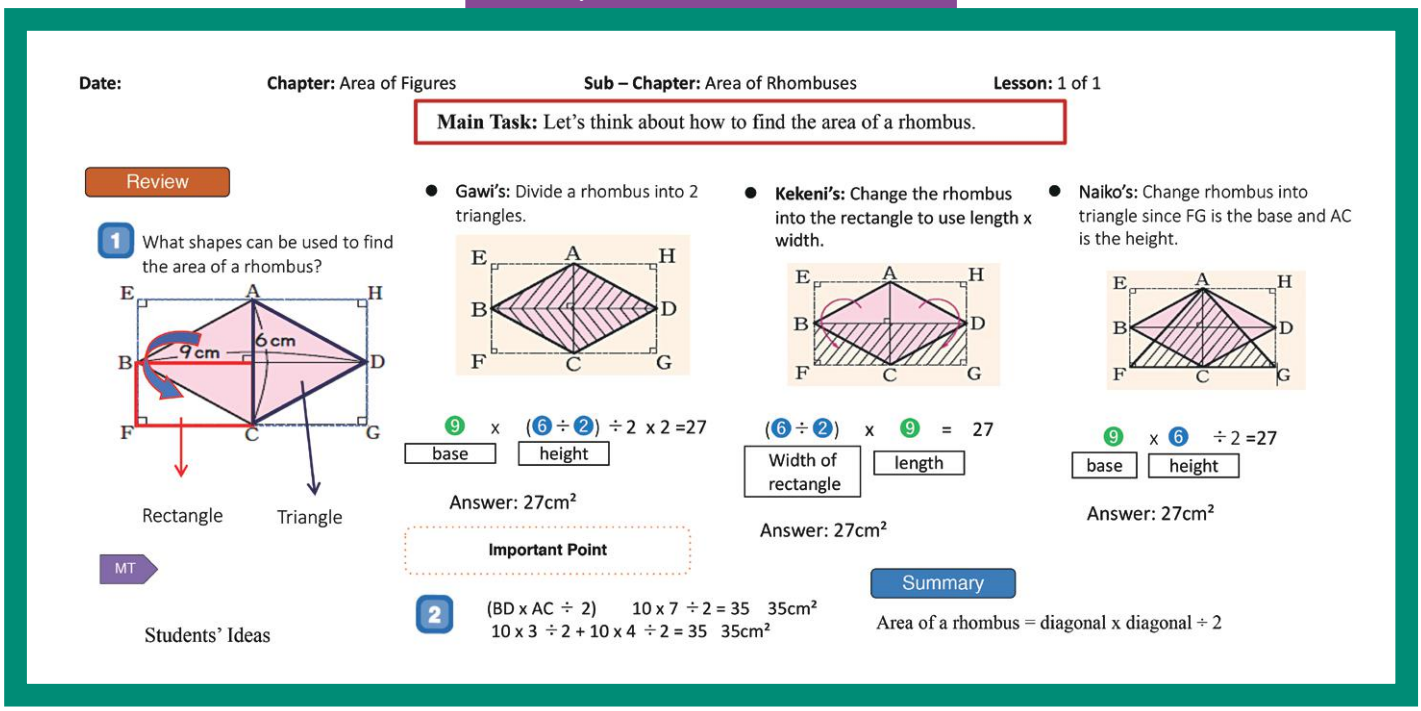
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 10

Unit: Area of Figures
Sub-unit 5: Thinking About How to Find the Area
Lesson 1 of 1

Textbook Page : 146
Actual Lesson 098

Sub-unit Objective

- To find the area of various quadrilaterals and pentagons.

Lesson Objectives

- To understand that the area of various quadrilaterals and pentagons can be found by separating them into known shapes.
- To calculate the area of various quadrilateral and pentagon by separating into known shapes and applying the correct formula.

Prior Knowledge

- Formulae for finding the area of triangle, parallelogram, rhombus and trapezoid

Preparation

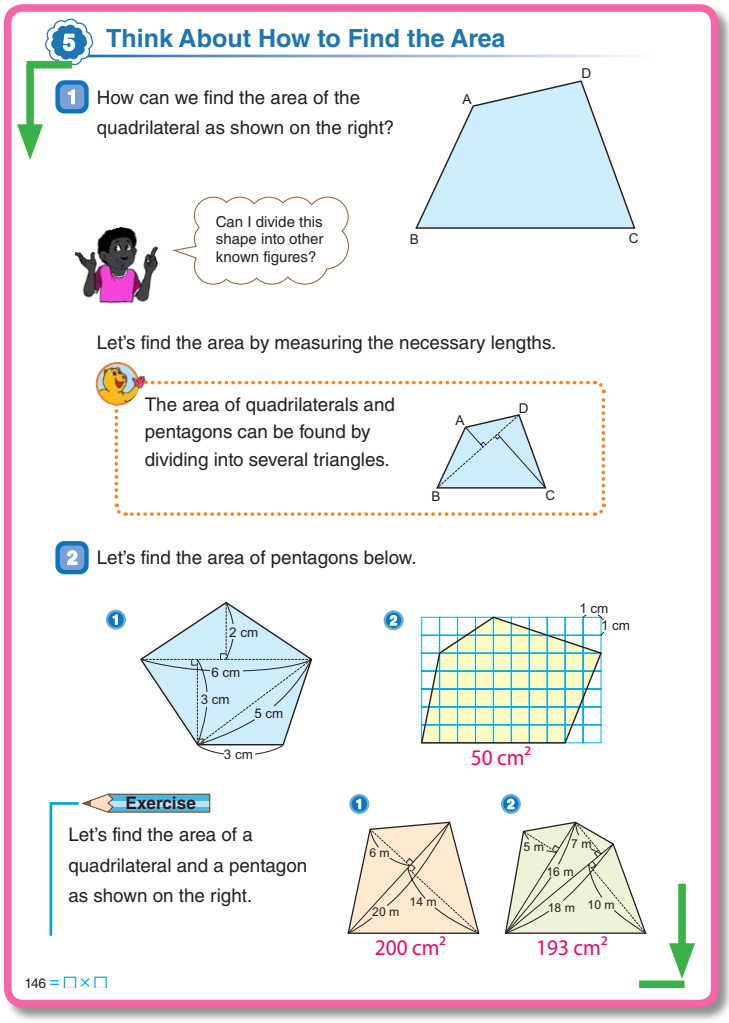
- Enlarged quadrilateral on the large sheet, rulers

Assessment

- Understand and explain how the area of various quadrilaterals and pentagons can be found. F
- Calculate the area of various quadrilaterals and pentagons. S F
- Complete the Exercise correctly. S

Teacher's Notes

In this lesson the area of quadrilateral and pentagon is found by dividing the two shapes into several triangles and applying the triangle formula to calculate.



Lesson Flow

1 Review the previous lesson.

2 ① Think of ways on how to find the area of a quadrilateral.

T Introduce the Main Task. (Refer to the BP)
T How can we find the area of a quadrilateral?
S Observe the quadrilateral and think of ways on how to find the area.
TN 1) Divide the quadrilateral into 2 triangles
2) Use the diagonals of the quadrilateral as a base of the 2 triangles.

3 Find the area of quadrilateral by measuring.

T Let the students to measure the required lengths before calculating the area.
S • Divide the shape into 2 triangles
• Measure the required lengths
• Apply the formula for triangle to calculate the area.

4 Important Point

T/S Explain the important point in the box .

5 ② Find the area of pentagons.

S ① Calculate the area of the pentagon using the measurements given.
S ② Divide the pentagon into known shapes and calculate the area.
T Ask students to present their calculations and confirm.

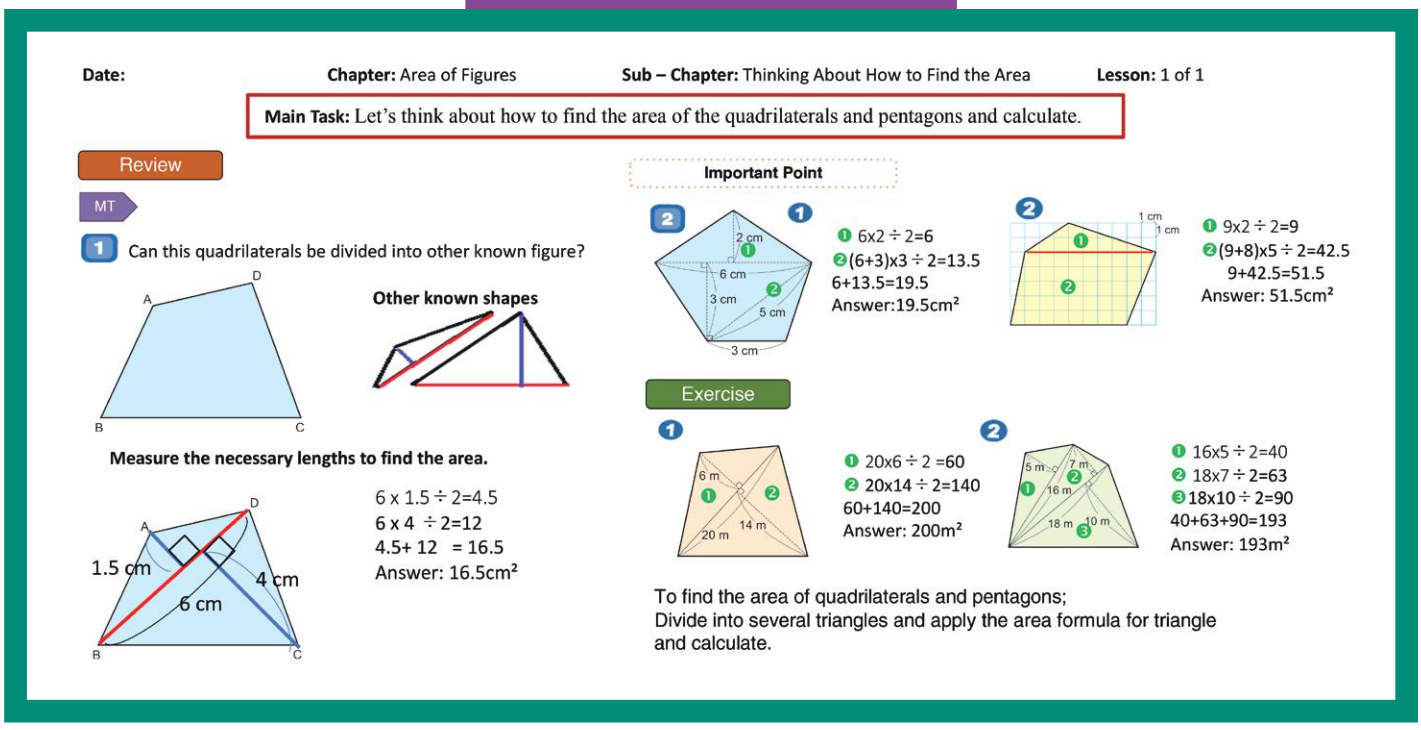
6 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 10

Unit: Area of Figures
Exercise, Problems, Evaluation and Math Extras
Lesson 1 and 2 of 2

Textbook Page : 147 to 149
Actual Lesson 99 and 100

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents learned in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 10. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

1 Let's find the area of these parallelograms. Pages 130 to 136

① 4 cm, 8 cm
$8 \times 4 = 32$ cm^2

② 5 cm, 2 cm
$2 \times 5 = 10$ cm^2

2 Let's find the area of these triangles. Pages 137 to 142

① 3 cm, 4 cm
$4 \times 3 \div 2 = 6$ cm^2

② 9 cm, 6 cm, 9 cm
$9 \times 9 \div 2 = 40.5$ cm^2

3 Let's find the area of these figures. Pages 143 to 146

① 1 cm, 1 cm
$8 \times 4 \div 2 = 16$ cm^2

② $(3+5) \times 5 \div 2 = 20$ cm^2

Let's calculate. Grade 4 Do you remember?

① $32 \div 2$ 16 ② $48 \div 4$ 12 ③ $60 \div 15$ 4 ④ $84 \div 21$ 4
⑤ $258 \div 3$ 86 ⑥ $624 \div 4$ 156 ⑦ $306 \div 17$ 18 ⑧ $837 \div 31$ 27

PROBLEMS

1 Let's find the area of these shapes.
● Finding the base and the height, and using formula.

① 3 cm, 3.5 cm, 6 cm
Parallelogram
$6 \times 3 = 18$ cm^2

② 8 cm, 5 cm, 7 cm
$8 \times 5 \div 2 = 20$ cm^2

Which lengths can we use?

③ 4 cm, 2 cm, 6 cm
$4 \times 6 \div 2 = 12$ cm^2

④ 3 cm, 6 cm, 8 cm
Parallelogram
$3 \times 6 = 18$ cm^2

2 Let's draw a triangle with an area same as the area of the triangle on the right and explain the reason why they are equal.
● Drawing a triangle with the same area.
1 cm, 1 cm
Since same base and height, the area is the same.

3 The triangle on the right has a height of 15 cm and an area of 135 cm^2.
How many cm long is the base?
● Finding the height or the base when the area is given.
15 cm, 135 cm^2
□ × 15 ÷ 2 = 135 cm^2
□ = 18 cm^2

4 Let's find the area of these shapes.
● Finding the area.

6 cm, 5 cm, 10 cm
Trapezoid
$(6+10) \times 5 \div 2 = 40$ cm^2

7 cm, 4 cm
Rhombus
$7 \times 4 \div 2 = 14$ cm^2

5 cm, 8 cm
$5 \times 8 \div 2 = 20$ cm^2

□ − □ = 147 148 = □ × □

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.
T Confirm students' answers.
TN 1 Finding the area of parallelograms.
2 Finding the area of triangles.
3 Finding the area of rhombus and trapezium.

2 Solve the Problems

S Solve all the problems.
T Confirm students' answers.
TN All problems to be done for homework.
TN 1 Finding the base and the height and using the formula.
2 Drawing the triangle with the same area.
3 Finding the height or the base when the area is given.
4 Finding the area.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.
S Complete the Evaluation Test.

Mathematics Practices in Papua New Guinea

Topic 3: Traditional Measuring System

In the past, people had no idea what the Metric System was. They did not use modern means of measurement such as rulers or tape measures to measure distances, watches or clock to measure time and scale or balances to measure weights. In traditional mathematics, people used simple materials. Nature and their body parts to measure distances or length, time and mass. To measure time they used the sun by reading their shadow, the chickens crowing and the sounds of birds. They also used bush ropes to tie knots which represented the days or months. When measuring distances or length they used ropes, arm length and pacing. Pacing was very useful when building houses. They measured the weight of something by lifting and comparing with another thing which is heavy or light. There weren't any units used for length, time and mass. All these means of measurement in traditional mathematics were simple and without cost.

Sticks used to measure area.

Traditional ropes used in making bilums.

Although the metric system was introduced recently in our societies, people still value and use these traditional measuring systems. The application of the skills and knowledge are passed on to the next generation for use. The skills involved develops the ability of a person to make good estimations in calculations.

Let's think of other ways to measure in which your people used in the past.

Share what your people used in the past with your friends.

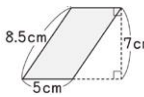
Source: Ethnomathematical Lessons for PNG by Mathematics students of UPNG-Goroka campus, 1993.

End of Chapter Test **Date:**

Chapter 10: Area of Figures	Name:	Score / 100

1. Find the area of the shaded figures. [4×15marks=60 marks]

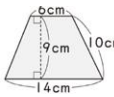
(1) Show working out



$5\times7=30$

Answer: $30\ cm^2$

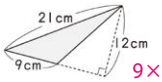
(2) Show working out



$(6+14)\times9\div2=90$

Answer: $90\ cm^2$

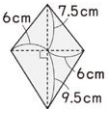
(3) Show working out



$9\times12\div2=54$

Answer: $54\ cm^2$

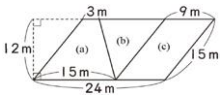
(4) Show working out



$12\times17\div2=102$

Answer: $102\ cm^2$

2. A piece of land shaped like a parallelogram is shared into 3 different shapes of (a), (b) and (c). Find the area of (a), (b), (c). [3×10 marks=30 marks]



Show working out (a)

$(15+3)\times12\div2=108$

Answer (a): $108\ cm^2$

Show working out (b)

$12\times12\div2=72$

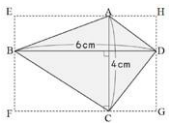
Answer (b): $72\ cm^2$

Show working out (c)

$9\times12=108$

Answer (c): $108\ cm^2$

3. EFGH is a rectangle. Find the area of quadrilateral ABCD. [10 points]



Show working out

$6\times4\div2=12$

Answer: $12\ cm^2$

200

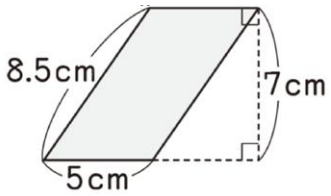
End of Chapter Test **Date:**

Chapter 10: Area of Figures	Name:	Score / 100

1. Find the area of the shaded figures.

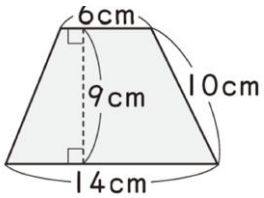
[4×15marks=60 marks]

(1) Show working out



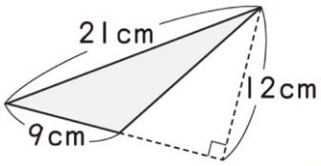
Answer:

(2) Show working out



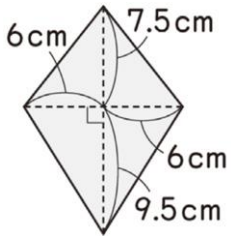
Answer:

(3) Show working out



Answer:

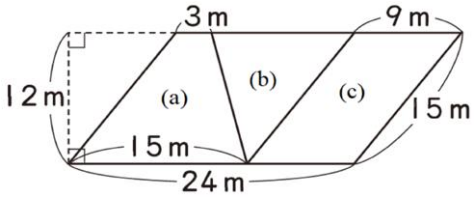
(4) Show working out



Answer:

2. A piece of land shaped like a parallelogram is shared into 3 different shapes of (a), (b) and (c). Find the area of (a), (b), (c).

[3×10 marks=30 marks]



Show working out (a)

Answer (a):

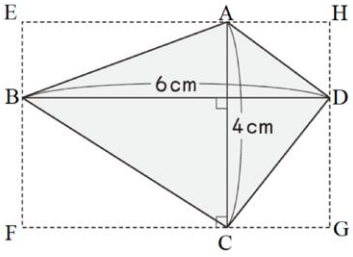
Show working out (b)

Answer (b):

Show working out (c)

Answer (c):

3. EFGH is a rectangle. Find the area of quadrilateral ABCD. [10 points]



Show working out

Answer:

Chapter 11 Multiplication and Division of Fractions

1. Content Standard

5.1.2 Extend learned multiplication and division to multiply and divide fractions by whole numbers.

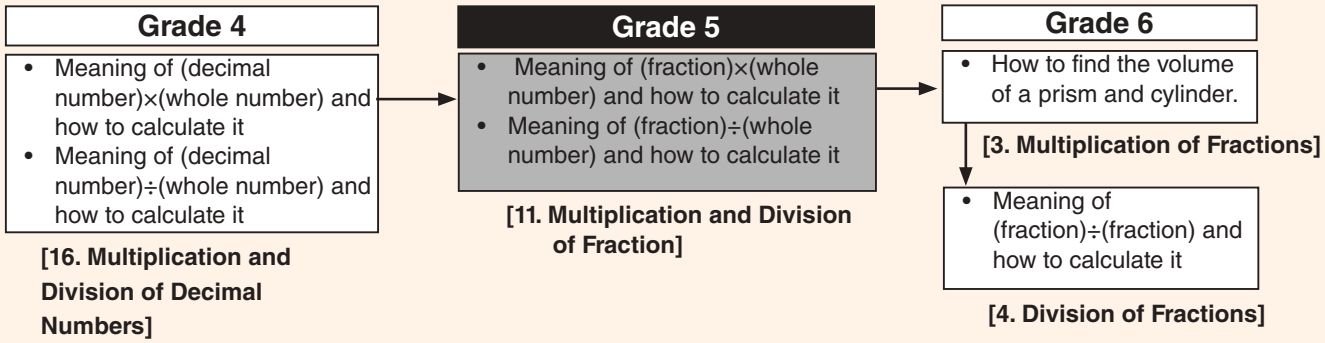
2. Unit Objectives

- To deepen understanding about fraction.
- To understand the meaning of multiplication and division of fractions by whole numbers and think about how to calculate.
- To master the calculation of fraction multiplied or divided by a whole number.

3. Teaching Overview

This unit is to get prepared for the further leaning of fraction × fraction and fraction ÷ fraction. As they summarise and consolidate operation of fractions × whole numbers and fractions ÷ whole numbers, they will also get used to the use of area diagram and rules of multiplications and divisions. In this unit, students should master operation of fractions × whole numbers and operations of fractions ÷ whole numbers, to enhance further learning of fractions.

4. Related Learning Contents



Unit 11

Unit: Multiplication and Division of Fractions
Sub-unit 1: Operation of Fractions × Whole Numbers
Lesson 1 of 3

Textbook Page s:
150 to 152
Actual Lesson 101

Sub-unit Objective

- To understand the meaning and how to calculate fraction multiplied by a whole number.

Lesson Objectives

- To think about how to calculate fraction multiplied by a whole number.
- Calculate fraction multiplied by a whole number.

Prior Knowledge

- Fractions in Grade 4

Preparation

- Chart and table for task 1 and activity 2

Assessment

- Think about how to calculate Fraction × Whole number. F
- Understand and explain how to calculate Fraction × Whole number. S

Teacher's Note

- Remind students to represent improper fractions to proper fractions as their final answer.
- From Yamo's idea on $2 \div 5 \times 3 = 2 \times 3 \div 5$, it is learned in Gr. 5 unit 1 that:
  i. $(2 \div 5) \times 3 = 0.4 \times 3 = \mathbf{1.2}$ and
  ii. $(2 \times 3) \div 5 = 6 \div 5 = \mathbf{1.2}$

11 Multiplication and Division of Fractions

1 Operation of Fractions × Whole Numbers

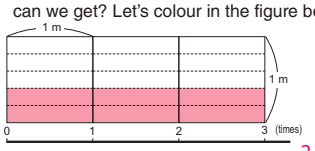
Meaning of Fraction × Whole number.

1 Flowerbeds are sprinkled with a bucket of water. When we use a large bucket, we can sprinkle 2 m² for each time. When we use a small bucket, we can sprinkle $\frac{2}{5}$ m² for each time.

		×3
Area (m²)	2	?
Number of sprinkles(times)	1	3
	×3	

1 If we sprinkle three times with a large bucket, what m² can we sprinkle water? $2 \times 3 = 6$ Answer: 6 m²
Write an expression and find the number.

2 If we sprinkle three times with the small bucket, how many m² can we get? Let's colour in the figure below.



		×3
Area (m²)	$\frac{2}{5}$	?
Number of sprinkles (times)	1	3
	×3	

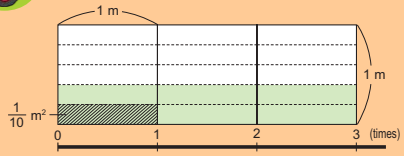
3 Let's write an expression of 2. $\frac{2}{5} \times 3$

4 Let's think about how to calculate.

Let's think about situations where you multiply fraction by a whole number and how to calculate it.

150 = □ × □

Sare's Idea



$\frac{2}{5}$ m² is 2 sets of $\frac{1}{5}$ m². $\frac{2}{5} \times 3$ is 3 sets of $\frac{2}{5}$ m².

So, $\frac{2}{5} \times 3$ is (2×3) sets of $\frac{1}{5}$. $\frac{2}{5} \times 3 = \frac{2 \times 3}{5} = \frac{6}{5} = 1\frac{1}{5}$

Yamo's Idea

Represent this fraction by division,
we get $\frac{2}{5} = 2 \div 5$.

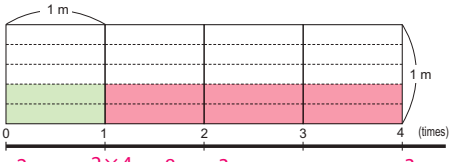
$\frac{2}{5} \times 3 = (2 \div 5) \times 3$
$= (2 \times 3) \div 5$

Represent this expression as one fraction,
we get $\frac{2}{5} \times 3 = \frac{2 \times 3}{5} = \frac{6}{5} = 1\frac{1}{5}$

$(2 \div 5) \times 3 = 0.4 \times 3 = 1.2$
$(2 \times 3) \div 5 = 6 \div 5 = 1.2$
so, the ÷5 and ×3 part can be switched.

How to calculate fraction × whole number

2 Sprinkling 4 times with the small bucket in 1, how many m² can you water? Let's write an expression and calculate.



$\frac{2}{5} \times 4 = \frac{2 \times 4}{5} = \frac{8}{5} = 1\frac{3}{5}$ Answer: $1\frac{3}{5}$ m²

□ − □ = 151

Lesson Flow

1 ① Meaning of Faction × Whole number.

T Introduce the picture of the new unit and have pre-discussion.

T/S Read and understand the situation using the table.

T Introduce the Main Task. (Refer to the BP)

T ① If we sprinkle three times with the large bucket, what m² can we get?

S Write a mathematical expression using the table as 2×3.

S Solve the problem. i.e.
$2 \times 3 = 6$

T ② If we sprinkle three times with the small bucket, how many m² can we get?

T Explain the diagram and table.

TN Assist students to colour the part for 1 time first, then colour in the part for 3 times.

S ③ Using the table write a mathematical expression as $\frac{2}{5} \times 3$.

S ④ Think about how to calculate and present own ideas.

T Confirm and explain students ideas using Sare's and Yamo's ideas.

2 ② How to calculate fraction × whole number.

T Explain the diagram and table.

TN Assist students to colour the part for 1 time first, then colour in the parts for 4 times.

S Write an expression and calculate using Sare's and Yamo's ideas.

TN $\frac{2}{5} \times 4 = \frac{2 \times 4}{5}$

3 Important Point

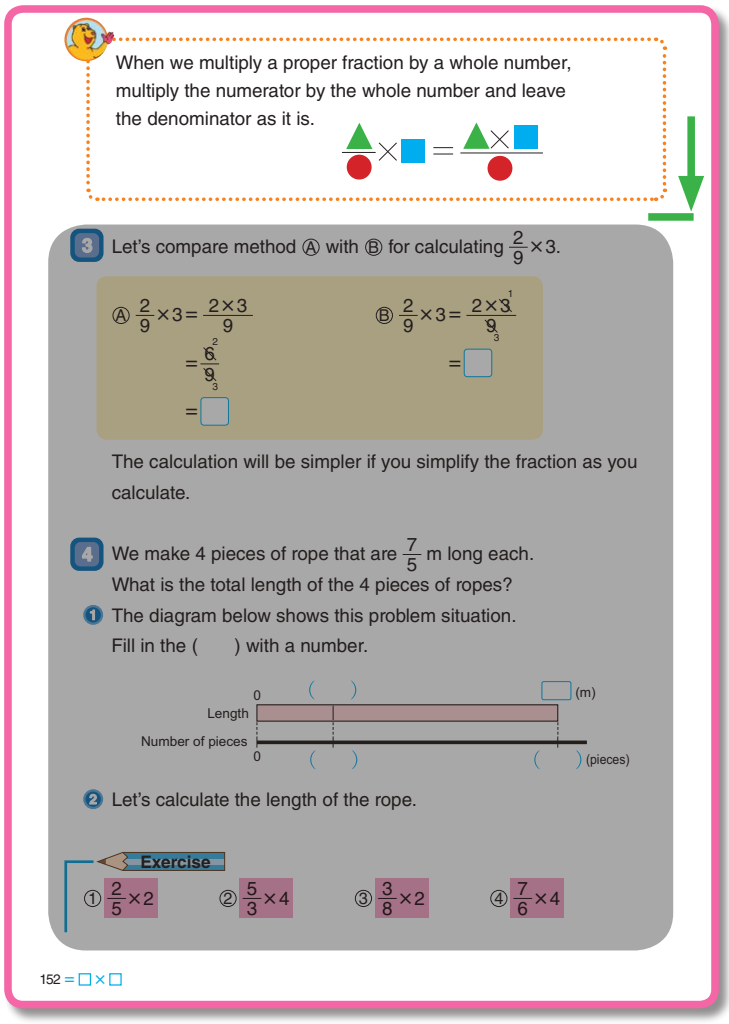
T/S Explain the important point in the box .

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students ideas to confirm important concepts of this lesson.



Sample Blackboard Plan

Lesson 101 Sample Blackboard Plan is on page 207.

Unit 11

Unit: Multiplication and Division of Fractions
Sub-unit 1: Operation of Fractions × Whole Numbers
Lesson 2 of 3

Textbook Page : 152
Actual Lesson 102

Lesson Objectives

- To understand how to simplify by cancelling in the middle of calculation of fraction multiplied by a whole number.
- To understand how to calculate improper fraction multiplied by a whole number.

Prior Knowledge

- How to calculate multiplication of fraction

Preparation

- Tape diagram for task 4

Assessment

- Demonstrate and explain the process of multiplying fraction with a whole number and simplifying in the middle of the calculation. F
- Do the exercise correctly. S

Teacher's Note

The process of expressing improper fractions to proper fractions is outlined in lesson flow 3.

When we multiply a proper fraction by a whole number, multiply the numerator by the whole number and leave the denominator as it is.

$\frac{▲}{●} \times ■ = \frac{▲ \times ■}{●}$

How to simplify fraction × whole number in the middle of the calculation.

3 Let's compare method Ⓐ with Ⓑ for calculating $\frac{2}{9} \times 3$.

Ⓐ $\frac{2}{9} \times 3 = \frac{2 \times 3}{9} = \frac{6}{9} = \frac{2}{3}$

Ⓑ $\frac{2}{9} \times 3 = \frac{2 \times \overset{1}{3}}{\underset{3}{9}} = \frac{2}{3}$

The calculation will be simpler if you simplify the fraction as you calculate.

Improper fraction × whole number.

4 We make 4 pieces of rope that are $\frac{7}{5}$ m long each.
What is the total length of the 4 pieces of ropes?

1 The diagram below shows this problem situation.
Fill in the ( ) with a number.

2 Let's calculate the length of the rope. $\frac{7}{5} \times 4 = \frac{7 \times 4}{5} = \frac{28}{5} = 5\frac{3}{5}$ m

Exercise

① $\frac{2}{5} \times 2$ $\frac{4}{5}$ ② $\frac{5}{3} \times 4$ $\frac{20}{3}$ $6\frac{2}{3}$ ③ $\frac{3}{8} \times 2$ $\frac{3}{4}$ ④ $\frac{7}{6} \times 4$ $\frac{14}{3}$ $4\frac{2}{3}$

152 = □ × □

Lesson Flow

1 Review the previous lesson.

T How can we solve $\frac{2}{5}\times 3$?

S $\frac{2}{5}\times 3=\frac{2\times 3}{5}=\frac{6}{5}=1\frac{1}{5}$

T Confirm answers using the definition $\frac{\blacktriangle}{\bullet}\times\blacksquare=\frac{\blacktriangle\times\blacksquare}{\bullet}$.

2 3 How to simplify fraction × whole number in the middle of the calculation.

T Introduce the Main Task. (Refer to the Blackboard Plan)

T Let students compare methods A with B.

TN Give enough time to the students to compare methods A and B.

S Compare Methods A and B.

TN A. Simplify after getting the answer.

B. Simplify by dividing 3 in both the numerator and the denominator in the middle of the calculation.

T What have you noticed about the two calculations?

S The calculation will be simpler if you simplify the fraction as you calculate.

3 4 Improper fraction × whole number.

T We make 4 pieces of rope that are $\frac{7}{5}$ m long each. What is the total lenght of the 4 pieces of rope?

S 1 Fill in the blank with a number using the tape diagram.

T 2 Calculate the length of the rope.

S Calculate.

TN $\frac{7}{5}\times 4=\frac{7\times 4}{5}=\frac{28}{5}=5\frac{3}{5}$ m.

Divisor is the Denominator

$5\overline{)\,28}$ → Quotient is the Whole number

$-\,25$

3 ← Remainder is the Numerator

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

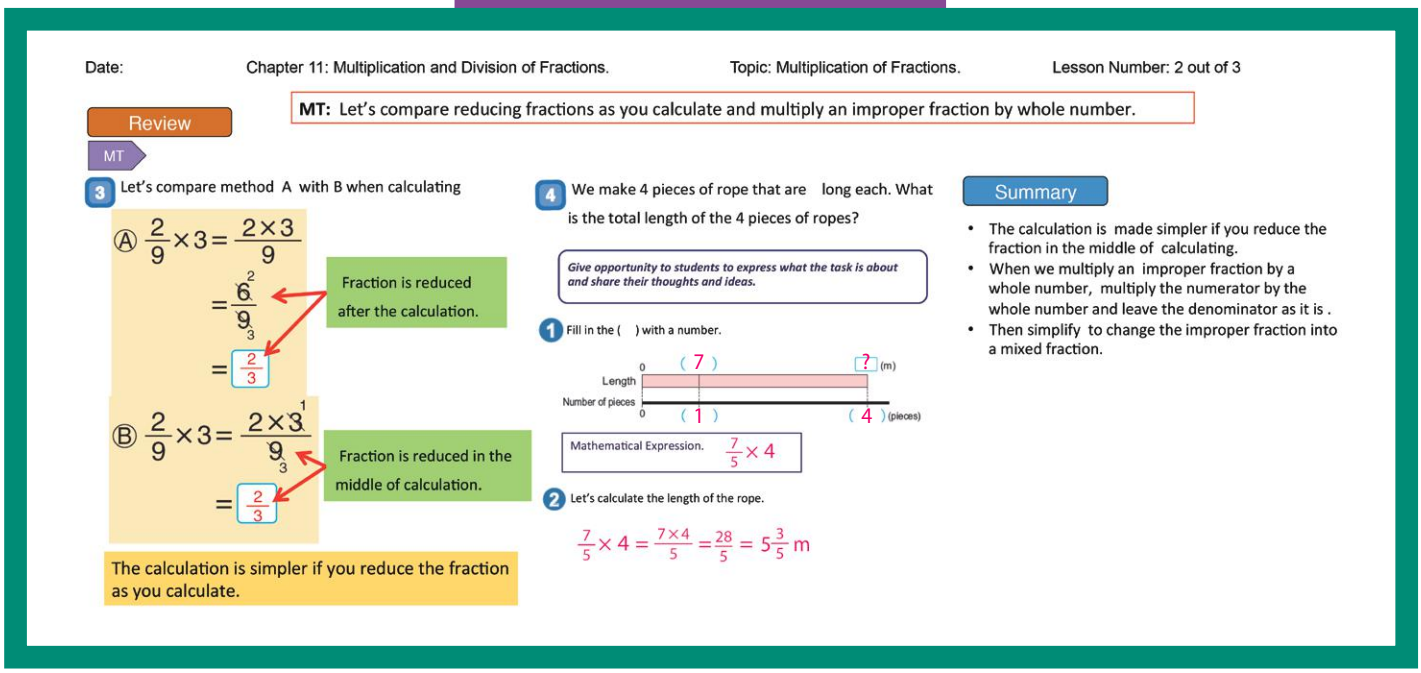
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 11

Unit: Multiplication and Division of Fractions
Sub-unit 1: Operation of Fractions × Whole Numbers
Lesson 3 of 3

Textbook Page : 153
Actual Lesson 103

Lesson Objectives

- To think about how to calculate mixed fraction multiplied by whole number.
- Calculate mixed fraction multiplied by whole number.

Prior Knowledge

- Multiplication of fractions (Unit 8)

Preparation

- Tape diagram for task 5
- Chart for Gawi's and Kekeni's ideas

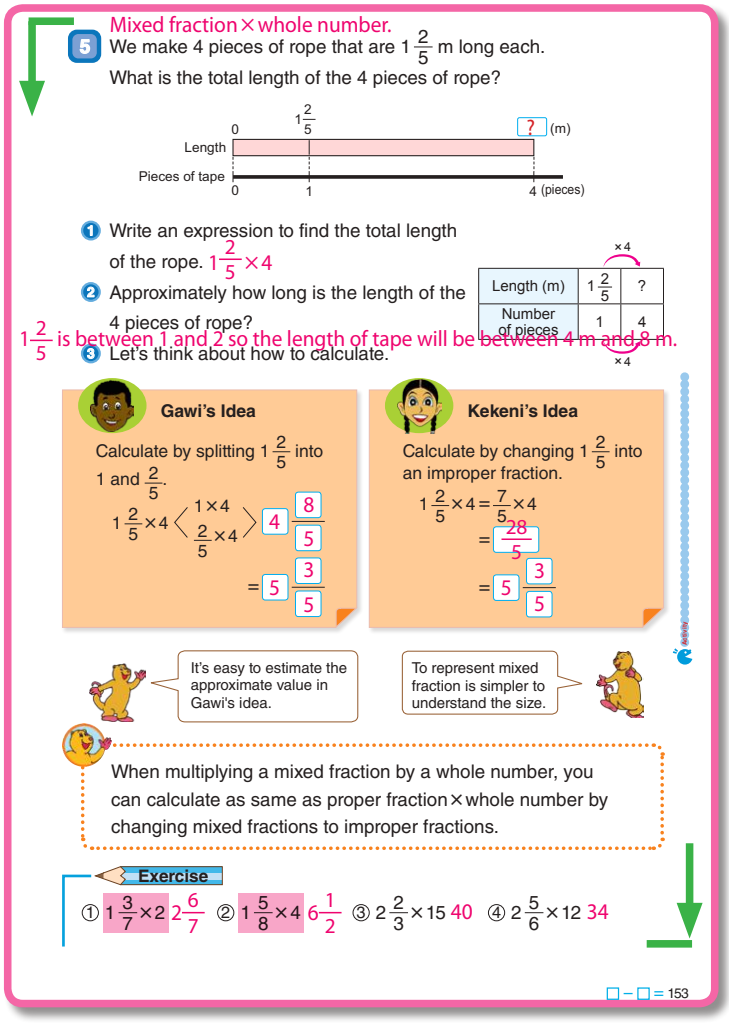
Assessment

- Demonstrate and understand the process of calculating mixed fraction multiplied by a whole number. F
- Complete the Exercise correctly. S

Teacher's Note

Remind students that answers in improper fractions should be changed to mixed fractions.

Complete theExercise
Students should solve exercise questions (1) to (4) leaving answers in their simplest form.



Lesson Flow

1 Review the previous lesson.

2 Mixed fraction × whole number.

T/S 5 Read and understand the given situation.
T Introduce the Main Task. (Refer to the BP)
T Explain the situation using the tape diagram to make four pieces of rope that are 1 2/5 m long each.
How long is the rope in metres do we need?
S 1 Write an expresison to find the total length of the rope. (1 2/5 × 4)
T 2 Approximately how long is the lenght of the 4 pieces of rope?
S 1 2/5 × 4 more than 4 metres.
T 3 Let's think about how to calculate.

Lesson Flow

3 How to calculate $1\frac{2}{5}\times 4$.

S Present their ideas on how to calculate $1\frac{2}{5}\times 4$.

T/S Refer to Gawi's and Kekeni's ideas to confirm their ideas and fill in the box.

TN
- Gawi's idea : Calculate by splitting $1\frac{2}{5}$ into 1 and $\frac{2}{5}$ as 1×4 and $\frac{2}{5}\times 4$.
- Kekeni's idea : Calculate by changing $1\frac{2}{5}$ into an improper fraction.

T When multiplying a mixed fraction by a whole number, you can calculate similarly as proper fractions × whole numbers by changing mixed fractions to improper fractions.

4 Important Point

T/S Explain the important point in the box .

5 Complete the Exercise.

S Solve the selected exercises.

T Confirm students' answers.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan (Lesson 101)

Date: Chapter 11: Multiplication and Division of Fractions. Topic: Multiplication of Fractions. Lesson Number: 2 out of 3

MT **MT:** Let's think about situations where you multiply a fraction by whole number.

1 Flowerbeds are sprinkled with a bucket of water. When we use a large bucket, we can sprinkle for each time. When we use a small bucket, we can sprinkle for each time.

1 Sprinkled 3 times with a large bucket, how many can we sprinkle?

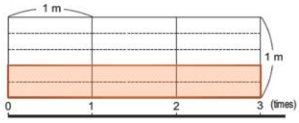
Mathematical Expression. 2×3

Mathematical Sentence. $2\times 3=6$

Area(m^2)	2	?
Number of sprinkles(times)	1	3

(×3 above, ×3 below)

2 Sprinkled 3 times with a small bucket, how many can we sprinkle?



Area(m^2)	$\frac{2}{5}$	?
Number of sprinkles(times)	1	3

(×3 above, ×3 below)

Give opportunity to students to colour the figure showing how many can be sprinkled when the small bucket is used to sprinkle 3 times.

3 Mathematical Expression.

4 Let's think about how to calculate.

Students give their own idea in how they would calculate

MT: Introduce main task here.

Sare's idea

$\frac{2}{5}$ m^2 is 2 sets of $\frac{1}{5}$ m^2. $\frac{2}{5}\times 3$ is 3 sets of $\frac{2}{5}$ m^2.

So, $\frac{2}{5}\times 3$ is (2×3) sets of $\frac{1}{5}$. $\frac{2}{5}\times 3=\frac{2\times 3}{5}=\frac{6}{5}=1\frac{1}{5}$

Yamo's idea

Represent this fraction by division,

we get $\frac{2}{5}=2\div 5$.

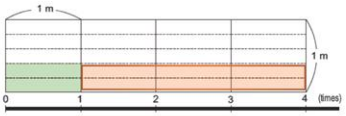
$\frac{2}{5}\times 3=(2\div 5)\times 3$

$=(2\times 3)\div 5$

Represent this expression as one fraction,

we get $\frac{2}{5}\times 3=\frac{2\times 3}{5}=\frac{6}{5}=1\frac{1}{5}$

2 Sprinkled 4 times with a large bucket, how many can we sprinkle?



= 1 Answer. 1 m

Summary

- When multiplying a fraction by a whole number, another way to calculate is when you represent the fraction by division where you get $=2\div 5\times 3=(2\div 5)\times 3=0.4\times 3=1.2$
  $=(2\times 3)\div 5=6\div 5=1.2$,

therefore, the ÷ 5 and ×3 part can be switched and the expression can be represented as one fraction, ×3= =1

- When we multiply a proper fraction by a whole number, multiply the numerator by the whole number and leave the denominator as it is .

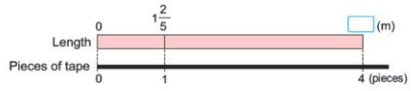
Sample Blackboard Plan (Lesson 103)

Date: Chapter 11: Multiplication and Division of Fractions. Topic: Multiplication of Fractions. Lesson Number: 3 out of 3

Review **MT:** Let's think about how to calculate a mixed fraction by a whole number.

5 We make 4 pieces of rope that are $1\frac{2}{5}$ m long each.

What is the total length of the 4 pieces of ropes?



1 Mathematical Expression.

$1\frac{2}{5}\times 4$

Length (m)	$1\frac{2}{5}$	?
Number of pieces	1	4

(×4 above, ×4 below)

2 Approximate length of the 4 piece of ropes

Example: Between 4 m and 8m

3 Let's think about how to calculate.

Students give their own idea in how they would calculate

MT

Gawi's idea

Multiplying a mixed fraction by splitting.

$1\frac{2}{5}\times 4$ ⟨ 1×4, $\frac{2}{5}\times 4$ ⟩ $=4\frac{8}{5}$

$=5\frac{3}{5}$

Kekeni's idea

Multiplying a mixed fraction by changing it into an improper fraction.

$1\frac{2}{5}\times 4=\frac{7}{5}\times 4$

$=\frac{28}{5}$

$=5\frac{3}{5}$

Summary

- When multiplying a mixed fraction by a whole number, you can calculate in the same way as in proper fraction × whole number by changing the mixed fraction into an improper fraction.
- When we multiply an improper fraction by a whole number, multiply the numerator by the whole number and leave the denominator as it is .
- Then simplify to change the improper fraction into a mixed fraction.

Unit 11

Unit: Multiplication and Division of Fractions
Sub-unit 2: Operation of Fractions ÷ Whole Numbers
Lesson 1 of 4

Textbook Page : 154 and 155
Actual Lesson 104

Sub-unit Objective

- To understand how to calculate fraction divided by a whole number.

Lesson Objective

- To think about the meaning and how to calculate fraction divided by a whole number.

Prior Knowledge

- Multiplication of fractions (Unit 8)

Preparation

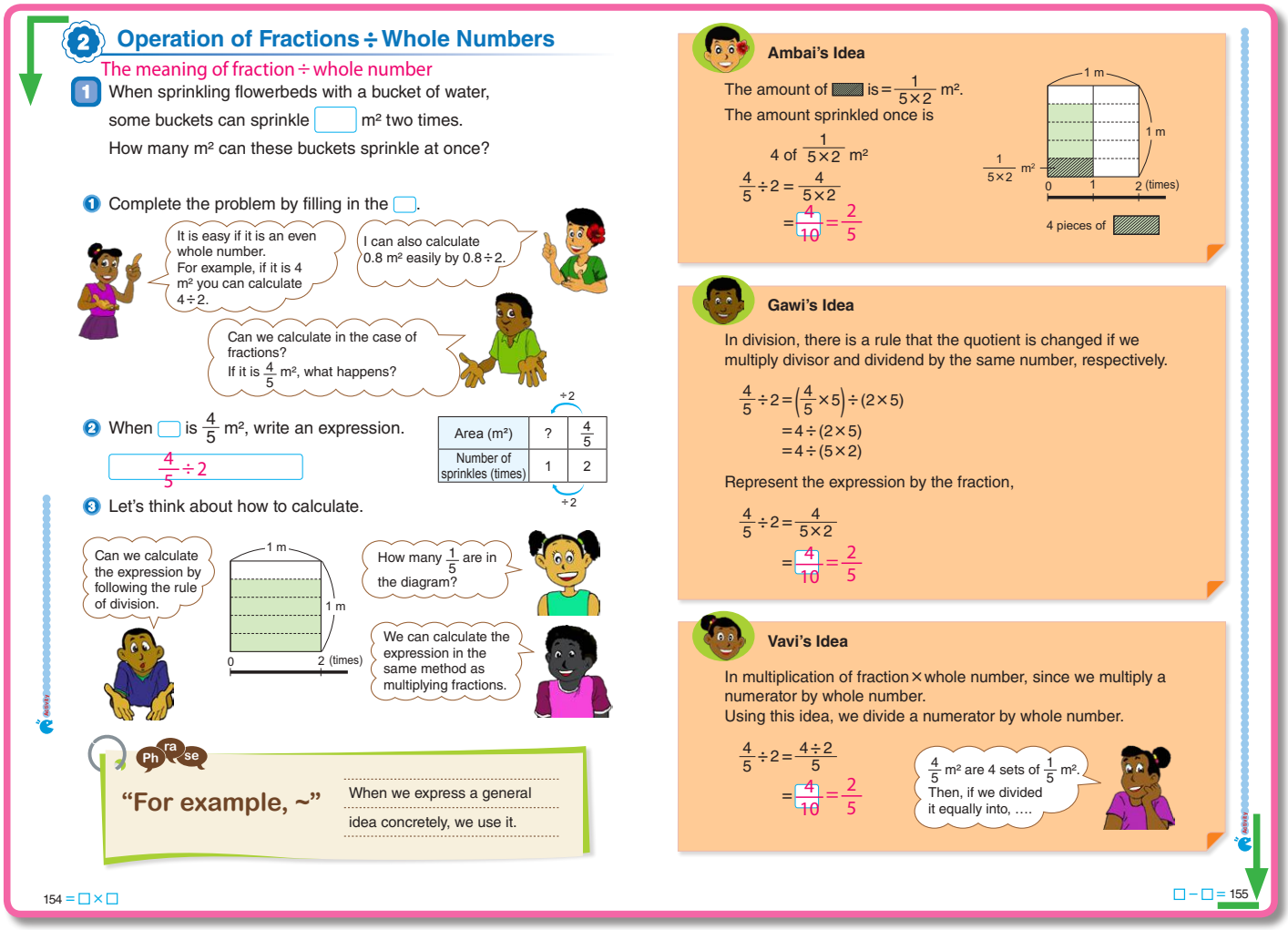
- Chart of the students' ideas

Assessment

- Explain the meaning of fraction ÷ whole number. F
- Think about how to calculate fraction ÷ whole number. S

Teacher's Note

There are three different ways of dividing a fraction by a whole number.
The teacher should inform students to decide which one of the three ideas is easier for them to use.



Lesson Flow

1 ① The meaning of fraction ÷ whole number.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T/S Read and understand the situation.
T How many m² can this bucket of water sprinkle at once?
S ① Complete the problem by filling in the box ☐.
TN It's easy if it's an even whole number. E.g. 4 m² ÷ 2 = 2 m².
S ② When it is $\frac{4}{5}$ m², write an expression.
S $\frac{4}{5} \div 2$

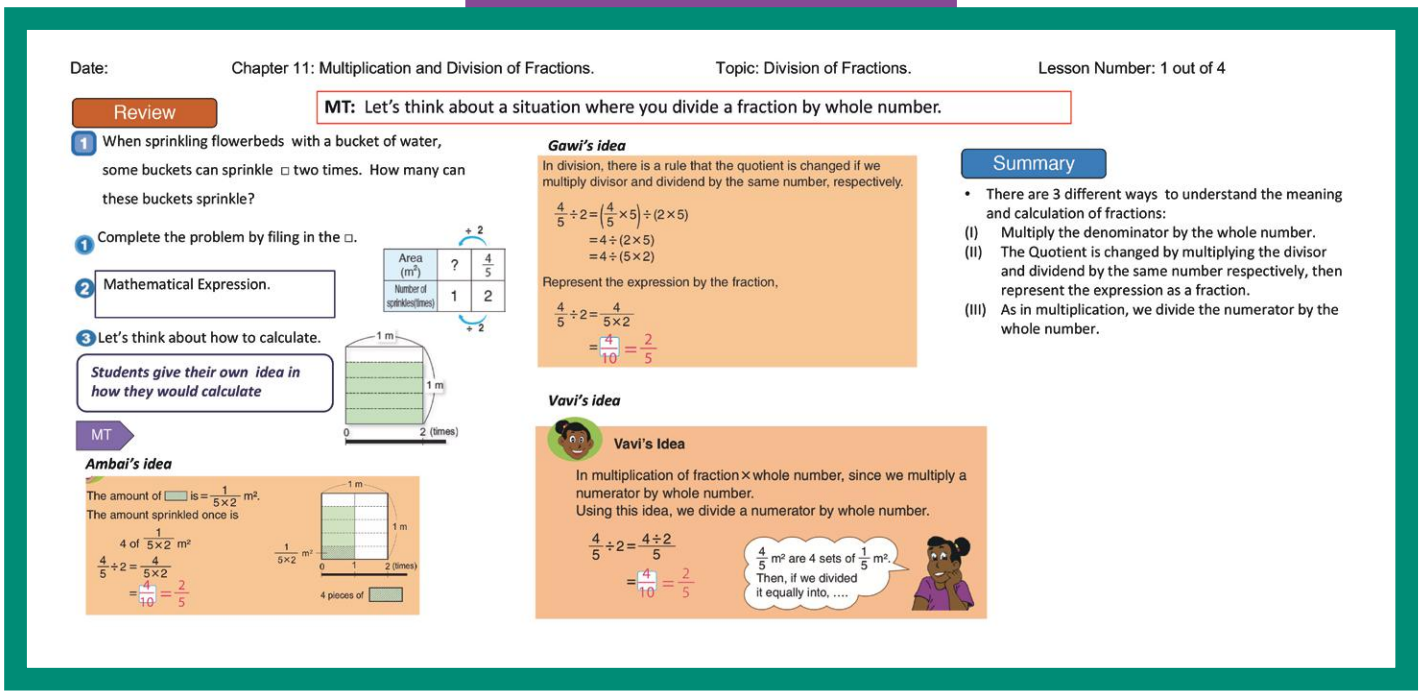
2 How to calculate $\frac{4}{5} \div 2$.

T ③ Let's think about how to calculate $\frac{4}{5} \div 2$.
S Present their ideas on how to calculate $\frac{4}{5} \div 2$.
TN When presenting their ideas concretely, they can use the phrase 'for example'.
T/S Refer to Ambai's, Gawi's and Vavi's ideas to confirm their ideas and fill in the box.
TN Compare the ideas.
Ambai's Idea : Using the unit idea.
Gawi's Idea : Using the rule of division that the quotient is changed if we multiply divisor and dividend with the same number.
Vavi's Idea : Applying the idea of multiplication of fraction, numerator × whole number.
In this case, its division so the numerator is divided by whole number.

3 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 11

Unit: Multiplication and Division of Fractions
Sub-unit 2: Operation of Fractions ÷ Whole Numbers
Lesson 2 of 4

Textbook Page : 156
Actual Lesson 105

Lesson Objective

- To deepen students' knowledge on how to calculate fraction ÷ whole number.

Prior Knowledge

- Multiplication of fractions (Unit 8)

Preparation

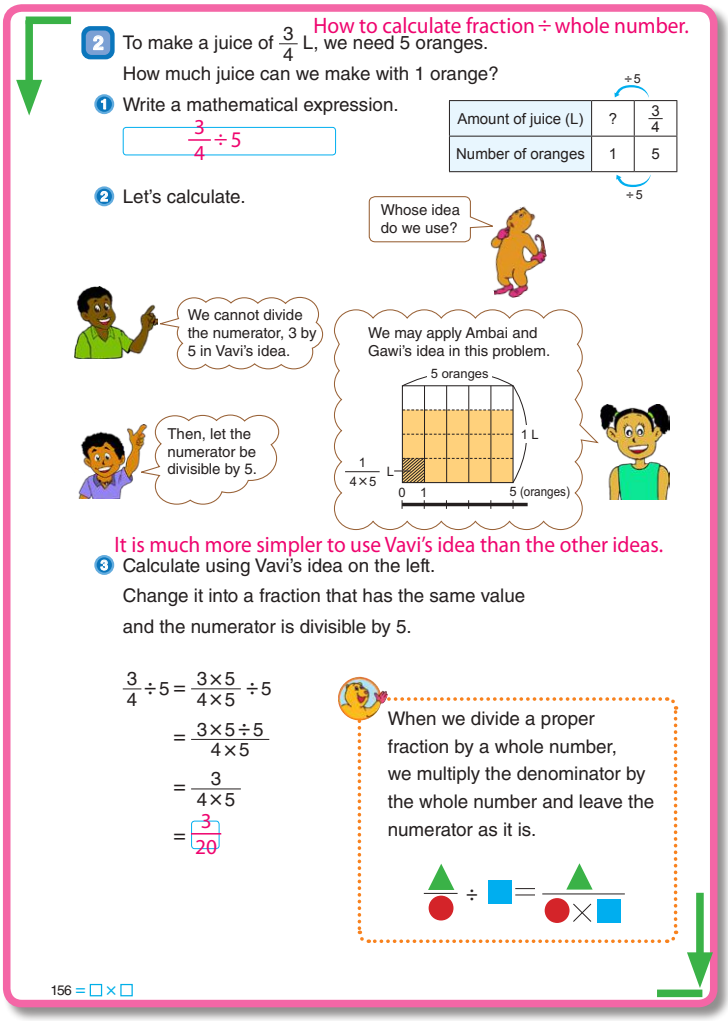
- Table and diagram representation for task 2

Assessment

- Think about how to calculate fraction divided by a whole number. F
- Calculate fraction ÷ whole number. S

Teacher's Note

We can still use the three ideas to solve task 2 however, let students find simpler ways to solve different types of problems given.



Lesson Flow

1 Review the previous lesson.

2 ② How to calculate fraction ÷ whole number.

T Introduce the Main Task.
(Refer to the Blackboard Plan)

T/S Read and understand the situation.

S ① Write a mathematical expression using the table. $\frac{3}{4} \div 5$

3 Let's calculate $\frac{3}{4} \div 5$ using the three ideas.

T ② Whose idea can we use to calculate $\frac{3}{4} \div 5$ easily?

TN We cannot divide the numerator, 3 by 5 in Vavi's idea therefore we may apply Gawi's or Ambai's idea to calculate easily.

T Use Ambai's idea from the diagram representation in the speech bubble to explain how to calculate $\frac{3}{4} \div 5$.

S Calculate $\frac{3}{4} \div 5$ using Ambai's idea.

$\frac{3}{4} \div 5 = \frac{3}{4 \times 5} = \frac{3}{20}$

T Use Gawi's idea by multiply divisor and dividend with the same number.

S Calculate $\frac{3}{4} \div 5$ using Gawi's idea.

$\frac{3}{4} \div 5 = 3 \div (4 \times 5) = \frac{3}{20}$

T ③ Ask students to apply Vavi's idea to calculate $\frac{3}{4} \div 5$.

S Calculate $\frac{3}{4} \div 5$ using Vavi's idea.

TN Change the fraction $\frac{3}{4}$ to an equivalent fraction which the numerator is divisible by 5 and complete the calculation in the textbook.

4 Important Point

T/S Explain the important point in the box .

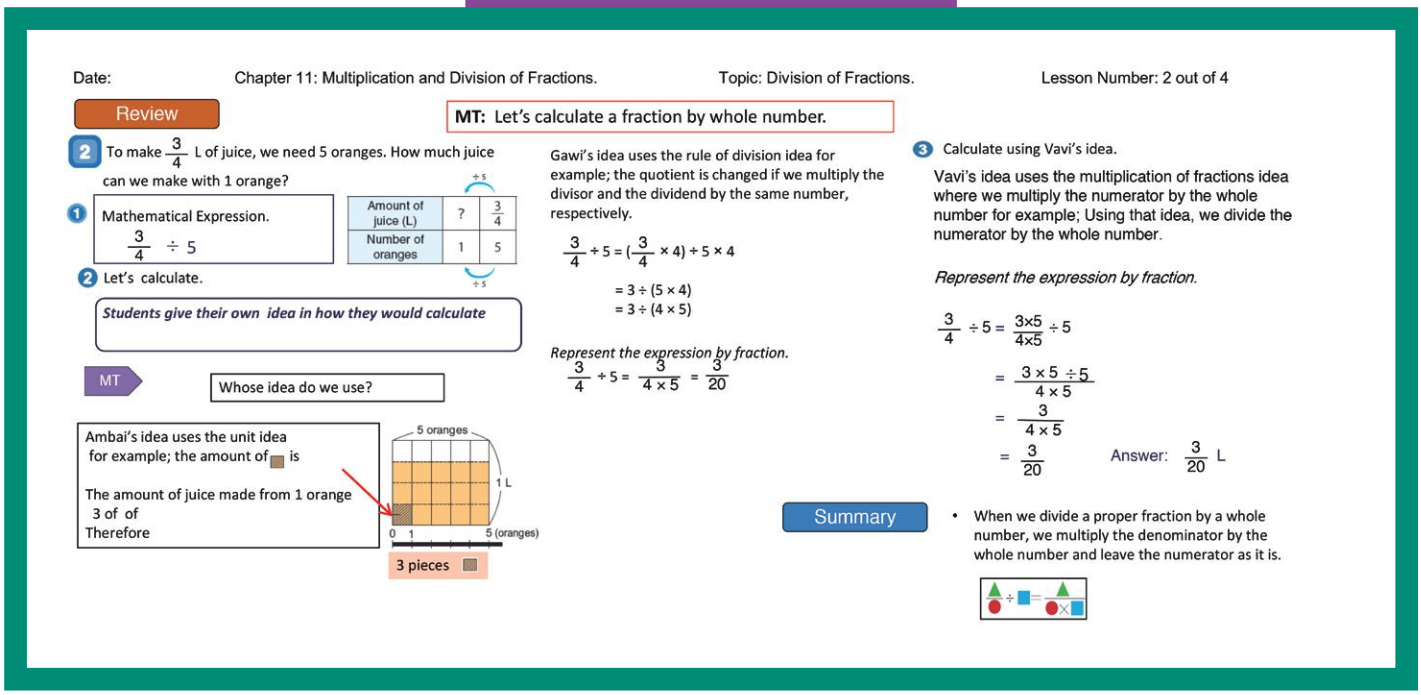
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 11

Unit: Multiplication and Division of Fractions
Sub-unit 2: Operation of Fractions ÷ Whole Numbers
Lesson 3 of 4

Textbook Page : 157
Actual Lesson 106

Lesson Objectives

- To think about how to calculate improper fractions divided by a whole number.
- Calculate improper fractions divided by a whole number.
- To simplify during the process of calculating a fraction divided by a whole number.

Prior Knowledge

- Division of fraction by whole number (Unit 8)

Preparation

- Chart for task 3
- Tape diagram and table for task 4

Assessment

- Calculate improper fraction ÷ whole number and simplify where necessary. F
- Complete the Exercise correctly. S

Teacher's Note

Emphasise on the two main ways to do cancellation in task 3.

Simplifying improper fraction ÷ whole number in the calculation.

3 Let's compare method Ⓐ with Ⓑ for calculating $\frac{10}{7} \div 4$.

Ⓐ $\frac{10}{7} \div 4 = \frac{10}{7 \times 4} = \frac{\cancel{10}^{5}}{\cancel{28}_{14}} = \frac{5}{14}$

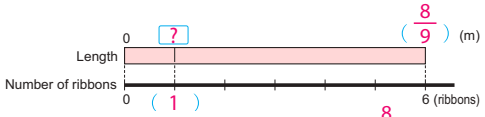
Ⓑ $\frac{10}{7} \div 4 = \frac{\cancel{10}^{5}}{7 \times \cancel{4}_{2}} = \frac{5}{14}$

The calculation will be easier if you reduce the fraction as you calculate.

Word problem of Fraction ÷ whole number

4 There is a $\frac{8}{9}$ m long tape.
We make 6 ribbons which are all the same in length from this tape.
How many metres is each ribbon?

1 The diagram shown below expresses the situation.
Let's fill in the ( ) with numbers.



Expression: $\frac{8}{9} \div 6$

2 Calculate the length of each ribbon.

Length (m)	?	$\frac{8}{9}$
Number of ribbons	1	6

(÷6 above and below)

$\frac{8}{9 \times 6} = \frac{8}{54} = \frac{4}{27}$

Exercise

① $\frac{1}{2} \div 4$ $\frac{1}{8}$ ② $\frac{3}{4} \div 2$ $\frac{3}{8}$ ③ $\frac{5}{6} \div 4$ $\frac{5}{24}$ ④ $\frac{7}{8} \div 5$ $\frac{7}{40}$

⑤ $\frac{2}{3} \div 2$ $\frac{1}{3}$ ⑥ $\frac{6}{7} \div 3$ $\frac{2}{7}$ ③ $\frac{7}{4} \div 3$ $\frac{7}{12}$ ④ $\frac{8}{3} \div 4$ $\frac{2}{3}$

□ – □ = 157

Lesson Flow

1 Review the previous lesson.

2 3 Simplifying improper fraction ÷ whole number in the calculation.

T Introduce the Main Task. (Refer to the Blackboard Plan)

T Compare method Ⓐ with Ⓑ for calculating $\frac{10}{7} \div 4$.

S Compare how the cancellation (or simplification) is done in Ⓐ and Ⓑ.

Ⓐ: Simplify after calculation.

Ⓑ: Simplify during calculation.

T What did you notice about methods Ⓐ and Ⓑ?

S The calculation will be easier if you simplify the fraction as you calculate as in Ⓑ.

3 4 Word problem of Fraction ÷ whole number

T/S Read and understand the situation.

S 1 Fill in the ( ) with numbers and write a mathematical expression using the tape diagram and table.

S 2 Calculate the length of each rope. $\frac{8}{9} \div 6 = \frac{\cancel{8}^{4}}{9 \times \cancel{6}_{3}} = \frac{4}{27}$

TN The calculation can be simplified during the process of calculation.

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

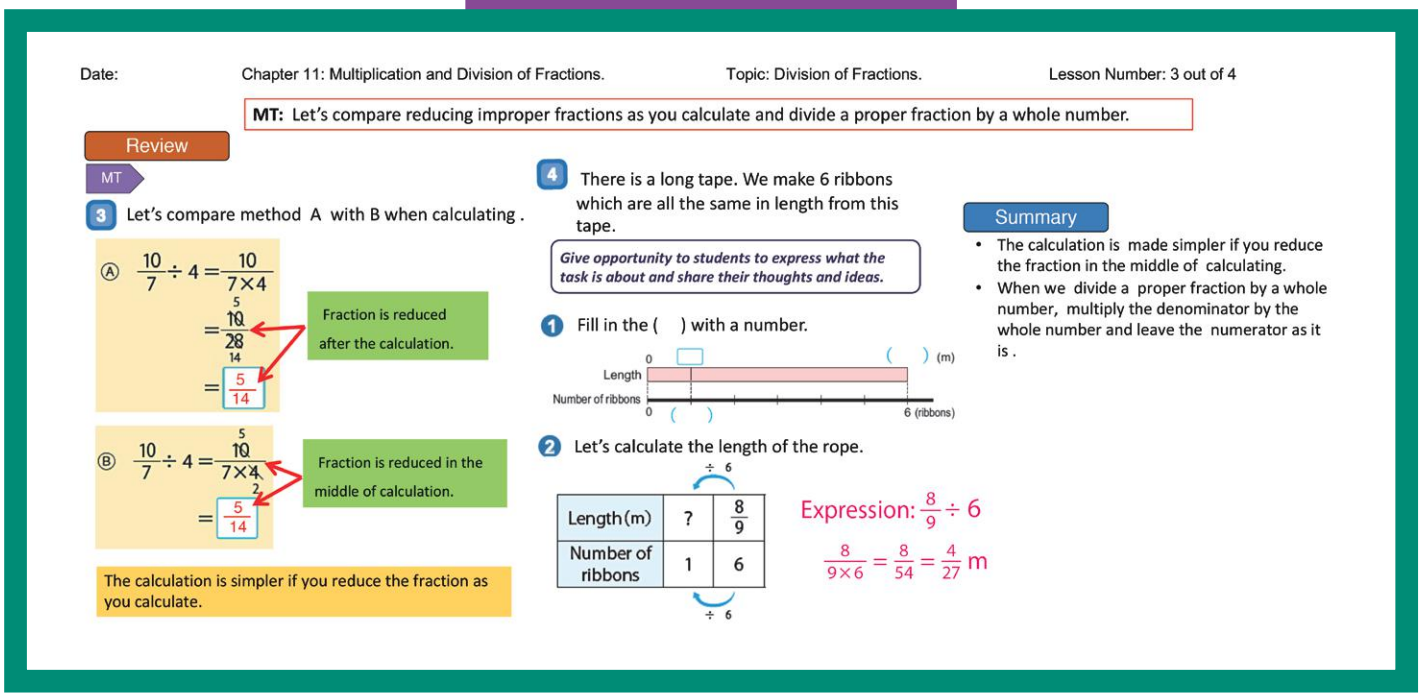
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 11

Unit: Multiplication and Division of Fractions
Sub-unit 2: Operation of Fractions ÷ Whole Numbers
Lesson 4 of 4

Textbook Page : 158
Actual Lesson 107

Lesson Objectives

- To understand how to calculate mixed fraction divided by a whole number.
- Calculate mixed fraction divided by a whole number.

Prior Knowledge

- Division of fractions (Unit 8)

Preparation

- Tape diagram and table for task 5

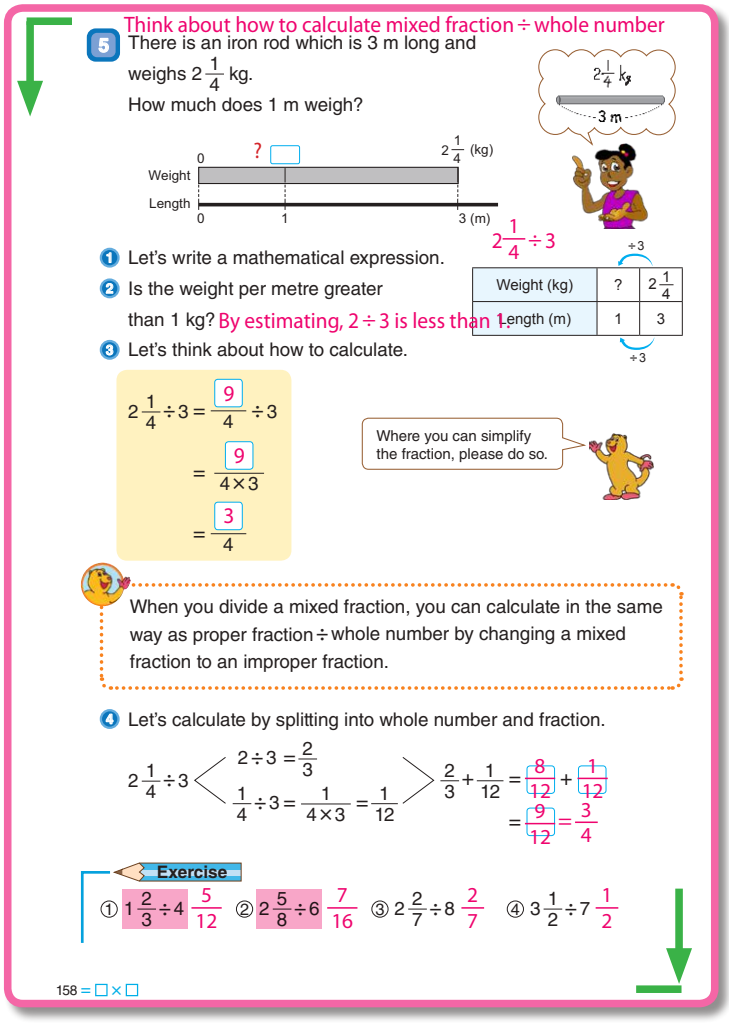
Assessment

- Calculate mixed fraction ÷ whole number using the process of calculation. F
- Complete the Exercise correctly. S

Teacher's Note

Exercise

Calculate: • questions 1 and 2 using splitting.
questions 3 and 4 by changing mixed fraction to improper fraction.



Think about how to calculate mixed fraction ÷ whole number

5 There is an iron rod which is 3 m long and weighs $2\frac{1}{4}$ kg.
How much does 1 m weigh?

1 Let's write a mathematical expression.
$2\frac{1}{4} \div 3$

2 Is the weight per metre greater than 1 kg? By estimating, $2 \div 3$ is less than 1.

3 Let's think about how to calculate.

		×3
Weight (kg)	?	$2\frac{1}{4}$
Length (m)	1	3
	÷3	

$$2\frac{1}{4} \div 3 = \frac{9}{4} \div 3 = \frac{9}{4 \times 3} = \frac{3}{4}$$

Where you can simplify the fraction, please do so.

When you divide a mixed fraction, you can calculate in the same way as proper fraction ÷ whole number by changing a mixed fraction to an improper fraction.

4 Let's calculate by splitting into whole number and fraction.

$2\frac{1}{4} \div 3$: $2 \div 3 = \frac{2}{3}$, $\frac{1}{4} \div 3 = \frac{1}{4 \times 3} = \frac{1}{12}$

$\frac{2}{3} + \frac{1}{12} = \frac{8}{12} + \frac{1}{12} = \frac{9}{12} = \frac{3}{4}$

Exercise

① $1\frac{2}{3} \div 4$ $\frac{5}{12}$ ② $2\frac{5}{8} \div 6$ $\frac{7}{16}$ ③ $2\frac{2}{7} \div 8$ $\frac{2}{7}$ ④ $3\frac{1}{2} \div 7$ $\frac{1}{2}$

158 = □ × □

Lesson Flow

1 Review the previous lesson.

2 5 Think about how to calculate mixed fraction ÷ whole number.

T Introduce the Main Task.
(Refer to the Blackboard Plan)
T/S Read and understand the situation.
T 1 Write a mathematical expression using the tape diagram and the table.
S $2\frac{1}{4} \div 3$.
T 2 Is the weight per metre greater than 1 kg?
S Estimate using the diagram above. $2\frac{1}{4}$ is less than 3 so the weight per metre is less than 1 kg.
S 3 Think about how to calculate by filling in the box ☐.
TN Remind students to refer to Kapul call out when calculating.

3 Important Point

T/S Explain the important point in the box ☐.

4 Calculating mixed fraction ÷ whole number by splitting.

T 4 Let's calculate $2\frac{1}{4} \div 3$ by splitting $2\frac{1}{4}$ into whole number and fraction.
TN Use prior knowledge of spliting mixed fraction and assist the students to fill in the box ☐.
S Calculate by filling in the box ☐.

5 Complete the Exercise

S Solve the selected exercises.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

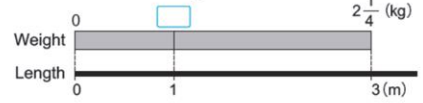
Sample Blackboard Plan

Date: Chapter 11: Multiplication and Division of Fractions. Topic: Division of Fractions. Lesson Number: 4 out of 4

Review

MT: Let's think about how to calculate a mixed fraction divided by a whole number.

5 There is an iron rod which is 3 m long and weighs $2\frac{1}{4}$ kg. How much does 1m weigh?



1 Mathematical Expression.

2 Estimate that 2÷3 is less than 1 therefore weight per metre is less than 1 kg.

3 Let's think about how to calculate.

		÷3
Weight (kg)	?	$2\frac{1}{4}$
Length (m)	1	3

Students give their own idea in how they would calculate

MT

$2\frac{1}{4} \div 3 = \frac{9}{4} \div 3 = \frac{9}{4 \times 3} = \frac{3}{4}$

Important Point

4 Let's calculate by splitting into whole number and fraction.

$2\frac{1}{4} \div 3$ < $2 \div 3 = \frac{2}{3}$, $\frac{1}{4} \div 3 = \frac{1}{4 \times 3} = \frac{1}{12}$ > $\frac{2}{3} + \frac{1}{12} = \frac{8}{12} + \frac{1}{12} = \frac{9}{12} = \frac{3}{4}$

Summary

- When you divide a mixed fraction, you can calculate in the same way as proper fraction ÷ by a whole number by changing the mixed fraction into an improper fraction.

Unit 11

Unit: Multiplication and Division of Fractions
Exercise, Problem and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 159 and 160
Actual Lesson 108 and 109

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems 1, Problems 2 and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise, Problems 1 and Problems 2 correctly. S

Teacher's Note

This is the last lesson of Chapter 11. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

1 Summarise how to calculate fraction × whole number and fraction ÷ whole number. Pages 152 and 156

① $\frac{2}{7}\times 3=\frac{2\times 3}{7}=\frac{6}{7}$

② $\frac{5}{7}\div 3=\frac{5}{7\times 3}=\frac{5}{21}$

2 Let's calculate. Pages 152 and 153

① $\frac{2}{5}\times 5$ 2 ② $\frac{7}{9}\times 6$ $4\frac{2}{3}$ ③ $\frac{7}{6}\times 8$ $9\frac{1}{3}$ ④ $2\frac{3}{4}\times 12$ 33

⑤ $\frac{5}{12}\times 3$ $1\frac{1}{4}$ ⑥ $\frac{3}{7}\times 28$ 12 ⑦ $\frac{9}{14}\times 7$ $4\frac{1}{2}$ ⑧ $3\frac{3}{10}\times 30$ 99

3 Gilbert drinks $\frac{5}{6}$ L of milk each day. How many litres will be drank in 3 days? Page 152

$\frac{5}{6}\times 3=\frac{15}{6}=2\frac{1}{2}$ L

4 Let's calculate. Pages 152 to 158

① $\frac{5}{6}\div 4$ $\frac{5}{24}$ ② $\frac{4}{7}\div 2$ $\frac{2}{7}$ ③ $\frac{3}{10}\div 6$ $\frac{1}{20}$ ④ $\frac{2}{5}\div 7$ $\frac{2}{35}$

⑤ $\frac{3}{2}\div 2$ $\frac{3}{4}$ ⑥ $\frac{10}{7}\div 10$ $\frac{1}{7}$ ⑦ $1\frac{3}{8}\div 3$ $\frac{11}{24}$ ⑧ $2\frac{5}{8}\div 3$ $\frac{7}{8}$

5 Divide $\frac{7}{6}$ L of pineapple juice equally into 3 bottles. How many L will there be in each bottle? Page 158

$\frac{7}{6}\div 3=\frac{7}{18}$ L

Grade 5 Do you remember?

Let's find a volume of the figures below.

① 2 cm, 4 cm, 6 cm

② 2.5 cm, 2.5 cm, 2.5 cm

③ 3 m, 6 m, 3 m, 7 m, 5 m

48 cm^3 15.625 cm^3 150 m^3

□ − □ = 159 160 = □ × □

PROBLEMS 1

1 Find wrong calculations below and correct them.

Understanding how to calculate.

① $\frac{2}{5}\times 10=\frac{2\times 10}{5\times 10_5}=\frac{1}{25}$ $\frac{2}{5}\times 10=\frac{2\times 10^2}{5_1}=4$

② $\frac{7}{8}\div 4=\frac{7\times 4^1}{8_2}=\frac{7}{2}$ $\frac{7}{8}\div 4=\frac{7}{8\times 4}=\frac{7}{32}$

2 Let's calculate.

Calculating fraction × whole number and fraction ÷ whole number.

① $\frac{1}{6}\times 5$ $\frac{5}{6}$ ② $\frac{5}{8}\times 6$ $3\frac{3}{4}$ ③ $\frac{7}{6}\times 12$ 14

④ $\frac{4}{9}\div 3$ $\frac{4}{27}$ ⑤ $\frac{12}{13}\div 4$ $\frac{3}{13}$ ⑥ $\frac{10}{9}\div 6$ $\frac{5}{27}$

3 There is a $\frac{7}{10}$ m long tape. Divide the tape equally among 5 students. How many m of the tape will each student receive?

Writing an expression of fractions and answering.

$\frac{7}{10}\div 5=\frac{7}{50}$ m

4 The length of a rectangle is $\frac{11}{6}$ cm and the width is 3 cm. Find the area of the rectangle.

Finding the area with fraction.

$\frac{11}{6}\times 3=\frac{11}{2}=5\frac{1}{2}$ cm^2

PROBLEMS 2

1 Let's represent time as a fraction.

Represent the time using fractions.

① How many hours are there in 20 minutes? Express as a fraction. Write the reason. $\frac{1}{3}$ hours

② How many days are there in 8 hours? Express as a fraction. $\frac{1}{3}$ days

③ How many minutes are there in $\frac{15}{4}$ seconds? Write an expression and calculate. $\frac{15}{4}\div 60=\frac{15}{4\times 60_4}=\frac{1}{16}$ minutes

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.
T Confirm students' answers.

2 Solve the Problems 1

S Solve all the problems.
T Confirm students' answers.
TN 1 Understanding how to calculate.
2 Calculating fraction × whole number and fraction ÷ whole number.
3 Writing an expression of fractions and answering.
4 Finding the area with fractions.

3 Solve the Problems 2

S Solve all the problems.
T Confirm students' answers.

4 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.
S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 11: Multiplication and Division of Fractions	Name:	Score / 100

1. Calculate. [6×10 marks = 60 marks]

(1) $\frac{1}{9}\times 5 = \frac{5}{9}$ Answer: $\frac{5}{9}$

(2) $\frac{2}{3}\times 6 = \frac{2}{3}\times \overset{2}{6} = 4$ Answer: 4

(3) $1\frac{1}{12}\times 5 = \frac{13}{12}\times 5 = \frac{65}{12}$ Answer: $\frac{65}{12}$ or $5\frac{5}{12}$

(4) $\frac{1}{6}\div 4 = \frac{1}{6}\times\frac{1}{4} = \frac{1}{24}$ Answer: $\frac{1}{24}$

(5) $2\frac{3}{5}\div 26 = \frac{\overset{1}{13}}{5}\times\frac{1}{\underset{2}{26}} = \frac{1}{10}$ Answer: $\frac{1}{10}$

(6) $2\frac{1}{5}\div 12 = \frac{11}{5}\times\frac{1}{12} = \frac{1}{60}$ Answer: $\frac{1}{60}$

2. Answer the following questions. [10 marks or maths expression and 10 marks for the answer]

(1) Find the weight of 8 coins weighing $1\frac{3}{5}$ g each in grams.

Mathematical Expression: $1\frac{3}{5}\times 8$ Answer: $\frac{64}{5}$ g or $12\frac{4}{5}$ g

(2) Find the share of rice for 1 person in kg if 7 people share $\frac{4}{5}$ kg of it equally.

Mathematical Expression: $\frac{4}{5}\div 7$ Answer: $\frac{4}{35}$ kg

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End of Chapter Test **Date:**

Chapter 11: Multiplication and Division of Fractions	Name:	Score / 100

1. Calculate.

[6 × 10 marks = 60 marks]

(1) $\frac{1}{9} \times 5$

Answer:

(2) $\frac{2}{3} \times 6$

Answer:

(3) $1\frac{1}{12} \times 5$

Answer:

(4) $\frac{1}{6} \div 4$

Answer:

(5) $2\frac{3}{5} \div 26$

Answer:

(6) $2\frac{1}{5} \div 12$

Answer:

2. Answer the following questions.

[10 marks or maths expression and 10 marks for the answer]

(1) Find the weight of 8 coins weighing $1\frac{3}{5}$ g each in grams.

Mathematical Expression:

Answer:

(2) Find the share of rice for 1 person in kg if 7 people share $\frac{4}{5}$ kg of it equally.

Mathematical Expression:

Answer:

Chapter 12 Proportions

1. Content Standard

5.4.1 Explore proportions in two changing quantities patterns and explain the patterns by using the relation of direct proportionality.

2. Unit Objectives

- To analyse the two changing quantities by observing the table.
- To understand the proportion of two quantities.
- To deepen the understanding of equations that shows the relation of two quantities.

3. Teaching Overview

This is the first unit for learning proportions.

They already built some foundations in the previous grades such as quantities changing together expressed as line graphs or mathematical sentences using ○ and □. I

n grade 5, students will deepen their understanding of mathematical sentences using □ and ○, and get familiar with simple proportional relationship.

Further learning will be expected in Grade 6.

Quantities Changing Together:

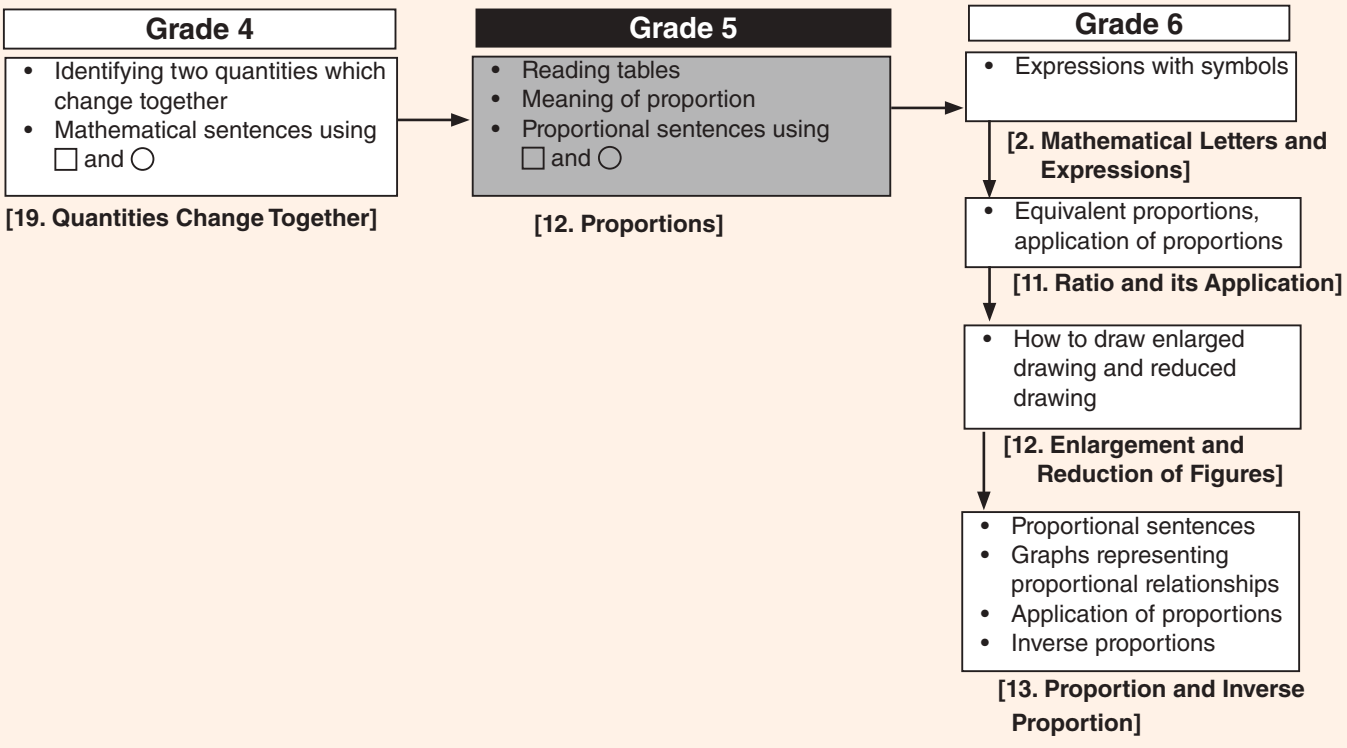
Students put appropriate values in a table based on a situation given and pay attention to changing quantities and constant.

They replace the changing quantities by □ and △. Students are to be given enough opportunities to interpret and use the expressions with ○, □ and △.

Proportions :

Many situations should be thought in this topic to investigate the patterns of changes and relationships of values corresponding.

4. Related Learning Contents



Unit 12

Unit: Proportions
Sub-unit 1: Quantities Changing Together
Lesson 1 of 1

Textbook Page : 162 and 163
Actual Lesson 110

Sub-unit Objectives

- To derive equations of two quantities that change together.
- To understand how the quantities change from observing the table.
- To write equations using the symbols □ and ○.

Lesson Objectives

- To find the quantities that change from the table.
- To write equations of two quantities using □ and ○.

Prior Knowledge

- Quantities that change together (Grade 4)

Preparation

- Table for task 1 and 2

Assessment

- Analyse two quantities by using the table. F
- Express equations of two quantities using □ and ○. S

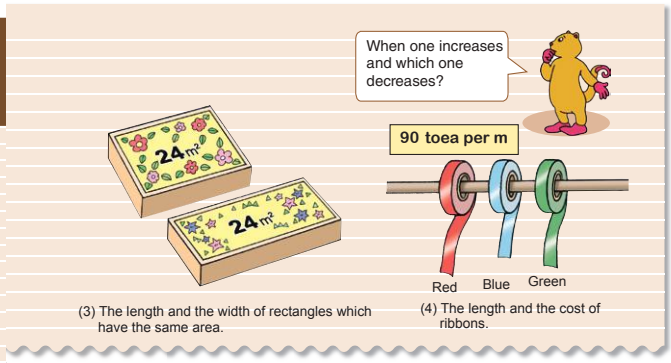
Teacher's Notes

The students had identified that in their surroundings in their lesson from Grade 4, there are some quantities that change as another quantity changes.
In this unit, the students will use their background knowledge to identify when one quantity changes, the other quantity changes together.
They will enhance their knowledge using the table and the symbols to understand the mathematical relationship between □ and ○.

12 Proportions

(1) The length and the width of rectangles which are made by the same rope.

(2) The length and weight of wires.



(3) The length and the width of rectangles which have the same area.

(4) The length and the cost of ribbons.

1 Quantities Changing Together

There are quantities when one quantity changes, the other quantity also changes together in our surrounding.

1 Yawa transferred 100 oranges from a box to a basket sent by his grandmother. Number of oranges in the box decreases and the number of oranges in the basket increases

1 Let's illustrate to explain the situation.

2 Write down the number of oranges in a box, the number of oranges in a basket and the total in the table.

Numbers of Oranges in a Box and in a Basket

Number of oranges in a basket	0	20	40	60	80	100
Number of oranges in a box	100	80	60	40	20	0
Total	100	100	100	100	100	100

Number of oranges in the basket and the number of oranges in the box.

3 When they transferred oranges from a box to a basket, which quantities changed together? Total quantity remains unchanged
Which quantities remain unchanged?

4 Put the number of oranges in a basket □ and the number of oranges in a box ○, write a mathematical sentence with the relationship between □ and ○. 100 − □ = ○
□ + ○ = 100

2 There are many boxes of the same shapes and sizes.
Pile up the boxes on a stand with a 10 cm height table and measure the whole height. When the number of boxes increases, the heigh from the table increases also.

1 Let's illustrate to explain the situation.

2 Write down the number of boxes, the height of boxes piled up and the whole height on the table.

Number of Boxes and Height

Number of boxes	0	1	2	3	4	5	6	7
Height of boxes (cm)	0	6	12	18	24	30	36	42
Whole height (cm)	10	16	22	28	34	40	46	52

3 When we pile up 1 box, how many cm does the height increase? 6 cm

4 When we pile up 7 boxes, what cm is the whole height? 52 cm

5 When we pile up boxes, which quantities change? Height of boxes, number of boxes, whole height.
Which quantity remains unchanged? Height of one box, height of the table.

6 Put the number of boxes □ and the whole height ○ cm, then write a mathematical sentence with the relationship between □ and ○. 6 × □ + 10 = ○

7 Let's calculate the whole height in 8 boxes by using the mathematical sentence.
6 × 8 + 10 = 58 Answer: 58 cm

162 = □ × □

□ − □ = 163

Lesson Flow

1 Investigate and understand the meaning of proportion.

T Discuss diagrams (1) to (4) with students and identify how the quantities are changing together.

TN (1) When length increases the width decreases.
(2) Both the length and the weight increase.
(3) When length increases the width decreases.
(4) Both the length and price increases.

2 Relationship between two quantities where one increases and the other decreases.

T/S 1 Read and understand the situation.

T Introduce the Main Task. (Refer to the BP)

T 1 Ask the students to refer to the table and answer .

S Explain the situation in own words or drawings.

TN The quantity of oranges decreases in the box as the amount of oranges increase in the basket.

S 2 Fill in the table.

T 3 Which quantities changes together?

S The quantity of oranges in the box and basket changed together but the total quantity of oranges remains the same.

S 4 Write the mathematical sentence between □ and ○. (□+○=100)

T Check and confirm students'answers.

3 Relationship between two quantities where both increases.

T/S 2 Read and understand the situation.

S 1 Explain the situation in own words or drawings.

TN When there are no boxes on the table, the height of the table is 10 cm.

T Ask students to refer to the table and complete activities 2 to 4.

S 2 Fill in the table.
3 When 1 box is piled, the height increases by 6 cm,
4 When 7 boxes are piled, the whole height is 52 cm.

T 5 Which quantities change and which quantity remain unchanged?

S As the number of boxes increases, the height and the whole height increases but the height of the table remains the same.

S 6 Write the mathematical sentence with the relationship between □ and ○. (6×□+10=○)

S 7 Calculate the whole height in 8 boxes using the mathematical sentence from 6.
6×8+10=58 Answer: 58 cm.

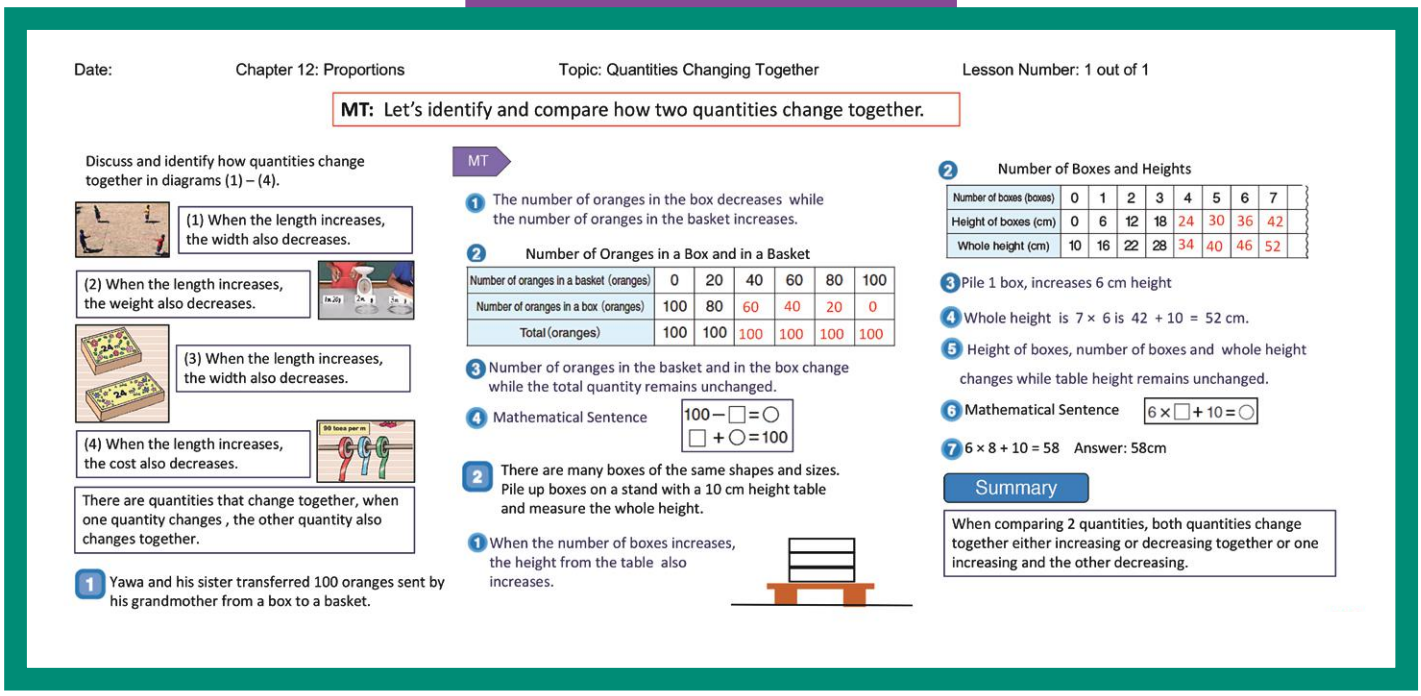
4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 12

Unit: Proportions
Sub-unit 2: Proportions
Lesson 1 of 4

Textbook Page : 164 and 165
Actual Lesson 111

Sub-unit Objectives

- To understand the meaning of proportion.
- To represent proportion as an equation.

Lesson Objective

- To investigate the relationship between the time and the height.

Prior Knowledge

- Two Changing Quantities

Preparation

- Diagram (height and time) and table for task 1

Assessment

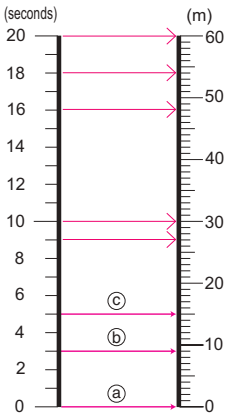
- Analyse two quantities by using the table. F
- Identify the changes between time and height. S

Teacher's Notes

This lesson focuses on time and height. As height increases the time increases as well. This leads the students to understand direct proportion that is when one changes, another changes.

2 Proportions

1 In Port Moresby, a hotel has 19 floors and people use elevators to move up and down.
The height of the building is 60 m from ground level.
When the elevator moves up, we recorded the time and the height on the table.



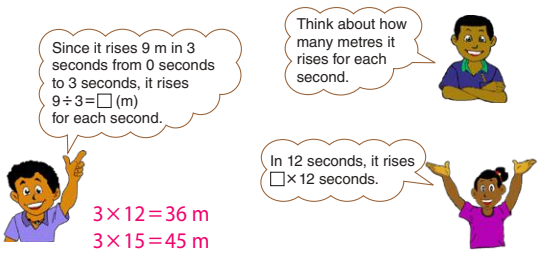
The Time and the Height

Time (seconds)	0	3	5	9	10	16	18	20
Height (m)	0	9	15	27	30	48	54	60
	ⓐ	ⓑ	ⓒ					

1 When the time is 3 seconds, we represent it with an arrow (→) that the height is 9 m as shown in ⓑ in the diagram on page164. Its height is 9 m.

2 How many metres does the elevator rise in one second? 3 m.

3 How can you tell the heights when the times are 12 seconds and 15 seconds respectively?



4 Draw a table between the time spent from the start and the height risen by the elevator.

The Time and the Height

Time (seconds)	0	1	2	3	4	5	6	7
Height (m)	0	3	6	9	12	15	18	21

The time spent from the start is □ seconds and the height risen is ○ m. When the time □ increases, then the height ○ also increases.

164 = □ × □

□ − □ = 165

Lesson Flow

1 Review the previous lesson.

2 Comparing time and height.

T/S 1 Read and understand the situation.
T Introduce the Main Task. (Refer to the Blackboard Plan)
T Ask the students to explain the diagram and table.
S Explain the situation in their own words.
T Ask students to answer 1 and 2
S 1 Draw → to represent other times to confirm the corresponding heights given in the table.
T 2 How many metres does the elevator rise in one second?
S In 1 second the elevator rises 3 m in height.
T 3 How can you tell the height when the time is 12 seconds and 15 seconds respectively?
TN Refer to the speech bubbles to find the answer.
S In 12 seconds it rises 36 m (3×12=36) and in 15 seconds it rises 45 m (3×15=45)
T 4 Ask the students to draw and complete the table.
S Draw and complete the table between time spent from start and the height risen by the elevator.
S Write the mathematical sentence between □ and ○.
Mathematica sentence : (3×□=○)
T Check and confirm students answers.

3 Summary

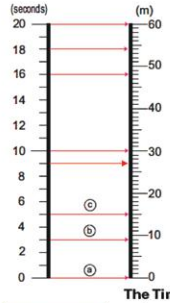
T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: Chapter 12: Proportions Topic: Proportions Lesson Number: 1 out of 4

MT: Let's compare how time and height change together.

1 In Port Moresby, a Hotel has 19 floors and elevators move up and down. The height of the building is 60 m. When the elevator moves up, we recorded the time and the height on the table?



9 s, height is 27m
10 s, height is 30 m
16 s, height is 48 m
18 s, height is 54m
20 s, height is 60 m

The Time and the Height

Time (seconds)	0	3	5	9	10	16	18	20
Height (m)	0	9	15	27	30	48	54	60
	ⓐ	ⓑ	ⓒ					

MT

1 Compare the time and height

When the time is 3 seconds , the height is 9 m.

2 How many metres does the elevator rise in 1 second?

When the time is 1 second , the height is 3 m.

Confirm
27 ÷ 9 = 3
30 ÷ 10 = 3
48 ÷ 16 = 3
54 ÷18= 3
60 ÷ 20 = 3

3 How can you tell the heights when the times are 12 seconds and 15 seconds?

Knowing that the elevator rises 3 m in 1 second,,
In 12 seconds, it rises 3 × 12=36
In 15 seconds, it rises 3 × 15=45

4 Draw a table between the time spent from the start and the height risen by the elevator.

The Time and the Height

Time(seconds)	0	1	2	3	4	5	6	7
Height (m)	0	3	6	9	12	15	18	21

The time spent from the start was □ second and the height risen by the elevator was ○ m. □Increases, then ○ increases together.

Summary

As time □ increases , height ○ increases together.
Mathematical Sentence
3 × □= ○

Unit 12

Unit: Proportions
Sub-unit 2: Proportions
Lesson 2 of 4

Textbook Page : 166
Actual Lesson 112

Lesson Objective

- To understand the meaning of proportion.

Prior Knowledge

- Quantities changing together

Preparation

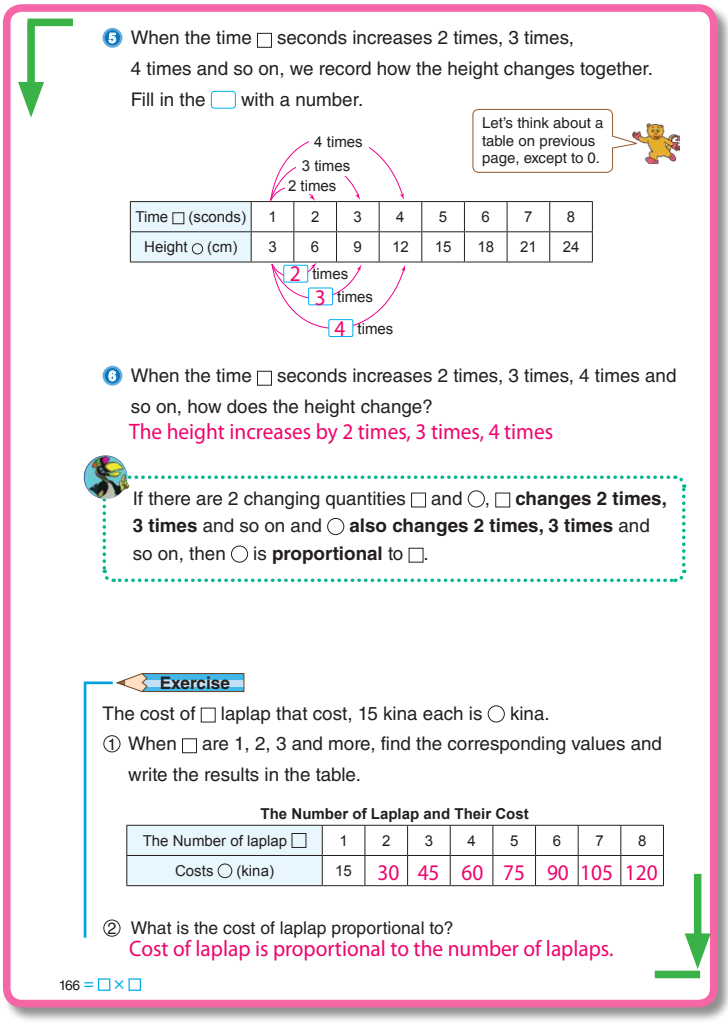
- Table for activity 5 and the exercise

Assessment

- Explain the meaning of proportion. F
- Solve the exercises correctly. S

Teacher's Notes

When the time in seconds increases by 2 times, 3 times and so on, the height increases by 2 times, 3 times and so on.
The time and height are proportional to each other.



5 When the time □ seconds increases 2 times, 3 times, 4 times and so on, we record how the height changes together. Fill in the ▭ with a number.

Let's think about a table on previous page, except to 0.

4 times
3 times
2 times

Time □ (sconds)	1	2	3	4	5	6	7	8
Height ○ (cm)	3	6	9	12	15	18	21	24

2 times
3 times
4 times

6 When the time □ seconds increases 2 times, 3 times, 4 times and so on, how does the height change?
The height increases by 2 times, 3 times, 4 times

If there are 2 changing quantities □ and ○, □ **changes 2 times, 3 times** and so on and ○ **also changes 2 times, 3 times** and so on, then ○ is **proportional** to □.

Exercise

The cost of □ laplap that cost, 15 kina each is ○ kina.

① When □ are 1, 2, 3 and more, find the corresponding values and write the results in the table.

The Number of Laplap and Their Cost

The Number of laplap □	1	2	3	4	5	6	7	8
Costs ○ (kina)	15	30	45	60	75	90	105	120

② What is the cost of laplap proportional to?
Cost of laplap is proportional to the number of laplaps.

166 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Investigate how the height changes when time increase by 2 times, 3 times, 4 times and so on.

T/S Read and understand the situation.
T Introduce the Main Task. (Refer to the Blackboard Plan)
T Ask students to refer to the table and fill in the box.
S ❺ Fill in the box ☐ with the correct number. (2, 3 and 4)
TN Identify that the increase in height is the same as the time by 2 times, 3times, 4 times and so.
T ❻ How does the height change when time increase by 2 times, 3 times, 4 times and so on?
S The height ○ cm also increases by 2 times, 3 times, 4 times and so on.
TN The height is proportional to the time.

3 Important Point

T/S Explain the important point in the box ⬚.

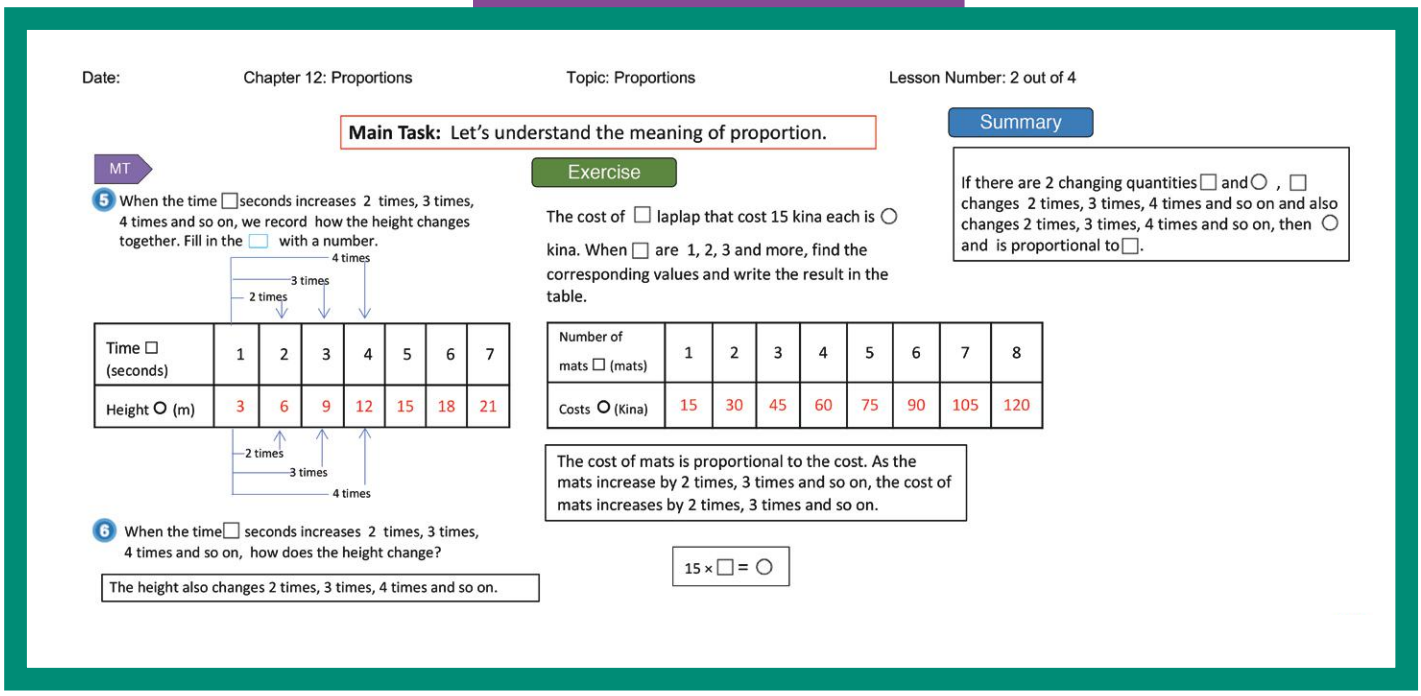
4 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 12

Unit: Proportions
Sub-unit 2: Proportions
Lesson 3 of 4

Textbook Page : 167
Actual Lesson 113

Lesson Objectives

- To understand how the area of parallelogram changes.
- To identify how the area of parallelogram changes.

Prior Knowledge

- Meaning of Proportion

Preparation

- Diagram for task 2, table for activity 3

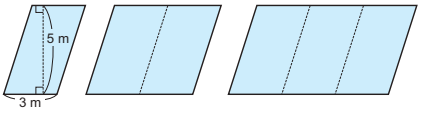
Assessment

- Identify how the area of parallelogram changes. F
- Solve the exercises correctly. S

Teacher's Notes

This lesson focuses on Area in relation to base and height of the parallelogram.
Remind the students on the term 'congruent'.

2 There are some congruent parallelograms that have 3 cm base and 5 cm height.
Make larger parallelograms by connecting them as shown below and find their areas.



1 Write the formula for the area of parallelogram

Area = base × height

Let's investigate which 2 quantities change together and which quantity remains unchange? The height remains the same but area and base changes.

2 Write the mathematical sentence by using □ cm as the base and ○ cm² as the area. ○=□×5

3 Write down the relationship between the base and the area of parallelogram on the table.

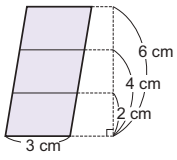
The Base and the Area of a Parallelogram

Base (cm)	3	6	9	12	15	18
Area (cm²)	15	30	45	60	75	90

4 Is the area of parallelogram proportional to the base? Yes
Let's write the reason.
As the base increases, the area also increases at the same rate.

Exercise

The height of a parallelogram is increased as shown on the right.
① Write the relationship between the height and the area on a table.
② Let's write what you have learned from the table.
Refer to sample blackboard plan for answers.



□ – □ = 167

Lesson Flow

1 Review the previous lesson.

2 Finding the base and the area of parallelogram

T Introduce the Main Task. (Refer to the Blackboard Plan)

T/S 2 Read and understand the situation.

TN Make larger paralellograms by connecting them as shown in 2 and find the area.

S 1)Base 3 cm, area 15 cm² 2) Base 6 cm, area 30 cm² 3) Base 9 cm, area 45 cm²

T 1 Write the formula for the area of parallelogram and investigate which two quantities change together and which quantity remains unchanged?

S Area = Base × Height (Perpendicular height)
Base and area will increase together but the Height of the parallelogram will remain the same.
2 The mathematical sentence becomes ○ = □ × 5.

T 3 Write down the relationship between the base and the area of parallelogram on the table.

S Fill in the table and identify that when the base increases by 2 times, 3 times and so on, the area also increase by 2 times, 3 times and so on.

T 4 Is the area of parallelogram proportional to the base? Let's write the reason.

S Yes,the area of parallelogram is proportional to the base because as the base increases by 2 times 3 times, 4 times the area also increases by 2 times 3 times, 4 times.

3 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

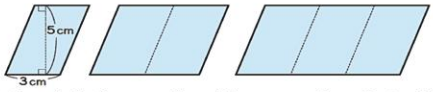
Date: **Unit:** Proportions **Topic:** Proportions **Lesson Number:** 2 **of** 4

MT: Let's Investigate area of Parallelogram.

Review

If there are 2 changing quantities □ and ○ , □ changes 2 times, 3 times, 4 times and so on, and ○ also changes 2 times, 3 times, 4 times and so on, then ○ is proportional to □. MT

2 There is a number of congruent parallelograms that have 3 cm base and 5 cm height. Make larger parallelograms by connecting them as shown below and find their areas.



1 Write the formula for the area of parallelogram and investigate which 2 quantities change together. Which quantity remains unchanged?

Area of parallelogram = base × height

The height remains the same but area and base changes

2 Write the mathematical sentence by using □ cm as the base and ○ cm² as the area. □ x 5 = ○ cm²

3 Write down the relationship between the base and the area of parallelogram on the table.

The Base and the Area of Parallelogram

Base (cm)	3	6	9	12	15	18
Area (cm²)	15	30	45	60	75	90

4 Is the area of parallelogram proportional to the base? Let's write the reason.

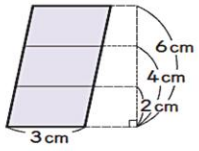
As the base of parallelogram increase by 2 times, 3 times and so on the area of parallelogram increases by 2 times, 3 times and so on. Thus the area of parallelogram is proportional to its base.

Exercise

The height of a parallelogram is increased as shown on the right.

① Write the relationship between the height and the area on the table.

② Write what you have learned.



Summary

As the Height of parallelogram increase by 2 times, 3 times and so on the area of parallelogram increases by 2 times, 3 times and so on. Thus the area of parallelogram is proportional to its height.

Unit 12

Unit: Proportions
Sub-unit 2: Proportions
Lesson 4 of 4

Textbook Page : 168
Actual Lesson 114

Lesson Objectives

- To understand how the area of triangle changes.
- To identify how the area of triangle changes.

Prior Knowledge

- Area of Parallelogram

Preparation

- Diagram for task 3, table for activity 2

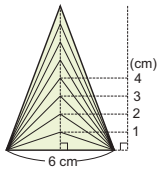
Assessment

- Identify and explain how the area of triangle changes. F
- Solve the exercises correctly. S

Teacher's Notes

This lesson focuses on Area in relation to base and height of the triangle.
Remind the students on the term 'congruent'.
In 4, A = base × height ÷ 2.
◯ = 6 × □ ÷ 2
◯ = □ × 6 ÷ 2
◯ = □ × 3

3 The height of the triangle is increased in steps of 1 cm as shown on the right.
Find the area of each triangle.



1 Write the formula for the area of the triangle and investigate which quantities change together. What remains unchanged?

Area = base × height ÷ 2
The area and height change together but the base remains unchanged.

2 Write down the relationship between the height and the area of the triangle on the table.

The Height and the Area of the Triangle

Height (cm)	1	2	3	4	5	6	7	8	9
Area (cm²)	3	6	9	12	15	18	21	24	27

3 Is the area of triangle proportional to the height? Let's write the reason.
Yes, as area increases by 2 times, 3 times and so on, height also increases by 2 times, 3 times and so on.

4 Write a simpler expression using □ cm as the height and ◯ cm² as the area in 1. ◯ = 3 × □

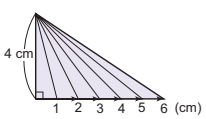
5 When the area of the triangle is 30 cm², what is the height in cm?
30 = 3 × □ (10 cm)

Exercise

The base of the right triangle on the right is extended in the steps shown below.

① Write the relationship between the base and the area of the triangle on a table.

② When the area of the triangle is 16 cm², what is the base in cm?



Refer to sample blackboard plan for answers.

168 = □ × □

Lesson Flow

1 Review the previous lesson.

T Introduce the Main Task. (Refer to the BP)

2 Finding the height and the area of triangle.

T/S 3 Read and understand the situation.

TN Make larger triangles by increasing the heights as shown in 3 and find the area.

S 1)height 1 cm, area 3 cm² (2) height 2 cm, area 6 cm² (3) height 3 cm, area 9 cm² (4) height 4, area 12cm²

T 1 Write the formula for the area of triangle and investigate which two quantities change together and which quantity remains unchanged?

S Area = (Base × Height) ÷ 2.
○ = 6 × □ ÷ 2
Height and area will increase together but the Base of the triangle will remain the same.

T 2 Write down the relationship between the base and the area of triangle on the table.

S Fill in the table and identify that when the height increases by 2 times, 3 times and so on, the area also increase by 2 times, 3 times and so on.

T 3 Is the area of the triangle proportional to the height? Let's write the reason.

S Yes,the area of the triangle is proportional to the height because as the area increases by 2 times 3 times, 4 times the height also increases by 2 times 3 times, 4 times.

T 4 Write a simpler expression using □ as the height and the ○ cm² as the area in 1.

S ○ = 6 × □ ÷ 2, ○ = 3 × □

T 5 What is the height in cm, when the area of the triangle is 30 cm²?

S Using ○ = 3 × □ 30 = 3 × □ therefore, □ = 30 ÷ 3 = 10 cm

3 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

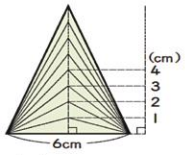
Date: **Unit:** Proportions **Topic:** Proportions **Lesson Number:** 2 **of** 4

MT: Let's Investigate area of Triangle.

Review

MT

3 The height of triangle is increased in steps of 1 cm as shown on the right. Find the area of each triangle.



1 Write the formula for the area of triangle and investigate which elements change together. What remains unchanged?

Area = base × height ÷ 2

2 Write down the relationship between the height and the area of triangle on the table.

The Height and the Area of Triangle

Height (cm)	1	2	3	4	5	6	7	8	9
Area (cm²)	3	6	9	12	15	18	21	24	27

3 Is the area of the triangle proportional to the height? Let's write the reason.

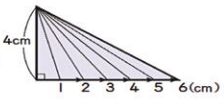
As the height of Triangle increase by 2 times, 3 times and so on the area of Triangle increases by 2 times, 3 times and so on. Thus the area of triangle is proportional to its height.

4 Write an expression using □ cm as the height and ○ cm as the area in 1. ○ = 3 x □

5 When the area of the triangle is 30 cm², what is the height in cm?
○ = 3 x □
30 = 3 x □ Answer: 10 cm

Exercise

The base of a right triangle is extended in steps as shown on the right?
Write the relationship between the base and area of triangle on a table. 16 = □ x 2
When the area of the triangle is 16 cm², what is the base? 16 = □ x 2
□ = 8 Answer: 8 cm



Summary

As the base of Triangle increase by 2 times, 3 times and so on the area of Triangle increases by 2 times, 3 times and so on. Thus the area of triangle is proportional to its height.

Unit 12

Unit: Proportions
Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 169
Actual Lesson 115 and 116

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

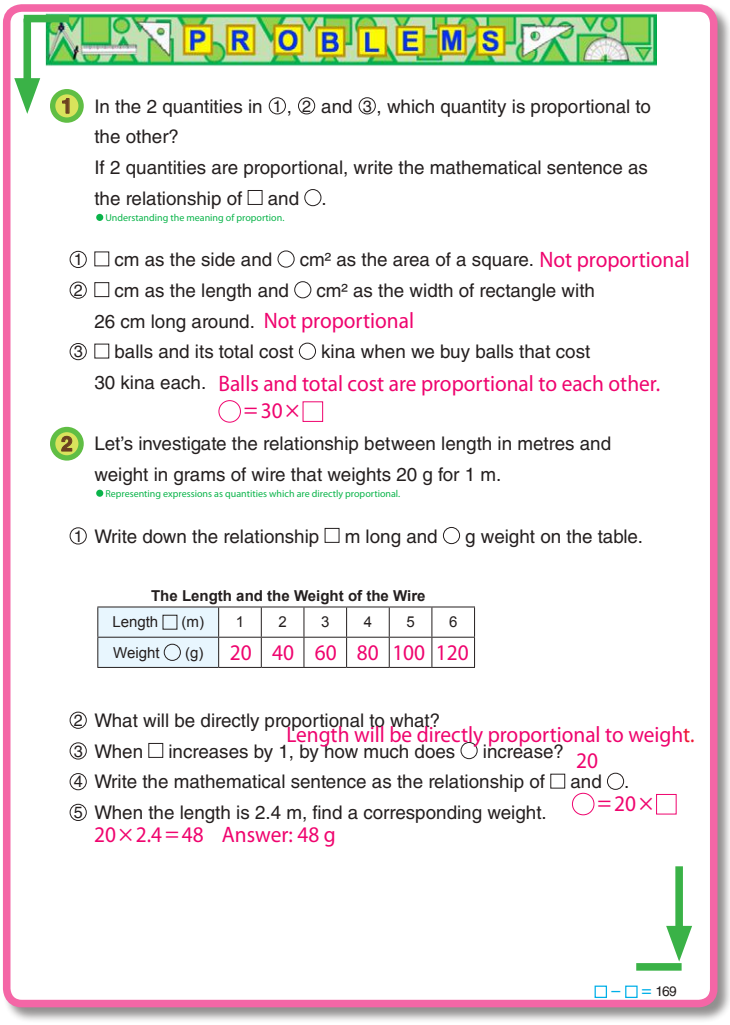
- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 12.
Students should be encouraged to use the necessary skills learned in this unit to solve the Problems in preparation for the evaluation test.
The test can be conducted as assessment for your class after completing all the exercises.
Use the attached evaluation test to conduct assessment for your class after finishing all the problems as a seperate lesson.



PROBLEMS

1 In the 2 quantities in ①, ② and ③, which quantity is proportional to the other?
If 2 quantities are proportional, write the mathematical sentence as the relationship of □ and ○.
● Understanding the meaning of proportion.

① □ cm as the side and ○ cm² as the area of a square. Not proportional
② □ cm as the length and ○ cm² as the width of rectangle with 26 cm long around. Not proportional
③ □ balls and its total cost ○ kina when we buy balls that cost 30 kina each. Balls and total cost are proportional to each other.
○ = 30 × □

2 Let's investigate the relationship between length in metres and weight in grams of wire that weights 20 g for 1 m.
● Representing expressions as quantities which are directly proportional.

① Write down the relationship □ m long and ○ g weight on the table.

The Length and the Weight of the Wire

Length □ (m)	1	2	3	4	5	6
Weight ○ (g)	20	40	60	80	100	120

② What will be directly proportional to what? Length will be directly proportional to weight.
③ When □ increases by 1, by how much does ○ increase? 20
④ Write the mathematical sentence as the relationship of □ and ○. ○ = 20 × □
⑤ When the length is 2.4 m, find a corresponding weight.
20 × 2.4 = 48 Answer: 48 g

□ – □ = 169

Lesson Flow

1 Solve the Problems 1

S Solve all the problems.

T Confirm students' answers.

TN 1 Understanding the meaning of proportion.

2 Representing expressions as quantities which are directly proportional.

2 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the problems as a seperate lesson.

S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 12: Proportions	Name:	Score / 100

1. Write ☑ if one quantity is proportional to another quantity in each statement.

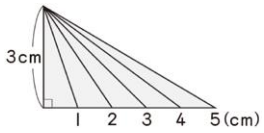
[3×15 marks=45 marks]

(1) ☐ The base and height in a parallelogram of 24 cm² .

(2) ☐ The duration of a day and night in days.

(3) ☑ The length of a side and the circumference of a square.

2. We extend the base of a right angled triangle as shown below.



(1) Fill in the table.

[5×5 marks=25 marks]

Base ○ (cm)	1	2	3	4	5
Area □ (cm²)	1.5	3	4.5	6	7.5

Show working out.

(2) How much of area increases when the base increases by 1 cm?

[10 marks]

Answer: 1.5 cm²

(3) Write a mathematical expression for showing the relationship between ○ and □.

[10 marks]

Answer: 1.5×○=□

(4) Find the base if the area of the triangle is 21 cm².

[10 marks]

1.5×○=21
○=21÷1.5
=14

Answer: 14 cm

232

End of Chapter Test **Date:**

Chapter 12: Proportions	Name:	Score / 100

1. Write ☑ if one quantity is proportional to another quantity in each statement.

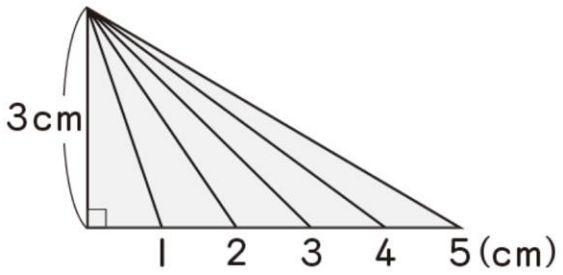
[3×15 marks=45 marks]

(1) ☐ The base and height in a parallelogram of 24 cm^2 .

(2) ☐ The duration of a day and night in days.

(3) ☐ The length of a side and the circumference of a square.

2. We extend the base of a right angled triangle as shown below.



(1) Fill in the table.

[5×5 marks=25 marks]

Base ○ (cm)	1	2	3	4	5
Area □ (cm^2)					

Show working out.

(2) How much of area increases when the base increases by 1 cm?

[10 marks]

Answer:

(3) Write a mathematical expression for showing the relationship between ○ and □.

[10 marks]

Answer:

(4) Find the base if the area of the triangle is 21 cm^2.

[10 marks]

Answer:

Chapter 13 Regular Polygons and Circles

1. Content Standard

5.3.2 Investigate and construct regular polygons and identify the properties of angles.

2. Unit Objectives

- To deepen the understanding about plane shapes through observation and activities.
- To know about polygons and regular polygons.
- To understand and use

3. Teaching Overview

In Grade 3, students learn how to draw circles and have the knowledge of centre, diameter and radius. In Grade 5, they learn ratio of circumference to diameter and utilise it to find the circumference.

They also investigate the relationship between a circle and its inscribed regular polygons and compare the circumferences of the circle and the polygon.

Regular Polygons :

Students will capture the features of regular polygons through activities of making them by folding and cutting a paper.

They should know the process of more accurate construction of regular polygons by dividing the centre angle equally.

Diameters and Circumferences :

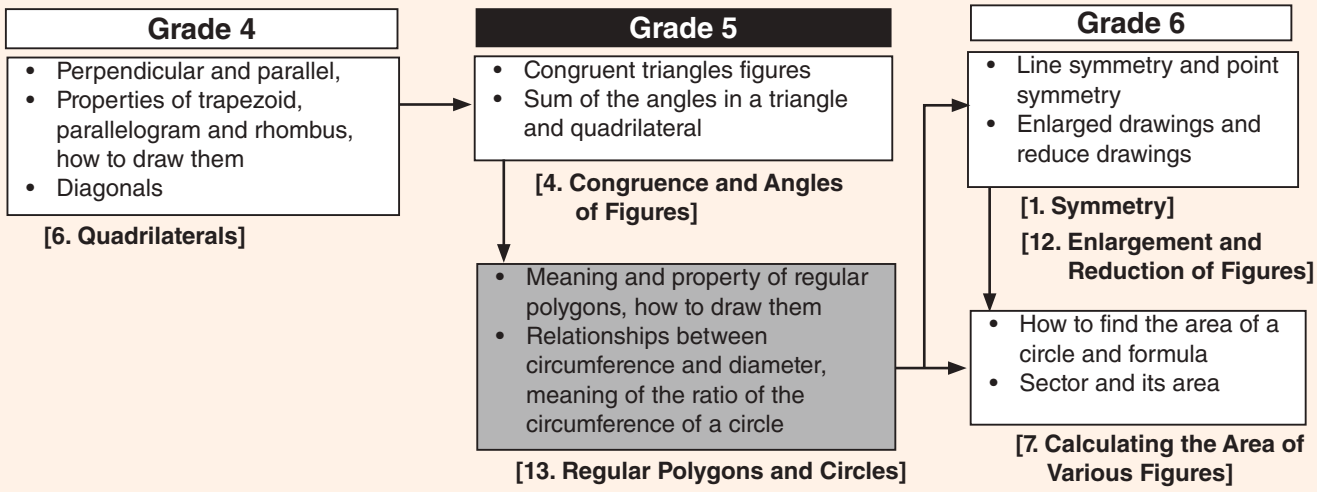
Students should find out by themselves that the circumference of a circle is greater than 3 times the diameter and less than 4 times through activities.

They should get used to finding the circumference from its diameter or radius and vise versa.

Encourage students to be interested in the history of the ratio of circumference to diameter and its infinity.

Note that teachers should not just give the ratio to the students, however, students should discover and calculate by themselves as much as possible.

4. Related Learning Contents



Unit 13

Unit: Regular Polygons and Circles
Sub-unit 1: Regular Polygons
Lesson 1 of 3

Textbook Page : 170 to 172
Actual Lesson 117

Sub-unit Objectives

- To understand properties of regular polygons by making their shapes using the square papers.
- To draw regular polygons, applying the properties of circumscribed or inscribed circles.

Lesson Objective

- To understand the definition of regular polygons and summarise their features.

Prior Knowledge

- Names and properties of basic shapes like square, triangle, rectangles, etc...

Preparation

- Square papers (Origami)
- Scissors, rulers, protractor, compass, equilateral triangle for the blackboard

Assessment

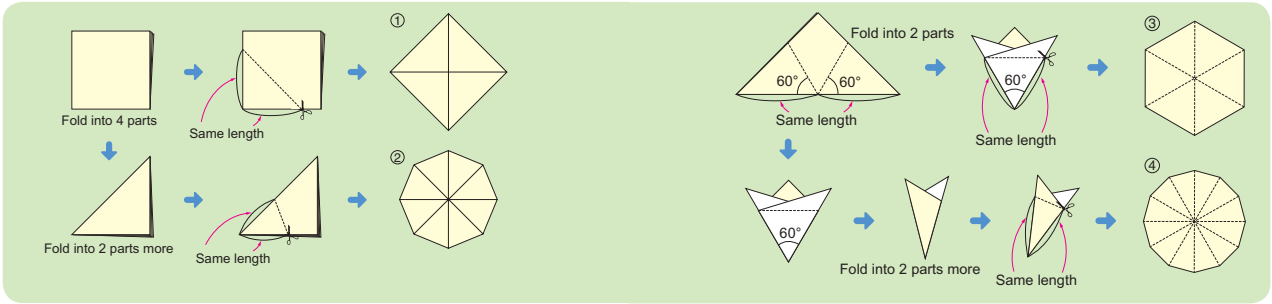
- Fold the square papers correctly and cut out to make regular polygons. F
- Understand and identify the features that are common and different in regular polygons. F
- Identify the number of sides and size of angles in regular polygons. S

Teacher's Notes

It's best for the teacher to try out the foldings and cuttings before the actual lesson. Demonstrate during lesson as students follow through.
To obtain a regular polygon, square papers (coloured papers if available) must be used. It is important that the students must be well guided to make the polygons using square papers because students can easily make mistake in folding and cutting.

13 Regular Polygons and Circles

Let's fold papers as follows, cut and spread to make shapes.



1 Have you seen the shapes in ① to ④?
Let's look for those shapes around you.

2 What is common amongst the 4 shapes ① to ④?
What are the differences?

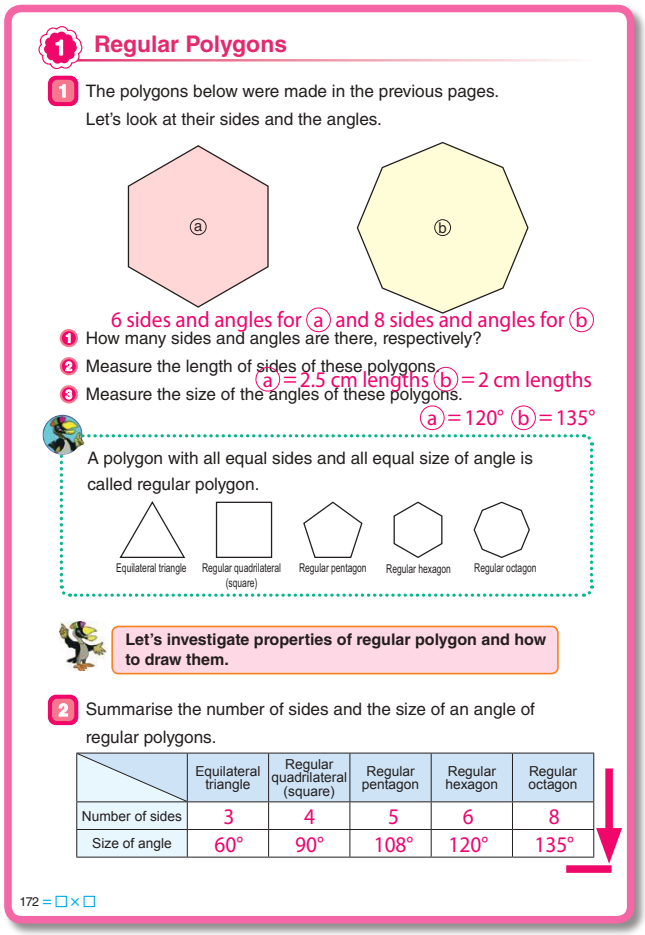
Common: all side lengths are same, all angles are same.
Difference: number of sides and each side length, number of angles and size of angles.

170 = □ × □ — □ − □ = 171

Lesson Flow

1 ▶▶ Discuss the features of shapes and make them.

T/S Discuss the shapes and describe them.
T Provide students with square paper and scissors and ask them to fold and cut according to the instruction in the textbook from ① to ④.



S Understand and make various polygons using square papers.
T 1 Ask students if they have seen the shapes ① to ④ around them.
S Identify the shapes around them.
T 2 Ask students to find the common and different features amongst the four shapes.
S 1) Common features: same side length, diagonals intersect at the centre and have congruent triangles.
2) Different features: number of sides, angles inside and number of edges.

2 1 Investigate the characteristics of regular hexagon and octagon.

T Ask students to answer activities 1 to 3.
S Share their answers.
1 Number of sides and angles for ⓐ is 6 and ⓑ is 8.
2 Length of sides ⓐ is 2.5 cm and ⓑ is 2 cm.
3 Sizes of angles for Ⓐ is 120° and Ⓐ is 135°.
T Confirm students answers

3 Important Point

T/S Explain the important point in the box .
T Introduce the Main Task. (Refer to the BP)

4 2 Investige the properties of regular polygons and how to draw them.

T Ask students to complete the table.
S Copy and complete the summary table.

5 Summary

TN Similar to next summary flow.

Sample Blackboard Plan

Date: **Chapter: Regular Polygons and Circles** **Topic 1:** Regular Polygons **Lesson Number:** 1 of 3

MT: Let's investigate properties of regular polygons and how to draw them.

▶▶ Let's fold a paper as follows, cut and spread it.

1 Have you seen the shapes in ① ~ ④ ?
Let's look for those shapes around you.

List down students responses from 1 .

Students paste their paper cuttings on the shape they cut.

2 What is common amongst the 4 shapes ① ~ ④ ?
What are the differences ?
Common: Same side lengths and same angles, diagonals intersect at centre, have congruent triangles.
Difference: Number of sides and length, number of angles inside and angle size, number of edges.

MT

1 The polygons below were made in the previous pages. Let's look at their sides and the angles.

ⓐ ⓑ

A polygon with all equal sides and all equal size of angle is called regular polygon.
Equilateral triangle Regular quadrilateral (square) Regular pentagon Regular hexagon Regular octagon

Summary

1 How many number of sides and angles are there, respectively?
2 Measure the length of sides of these polygons.
6 sides and angles for ⓐ and 8 sides and angles for ⓑ
ⓐ = 2.5 cm lengths ⓑ = 2 cm lengths
3 Measure the size of angles of these polygons.
Shape a has 120° and 135° for shape b.

2 Summarise the number of sides and the size of an angle of regular polygons.

	Equilateral triangle	Regular quadrilateral (square)	Regular pentagon	Regular hexagon	Regular octagon
Number of sides	3	4	5	6	8
Size of angle	60°	90°	108°	120°	135°

Unit 13

Unit: Regular Polygons and Circles
Sub-unit 1: Regular Polygons
Lesson 2 of 3

Textbook Page : 173
Actual Lesson 118

Lesson Objective

- To investigate properties of regular polygons and how to draw them.

Prior Knowledge

- Meaning and features of regular polygons

Preparation

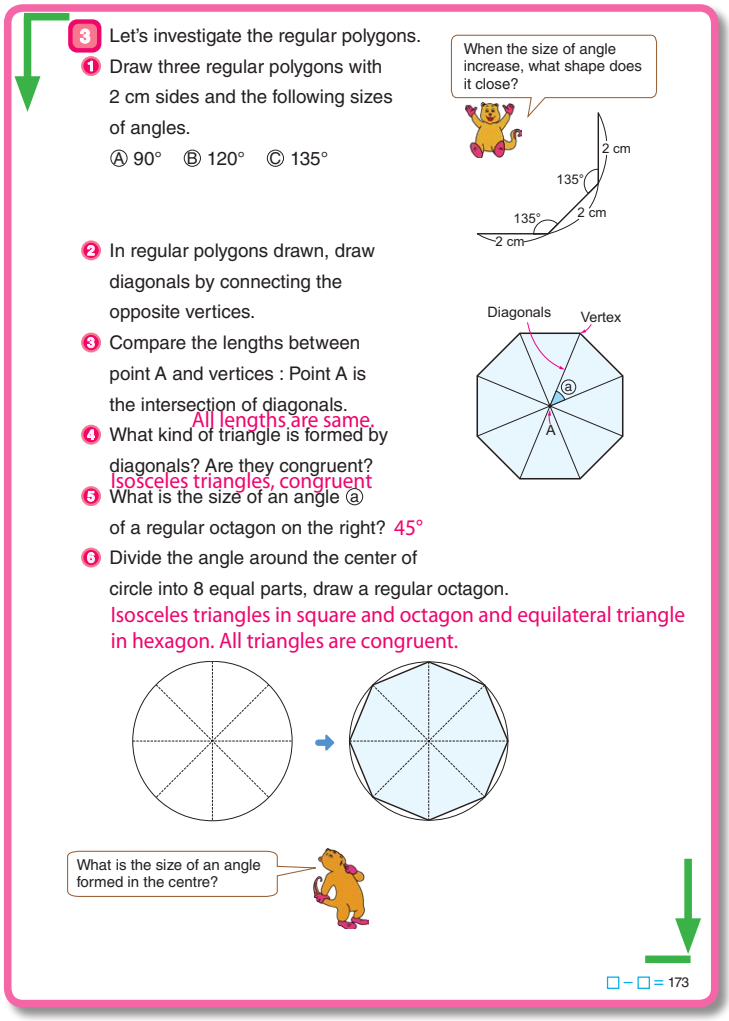
- Regular hexagon and octagon
- Ruler, compass, and protractor

Assessment

- Think about how to draw the regular polygons correctly. F
- Discover the features of regular polygons with angles made by diagonals. F
- Use math set to draw regular polygons correctly. S

Teacher's Notes

Constructing regular polygons accurately is very significant in geometry and is easy to do if children know how to precisely use ruler, compass, and protractors.
A rule of polygons is that the sum of the exterior angles always equals 360 degrees. Since it is a regular octagon, so each of the interior angles of octagon should be equal. Distance from the centre of the octagon to the vertex is also the same.



Lesson Flow

1 Review the previous lesson.

2 ❸ Let's investigate regular polygons.

T/S Read and understand the given situation.

T Introduce the Main Task. (Refer to the BP)

T ❶ Ask students to draw 3 regular polygons with 2 cm sides and the following sizes of angles of Ⓐ 90°, Ⓑ 120° and Ⓒ 135° using rulers and protractors.

S Draw the 3 regular polygons using the given measurements.

TN The incomplete shape is for Ⓒ.

T What is the name of the regular polygon in Ⓐ, Ⓑ and Ⓒ?

S square, hexagon, octagon.

3 Find out an easier way to draw a regular octagon.

S ❷ Draw diagonals by connecting pairs of opposite vertices.

T Compare the lengths between point A and vertices: Point A is the intersection of diagonals.

S ❸ The length of diagonal from the center point to all the vertices are all the same.

T ❹ What kind of triangles are formed by the diagonals? Are they congruent?

S The kind of triangles formed are Isosceles and all are congruent.

S ❺ Refer to the activity and find that the angles divided equally from the centre is 360 ÷ 8 = 45. Answer 45°.

4 ❻ Draw a circumscribed regular octagon.

T Ask students to draw a regular octagon, drawing a circle first and then dividing center into 8 equal angles (360° ÷ 8 = 45°) and connecting lines on vertex points.

S Draw the regular octagon.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter: Regular Polygons and Circles** **Topic 1:** Regular Polygons **Lesson Number:** 2 of 3

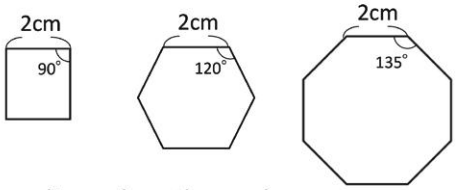
MT: Let's draw polygons: 2cm sides, and 90º, 120º and 135º.

Review

MT

3 Let's investigate the regular polygons.

❶



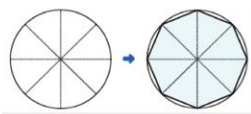
❷ Draw diagonals on the regular polygons

❸ Compare the lengths between point a and vertices: All equal

❹ Formed triangles in the polygons: isosceles triangles congruent

❺ Centre angles equally divided: 45º (360÷8=45)

❻ Let's draw the octagon, using circle and dividing the centre angle into 8 equal ones



Which one is more efficient?

- Use angles on vertices and length of sides
- Draw a circle and divide equally the center angle

Summary

Confirm the efficient way in order

1) Draw a circle
2) Divide the center angle into equal angles, based on the number of sides of polygon
3) Draw corresponding diagonals
4) Connect vertex to make sides of polygon

Unit 13

Unit: Regular Polygons and Circles
Sub-unit 1: Regular Polygons
Lesson 3 of 3

Textbook Page : 174
Actual Lesson 119

Lesson Objectives

- Draw regular pentagons and hexagons inscribed in a circle.
- Identify the centre of the polygon and divide angle into equal parts.
- Investigate the properties of pentagon and hexagon.

Prior Knowledge

- Ideas about angles and basic shapes in geometry.
- Understanding of what regular shapes are with regard to their sides and angles property.
- Interior angle sum of quadrilaterals and polygons

Preparation

- Protractors, Compass, Rulers

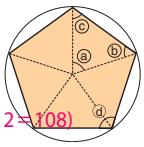
Assessment

- Think about how to draw regular hexagon, using compass. F
- Find the size of centre angles and angle on the vertices. F
- Draw regular pentagon and hexagon correctly. S

Teacher's Notes

The center of the regular polygon is the same as the center of the circle if the polygon is inscribed in the circle.
Thus, the radius of the circle is the same as the distance from the center to the vertex of the polygon.
Dividing the angle around the center of the circle of the regular polygon into equal parts.
For a regular pentagon, there are congruent triangles, and in the case of hexagon, there are 6 congruent equilateral triangles.

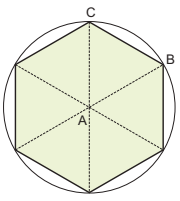
4 Let's draw a regular pentagon by dividing the angles around centre of circle into 5 equal parts.



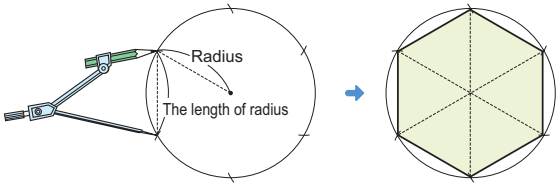
1. What is the size of angle ⓐ? $360 \div 5 = 72°$
2. Find the size of angles ⓑ, ⓒ and ⓓ.
   ⓑ and ⓒ $= (180-72) \div 2 = 54°$ ⓓ is $108° (54 \times 2 = 108)$
3. Write down the properties of a regular pentagon in your exercise book.
   5 equal side lengths and edges

5 Let's think about how to draw a regular hexagon.

1. Draw a regular hexagon by dividing the angle around the centre of the circle into 6 equal parts.



2. Draw a regular hexagon by dividing the circumference by the length of radius, using a compass below.



To keep the side lengths equal.

3. Explain the reason why we can draw by using a compass.
4. Write down the properties of a regular hexagon in your exercise book.
   Refer to sample blackboard plan for properties

174 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Let's draw a regular pentagon by dividing the angle around the of circle into 5 equal parts.

T/S ❹ Read and understand the given situation.

T Introduce the Main Task. (Refer to the BP)

T Ask students to answer activities ❶, ❷ and ❸

S ❶ The angle ⓐ is (360 ÷ 5 = 72).
Answer 72°.

S ❷ The sizes of angles; ⓑ and ⓒ is 54° (180 − 72) ÷ 2 = 54). ⓓ is 108° (54 × 2 = 108).

S ❸ The properties of regular pentagon are; 5 equal side lengths, edges and 5 isosceles triangles.

3 Let's think about how to draw regular hexagon.

T/S ❺ Read and understand the given situation.

S ❶ Draw a circle using the compass, dividing the center angle into 6 equal parts. Join all the points on the circumference with straight lines to form a regular hexagon.

TN First of all draw a circle, find out the 6 equal angles and draw diagonals and the regular hexagon in the circle, indicating that the triangles made in the hexagon are equilateral triangles (like ABC) and congruent to each other, since all the angles are 60° with equal sides.

4 ❷ Draw a regular hexagon by dividing the circumference by the lenght of radius, using a compass.

S Draw a circle by using a compass and divide the circle's circumference by the same length of the compass (the same length of its radius). Then, draw a regular hexagon, connecting the points made in the previous activity.

S ❸ Think about the reason why regular hexagon is drawn using a compass.

S To keep the side lengths equal by using a compass.

S Write down the properties of regular hexagon.

TN Refer to the board plan for thee properties.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

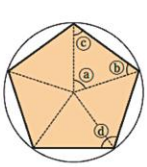
Date: **Chapter: Regular Polygons and Circles** **Topic 1:** Regular Polygons **Lesson Number:** 3 of 3

MT: Let's draw regular polygons using circles.

Review

MT

4 Let's draw a regular pentagon by dividing angle around center of circle into 5 equal parts.



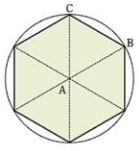
1 What is the size of angle ⓐ?
360 ÷ 5=72 Answer: ⓐ is 72°

2 Find the size of angles ⓑ, ⓒ and ⓓ.
ⓑ and ⓒ is 54° (180-72) ÷ 2=54
ⓓ is 108° 54 × 2=108

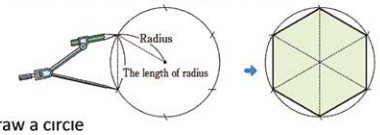
3 Write down the properties of regular pentagon in your exercise book.
- 5 equal angles and side lengths.
- 5 vertices
- Produce 5 isosceles triangle

5 Let's think about how to draw a regular hexagon

1 Draw a regular hexagon by dividing the angle around the centre of the circle into 6 equal parts



2 Draw a regular hexagon by dividing the circumference by the length of radius, using a compass as below.



1. Draw a circle
2. Mark points on the circumference, using the compass with the same length of radius
3. Connect all the points on the circumference and corresponding diagonals for the hexagon

3 Why we can draw a hexagon?
- The sides of hexagon are equal to radius
- The triangles made in the hexagon are equilateral triangles
- All the angles made in the shape are 60°

4 List down all the properties of a regular hexagon found out through the activities.

Summary

The sides of a regular polygon are equal to the radius.
They form equilateral triangles from the centre
All their side lengths are equal.

Unit 13

Unit: Regular Polygons and Circles
Sub-unit 2: Diameters and Circumferences
Lesson 1 of 4

Textbook Page : 175
Actual Lesson 120

Sub-unit Objectives

- To understand the meaning of circumference and diameter and how to find them.
- To understand the meaning of the ratio of circumference to its diameter.

Lesson Objectives

- To explore and understand the relationship between the diameter of the circle and its circumference.
- Find the length of circumference.

Prior Knowledge

- How to draw regular pentagon, hexagon, dividing circle center into equal angles
- How to draw circle by compass and divide the circumference

Preparation

- Charts, drawing sheets, compass, rulers, scissors, sticky tape

Assessment

- Understand and explain the relationship between the diameter of the circle and its circumference. F
- Discover that the circumference is longer than 3 times diameter, but shorter than 4 times diameter. S

Teacher's Notes

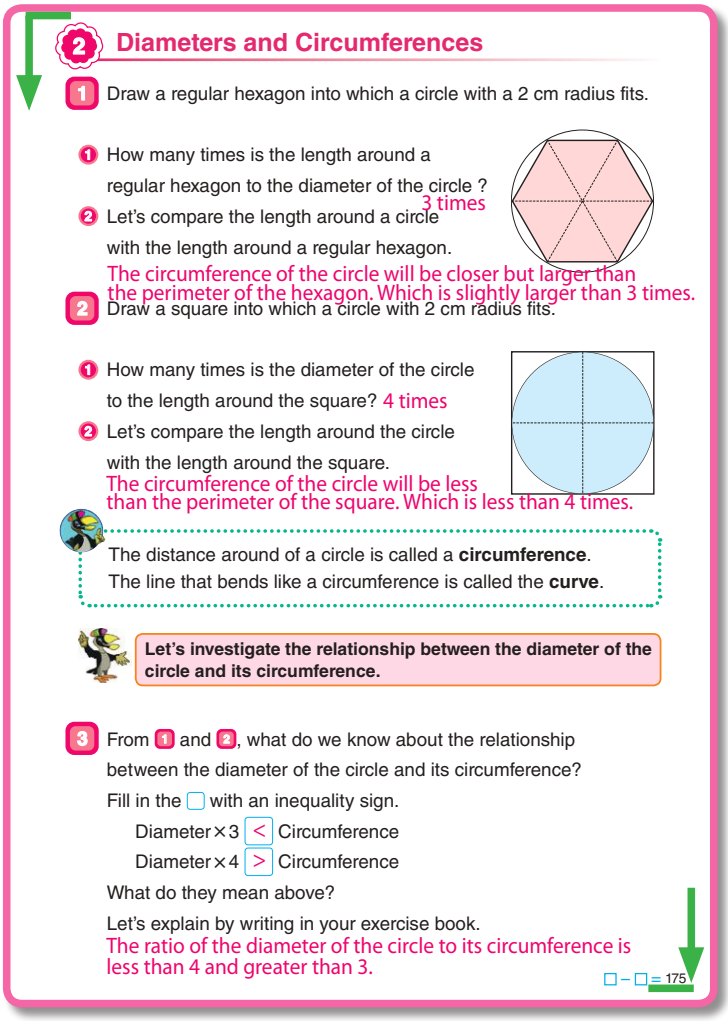
- How to draw the shape in 1.

1. Measure the length of the compass to get 2 cm.
2. Draw the circle
3. Use the compass to make 6 points around the circumference.
4. Connect the points inside the circle as diagonals.
5. Create a regular hexagon by drawing the sides.

- The length around the regular hexagon is less than the circumference of the circle
- The circumference of the circle is less than the perimeter of the square.

Lesson Summary

- Conduct the summary at the end of the lesson similar to the process in previous lessons.



2 Diameters and Circumferences

1 Draw a regular hexagon into which a circle with a 2 cm radius fits.

1 How many times is the length around a regular hexagon to the diameter of the circle ? 3 times

2 Let's compare the length around a circle with the length around a regular hexagon.

The circumference of the circle will be closer but larger than the perimeter of the hexagon. Which is slightly larger than 3 times.

2 Draw a square into which a circle with 2 cm radius fits.

1 How many times is the diameter of the circle to the length around the square? 4 times

2 Let's compare the length around the circle with the length around the square.

The circumference of the circle will be less than the perimeter of the square. Which is less than 4 times.

The distance around of a circle is called a **circumference**.
The line that bends like a circumference is called the **curve**.

Let's investigate the relationship between the diameter of the circle and its circumference.

3 From 1 and 2, what do we know about the relationship between the diameter of the circle and its circumference?

Fill in the ☐ with an inequality sign.

Diameter × 3 < Circumference

Diameter × 4 > Circumference

What do they mean above?

Let's explain by writing in your exercise book.

The ratio of the diameter of the circle to its circumference is less than 4 and greater than 3.

☐ – ☐ = 175

Lesson Flow

1 Review the previous lesson.

2 ① Draw a regular hexagon into which a circle with a 2 cm radius fits.

T Introduce the Main Task. (Refer to the BP)

T Ask students to use their previous knowledge to draw a regular hexagon in which a circle with a 2 cm radius is circumscribed.

S Draw a regular hexagon on which a circle with a 2 cm radius fits.

T ① How many times is the length around a regular hexagon to the diameter of the circle?

S The perimeter of a regular hexagon is 3 times the length of the diameter.

T ② Let's compare the length around the circle with the length around the regular hexagon.

S The perimeter of the circle is longer than the perimeter of the hexagon.

TN Observe one side of the equilateral triangle part and the length of corresponding curve, the curved line is longer than its corresponding straight line.

3 ② Draw a square into which a circle with a 2 cm radius fits.

T ① How many times is the diameter of the circle to the length around the square?

S Find out that the length of the perimeter of square is 4 times the length of diameter.

T ② Let's compare the length around the circle with the length around the square.

S The perimeter of the circle is less than the perimeter of square.

TN The length of 2 sides of square is longer than the corresponding quarter part of the perimeter of circle.

4 Important Point

T/S Explain the important point in the box .

5 ③ Investigate the relationship between the circumference and diameter of a circle.

T Ask students to investigate the relationship between the diameter of the circle and its circumference and fill in theb box with an inequality sign

S In groups or individually discuss the relationship between the diameter of the circle and its circumference, referring to the previous two activities of comparison among the circle, the regular hexagon and square. Conclude that Diameter × 3 < Circumference, and Diameter × 4 > Circumference.

S Conclude that the circumference is longer than 3 times the diameter and shorter than 4 times the diameter.

Sample Blackboard Plan

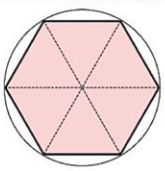
Date: **Chapter: Regular Polygons and Circles** **Topic 2:** Diameters and Circumference **Lesson Number:** 1 of 4

Main Task: Let's investigate the relationship between the diameter of the circle and its circumference.

Review

MT

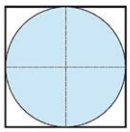
① Draw a regular hexagon into which a circle with a 2 cm radius fits.



① How many times is the length around a regular hexagon to the diameter of the circle? 3 times

② Let's compare the length around a circle with the length around a regular hexagon.
The circumference of the circle will be slightly larger than the perimeter of the hexagon.

② Draw a square into which a circle with 2 cm radius fit.



① How many times is the diameter of the circle to the length around the square? 4 times

② Let's compare the length around the circle with the length around the square.
The circumference of the circle will be slightly less than the perimeter of the square.

The surrounding of a circle is called a circumference.
The line that bends like a circumference is called the curve.

③ From ① and ②, what do we know about the relationship between the diameter of the circle and its circumference?

Diameter × 3 < Circumference
Diameter × 4 > Circumference

What do they mean above?
The ratio of the diameter of the circle to its circumference is less than 4 and greater than 3.

Summary

The circumference of the circle will be slightly larger than the perimeter of the hexagon.

The circumference of the circle will be slightly less than the perimeter of the square.

Unit 13

Unit: Regular Polygons and Circles
Sub-unit 2: Diameters and Circumferences
Lesson 2 of 4

Textbook Page : 176
Actual Lesson 121

Lesson Objective

- Investigate the relationship between diameter and circumference.

Prior Knowledge

- Parts of a circle and meaning of circumference, diameter and radius

Preparation

- Hard cardboard (circles with diameter of 10 cm, 20 cm, 30 cm and 40 cm), ropes or tapes (correspond to the length of their circumference), scissors, sticky tapes, A4 papers, rulers, compass

Assessment

- Think about and explain the relationship between the diameter and circumference through experiment. F
- Explain the relationship between the diameter and circumference. S

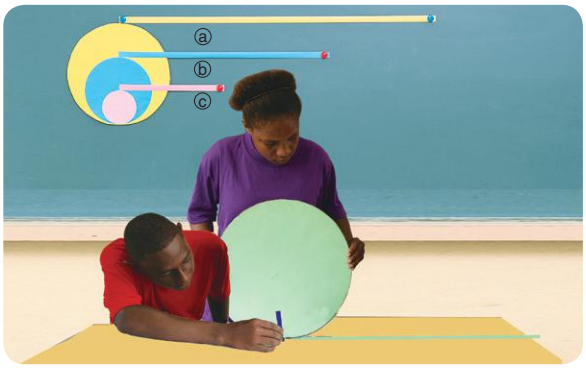
Teacher's Notes

The teacher must understand that there is a relationship between the diameter and circumference that they have a common ratio. In order to apply an experiment to confirm this relationship, the teacher need to:

(1) Prepare a table for students to roll the circle 1 time well before lesson.

(2) Mark out the start point for the roll and mark the distance up to 130 cm (1.3 m) before lesson, since if the diameter is 40 cm, the circumference would be between 120 cm and 130 cm.

4 Cut a piece of cardboard to make circle ⓐ, ⓑ and ⓒ which have diameters of 10 cm, 20 cm and 30 cm respectively. Then, roll them one complete rotation and investigate how far they advance.



1. Talk about the distance of the circle rolled and what does it relate to. Diameter
2. Estimate how many centimetres a circle with a 40 cm diameter will advance in one rotation. 40 × 3 = 120. Around 120 cm.
3. Make sure how many centimetres a circle with a 40 cm diameter advance. Students should have answers around 120 cm.
4. Write the results in the table.

	ⓐ	ⓑ	ⓒ	
Diameter (cm)	10	20	30	40
Circumference (cm)	31	62	94	124

5. When the diameter increases by 2 times, 3 times and 4 times, how does the circumferences change?
The circumference increases by 2, 3 and 4 times also.

176 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ④ To make three circles with diameter of 10 cm, 20 cm and 30 cm and to survey how many cm the circles route 1 time

T Introduce the Main Task. (Refer to the BP)

S In group or pair, draw circles ⓐ, ⓑ, and ⓒ using compass and cut them out according to the diameter length given.

T Using the 3 circles from the students, ask students in group or pair at a time to measure the distance in cm. The circle should be rotated 1 time and record the results in the table using tape or rope to measure it.

S Carefully, rotate the circles 1 time and record results in cm as instructed and record them on a table prepared for the experiment.

3 ① Discuss what kind of thing is related to the distance a circle rotates 1 time.

T Ask each group or pair to share with the whole class their results about the rotation of the 3 circles.

S Express their results

T What happens to the distance when a circle rotates 1 time?

S 1) the distance is equal to circumference of each circle.

2) if the diameter of circle gets longer, the distance also gets longer.

4 ② Predict how many cm a circle with 40 cm diameter rotates 1 time.

T Ask the students to predict the length a circle with 40 cm diameter make if it routes 1 time. Write the prediction beside the table. Then do the experiment and record the results on the table.

S ③ Confirm it by experimenting.
After the experiment, they should have an answer around 124 cm.

S ④ Record the results on the table.

5 ⑤ Survey the relationship between length of diameter and circumference.

T Ask students to summarize what they noticed on the table, preciously the relationship between the length of diameter and circumference.

S The circumference will increase 2 times, 3 times or 4 times according to the increase in diameter such as 2 times, 3 times or 4 times.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

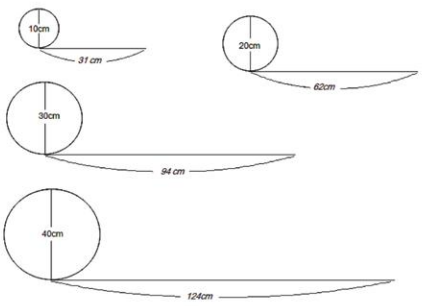
Date: **Chapter: Regular Polygons and Circles** **Topic 2:** Diameters and Circumference **Lesson Number:** 2 of 4

Main Task: Let's investigate the relationship between the diameter and circumference.

Review

MT

4 Cut a piece of cardboard to make circle ⓐ, ⓑ and ⓒ which have diameters of 10 cm, 20 cm and 30 cm respectively. Then, roll them one complete rotation and investigate how far they advance.



1 Talk about the distance of the circle rolled and what does it related to. Diameter

2 Estimate how many centimeters a circle with a 40 cm diameter will advance in one rotation. 40 x 3 = 120 cm

3 Make sure how many centimeters a circle with a 40 cm diameter advance. Students should have answers between 120 and 124 cm.

4 Write the results on the table.

	ⓐ	ⓑ	ⓒ	
Diameter (cm)	10	20	30	40
Circumference (cm)	31	62	94	124

5 When the diameter increases by 2 times, 3 times and 4 times, how does the circumferences change?
The circumference increases by 2, 3 and 4 times also.

Summary

- The distance a circle rotates 1 time is circumference
- The Circumference gets 2, 3, 4 times longer, if the diameter gets 2, 3, 4 times longer.

Unit 13

Unit: Regular Polygons and Circles
Sub-unit 2: Diameters and Circumferences
Lesson 3 of 4

Textbook Page : 177 and 178
Actual Lesson 122

Lesson Objectives

- To understand the meaning of the ratio of circumference of a circle to its diameter.
- Derived from the relationship between diameter and circumference.

Prior Knowledge

- How to draw a circle and measure its circumference, and record on a comparative table.
- Understanding the relationship between diameter and circumference

Preparation

- Strips of papers, cylindrical item (can), some kinds of objects whose shape is circle, cardboard cutout circles of various sizes; 10 cm, 20 cm and 30 cm and tapes or ropes

Assessment

- Measure the circumference and diameter using strip of paper and diameter using rulers. F
- Find the proportional relationship between diameter of a circle and its circumference. F S

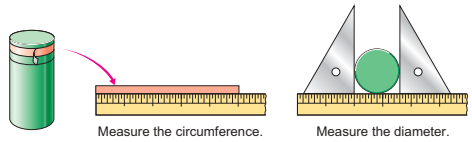
Teacher's Notes

At this stage the students are just defining the meaning of the word " Pi".
However, the teacher should not use this term to students yet but instead say 'the **'ratio of the circumference'.**

Lesson Summary
Conduct the summary at the end of the lesson similar to the process in previous lessons.

5 Let's investigate the relationship between the circumferences and diameters of various circles.

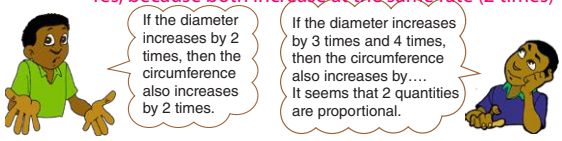
1 Measure the circumferences and diameters easily.



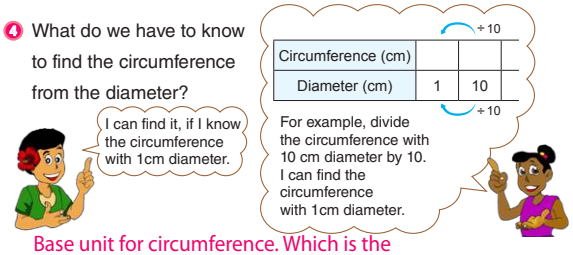
2 Write the results on the table.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)	31	62	94	12.5	22
Diameter (cm)	10	20	30	4	7

3 Is the circumference and the diameter proportional?
Yes, because both increase at the same rate (2 times)



4 What do we have to know to find the circumference from the diameter?



Base unit for circumference. Which is the circumference when the diameter is 1cm.

□ − □ = 177

5 Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding the thousandth.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)	31	62	94	12.5	22
Diameter (cm)	10	20	30	4	7
Circumference ÷ Diameter	3.1	3.1	3.13	3.13	3.14

Circumference ÷ Diameter is the same number regardless of a circle's size.

The above number is called ratio of circumference.

Ratio of circumference = circumference ÷ diameter

The ratio of circumference is a number that continues infinitely like 3.14159 ....., we usually use 3.14.

6 Let's write an expression of the relationship between ○ and □, where the circumference is ○ cm and the diameter is □ cm.
○ ÷ □ = 3.14

6 How many cm long is the circumference of the circle with the diameter of 8 cm?

Circumference = diameter × 3.14

Exercise
Let's find the circumference of these circles.
① A circle with a 15 cm diameter.
② A circle with a 25 cm radius.

178 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ⑤ Investigate the relationship between the circumferences and diameters of various circle.

T Introduce the Main Task. (Refer to the BP)

T ① How would you measure the circumference and diameter of a cylinder?

S 1) Use a paper strip to wrap it around the cylinder and then measure it with a ruler.
2) Place the cylinder in between the two triangle rulers and take the measurement using a stright ruler.

S ② Measure and record the measurements in the table.

3 ③ Find whether the circumference is proportional to the diameter.

T From the results obtained and recorded in the table, what is your thinking about the circumference and the diameter, are they proportional?

TN Remind the students about the meaning of proportion, if necessary, show another examples.

S Referring to the table and remembering the relationship found in the previous lesson between the diameter and circumference, diameter increases by 2, the circumference increases by 2 also. If the diameter increases by 3 or 4 times, then the circumference increases at the same ratio. The diameter and circumference are proportional.

TN The speech bubbles can help students to identify if two quantities are proportionl.

S ④ Think about the circumference of a circle with 1 cm diameter.

TN The speech bubble can help to identify the unkown quantity.

T ⑤ Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding the thousandth.

S Complete the table.

4 Important Point

T/S Explain the important point in the boxes ⬚ and ⬚.

5 ⑥ Relationship between the length of circumference and diameter.

T Ask students to write a mathematical expression of the relationship between the circumference and the diameter.

S When the circumference is □ cm and the diameter is ○ cm. Write down the expression as; □÷○=3.14

Sample Blackboard Plan

Date: **Chapter: Regular Polygons and Circles** **Topic 2:** Diameters and Circumference **Lesson Number:** 3 of 4

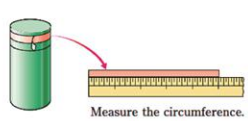
Main Task: Let's investigate how to find the ratio of circumference

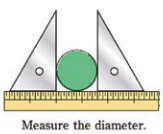
Review

MT

5 Let's investigate the relationship between the circumferences and diameters of various circles..

1 Measure the circumferences and diameters easily.


Measure the circumference.


Measure the diameter.

2 Write the results on the table.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)	31	62	94	12.5	22
Diameter (cm)	10	20	30	4	7

3 Is the circumference and the diameter proportional?

Yes because both increase at the same rate

4 (2times)

What do we have to know to find the circumference from the diameter?

5 Base unit for circumference, which is the circumference when the diameter is 1cm

Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)	31	62	94	12.5	22
Diameter (cm)	10	20	30	4	7
Circumference÷Diameter	3.1	3.1	3.13	3.13	3.14

Circumference ÷ Diameter is the same number regardless of a circle's size.

The above number is called ratio of circumference.

Ratio of circumference = circumference ÷ diameter

The ratio of circumference is a number that continues infinitely like 3.14159 ....., we usually use 3.14.

Let's write an expression of the relationship between ○ and □, where the circumference is ○ cm and the diameter is □ cm.

○ ÷ □ = 3.14

Summary

The relationship between the circumference and the diameter are proportional.

Circumference ÷ Diameter = 3.14

Unit 13

Unit: Regular Polygons and Circles
Sub-unit 2: Diameters and Circumferences
Lesson 4 of 4

Textbook Page : 178 and 179
Actual Lesson 123

Lesson Objective

- To apply the ratio of circumference and calculate the length of the circumference when the diameter is known or vice versa.

Prior Knowledge

- Understand the ratio of circumference, which is usually defined as 3.14

Preparation

- An items similar to the one in the textbook

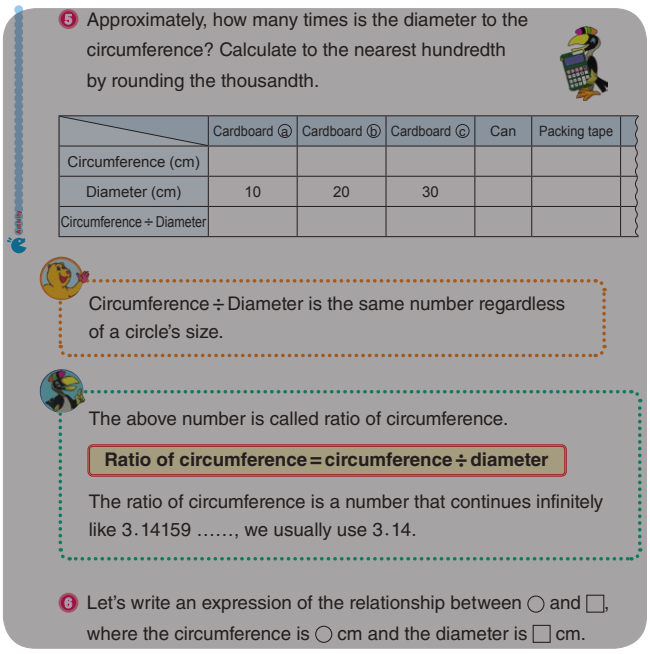
Assessment

- Calculate the length of circumference and diameter. F
- Use the formula to find the circumference or diameter. S
- Solve the exercises correctly. S

Teacher's Notes

The ratio of circumference and rearranging its formula is important to find information about circles.

1) 3.14 = circumference ÷ diameter
2) Circumference = diameter × 3.14
3) Diameter = Circumference ÷ 3.14



5 Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding the thousandth.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)					
Diameter (cm)	10	20	30		
Circumference ÷ Diameter					

Circumference ÷ Diameter is the same number regardless of a circle's size.

The above number is called ratio of circumference.

Ratio of circumference = circumference ÷ diameter

The ratio of circumference is a number that continues infinitely like 3.14159 ....., we usually use 3.14.

6 Let's write an expression of the relationship between ○ and □, where the circumference is ○ cm and the diameter is □ cm.

6 How many cm long is the circumference of the circle with the diameter of 8 cm?

8 × 3.14 = 25.12 Circumference is 25.12 cm

Circumference = diameter × 3.14

Exercise

Let's find the circumference of these circles.

① A circle with a 15 cm diameter. ① 15 × 3.14 = 47.1 (cm)

② A circle with a 25 cm radius. ② 25 × 2 × 3.14 = 157 (cm)

7 The circumference of a figure as shown on the picture is 62.8 cm.

1 If the diameter of the figure is ○ cm, write the mathematical sentence by using the formula in 6. ○ × 3.14 = 62.8

2 What is the diameter of the figure in cm?

○ × 3.14 = 62.8

○ = 62.8 ÷ 3.14 = 20 cm

Exercise

1 Let's find the diameter of a circle with these circumferences.

① 28.26 cm ② 31.4 cm ③ 37.68 cm

28.26 ÷ 3.14 = 9 (cm) 31.4 ÷ 3.14 = 10 (cm) 37.68 ÷ 3.14 = 12 (cm)

2 The photograph on the right shows an image of the mining site at Porgera Gold Mine in Enga Province. The circumference of this opencast mine is 1550 m. Let's find the diameter to the nearest whole number by rounding to the tenths.

1550 ÷ 3.14 = 493.6 = 494 (m)

How Many Metres is the Diameter of this Rain tree?

Six students formed a circle around a big rain tree as shown in the picture on the right.
Approximately, how many metres is the diameter of this tree?
Each student covers a length of about 1.4 m. Let's calculate the diameter by 3 instead of 3.14 as the ratio of circumference.

1.4 × 6 ÷ 3 = 2.8 Answer: Approximately 2.8 m

178 = □ × □

□ − □ = 179

Lesson Flow

1 Review the previous lesson.

2 6 Find the length of circumference for a circle with 8 cm diameter.

T Introduce the Main Task. (Refer to the BP)
T How many cm long is the circumference of the circle with 8 cm diameter?
S Circumference ÷ diameter = 3.14, can be changed to: Circumference = diameter × 3.14
Therefore, □ = ○ × 3.14, I put 8 cm in the ○ and multiply by 3.14 to get □ = 25.12 cm.

3 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

4 7 Find the length of diameter for the figure with 62.8 cm of circumference.

S ① If circumference is 62.8 cm, then: ○ × 3.14 = 62.8.
S ② Therefore, ○ = 62.8 ÷ 3.14 = 20. Answer 20 cm.

5 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

6 How many metres is the Diameter of the Rain Tree.

T/S Read and understand the situation and calculate the diameter of the rain tree.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter: Regular Polygons and Circles** **Topic 2:** Diameters and Circumference **Lesson Number:** 4 of 4

Main Task: Let's find the circumference and diameter using the ratio of circumference

Review

MT

6 How many cm long is the circumference of the circle with the diameter of 8 cm diameter?

Circumference = diameter × 3.14

The circumference of a circle with 8 cm diameter
□ = ○ x 3.14
□ = 8 x 3.14 = 25.12 (cm)

Exercise

① Circle with diameter of 15 cm
□ = ○ x 3.14
= 15 x 3.14
= 47.1 (cm)
② Circle with radius of 25 cm
□ = ○ x 3.14
= 25 x 2 x 3.14
= 157 (cm)

7 The diameter of a circle with 62.8 cm circumference
□ = ○ x 3.14
Math Sentence: 62.8 = ○ x 3.14
○ x 3.14 = 62.8
○ x 3.14 ÷ 3.14 = 62.8 ÷ 3.14
○ = 20 (cm)

Exercise

①Circle with circumference of 28.26 cm
○ = 28.26 ÷ 3.14 = 9 (cm)
②Circle with circumference of 31.4 cm
○ = 31.4 ÷ 3.14 = 10 (cm)
③Circle with circumference of 37.68 cm
○ = 37.68 ÷ 3.14 = 12 (cm)

Summary

Circumference = diameter × 3.14

Unit 13

Unit: Regular Polygons and Circles
Exercise and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 181
Actual Lesson 124 and 125

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise correctly. S

Teacher's Notes

This is the last lesson of Chapter 13. Students should be encouraged to use the necessary skills learned in this unit to solve the in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the problems as a seperate lesson.

The History of the Ratio of Circumference

3.14159265358979…

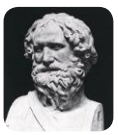
Can you remember the ratio of circumference shown above continuously?

The ratio of circumference is represented as decimal numbers 3.14159265358979…, which continues without end. Nowadays, this number has been computed to the 1 trillion 241 billion and 100 million digits by the supercomputer. But it was very difficult to calculate this number in ancient times.

(1) Many years ago, 3 was used as the ratio of circumference.

(2) About 4000 years ago, $3\frac{1}{8}$ and $3\frac{31}{81}$ were used in Egypt and some other countries.

(3) About 2000 years ago, Archimedes in Greece found that the ratio of circumference is larger than $3\frac{10}{71}$ and smaller than $3\frac{1}{7}$.



Archimedes

(4) In China about 1500 years ago, Zu Chongzhi used the fractions $\frac{22}{7}$ and $\frac{355}{113}$.

(5) In Japan about 300 years ago, Takakazu Seki calculated the ratio of circumference that was slightly smaller than

3.14159265359

Takakazu Seki

Let's change the fractions in (2) to (4) into decimal numbers.

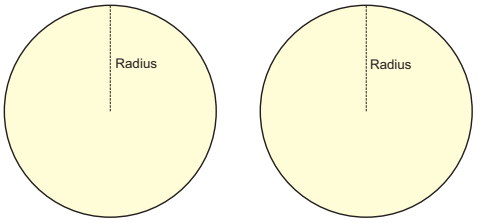
3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706…

180 = □ × □

EXERCISE

1 Let's draw regular polygons based on a circle. Pages 173 to 175

① Regular hexagon ② Regular pentagon



2 Let's find the circumferences of these circles. Pages 176 to 178

① A circle with a 6 cm diameter. $6 \times 3.14 = 18.84$ cm

② A circle with a 5 cm radius. $5 \times 2 \times 3.14 = 31.4$ cm

3 Let's find the diameters of these circles. Pages 175 to 179

① A circle with a 6.28 circumference. $6.28 \div 3.14 = 2$ cm

② A circle with a 12.56 circumference. $12.56 \div 3.14 = 4$ cm

4 There are 2 circles A and B as shown on the right. Pages 176 to 178

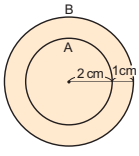
One has a 2 cm radius, and the other has a radius 1 cm larger than the radius of circle A.

How many cm is the circumference of circle B larger than the circumference of circle A?

$4 \times 3.14 = 12.56$

$6 \times 3.14 = 18.84$

$18.84 - 12.56 = 6.28$ cm



Let's calculate. Grade 5 Do you remember?

① 5×1.6 8 ② 28×3.5 98 ③ 17×0.78 12.26

④ 1.2×2.3 2.76 ⑤ 7.6×4.3 32.68 ⑥ 3.18×6.2 19.716

□ − □ = 181

1 Complete the Exercise

S Solve all the exercises.
T Confirm students' answers.
TN 1 Drawing regular polygons based on a circle.
2 Finding the circumference of circles.
3 Finding the diameter of circles.
4 Comparing the circumference of circles by its definition.

2 Complete Do You Remember exercises.

S Solve the exercises.
T Confirm students' answers.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises as a seperate lesson.
S Complete the Evaluation Test.

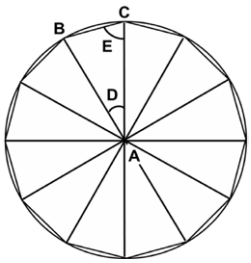
End of Chapter Test **Date:**

Chapter 13: Proportions	Name:	Score / 100

1. Answer all questions about a regular polygon called dodecagon with 12 equal sides and angles. [4×15 marks = 60 marks]

(1) Write the name of Triangle ABC.

Answer: Isosceles triangle



(2) Find Angle D. $360° \div 12 = 30°$

Answer: 30°

(3) Find Angle E. $(180° - 30°) \div 2 = 75°$

Answer: 75°

(4) Find an angle of a regular dodecagon.

Answer: 150°

$75° \times 2 = 150°$

2. Find the circumference of the following circles. [2×15 marks = 30 marks]
(1) Circle with the diameter of 8 cm (2) Circle with the radius of 2.5 m

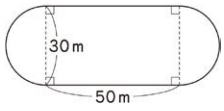
$8 \times 3.14 = 25.12$ $5 \times 3.14 = 15.7$

Answer: 25.12 cm Answer: 15.7 m

3. An athletic field has a track as shown below. The shape is made up with 2 semi-circles and a rectangle. The semi-circles are exactly half of a circle. Find the circumference of the athletic track. [10 marks]

Write working out

$30 \times 3.14 + 50 + 50 = 194.2$



Answer: 194.2 m

250

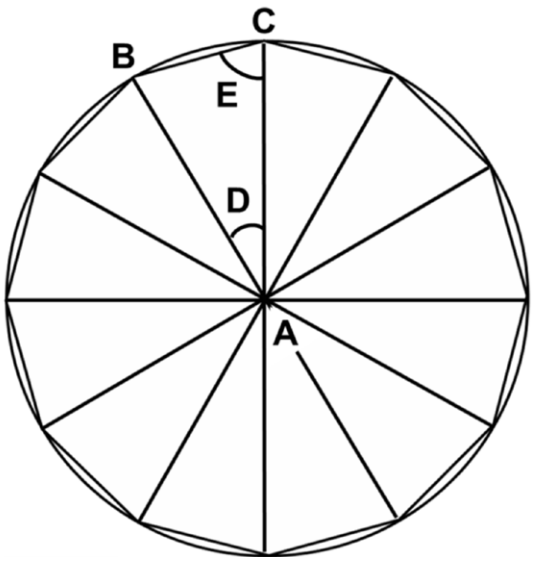
End of Chapter Test **Date:**

Chapter 13: Proportions	Name:	Score / 100

1. Answer all questions about a regular polygon called dodecagon with 12 equal sides and angles. [4×15 marks=60 marks]

(1) Write the name of Triangle ABC.

Answer: triangle



(2) Find Angle D.

Answer:

(3) Find Angle E.

Answer:

(4) Find an angle of a regular dodecagon.

Answer:

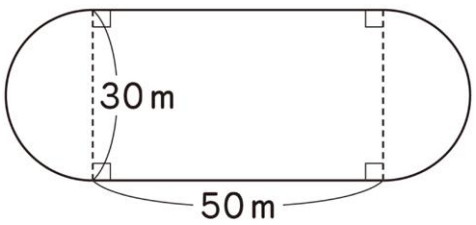
2. Find the circumference of the following circles. [2×15 marks=30 marks]

(1) Circle with the diameter of 8 cm (2) Circle with the radius of 2.5 m

Answer: Answer:

3. An athletic field has a track as shown below. The shape is made up with 2 semi-circles and a rectangle. The semi-circles are exactly half of a circle. Find the circumference of the athletic track. [10 marks]

Write working out



Answer:

Chapter 14 Solids

1. Content Standard

5.3.4 Investigate and identify the properties of solids (Prisms and cylinders).

2. Unit Objectives

- To make students understand the solid shapes, through activities such as observation and construction of solid shapes.
- To understand prisms and cylinder.
- To be able to draw sketch (3 dimensions) and nets of solid shapes.

3. Teaching Overview

In this unit, students observe prisms and cylinders, then express these solids as sketches and nets.

Sketches and nets also give other pictures.

Prisms and Cylinders :

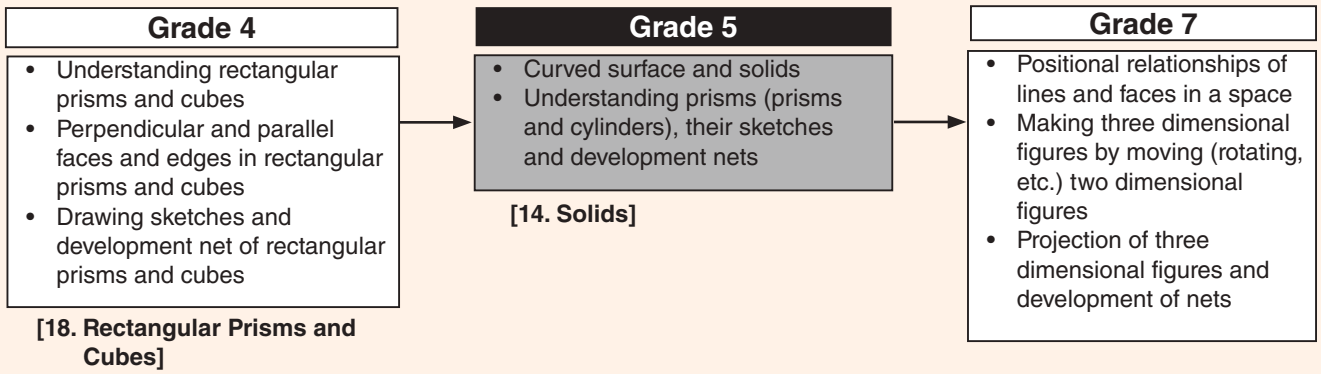
Students are to capture the features of prisms and cylinders through verbal expressions and identify those solids from their features.

It will enhance students' 3-dimensional sense of geometry.

Sketches and Nets of Prisms and Cylinders :

It will enhance students' spatial imagination skills by drawing sketches, assembling and disassembling nets. Students are to think which sides meet.

4. Related Learning Contents



Unit 14

Unit: Solids
Sub-unit 1: Prisms and Cylinders
Lesson 1 of 3

Textbook Page : 182 and 183
Actual Lesson 126

Sub-unit Objectives

- To understand structural components (face, side, vertex) of solid shapes through a game of finding out shapes.
- To understand definitions, names and structural components with respect to prisms and cylinder.

Lesson Objective

- To be familiar with the structural components, by classifying solid shapes based on shapes of faces or number of vertex.

Prior Knowledge

- Difference between Triangles and Quadrilaterals
- Knowledge of angles and faces of plane shapes
- Difference between Circles and Spheres
- Difference between Cuboids and Cubes

Preparation

- Boxes filled with different types of solids

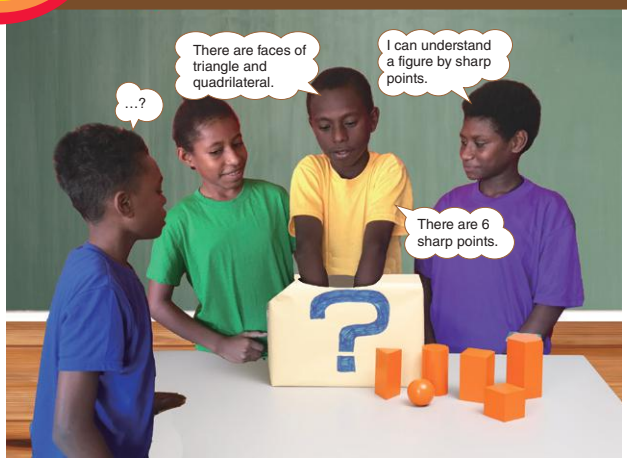
Assessment

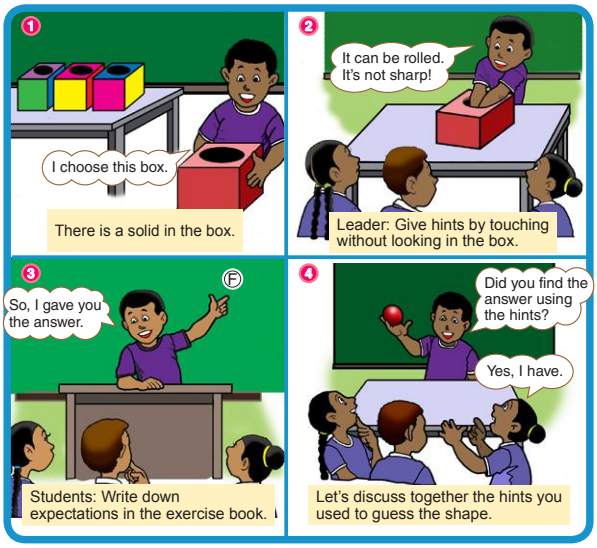
- Investigate the properties of solids such as faces and sharp points. F
- Use the properties of solids and categorise them in various ways. F
- Understand the meaning of curved surface and solids. S

Teacher's Notes

- On a solid figure, there are three viewpoints:
  (i) Shape, number and position of the surface
  (ii) Number and position of sides
  (iii) Number of vertex
- Among these viewpoints, surface is a new structural concept for students. Shapes or congruency of surface and positions of surface are expected to be found by children themselves.

14 Solids



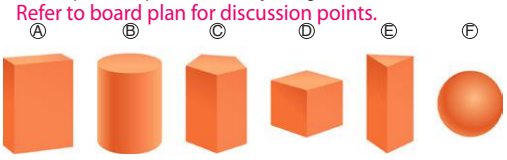


▶▶ Play a shape guessing game.

Let's explore shape in the box by using hints.

Refer to board plan for discussion points.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ



The surface that bends and is not plane is called a **curved surface**. The shape that is covered by planes or curved surfaces is called a **solid**.

▶▶ Let's categorise solids Ⓐ to Ⓕ in various ways. Write "how to categorise" and "the reason."

Let's investigate properties of solids.

182 = □ × □

□ − □ = 183

Lesson Flow

1 Investigate rules of the game in finding out shapes.

T Introduce the Main Task. (Refer to the BP)

T Display the solids and ask students what they know about these solids.

S Use their previous knowledge to tell anything they know about the displayed solids Ⓐ to Ⓕ. Name the plane shapes found in the solid shapes.

T Introduce and explain how to play the game to guess a shape in a box by hints.
Ask a student volunteer to choose a solid in the box without looking in the box and provide hint for other students to guess the solid as per described.

S Guess the name of solid without looking in the box and write down their answers in their exercise books.
They check their expectation after the display.

2 Important Point

T/S Explain the important point in the box .

3 Play the game.

T Group students and ask them to play the game in their small groups.

S In groups students categorise solids in various ways: (i) solids made of only plane surface (ii) solids made of plane and curved surface (iii) solids made of only curved surface

4 Share and summarise the words (terms) the students have used for the game.

T Ask students to share their description words for each shape.

S Share and call out the words (terms) such as 'sharp, not sharp, round, not round, flat, smooth, plane, curved surface" etc..

T Ask the students to think about how to categorise the solids using the definition of planes and curved surface.

5 Categorise the solid shapes.

T Ask students to categorise solids from Ⓐ to Ⓕ in various ways.

S In groups categorise solids in various ways: (i) solids made of only plane surface (ii) solids made of plane and curved surface (iii) solids made of only curved surface.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** Solids **Topic 1:** Prisms and Cylinders **Lesson Number:** 1 of 3

Main Task: Let's investigate properties of solids.

▷▷ Play a shape expected game. Let's guess a shape in a box by hints.

MT

Terms to use when describing the solids

- Curved surface
- Straight edges
- Corner or sides
- Plane surface

Rules to play

1. Without looking inside the box, pick a solid using you hands.
2. Describe the solid shape
3. Let others to write down your description and guess the solid shape.
4. Take out the solid and check your guesses.
5. Discuss what kind of features were useful to judge the shape.

Solids to use in the game

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ

The surface that bends and is not plane is called a **curved surface**. The shape that is covered by planes or curved surfaces is called a **solid**.

▷▷ Let's categorise solids Ⓐ ~ Ⓕ in various ways. Write "how to categorise" and "the reason".

- Solids made of only one plane surface are solids A, C, D and E.
- Solids made of plane and curved surface is solid B only.
- Solids made of only curved surface is only solid F.

Summary

Solids can be categorised using features such as plane and curved

Unit 14

Unit: Solids
Sub-unit 1: Prisms and Cylinders
Lesson 2 of 3

Textbook Page : 184 and 185
Actual Lesson 127

Lesson Objective

- To survey properties of prisms, based on their structural components such as face, side, vertex, base face and side face.

Prior Knowledge

- Classification of solid shapes based on shapes of faces or number of vertex

Preparation

- Charts of solids covered by planes only such as quadrangular, triangular prisms

Assessment

- Compare the sizes of bases and identify the perpendicular faces of solids. F
- Name the prisms Ⓐ to Ⓓ correctly. S
- Find the number of vertex, side and faces of prisms and complete the summary table. S

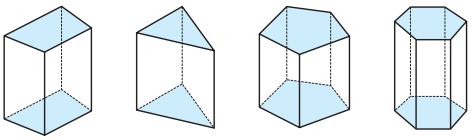
Teacher's Notes

- The most important thing for this lesson is for the students to understand regularity which exists among the number of faces, vertex and sides and to construct mathematical expressions to calculate them.
- Some plane figures can have squares or rectangles so we use the term quadrilateral to generalise the planes.

1 Prisms and Cylinders

1 In solids covered by planes only, let's look at the following solids that have parallel faces.

Ⓐ Ⓑ Ⓒ Ⓓ



1 For each solid, what is the shape of the coloured parallel faces? Compare the sizes of each pair, respectively.

Ⓐ Quadrilateral, Ⓑ Triangle, Ⓒ Pentagon, Ⓓ Hexagon and each pair are same

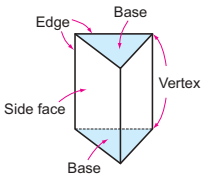
2 What is the shape of the faces that are not coloured? How many are there?

Ⓐ 4 quadrilaterals, Ⓑ 3 quadrilaterals, Ⓒ 5 quadrilaterals and Ⓓ 6 quadrilaterals

3 Which faces are perpendicular?

Coloured faces and non-coloured faces.

The solids like Ⓐ, Ⓑ, Ⓒ and Ⓓ are called **prisms**.
The 2 parallel congruent faces of prism are called **bases** and the rectangular faces around the bases are called **side faces**.



When the bases are triangles, quadrilaterals or pentagons, their prisms are called **triangular prism, quadrilateral prism or pentagonal prism**, respectively.
Cubes and rectangular prisms are types of prisms.

4 Say the names of the shapes Ⓐ, Ⓑ, Ⓒ and Ⓓ.

Ⓐ Prism, Ⓑ Triangular prism, Ⓒ Pentagonal prism, Ⓓ Hexagonal prism

5 Summarise the vertices, edges and faces of prisms.

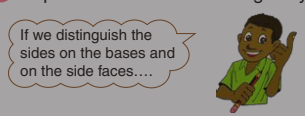
	Triangular prism	Quadrilateral prism	Pentagonal prism	Hexagonal prism
Shape of bases	Triangle	Quadrilateral	Pentagon	Hexagon
Shape of side faces	Rectangle	Quadrilateral	Quadrilateral	Quadrilateral
Number of vertices	3×2=6	4×2=8	5×2=10	6×2=12
Number of edges	3×2+3=9	4×2+4=12	5×2+5=15	6×2+6=18
Number of faces	2+3=5	2+4=6	2+5=7	2+6=8

Let's look at each row of the table made in 1, 5 above.

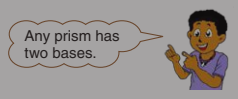
2 Put primes as triangular prism, quadrilateral prism and so on □ side faces in prism, the number of vertices is represented as follows.

Number of vertices =□×2

1 Represent the number of edges by using □.



2 Represent the number of faces by using □.



3 Check expressions to find the number whether they one correct, in the case of octagonal prism.

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184 = □×□

□−□= 185

Lesson Flow

1 Review the previous lesson.

2 ❶ Investigate and identify solid shapes with planes that have parallel faces.

T Introduce the Main Task. (Refer to the BP)

S Look at the solids covered by planes Ⓐ, Ⓑ, Ⓒ and Ⓓ and ask students to answer the following question.

T ❶ For these solids, what is the shape of the coloured parallel faces?
Compare the sizes of each pair, respectively.

S Observe the solids covered by planes and use their prior knowledge to name the shape of the coloured parallel faces and compare the sizes of each pair respectively.

TN Provide opportunity for students to think and answer the question.

T ❷ What is the shape of the faces that are not coloured? How many are there?

S Identify that they are quadrilaterals where Ⓐ has 4, Ⓑ has 3, Ⓒ has 5 and Ⓓ has 6 quadrilaterals.

T ❸ Which faces are perpendicular?

S Use prior knowledge to identify whic faces are perpendicular.

3 Important Point

T/S Explain the important point in the box .

4 To understand names and structural components of prisms

T ❹ Say the names of the shapes Ⓐ, Ⓑ, Ⓐ and Ⓓ.

S Ⓐ is a rectangula prism, Ⓑ is triangular prism, Ⓒ is a pentagonal prism and Ⓓ is a hexagonal prism.

T ❺ Ask the students to complete the table.

S Work in groups to discuss and complete the table of summary for vertices, edges and faces of prisms.

TN Guide the students to think and complete the summary table.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Chapter:** Solids **Topic:** Prisms and Cylinders **Lesson Number:** 2 of 3

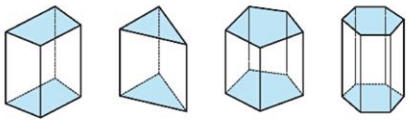
Main Task: Let's investigate the features of solids covered by planes and rules for finding the number of vertices, edges and faces of prisms

Review

MT

❶ In solids covered by planes only, let's look at the following solids that have parallel faces.

Ⓐ Ⓑ Ⓒ Ⓓ



❶ For each solid, what is the shape of the coloured parallel faces?
Compare the sizes of each pair.

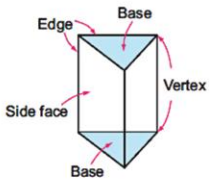
Ⓐ Quadrilateral Ⓑ Triangle Ⓒ Pentagon Ⓓ Hexagon

❷ What is the shape of the faces that are not coloured? How many are there?

Ⓐ 4 not coloured quadrilaterals Ⓑ 3 not coloured quadrilaterals
Ⓒ 5 not coloured quadrilaterals Ⓓ 6 not coloured quadrilaterals

❸ Which faces are perpendicular?

Coloured faces and non-coloured faces



The solids like Ⓐ, Ⓑ, Ⓒ and Ⓓ are called **prisms**.
The 2 parallel congruent faces of prism are called **bases** and the rectangular faces around the bases are called **side faces**.

When the bases are triangles, quadrilaterals or pentagons, their prisms are called **triangular prism, quadrilateral prism or pentagonal prism**, respectively.
Cubes and rectangular prisms are types of prisms.

❹ Say the names of the shapes Ⓐ, Ⓑ, Ⓒ and Ⓓ.

Ⓐ Prism Ⓑ Triangular prism
Ⓒ Pentagonal prism Ⓓ Hexagonal prism

Summary

❺ Summarise the vertices, edges and faces of prisms

	Triangular prism	Quadrilateral prism	Pentagonal prism	Hexagonal prism
Shape of bases	Triangle	Quadrilateral	Pentagon	Hexagon
Shape of side faces	Rectangle	Quadrilateral	Quadrilateral	Quadrilateral
Number of vertices	3×2=6	4×2=8	5×2=10	6×2=12
Number of edges	3×2+3=9	4×2+4=12	5×2+5=15	6×2+6=18
Number of faces	2+3=5	2+4=6	2+5=7	2+6=8

Unit 14

Unit: Solids
Sub-unit 1: Prisms and Cylinders
Lesson 3 out of 3

Textbook Page : 185 and 186
Actual Lesson 128

Lesson Objectives

- To investigate the relationship among the number of faces, side and vertex of prisms.
- To understand the definitions, name and structural components of a cylinder.

Prior Knowledge

- Knowledge of the properties of prisms, based on their structural components such as face, side, vertex, base face and side face

Preparation

- Boxes filled with different types of Solids

Assessment

- Investigate the properties of solids such as faces and sharp points. F
- Use the properties of solids and categorise them in various ways. F
- Understand the meaning and properties of curved surface and solids. S

Teacher's Notes

This lesson is the same as the previous lesson. However, this lesson is for students to understand the similarity between prisms and cylinder such as height and base faces, and the difference about side faces.

4 Say the names of the shapes Ⓐ, Ⓑ, Ⓒ and Ⓓ.
5 Summarise the vertices, edges and faces of prisms.

	Triangular prism	Quadrilateral prism	Pentagonal prism	Hexagonal prism
Shape of bases	Triangle			
Shape of side faces	Rectangle			
Number of vertices	3×2=6			
Number of edges	3×2+3=9			
Number of faces	2+3=5			

Are there any rules?

Let's look at each row of the table made in 1, 5 above.

2 Put primes as triangular prism, quadrilateral prism and so on □ side faces in prism, the number of vertices is represented as follows.

Number of vertices =□×2

1 Represent the number of edges by using □.

If we distinguish the sides on the bases and on the side faces....

□×2+□
(□×3)

2 Represent the number of faces by using □.

2+□

Any prism has two bases.

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3 Check expressions to find the number whether they one correct, in the case of octagonal prism.

8×2=16 (Vertices)
8×2+8=24 (Edges)
2+8=10 (Faces)

Octa means 8.

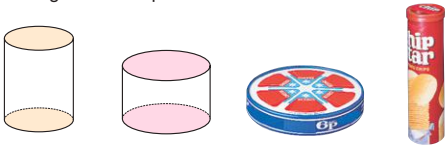
□ – □ = 185

3 Let's look at each column of the table made in 1 and activity 5 on page 185.

Let's discuss what the relationships are among the numbers of vertices, edges, faces and □ side faces in the prisms.

In the **triangular** prism, the sum of the number of vertices **3** which corresponds to 3-sides prism is the number of edges.

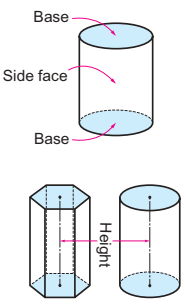
4 Let's investigate the shapes below.



1 What types of faces are they covered by?
Circles and curved surfaces

2 Compare the shapes and the sizes of the 2 parallel faces.
The two parallel faces are congruent (same shape and size).

The shape shown on the right is called a **cylinder**.
The 2 parallel congruent faces shaped as circle of a cylinder are called **bases** and the curved surface around the bases is called **side face**.
The length of the line that are between the 2 bases and perpendicular to the 2 bases of prism or cylinder is called **height** of prism or cylinder, respectively.



186 = □×□

Lesson Flow

1 Review the previous lesson.

2 ② Think about how to finds the number of vertex, side and face.

T Introduce the Main Task. (Refer to the BP)

T ① Ask students to study each row of the table made. Use Triangular and Quadrilateral prisms as an example. ☐ sides prism and confirm that the number of vertices is ☐×2

S Confirm that the number of vertices is ☐×2.

T Ask students to represent the number of faces by using the box ☐.

S Use the summary table and pattern to identify the expression using the box ☐.
Number of edges=☐×2+☐ or (☐×3)

TN Students are to consider the number of sides, separating side face and base face

T ② Ask students to write a mathematical expression for the number of faces of prism using the box ☐.

S Use the summary table and pattern to identify an expression for the number of faces: ☐+2,

TN Students are to consider that the numbers of faces of the bases are always 2.

T ③ Ask students to use their rules to check for the case of octagonal prism.

S Use their rules to check and confirm the number of vertices, edges and faces of octagonal prism.

3 ③ Discuss what the relationships amongst the number of vertices, edges, faces and sides in prisms.

T Group students and ask them to discuss and think about the relationship amongst the number of vertices, sides and faces on the summary table.

S In groups discuss and think about the relationship Number of vertices=☐×2, Number of edges=☐×2+☐, Number of faces=☐+2

4 ④ Investigate cylinders.

T Display or show different sizes of cylinders and ask student to do the following investigation.

T ① What kinds of faces are they covered by?

S Circles and curved surfaces.

T ② Compare the shape and sizes of the two parallel faces of each cylinder.

S The two paralle faces are congruent (same shape and size).

5 Important Point

T/S Explain the important point in the box ☐.

6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

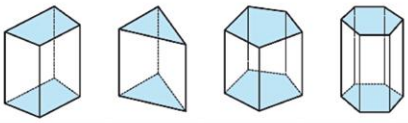
Sample Blackboard Plan

Date: **Chapter:** Solids **Topic 1:** Prisms and Cylinders **Lesson Number:** 3 of 3

Main Task: Let's investigate the relationship among the number of faces, sides and vertex of prisms.

Review

Ⓐ Ⓑ Ⓒ Ⓓ



	Triangular prism	Quadrilateral prism	Pentagonal prism	Hexagonal prism
Shape of bases	Triangle	Quadrilateral	Pentagon	Hexagon
Shape of side faces	Rectangle	Quadrilateral	Quadrilateral	Quadrilateral
Number of vertices	3×2=6	4×2=8	5×2=10	6×2=12
Number of edges	3×2+3=9	4×2+4=12	5×2+5=15	6×2+6=18
Number of faces	2+3=5	2+4=6	2+5=7	2+6=8

MT ② Put primes as triangular prism, quadrilateral prism and so on.

① Represent the number of edges by using ☐

☐ x 2 + ☐

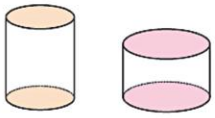
② Represent the number of faces by using ☐

2 + ☐

③ Octagonal prism
Number of vertices: 2 x 8 = 16
Number of edges: 8 x 2 + 8 = 24
Number of faces: 2 + 8 = 10

③ Number of vertices: ☐ x 2
Number of edges: ☐ x 2 + ☐
Number of faces: 2 + ☐

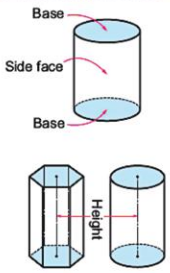
④ Investigate the shapes below



① What types of faces are they covered by?
2 Parallel faces (circles) and curved surfaces

② Compare the shapes and the size of the 2 parallel faces. Circles of equal size

Important Point



Summary

The 2 parallel faces as circles in a cylinder are called the **base** and the curved surface around the base is called the **side face**.
The length of line between the 2 bases and perpendicular to to the bases of a prism or cylinder is called the **height**.

Unit 14

Unit: Solids
Sub-unit 2: Sketches and Nets of Prisms and Cylinders
Lesson 1 of 3

Textbook Page : 187
Actual Lesson 129

Sub-unit Objectives

- To sketch and draw the net of triangular prism.
- To sketch and draw the net of cylinder.

Lesson Objective

- To think of ways to sketch a rectangular prism based on how to sketch triangular prism.

Prior Knowledge

- Knowledge of the properties of prisms based on their structural components such as face, side, vertex, base face and side face

Preparation

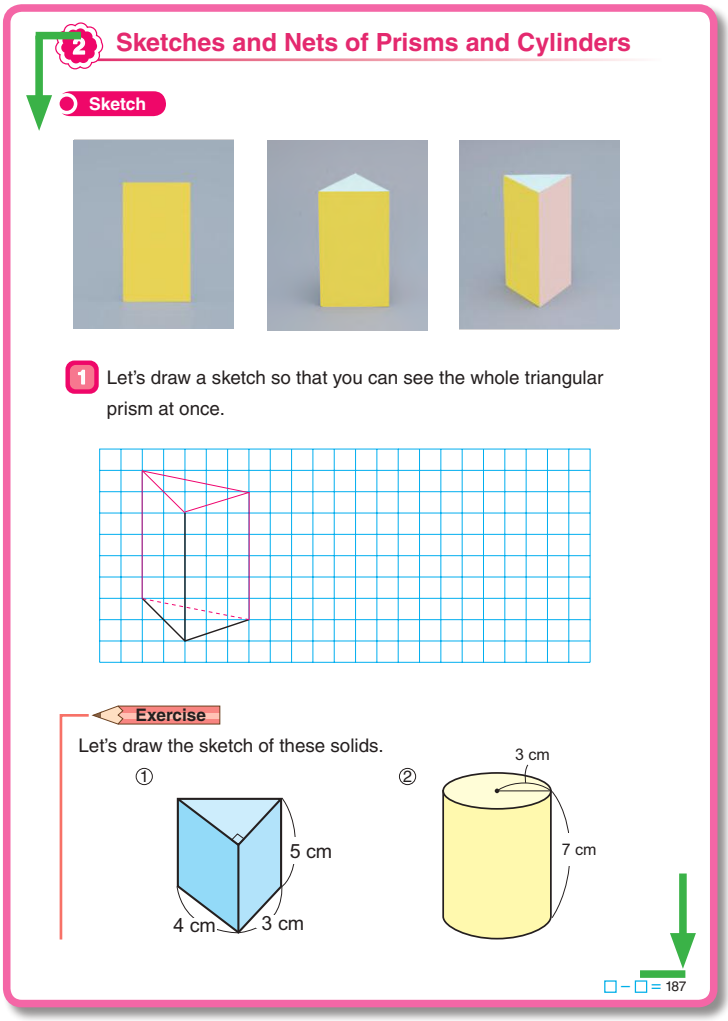
- Cardboard paper, pictures of common triangular prism and cylinder, grid paper

Assessment

- Draw common solids (triangular prism, cylinder). F
- Think about how to make sketches to see three faces at once. F
- Make sketch of a triangular prism and cylinder on the grid paper. S
- Solve the exercises correctly. S

Teacher's Notes

- It's important to make students notice that when three faces are seen, we understand this is a triangular prism and then we need to be able to sketch it on this position. The three different sides should be drawn first to have a good shape of prism.
- Base of the cylinder can be sketched by free hands. Shape of bases are not congruent to the real sides or shape.
- A concrete example could be eminent for learners who are finding difficulties to sketch such solids.
- Line cannot be seen is drawn as a dotted line.



Lesson Flow

1 Review the previous lesson.

2 ① Sketch a triangular prism to see the three faces at one glance.

T Introduce the Main Task. (Refer to the BP)
T Display the side face view of the triangular prism in three different positions and ask if they can be able to see all the faces at one glance.
S Observe and think about the display of triangular prism in different positions.
T Ask students to identify in which position they can decide if this shape is a triangular prism.
S Understand and explain when the three faces can be seen we can decide this is a triangular prism
T Guide students to draw the triangular prism so that the three faces can be seen (i) to draw it based on the black three sides (ii) draw the side behind the sketch, with dotted line.
S Practice using the grid papers to sketch the solids which should have three faces at one glance.

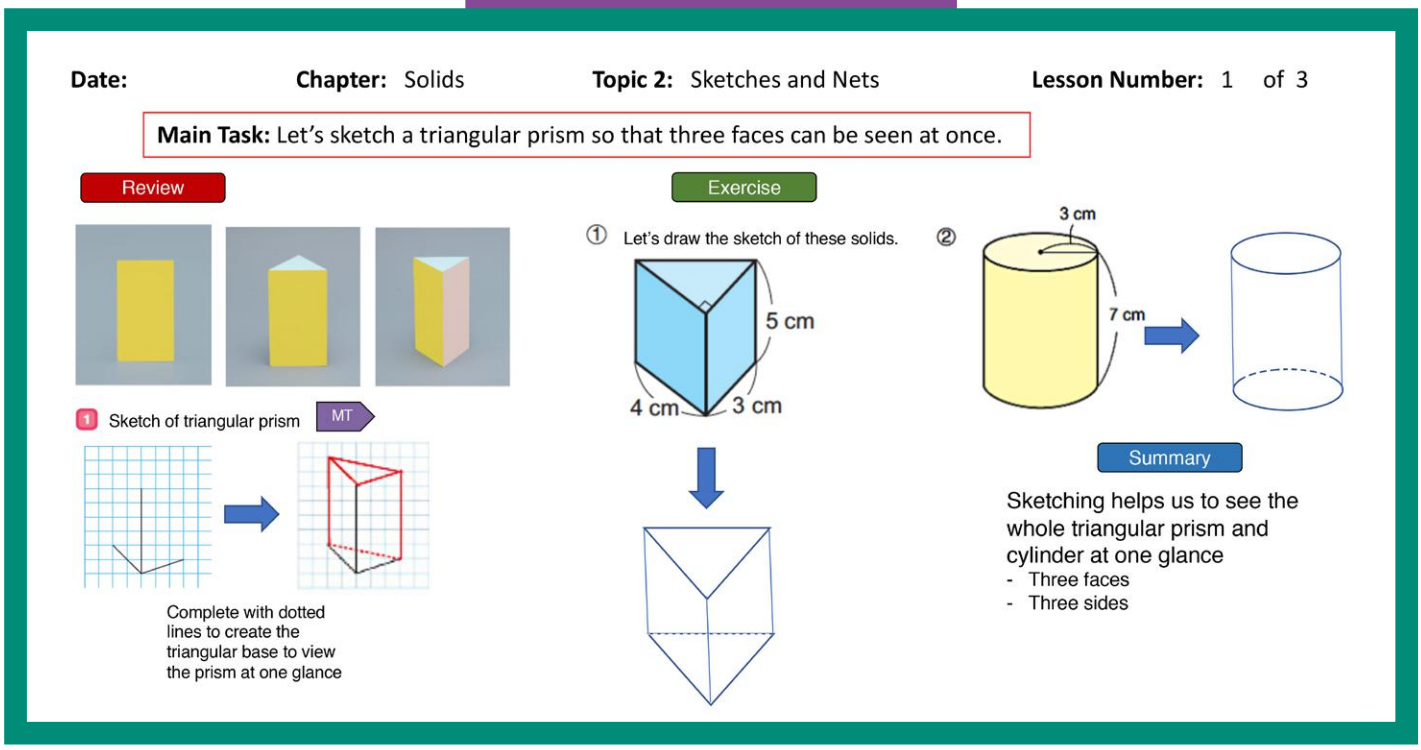
3 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

4 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 14

Unit: Solids
Sub-unit 2: Sketches and Nets of Prisms and Cylinders
Lesson 2 of 3

Textbook Page : 188
Actual Lesson 130

Lesson Objectives

- To investigate and draw the development (net) of a triangular prism, based on the way of drawing rectangular prism.
- To think of other nets for making a triangular prism and nets for other types of prisms.

Prior Knowledge

- Sketching solids such as rectangular prism

Preparation

- Cardboard papers, example of solid figures such as rectangular, triangular, hexagonal prisms and nets of corresponding figures

Assessment

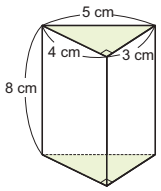
- Investigate and confirm the properties of solids such as faces and sharp points. F
- Draw triangular and hexagonal prism correclty applying previous knowledge. S
- Solve the exercises correctly. S

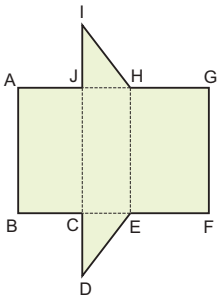
Teacher's Notes

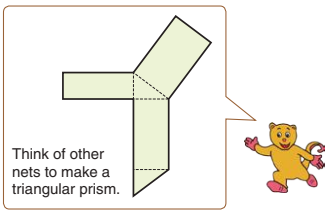
Label all the corners and edges of the rectangular, triangular and hexagonal prism on the cardboard before development of the net (construction of solid shapes).
It is important for all students to participate in developing the net of the triangular and hexagonal prism and check each other's shapes.

Net

2 Let's draw the **net (development)** on the cardboard to make a triangular prism as shown on the right.



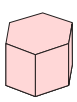


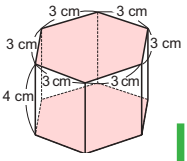


1. Which parts are the bases and the side face in a net?
   Bases: IJH and CDE Side Faces: ABCJ, EFGH and CEHJ
2. Where does the height correspond in a net?
   Lines AB, JC, HE and GF
3. How many cm are the lengths of side AB, BC and DE?
   AB = 8 cm BC = 4 cm DE = 5 cm
4. When you make the shape, which points does point A overlap?
5. Fold the net. Point A overlaps with points I and G.

Exercise

The solid on the right shows a hexagonal prism with the base of a regular hexagon.
Let's draw the net and make it.
Refer to board plan.





188 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ② Net of a triangular prism.

T Introduce the Main Task. (Refer to the BP)

T Display and ask students to answer question ① to ⑤ respectively.

T ① Which parts are the bases and the side face in a net?

S Bases: triangles IJH and CDE, Side faces: rectangles ABCJ, EFGH and CEHJ

T ② Where does the height correspond in a net?

S Height: Lines AB, JC, HE and GF

T ③ How many cm are the length of side AB, BC and DE?

S AB＝8 cm, BC＝4 cm and DE＝5 cm

T ④ When you make the shape, which point does A overlap?

S Points: I and G

S ⑤ Draw on a cardboard the net based on the answers for ① to ④ and construct a triangular prism, using the net.

TN Guide the students to measure and confirm all the lengths correctly to draw the net and confirm which sides and vertices overlap each other and fold the net.

3 To draw other nets for making a triangular prism.

T Ask students to think of other nets for making the same triangular prism.

S Think about other nets to make a triangular prism, confirming whether the all sides and vertices overlap each other correctly.

T Ask some students to put their drawn nets on the blackboard and explain what they considered in drawing nets.

S Explain and share it to the whole class.

4 Complete the Exercise

S Solve the exercise.

T Confirm students' answers.

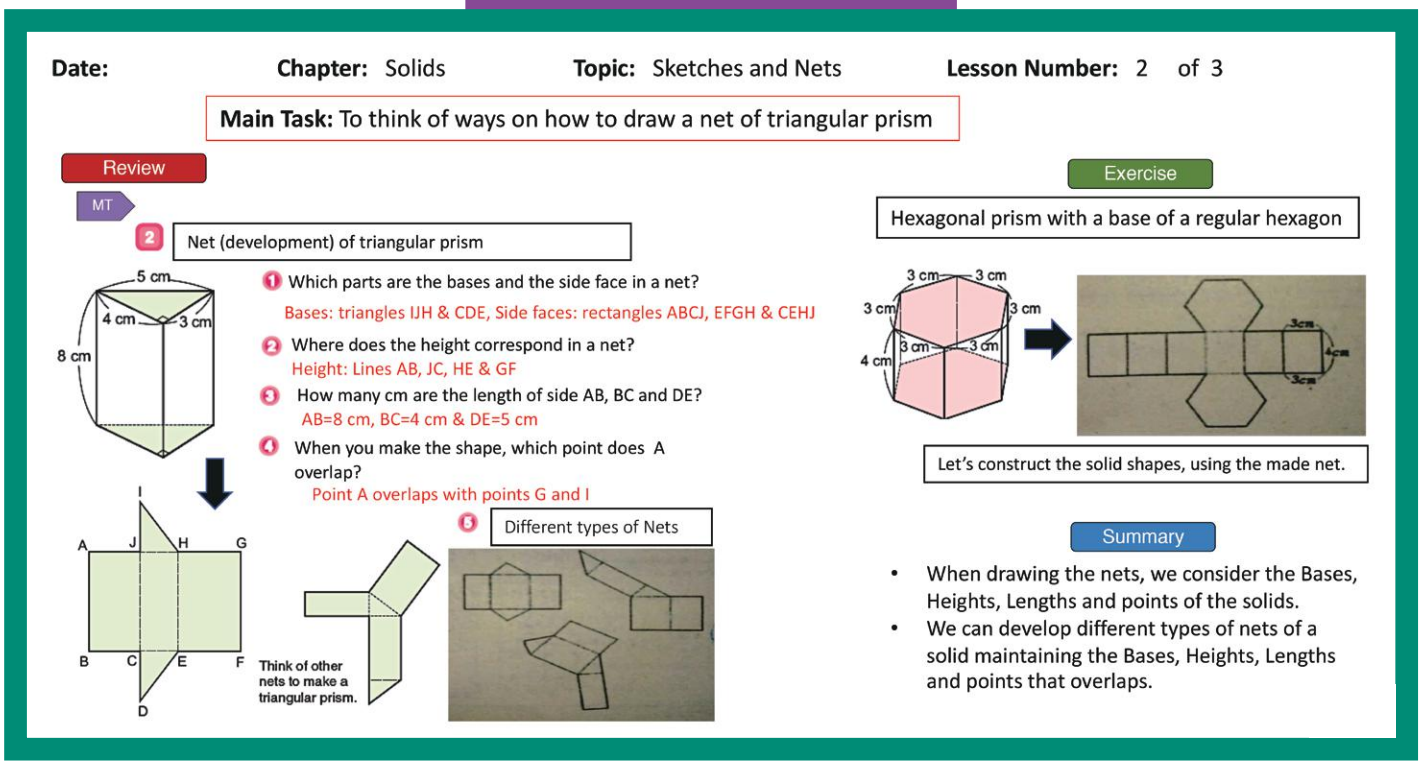
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan



Unit 14

Unit: Solids
Sub-unit 2: Sketches and Nets of Prisms and Cylinders
Lesson 3 of 3

Textbook Page : 189
Actual Lesson 131

Lesson Objective

- To investigate and draw the development (net) of a cylinder.

Prior Knowledge

- Identify the faces of a cylinder and sketch it.
- Calculate the circumference.

Preparation

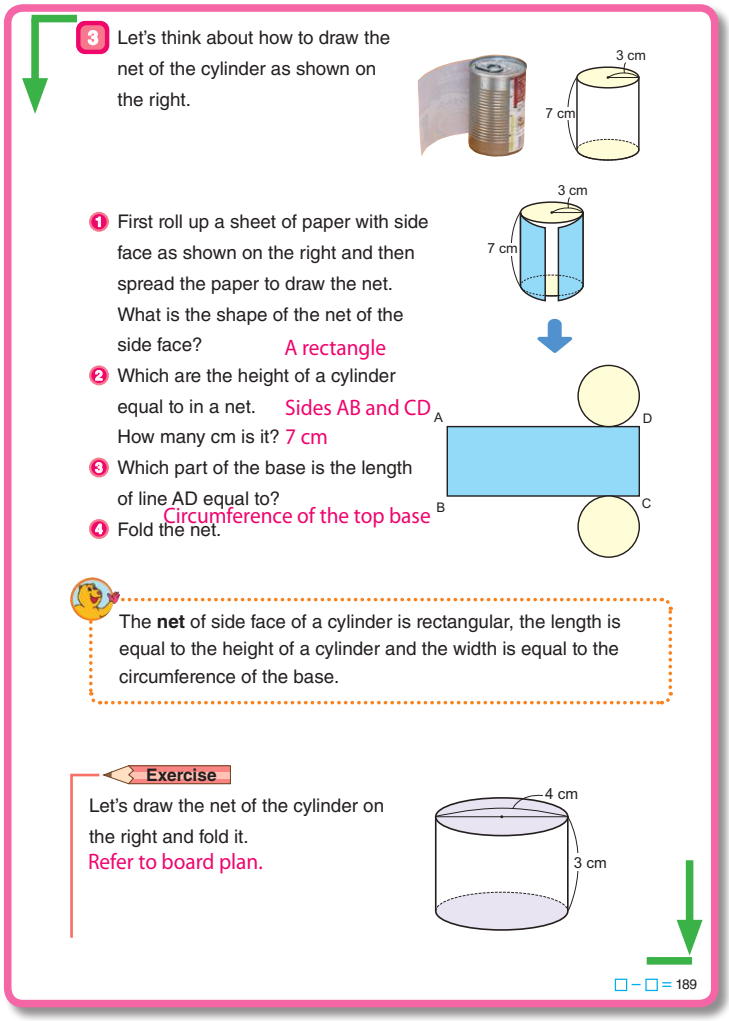
- Different cylinders (e.g. tinned fish, soft drink can), scissors and cardboard papers.

Assessment

- Investigate and confirm the properties of solids. F
- Draw the net of cylinder, applying previous knowledge correctly. S
- Solve the exercises correctly. S

Teacher's Notes

- The net of side face of a cylinder is rectangular, the length is equal to the height of the cylinder and the width is equal to the circumference of the base.
- In order to draw the net, it's indispensable to calculate the length of circumference of the base circle before drawing the rectangle.
- To construct the solid figure of cylinder, it's necessary to keep the rectangle and the 2 base circles tangible.
- If any students fail to do it, they can paste the rectangle and the 2 base circles with tape.
- To construct it, it's better to form, first of all, a side (curved) faces from the rectangle of net, and then paste the 2 base circles on it.



Lesson Flow

1 Review the previous lesson.

2 ③ To think about the ways of drawing a net of cylinder.

T Introduce the Main Task. (Refer to the BP)

T Show the students a cylindrical object and ask them to think about how to draw the net of a cylinder.

TN Teacher can use drawings or concrete cylindrical objects to show students. Teacher can give hints such as:
1) What kind of faces does a cylinder have?
2) Can we fit a paper on and around the cylinder to see the side faces.

S 1) There are 2 circles on the upper and lower bases
2) The side (curved) face can be rolled and copied on a paper, etc.

T ① What is the shape of the net of the side face?

S It's a quadrilateral.

T ② Which are the height of the cylinder equal to in a net?
How many cm is it?

S It's the same length as the rectangle's side face which the widths AB and CD are 7cm long.

T ③ Which part of the base is the length of line AD equal to?

S Line AD is equal to the circumference of the top base.

S ④ Fold the net.

3 Important Point

T/S Explain the important point in the box .

4 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

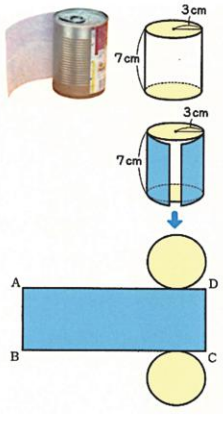
Date: **Unit:** Solids **Topic:** Sketches and Nets **Lesson Number:** 3 of 3

Main Task: To think of ways on how to sketch a cylinder and construct its Net.

Review

MT

③ Practice to draw the net of this cylinder



① Roll up the cardboard paper around the side face and then spread the paper to draw the net. What kind of shape? Rectangle

② The height of cylinder: the width AB & CD, 7cm

③ The length of rectangle: the circumference of base circle 3 x 2 x 3.14= 18.84 (cm)

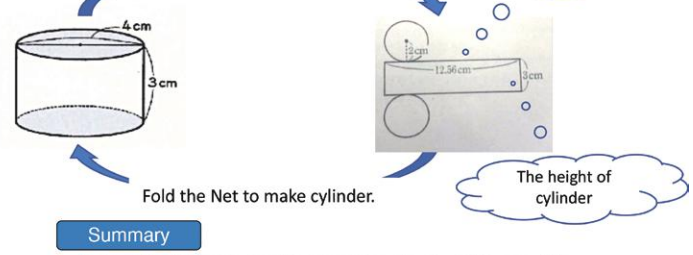
④ Practice to construct the cylinder using its net

The **net** of side face of a cylinder is rectangular, the length is equal to the height of a cylinder and the width is equal to the circumference of the base.

Exercise

Let us draw the net of the cylinder below

2 x 2 x 3.14= 12.56 (cm)



Fold the Net to make cylinder.

Summary

- The length of the side face (rectangle) can be found to calculate the circumference of the base circle
- The width of the side face (rectangle) is the height of cylinder

Unit 14

Unit: Solids
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 190 and 191
Actual Lesson 132 and 133

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise, Problems and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 14. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assessment for your class after completing all the exercises. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.

EXERCISE

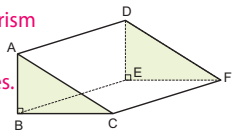
1 There is a solid as shown on the right. Pages 184 to 186

① What type of shape is it? Triangular prism

② How many faces and edges are there respectively? 5 faces and 6 edges.

③ Which faces are parallel to face ABC and are perpendicular to face ABC, respectively? Parallel to face DEF and perpendicular to face ACFD, BCFE and ABED

④ Which sides of the solid are used to measure the height? Sides AD, BE and CF



2 Let's summarise prisms in the table below. Page 186

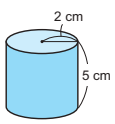
	Heptagonal prism	Octagonal prism	Nonagonal prism	Decagonal prism
Number of vertices	7×2=14	8×2=16	9×2=18	10×2=20
Number of edges	7×2+7=21	8×2+8=24	9×2+9=27	10×2+10=30
Number of faces	2+7=9	2+8=10	2+9=11	2+10=12

3 Let's look at the solid shown on the right. Pages 186 and 189

① Name the solid. cylinder

② Find the width of side face when you draw the net.
Calculate the number using 3.14 as the ratio of circumference and round this to the nearest hundredth. 4×3.14=12.56 width is about 12.6 cm

③ Draw a net.



Let's calculate. Grade 5 Do you remember?

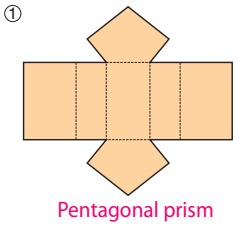
① 8÷0.5 16 ② 18÷4.5 4 ③ 56÷1.6 35

④ 6.4÷0.8 8 ⑤ 8.06÷3.1 2.6 ⑥ 45.9÷5.1 9

190 = □×□

PROBLEMS

1 What solids can we make the shapes from these nets?
● Imagine the solid from a net.

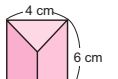


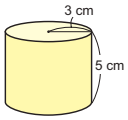
Pentagonal prism Cylinder

2 Let's draw the following net.
● Drawing the net.

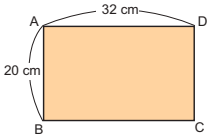
① A triangular prism that has the base of an equilateral triangle with 4 cm side and 6 cm height.

② A cylinder that has the base of a circle with 3 cm radius and 5 cm height.





3 Using a rectangular cardboard as shown below, make a cylinder by overlapping sides AB and CD.
How many cm is the diameter of the circle to make the bases?
Calculate using 3.14 as the ratio of the circumference and round this to the nearest hundredth.
● Finding a diameter of circle of the base.
32÷3.14=10.19 10.2 cm



□−□=191

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.
T Confirm students' answers.
TN 1 Identifying the type of solid shapes.
2 Understanding the prisms.
3 Understanding and identifying the type of shapes that make up a cylinder.

2 Solve the Problems

S Solve all the problems.
T Confirm students' answers.
TN 1 Imagine the solid from a net.
2 Constructing the net of the solid shapes given.
3 Finding the diameter of circle base formed from the net.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.
S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 14: Solids	Name:	Score / 100

1. The diagram below shows a net of a solid. Answer each question. [4×15 marks = 60 marks]

(1) What is the name of the solid?

Answer: Hexagonal prism

(2) Which faces are the bases?

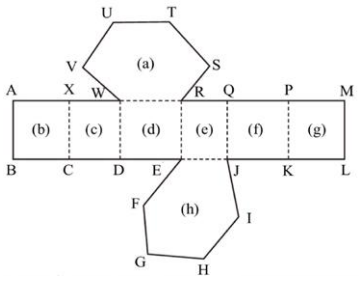
Answer: (a) (h)

(3) Which point will overlap point A when assembling the net?

Answer: U (M)

(4) Which side will overlap side GH?

Answer: Side CB



2. Look at the prisms below and answer each question. [4×10 marks = 40 marks]

(1) How many edges does (b) have?

Answer: 8

(2) What is the shape of the base of (c)?

Answer: Pentagon

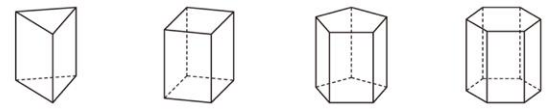
(3) Which prism has 5 faces?

Answer: (a)

(4) Answer the relationship between bases of each prism.

Answer: Parallel

(a) (b) (c) (d)



266

End of Chapter Test **Date:**

Chapter 14: Solids	Name:	Score / 100

1. The diagram below shows a net of a solid. Answer each question.

[4×15 marks=60 marks]

(1) What is the name of the solid?

Answer:

(2) Which faces are the bases?

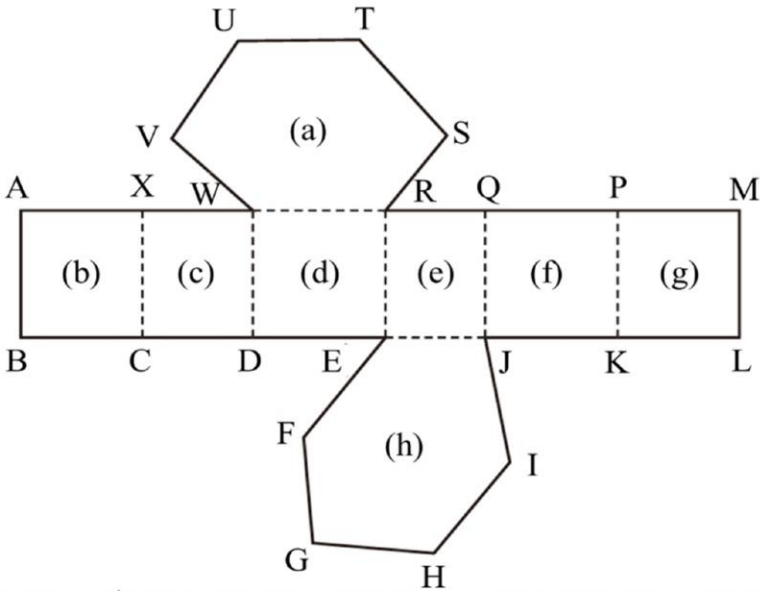
Answer:

(3) Which point will overlap point A when assembling the net?

Answer:

(4) Which side will overlap side GH?

Answer:



2. Look at the prisms below and answer each question. [4×10 marks=40 marks]

(1) How many edges does (b) have?

Answer:

(2) What is the shape of the base of (c)?

Answer:

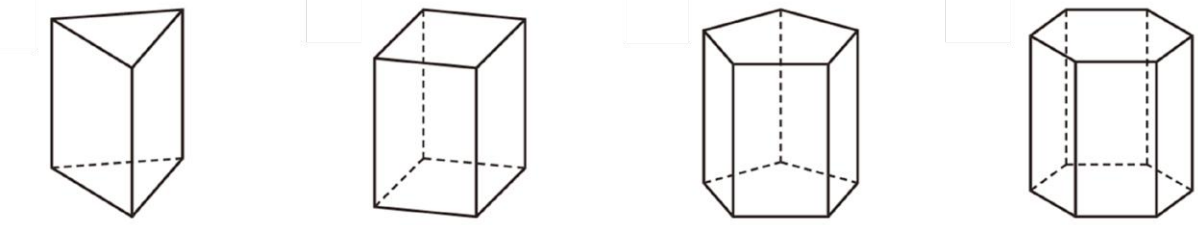
(3) Which prism has 5 faces?

Answer:

(4) Answer the relationship between bases of each prism.

Answer:

(a) (b) (c) (d)



Chapter 15 Rates and Graphs

1. Content Standard

5.4.2 Extend their understanding of data and statistics to construct graphs to scale of given quantities.

2. Unit Objectives

- To understand percentage.
- To understand the meaning of rate, how to find and compare ratios and the meaning of percentage and how to express in percentage.
- To understand how to find basic quantities and compare quantities.
- To understand how to solve problems which involve a ratio expressed as a percentage.
- To gather and organise data according to their purposes and represent them by using pie graphs and band graphs and investigate features of graph.

3. Teaching Overview

In this topic, ratio is understood as a quantity compared to another quantity when the compared quantity is expressed as a value of 1 or 100.

Rates :

First, students compare 2 quantities in a relationship of inclusion. Next, they compare 2 quantities which are not in a relationship of inclusion.

They also handle a situation which gives more than 1 as the ratio.

Percentages :

Students compare 2 quantities when they take another quantity as 100.

Problems Using Rates :

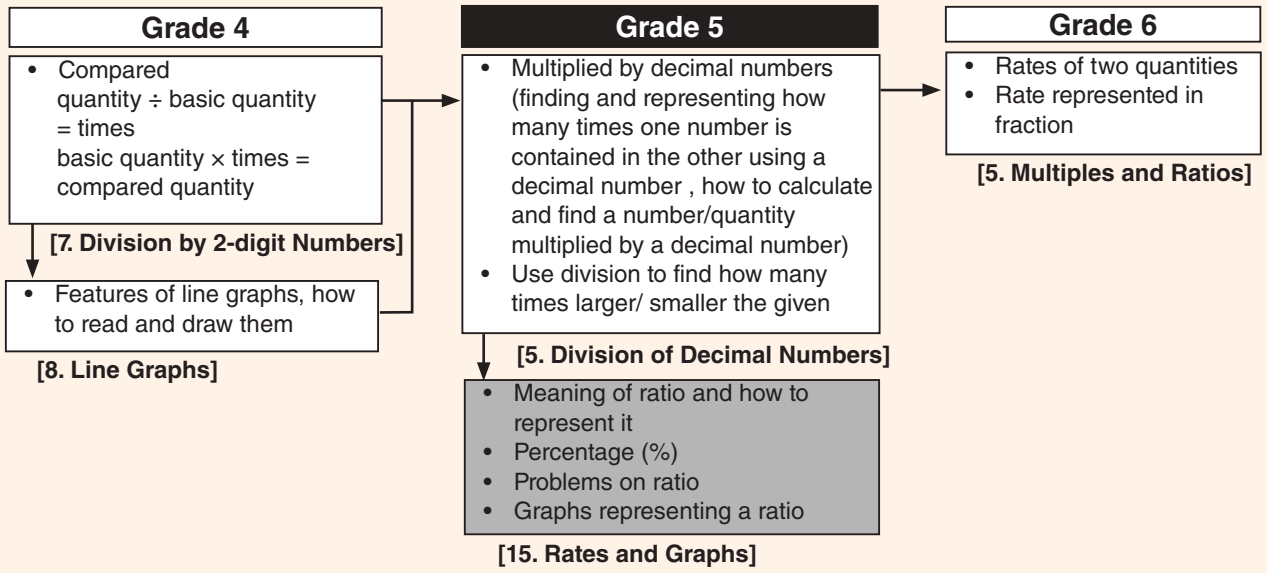
They find the quantity when they are given the ratio.

They also find the ratio of remaining part by subtracting the part ratio from 1.

Graphs Expressing Ratios :

Students will express ratio by pie charts and percentage bar charts.

4. Related Learning Contents



Unit 15

Unit: Rates and Graphs
Sub-unit 1: Rates
Lesson 1 of 3

Textbook Page : 192 to 194
Actual Lesson 134

Sub-unit Objective

- To understand the meaning of rate.

Lesson Objectives

- To think about how to compare the results of shots in a basketball game.
- To understand how to express rate of scored shots in numerals.

Prior Knowledge

- Line graphs (Grade 4)

Preparation

- Table that shows the record of shots, disc (if available)

Assessment

- Understand and explain the meaning of rate and its representation. F
- Compare and represent rate as a graph, decimal and reduced fraction. S

Teacher's Notes

- There are two aspects of rate:

1. Rate can be used to show the relationship of two quantities, that is the **total quantity** and the **part of the quantity**.
   In this case, the rate should be less than1.
2. Rate can be used to show the proportional relationship of two quantities. In this case, one of them is considered as a **basic quantity** and the other as a **compared quantity**.

- Ensure students realise that it is better to use fractions as they are dealing with a set of two numbers for each students' record, which is the number of scores and that of shots.

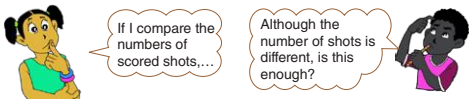
15 Rates and Graphs

A group of students played a netball game The table below shows the shooting data of Jaydan and others.

Jaydan	○ × ○ × ○ ○ × ○
Tom	○ ○ × × ○ × ○ × × ○
Madu	× ○ ○ ○ × × ○ ○ × ○

○ Scored shots
× missed shots

Let's think about how to compare the results and discuss about your opinions.



Let's think about how to compare the result of shots.

192 = □ × □

1 Rates

1 Let's compare the shooting record on page 192 by expressing as numbers.

	Jaydan	Tom	Madu
Number of score	5	5	6
Total Number of shots	8	10	10

1. Compare Jaydan's results with Tom's.
   Jaydan scored 5 out of 8 and Tom scored 5 out of 10
2. Compare Tom's results with Madu's.
   Tom scored 5 out of 10 and Madu scored 6 out of 10
3. Think about how to compare the Jaydan's with Madu's.

Mero's Idea

Express them on graphs of the same length.

Jaydan $\frac{5}{8}$

Madu $\frac{6}{10}$

Yamo's Idea

Change fractions to decimal numbers.

Jaydan $\frac{5}{8} = 5 \div 8 = 0.625$

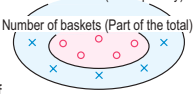
Madu $\frac{6}{10} = 6 \div 10 = 0.6$

Kekeni's Idea

Reduce fractions.

Jaydan $\frac{5}{8} = \frac{25}{40}$ Madu $\frac{6}{10} = \frac{24}{40}$

4. Explain the ideas of the 3 students by using words.
5. Express the Tom's result as number.
   If we put the total number as the number of shots, the number of scores will be one part of this total.



Shooting result = Number of scores ÷ Number of shots

Part of the total / Total quantity

$5 \div 10 = 0.5$

□ − □ = 193

Lesson Flow

1 Comparing Shooting records

T Let students see the pictures and discuss on the netball game.

T/S Read and understand the situation.

T Introduce the Main Task. (Refer to the BP)

2 Comparing the results of the shots.

T How can we best express the results of each person's shots?

S Refer to table of results in textbook and give results.

3 ① Compare the shooting records by expressing as numbers.

S Compare the result using the table.

TN ① Jaydan and Tom.
The number of scores is same but Jaydan has less number of shot.

TN ② Tom and Madu.
The number of shots are same but Madu has more number of scores.

S ③ Think about how to compare the result of Jaydan and Madu.

T Let students discuss Mero, Yamo and Kekeni's ideas to compare results. (Refer to board plan)

S ④ Explain the 3 ideas by using words.

S ⑤ Express the result of Tom as a number.

4 ② Express result in table as numbers.

T Let students' to study the table of shooting record in textbook page 194.

S Express the shooting results as a number. (Refer to board plan)

5 Summary

TN Similar to the summary flow in the next lesson.

Page 194 of the textbook

② The table below shows the record of Sandra's shot.
Express the result as numbers.

Game 1	○ ○ ○ ○ ○
Game 2	× × × × × × ×

Game 1, 5 ÷ 5 = 1
Game 2, 0 ÷ 7 = 0

The number expressing the result of the shots is between 0 and 1.

Sample Blackboard Plan

Date: **Unit:** Rate and Graph **Topic:** Rate **Lesson Number:** 1 of 3

Main Task: Let's think about how to compare the results of shots.

▶▶ A group of students played a netball game The table below shows the shooting data of Jaydan and others.

Jaydan	○× ○× ○○× ○
Tom	○○×× ○× ○×× ○
Madu	× ○○○×× ○○× ○

○ Scored shots
× missed shots

1. Jaydan
   5 baskets out of 8 shots
2. Tom
   5 baskets out of 10 shots
3. Madu
   6 baskets out of 10 shots

① Let's compare the shooting record expressing them as numbers.

	Jaydan	Tom	Madu
Number of score	5	5	6
Total Number of shots	8	10	10

① Compare the result of Jaydan with Tom.
Jayden $\frac{5}{8}$ and Tom $\frac{5}{10}$

② Compare the result of Tom and Madu.
Tom $\frac{5}{10}$ and Madu $\frac{6}{10}$

③ Think about how to compare the results of Jaydan and Madu

Mero's idea
Express them on graphs of the same length.
Jaydan $\frac{5}{8}$
Madu $\frac{6}{10}$

Yamo's idea
Change fractions to decimal numbers.
Jaydan $\frac{5}{8}$ = 5÷8 = 0.625
Madu $\frac{6}{10}$ = 6÷10 = 0.6

Kekeni's idea
Reduce fractions.
Jaydan $\frac{5}{8} = \frac{25}{40}$ Madu $\frac{6}{10} = \frac{24}{40}$

④ Explain the ideas of three children by using words.
The larger the number becomes, the better the result is when the whole quantity is the basis.

⑤ Express the result of Tom as a number.

Shooting result = number of scores (Part of the total) ÷ number of shots (Total quantity)
= 5 ÷ 10
= 0.5

② The table below shows the shooting record of Sandra. Express the result as a number.

Game 1	○ ○ ○ ○ ○
Game 2	× × × × × × ×

Game 1 = 5÷5 =1 Game 2 = 0÷7 =0

Summary
Summarise based on what the students have learnt.

Unit 15

Unit: Rates and Graphs
Sub-unit 1: Rates
Lesson 2 of 3

Textbook Page : 194 and 195
Actual Lesson 135

Lesson Objective

- To understand how to compare and find rates.

Prior Knowledge

- Meaning of rate

Preparation

- Tape and number line diagrams to show the degree of crowdedness of planes
- Tables to show the relationships of the degree of crowdedness of each plane

Assessment

- Understand and explain the process in comparing and finding rates. F
- Think about how to express the degree of crowdedness. S
- Solve the exercises correctly. S

Teacher's Notes

Crowdedness means a number that is expressed by the derived quantity when the basic quantity is made 1. Further explanation is in page 209 of the textbook with examples.

2 The table below shows the record of Sandra's shot.
Express the result as numbers.

Game 1	○ ○ ○ ○ ○
Game 2	× × × × × × ×

The number expressing the result of the shots is between 0 and 1.

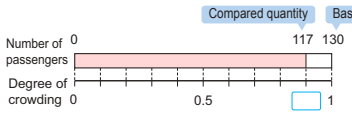
3 Let's investigate the number of passengers on planes in a day.
Which plane is more crowded?

Number of Passengers and Seats

	Small plane	Large plane
Number of passengers	117	442
Number of seats	130	520

The degree of crowding is represented as a number that allows comparing the number of passengers when the number of seats is made 1.

1 Let's find the degree of crowding for the small plane.

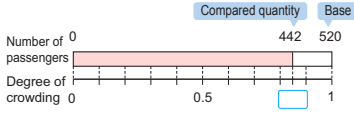


Number of passengers	130	117	
Degree of crowding	1	?	

÷130 ÷130

117 ÷ 130 = 0.9

2 Let's find the degree of crowding for the large plane.



Number of passengers	520	442	
Degree of crowding	1	?	

÷520 ÷520

442 ÷ 520 = 0.85

194 = □ × □

The result of the shots in **1** is expressed by how many the derived quantities when the base quantity is made 1.

A number that is expressed by the derived quantity when the base quantity is made 1, like a shooting result or crowding, is called rate.

Rate = compared quantity ÷ base quantity

The degree of crowding for the small plane in the previous page is
117 ÷ 130 = 0.9
A degree of crowding for the 0.9 means that the number of passengers is 0.9 when we make the total number of seats 1.

Small Plane

	Number of seats	Number of passengers
Number of passengers	130	117
Rate	1	0.9

÷130 ÷130

Large Plane

	Number of seats	Number of passengers
Number of passengers	520	442
Rate	1	0.85

÷520 ÷520

To make130 become 1, we should divide by 130.

Exercise

1 Let's find the rates.
① A rate of correct answer, when 6 out of 10 problems were answered correctly. 6 ÷ 10 = 0.6
② A rate of games won when a team won 6 out of 6 soccer games. 6 ÷ 6 = 1
③ The rate of winning goals, when Tali missed 7 goals out of 7 shots. 0 ÷ 7 = 0

2 There are 75 students at a party including Ben. There are 15 students from the grade 5. Let's find the rate of the grade 5 students based on the total number of the students at the party.
15 ÷ 75 = 0.2

□ − □ = 195

Lesson Flow

1 Review the previous lesson.

2 ③ Investigating the number of passengers on planes in a day.

T Introduce the Main Task. (Refer to the BP)
T/S Read and understand the situation.
T Have the students to think about and explain how they can find the degree of crowdedness of each plane.
S Identify that there are two quantities, 1) capacity of the plane and 2) number of passengers.
S Identify which quantity is the total quantity and which is the partial quantity.

3 How to express the degree of crowdedness.

S ① ② Think about how to express the degree of crowdedness.
T Assist students to understand that they can express the degree of crowdedness by setting the capacity as the total quantity 1 and the number of passengers as the partial quantity.
TN The expression can be written as 'the partial quantity ÷ the whole quantity'.
The degree of crowdedness = the number of passengers ÷ capacity.
(Compared quantity)(Basic quantity)
S Write mathematical expressions, calculate them and express the degree of crowdedness in decimal numbers.
S ① Small plane ..... 117÷130=0.9
② Large plane ..... 442÷520=0.85
S The small plane is more crowded than the large plane.
T Which plane is more crowded?
S The smaller plane.

4 Important Point

T/S Explain the important point in the box .

5 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Rate and Graph **Topic:** Rate **Lesson Number:** 2 of 3

Main Task: Let's think about how to compare and find rates

Review

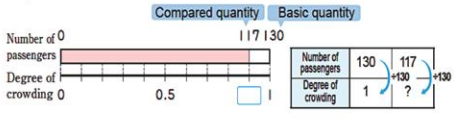
MT

③ Let's investigate the number of passengers on planes in a day

Number of Passengers and Seats

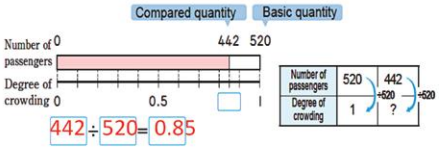
	Small plane	Large plane
Number of passengers	117	442
Number of seats	130	520

① Let's find the degree of crowding for the small plane.



117÷130 = 0.9

② Let's find the degree of crowding for the large plane.



442÷520=0.85

By comparing ① and ② we can clearly see that the small plane is more crowded than the larger plane.

A number that is expressed by the derived quantity when the basic quantity is made 1, like a shooting result or crowding, is called ratio.

Ratio = compared quantity ÷ basic quantity

Exercise

1 Let's find the ratios.

① A ratio of correct answer, when 6 problems out of 10 were answered correctly. 6 ÷ 10 = 0.6

② A ratio of games won when a team won 6 out of 6 soccer games. 6 ÷ 6 = 1

③ A ratio of winning lots, when s re blank. 0 ÷ 7 = 0

2 There are 75 children at a party including Ben. There are 15 children from the fifth grade. Let's find the ratio of the grade 5 children based on the total number of children at the party.

15 ÷ 75 = 0.2

Summary

The degree of crowding for the small plane in the previous page is 117 ÷ 130 = 0.9.

A degree of crowding for the 0.9 means that the number of passengers is 0.9 when we make the total number of seats 1.

Unit 15

Unit: Rates and Graphs
Sub-unit 1: Rates
Lesson 3 of 3

Textbook Page : 196
Actual Lesson 136

Lesson Objectives

- To understand and express rate when comparing two quantities which one being the total quantity and the other being part of the total.
- To understand that there are cases where rate becomes larger than 1.

Prior Knowledge

- Meaning of rate
- How to find rate

Preparation

- Tape, number line diagrams and tables prepared for diagram representation of each task

Assessment

- Think about how to express rate when comparing two quantities. F
- Understand and explain the meaning of rate larger than 1. F
- Solve the exercises correctly. S

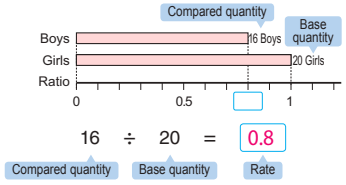
Teacher's Notes

- If students think that a compared quantity = partial quantity (smaller) and a base quantity = total (larger), they may also find it strange to have the rate larger than 1.
- Teacher should facilitate well by advising students to use a tape, number line diagrams and table to further understand rate larger than 1.
- Students are yet to learn about percentages, therefore teacher should not introduce it in this lesson.

The Rate of two Quantities

We can express the proportion between two quantities even if one of them is not a part of the other.

4 There are 16 boys and 20 girls in Kuman's class. Let's find the rate of the number of boys to the number of girls.



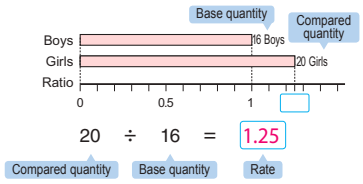
	Boys	Girls
Number of students	16	20
Rate	?	1

(÷20 from Boys to Girls; ÷20 from Girls to Rate)

16 ÷ 20 = 0.8

Compared quantity | Base quantity | Rate

5 In Kuman's class in **4**, let's find the rate of the number of girls to the number of boys.



	Boys	Girls
Number of students	16	20
Rate	1	1.25

(÷16 from Boys to Girls; ÷16 from Girls to Rate)

20 ÷ 16 = 1.25

Compared quantity | Base quantity | Rate

The rate will change if we change the base quantity. In some cases, the rate will become larger than 1.

Exercise

A 50 m building was constructed across the street from a 20 m building.

① Find the rate of the height of the 20 m building based on the 50 m building.
20 ÷ 50 = 0.4

② Find the rate of the height of the 50 m building based on the 20 m building.
50 ÷ 20 = 2.5

196 = □ × □

Lesson Flow

1 Review the previous lesson.

2 The rate of two quantities smaller than 1.

T Introduce the Main Task. (Refer to the BP)
T/S 4 Read and understand the situation.
T Confirm which quantities are base quantities and which are compared quantities.
S Use the table to write the mathematical sentence.
S Calculate and find the rate of the number of boys to that of girls. (Rate of boys to girls = 0.8).
T Present the tape diagram and table to confirm that the rate is smaller than 1.
TN Teacher can add and explain that in this case, we can say the number of boys is 0.8 times that of girls.

3 The rate of two quantities larger than 1.

T/S 5 Read and understand the situation.
T Confirm which quantities are base quantities and which are compared quantities.
S Use the table to write the mathematical sentence.
S Calculate and find the rate of the number of girls to that of boys. (Rate of girls to boys = 1.25).
T Guide students with the tape diagram and tables to calculate the rate.
S Notice that the rate is larger than 1.
T Let the students to compare the rates in 4 and 5.
S The rate of boys to girls is less than 1 and the rate of girls to boys is larger than 1.

4 Important Point

T/S Explain the important point in the box .

5 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

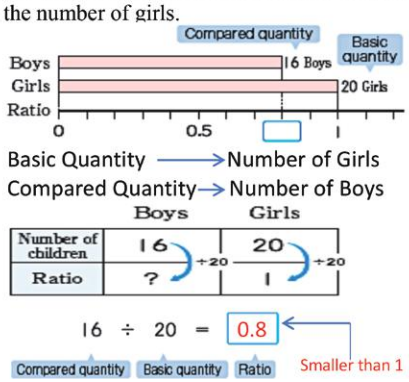
Date: **Unit:** Rate and Graph **Topic:** Rate **Lesson Number:** 3 of 3

MT: Let's express rate when comparing two quantities, 'total quantity' and the other being 'part of the total quantity'.

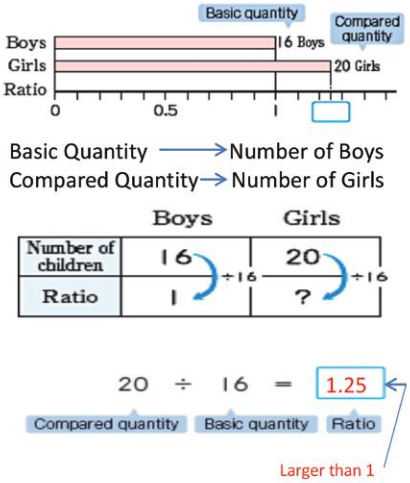
Review

MT

4 There are 16 boys and 20 girls in Kuma's class. Let's find the ratio of the number of boys to the number of girls.



5 Let's find the ratio of the number of girls to the number of boys in 4.



Exercise

(1) 20 ÷ 50 = 0.4 *Answer*: 0.4

(2) 50 ÷ 20 = 2.5 *Answer*: 2.5

Summary

- When we two quantities that are not related to each other as the total quantity and partial quantity, we can use ratio.
- The ratio will change if we change the basic quantity.
- In some cases the ratio becomes larger than 1.
- The ratio becomes larger than 1 when the compared quantity is larger than basic quantity

Unit 15: Unit: Rates and Graphs

Sub-unit 2: Percentages

Lesson 1 of 2

Textbook Page : 197 and 198
Actual Lesson 137

Sub-unit Objectives

- To understand that rates can also be expressed in percentage and understanding their meaning.
- To express various rates in percentages.

Lesson Objective

- To understand the meaning of percentage and how to express rate in percentage.

Prior Knowledge

- The Rates

Preparation

- Tape diagram that shows the number of passengers and rate and a table that shows the number of passengers and rate (decimal number and percentage)

Assessment

- Understand and explain the meaning of percentage and its symbol. F
- Understand and express rate in percentage. F
- Solve the exercises correctly. S

Teacher's Notes

- Rate = Compared quantitiy ÷ Base quantity.

2 Percentages

1 There are 40 passengers in a bus that has 50 seats.

(1) Find the degree of crowding in the bus.

40 ÷ 50 = 0.8

(2) Let's express this rate by making the basic quantity 100.

2 times

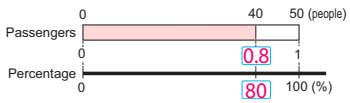
40 ÷ 50 = 80 ÷ 100

2 times

We often express a rate by making the basic quantity 100.
This expression is called percentage.
The rate 0.01 is a decimal number, which is called 1 percent and is written as 1%.

Percentage = Rate × 100

(3) If we multiply a rate that is expressed as a decimal number by 100, it will become a percentage.
Let's express the degree of crowding of the bus as a percentage.



Number of passengers (people)	40	(÷50)	50	(÷50)
Rate (decimal numbers)	?		1	
Percentage (%)	?	(×100)	100	(×100)

40 ÷ 50 × 100 = 80 (%)

□ − □ = 197

2 Patrick and his friends kept a record of the vehicles on the road in front of their school for 20 minutes.

Record of Type of Vehicles

	Number of vehicles	Percentage (%)
Cars	63	45
Trucks	35	25
Buses	21	15
TAXI	7	5
Others	14	10
Total	140	100

(1) Let's express the rate of each type of vehicle to the total number of vehicles.

(2) What is the total of all the percentages? 100 %

Exercise

Let's change the following rate from decimal numbers to percentages, and from percentages to decimal numbers.

① 0.75 → 75 %　② 0.8 → 80 %　③ 0.316 → 31.6 %　④ 16 % → 0.16　⑤ 2 % → 0.02

Rates Larger than 100 %

3 Conference rooms in Steven's guest house can hold 120 people.
Let's find the degree of crowding in each conference room.

(1) Find the degree of crowding for the Kumul conference room.
108 ÷ 120 × 100 = □ (%)

(2) Find the degree of crowding for the Muruk conference room.
144 ÷ 120 × 100 = □ (%)

Today's Number of guests in conference rooms.
Kumul : 108 guests
Muruk : 144 guests

When the number of guests is more than the capacity, the percentage is larger than 100 %.

198 = □ × □

Lesson Flow

1 Review the previous lesson.

2 The meaning of percentage and its symbol.

T Introduce the Main Task. (Refer to the BP)
T/S ❶ Read and understand the situation.
S ❶ Find the degree of crowding in the bus
T Confirm students' answers.
S ❷ Express the rate solved in ❶ by making the base quantity 100.

3 Important Point

T/S Explain the important point in the box .

4 Expressing the degree of crowding from rates to percentages.

S ❸ Understand situation given and express the degree of crowding of the bus as a percentage using the tape diagram and table.
T Using the tape diagram and the table to confirm students' conversion from rate to percentage.
S Learn that a graph needs to be arranged to have the scale with 100 marks in order to convert from rate to percentage.

5 Problem involving calculating rate and converting rate to percentage.

T/S ❷ Read and understand the situation.
S ❶ Express the rate of each type of vehicle to the total number of vehicles.
T Confirm students expression of rate.
S ❷ Calculate the total percentage of all the vehicles.
T Confirm that percentage is used to express a certain quantity per 100, having 100 as the total.
TN Teacher should emphasise that the total of all the percentages listed down should be 100 %.

6 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

7 Important Point

T/S Explain the important point in the box .

8 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Rate and Graph **Topic:** Percentages **Lesson Number:** 1 of 2

MT: Let's express various rates in percentages

Review

MT

❶ Bus Capacity → 50 Passengers
Actual Passengers → 40 passengers

❶ 40 ÷ 50 = 0.8

❷ i. Total 50 passengers → Consider it as 1
Partial 40 passengers → Considered as 0.8

ii. Total 50 passengers → Consider it as 100
Partial 40 passengers → Considered as 80

2 times
40 ÷ 50 = 80 ÷ 100
2 times

Decimal number Basic Quantity = 1
Percentage Basic Quantity = 100

Decimal Number ×100 = Percentage

❸ Passengers: 0, 40, 50 (People); 0, 0.8, 1
Percentage: 0, 80, 100(%)

Number of passengers (people)	40	÷50	50	÷50
Ratio (decimal numbers)	?	×100	1	×100
Percentage (%)	?		100	

40 ÷ 50 × 100 = 80 (%)

❷ Research on Vehicles on the road

	Number of vehicles	Percentage (%)
Cars	63	45
Trucks	35	25
Motorcycle	21	15
Buses	7	5
Others	14	10
Total	140	100

Summary

We often express a ratio by making the basic quantity 100.
This expression is called percentage.
The ratio 0.01, which is a decimal number, is called 1 percent and is written as 1%.
Percentage = Ratio x 100

Unit 15

Unit: Rates and Graphs
Sub-unit 2: Percentages
Lesson 2 of 2

Textbook Page : 198 and 199
Actual Lesson 138

Lesson Objective

- To understand how to express the quantities that exceed 100 %.

Prior Knowledge

- Rate, Percentage

Preparation

- Chart of table in the exercise

Assessment

- Calculate the degree of crowding in a given situation. F
- Think about how to express percentages that exceeds 100 %. F
- Solve the exercises correctly. S

Teacher's Notes

- Teacher can use a band graph and table as in the previous lessons to explain the concepts.
- If students are not clear with the term 'the degree of crowdedness' a teacher can use a term more common such as 'vehicle capacity'.

2 Patrick and his friends kept a record of the vehicles on the road in front of their school for 20 minutes.

Record of Type of Vehicles

	Number of vehicles	Percentage (%)
Cars	63	45
Trucks	35	
Buses	21	
TAXI	7	
Others	14	
Total	140	

① Let's express the rate of each type of vehicle to the total number of vehicles.
② What is the total of all the percentages?

Exercise

Let's change the following rate from decimal numbers to percentages, and from percentages to decimal numbers.

① 0.75 ② 0.8 ③ 0.316 ④ 16 % ⑤ 2 %

Rates Larger than 100 %

3 Conference rooms in Steven's guest house can hold 120 people. Let's find the degree of crowding in each conference room.

① Find the degree of crowding for the Kumul conference room.
108 ÷ 120 × 100 = 90 (%)
② Find the degree of crowding for the Muruk conference room.
144 ÷ 120 × 100 = 120 (%)

Today's Number of guests in conference rooms.
Kumul : 108 guests
Muruk : 144 guests

When the number of guests is more than the capacity, the percentage is larger than 100 %.

198 = □ × □

Exercise

Investigate the degree of crowding on the bus for one day.

Number of Passengers and Capacity of the Bus

	AM 8:00	AM 10:00	Afternoon
Number of passengers (people)	65	18	26
Capacity (people)	50	50	50

1.3 (130 %) 0.36 (36 %) 0.52 (52 %)

① Let's express the degree of crowding at each time.
② At what time is the bus most crowded?
8:00 AM

4 Henry made 1 run in 4 turns at batting in a softball game. The rate of the total number of runs to bats is called **batting average**.

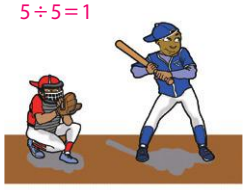
① Let's find Henry's batting average.

Runs		Bats		Batting average
1	÷	4	=	0.25

Result of Softball

	Bats	Runs
Henry	4	1
Takale	5	2
Sam	5	5

② Let's find the batting average for Takale and Sam's batting average.
Takale: 2 ÷ 5 = 0.4
Sam: 5 ÷ 5 = 1



Batting average is to use one of the evaluation criteria for softball or baseball players.

□ – □ = 199

Lesson Flow

1 Review the previous lesson.

2 Find the rate that expresses the degree of crowdedness in a hotel.

T Introduce the Main Task. (Refer to the BP)
T/S 3 Read and understand the situation.
S 1 Calculate the degree of crowdedness in the Kumul conference room.
S 2 Calculate the degree of crowdedness in the Kasawari conference room.
T Confirm students' answers.

3 Important Point

T/S Explain the important point in the box .

4 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

5 Calculate batting average in a softball game.

T/S 4 Read and understand the situation.
S 1 Finding the batting average for Henry.
T Further express the answer 0.25 to percentage as $0.25 \times 100 = 25$ %.
S 2 Calculate the batting average for Takale and Sam.
T Instruct and assist students to express their answers as percentages.

6 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

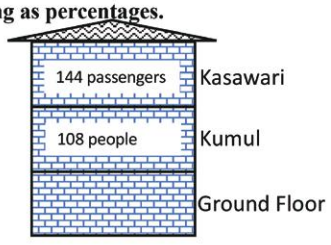
Sample Blackboard Plan

Date: **Unit:** Rate and Graph

MT: Let's find ways on how to express the quantities that exceed 100%.

MT

3 Let's find the degree of crowding in the building as percentages.



1 Degree of crowding for the first floor.
$108 \div 120 \times 100 =$ 90 (%)

2 Degree of crowding for the second floor.
$144 \div 120 \times 100 =$ 120 (%)

Topic: Percentages

When the number of people is more than the capacity, the percentage is larger than 100%.

4 Calculating Batting average

Result of Baseball

	Bats	Runs
Henry	4	1
Taku	5	2
Kunai	5	5

1 Batting average of Henry

Runs ⋮ 1 ÷ Bats ⋮ 4 = Batting average ⋮ 0.25

$0.25 \times 100 =$ 25%

2 Batting average of Taku and Kunai

1. Taku: $2 \div 5 = 0.4$
$0.4 \times 100 = 40\%$

Lesson Number: 2 of 2

2. Kunai:
$5 \div 5 = 1$
$1 \times 100 = 100\%$

Exercise

Investigate the degree of crowding on the bus for one day.

Number of Passengers and Capacity of the Bus

	a.m. 8	a.m. 10	Afternoon
Number of passengers (people)	65	18	26
Capacity (people)	50	50	50

① 8am: $65 \div 50 = 1.3$ *or* 130%
10am: $18 \div 50 = 0.36$ *or* 36%
Afternoon: $26 \div 50 = 0.52$ *or* 52%
② Most crowded at 8am

Summary

- When a compared quantity is larger than a basic quantity, the percentage becomes larger than 100%.
- When a compared quantity is equal to the basic quantity, the percentage is equal to 100%

Unit 15

Unit: Rates and Graphs
Sub-unit 3: Problems Using Rates
Lesson 1 of 3

Textbook Page : 200
Actual Lesson 139

Sub-unit Objectives

- To understand how to find compared quantity and basic quantities.
- To deepen ones understanding about how to solve discount problems that involves percentages.

Lesson Objective

- To think about how to find the compared quantity when the base quantity and the rate are given.

Prior Knowledge

- Previous two sub units on 'the rate' and 'percentages'

Preparation

- Chart of the table, tape diagram and number line

Assessment

- Think about how to solve problems using rates. F
- Convert percentage to decimal numbers. F
- Solve the exercises correctly. S

Teacher's Notes

In activity 2 remind the students that when changing percentage to decimal numbers, we divide by 100.

3 Problems Using Rates

Problems of Finding Compared Quantities

1 Jonah is painting a wall that has an area of 24 m². He has painted 25 % of the wall. How many m² did he paint?

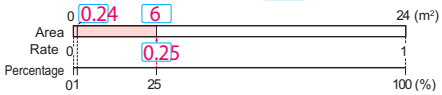
1 Let's find by using these ideas.

① If he painted 24 m², it would be 100 % of the total area.

② 1% of the area is 24 ÷ 100 = 0.24

③ 25 % of the area is 0.24 × 25 = 6.

	Base quantity	1%	Compared quantity
Area (m²)	24	0.24	?
Percentage (%)	100	1	25
	①	②	③



2 Find by changing 25 % to a decimal number. Answer: 6 m²

24 × 0.25 = 6

Base quantity, Rate, Compared quantity

Area (m²)	24	?
Rate	1	0.25

×0.25 ×0.25

Compared quantity = Base quantity × Rate

Exercise

1 In a lottery, 5 % of the tickets are prize winning tickets. If they make 80 tickets, how many prizes will be needed?
80 × 0.05 = 4 They need 4 prizes

2 A conference room has a capacity of 80 guests in each row. When the degree of crowding is 110%, how many guests are there in each row? 80 × 1.1 = 88
There are 88 guests

200 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Understand how to find the 'compared quantities'.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T/S ❶ Read and understand the situation.
S ❶ Find the compared quantity by using the three ideas given.
TN Refer to blackboard plan for calculation.
1. 24 m² = 100 % of the total area painted.
2. 1 % of the area painted is = 24 ÷ 100 = 0.24
3. 25 % of the area is 0.24 × 25 = 6
S Use the band graph and the table to help find the compared quantity.

3 Understand how to convert percentage to decimal numbers.

S ❷ Convert 25 % into decimal number and solve the problem.
TN Students can find the compared or partial quantity using the formula
Compared quantity = Base quantity × rate

4 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Rate and Graph **Topic:** Problems Using Rates **Lesson Number:** 1 of 3

Main Task: Let's investigate how to find basic and compared quantities.

Review

MT

❶

	Basic quantity	1 %	Compared quantity
Area (m²)	24	0.24	?
Percentage (%)	100	1	25
	①	②	③

❶ Let's find the compared quantity using the ideas:
① If is painted 24m², it would be 100% of the total area.
24m² = 100% of the total area painted.

② 1% of the wall is 24 ÷ 100 = 0.24 m^2.

③ 25% of the area 0.24×25 = □.

□ = 0.24×25
= 6 m^2

❷ Find compared quantity by changing 25% to a decimal number.

Area (m²)	24	?
Ratio	1	0.25

× 0.25 ×0.25

24 × 0.25 = 6

Basic quantity Ratio Compared quantity

Compared quantity = basic quantity × ratio

Exercise

1. 5% of 80, 80 x 0.05 = 4 prizes are needed
2. 80 x 1.1 = 88 guests.

Summary

Finding the compared or partial quantity, we use the formula:
Compared quantity ÷ Basic quantity = Ratio

Unit 15

Unit: Rates and Graphs
Sub-unit 3: Problems Using Rates
Lesson 2 of 3

Textbook Page : 201
Actual Lesson 140

Lesson Objective

- To think about how to find compared quantities in the problems which involves rate.

Prior Knowledge

- Problems of finding compared quantities

Preparation

- Advertising leaflets and posters including descriptions about discounted items

Assessment

- Understand and explain the meaning of discount in a quantity. F
- Calculate the discounted quantity from a basic quantity using the formula 'base quantity × rate = compared quantity. F
- Solve the exercises correctly. S

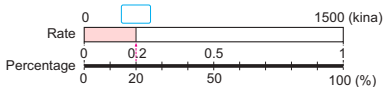
Teacher's Notes

The compared quantity can be calculated as 'Base quantity × Rate = Compared quantity.'

2 A home centre is having a clearance sale.

1 Sonia's father bought a water tank at a 20 % discount that had an original price of 1500 kina.

How much did he pay less than the original price?



1500 × 0.2 = 300

Base quantity | Rate | Compared quantity

Cost	1500	?
Rate	1	0.2

×0.2 ×0.2

2 If the original price of the water tank was 1500 kina, how much did he pay?
Find the cost by using the ideas of these 2 students.

Vavi's Idea

Since it is a 20 % discount,
1500 × 0.2 = 300
is the amount discounted.
1500 − 300 = 1200

Naiko's Idea

Since it is a 20 % discount, he can buy the water tank at 80 % of the original price.
1500 × (1 − 0.2)
= 1500 × 0.8
= 1200

Exercise

When we buy something from the store, we have to pay a GST (Goods & Services Tax) that is 5 % of the sales price. When we buy a bicycle for 500 kina, how much do we have to pay in total?
500 × 0.05 = 25
500 + 25 = 525 We pay 525 kina.

□ − □ = 201

Lesson Flow

1 Review the previous lesson.

2 Find discount amount using the formula 'base quantity × rate = compared quantity'.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T/S 2 Read and understand the situation.
T Assist students to identify the known quantities in the problem:
1. The base quantity.
2. Percentage of the amount that was discounted from the original price.
S 1 Think about how much less Sonia's mother paid than the original price.
T Ask students to work out the discounted amount using the band graph and the table.
S Represent 20 % of 1500 kina.
T Confirm students' answers.

3 2 Find the amount paid after discount.

S Think about how to find the amount paid after discounts.
T Let students to share Vavi's and Naiko's ideas to help them find the ways of calculation.
S Calculate the amount paid after discount using the ideas.

4 Complete the Exercise

S Solve the exercise.
T Confirm students' answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Rate and Graph **Topic:** Problems Using Rates **Lesson Number:** 2 of 3

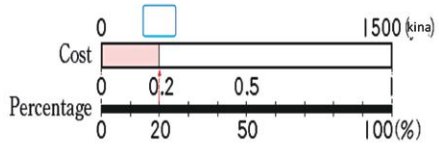
Main Task: Let's express rate when comparing two quantities, 'total quantity' and the other being 'part of the total quantity'.

Review

MT

2 Sonia's father bought a washing machine at a 20% discount that had an original price of 1500 kina.

1 How much did he pay less than the original price?



From Band Graph:

Basic Quantity → 1500 kina
Ratio → 20% = 0.2
Compared Quantity → ?

Using the Table

Cost	1500	?
Ratio	1	0.2

× 0.2 (above), × 0.2 (below)

1500 (basic quantity) x 0.2 (ratio) = ☐ (compared quantity)

2 Finding amount Sonia's father paid.

Vavi's idea
Since it is a 20 % discount,
1500 × 0.2 = 300
is the amount discounted.
1500 – 300 = 1200

Naiko's idea
Since it is a 20% discount, he can buy the water tank at 80 % of the original price.
1500 × (1–0.2)
=1500 × 0.8
=1200

Exercise

When we buy something, we have to pay a consumption tax that is 5% of the sales price. When we buy something for 500 kina, how much do we have to pay in total?

1. 5% *of* 500 *kina* = 500×0.05
= 25 *kina*
Amount to be paid = 500 + 25
= 525 kina

2. We can calculate the sales price and the consumption tax at the same time.
(1+0.05)% of the sales price.
The total amount to be paid is:
500 × (1+0.05) = 525 kina

Summary

Basic Quantity × Ratio = Compared Quantity

Unit 15

Unit: Rates and Graphs
Sub-unit 3: Problems Using Rates
Lesson 3 of 3

Textbook Page : 202
Actual Lesson 141

Lesson Objective

- To think about how to find base quantities when compared quantities and rates are made known.

Prior Knowledge

- Calculating the discounted quantity

Preparation

- Tape diagram, number line and tables

Assessment

- Calculate basic quantity when compared quantity and rate is given. F
- Solve the exercises correctly. S

Teacher's Notes

Rearranging the formula from the previous lesson, the Base quantity can be calculated as,

Compared Quantity ÷ Rate = Base Quantity

Problems Finding Basic Quantities

3 Namari's family has a flower garden that is part of a large field. The area of the garden is 60 m², which is 20 % of the total area of the field.

How many m² is the field?

1 Let's find the area by using these ideas.

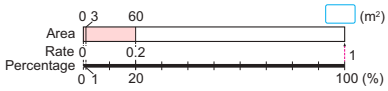
① 20 % of the area of the field is 60 m².

② 1% of the area is 60 ÷ 20 = 3

③ 100 % of the area is 3 × 100 = 300

	Base quantity	1%	Compared quantity
Area (m²)	?	3	60
Percentage (%)	100	1	20

(×100, ÷20 above; ③ ×100, ② ÷20, ① below)



2 Put the total area of the field in m². Write a mathematical expression to calculate the area of the flower garden and then find the correct number for □ using the calculation of 3, 1.

① Since 20 % of the area is 0.2, □ × 0.2 = 60.

② 60 ÷ 0.2 = 300

Base quantity, Rate, Compared quantity

Area (m²)	?	60
Rate	1	0.2

(÷0.2 above and below)

Exercise

1 There is a fundraising where 15 % of the tickets sold are winning tickets. If there are 30 winning tickets, how many tickets are needed in all? 30 ÷ 0.15 = 200 200 tickets needed

2 A boat carried 122 passengers on Friday. The degree of crowding was 120%. What is the required number of passengers the boat should carry? 102 ÷ 1.2 = 85 capacity is 85 passengers

202 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Problems Finding Base Quantity.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T/S ❸ Read and understand the situation.
T Assist students to identify the known quantities, compared quantity and rate.
S Identify from the table that compared quantity is 60 m² and rate is 20 %.
S ❶ Find the area of the field using the three ideas.

1. 20 of the area of the field is 60 m².
2. 1 % of the area is 60 ÷ 20 = 3 m²
3. 100 % of the area is 3 × 100 = 300 m²

T Confirm the three ideas above with the band graph and the table.

3 Calculate the area of the field (Base Quantity).

S ❷ Write an expression to calculate the area of the flower garden.
T Assist students to write the expression using the formula 'compared quantity ÷ rate = base quantity.
S Since 20 % of the area is 0.2, □ × 0.2 = □

2.60	÷	0.2	=	300 m²
Compared quantity		Rate		Base Quantity

4 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

5 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: **Unit:** Rate and Graph **Topic:** Problems Using Rates **Lesson Number:** 3 of 3

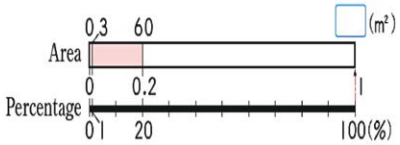
Main Task: Let's think about how to find basic quantity when compared quantity and rates are made known.

Review MT

❸ If the area of the garden is 60 which is 20% of the field, how many is the field?

	Basic quantity	1 %	Compared quantity
Area (m²)	?	3	60
Percentage (%)	100	1	20

(3) × 100 (2) ÷ 20 (1)



❶ Let's find by first finding 1% of the quantity:
(1) 20% of the field is 60 m² .
(2) 1% of the area is, 60 ÷ 20 = 3
(3) 100% of the area is 3 x 100 = 300

❷ (1) Let's find by using the formula
Basic Quantity × Ratio = Compared quantity
□ ×0.2 = 60
60 ÷ 0.2 = □
Compared quantity ÷ Ratio = Basic quantity
= 300 m^2

(2) Using the table

Area (m²)	?	60
Ratio	1	0.2

÷ 0.2 (top) ÷ 0.2 (bottom)

60 ÷ 0.2 = 300 m^2

Exercise

1) Compared quantity = 30 tickets
Ratio = 15% = 0.15
Using the formula:
30 ÷ 0.15 = 200

2) Compared quantity = 102 passengers
Ratio = 120% = 1.2
Using the formula
102 ÷ 1.2 = 85

Summary

Compared quantity ÷ Ratio = Basic quantity

Unit 15

Unit: Rates and Graphs
Sub-unit 4: Graphs Expressing Rates
Lesson 1 of 2

Textbook Page : 203 and 204
Actual Lesson 142

Sub-unit Objective

- To understand the meaning and how to read and draw a band graph and circle graph.

Lesson Objectives

- To understand the meaning and features of a band graph.
- To understand how to read and draw a band graph.

Prior Knowledge

- Simple band graphs

Preparation

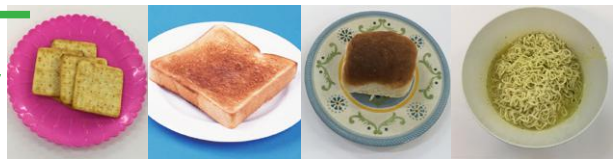
- Band graphs and tables
- Simple calculator

Assessment

- Understand and explain the features of a band graph. F
- Read and draw a band graph. S

Teacher's Notes

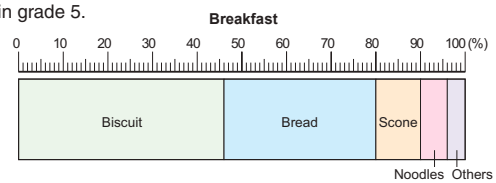
- There could be students answer as 80 % for the choice of bread which is incorrect. Measure the lengths for each band separately to get the percentages.
- Teacher should follow up with students who may make this mistake and advise them to write in mathematical expressions with subtraction.



4 Graphs Expressing Rates

Band Graph

1 The graph below shows the result of breakfast taken by students in grade 5.



1. What is the percentage of biscuit compared to the total number of students? 46 %
2. What percentage is bread, cereal and noodles compared to the total number of students, respectively? Bread 34 %, Scone10 %, Noodles 6 %
3. There are 50 students in the grade 5.
   Let's find the number of students for each type.
   Biscuit 23, Bread 17, Scone 5, Noodles 3, Others 2

A graph that expresses the total as a rectangle-like band is called **band graph**.
With a band graph, it is easy to see the rate of each part of the total because the size of each part is shown by the area of its rectangle.

How to Draw a Band Graph

2 The tables below show the types of traffic accidents causes by students in Eriku, Lae.
Let's draw band graphs to express these numbers.

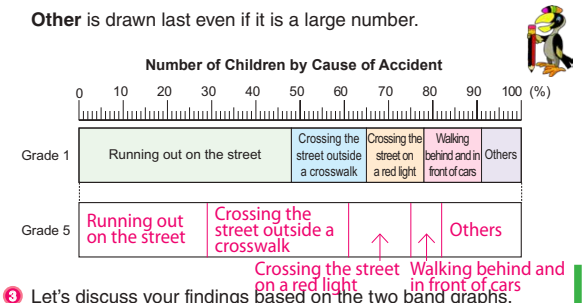
Causes of Accidents in Grade 1

Cause	Number of students	Percentage (%)
Running out on the street	11	48
Crossing the street outside a crosswalk	4	17
Crossing the street on a red light	3	13
Walking behind and in front of cars	3	13
Others	2	9
Total	23	100

Causes of Accidents in Grade 5

Cause	Number of students	Percentage (%)
Running out on the street	8	29
Crossing the street outside a crosswalk	9	32
Crossing the street on a red light	4	14
Walking behind and in front of cars	2	7
Others	5	18
Total	28	100

1. Let's find the rate of each cause of accidents to the nearest hundredth by rounding to the thousandth.
   Then find each percentage and write them in the table.
2. Draw a band graph of the grade 5.
   Other is drawn last even if it is a large number.



3. Let's discuss your findings based on the two band graphs.

□ − □ = 203 204 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Understanding the meaning and how to read a band graph.

T Introduce the Main Task. (Refer to the BP)
T/S ❶ Read and understand the situation.
TN Questions teacher should ask to lead up in understanding the graph:
- What is this graph trying to examine? (Various kinds of breakfast students like)
- What are the kinds of breakfast examined and how many kinds? (There 5 types, namely, biscuit, bread, scone and noodles)
- How can we compare the rate of each part? (We can compare based on the size of each rectangular or band-like sections. The heights the same s we basically look at the width)

3 Find the percentage of each type of breakfast using the band graph.

S ❶ Based on the graph, find the percentage of rice compared to the total number of students.
T Confirm how students find the answer as 46 % using the graph.
S ❷ Find the percentage of bread, scone and noodles compared to the total number of children, respectively.
TN Bread: 80 − 46 = 34 %, scone: 90 − 80 = 10 % and noodles 96 − 90 = 6 %
T ❸ If there are 50 students in Grade 5, let's find the number of students for each type?
S Before calculating, identify the compared and base quantity. The rate is found in ❶ and ❷.
S Using the equation 'base quantity × rate = compared quantity, find the number of children for each type.
TN Biscuit: 50 × 0.46 = 23, bread: 50 × 0.34 = 17, scone: 50 × 0.1 = 5 noodles: 50 × 0.06 = 3

4 Important Point

T/S Explain the important point in the box .

5 Find the rate of quantities.

T/S ❷ Read and understand the situation.
S ❶ Read the situation and find the percentage of students for each cause of accident.
TN Assist students to use the formula 'compared quantity ÷ base quantity × 100 = percentage'.
e.g. for first grade in the first table,
11 ÷ 23 × 100 = 48 % or 11 ÷ 23 = 0.48 × 100 = 48 %

6 Draw a band graph using the information in the completed table from ❶.

T Let students to determine how big the graph should be according to the information given.
S ❷ Construct the graph.
TN The graph should contain a title, scales, colour each rectangular section with a different colour pencil and label each section corresponding to each cause of accident.

7 Summary

T What have you learned in this lesson?
S Present ideas on what they have learned.
T Use students' ideas to confirm the important concepts of this lesson.

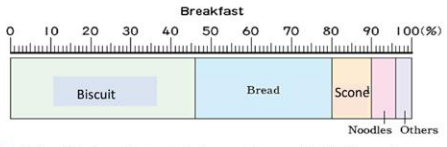
Sample Blackboard Plan

Date: **Unit:** Rate and Graph **Topic:** Graphs Expressing Rates **Lesson Number:** 1 of 2

Main Task: Let's investigate the features of a band graph and draw one.

A graph that expresses the total as a rectangle-like band is called **band graph**.

❶ Results of breakfast by children in Gr. 5.



❶ % of biscuit to total number of children is 46 %
❷ % of bread → 80 − 46 = 34%
% of scone → 90 − 80 = 10%
% of noodles → 96 − 90 = 6%

❸ If there are 50 children in Gr. 5, let's find the number of children for each type.
Biscuit → 50×0.46 = 23 students
Bread → 50×0.34 = 17 students
Scone → 50×0.1 = 5 students
Noodles → 50×0.06 = 3 students

How to Draw a Band Graph

❷ ❶ Complete the table by finding the ratios.

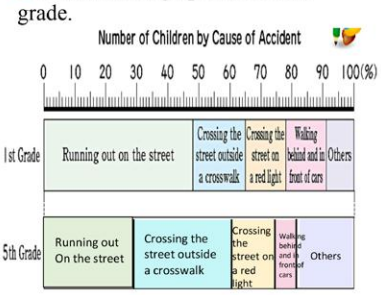
Causes of Accidents the First Grade

Cause	Number of children	Percentage (%)
Running out on the street	11	48
Crossing the street outside a crosswalk	4	17
Crossing the street on a red light	3	13
Walking behind and in front of cars	3	13
Others	2	9
Total	23	100

Causes of Accidents the Fifth Grade

Cause	Number of children	Percentage (%)
Running out on the street	8	29
Crossing the street outside a crosswalk	9	32
Crossing the street on a red light	4	14
Walking behind and in front of cars	2	7
Others	5	18
Total	28	100

❷ Draw a band graph of the fifth grade.



❸ Discuss the findings on the graph based on two band graphs.

Unit 15

Unit: Rates and Graphs
Sub-unit 4: Graphs Expressing Rates
Lesson 2 of 2

Textbook Page : 205 and 206
Actual Lesson 143

Lesson Objectives

- To understand the meaning and features of a circle graph
- To understand how to read and draw a circle graph.

Assessment

- Understand and explain the meaning of circle graphs. F
- Construct a circle graph. S

Prior Knowledge

- The rate, equation of rates

Preparation

- Circle graph paper with 100 scale, basic calculator and chart on kinds of injury.

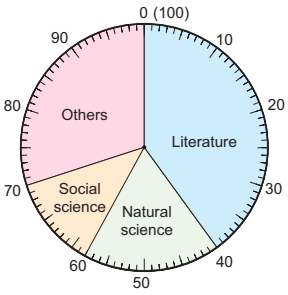
Teacher's Notes

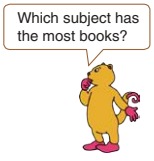
- We can compare circle graphs based on the size of each section separated by two lines drawn towards the centre (radius).
- We read the scale written around the circumference.

Circle Graph

3 The graph below shows the types of library books at Ray's school and their rates.

Library Books





1 What is the percentage of literature compared to the total number of books? 40 %

2 What are the percentages of natural sciences and social science books compared to the total number of books? Natural Science 18 %, Social science 12 %

3 There are 3 600 books at the library.
How many books are there in each field?
Literature: 1 440, Natural Science: 648,
Social science: 432, Others: 1 080

A graph that is drawn as a circle is called a **pie graph**. With a pie graph, it is easy to see the rate of each part of the total because the size of each part is shown by its area.

How to Draw a Circle Graph

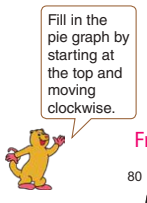
4 The table below shows the types of injuries that occurred during a year at Asaro Primary School. Draw a pie graph to show these numbers.

Types of Injuries

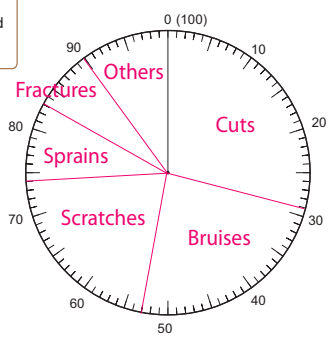
Injuries	Number	Percentage (%)
Cuts	250	29
Bruises	202	24
Scratches	176	21
Sprains	75	9
Fractures	58	7
Others	89	10
Total	850	100

1 Let's find the total rate of each injury to the nearest tenth by rounding to the hundredth. Then find their percentages and write them in the table.

2 Let's draw the pie graph. "Others" is drawn last even if its rate is large.



Types of Injuries



□ − □ = 205 206 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Understanding the meaning and how to read a circle graph.

T Introduce the Main Task. (Refer to the BP)

T Put up the circle graph on the blackboard with its word problem.

T/S ❸ Read and understand the situation.

S ❶ Find the percentage of literature compared to the total number of books using the circle graph.

S ❷ Find the percentages of Natural Science and Social Science compared to the total number of books. Natural Science = 58 − 40 = 18 % and Social Science = 70 − 58 = 12 %

T Confirm students' answers for ❶ and ❷ using the circle graph.

S ❸ Find how many books are there in each field if there are 3 600 books at the library.

TN Let students to use the formula 'base quantity × rate = compared quantity'

S Literature, 3600 × 0.4 = 1440, Natural Science, 3600 × 0.18 = 648, Social Science, 3600 × 0.12 = 432 and Others are 3600 × 0.3 = 1080

3 Important Point

T/S Explain the important point in the box .

4 How to draw a Circle Graph

T/S ❹ Read and understand the situation.

S ❶ Complete the table by finding the rate to the nearest tenth by rounding to the nearest hundredth.

TN Using the formula compare quantity ÷ base quantity = ☐ × 100.
e.g. for the first one, in the table is cuts where 250 ÷ 850 = 0.29 × 100 = 29 %.

S ❷ Draw a circle graph of kinds of injury using the information from the completed table in ❶.

T Confirm students' answers.

5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

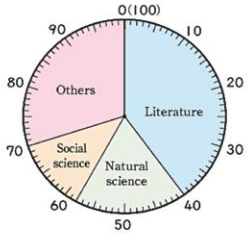
Date: **Unit:** Rate and Graph **Topic:** Graphs Expressing Rates **Lesson Number:** 2 of 2

Main Task: Let's investigate the features of a circle graph and draw one.

Review

MT

❸ Library Books



❶ % of Literature → 40%

❷ % of Natural science → 58 − 40 = 18 %
% of Social science → 70 − 58 = 12 %
% of others → 100 − 70 = 30 %

❸ How many books are there in each field if there are 3600 books at the library?
Literature → 3600×0.4 = 1440 books
Natural science → 3600×0.18 = 648 books
Social science → 3600×0.12 = 432 books
Others → 3600×0.3 = 1080 books

A graph that is drawn as a circles is called circle graph.

How to Draw a circle graph

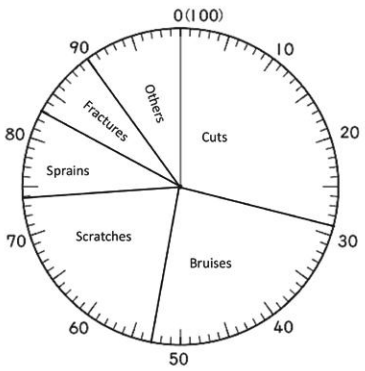
❹ ❶ Fill in the table by finding the ratio to the nearest tenth.

Types of Injuries

Injuries	Number	Percentage (%)
Cuts	250	29
Bruises	202	24
Scratches	176	21
Sprains	75	9
Fractures	58	7
Others	89	10
Total	850	100

❷ Using the information in the table, draw a circle graph.

Kind of Injuries



Unit 15

Unit: Rates and Graphs
Exercise and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 207
Actual Lesson 144 and 145

Lesson Objective

- To confirm their understanding on the concepts they learned in this unit by completing the Exercise and the Evaluation Test confidently.

Prior Knowledge

- All the contents covered in this unit

Preparation

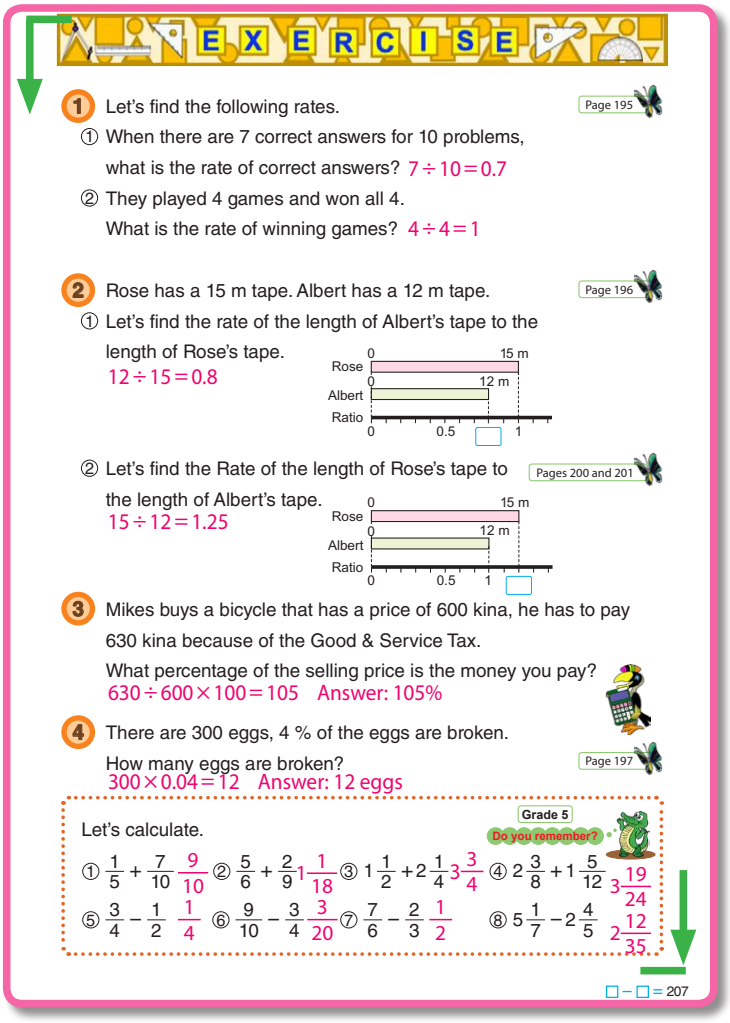
- Evaluation test copy for each student

Assessment

- Complete the Exercise correctly. S

Teacher's Notes

This is the last lesson of Chapter 15.
Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises in preparation for the evaluation test.
The test can be conducted as assessment for your class after completing all the exercises.
Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

1 Let's find the following rates. Page 195

① When there are 7 correct answers for 10 problems, what is the rate of correct answers? $7 \div 10 = 0.7$

② They played 4 games and won all 4. What is the rate of winning games? $4 \div 4 = 1$

2 Rose has a 15 m tape. Albert has a 12 m tape. Page 196

① Let's find the rate of the length of Albert's tape to the length of Rose's tape. $12 \div 15 = 0.8$

② Let's find the Rate of the length of Rose's tape to the length of Albert's tape. $15 \div 12 = 1.25$ Pages 200 and 201

3 Mikes buys a bicycle that has a price of 600 kina, he has to pay 630 kina because of the Good & Service Tax.
What percentage of the selling price is the money you pay?
$630 \div 600 \times 100 = 105$ Answer: 105%

4 There are 300 eggs, 4 % of the eggs are broken. Page 197
How many eggs are broken?
$300 \times 0.04 = 12$ Answer: 12 eggs

Grade 5 Do you remember?

Let's calculate.

① $\frac{1}{5} + \frac{7}{10}$ $\frac{9}{10}$ ② $\frac{5}{6} + \frac{2}{9}$ $1\frac{1}{18}$ ③ $1\frac{1}{2} + 2\frac{1}{4}$ $3\frac{3}{4}$ ④ $2\frac{3}{8} + 1\frac{5}{12}$ $3\frac{19}{24}$

⑤ $\frac{3}{4} - \frac{1}{2}$ $\frac{1}{4}$ ⑥ $\frac{9}{10} - \frac{3}{4}$ $\frac{3}{20}$ ⑦ $\frac{7}{6} - \frac{2}{3}$ $\frac{1}{2}$ ⑧ $5\frac{1}{7} - 2\frac{4}{5}$ $2\frac{12}{35}$

□ − □ = 207

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN 1 Finding rates.
2 Word problem involving rates.
3 Finding the percentage of selling price.
4 Deriving rate from the word problem.

2 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assessment for your class after finishing all the exercises as a seperate lesson.

S Complete the Evaluation Test.

End of Chapter Test **Date:**

Chapter 15: Rates and Graphs	Name:	Score / 100

1. Convert; [4×5 marks=20 marks]
(1) 0.64 into percentage (2) 82.5 % to decimal

Answer: 64 % Answer: 0.825

2. Fill in the ☐
(1) 60 % of 45 kg is ☐ kg. (2) ☐ % of 640 people is 288 people.

Answer: 27 Answer: 45

3. Farmers harvested 7800 kg of peanuts in the last year. For this year, they harvested peanuts less than last year by 30 %. Find the weight of peanuts harvested in this year.
[10 marks for maths expression and 10 marks for the answer]

Mathematical Expression: $7800\times(1-0.3)=5460$

Answer: 5460 g

4. Boys are 48 % in a school. There are 360 boys in the school.
How many students are there altogether in the school?
[10 marks for maths expression and 10 marks for the answer]

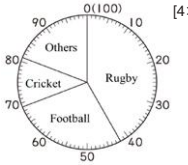
Mathematical Expression: $360\div0.48=750$

Answer: 750 students

5. The pie chart shows the result of a research on students' favorite sports in a school.
The number of students is 700 in the school.
Find the percentage and number of students for Rugby and Cricket. [4×5 marks=20 marks]

Rugby: 42 %, 294 students

Cricket: 12 %, 84 students



290

End of Chapter Test **Date:**

Chapter 15: Rates and Graphs	Name:	Score / 100

1. Convert; [4×5 marks=20 marks]

(1) 0.64 into percentage

Answer:

(2) 82.5 % to decimal

Answer:

2. Fill in the ☐

(1) 60 % of 45 kg is ☐ kg.

Answer:

(2) ☐ % of 640 people is 288 people.

Answer:

3. Farmers harvested 7800 kg of peanuts in the last year. For this year, they harvested peanuts less than last year by 30 %. Find the weight of peanuts harvested in this year.

[10 marks for maths expression and 10 marks for the answer]

Mathematical Expression:

Answer:

4. Boys are 48 % in a school. There are 360 boys in the school.
How many students are there altogether in the school?

[10 marks for maths expression and 10 marks for the answer]

Mathematical Expression:

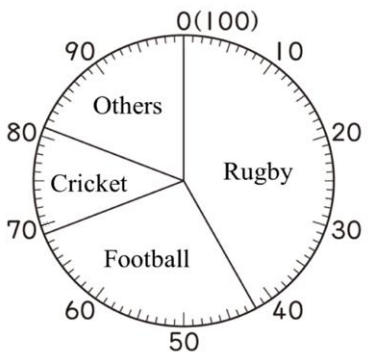
Answer:

5. The pie chart shows the result of a research on students' favorite sports in a school.
The number of students is 700 in the school.
Find the percentage and number of students for Rugby and Cricket.

[4×5 marks=20 marks]

Rugby: ☐ %, ☐ students

Cricket: ☐ %, ☐ students

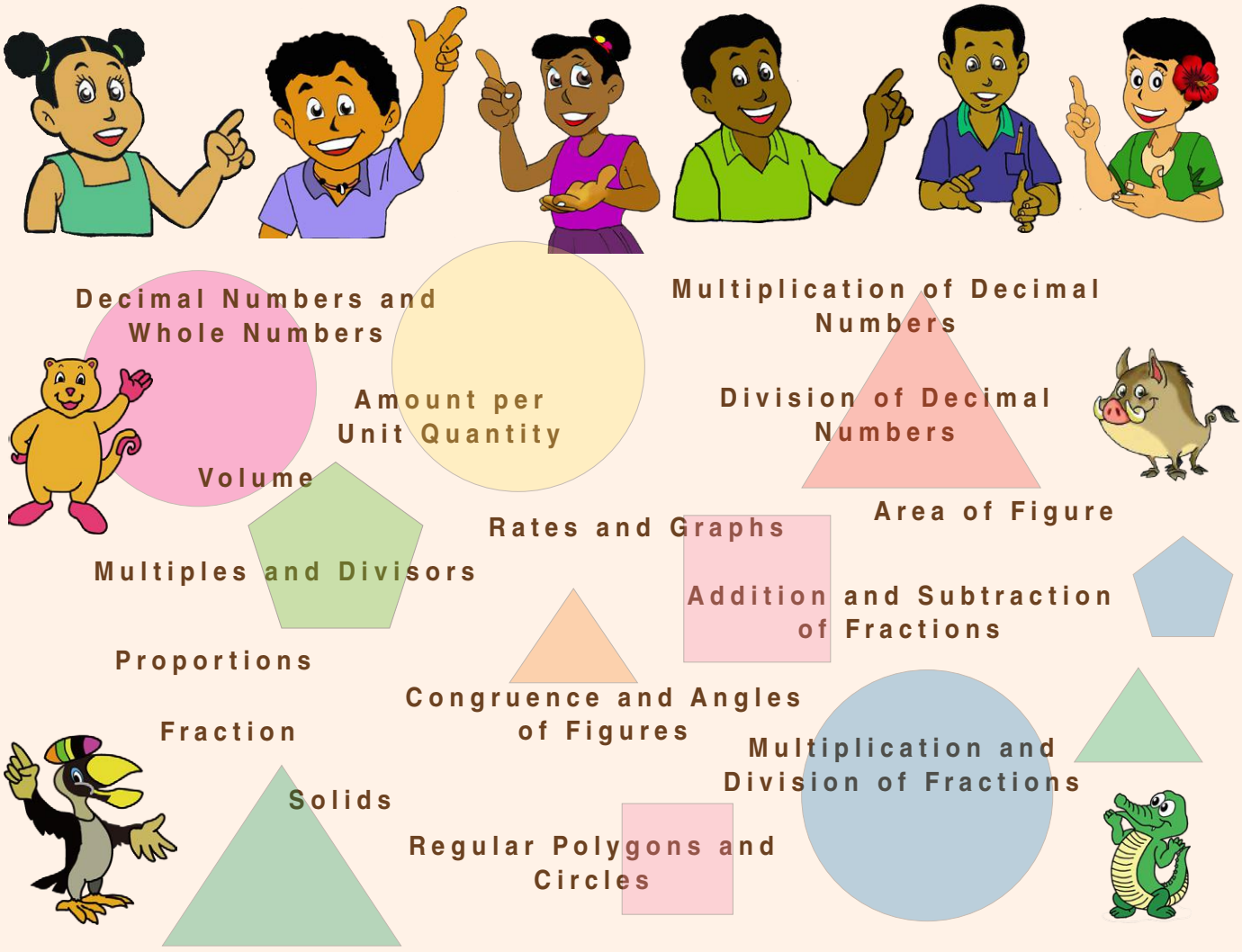


Chapter 16 Summary of Grade 5

This chapter is a summary of all the contents in Grade 5.

It is important for the students to acquire the mathematical knowledge and skills in Grade 5. Students have used various procedures and processes to deepen their understanding of mathematical concepts in problem solving and calculation methods in this grade level.

Various problems learned in Grade 5 are included in this chapter, so give sufficient time to students to solve all the problems.



Unit 16

Unit: Summary of Grade 5
Topic 1: Applying Mathematics in Daily Life
Lesson 1 of 5

Textbook Page : 208 and 209
Actual Lesson 146

Lesson Objective

- To relate and apply mathematical knowledge to daily life.

Prior Knowledge

- Large numbers, Multiplication of decimal numbers

Preparation

- A table for 1

Assessment

- Think about how to calculate the amount of water needed to keep the water clean applying the mathematical knowledge. F S

Lesson Flow

1 Think about how many litres do we need to make the water clean when the rice water is poured down four times.

T/S 1 Read and understand the situation.
T Introduce the Main Task. (Refer to the BP)
S Rice is washed 4 times and the rice water is poured away.
S When the rice water is poured the first time down the drain, it must be mixed with water to make it clean.
T How much water did she use to make the water clean the first time?
S She used water from 0.9 cup of bathtub which contains 300L of water to make the water clean.

16 Summary of Grade 5

Applying mathematics in daily life

Different types of garbage come from the kitchen every day. There is much more garbage than packing materials and vegetables. Water used to wash rice, leftover noodle soup, tea and the oil used to fry fish will all eventually reach rivers, seas and the ocean. As bodies of water are polluted, fish and other living things will no longer be able to survive.

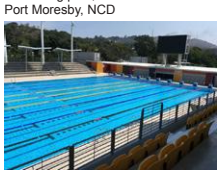
1 When I wash rice, I wash it four times and pour away the rice water. When this rice water is poured the first time down the drain, it must be mixed with water to make it clean. I use water from 0.9 cup of a bathtub which contains 300 L of water to make the water clean. The table below shows the amount of water to make the water clean. When the rice water is poured down four times, how many L do we need to make the water clean?

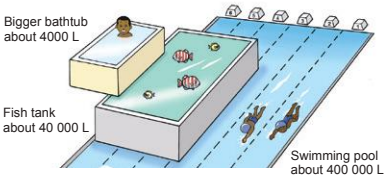
270 + 270 + 180 + 150 = 870 L

Amount of Water to Clean Rice Water

Number of washing of rice	1	2	3	4
Amount of water to clean rice water(cups)	0.9	0.9	0.6	0.5
Amount of water (L)	270	270	180	150

Swimming pool, Port Moresby, NCD





Camp Welch River, Central Province

Jais Aben, Madang Province

2 A bowl of noodle soup is poured down the kitchen sink. About 750 L of water is needed to make the leftover soup clean enough for fish to survive. If a person pours a bowl of noodle soup down the drain every day for a year, how much is the amount of water needed to make the soup clean?

750 × 365 = 273 750 L

3 A table spoon of oil is 15 mL. When this oil is poured down the drain, it must be mixed with about 5100 L of water to make the water clean. 5 100 ÷ 15 = 340.

1 How much water is needed as multiple of the oil?
for every ml of oil, we need 340 L of water.
2 If we use 450 mL of cooking oil in a pot and pour it directly down the drain, how much water will be needed to clean this oil?
340 × 450 = 153 000 L of water needed.

Let's think about what we can do to keep the water clean.

208 = □ × □

□ − □ = 209

Lesson Flow

S Let's think about how to calculate the amount of water in liters to clean rice water the first time.
0.9×300=270

T Have students to use the idea to complete the table by filling the amount of water in litres the second, third and finally the fourth time.

2 Think about the amount of water needed to make the soup clean when a bowl of coconut soup is poured down the kitchen sink.

T/S 2 Read and understand the situation.

S When a bowl of coconut soup is poured down the kitchen sink, about 750 litres (L) of water is needed to make the leftover soup clean.

T If a person pours a bowl of soup down the drain every day for a year, how much amount of water is needed to make the soup clean?

T Have the students to think about how many days in a year?

S 365 days is 1 year.

S Let's think about how to work out the amount of water in litres to make the soup clean for a year?
750×365=273750

3 Think about how much water is needed to a millilitre of oil?

T/S 3 Read and understand the situation.

S A table spoon of oil is 15 mL and when it is poured down the drain, it must be mixed with 5100 L of water to make the water clean.

T What are we asked to find?

S We are asked to find how much water is needed to clean 1millitre of oil?

S There are two different units used to measure liquid, (oil 15 mL) and water (5100 Litres)

S Calculate how many millilitres of water is equal to 5100 litres? (Hint: 1000 mL=1 Liter)
5100×1000=5 100 000

T What kind of operation do we use to find the multiple of oil?
5 100 000÷15=340000
Ans: 340 000 mL (340 L) of water is mixed to clean 1 mL of oil.

T If we use 450 mL of peanut oil in a pot and pour it directly down the drain how much water will be needed to clean this oil?

S 450×340 000=153 000 000
Ans: 153 000 Litres (L)

Sample Blackboard Plan

Date: **Unit:** Summary of the Fifth Grade **Topic:** Application of mathematical knowledge to daily life **Lesson Number:** 1 of 5

Main Task: Let's think about what we can do to keep the water clean.

1 How many liters of water do we need to make the rice water clean?

Amount of Water to Clean Rice Water

Number of washing of rice	1	2	3	4
Amount of water to clean rice water(cups)	0.9	0.9	0.6	0.5
Amount of water (L)	270	270	180	150

270 + 270 + 180 + 150 = 870 L

2 How much amount of water is needed to make a soup clean?
750 x 365 = 273 750 L

3 A table spoon of oil is 15mL. When this oil is poured down the drain, it must be mixed with about 5 100 L of water to make the water clean.

1 How much water is needed as multiple of oil?
5 100 ÷ 15 = 340
For every mL of oil, we need 340 L of water.

2 If we use 450 mL of cooking oil in a pot and pour it directly down the drain, how much water will be needed to clean this oil?
340 x 450 = 153 000 L of water

Summary
Summarise based on what the students learned during the lesson

Unit 16

Unit: Summary of Grade 5
Topic 2: Numbers and Calculations
Lesson 2 of 5

Textbook Page : 210 and 211
Actual Lesson 147

Lesson Objective

- To review the strand of number and calculation.

Prior Knowledge

- Changing denominators by using decimal numbers
- How to calculate the multiplication and division of decimals
- How to calculate the addition, subtraction, multiplication and division of fractions

Preparation

- A table for 1

Assessment

- Review the domain of numbers and calculation.
  F S

Numbers and Calculations

1

1 Let's calculate 100 times and $\frac{1}{100}$ of the following numbers.

1 5.18 518, 0.0518 2 0.407 40.7, 0.0407 3 13.4 1340,0.134 4 3600 360 000, 36

3 5 8 11

2 Let's calculate.

1 8×1.6 12.8 2 5×2.2 11 3 32×6.4 204.8
4 2.4×1.5 3.6 5 5.72×8.1 46.332 6 0.4×0.28 0.112
7 $9\div0.5$ 18 8 $48\div1.6$ 30 9 $54\div1.8$ 30
10 $1.2\div0.3$ 4 11 $8.05\div3.5$ 2.3 12 $0.03\div0.15$ 0.2
13 $\frac{3}{4}+\frac{1}{8}$ $\frac{7}{8}$ 14 $\frac{2}{5}+\frac{3}{7}$ $\frac{29}{35}$ 15 $2\frac{1}{8}+1\frac{5}{12}$ $\frac{13}{24}$
16 $\frac{5}{6}-\frac{2}{3}$ $\frac{1}{6}$ 17 $\frac{8}{15}-\frac{4}{9}$ $\frac{4}{45}$ 18 $3\frac{3}{16}-1\frac{7}{8}$ $1\frac{5}{16}$
19 $\frac{3}{7}\times2$ $\frac{6}{7}$ 20 $\frac{3}{2}\times3$ $4\frac{1}{2}$ 21 $\frac{2}{9}\times3$ $\frac{2}{3}$
22 $\frac{3}{5}\div2$ $\frac{3}{10}$ 23 $\frac{4}{7}\div2$ $\frac{2}{7}$ 24 $\frac{8}{9}\div4$ $\frac{2}{9}$

7

3 Let's summarise the properties of whole numbers.

1 How many common multiples of 4 and 6 are there between 50 and 100? four: 60, 72, 84 and 96
2 Let's find the least common multiples and greatest common divisor of the following pairs. Ⓐ LCM: 36, HCD: 6 Ⓑ LCM: 16, HCD: 8
Ⓐ (12, 18) Ⓑ (8, 16)
3 What is the biggest prime number between 1 and 100? 97

8

4 Arrange the following fractions and decimal numbers from the smallest to the largest.

$\frac{4}{5}$ (2) $\frac{17}{8}$ (5) 0.7 (1) 1.6 (3) $1\frac{3}{4}$ (4) 3.08 (6)

5 A 7.2 cm wire weighs 3.6 g.

1 How many g is the weight of 1cm of this wire? $3.6\div7.2=0.5$ answer: 0.5 grams
2 How many g is 3.6 m of this wire?
$0.5\times360=180$ answer:180 grams

3 5

The Secret of □ ÷ 7

Write whole numbers in order in the □ of □ ÷ 7 and calculate the numbers.

$1\div7=$ 0.1428571
$2\div7=$ 0.2857142
$3\div7=$ 0.4285714
$4\div7=$ 0.5714285
$5\div7=$ 0.7142857
$6\div7=$ 0.8571428
$7\div7=$ 1
$8\div7=$ 1.1428571
$9\div7=$ 1.2857142
⋮

$$7\overline{)1.0}\quad 0.1428571\ldots$$
$$\frac{7}{30}\ \frac{28}{20}\ \frac{14}{60}\ \frac{56}{40}\ \frac{35}{50}\ \frac{49}{10}\ \frac{7}{3}$$

The aligned dots indicate to continue.

What do you see?

210 = □ × □

□ − □ = 211

Lesson Flow

1 ❶ Calculate.

T Introduce the Main Task.
(Refer to the Blackboard Plan)

T Have the students to calculate 100 times and $\frac{1}{100}$ of the following number.

S Complete exercise ❶ to ❹.

2 ❷ Calculate.

T Let the students to do calculations for the following questions.

S Complete these selected exercises 1, 7, 13, 16, 19, 22. The rest do for homework.

3 ❸ Summarise the properties of the whole number.

T Ask the students to do activity ❶ to ❸.

S Do the activities.

4 ❹ Arrange fractions and decimals from smallest to largest.

T Let the students to do this activity.

S Do the activities.

5 Calculate how many grams are there in 3.6 m of the wire.

S Use a table to interpret the situation.

S Identify the divisor and dividend from the table.

S Write an expression and think about how to calculate.

T ❶ How many grams is the weight of 1 cm of this wire?

S $3.6 \div 7.2 = 0.5$
Answer: 0.5 grams

T ❷ How many grams is 3.6 m of this wire?

TN 100 centimetre (cm) = metre (m).

S $0.5 \times 360 = 180$
Answer: 180 grams.

6 Solve problem 5 ❶ and ❷.

Sample Blackboard Plan

Date: **Unit:** Summary of the Fifth Grade **Topic:** Numbers and Calculation **Lesson Number:** 2 of 5

Main Task: Let's review the strand of numbers and calculation.

Review

Recap main ideas from previous lesson.

❶ 8×1.6 12.8 ❷ 5×2.2 11 ❸ 32×6.4 204.8
❹ 2.4×1.5 3.6 ❺ 5.72×8.1 46.332 ❻ 0.4×0.28 0.112
❼ 9÷0.5 18 ❽ 48÷1.6 30 ❾ 54÷1.8 30
❿ 1.2÷0.3 4 ⓫ 8.05÷3.5 2.3 ⓬ 0.03÷0.15 0.2
⓭ $\frac{3}{4}+\frac{1}{8}$ $\frac{7}{8}$ ⓮ $\frac{2}{5}+\frac{3}{7}$ $\frac{29}{35}$ ⓯ $2\frac{1}{8}+1\frac{5}{12}$ $3\frac{13}{24}$
⓰ $\frac{5}{6}-\frac{2}{3}$ $\frac{1}{6}$ ⓱ $\frac{8}{15}-\frac{4}{9}$ $\frac{4}{45}$ ⓲ $3\frac{3}{16}-1\frac{7}{8}$ $1\frac{5}{16}$
⓳ $\frac{3}{7}\times 2$ $\frac{6}{7}$ ⓴ $\frac{3}{2}\times 3$ $4\frac{1}{2}$ ㉑ $\frac{2}{9}\times 3$ $\frac{2}{3}$
㉒ $\frac{3}{5}\div 2$ $\frac{3}{10}$ ㉓ $\frac{4}{7}\div 2$ $\frac{2}{7}$ ㉔ $\frac{8}{9}\div 4$ $\frac{2}{9}$

❶ Let's calculate 100 times and $\frac{1}{100}$ of the following numbers.
❶ 5.18 ❷ 0.407 ❸ 13.4 ❹ 3600
518 / 0.0518 40.7 / 0.0407 1340 / 0.134 360000 / 36

❸ Let's summarise the properties of whole numbers.
❶ How many common multiples of 4 and 6 are there between 50 and 100? Four: 60, 72, 84 and 96
❷ Let's find the least common multiples and greatest common divisor of the following pairs.
LCM: 36, HCD: 6 LCM: 16, HCD: 8
Ⓐ (12,18) Ⓑ (8,16)

❸ What is the biggest prime number up to 100? 97

❹ Arrange the following fractions and decimal numbers from smallest to largest.
$\frac{4}{5}$, $\frac{17}{8}$, 0.7, 1.6, $1\frac{3}{4}$, 3.08
(2) (5) (1) (3) (4) (6)

❺ A 7.2 cm wire weighs 3.6 g.
❶ How many g is the weight of 1cm of this wire?
3.6 ÷ 7.2 = 0.5 answer: 0.5 grams
❷ How many g is 3.6 m of this wire?
0.5 x 360 = 180 answer:180 grams

Summary

Summarise based on what the students learned during the lesson

Unit 16

Unit: Summary of Grade 5
Topic 3: Measurement
Lesson 3 of 5

Textbook Page : 212 and 213
Actual Lesson 148

Lesson Objective

- To review what has been learned in measurement per unit quantity, volume of figures and area of shapes.

Prior Knowledge

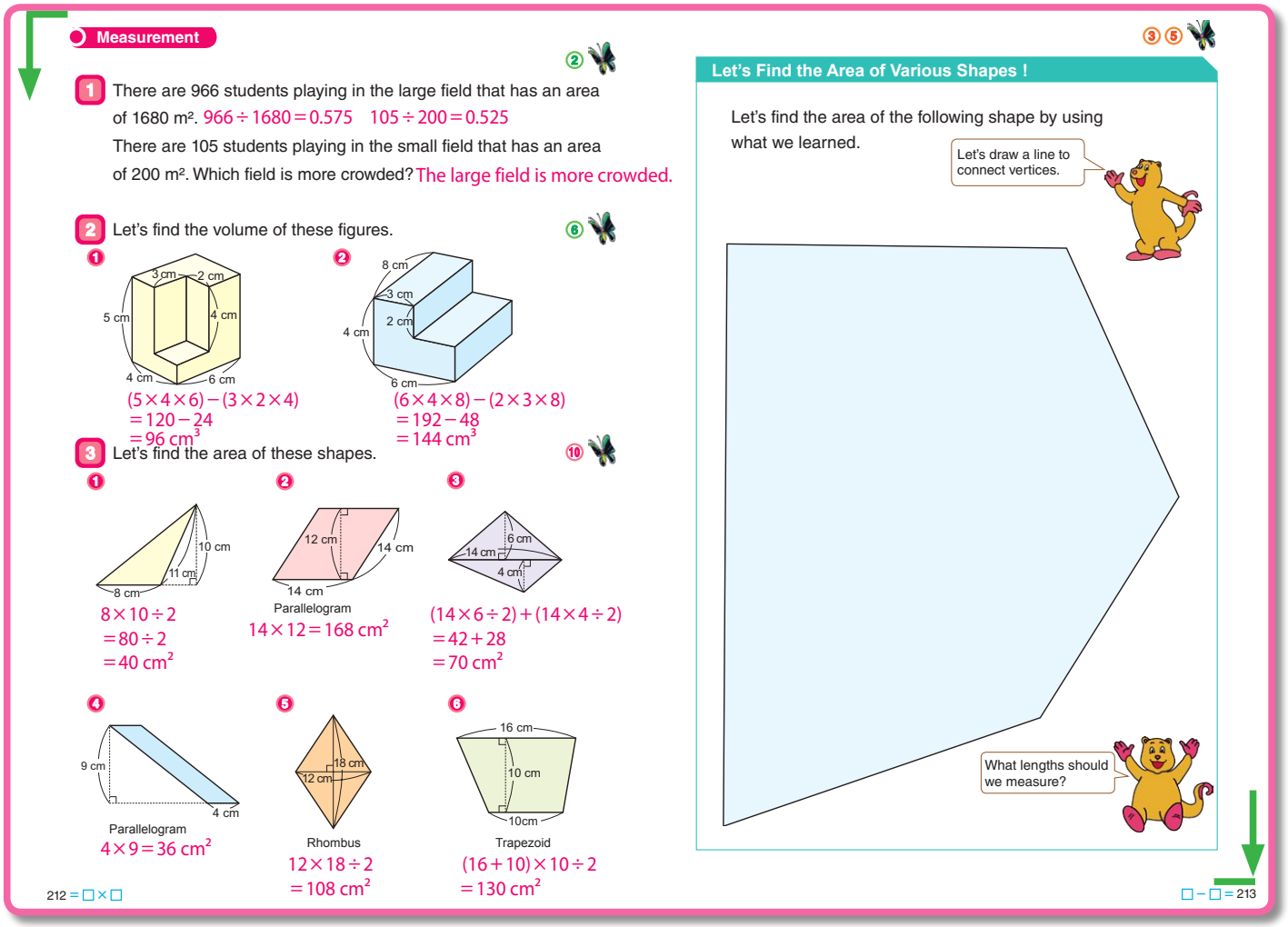
- Measurement per unit quantity
- Volume of figures
- Area of shapes

Preparation

- Work sheets with activities

Assessment

- Review the domain of measurement. F S



Measurement

② 1 There are 966 students playing in the large field that has an area of 1680 m². 966 ÷ 1680 = 0.575 105 ÷ 200 = 0.525
There are 105 students playing in the small field that has an area of 200 m². Which field is more crowded? The large field is more crowded.

⑥ 2 Let's find the volume of these figures.

1 3 cm, 2 cm, 5 cm, 4 cm, 4 cm, 6 cm
(5 × 4 × 6) − (3 × 2 × 4)
= 120 − 24
= 96 cm³

2 8 cm, 3 cm, 2 cm, 4 cm, 6 cm
(6 × 4 × 8) − (2 × 3 × 8)
= 192 − 48
= 144 cm³

⑩ 3 Let's find the area of these shapes.

1 10 cm, 11 cm, 8 cm
8 × 10 ÷ 2
= 80 ÷ 2
= 40 cm²

2 12 cm, 14 cm, 14 cm
Parallelogram
14 × 12 = 168 cm²

3 14 cm, 6 cm, 4 cm
(14 × 6 ÷ 2) + (14 × 4 ÷ 2)
= 42 + 28
= 70 cm²

4 9 cm, 4 cm
Parallelogram
4 × 9 = 36 cm²

5 18 cm, 12 cm
Rhombus
12 × 18 ÷ 2
= 108 cm²

6 16 cm, 10 cm, 10cm
Trapezoid
(16 + 10) × 10 ÷ 2
= 130 cm²

212 = □ × □

③ ⑤

Let's Find the Area of Various Shapes !

Let's find the area of the following shape by using what we learned.

Let's draw a line to connect vertices.

What lengths should we measure?

□ − □ = 213

Lesson Flow

1 ❶ Solve the task.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T Let the student calculate which area is crowded using known knowledge.
S Compare the crowdedness.

2 ❷ Find the volume of the given figures.

S Complete activities ❶ and ❷.

3 ❸ Find the area of the given shapes.

S Complete activities ❶ to ❻.

4 Solve the additional activity.

T Let the students find the area of the following shape using known knowledge.
S Draw lines to make three triangles.
T Have the students to see that the lines show connected vertices.

5 Find the area of the shape.

T Allow students to discuss what lengths they should measure.
S Measure the lengths needed for calculations and finally using area formulas to find the area of the shape.

Sample Blackboard Plan

Date: **Unit:** Summary of the Fifth Grade **Topic:** Measurement **Lesson Number:** 3 of 5

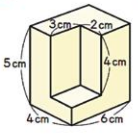
Main Task: Let's find the areas and volumes of various shapes and solids

❶ There are 966 children playing in the field that has an area of 1680 m^2. There are 105 children playing in the middle garden that has an area of 200 m^2. Which one is more

966 ÷ 1680 = 0.575 105 ÷ 200 = 0.525
Therefore, 1680 m^2 field is more crowded.

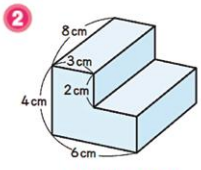
❷ Let's find the volume of these figures.

❶



(5 x 4 x 6) - (3 x 2 4)
= 120 -24
= 96 cm^3

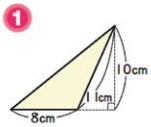
❷



(6 x 4 x 8) - (2 x 3 x 8)
= 192 -48
= 144 cm^3

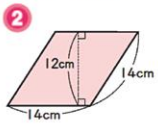
❸ Let's find the area of these shapes.

❶



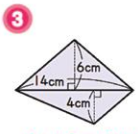
8 x 10 ÷ 2
= 80 ÷2
= 40 cm^2

❷



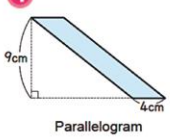
14 x 12 = 168 cm^2
Parallelogram

❸



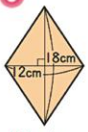
(14 x 6 ÷ 2) + (14 x 4 ÷2)
= 42 + 28
= 70 cm^2

❹



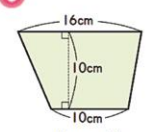
Parallelogram
4 x 9 = 36 cm^2

❺



Rhombus
12 x 18 ÷ 2
= 108 cm^2

❻



Trapezoid
(16 + 10) x10 ÷ 2
= 130 cm^2

Summary

Summarise based on what the students learned during the lesson

Unit 16

Unit: Summary of Grade 5
Topic 4: Shapes and Figures
Lesson 4 of 5

Textbook Page : 214 and 215
Actual Lesson 149

Lesson Objective

- To review what has been learned in geometrical figures.

Prior Knowledge

- Finding the area of various shapes using learned knowledge

Preparation

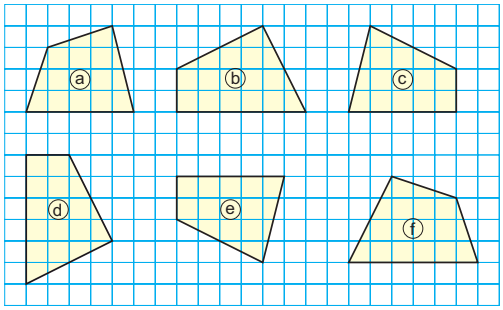
- Work sheets with activities

Assessment

- Review the domain of shapes and figures. F S

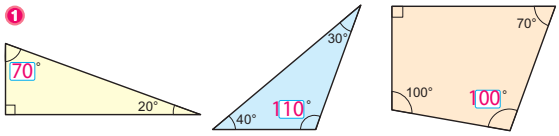
Shapes and Figures

1 Let's find the congruence figures. ④

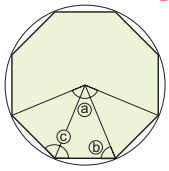


ⓒ and ⓔ, ⓑ and ⓓ

2 Fill the ☐ with a number. ④



3 We draw a regular octagon by dividing the angle around the centre of the circle into 8 equal parts. ⑬



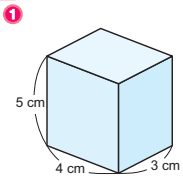
1. What is the size of angle ⓐ? 135°
2. What is the size of angle ⓑ? 67.5°
3. What is the size of angle ⓒ? 135°

4 Let's find the circumference of these circles. ⑬

1. A circle with 4 cm diameter. 3.14×4=12.56 cm
2. A circle with 5 cm radius. 3.14×10=31.4 cm

5 Let's draw the net of these solids. ⑭

1



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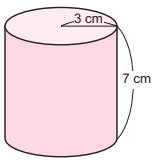
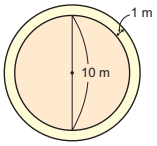


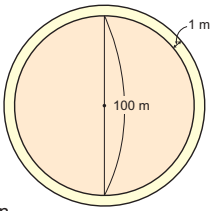
Circles Separated by 1 m

Draw a circle with a 10 m diameter and then draw another circle that is 1 m outside that circle.
How many metres longer is the circumference of the outer circle than the inner circle? 6.28 m



Try to guess the answer first.

Draw a circle that is 1 m outside a circle with a 100 m diameter.
How many metres longer is the circumference of the outer circle than the inner circle? 6.28 m



214 = ☐×☐

☐−☐=215

Lesson Flow

1 ① Find the congruence figures.

T Introduce the Main Task. (Refer to the Blackboard Plan)

T Let the students to think about how to find the congruence figures and share ideas.

S b and d, c and e are congruent because they fit by overlapping exactly on top of one another.

2 ② Calculate the missing angle.

S Calculate the missing angles in ② and ③ and share their workouts.

3 ③ Analyse the interior angle of a regular octagon.

TN ① $360 \div 8 \times 3 = 135$ $\underline{135°}$

② $360 \div 8 = 45$ $180 - 45 \div 2 = 67.5$ $\underline{67.5°}$

③ $67.5 \times 2 = 135$ $\underline{135°}$

4 ④ Find the circumference of the circles.

S Complete activities ① and ②.

5 ⑤ Draw the net of the given solids.

S Complete activities ① and ②.

TN If there is enough time have the students to try and workout circles separated by 1 m.

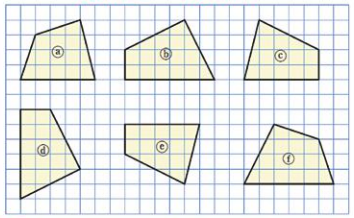
Sample Blackboard Plan

Date: **Unit:** Summary of the Fifth Grade **Topic:** Shapes and Figures **Lesson Number:** 4 of 5

Main Task: Let's find properties of the geometric figures given and calculate the unknown.

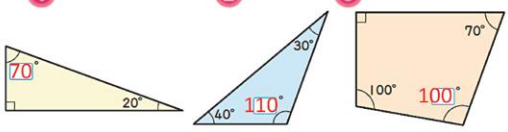
① Let's find the congruence of figures

c and e b and d

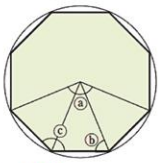


② Fill the ☐ with a number.

① ② ③



③ We draw a regular octagon by dividing the angle around the center of the circle into 8 equal parts.



① What is the size of angle ⓐ ? 135°

② What is the size of angle ⓑ ? 67.5°

③ What is the size of angle ⓒ ? 135°

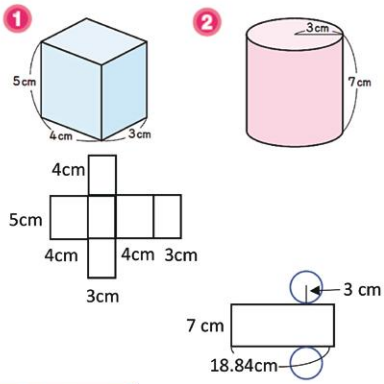
④ Let's find the circumference of these circles.

① A circle with 4 cm diameter. 3.14 x 4 = 12.56 cm

② A circle with 5 cm radius. 3.14 x 10 = 31.4 cm

⑤ Let's draw the net of these solids.

① ②



Summary

Summarise based on what the students learned during the lesson.

Unit 16

Unit: Summary of Grade 5
Topic 5: Relationship among Quantities
Lesson 5 of 5

Textbook Page :
p. 210
Actual Lesson 150

Lesson Objective

- To review on making mathematical relationship among quantities.

Prior Knowledge

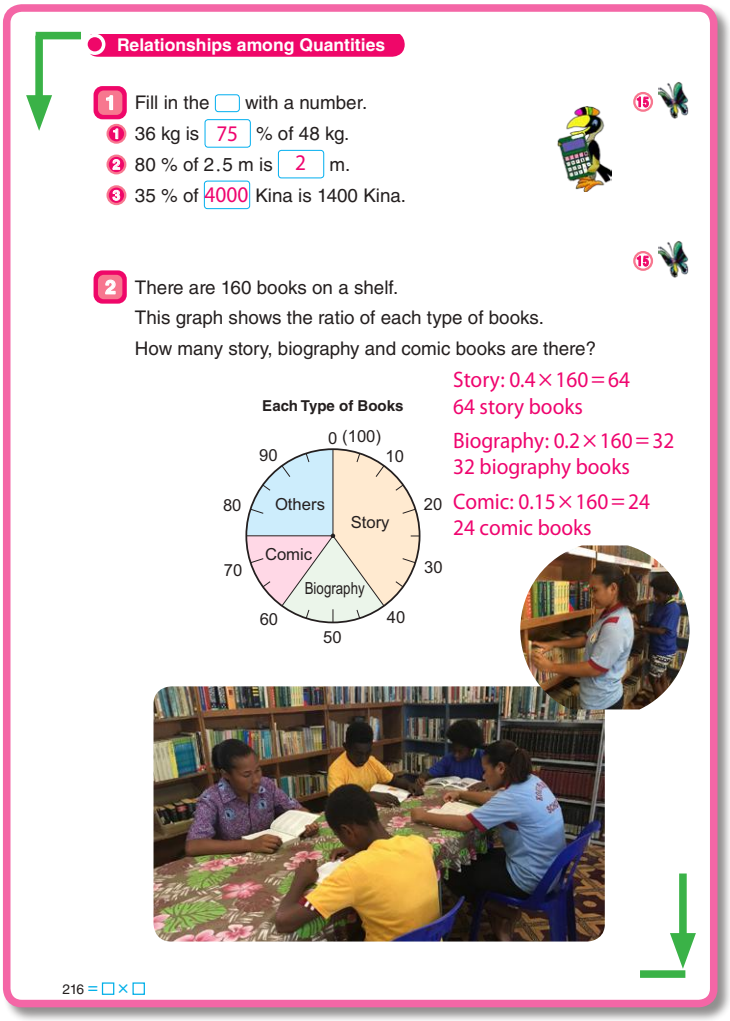
- Finding congruent figures, circumference of circles and drawing nets of solids
- Calculate the missing angle of geometrical figures

Preparation

- Simple calculators, pie chart

Assessment

- Review the domain of relationships among quantities. F S



Lesson Flow

1 ① Complete the task.

T Introduce the Main Task. (Refer to the Blackboard Plan)
S Complete activities ①, ② and ③.
T Let the students to represent a certain quantity as a ratio of 100 first.
S Calculate the percentage of the weight given?
S Find the length in metres.
S Work out what the amount should be in kina.

2 ② Complete the task.

T Let the students to represent a certain quantity as a ratio of 100 first.
S Calculate how many Story books, Biography and Comic books are there.
TN If there is enough time find out how many books are in Others?

Sample Blackboard Plan

Date: **Unit:** Summary of the Fifth Grade **Topic:** Relationships among Quantities **Lesson Number:** 4 of 5

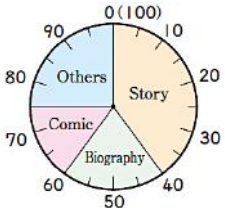
Main Task: Let's find properties of the geometric figures given and calculate the unknown.

Review: Recap main ideas covered in the previous unit.

① Fill the ☐ with a number.

① 36 kg is 75 % of 48 kg.
② 80% of 2.5 m is 2 m.
③ 35% of 4000 Kina is 1400 Kina.

② There are 160 books on a shelf. This graph shows the ratio of each type of books.



How many story, biography and comic books are there?

Story: 0.4 x 160 = 64 64 story books
Biography: 0.2 x 160 = 32 32 biography books
Comic: 0.15 x 160 = 24 24 comic books

Summary

Summarise based on what the students learned during the lesson

Unit 16

Unit: Summary of Grade 5
Supplementary Topic: Mathematics Adventure

Textbook Page : 217 to 221
Topic: 1 and 2

Introduction to Supplementary Topic

Sub-Unit: Math Adventure is a supplimentary topic for students to explore mathemaics skills and ideas through strories. Students will travel some places in the world with Prof. Steven and our friends to learn mathematics ideas from shapes of buildings and global warming issues through world heritage.

Supplementary Topic Objectives

- To apply mathematics knowledge and skills which were learned to solve problems around us.
- To apply daily life experiences to solve problems.

Topic Objectives 1

T1: To calculate volume using top view and bottom pictures or shapes.
T1: To find mean with specific conditions from data.
T2: To find unknown number □ through making mathematical sentencesusing □ to connect problems.
T3: To learn units for large amount of volume.
T3: To think about how many cubic metre equals 1 km^3.
T4: To solve problems using the idea of divisors.
T5: To solve problems by changing fractions to common denominators.

Topic Objectives 2

T6: To develop interest on how people in the past represented fractions in old mathematics documents.
T7: To find areas and volumes of various objects using drawings.
T8: To solve problems using the relationship between proportion and the length of circumference.
T9: To estimate the area of shapes formed by natural shapes.
T10: To find the change of amount per unit quantity using the relationship of proportions.

Preparation

- Copies of enlarged pictures, maps and drawings in the textbook for each topic.

Math Adventure has two parts. Part 1 consists of Topic 1 to 5 and Part 2 with Topics 6 to 10. In the adventure, students will visit world heritage sites in places likeToky, Italy UK, USA and Egypt. They will apply mathematical skills in real life situations in these interesting places as part of their adventure. (See maps below)

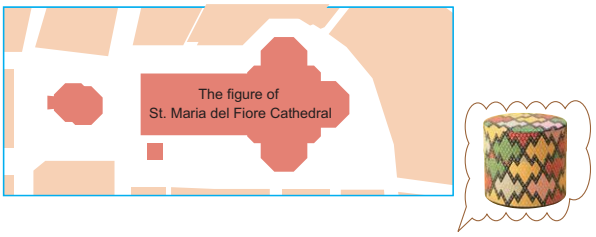
At the end of every topic, there are pieces of a puzzle which will be obtained by cutting out after answering the given question correctly.

Each puzzle is a piece of the key for the adventure and will be completed at the end of the adventure where the puzzles will be placed together to reveal the key.

1 Cathedral from Birds' Eyes

Old city area in Florence, Italy, is approved as one of the World Heritage Sites.
The building which can be seen from anywhere in this city is St. Maria del Fiore Cathedral.

This Cathedral's appearance varies differently depending on the position of the viewer. What kind of shape can we see from the top view?
The most Christian church's top view is cross-shaped. Appearances of buildings is dependent upon the viewer's positions.



Yes, there is a story that the number of chimneys is viewed as one, but actually there are two.

A cylinder also has a circle shape from the top view, but a rectangle from the side view.

I will give you a problem now. If we create a solid which consists of the front view "凵", the side view "田" and the top view "+" using cubic blocks, you can access the fragment key.
The design of solid is on the next page.

Design

A. Front view

		5		
		3		
1		5		1
1		3		1
1	1	5	1	1

B. Side view

1	1	1	1	1
1		1		1
1	1	3	1	1
1		3		1
1	1	5	1	1

C. Top view

		5		
		3		
3	1	5	1	3
		3		
		5		

The numbers in the design indicate the number of blocks used for the corresponding slots.

We can imagine the shape, can't we?
Let's make those shapes.

We did it!

I got the answer without calculation!

Well done. So, divide the numbers of all blocks by the number of slots with numbers in each A, B, and C to get the average for one slots of each.

Why did she get the answer without calculation? Write your reasoning in your exercise book.

Ⓐ
Ⓑ
Ⓒ

• Let's cut out fragments on page 246 and paste on the last page.

Let's go to the next place to find the fragments of the key!

2 World Heritage Sites – Comparing Height

Ⓐ Eiffel Tower

The Eiffel Tower in Paris, France, was built in 1889, when the Paris International exhibition was held. Its roof top height is about 300 metres.

I want to go up there one day.

But, Tokyo Tower is a little bit taller.

Let's find out the heights of the following buildings in World Heritage sites. In this activity, there is a hint to get to another key fragment.

Ⓑ The Leaning Tower of Pisa in Italy:
It has a lean of 5° towards the south.

Ⓒ Big Ben in the England

Ⓓ King Khufu's Pyramid in Egypt

Ⓔ The Statue of Liberty in the United States of America
(the height included a part of plinth)

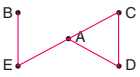
There are 4 sentences below. If the heights of B to E is represented by □, write expressions for calculating their heights.
The height of the 'Eiffel Tower is known.

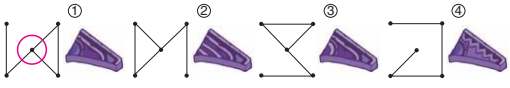
① The height which is 1 metre less than the Leaning Tower of Pisa is 0.18 times of the Eiffel Tower. □ − 1 = 300 × 0.18 55 m
② The height which is 4 times the Statue of Liberty is 72 metres higher than the Eiffel Tower. □ × 4 = 300 + 72 93 m
③ The height of Big Ben is 0.72 metre less than the height which is 1.04 times the Statue of Liberty. □ = 93 × 1.04 − 0.72 96 m
④ If we add the heights of King Khufu's Pyramid and the Leaning Tower of Pisa, it is twice the height of Big Ben. □ + 55 = 96 × 2 137 m

If the height of the Leaning Tower of Pisa is □ m, the height which is 1 metre less than □ m is (□ − 1) m.
The height which is 0.18 times as high as the Eiffel Tower is expressed as 300 × 0.18, therefore, we can make the expression,
□ − 1 = 300 × 0.18
Using this expression, we can get □. 55 m

If the height of The Statue of Liberty is □ m, the height which is 4 times □ is the same as the answer of the addition between 72 and the height of the Eiffel Tower.
Therefore, we can represent it as follows □ × 4 = (The height of Eiffel Tower) + 72 93 m

Likewise, calculate the heights of the 4 buildings and in the order of their heights from tallest, draw lines.
What kind of shapes can we make?





• Let's cut out fragments on page 246 and paste on the last page.

Let's go to the next place to find the fragments of the key!

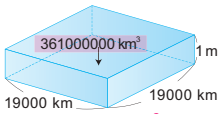
Unit 16

Unit: Summary of Grade 5
Supplementary Topic: Mathematics Adventure

Textbook Page : 222 to 231
Topic: 4 to 6

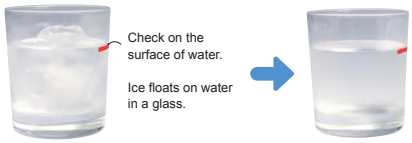
3 Sinking Islands

It is said that Global warming leads to the rise in sea level. It is also predicted by some researchers that the sea level will rise to a maximum of 59 cm in the 21st century. In Maldives, in the Indian Ocean, $\frac{4}{5}$ of their land has only less than 1m altitude from the sea level.
It might sink forever if the sea level continuously rises.
The area of the sea on earth is about 361000000 km².
If we think of the area as a square, the length of one side is about 19000 km.
If we think of the following rectangular prism using this square, what km³ of water is necessary for the sea level to rise by one metre? Let's calculate it.



A large amount of water is necessary. If the sea level rises by one metre, most lands of Maldives will sink.
I wonder where this large amount of water comes from. Is it because of Global Warming? It might be as a result of ice melting in the Arctic Ocean.

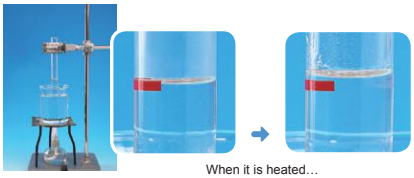
So, let's experiment! Let's add water and ice in a glass and check the surface of the water.



Ah, the surface of water has not risen.

In fact, it is said that one of the causes of the rise in the sea level is "Expansion of the seawater because of Global Warming."

Right. Water expands when it is heated.



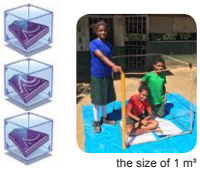
Another cause of rise in the sea level is "Decrease of glacier."
It means that ice on land melts and it flows into the sea.
Let's search how much glacier actually melts.
The glacier on Padagonia icy field in Chile and Argentina melts at a faster speed than any other glacier on the earth.
It is said that in the past 7 years, 42 km² of ice is lost every year.
How many 1 m³ ice cubes have melted over the past 7 years?
This is a hint to find a fragment.

Padagonia icy field

A : 200 billion or less than 200 billion

B : more than 200 billion and less than 250 billion or equal to 250 billion

C : more than 250 billion and less than 300 billion or equal to 300 billion


the size of 1 m³

• Let's cut out fragments on page 246 and paste on the last page.

4 Roman Empire Cities with Water Supply

There was a country named the Roman Empire in the Mediterranean area more than 2000 years ago. This country constructed water bridges combining roads connecting to various places with water pipes to send water. One water bridge of these constructions still exists in France and is approved as a part of World Heritage.

Roman aqueduct (France)

I am surprised that there were water pipes in such far past!

It is amazing that it was constructed by piling stones which enabled water to flow!

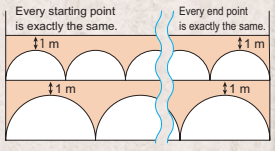
The length of this Water Bridge is 275 m, the height is 49 m and it has 3 levels. The 1st level is supported by 6 arches, the 2nd by 11 and the 3rd by 35.

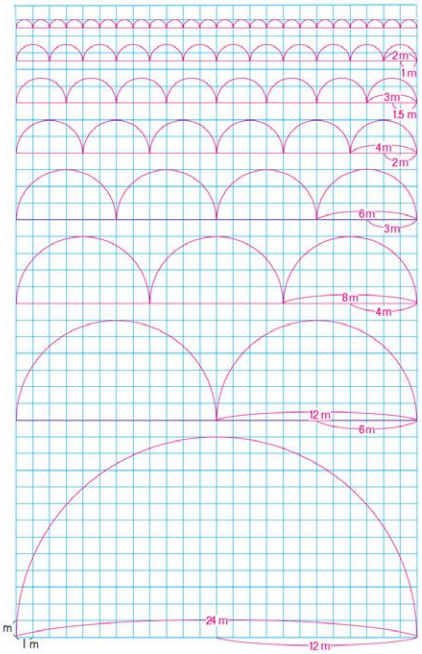
I will tell you a hint to find the key fragment. If you design a water bridge with a length of 24 m, you will find the place of the fragment.

How to design

- The number of arches begins from one in the 1st level and then it increases gradually as the level goes up.
- The width of the arches in each level is the same size and so the total length of every level should be the same.
- The width of the arches should be expressed by a whole number with a unit of "metre".
- The width of the arches in each level is a divisor of 24.
- The shapes of the arches are semicircles and the difference between the highest point of the semicircles in each level and the bridge of the next level is 1 m.

Draw the design using a compass.





You can find a fragment at the number which is an answer of multiplication between the number of arches in 3rd level and the number of arches in 6th levels.

3×8=24

① 22 ② 23 ③ 24 ④ 25

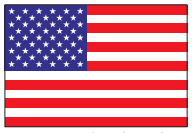
• Let's cut out fragments on page 246 and paste on the last page.

5 Pentagon by Fractions

The shape of stars is frequently used in the national flags in the world.
The United States, which has "The Statue of Liberty" as a part of World Heritage also use stars indicating each state in their national flag.
In Japan, Nagasaki city also has stars in their flag.

The Statue of Liberty

Peace Statue (Nagasaki city, Japan)


The national flag of the USA

Nagasaki city's flag

There is an interesting way to draw a star. It is $\frac{5}{2}$.

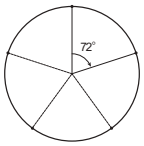
What? How can we draw stars by fractions?

The denominator and the numerator indicate the way to draw it, right?

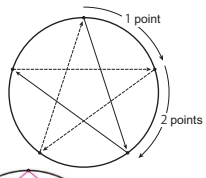
You have an eye on good points. I will show you the way now, so let's do it together.

At first, the numerator (5) indicates that drawing 5 points divides a circle equally into 5 sectors.

A circle has 360 degrees, so $360 \div 5 = 72$, we can divide by 72 degrees for each.

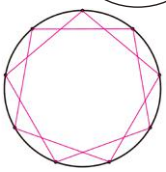


Next, I will explain the meaning of the denominator (2). Decide a starting point and then draw a line connecting the starting point and a point (end point) locating 2 points after the starting point and line connecting the end point with a point locating 2 points after the point again, and continue until it reaches the starting point!



Oh, Yes! We can draw a star.

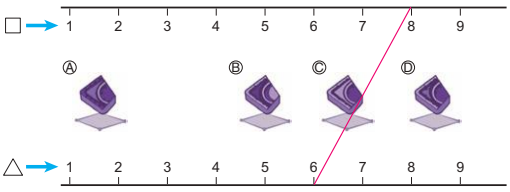
I want to try it by another fraction. How about the case of $\frac{9}{2}$?



Awesome! If we use $\frac{9}{3}$, we can draw a triangle!

$\frac{9}{3}$ reduces to $\frac{3}{1}$. We divide a circle to 3 sectors and draw a line one by one, so it will surely be a triangle.

So, to find the fragment of the key, we should find it by $\frac{\square}{\triangle}$ which enable us to draw a "square". The line between the denominator and the numerator is found in the following diagram. The fragment can be found on the line you drew.



• Let's cut out fragments on page 246 and paste on the last page and make the key completed.

Let's go to the next place to find the fragments of the key!

6 The Oldest Scroll of Mathematics

There are many sites of the ancient Egyptian Royal Dynasty in Egypt. These huge pyramids are all royal sites.

Pyramids (Egypt)

About 3700 years ago, the scribe Ahmose, who worked under a pharaoh, recorded the mathematics knowledge of that period on a papyrus paper scroll.
In 1858, an English explorer Alexander Henry Rhind found the scroll and it was deciphered 20 years later.
The scroll shows questions about various fractions which are written as the sum of different unit fractions.

For example, you express $\frac{2}{3}$ as addition of unit fractions as;

$$\frac{2}{3} = \frac{1}{\square} + \frac{1}{\triangle}$$

Put different numbers in □ and △.

So, we need to express $\frac{2}{3}$ as a sum of different unit fractions.

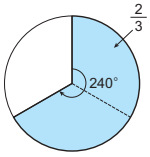
How about putting any number in the blanks. See if it's right or not.

A unit fraction is a fraction where the numerator is 1.

Imagine a circle. How many degrees is $\frac{2}{3}$?

One circle means 360° so dividing it by 3 and two pieces of that are $\frac{2}{3}$.

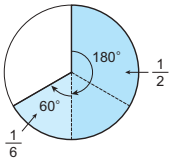
Then, $360 \div 3 \times 2 = 240$ so, it is 240°.



240° is 180° + 60°, right?

Oh, 180° is, $\frac{180}{360} = \frac{1}{2}$. 60° is $\frac{60}{360} = \frac{1}{6}$.

I see! The answer is $\frac{2}{3} = \frac{1}{2} + \frac{1}{6}$.



This is a quiz to find the key fragment.
You can find the hint to the hiding place by expressing $\frac{2}{5}$ as unit fractions.

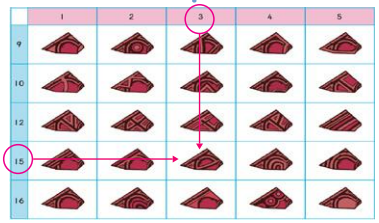
$\frac{2}{5} = \frac{1}{3} + \frac{1}{15}$

Let's study the relationship between fractions and angles. You can calculate the addition of fractions by the addition of angles after we study fractions by dividing a circle and the angle.

Fraction	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{8}$	$\frac{1}{9}$	$\frac{1}{10}$	$\frac{1}{12}$
Angle	360°	180°	120°	90°	72°	60°	45°	40°	36°	30°
	$\frac{1}{15}$	$\frac{1}{16}$	$\frac{1}{18}$	$\frac{1}{20}$	$\frac{1}{24}$	$\frac{1}{25}$	$\frac{1}{30}$	$\frac{1}{36}$	$\frac{1}{40}$	$\frac{1}{45}$
	24°	22.5°	20°	18°	15°	14.4°	12°	10°	9°	8°
	$\frac{1}{60}$	$\frac{1}{72}$	$\frac{1}{90}$	$\frac{1}{120}$	$\frac{1}{180}$	$\frac{1}{360}$				
	6°	5°	4°	3°	2°	1°				

$\frac{2}{5}$ is 114° so, I see!

The column represents the denominator of the bigger angle and the row represents the denominator of the smaller angle.



• Let's cut out a fragment on page 247 and paste on the last page.

Let's go to the next place to find the fragments of the key!

Unit 16

Unit: Summary of Grade 5
Supplementary Topic: Mathematics Adventure

Textbook Page : 232 to 239
Topic: 7 to 10

7 Ayers Rock the Center of the Earth

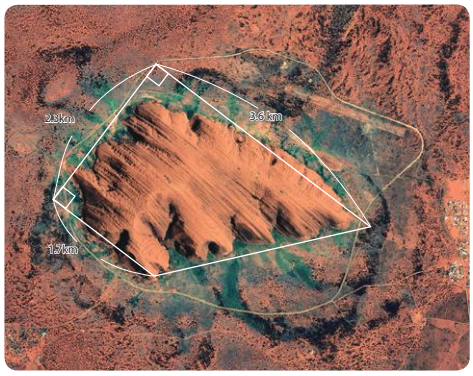
There is a famous rocky mountain called Ayers Rock in Australia.

How big is it?

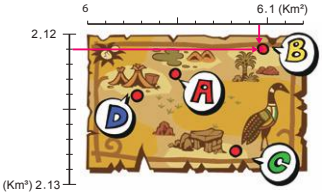
I can see how big it is as I'm getting closer.

It is a huge monolith. It is said that the monolith is 9 km around, 348 m in height, 3.6 km in length and 2.4 m wide.

Let's consider Ayers Rock to be a trapezoid looked from straight above. The upper base is 3.6 m and the lower base is 1.7 m as shown below.



The location of the key fragment is shown on the following map. The area of Ayers Rock seen from straight above defines a number of the horizontal line and the volume defines a number of the straight lines. (The number of horizontal lines shows an approximate area of Ayers Rock seen from straight above and the number of vertical lines shows the approximate volume.) Round off the value of the volume to three decimal places.
You can find out the location with these two answers.



I see, the point where two lines intersect is the place of the fragment!

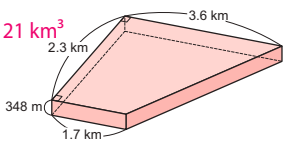
But, how can we find the approximate area and volume?

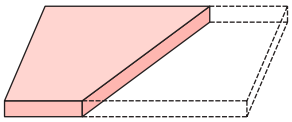
Area $(3.6+1.7)\times 2.3\div 2=6.095$ km^2

Imagine a figure as shown below.

Volume $6.095\times 0.348=2.121$ km^3

Oh yeah, joining two of these shapes together it becomes a rectangular prism!





• Let's cut out a fragment on page 245 and paste on the last page.

8 A Mysterious Circle of Stones

At the Stonehenge in the southern part of the England, there are ruins composed of a circle of large stones.
This was built about 3600 to 5000 years ago.
The weight of a stone pillar is about 25 tonnes and there is another stone which weighs 7 tonnes on the top of this.
It seems that these stones were carried from a place about 38 km away from this place. It is said that it took 600 people and 1 year to carry 1 stone.
If there were 1800 people to carry stones, how many years did it take to carry 120 stones?

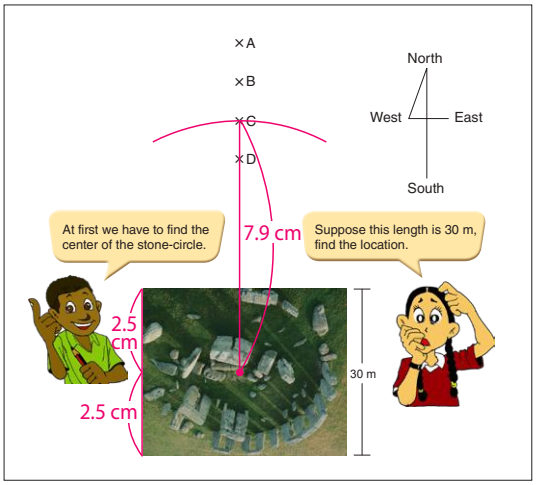
1800 people could carry 3 stones in 1 year. $1800\div 600=3$

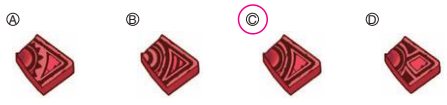
Then, $120\div 3=40$ so, it takes 40 years.

But how did they carry these stones?

Even in modern science it cannot be explained.

The key fragment is hidden near this stone circle. You will find the location when you go half way round the circumference from the centre of the stone-circle facing North. The stone-circle is 30 m in diameter but in this quiz let the diameter be 5 cm. Draw a figure then find the answer.





• Let's cut out a fragment on page 245 and paste on the last page.

9 World Heritage – Comparing the Areas of the Lakes

Lake Baikal, Russia

Lake Malawi, Malawi

Lake Baikal in Russia and Lake Malawi in Africa are both far away from each other but their shape is similar. This is because the two lakes were made in the same way.

There are many other lakes in the World Heritage list. Lake Ohrid in Macedonia and Yellowstone Lake in the United States are famous. Let's compare the areas of these lakes.
While Lake Ohrid is 350 km² big, Lake Baikal is 90 times bigger. The area of Yellowstone Lake is 1.2 % of Lake Malawi, 360 km².

Lake Ohrid and Yellowstone Lake are approximately the same in area.
The areas of Lake Baikal and Lake Malawi are almost the same.
Let's calculate their areas.

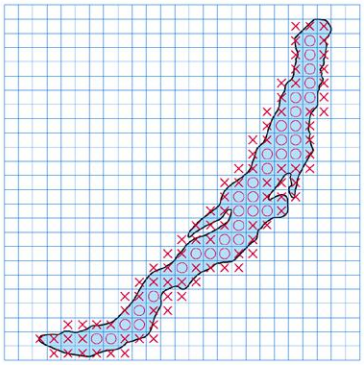
You can calculate the area of Lake Baikal by using the area of Lake Ohrid.

350×90
$= 31500$ km²

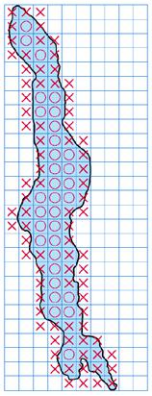
You can divide the area of Yellowstone Lake by 0.012 to find the area of Lake Malawi.

$360 \div 0.012$
$= 30000$ km²

Count the squares on the next page to find the approximate areas of Lake Baikal and Lake Malawi. Compare the calculated value and the counted value of each lake. Which pair has less difference?
Choose the right pair to get a broken piece of the key (The key fragment is hidden in the one with the closer area.).



A : Lake Baikal



B : Lake Malawi

○ 34, × 91 pices
$400 \times (34 + 91 \div 2) = 31\,800$ km²
The side of each square is 20 km for each figure.

○ 32, × 81
$400 \times (32 + 81 \div 2)$
$= 29000$ km²

Both lakes look equal.

The incomplete squares are counted as half an area.

To begin with, put 𝒙 on incomplete squares and o on complete squares.
Then calculate. Lake Baikal: $31800 - 31500 = 300$ km²
Lake Malawi: $30000 - 29000 = 1000$ km²

We can calculate area of 1 square as $20 \times 20 = 400$ (km²).

Ⓐ

Ⓑ

• Let's cut out a fragment on page 245 and paste on the last page.

Let's go to the next place to find the fragments of the key!

10 Disappearing Lake from Map

The Aral Sea is a salt lake that lies between Kazakhstan and Uzbekistan.

An abandoned ship that was once at the bottom of the lake.

This lake used to have a water volume of 1090 km³ containing 10 g salt per litre in 1960. However, the water volume has been reducing because of the constructions of canals for agricultural water supply.
Consequently, the amount of salt per litre has been increasing. In short, the salt water is more concentrated. In 1989, the lake separated into the South Aral Sea and the North Aral Sea and in 2003, the total volume of water in the two lakes decreased to 109 km³. Even at the locations of low salt concentration in the South Aral Sea it contains 80 g of salt per litre.

1960

1996

What is the percentage of the volume of water in 2003 compared to the volume of water in 1960?
$109 \div 1090 \times 100 = 10$ %

You can apply the knowledge of proportion to find the answer.

The chart below shows how the salt concentration has increased since 1987. Study when (from what year to what year) the salt concentration became equal to that of the sea and you can find the key fragment.

How many grams of salt does the sea water contain?

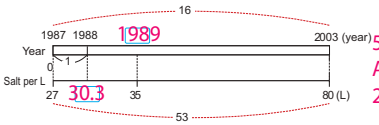
It is 35 g per litre in average.

The Change in the Concentration of Salt in Aral Sea

Year	1987	1988	1989		2003
The salt per litre (g)	27	?	?		80

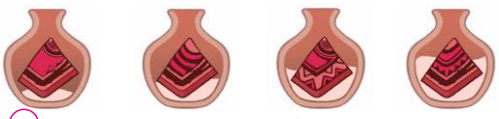
Suppose that the concentration of salt increases at the constant rate every year from 1987 to 2003…

The amount of salt per litre in 1987 is 27 g per 1 L and the salt per 1 L in 2003 is 80 g per 1 L. So, there is an increase of 53 g in 16 years.



$53 \div 16 = 3.3125$
Approximately 3.3 g
$27 + 3.3 = 30.3$ g

There are four jars with the key fragment inside. The final key fragment is in the jar made in the same year as the salt concentration was 35 g per litre.



A 1989　B 1992　C 1995　D 1997

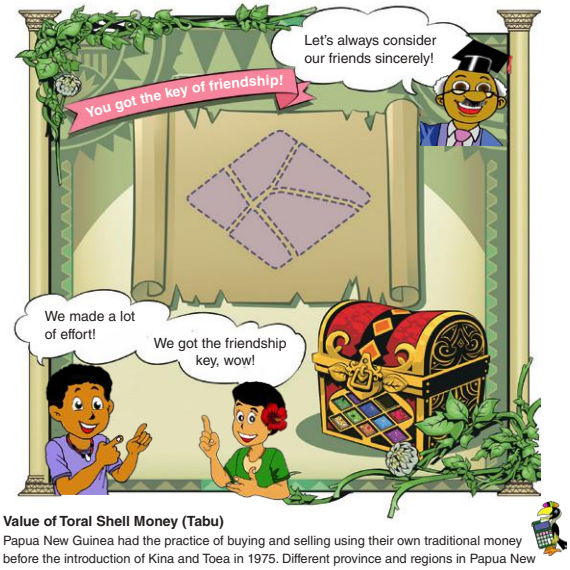
• Let's cut out a fragment on page 245 and paste on the last page and make the key completed.

Let's go to the next place to find the fragments of the key!

Unit 16

Unit: Summary of Grade 5
Supplementary Topic: Mathematics Adventure

Textbook Page :
228 to 240
Keys and Math Extras



Value of Toral Shell Money (Tabu)

Papua New Guinea had the practice of buying and selling using their own traditional money before the introduction of Kina and Toea in 1975. Different province and regions in Papua New Guinea have their own way of paying for goods, we call Barter system. When there is need for payments such as bride price ceremony or compensation, the people pay using the goods they produce or raised or pay with the traditional money they have. The Rabaul people use Tabu or shell money as shown in the picture. During a ceremony, rings of Tabu are displayed. The value of Tabu is 10 toea for 12 tabu beads per stick. One arm span is 5 kina. In a bundled ring Tabushell, there are 40 rings with a diameter of 80 cm. If 70 cm of tabu (one arm length) is 5 kina, what is the total value of this bundle ring?

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At the end of the Adventure Part 1, there will be 5 purple pieces of the puzzle that should be collected after answering the given questions correctly.

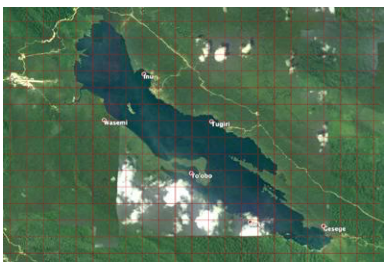
When each pieces of the puzzle are combined together, they will reveal the key of friendship.

Having this key indicates that the students can utilise the necessary knowledge and skills learned to move onto Adventure Part 2.

Area of Lake Kutubu

Papua New Guinea has many lakes. The two largest lakes are Lake Murray and Lake Kutubu. Lake Kutubu is famous because of its location which is near to the Kutubu Oil Project, in the Southern Highlands Province. The water is clear and the lake reaches a depth of 70 m (230 feet) and is about 800 m above sea level.

The picture shows the map of Lake Kutubu. For each square grid, the area is 10 km^2. Find the total area of the Lake using the method of calculating the approximate area learned in this grade.



240

At the end of the Adventure Part 2, there will be 5 maroon pieces of the puzzle that should be collected after answering the given questions correctly.

When each pieces of the puzzle are combined together, they will reveal the key of reliability.

Having this key indicates that the students can utilise the necessary knowledge and skills learned to advance onto the next grade level and apply them in their daily lives.

Appendices

Let's have fun with Math Game for improving Math Skills

Some interesting games are introduced in the Teacher's Manual for improving students mathematics thinking skills. Teachers are encouraged to facilitate these games during lesson time, recess, lunch and after lessons. Two (2) games, materials and answers are introduced page 309 to 313. The first game is an example of addition, subtraction and multiplication in a number card game to improve students' mental calculation skills. The second game is square calculations.

Math game 1

Let's Play 'Number Card Game'

Objective: Students will be able to do mental calculations of addition (up to 9 + 9), subtraction(up to 18 − 9), and the multiplication(up to 9 × 9).

When to play

It is very effective if you play the game 5 minutes at the beginning of every lesson.

How to play

1. Addition

Teacher gives the students a number to be added. Teacher shows different number cards and the students do mental calculation to add the number mentioned to the number shown as quickly as possible.

Example:

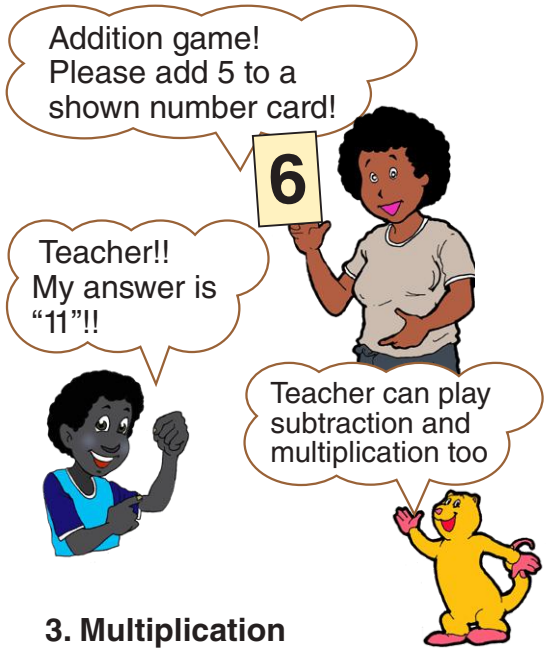
Teacher: "Please add 5 to the shown number card". Show a number card (3).
Students: "8"
Teacher: Show a number card (6).
Students: "11"

2. Subtraction

Teacher gives the students a number to be subtracted from. Teacher shows different number cards and the students do mental calculation to subtract the number mentioned to the number shown as quickly as possible.

Example:

Teacher: "Please subtract the number shown on the card from 15".
Teacher: Show a number card (8).
Students: "7"
Teacher: Show a number card (6).
Students: "9"



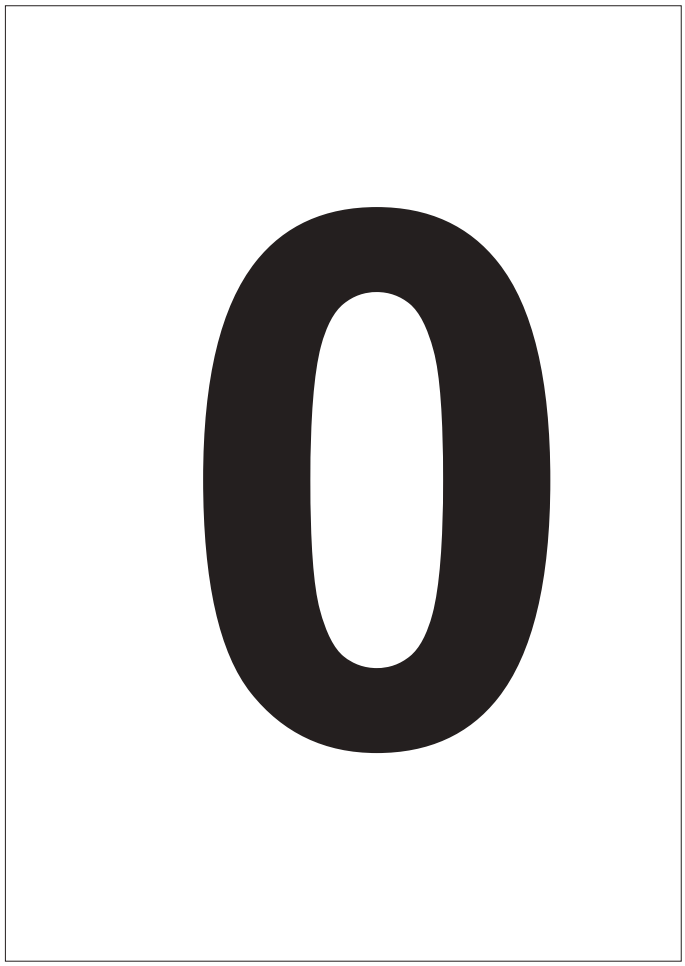
3. Multiplication

Teacher gives the students a number to be multiplied. Teacher shows different number cards and the students do mental calculation to multiply the number given by the teacher with the number in the card and answer as quickly as possible.

Example:

Teacher: "Please multiply 3 to the shown number card".
Teacher: Show a number card (8).
Students: "24"
Teacher: Show a number card (5)
Students: "15"

Number card samples, 0 - 9



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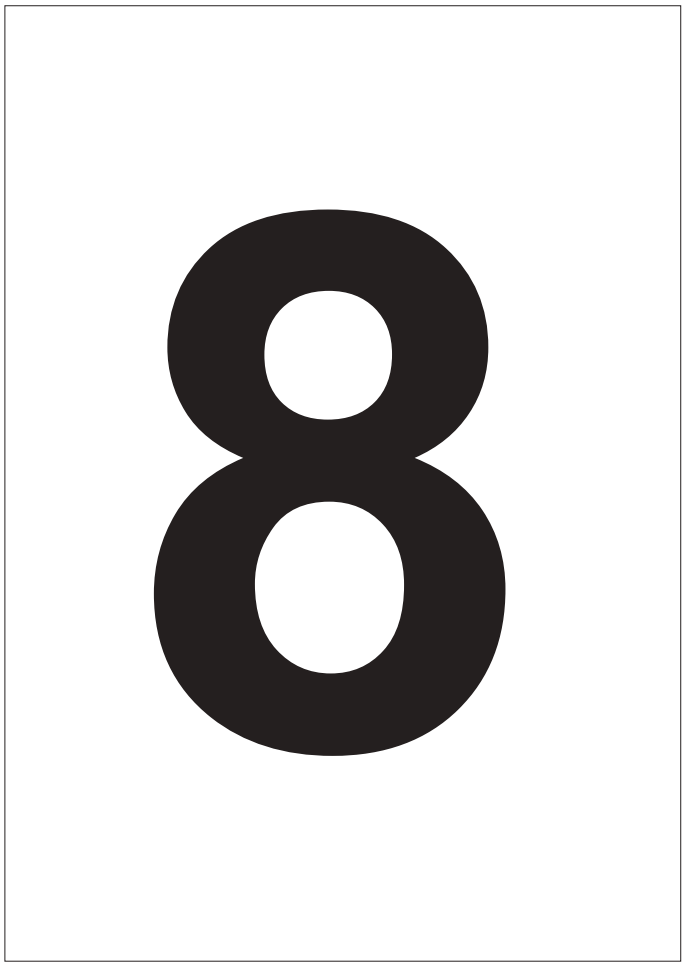
5

6

7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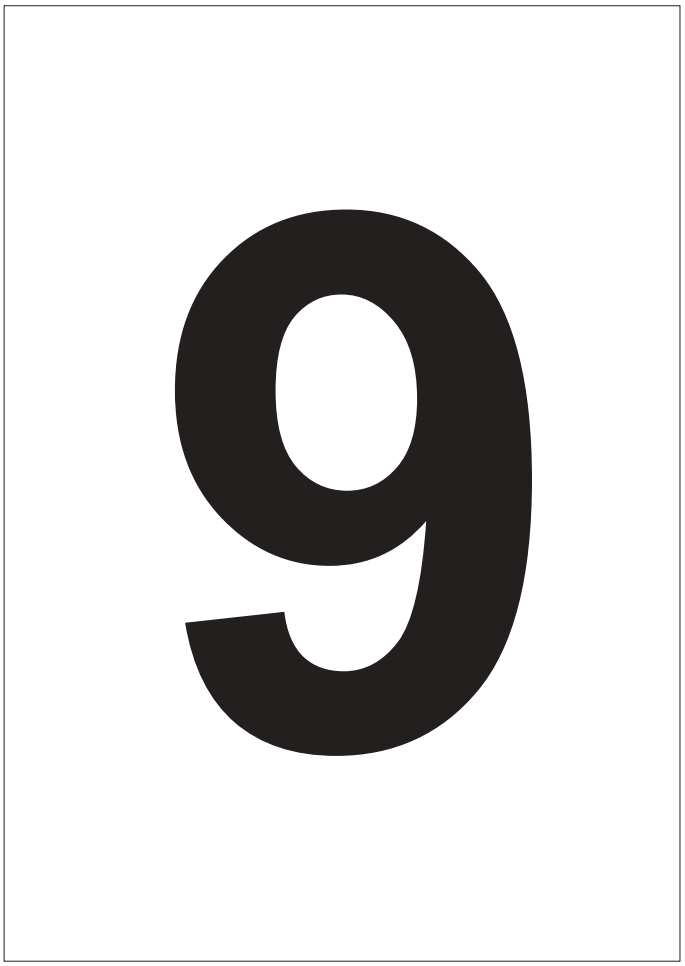

9

Math game 2

Let's enjoy SQUARE CALCULATION!!!

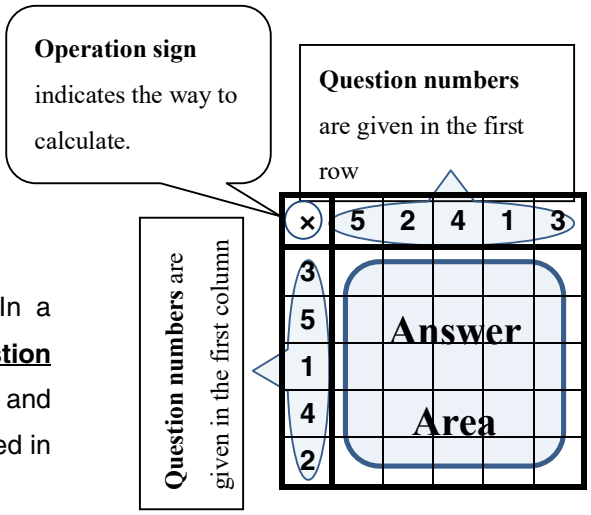
Background

We, the Japanese volunteer teachers have taught mathematics at selected schools for more than 10 years. We observed that PNG students' mathematical ability is poor because they don't understand the basic calculation. Therefore we introduced **a SIMPLE and HELPFUL Activity**. In fact, the activity was adopted in 2010 by the neighboring country, Vanuatu. Since then calculation ability of students in Vanuatu has improved steadily. Besides we have already confirmed the great impact of the activity at the selected schools in PNG as well. We have assurance that the activity will improve students' mathematical ability dramatically.

Objectives of Square Calculation

By using **Square Calculation** students from Grade 3 to 8 will

1. improve calculation on speed and accuracy.
2. improve their concentration.
3. form habit of re-check after they finished their work.



What is Square Calculation?

This activity is named **Square Calculation** after its shape. In a square there is a given **operation sign** (+, − or ×), **question numbers** written in the first row and first column at random and **answer space** for students to fill. Division sign (÷) cannot be used in this activity because remainders appear many times.

Multiplication

Multiply the left numbers by the above numbers.

×	4	5	1	7	9
8	32	40	8	56	72
2	8	10	2	14	18
3	12	15	3	21	27
7	28	35	7	49	63
4	16	20	4	28	36

Addition

Add the above numbers to the left numbers.

+	4	5	1	7	9
8	12	13	9	15	17
2	6	7	3	9	11
3	7	8	4	10	12
7	11	12	8	14	16
4	8	9	5	11	13

Subtraction

Subtract the above numbers from the left numbers.

−	3	2	8	9	10
18	15	16	10	9	8
11	8	9	3	2	1
15	12	13	7	6	5
20	17	18	12	11	10
16	13	14	8	7	6

Note: Write numbers from 11 to 20 in the first column.

*Note: Students should calculate from left to right and row by row without missing a space in Answer area.

How to use Square Calculation

(A) During activity

Teacher should;

1. select a size of square (5×5, 7×7 or 10×10)[*1] and then write down the square on the blackboard.
2. give the operation sign (+, − or ×) and numbers from 1 to 10 **at random** in the first row and column.[*2]
3. set a time for the activity.[*3]

4. allow the students to work within the set time.
5. give their timing when students have completed the square sheet before the time.
6. stop the students when the time is up.

*1, *3: Refer to the next page “Square Calculation options”.

*2: Only in subtraction choose numbers in the first column from 11 to 20; otherwise, negative answers will appear.

Students should;

1. draw a square grid unless teachers prepare activity sheets
2. copy the operation sign and numbers written in the first column and the first row.
3. write each answer from left to right and row by row without missing a space.
4. raise their hands and write their timing given by the teacher when they have finished.
5. recheck their own answers until time is up.

(B) During correction

Teacher should;

1. allow the students to exchange their activity sheet with neighbors.
2. allow students to read out their answers with questions.
3. read answers on the blackboard as you write.

Students should;

1. mark their friend’s answers by putting ✓ on a correct answer or ○ on a wrong answer and a blank square.
2. write their score on the activity sheet.

Time 0:47 Score 22/25

×	4	5	1	6	9
8	✓	✓	✓	✓	(45)
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
7	(14)	✓	✓	✓	✓
4	✓	✓	✓	✓	(32)

Example of correction

(C) During recording

Teacher should;

1. collect their activity sheets.
2. record children’s score into recording sheet at least once a week.

Note: **Bad examples** when the teacher writes question numbers on the blackboard

Don’t use same numbers in the first column or row.

×	4	5	(1)	(1)	9
(3)					
2					
(3)					
7					
4					

Don’t Use numbers over 10 in the first column or row in addition or multiplication.

×	6	(13)	(15)	2	9
2					
(15)					
4					
(18)					
3					

Don’t Use numbers from 1 to 10 in the first column in Subtraction.

−	2	3	5	7	9
4	2	1	(-1)	(-3)	
5					
4					
8					
3					

Note: **Bad examples** when students write answers on their activity sheets.

Don't miss a space.

×	2	5	4	1	3
4	8	20		4	12
1	2	5	4	1	3
3					
5	10	25	20	5	
2	4	10	8	2	6

Don't calculate from top to bottom.

×	2	5	4	1	3
4	8	20	16		
1	2	5	4		
3	6	15	12		
5	10	25			
2	4	10			

Square Calculation options

1. Size of a square (5×5, 7×7, 10×10).
2. Set time as shown in the table on the right.

Size	Time limit
5×5	1-2 min
7×7	2-4 min
10×10	5 min

Sample teaching plan

Teaching plan below is just sample. Teacher can arrange the size, operation sign and time limit depending on students' understanding. But we highly recommend that teacher should choose the smaller size 5×5 and longer time limit 2 min at first and should continue to give the activity with the same operation sign **every day through each term**.

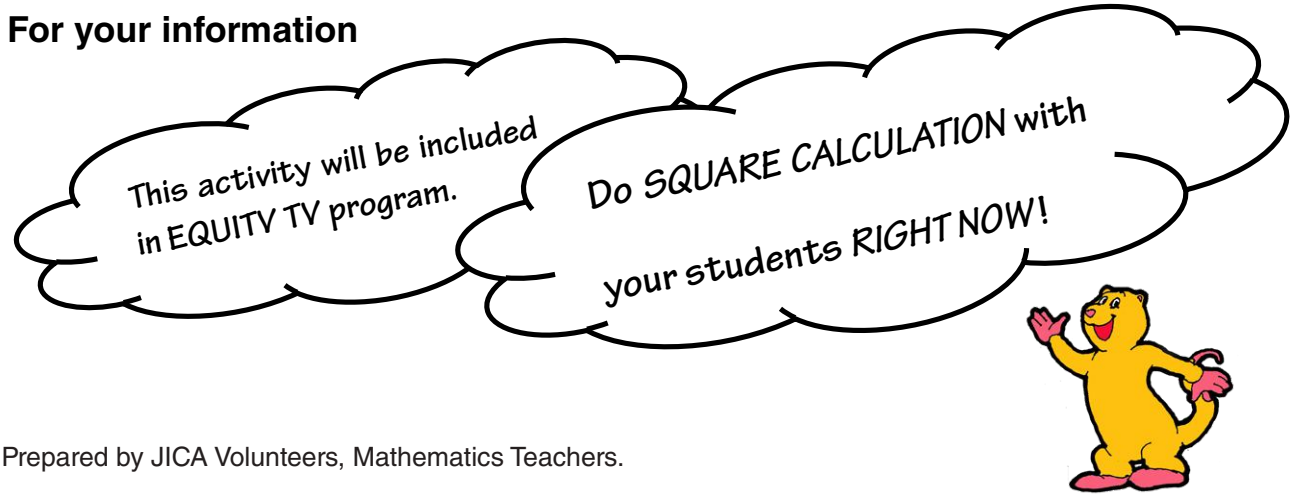
Sample teaching plan for Grade 3

	Term1	Term 2	Term3	Term4
Size	5×5	5×5	5×5	5×5
Operation	Addition	Subtraction	Multiplication	Multiplication
Time limit	2 min	2 min	2 min	1 min

Sample teaching plan for Grade 6

	Term1	Term 2	Term3	Term4
Size	5×5	5×5	5×5	7×7
Operation	Multiplication	Multiplication	Subtraction	Addition
Time limit	2 min	1 min	2 min	3 min

For your information



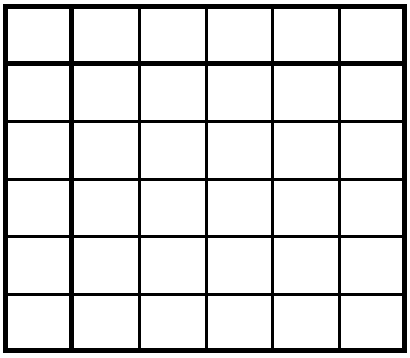
Prepared by JICA Volunteers, Mathematics Teachers.

SQUARE CALCULATION SHEETS（Answer area: 5×5）

Name: _____

Class: _____ Date: _____/_____

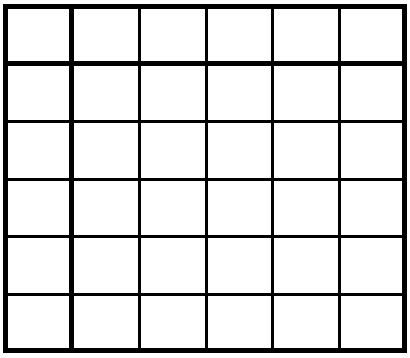
Time: _____:_____ Score: _____/



Name: _____

Class: _____ Date: _____/_____

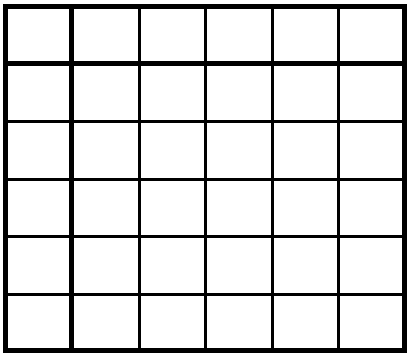
Time: _____:_____ Score: _____/



Name: _____

Class: _____ Date: _____/_____

Time: _____:_____ Score: _____/



Name: _____

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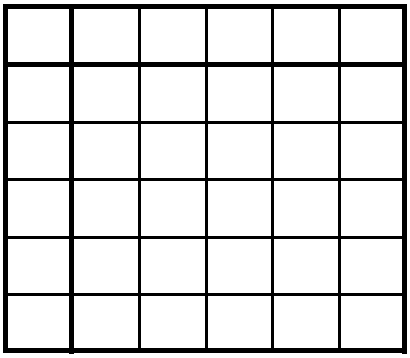
Time: _____:_____ Score: _____/



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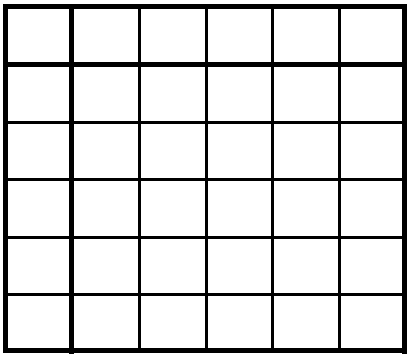

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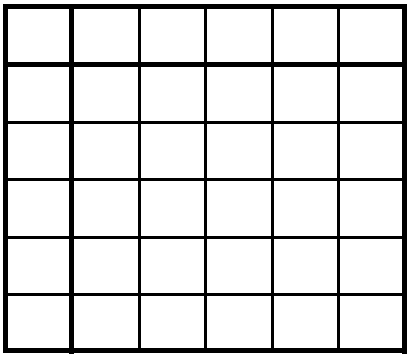

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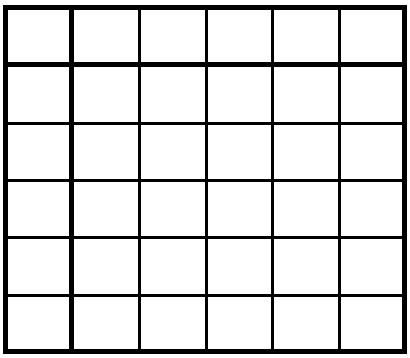

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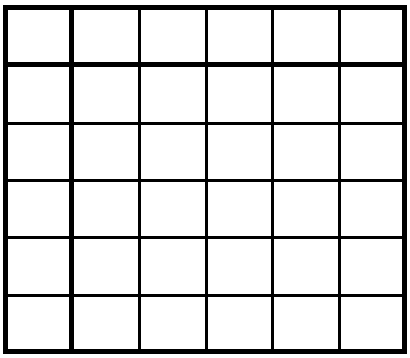

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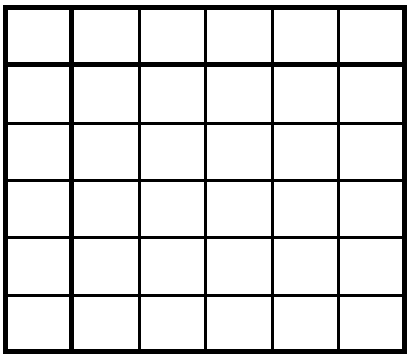
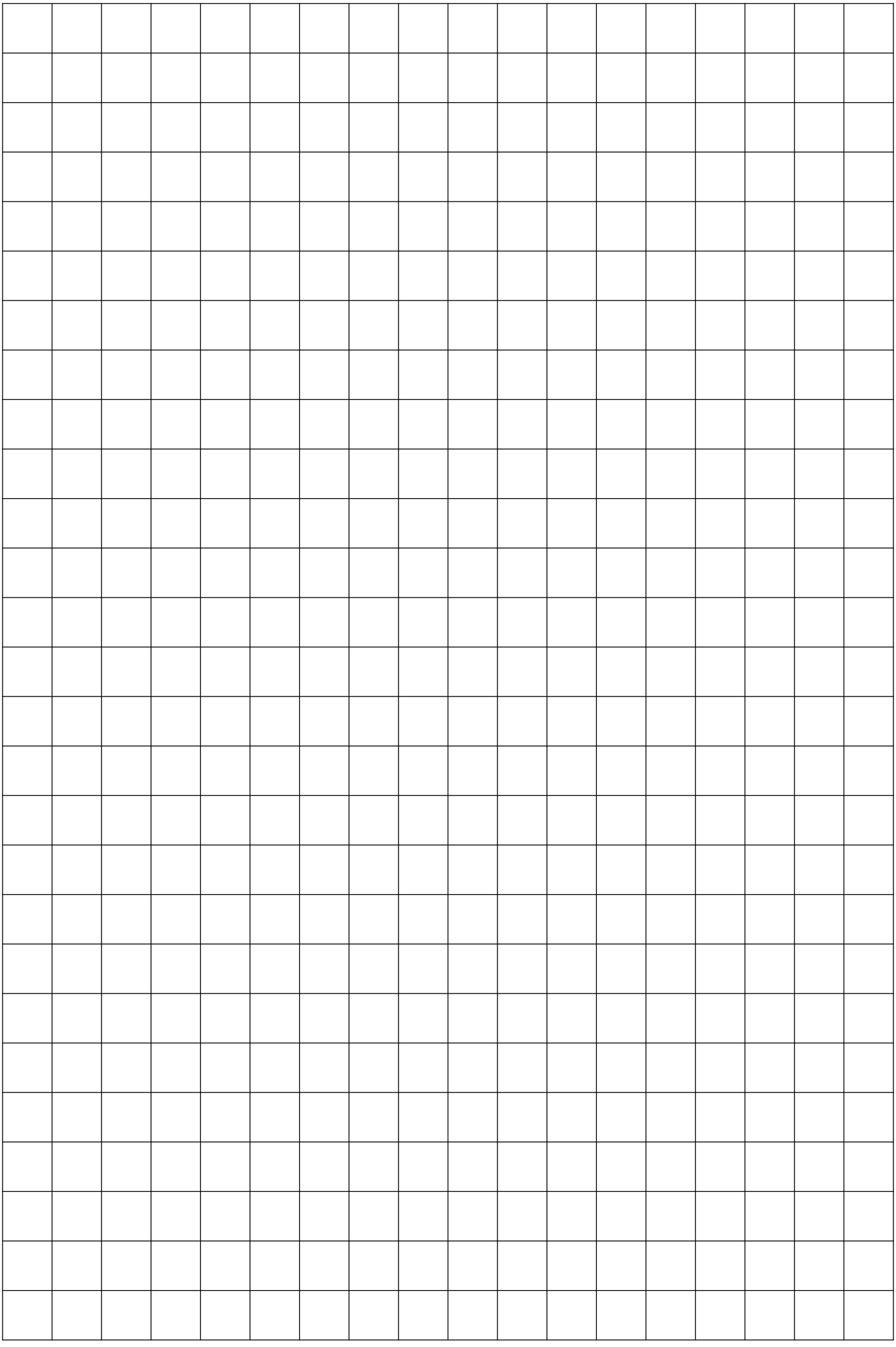
Time: _____:_____ Score: _____/



1cm^2 grid



Structure of learning contents in Mathematics from Elementary Prep to Grade 8

Number and Operation

Elementary Prep – Elementary 2

Elementary Prep

- Natural numbers up to 120

- Natural numbers up to 120
- Additions and subtraction of one-digit numbers
- Additions and subtractions of simple 2-digit numbers

Elementary 1

- Natural numbers up to 1000

- Simple fractions

- Additions and subtractions of 2-digit numbers
- Additions and subtractions of simple 3-digit numbers

Elementary 2

- Natural numbers up to 10000

- Meaning of multiplication
- Multiplication table
- Multiplication of simple 2-digit numbers

Grade 3 – Grade 4

Grade 3

- Natural numbers less than 100 000
- Addition and subtraction of natural numbers (with carrying & borrowing)
- Multiplication of natural numbers
- Meaning of division
- Division in the simple case where divisors are 1-digit numbers

- The meaning and the representations of decimal numbers
- Addition and subtraction of decimal numbers (the tenths place)
- The meaning and the representation of fractions
- Simple addition and subtraction of fractions with same denominator less than 1

Grade 4

- Natural numbers less than billion
- Round numbers, round up and round down
- Division in the case where divisors are 2-digit numbers
- Acquisition and utilization of 4 operations of natural numbers

- Addition and subtraction of decimal numbers (the tenths and the hundredths places)
- Multiplication and division of decimals by whole numbers
- Addition and subtraction of fractions with same denominators (proper fraction, mixed numbers)

Grade 5 – Grade 6

Grade 5

- Even and odd numbers, prime numbers, multiples and whole numbers

- Multiplications and divisions by decimal (tenths and hundredths pace, etc)
- Addition and subtraction of fractions with different denominators

Grade 6

- Multiplication and division of fractions
- Calculations that involve both fractions and decimals
- Consolidation and utilization of the 4 basic operations of decimals and

Grade 7 – Grade 8

Grade 7

Positive numbers, negative numbers

- Necessity and meaning of positive and negative numbers (set of numbers and the 4 fundamental operations)
- Four basic operations with positive and negative numbers

Algebraic expressions using letters

- Necessity and meaning of using letter
- How to express multiplication and division
- Additional and subtraction with linear expressions
- Representing with algebraic expressions with letters (representations in inequality)

Linear equations with one unknown

- Meaning of equations and their solutions
- Property of equality and how to solve equations
- Solving and using linear equations (proportional expressions)

Grade 8

Calculations of 4 basic operations with expressions using letters

- Calculations of addition and subtractions with simple polynomials, as well as multiplication and division with monomials

Simultaneous linear equations with unknowns

- Necessity and meaning of simultaneous linear equations with two unknowns and the meaning of their solutions
- Meaning of simultaneous equations and their solutions
- Solving simultaneous equations and applying them

Quantities and Measurements

Elementary Prep – Elementary 2	Grade 3 – Grade 4	Grade 5 – Grade 6	Grade 7 – Grade 8
Elementary Prep • Comparing amount of length, area, volume (arbitrary) • Telling clock times (O'clock)	**Grade 3** • Unit of length (km) • Unit of weight (g, kg, t) • Calculations with time	**Grade 5** • Area of triangles, rectangles, parallelograms, trapeziums and rhombi • Unit of volume (cubic cm, cubic m, mL, kL) • Volumes of cuboids and cubes • Mean of measurements • Per unit quantity	**Grade 7** • Volume cylinders
Elementary 1 • Unit of length (cm, mm, m) • Reading times • Additions and subtractions of 2-digit numbers • Additions and subtractions of simple 3-digit numbers	**Grade 4** • Unit of area (square cm, square m, square km, a, ha) • Finding area of rectangle and square • Unit of angle (degree)	**Grade 6** • Area of approximate shape • Area of circle • Volume of prisms • Metric system • Speed	
Elementary 2 • Unit of volume (L, dL, mL) • Unit of time (day, hour, minute, second)			

Geometrical figure

Elementary Prep – Elementary 2

Elementary Prep

- Observing and composing the shapes of planer figures and solid figures

Elementary 1

- Triangles, quadrilaterals, rectangles, squares, right triangles
- Shape of a box

Elementary 2

- Circle, sphere

Grade 3 – Grade 4

Grade 3

- Isosceles triangle, equilateral triangles
- Angle

Grade 4

- Perpendicular and parallel
- Parallelogram, rhombus, trapezium
- Cube, cuboid

Grade 5 – Grade 6

Grade 5

- Polygons and regular polygons (irregular polygons)
- Congruence of triangles and quadrilaterals
- Circular constant
- Prism, cylinders, sketches, nets

Grade 6

- Line symmetry, point symmetry
- Enlarged and reduced figures

Grade 7 – Grade 8

Grade 7

Plane figures
- Fundamental methods for constructing of figures and their applications
- Moving figures (parallel translation, symmetric transformation, rotation)

Space figures
- Positional relationship between straight lines and planes
- Structure of space figures and their representation on the plane (sketches, nets, projection drawings)
- Length of arc of a sector and area of the sector
- Surface area and volume of prisms, cones and spheres

Grade 8

Basic plane figures and properties of parallel lines
- Properties of parallel lines and angles
- Properties of angles of polygons

Congruence of plane figures
- Congruence of plane figures and conditions of congruence of triangles
- Necessity, meaning and methods of proof
- Basic properties of triangles and parallelograms

Mathematical Relations

Elementary Prep – Elementary 2	Grade 3 – Grade 4	Grade 5 – Grade 6	Grade 7 – Grade 8
Elementary Prep • Representing the number of objects using pictures and figures	**Grade 3** • Representing the situations where divisions are used by algebraic expressions • Making connections between algebraic expressions and diagrams, Algebraic expressions that use empty boxes • Tables and graphs (Bar + Columns) in numerical representation	**Grade 5** • Simple proportional relations • Relations of two quantities that are expressed by simple algebraic relations • Percentage, pie charts	**Grade 7** Direct proportion and Inverse proportion • Meaning of functional relationship • Application of direct proportion and inverse proportion Dispersion of data and representative value of data • Necessity and meaning of histogram and representative values • Applying histogram and representative values
Elementary 1 • Relationship between addition and subtraction • Basic table and graphs	**Grade 4** • Algebraic expressions that contain some of the 4 basic operations and expressions with brackets and formulas • Expression with empty boxes and empty triangles • Relationship between two number/quantities as they vary simultaneously • Points, broken line graphs	**Grade 6** • Algebraic expressions using letters such as x or a • Proportional relationship • Proportion and inverse proportion • The average of data, frequency distribution, histgram	**Grade 8** Linear functions • Phenomena and linear functions • Tables, algebraic expressions and graphs of linear functions • Linear equations with two unknowns and functions • Using linear functions Probability • Necessary and meaning of probability and finding the probability
Elementary 2 • Representing situations where multiplication is used • Tables and bar graphs in pictorial/ symbols			

Mathematics Grade 5 Teacher's Manual Development Committees

The Mathematics Teacher's Manual was developed by Curriculum Development Division (CDD), Department of Education in partnership with Japan International Cooperation Agency (JICA) through the Project for Improving the Quality of Mathematics and Science Education (QUIS-ME Project). The following stakeholders have contributed to manage, write, validate and make quality assurance for developing quality Textbooks and Teacher's Manuals for students and teachers of Papua New Guinea.

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