Mathematics

Teacher's Manual

Grade 6

Papua New Guinea
Department of Education

Issued free to schools by the Department of Education

First Edition

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Secretary's Message

Dear Teacher,

The Mathematics Teacher's Manual is produced for Grade 6 teachers to guide them to plan and teach the Mathematics lessons jointly with the National Grade 6 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 6 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

Introduction

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 6, 7 & 8 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 theTeacher'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 Colours

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

Term 1

Term 3

Term 2

Term 4

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 by 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. Ice breaking Activity Symbol ▶▶

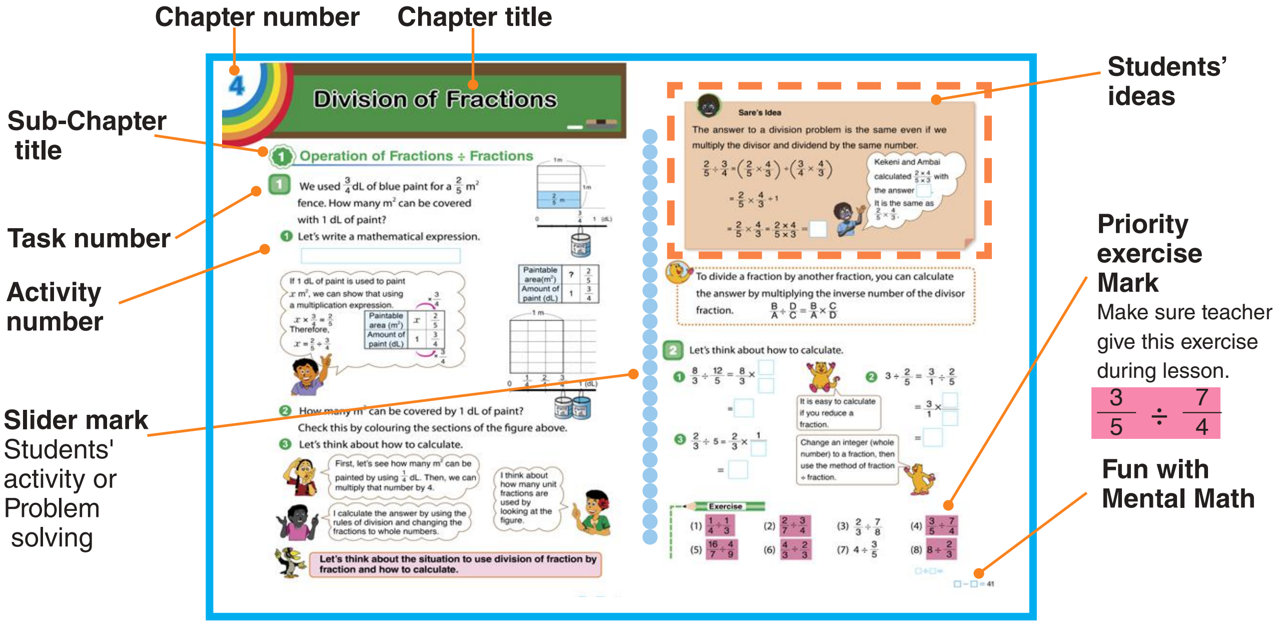
Some chapters have Ice breaking activity as the lead up activity for the chapter.

5. Fun with Mental Math!

26 = ☐ × ☐

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

Sample Textbook Page



4

Division of Fractions

① Operation of Fractions ÷ Fractions

1 We used $\frac{3}{4}$ dL of blue paint for a $\frac{2}{5}$ m² fence. How many m² can be covered with 1 dL of paint?

① Let's write a mathematical expression.

If 1 dL of paint is used to paint x m², we can show that using a multiplication expression.

$x \times \frac{3}{4} = \frac{2}{5}$

Therefore,

$x = \frac{2}{5} \div \frac{3}{4}$

Paintable area (m²)	x	$\frac{2}{5}$
Amount of paint (dL)	1	$\frac{3}{4}$

$\times\frac{3}{4}$

Paintable area(m²)	?	$\frac{2}{5}$
Amount of paint (dL)	1	$\frac{3}{4}$

② How many m² can be covered by 1 dL of paint? Check this by colouring the sections of the figure above.

③ Let's think about how to calculate.

First, let's see how many m² can be painted by using $\frac{1}{4}$ dL. Then, we can multiply that number by 4.

I calculate the answer by using the rules of division and changing the fractions to whole numbers.

I think about how many unit fractions are used by looking at the figure.

Let's think about the situation to use division of fraction by fraction and how to calculate.

Sare's Idea

The answer to a division problem is the same even if we multiply the divisor and dividend by the same number.

$$\frac{2}{5} \div \frac{3}{4} = \left(\frac{2}{5} \times \frac{4}{3}\right) \div \left(\frac{3}{4} \times \frac{4}{3}\right)$$

$$= \frac{2}{5} \times \frac{4}{3} \div 1$$

$$= \frac{2}{5} \times \frac{4}{3} = \frac{2 \times 4}{5 \times 3} = \square$$

Kekeni and Ambai calculated $\frac{2 \times 4}{5 \times 3}$ with the answer ☐. It is the same as $\frac{2}{5} \times \frac{4}{3}$.

To divide a fraction by another fraction, you can calculate the answer by multiplying the inverse number of the divisor fraction. $\frac{B}{A} \div \frac{D}{C} = \frac{B}{A} \times \frac{C}{D}$

2 Let's think about how to calculate.

① $\frac{8}{3} \div \frac{12}{5} = \frac{8}{3} \times \frac{\square}{\square}$

$= \square$

② $3 \div \frac{2}{5} = \frac{3}{1} \div \frac{2}{5}$

$= \frac{3}{1} \times \frac{\square}{\square}$

$= \square$

③ $\frac{2}{3} \div 5 = \frac{2}{3} \times \frac{1}{\square}$

$= \square$

It is easy to calculate if you reduce a fraction.

Change an integer (whole number) to a fraction, then use the method of fraction ÷ fraction.

Exercise

(1) $\frac{1}{4} \div \frac{1}{3}$ (2) $\frac{2}{7} \div \frac{3}{4}$ (3) $\frac{2}{3} \div \frac{7}{8}$ (4) $\frac{3}{5} \div \frac{7}{4}$

(5) $\frac{16}{7} \div \frac{4}{9}$ (6) $\frac{4}{3} \div \frac{2}{3}$ (7) $4 \div \frac{3}{5}$ (8) $8 \div \frac{2}{3}$

☐+☐=

☐−☐=41

Key Competencies acquired through the use of the Textbook

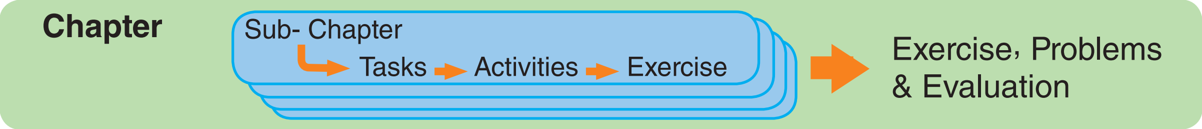
Experimental mathematical activities such as **measure**, **compare**, **divide**, **order**, **touch**, **pile up** and **throw** are contained in all grades. It is intended to develop the ability and skills to be able to solve various problems logically in daily life by considering many ways.

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 Chapter consists of several Sub-chapters, Tasks, Activities, Exercises and ends with a set of Exercise and Problems.


Chapter

Sub- Chapter

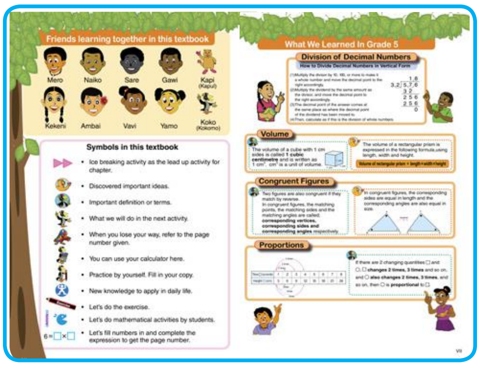
Tasks → Activities → Exercise

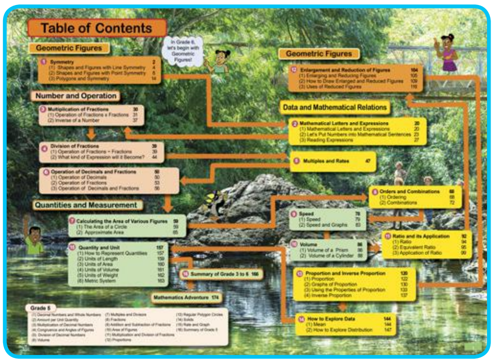
→ Exercise, Problems & Evaluation

Parts of the Textbook

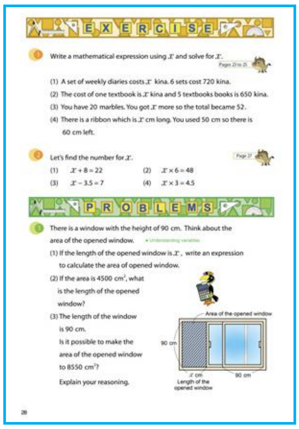
Textbook Introduction Page

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


EXERCISE

① Write a mathematical expression using x and solve for x. Pages 23 to 25

(1) A set of weekly diaries costs x kina. 6 sets cost 720 kina.

(2) The cost of one textbook is x kina and 5 textbooks books is 650 kina.

(3) You have 20 marbles. You got x more so the total became 52.

(4) There is a ribbon which is x cm long. You used 50 cm so there is 60 cm left.

② Let's find the number for x. Page 27

(1) $x + 8 = 22$ (2) $x \times 6 = 48$

(3) $x - 3.5 = 7$ (4) $x \times 3 = 4.5$

PROBLEMS

① There is a window with the height of 90 cm. Think about the area of the opened window. • Understanding variables

(1) If the length of the opened window is x, write an expression to calculate the area of opened window.

(2) If the area is 4500 cm², what is the length of the opened window?

(3) The length of the window is 90 cm. Is it possible to make the area of the opened window to 8550 cm²? Explain your reasoning.

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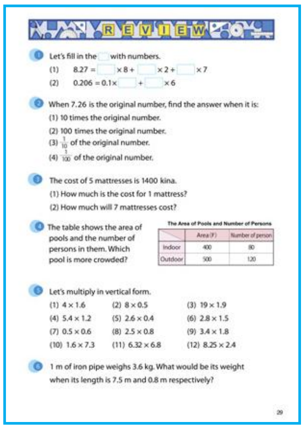
REVIEW

① Let's fill in the ☐ with numbers.

(1) 8.27 = ☐ × 8 + ☐ × 2 + ☐ × 7

(2) 0.206 = 0.1 × ☐ + ☐ × 6

② When 7.26 is the original number, find the answer when it is:

(1) 10 times the original number.

(2) 100 times the original number.

(3) $\frac{1}{10}$ of the original number.

(4) $\frac{1}{100}$ of the original number.

③ The cost of 5 mattresses is 1400 kina.

(1) How much is the cost for 1 mattress?

(2) How much will 7 mattresses cost?

④ The table shows the area of pools and the number of persons in them. Which pool is more crowded?

The Area of Pools and Number of Persons

	Area (m²)	Number of person
Indoor	400	80
Outdoor	500	120

⑤ Let's multiply in vertical form.

(1) 4 × 1.6 (2) 8 × 0.5 (3) 19 × 1.9

(4) 5.4 × 1.2 (5) 2.6 × 0.4 (6) 2.8 × 1.5

(7) 0.5 × 0.6 (8) 2.5 × 0.8 (9) 3.4 × 1.8

(10) 1.6 × 7.3 (11) 6.32 × 6.8 (12) 8.25 × 2.4

⑥ 1 m of iron pipe weighs 3.6 kg. What would be its weight when its length is 7.5 m and 0.8 m respectively?

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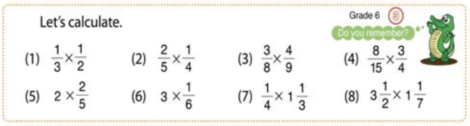
At the end of each chapter, Exercises are set for students to consolidate what has been learned in a particular chapter. Page numbers indicating specific content found for each exercise is tagged beside each exercise.
Problems and Review are placed after each Exercise in each chapter. The problems are 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?"

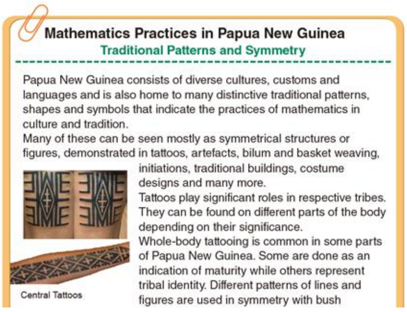

Let's calculate.

(1) $\frac{1}{3}\times\frac{1}{2}$ (2) $\frac{2}{5}\times\frac{1}{4}$ (3) $\frac{3}{8}\times\frac{4}{9}$ (4) $\frac{8}{15}\times\frac{3}{4}$

(5) $2\times\frac{2}{5}$ (6) $3\times\frac{1}{6}$ (7) $\frac{1}{4}\times1\frac{1}{3}$ (8) $3\frac{1}{2}\times1\frac{1}{7}$

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


Mathematics Practices in Papua New Guinea

Traditional Patterns and Symmetry

Papua New Guinea consists of diverse cultures, customs and languages and is also home to many distinctive traditional patterns, shapes and symbols that indicate the practices of mathematics in culture and tradition.
Many of these can be seen mostly as symmetrical structures or figures, demonstrated in tattoos, artefacts, bilum and basket weaving, initiations, traditional buildings, costume designs and many more.
Tattoos play significant roles in respective tribes. They can be found on different parts of the body depending on their significance.
Whole-body tattooing is common in some parts of Papua New Guinea. Some are done as an indication of maturity while others represent tribal identity. Different patterns of lines and figures are used in symmetry with bush

Central Tattoos

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, Objectives, Prior Knowledge, Assessment, Preparation, 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 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.

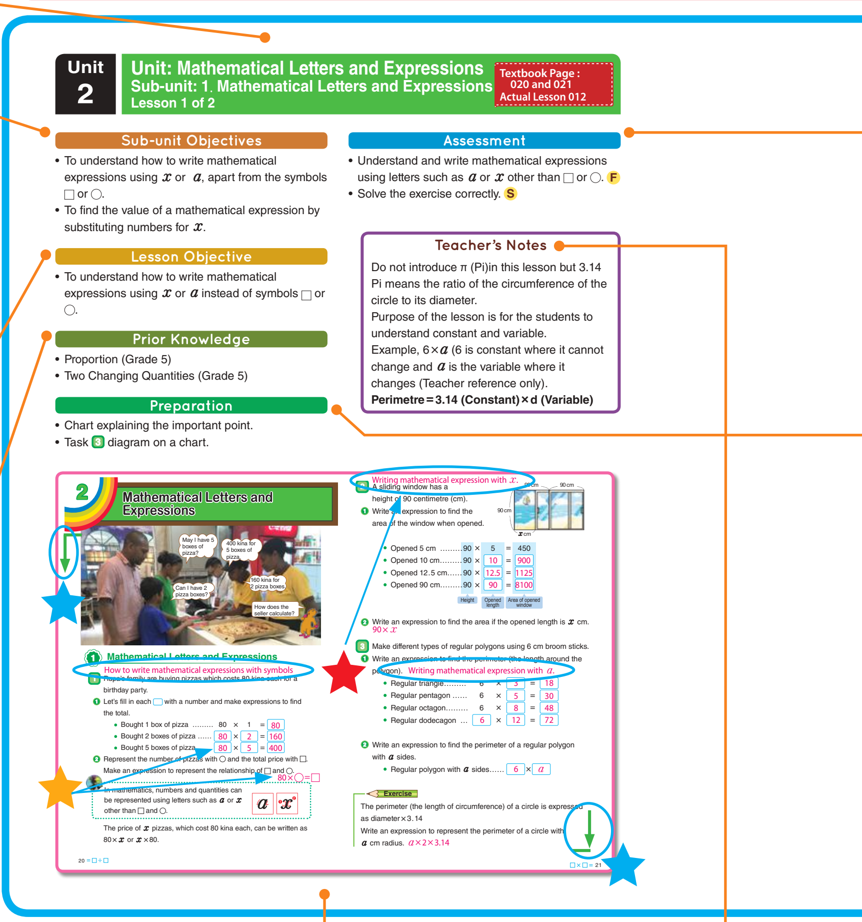
Lesson Objective

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



Unit 2 Unit: Mathematical Letters and Expressions
Sub-unit: 1. Mathematical Letters and Expressions
Lesson 1 of 2

Textbook Page : 020 and 021
Actual Lesson 012

Sub-unit Objectives

- To understand how to write mathematical expressions using x or a, apart from the symbols □ or ○.
- To find the value of a mathematical expression by substituting numbers for x.

Lesson Objective

- To understand how to write mathematical expressions using x or a instead of symbols □ or ○.

Prior Knowledge

- Proportion (Grade 5)
- Two Changing Quantities (Grade 5)

Preparation

- Chart explaining the important point.
- Task 3 diagram on a chart.

Assessment

- Understand and write mathematical expressions using letters such as a or x other than □ or ○. F
- Solve the exercise correctly. S

Teacher's Notes

Do not introduce π (Pi)in this lesson but 3.14 Pi means the ratio of the circumference of the circle to its diameter.
Purpose of the lesson is for the students to understand constant and variable.
Example, 6×a (6 is constant where it cannot change and a is the variable where it changes (Teacher reference only).
Perimetre = 3.14 (Constant) × d (Variable)

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.

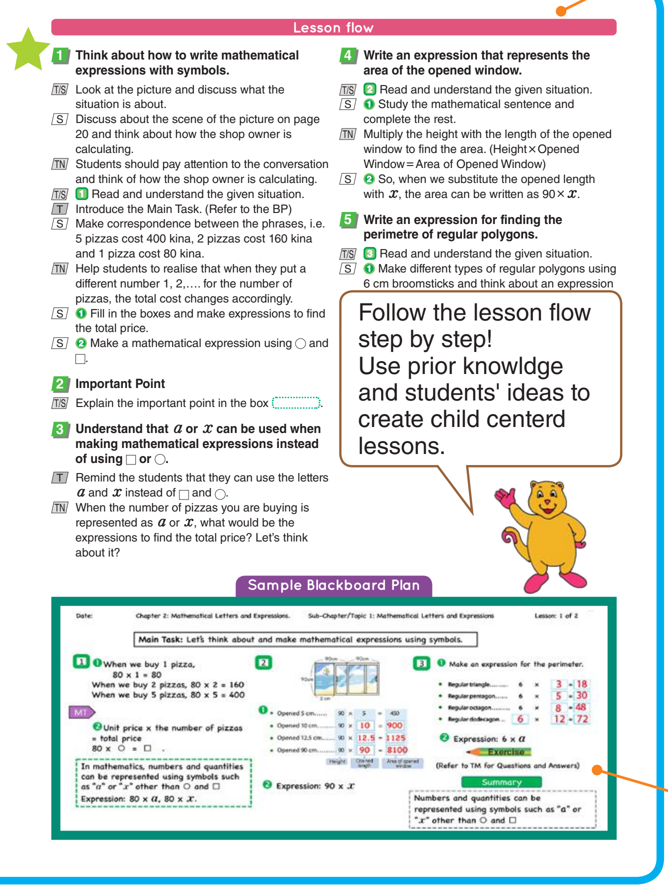
- **Lesson span** : Where the lesson begins ↓ and ends ↓ is indicated. ★
- Answers and solutions of the Tasks, Activities, Problems and Exercises. ★
- Teaching points such as; Purpose of the Tasks, Exercises and Problem types and characteristics of the problem, calculation and concepts. ★

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.

Assessment

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



Lesson flow

1 Think about how to write mathematical expressions with symbols.

T/S Look at the picture and discuss what the situation is about.
S Discuss about the scene of the picture on page 20 and think about how the shop owner is calculating.
TN Students should pay attention to the conversation and think of how the shop owner is calculating.
T/S 1 Read and understand the given situation.
T Introduce the Main Task. (Refer to the BP)
S Make correspondence between the phrases, i.e. 5 pizzas cost 400 kina, 2 pizzas cost 160 kina and 1 pizza cost 80 kina.
TN Help students to realise that when they put a different number 1, 2,.... for the number of pizzas, the total cost changes accordingly.
S ① Fill in the boxes and make expressions to find the total price.
S ② Make a mathematical expression using ○ and □.

2 Important Point

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

3 Understand that a or x can be used when making mathematical expressions instead of using □ or ○.

T Remind the students that they can use the letters a and x instead of □ and ○.
TN When the number of pizzas you are buying is represented as a or x, what would be the expressions to find the total price? Let's think about it?

4 Write an expression that represents the area of the opened window.

T/S 2 Read and understand the given situation.
S ① Study the mathematical sentence and complete the rest.
TN Multiply the height with the length of the opened window to find the area. (Height × Opened Window = Area of Opened Window)
S ② So, when we substitute the opened length with x, the area can be written as $90 \times x$.

5 Write an expression for finding the perimetre of regular polygons.

T/S 3 Read and understand the given situation.
S ① Make different types of regular polygons using 6 cm broomsticks and think about an expression

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

Sample Blackboard Plan

Date: Chapter 2: Mathematical Letters and Expressions. Sub-Chapter/Topic 1: Mathematical Letters and Expressions Lesson: 1 of 2

Main Task: Let's think about and make mathematical expressions using symbols.

1 ① When we buy 1 pizza,
$80 \times 1 = 80$
When we buy 2 pizzas, $80 \times 2 = 160$
When we buy 5 pizzas, $80 \times 5 = 400$

MT

② Unit price × the number of pizzas
= total price
80 × ○ = □ .

In mathematics, numbers and quantities can be represented using symbols such as "a" or "x" other than ○ and □
Expression: $80 \times a$, $80 \times x$.

2

① • Opened 5 cm....... 90 × 5 = 450
• Opened 10 cm......... 90 × 10 = 900
• Opened 12.5 cm...... 90 × 12.5 = 1125
• Opened 90 cm......... 90 × 90 = 8100

② Expression: $90 \times x$

3 ① Make an expression for the perimeter.
• Regular triangle......... 6 × 3 = 18
• Regular pentagon...... 6 × 5 = 30
• Regular octagon......... 6 × 8 = 48
• Regular dodecagon... 6 × 12 = 72

② Expression: $6 \times a$

Exercise

(Refer to TM for Questions and Answers)

Summary

Numbers and quantities can be represented using symbols such as "a" or "x" other than ○ and □

Teacher's Notes

Contains supplementary information that is useful to 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 VIII for more detail.

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 Standard outlineses 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.

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 capacity and content.

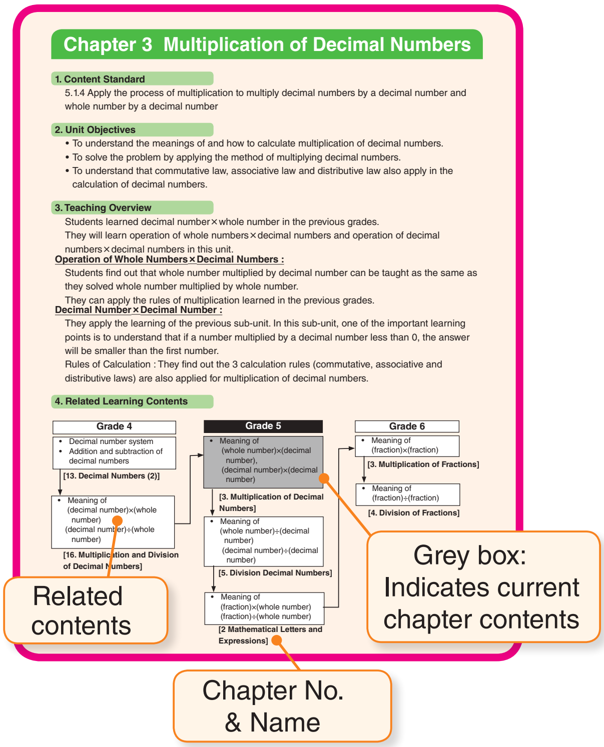
3. Teaching Overview

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.

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.



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

Grade 4
• Decimal number system
• Addition and subtraction of decimal numbers
[13. Decimal Numbers (2)]
• Meaning of (decimal number)×(whole number) (decimal number)÷(whole number)
[16. Multiplication and Division of Decimal Numbers]
Grade 5
• Meaning of (whole number)×(decimal number), (decimal number)×(decimal number)
[3. Multiplication of Decimal Numbers]
• Meaning of (whole number)÷(decimal number) (decimal number)÷(decimal number)
[5. Division Decimal Numbers]
• Meaning of (fraction)×(whole number) (fraction)÷(whole number)
[2 Mathematical Letters and Expressions]
Grade 6
• Meaning of (fraction)×(fraction)
[3. Multiplication of Fractions]
• Meaning of (fraction)÷(fraction)
[4. Division of Fractions]

Related contents

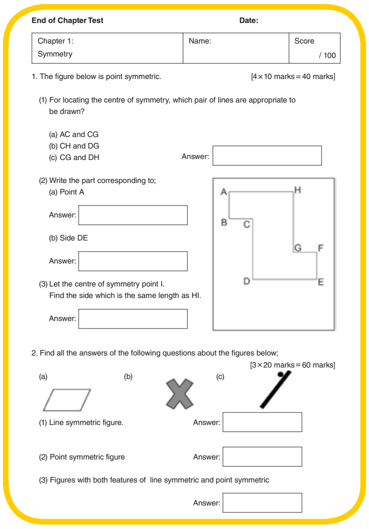
Grey box: Indicates current chapter contents

Chapter No. & Name

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 used 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 on the left.

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



End of Chapter Test **Date:**

Chapter 1: Symmetry	Name:	Score / 100

1. The figure below is point symmetric. [4×10 marks＝40 marks]

(1) For locating the centre of symmetry, which pair of lines are appropriate to be drawn?

(a) AC and CG
(b) CH and DG
(c) CG and DH

Answer:

(2) Write the part corresponding to;
(a) Point A

Answer:

(b) Side DE

Answer:

(3) Let the centre of symmetry point I.
Find the side which is the same length as HI.

Answer:

2. Find all the answers of the following questions about the figures below; [3×20 marks＝60 marks]

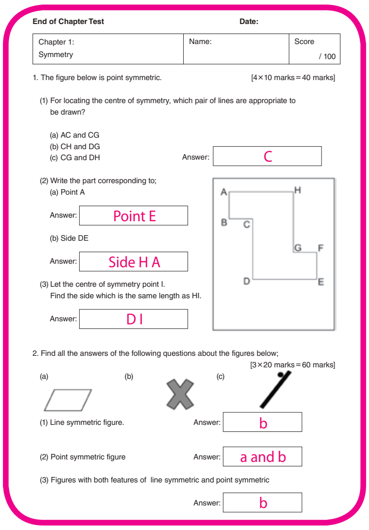
(1) Line symmetric figure. Answer:

(2) Point symmetric figure Answer:

(3) Figures with both features of line symmetric and point symmetric

Answer:

End of Chapter Test



End of Chapter Test **Date:**

Chapter 1: Symmetry	Name:	Score / 100

1. The figure below is point symmetric. [4×10 marks＝40 marks]

(1) For locating the centre of symmetry, which pair of lines are appropriate to be drawn?

(a) AC and CG
(b) CH and DG
(c) CG and DH

Answer: C

(2) Write the part corresponding to;
(a) Point A

Answer: Point E

(b) Side DE

Answer: Side H A

(3) Let the centre of symmetry point I.
Find the side which is the same length as HI.

Answer: D I

2. Find all the answers of the following questions about the figures below; [3×20 marks＝60 marks]

(1) Line symmetric figure. Answer: b

(2) Point symmetric figure Answer: a and b

(3) Figures with both features of line symmetric and point symmetric

Answer: b

Answers of End of Chapter Test

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 lessons 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.)

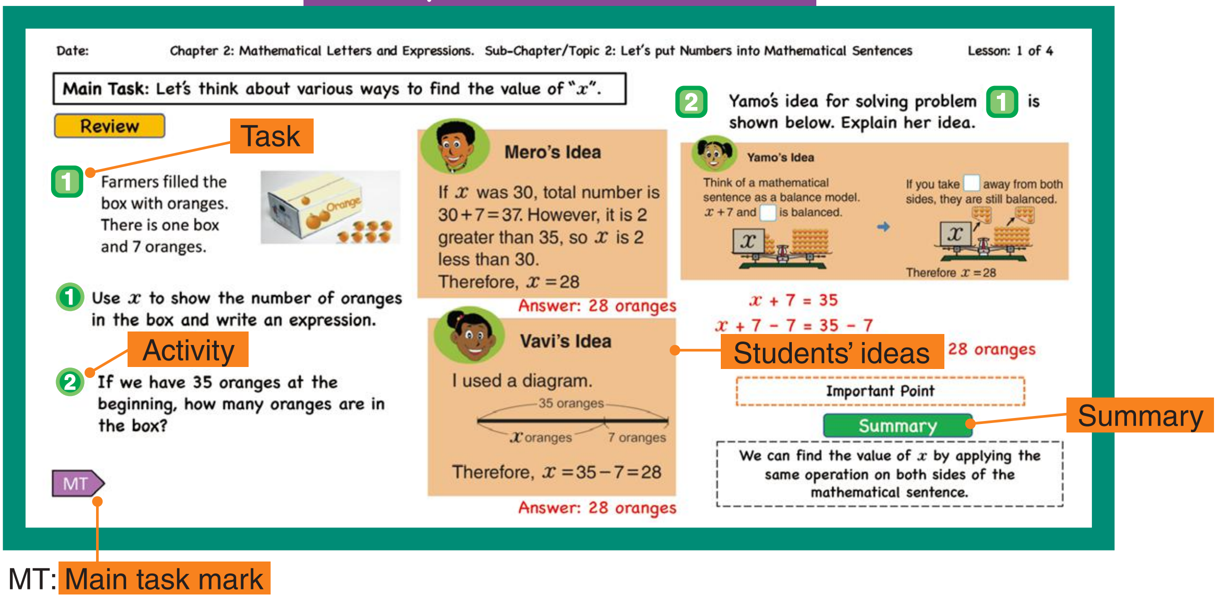
Points to consider.

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 if you intend 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 the whole blackboard to point out important points.

Sample Blackboard Plan



Date: Chapter 2: Mathematical Letters and Expressions. Sub-Chapter/Topic 2: Let's put Numbers into Mathematical Sentences Lesson: 1 of 4

Main Task: Let's think about various ways to find the value of "x".

Review

1 Farmers filled the box with oranges. There is one box and 7 oranges.

① Use x to show the number of oranges in the box and write an expression.

② If we have 35 oranges at the beginning, how many oranges are in the box?

Mero's Idea

If x was 30, total number is $30+7=37$. However, it is 2 greater than 35, so x is 2 less than 30.
Therefore, $x=28$

Answer: 28 oranges

Vavi's Idea

I used a diagram.

35 oranges
x oranges 7 oranges

Therefore, $x=35-7=28$

Answer: 28 oranges

2 Yamo's idea for solving problem 1 is shown below. Explain her idea.

Yamo's Idea

Think of a mathematical sentence as a balance model. $x+7$ and ☐ is balanced.

If you take ☐ away from both sides, they are still balanced.

Therefore $x=28$

$x + 7 = 35$
$x + 7 - 7 = 35 - 7$
28 oranges

Important Point

Summary

We can find the value of x by applying the same operation on both sides of the mathematical sentence.

MT: Main task mark

The Main Task is introduced as indicated on the 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 are 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

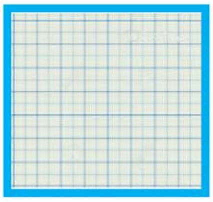
Summative assessment examples include:

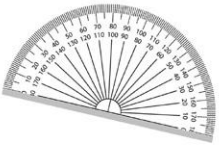
- Exercise and Problems
- End of Chapter Test
- Projects
- Homework and Assignments.

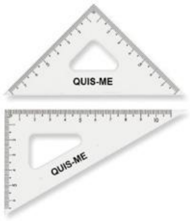
5. Attachments

The Teacher's Manual has four attached pages that the teacher can use when teaching lessons. The pages consist of a Mathematic games' information, triangle rulers and protractor, 5 mm^2 grid, 1 cm^2 grid, 1 cm^2 dotted grid and Structure of learning contents.

1. **Mathematics game information**
2. **Triangle rulers and protractor**
   The triangle rulers and protractor can be used to draw shapes and figures, measure and confirm lengths and angles.
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. **Content Chart from Elementary Prep to Grade 8**







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 #
Geometric Figures	1	**Symmetry**		**2**
		1. Shapes and Figures with Line Symmetry	1	2,3,4
			2	5,6
			3	7
		2. Shapes and Figures with Point Symmetry	4	8
			5	9,10
			6	11
			7	12,13
		3. Polygons and Symmetry	8	14
			9	15,16
		Exercise, Problems and Evaluation	10,11	17,18,19
Data & Mathematical Relations	2	**Mathematical Letters and Expressions**		**20**
		1. Mathematical Letters and Expressions	12	20,21
			13	22
		2.Let's Put Numbers into Mathematical Sentences	14	23
			15	24,25
			16	25
			17	26
		3. Reading Expressions	18	27
		Exercise, Problems, Review and Evaluation	19,20	28,29
Number & Operation	3	**Multiplication of Fractions**		**30**
		1. Operation of Fractions × Fractions	21	30,31,32
			22	33
			23	34
			24	35
			25	36
		2. Inverse of a Number	26	37
		Exercise, Problems and Evaluation	27,28	38
Number & Operation	4	**Division of Fractions**		**39**
		1. Operation of Fractions ÷ Fractions	29	39,40,41
			30	41
			31	42
			32	43
		2. What kind of Expression will it Become?	33	44
		Exercise, Problems and Evaluation	34,35	45,46
Data & Mathematical Relations	5	**Multiples and Rates**	**36**	**47**
			37	48
			38	49
Number & Operation	6	**Operation of Decimals and Fractions**		**50**
		1. Operation of Decimals	39	50
			40	51
			41	52
		2. Operation of Fractions	42	53
			43	54
			44	55
		3.Operation of Decimals and Fractions	45	56,57
		Exercise and Evaluation	46,47	58

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: blue, term 3: orange and term 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 'units' is used while the term 'chapter' is used in the textbook.

Strand	Unit #	Unit Name and Sub-unit Name	Lesson #	Page #
Measurement	7	**Calculating the Area of Various Figures**		**59**
		1. The Area of a Circle	48	59,60
			49	61,62
			50	63
			51	64
		2. Approximate Area	52	65
		Exercise, Problems and Evaluation	53,54	66,67
Data & Mathematical Relations	8	**Orders and Combinations**		**68**
		1. Ordering	55	68,69,70
			56	71
		2. Combinations	57	72,73
			58	74
		Exercise, Problems, Review and Evaluation	59,60	75,76,77
Measurement	9	**Speed**		**78**
		1. Speed	61	78,79,80
			62	81
			63	82
		2. Speed and Graphs	64	83
		Exercise, Problems and Evaluation	65,66	84,85
Measurement	10	**Volume**		**86**
		1. Volume of a Prism	67	86
			68	87
		2. Volume of a Cylinder	69	88
			70	89
		Exercise, Problems and Evaluation	71,72	90,91
Data & Mathematical Relations	11	**Ratio and its Application**		**92**
		1. Ratio	73	92,93,94
		2. Equivalent Ratio	74	95,96
			75	96
			76	97
			77	98
		3. Application of Ratio	78	99
			79	100
		Exercise, Problems, Evaluation and Mathematics Extra	80,81	101,102, 103
Geometric Figures	12	**Enlargement and Reduction of Figures**		**104**
		1. Enlarging and Reducing Figures	82	104,105
			83	106,107
			84	108
		2. How to Draw Enlarged and Reduced Figures	85	109,110
			86	111,112
			87	113
			88	114
			89	115
		3. Uses of Reduced Figures	90	116,117
		Exercise, Review and Evaluation	91,92	118,119

Chapter 1 Symmetry

1. Content Standard

6.3.1. Students will be able to examine symmetrical figures, and find out about their properties, and enjoy constructing symmetrical figures.

2. Unit Objectives

- To deepen the understanding about learning figure through observation and manipulation.
- To understand the definition and characteristics of learning line symmetry.
- To understand the definition and characteristic of learning point symmetry.

3. Teaching Overview

In Grade 6, students observe the features of figures by paying attention to the aspect of symmetry. Students are to analyse the axis, centre, corresponding points and sides of figures through several activities.

Figures with Line Symmetry :

Folding and overlapping activities will help students understand line symmetry. They also should discover that the line between 2 corresponding points are cut perpendicularly by the line of symmetry.

Figures with Point Symmetry:

Rotating activities will help students understand point symmetry. Note that the figure should be cut, not only drawing so that students will see clearly how it is overlapped by rotation. They also should find that the point of symmetry is the mid-point of the line between 2 corresponding points.

Polygons and Symmetry :

They observe the known polygons by the aspects of line and point symmetries.

4. Related Learning Contents

Grade 3	Grade 4	Grade 5	**Grade 6**	Grade 7
• Properties of triangle	• Properties of quadrilaterals • Perpendicular and parallel	• Properties of congruent figures	• Properties of line symmetry and point symmetry	• Displacement of figures (parallel displacement, line symmetric displacement, rotational displacement
[13 Triangles]	**[6 Quadrilaterals]**	**[4 Congruent Figures and Angles]**	**[1 Symmetry]**	

Unit
1

Unit: Symmetry

Sub-unit: 1. Shapes and Figures with Line Symmetry

Lesson 1 of 3

Textbook Pages : 002 to 004
Actual Lesson 001

Sub-unit Objectives

- To understand the definition and characteristics of line symmetry.
- To understand how to draw figures with line symmetry properties.

Assessment

- Identify balanced and beautiful shapes. F
- Define line of symmetry and its characteristics. F
- Draw and understand the line of symmetry. S

Lesson Objectives

- To realise that there is a balanced shape through the activities.
- To understand the meaning and definition of line symmetry.

Teacher's Notes

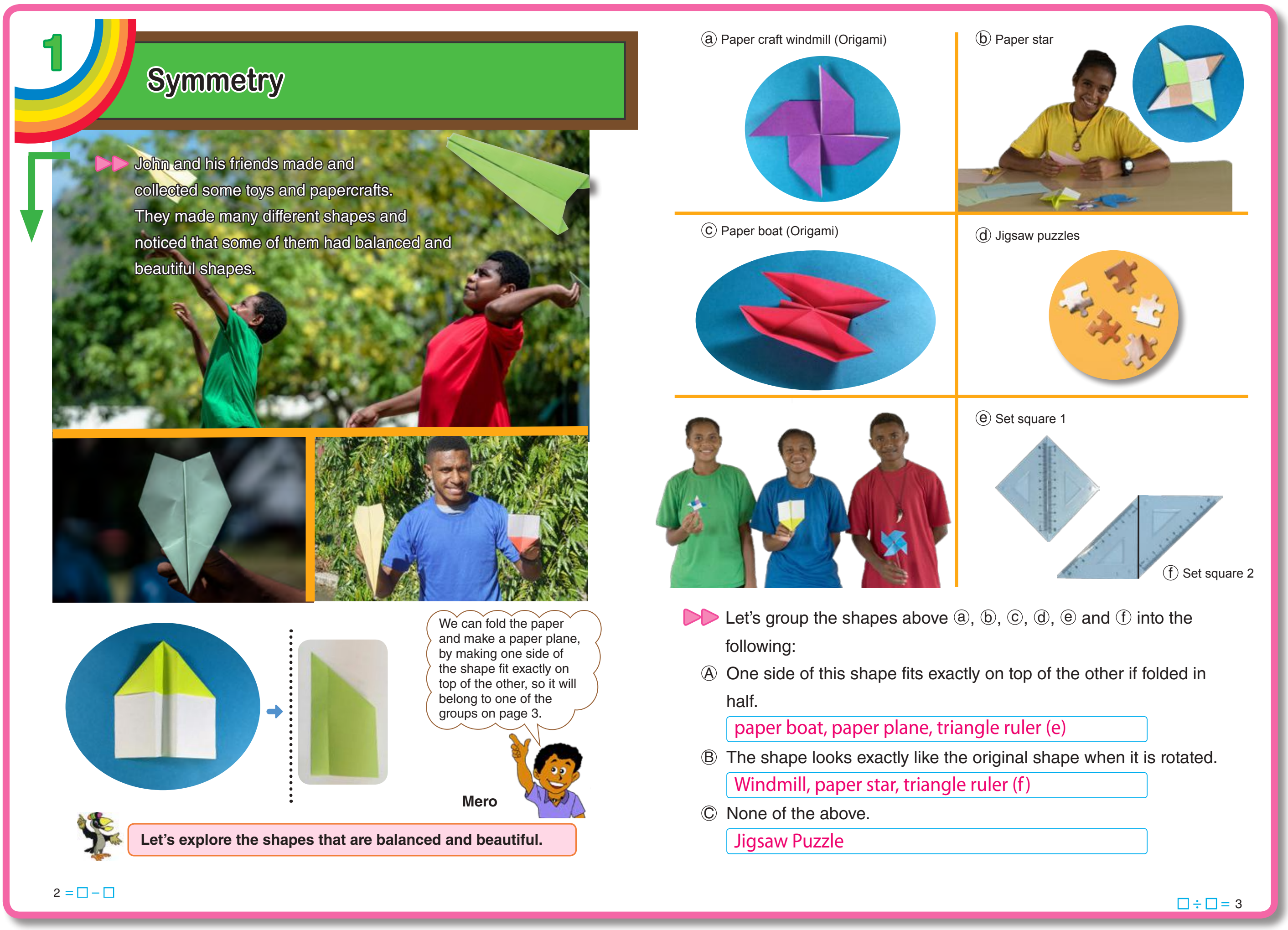
Line of Symmetry or Axis of Symmetry is a new concept that the students may have to experience by using the line of symmetry. Assist them to realise that the folding line that the figure makes fits exactly on top of the other is called the line or the axis of symmetry. Teacher may use block letters A M E to explain features of the line of symmetry when folded.

Prior Knowledge

- Properties of quatrilaterals (Grade 4)

Preparation

- Task 1 A, B and C on printed paper for manipulation.
- Copies of grid papers.



1 Symmetry

John and his friends made and collected some toys and papercrafts. They made many different shapes and noticed that some of them had balanced and beautiful shapes.

We can fold the paper and make a paper plane, by making one side of the shape fit exactly on top of the other, so it will belong to one of the groups on page 3.

Mero

Let's explore the shapes that are balanced and beautiful.

2 = □ − □

ⓐ Paper craft windmill (Origami)

ⓑ Paper star

ⓒ Paper boat (Origami)

ⓓ Jigsaw puzzles

ⓔ Set square 1

ⓕ Set square 2

Let's group the shapes above ⓐ, ⓑ, ⓒ, ⓓ, ⓔ and ⓕ into the following:

Ⓐ One side of this shape fits exactly on top of the other if folded in half.

paper boat, paper plane, triangle ruler (e)

Ⓑ The shape looks exactly like the original shape when it is rotated.

Windmill, paper star, triangle ruler (f)

Ⓒ None of the above.

Jigsaw Puzzle

□ ÷ □ = 3

Lesson flow

1 Explore figures that are balanced and beautiful.

T/S ▶▶ Read the situation and study the picture in the textbook.

S Check Mero's explanation in the speech bubble.

S Describe the different shapes in the textbook.

T "What similarities can you notice about these shapes?"

S Observe and share ideas about the figures; "they are the same when folded", "they are same when rotated at one point."

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

2 Categorise the figures.

T/S ▶▶ "Based on the discussions, categorise the figures into sections Ⓐ, Ⓑ and Ⓒ"

S Categorise into:
Ⓐ paper boat, paper star, paper plane, ruler ⓔ
Ⓑ windmill, paper star, ruler ⓕ
Ⓒ jigsaw puzzle

3 Fold figures in half and draw centre line.

T/S 1 Read and understand the given situation.

T ① How do you fold figures in Ⓐ, Ⓑ and Ⓒ in half?

S By folding the figure, the left side and right side overlaps and fits exactly.

4 ② Draw shapes that can fit exactly by folding.

TN Give enough time for students to draw their figures that can fit exactly when folded into half.

S Draw figures that can fit exactly when folded into half.

5 Important Point

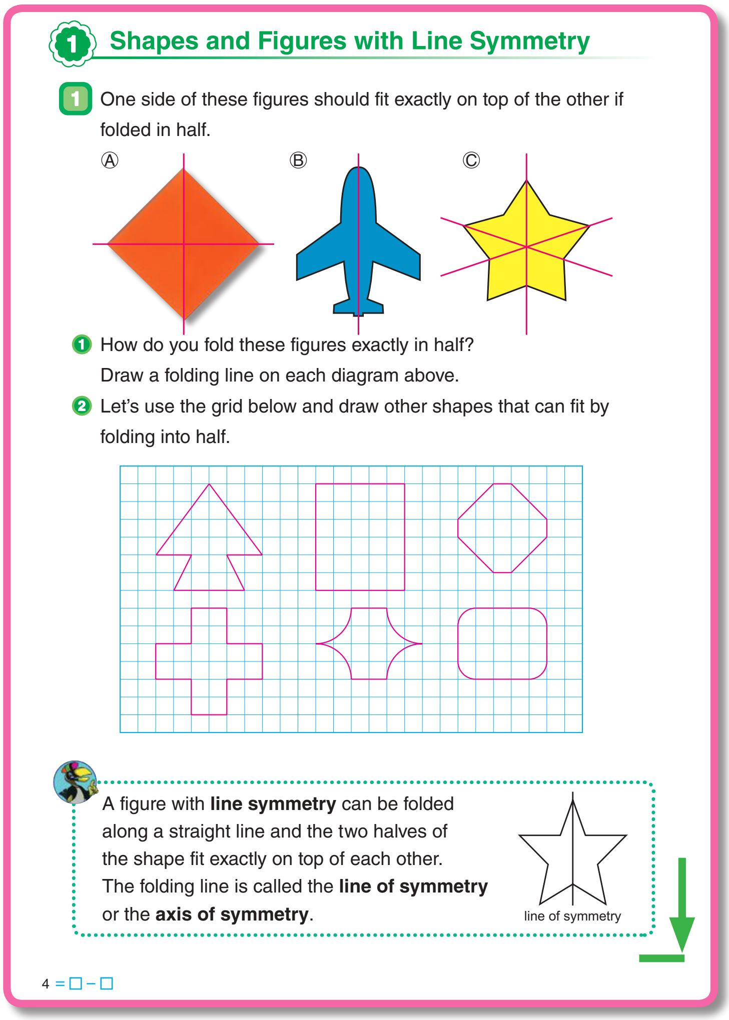
T/S Explain the important point in the box ⬚.

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.



① Shapes and Figures with Line Symmetry

1 One side of these figures should fit exactly on top of the other if folded in half.

① How do you fold these figures exactly in half?
Draw a folding line on each diagram above.

② Let's use the grid below and draw other shapes that can fit by folding into half.

A figure with **line symmetry** can be folded along a straight line and the two halves of the shape fit exactly on top of each other.
The folding line is called the **line of symmetry** or the **axis of symmetry**.

Sample Blackboard Plan

Lesson 001 Sample Blackboard Plan
is on page 5.

Unit
1

Unit: Symmetry
Sub-unit: 1. Shapes and Figures with Line Symmetry
Lesson 2 of 3

Textbook Page :
005 and 006
Actual Lesson 002

Lesson Objective

- To investigate the characteristics of corresponding points, sides and angles in line of symmetry.

Prior Knowledge

- Meaning of line symmetry.

Preparation

- Square grid paper, rulers and tracing paper.

Teacher's Notes

Use the terms corresponding points, corresponding sides and corresponding angles in the discussion with the students. There are two main investigations in this lesson. Allow students to copy notes through the sequence. Students should come up with their own conclusion on what they have learned in these investigations.

Assessment

- Investigate and identify the characteristics of line symmetry. F
- Solve the exercises correctly. S

Lesson Flow

1 Review the previous lesson.

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

2 ② Investigate the properties of line symmetry.

T Read the task with students. Can you identify anything that overlaps and fits exactly?

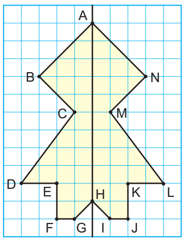
S Complete activities ① to ③ before answering the teacher.

Find out that corresponding points, sides and angles overlap and fits exactly.

Properties of Figures with Line Symmetry

Properties of Line of Symmetry

② The figure on the right has a line symmetry. Let's explore the points, sides and angles when it is folded along its line of symmetry.



axis of symmetry

① Which points lie on point B and point K respectively when the figure is folded along its symmetric axis? Point N and E

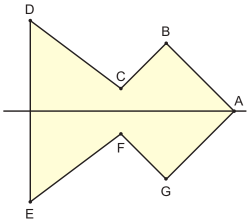
② Which side lies on top of side AB and DE, respectively? Lines AN and KL

③ Which angles lie on top of angle D and J, respectively? Angle L and angle F

When the figure with line symmetry is folded along its axis of symmetry, the matching points are called **corresponding points** and the matching sides are called **corresponding sides** and the matching angles are called **corresponding angles**.
In line symmetric figures, the sizes of corresponding sides and angles are respectively equal.

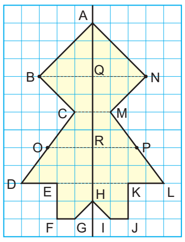
Exercise

The figure on the right has a line symmetry.
Let's write the corresponding points, sides and angles.



Points D & E, C & F, B & G
Angle D & E, C & F ,B & G
Sides DC & EF, CB & FG, AB & AG

③ Let's explore the figure with line symmetry on the right.



① The points B and N are corresponding. Consider how the line BN intersects with the line of symmetry. Perpendicularly

② The points O and P are corresponding. Consider how the line OP intersects with the line of symmetry. Perpendicularly

③ Compare the lengths of lines QB and QN, RP and RO.
Line BQ and QN are equal
Line RP and RO are equal.

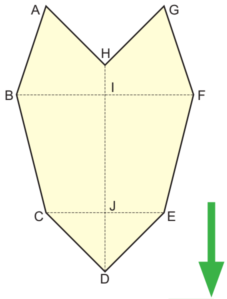
For figures with line symmetry, a line that connects two corresponding points always intersects in perpendicular with the line of symmetry.
The length from the line of symmetry to the corresponding points are equal.

Exercise

The figure on the right has a line symmetry.

① How does the line CE intersect with the line of symmetry? Perpendicularly

② If the length of the line BI is 25 mm, what is the length of line IF? 25 mm



Lesson flow 2

3 Important Point

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

4 Complete the Exercise.

T Allow students to give their answers in class and do on the spot correction.

T/S Do correction on the blackboard through discussions.

5 Investigate the relationship between lines of symmetry and lines connecting two points.

T/S 3 Read and understand the given situation.

T "Do you notice any relationship between the line that connects two points and the line of symmetry?"

S Solve activities ① to ③ before answering the teacher. Identify that the corresponding squares on the grid are exactly the same on both sides of the points.

6 Important Point

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

7 Complete the Exercise.

S Solve all the exercises.

T Confirm students' answers.

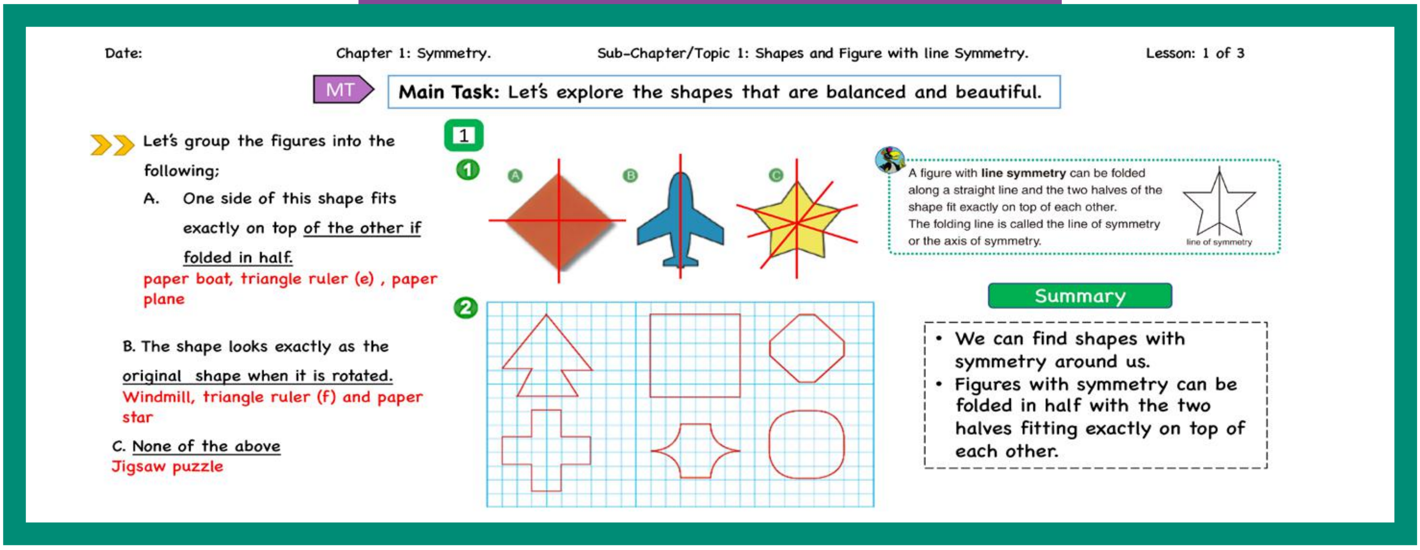
8 Summary

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 1)



Date: Chapter 1: Symmetry. Sub-Chapter/Topic 1: Shapes and Figure with line Symmetry. Lesson: 1 of 3

MT **Main Task:** Let's explore the shapes that are balanced and beautiful.

Let's group the figures into the following;

A. One side of this shape fits exactly on top of the other if folded in half.
paper boat, triangle ruler (e) , paper plane

B. The shape looks exactly as the original shape when it is rotated.
Windmill, triangle ruler (f) and paper star

C. None of the above
Jigsaw puzzle

1

①

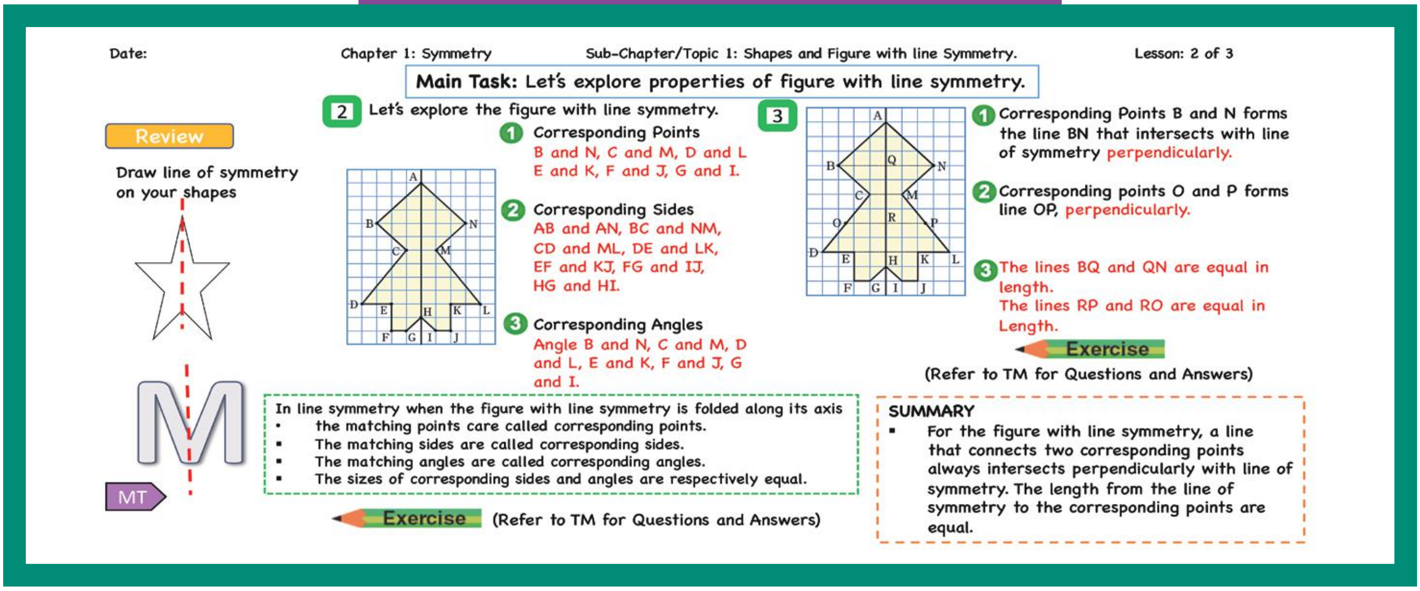
②

A figure with **line symmetry** can be folded along a straight line and the two halves of the shape fit exactly on top of each other.
The folding line is called the line of symmetry or the axis of symmetry.

Summary

- We can find shapes with symmetry around us.
- Figures with symmetry can be folded in half with the two halves fitting exactly on top of each other.

Sample Blackboard Plan (Lesson 2)



Date: Chapter 1: Symmetry Sub-Chapter/Topic 1: Shapes and Figure with line Symmetry. Lesson: 2 of 3

Main Task: Let's explore properties of figure with line symmetry.

Review

Draw line of symmetry on your shapes

MT

2 Let's explore the figure with line symmetry.

① Corresponding Points
B and N, C and M, D and L
E and K, F and J, G and I.

② Corresponding Sides
AB and AN, BC and NM,
CD and ML, DE and LK,
EF and KJ, FG and IJ,
HG and HI.

③ Corresponding Angles
Angle B and N, C and M, D and L, E and K, F and J, G and I.

In line symmetry when the figure with line symmetry is folded along its axis
- the matching points care called corresponding points.
- The matching sides are called corresponding sides.
- The matching angles are called corresponding angles.
- The sizes of corresponding sides and angles are respectively equal.

Exercise (Refer to TM for Questions and Answers)

3

① Corresponding Points B and N forms the line BN that intersects with line of symmetry perpendicularly.

② Corresponding points O and P forms line OP, perpendicularly.

③ The lines BQ and QN are equal in length.
The lines RP and RO are equal in Length.

Exercise

(Refer to TM for Questions and Answers)

SUMMARY
- For the figure with line symmetry, a line that connects two corresponding points always intersects perpendicularly with line of symmetry. The length from the line of symmetry to the corresponding points are equal.

Unit 1

Unit: Symmetry

Sub-unit: 1. Shapes and Figures with Line Symmetry

Lesson 3 of 3

Textbook Page : 007
Actual Lesson 003

Lesson Objective

- To understand how to draw line of symmetry by investigating the characteristics of corresponding points, sides and angles.

Prior Knowledge

- Meaning of line symmetry.
- Characteristics of line symmetry

Preparation

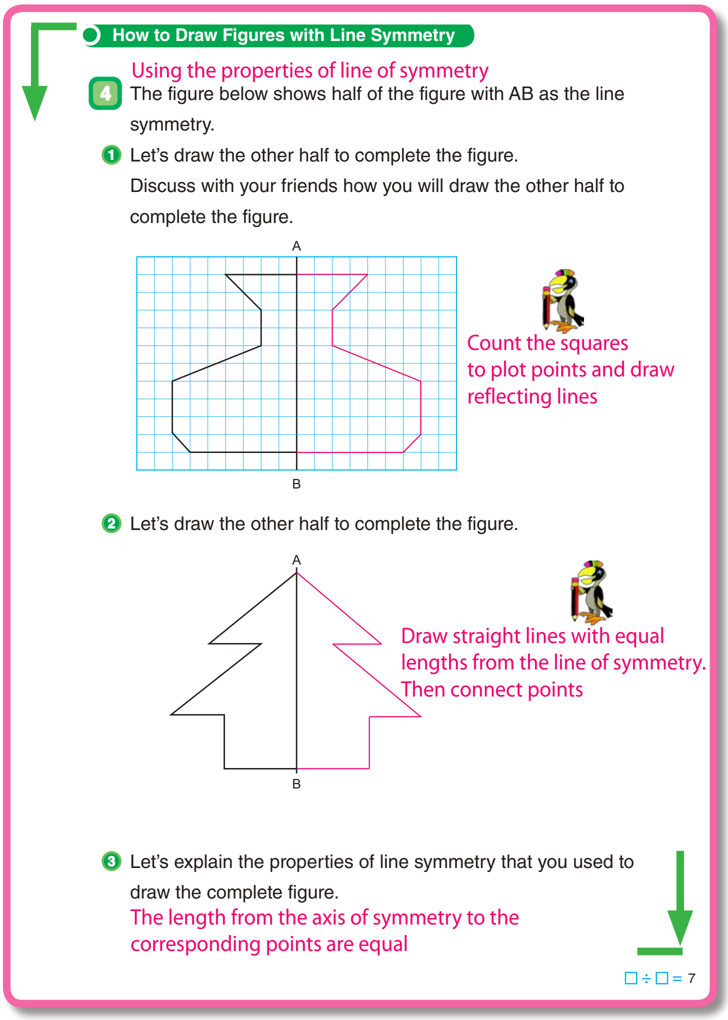
- Square grid paper, tracing papers and rulers.

Assessment

- Draw line symmetrical figures by investigating the characteristics of line symmetry. F
- Solve the exercise correctly. S

Teacher's Notes

Assist the students to use line of symmetry to complete the drawing and set the understanding that corresponding lengths and corresponding angles are equal in figures of line symmetry.
Ensure that both sides of the line symmetry are equal.
After completing a series of study about line symmetric figures, it is good to create line-symmetric shapes using a mirror.
If you place a triangular figure on a mirror, various line symmetric figures will appear depending on how you place it on the mirror.
It is also fun to learn to create various line-symmetric figures by reflecting in the mirror not only triangles but also rectangles, squares and so on.



How to Draw Figures with Line Symmetry

Using the properties of line of symmetry

4 The figure below shows half of the figure with AB as the line symmetry.

① Let's draw the other half to complete the figure.
Discuss with your friends how you will draw the other half to complete the figure.

A
B
Count the squares to plot points and draw reflecting lines

② Let's draw the other half to complete the figure.

A
B
Draw straight lines with equal lengths from the line of symmetry. Then connect points

③ Let's explain the properties of line symmetry that you used to draw the complete figure.
The length from the axis of symmetry to the corresponding points are equal

□÷□= 7

Lesson flow

1 Review the previous lesson.

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

2 Draw a figure of line symmetry with and without a grid.

T/S 4 Read and understand the given situation.

T Give out square grid paper and ask the students to complete ①.

S ① Draw the other half with grid paper to complete the figure and discuss with friends on how you drew your figure.

S Possible response: I completed the other half by counting the number of squares to the line Symmetry.

3 Draw the other half without grid to complete the figure.

T ② How can we draw the other half without the square grid paper?

S From the line of symmetry draw perpendicular lines that are the same length as the opposite side and connect to the corresponding points.

TN Ensure that the distance from the centre for both sides are equal.

4 ③ Use the properties of line of symmetry.

T Ask the students to explain the properties of line of symmetry that they used to draw the complete figure.

S Explain that the length from the axis of symmetry to the corresponding points are equal.

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 1: Symmetry Sub-Chapter/Topic 1: Shapes and Figure with line Symmetry. Lesson: 3 of 3

Main Task: Let's draw figure with line symmetry.

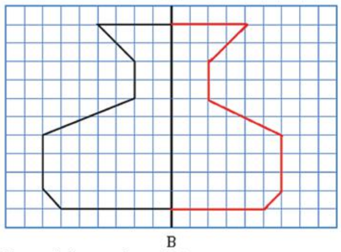
Review

Important Point:

- The sizes of corresponding sides and angles are respectively equal.
- The line that connects two corresponding points always intersects perpendicularly.
- The length from the line of symmetry to the corresponding points are equal.

MT

4 ① Let's draw figures using grid paper.

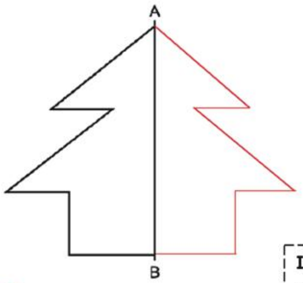


How did you drew it?

Students' Possible Response

I completed the drawing by counting equal squares from the line symmetry to the other end. Then I connect the lines

② Let's draw without the grid paper



③ Students explain how they complete the drawing using the properties of line symmetry.

How did you drew it?

Students' Possible Response

I drew perpendicular lines with equal distance from the corresponding points to completed the drawing

Summary

In line symmetry

- Length of the corresponding points are equal.
- The measure of the corresponding angles are equal.

Unit
1

Unit: Symmetry

Sub-unit: 2. Shapes and Figures with Line Symmetry

Lesson 1 of 4

Textbook Page : 008
Actual Lesson 004

Sub-unit Objectives

- To understand the definition and characteristics of point symmetry.
- To understand how to draw figures with point symmetry.

Lesson Objective

- To understand the definition and characteristics of figures with point symmetry.

Prior Knowledge

- Characteristics of Line symmetry

Preparation

- Cut out image A, B and C from printed paper or by tracing

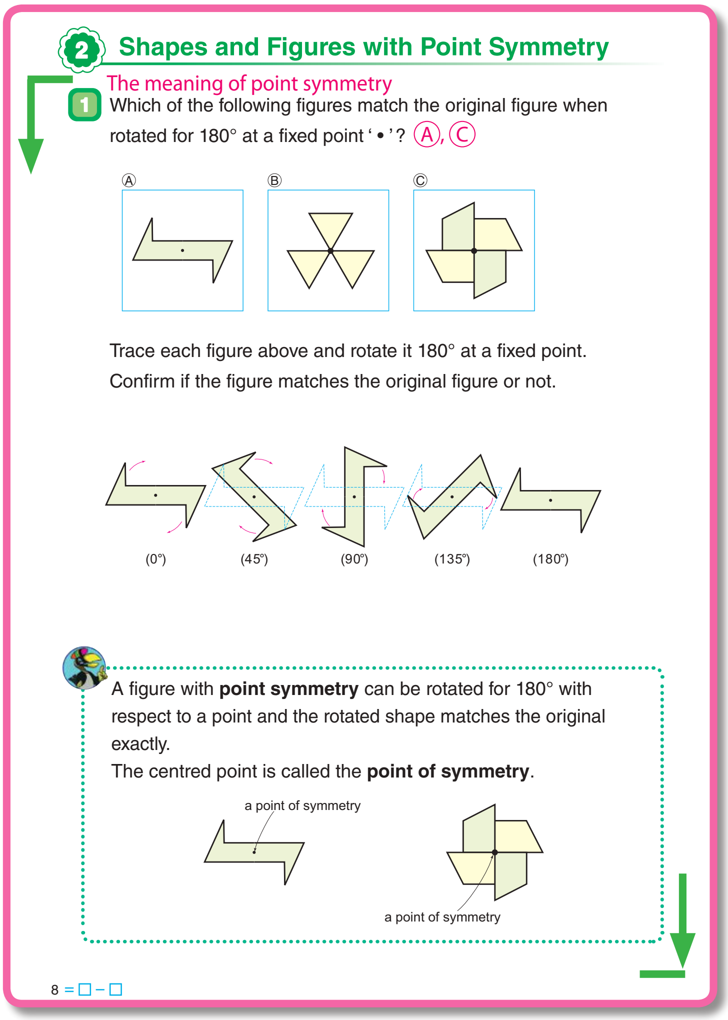
Assessment

- Show understanding that by rotating the figure the shape is the same. F
- Define point of symmetry and its characteristics. S

Teacher's Notes

A figure that will match the original shape when turned 180° around a point is called the point of symmetry.
You may use block letters S Z D for further explanation. Place center point on one of these letters and rotate 180°.

It is important not only to learn point symmetric figures as knowledge but also to analyse them through manipulating figures. Students can capture the meaning of point symmetry through rotating various figures by 180 °.



② Shapes and Figures with Point Symmetry

The meaning of point symmetry

1 Which of the following figures match the original figure when rotated for 180° at a fixed point ‘ • ’? Ⓐ, Ⓒ

Trace each figure above and rotate it 180° at a fixed point.
Confirm if the figure matches the original figure or not.

A figure with **point symmetry** can be rotated for 180° with respect to a point and the rotated shape matches the original exactly.
The centred point is called the **point of symmetry**.

Lesson flow

1 Review the previous lesson.

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

2 Discuss which of the three figures matches its original figure when rotated at 180°.

T/S 1 Read and understand the given situation.

T What can you notice about the three (3) figures?

S B has a line of symmetry

S If figures A and C are rotated at 180°, the figure will be the same as the original.

3 Cut out the figures of A, B and C.

S Trace and cut out figures A, B and C.

TN Provide photocopied images if available or students may trace out the figures using tracing papers.

4 Confirm what will happen if these figures are rotated at 180° on the same point.

TN Emphasise that rotation should be made on a fixed point.

S Rotate the figure at 180° on a fixed point to confirm if the figures match the original.

T What can you notice?

S If A is rotated at 180°, the figure will be the same.

S If B is rotated at 180°, it will be different.

S If C is rotated as, A and B, the figure will be the same.

5 Important Point

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

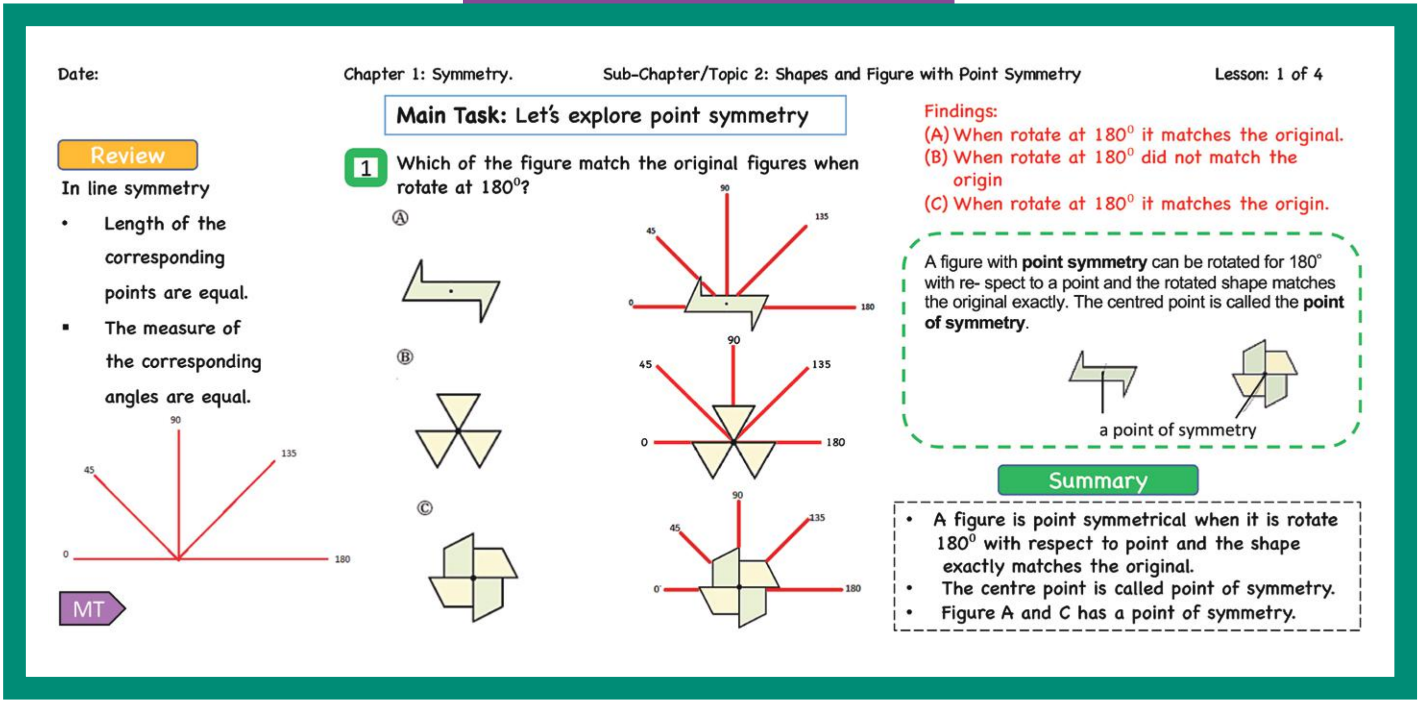
6 Summary

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 1: Symmetry.

Sub-Chapter/Topic 2: Shapes and Figure with Point Symmetry

Lesson: 1 of 4

Review

In line symmetry

- Length of the corresponding points are equal.
- The measure of the corresponding angles are equal.

Main Task: Let's explore point symmetry

1 Which of the figure match the original figures when rotate at 180⁰?

Findings:

(A) When rotate at 180⁰ it matches the original.

(B) When rotate at 180⁰ did not match the origin

(C) When rotate at 180⁰ it matches the origin.

A figure with **point symmetry** can be rotated for 180° with re- spect to a point and the rotated shape matches the original exactly. The centred point is called the **point of symmetry**.

Summary

- A figure is point symmetrical when it is rotate 180⁰ with respect to point and the shape exactly matches the original.
- The centre point is called point of symmetry.
- Figure A and C has a point of symmetry.

Unit 1

Unit: Symmetry
Sub-unit: 2. Shapes and Figures with Line Symmetry
Lesson 2 of 4

Textbook Page : 009 and 010
Actual Lesson 005

Lesson Objective

- To investigate the characteristics of corresponding points, sides and angles using point symmetry.

Prior Knowledge

- Meaning of Point Symmetry

Preparation

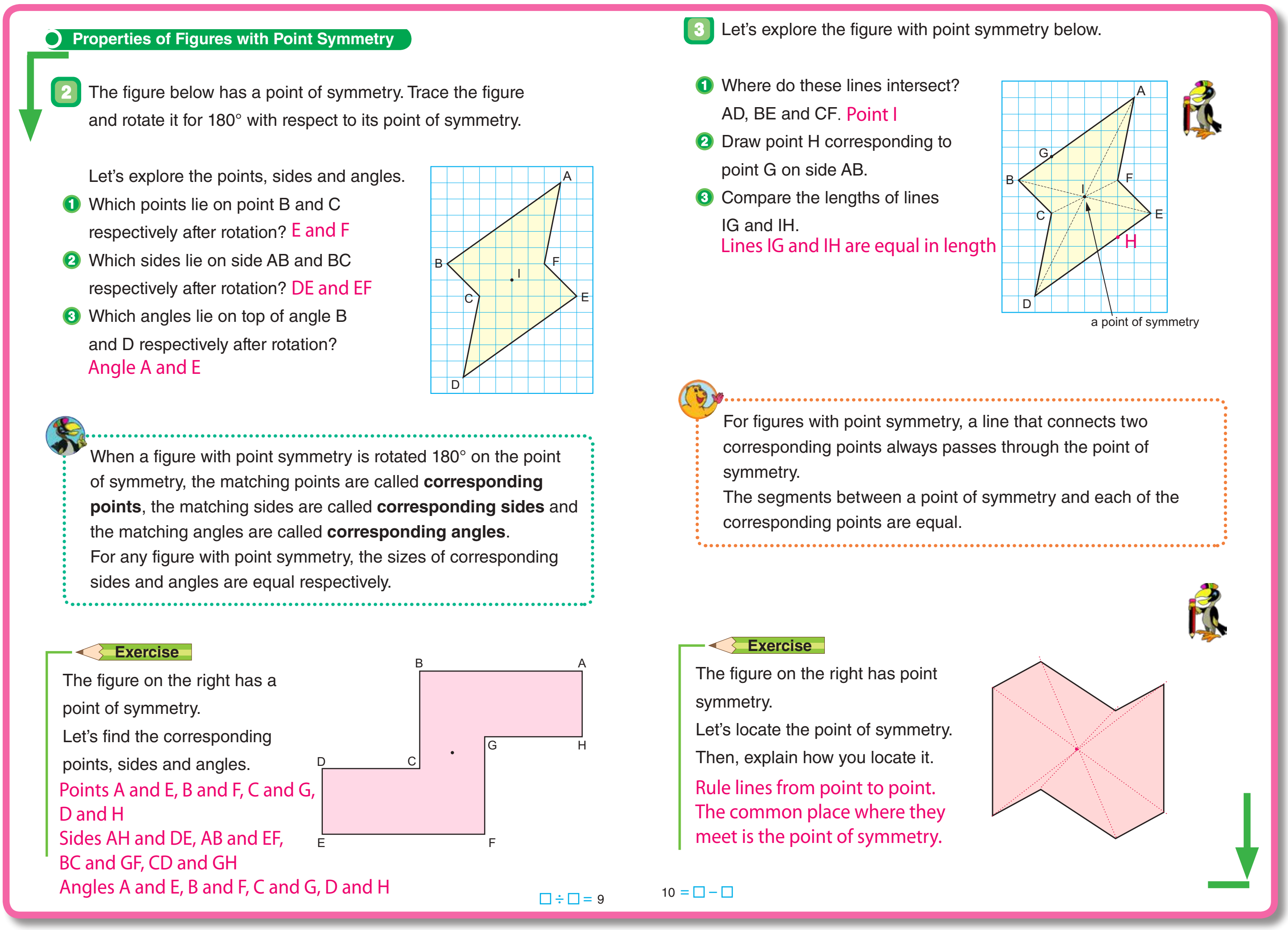
- Square grid paper and rulers

Assessment

- Investigate and identify the corresponding points, sides and angles of point symmetry. F
- Solve the exercises correctly. S

Teacher's Notes

The corresponding sides, points and angles of point symmetry can be obtained when rotating 180° at the point of symmetry.
The size of corresponding sides and angles are equal respectively.
Avoid the misconception of folding point symmetry to find corresponding sides, points and angles.



Properties of Figures with Point Symmetry

② The figure below has a point of symmetry. Trace the figure and rotate it for 180° with respect to its point of symmetry.

Let's explore the points, sides and angles.

① Which points lie on point B and C respectively after rotation? E and F

② Which sides lie on side AB and BC respectively after rotation? DE and EF

③ Which angles lie on top of angle B and D respectively after rotation? Angle A and E

When a figure with point symmetry is rotated 180° on the point of symmetry, the matching points are called **corresponding points**, the matching sides are called **corresponding sides** and the matching angles are called **corresponding angles**.
For any figure with point symmetry, the sizes of corresponding sides and angles are equal respectively.

Exercise

The figure on the right has a point of symmetry.
Let's find the corresponding points, sides and angles.
Points A and E, B and F, C and G, D and H
Sides AH and DE, AB and EF, BC and GF, CD and GH
Angles A and E, B and F, C and G, D and H

③ Let's explore the figure with point symmetry below.

① Where do these lines intersect? AD, BE and CF. Point I

② Draw point H corresponding to point G on side AB.

③ Compare the lengths of lines IG and IH.
Lines IG and IH are equal in length

For figures with point symmetry, a line that connects two corresponding points always passes through the point of symmetry.
The segments between a point of symmetry and each of the corresponding points are equal.

Exercise

The figure on the right has point symmetry.
Let's locate the point of symmetry.
Then, explain how you locate it.
Rule lines from point to point.
The common place where they meet is the point of symmetry.

Lesson flow

1 Review the previous lesson.

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

2 Investigate the characteristics of corresponding points, angles and sides using point symmetry.

T/S 2 Read and understand the given situation.

S Discuss with a friend and solve activity ① to ③.

① E and F, ② DG and EF and ③ Angle A and E

T Explain the difference between line symmetry and point symmetry to avoid misconception. (Refer to TN)

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 Investigate the relationship between the corresponding points and point symmetry.

T/S 3 Read and understand the given situation.

S Solve activity ① to ③.

① Point I

② Drawing point H.

③ Lines IG and IH are equal in length.

T Confirm students' answers.

6 Important Point

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

7 Complete the Exercise.

S Solve the exercise.

T Confirm students' answers.

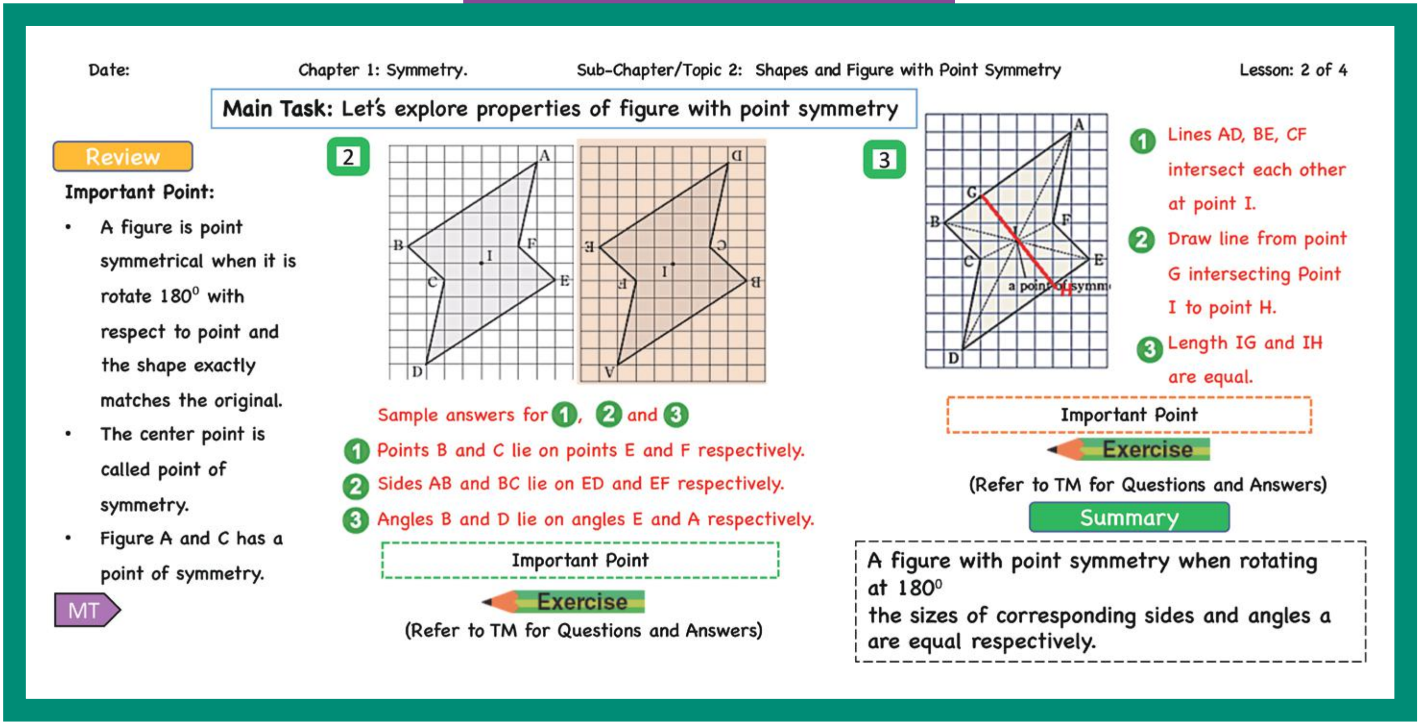
8 Summary

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



Date: Chapter 1: Symmetry. Sub-Chapter/Topic 2: Shapes and Figure with Point Symmetry Lesson: 2 of 4

Main Task: Let's explore properties of figure with point symmetry

Review

Important Point:

- A figure is point symmetrical when it is rotate 180⁰ with respect to point and the shape exactly matches the original.
- The center point is called point of symmetry.
- Figure A and C has a point of symmetry.

MT

2

Sample answers for ①, ② and ③

① Points B and C lie on points E and F respectively.

② Sides AB and BC lie on ED and EF respectively.

③ Angles B and D lie on angles E and A respectively.

Important Point

Exercise

(Refer to TM for Questions and Answers)

3

① Lines AD, BE, CF intersect each other at point I.

② Draw line from point G intersecting Point I to point H.

③ Length IG and IH are equal.

Important Point

Exercise

(Refer to TM for Questions and Answers)

Summary

A figure with point symmetry when rotating at 180⁰
the sizes of corresponding sides and angles a are equal respectively.

Unit
1

Unit: Symmetry

Sub-unit: 2. Shapes and Figures with Line Symmetry

Lesson 3 of 4

Textbook Page : 011
Actual Lesson 006

Lesson Objective

- To demonstrate the understanding of how to draw figures with point symmetry.

Prior Knowledge

- Meaning of point symmetry
- Characteristics of point symmetry

Preparation

- Square grid paper, tracing paper and rulers

Assessment

- Enjoy drawing the figures using point symmetry. F
- Explain the properties of point symmetry. S

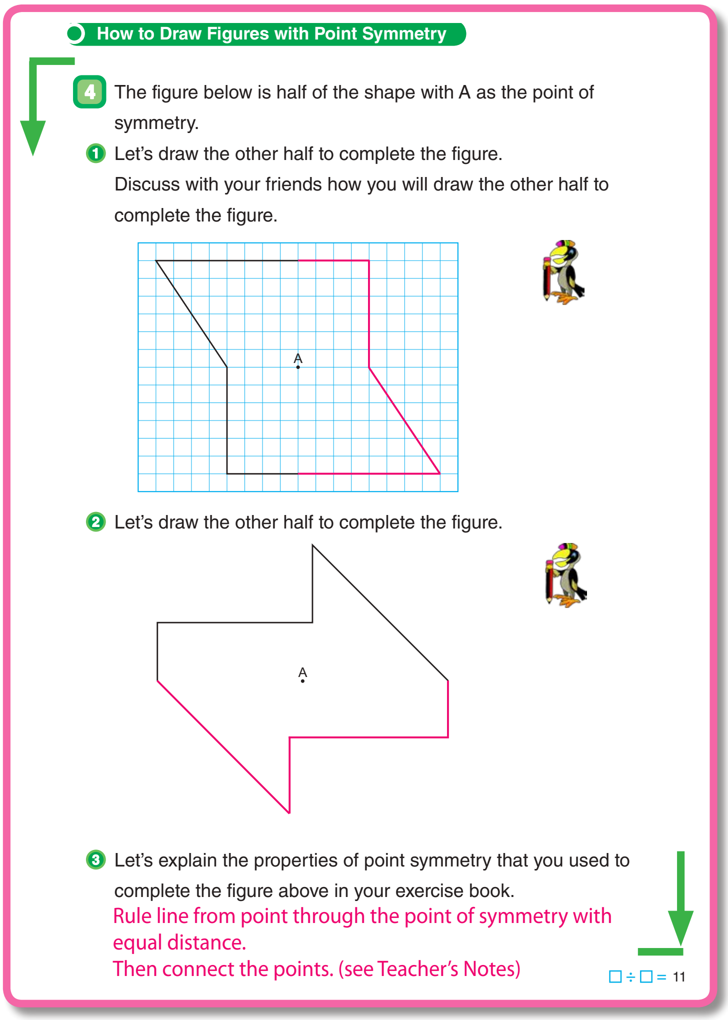
Teacher's Notes

Use the Properties of Point of Symmetry below to draw figures ;

- The lengths from the centre to the corresponding points are equal.
- The segment connecting corresponding points will pass through the centre of symmetry.

(use the 2 points above for flow 3)

In order to draw a point-symmetric figure, it is necessary to think beforehand about what kind of shape it will be.
It is necessary to be aware of three things: finding the corresponding points, a line connecting the corresponding points passes through the center of point symmetry, and the line has an equal distance from the center.



How to Draw Figures with Point Symmetry

4 The figure below is half of the shape with A as the point of symmetry.

① Let's draw the other half to complete the figure.
Discuss with your friends how you will draw the other half to complete the figure.

A

② Let's draw the other half to complete the figure.

A

③ Let's explain the properties of point symmetry that you used to complete the figure above in your exercise book.
Rule line from point through the point of symmetry with equal distance.
Then connect the points. (see Teacher's Notes)

□÷□= 11

Lesson flow

1 Review the previous lesson.

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

2 Draw a figure with point symmetry using grid paper.

T/S 4 Read and understand the given situation.
S ① Identify the corresponding points by counting the squares from the centre.
S Explain how they drew to complete their figures.

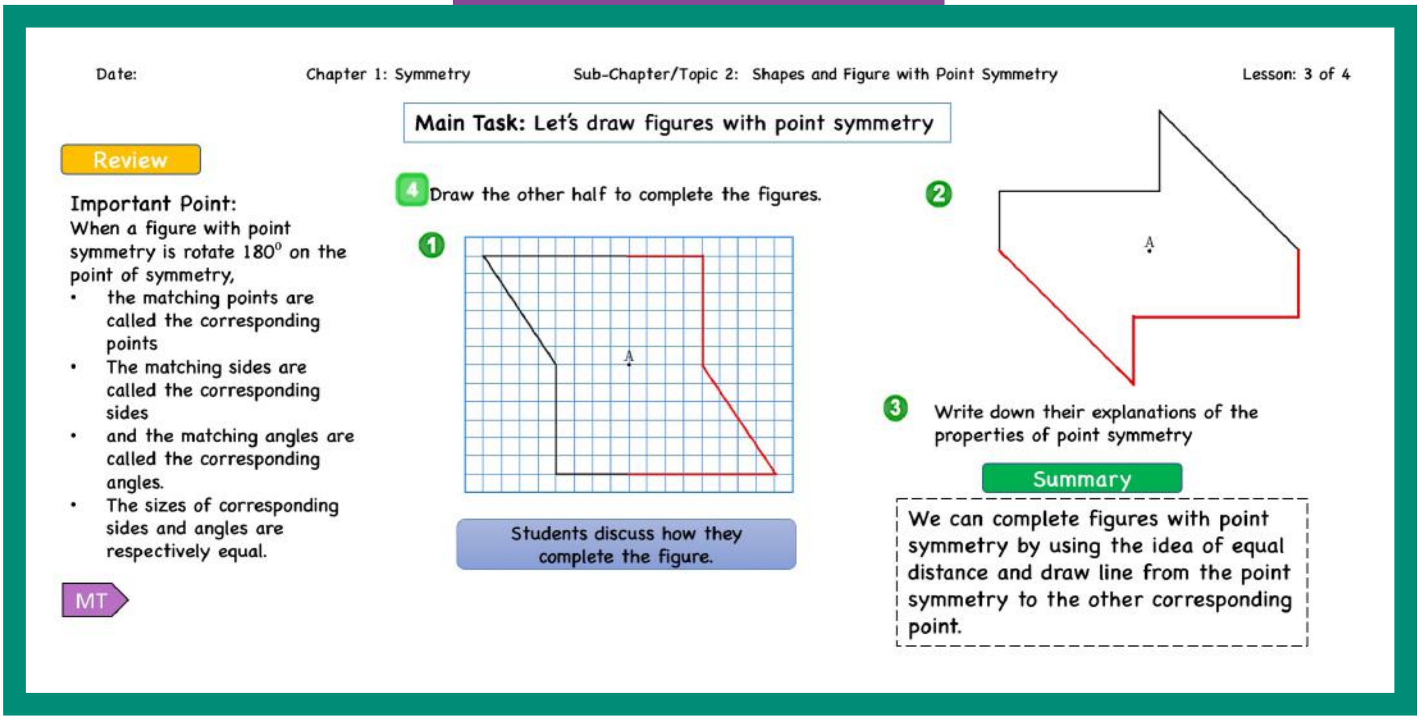
3 Draw a figure with point symmetry without using grid paper.

T ② How can we draw using point symmetry without a square grid paper?
S Identify the corresponding points without the squares to complete the figure by extending lines with the same distance.
S ③ Write down their explanation of the properties of point symmetry.

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 1: Symmetry Sub-Chapter/Topic 2: Shapes and Figure with Point Symmetry Lesson: 3 of 4

Main Task: Let's draw figures with point symmetry

Review

Important Point:
When a figure with point symmetry is rotate 180° on the point of symmetry,

- the matching points are called the corresponding points
- The matching sides are called the corresponding sides
- and the matching angles are called the corresponding angles.
- The sizes of corresponding sides and angles are respectively equal.

MT

4 Draw the other half to complete the figures.

①

Students discuss how they complete the figure.

②

③ Write down their explanations of the properties of point symmetry

Summary

We can complete figures with point symmetry by using the idea of equal distance and draw line from the point symmetry to the other corresponding point.

Unit 1

Unit: Symmetry
Sub-unit: 2. Shapes and Figures with Line Symmetry
Lesson 4 of 4

Textbook Pages : 012 and 013
Actual Lesson 007

Lesson Objective

- To find line or point symmetry in the figures using the characteristics of line and point symmetry.

Prior Knowledge

- Characteristics of line of Symmetry
- Characteristics of point of Symmetry

Preparation

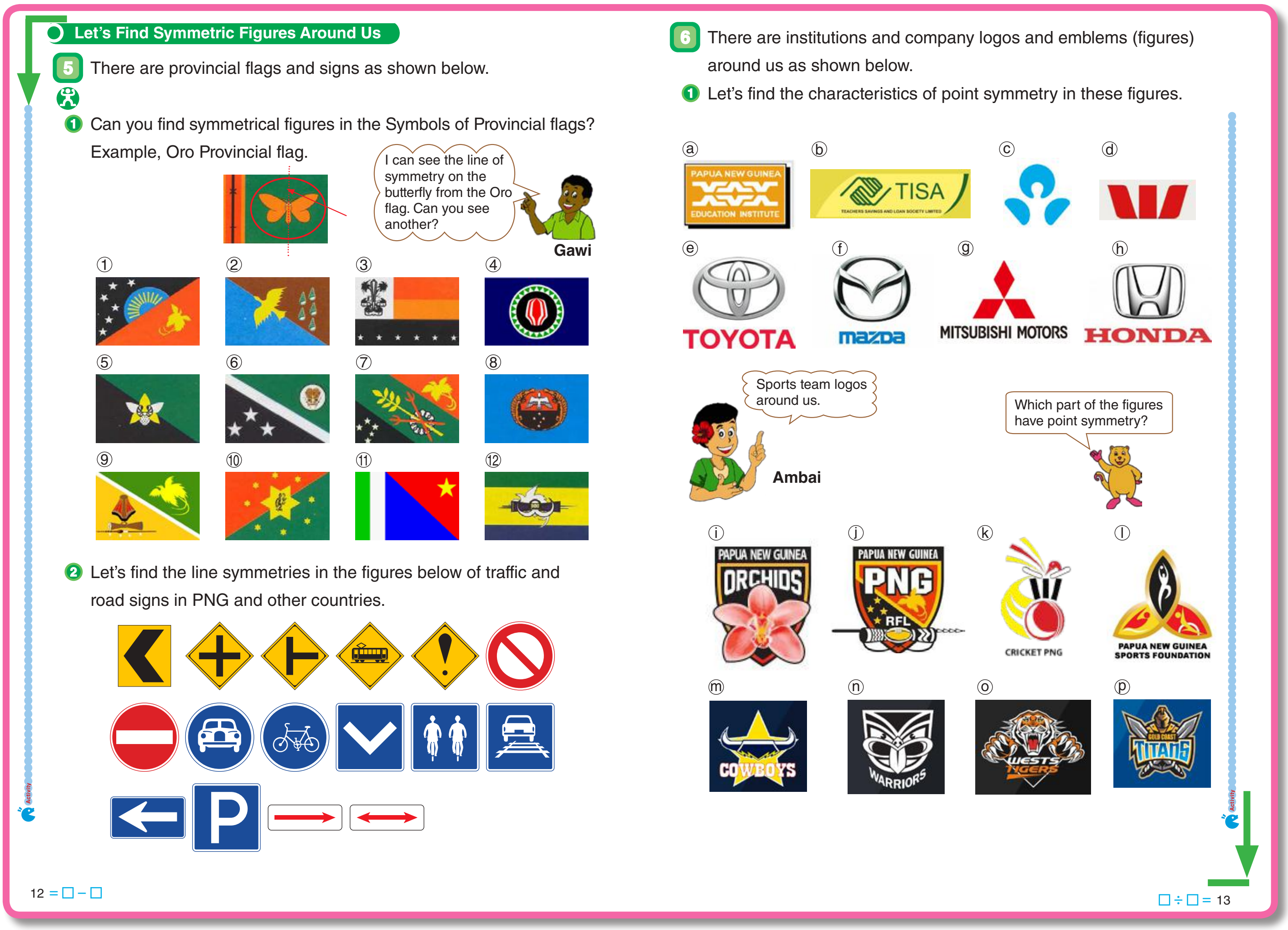
- Images from the textbook

Assessment

- Identify and appreciate the symbols and signs around them that have the line of symmetry or point symmetry. **F**
- Categorise the symbols and signs into line symmetry and point symmetry according to their characteristics. **S**

Teacher's Notes

Discuss symbols and signs that are common to students in their provinces.
Allow students to identify figures within the symbols and not just looking at the overall symbol itself.



Let's Find Symmetric Figures Around Us

5 There are provincial flags and signs as shown below.

① Can you find symmetrical figures in the Symbols of Provincial flags?
Example, Oro Provincial flag.

I can see the line of symmetry on the butterfly from the Oro flag. Can you see another?
Gawi
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
P

② Let's find the line symmetries in the figures below of traffic and road signs in PNG and other countries.

12 = ☐ − ☐

6 There are institutions and company logos and emblems (figures) around us as shown below.

① Let's find the characteristics of point symmetry in these figures.

☐ ÷ ☐ = 13

Lesson flow

1 Review the previous lesson.

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

2 Discuss symmetrical figures in symbols.

T Ask the following questions; Are these figures familiar to you?
How can we categorise the symbols and signs?
S Identify the line of symmetry and point of symmetry through discussions in pairs.
T Introduce the Main Task. (Refer to Blackboard Plan)

3 Categorise figures with line symmetry.

T/S 5 Read and understand the given situation.
T Ask students to complete the task by categorising the figures with line symmetry.
S ① and ②. Categorise the figures with line symmetry.

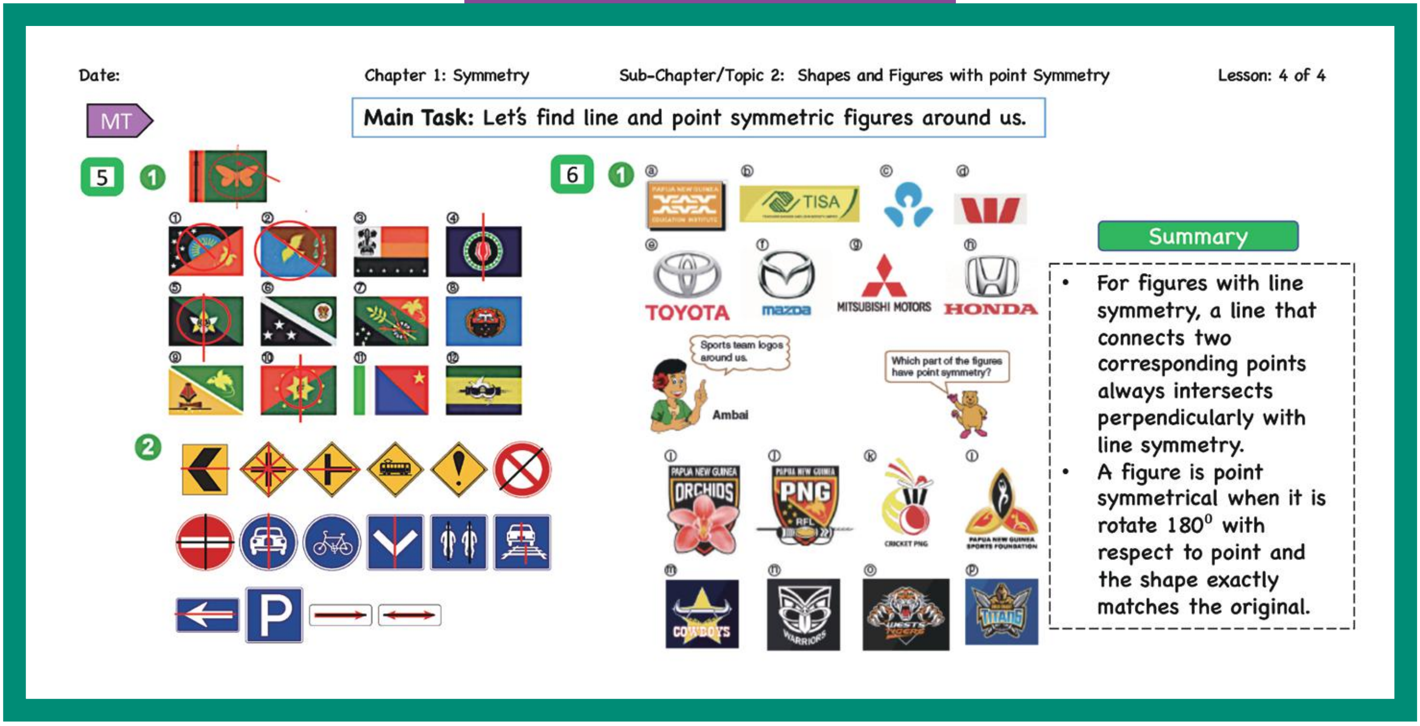
4 Categorise figures with point symmetry.

T/S 6 Read and understand the given situation.
T ① Ask students to complete the task by categorising the figures with point symmetry.
S Explore the characteristics of point symmetry of company and sports logos.
S Confirm the lines of symmetry and points of symmetry.

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 1: Symmetry Sub-Chapter/Topic 2: Shapes and Figures with point Symmetry Lesson: 4 of 4

MT **Main Task:** Let's find line and point symmetric figures around us.

Summary

- For figures with line symmetry, a line that connects two corresponding points always intersects perpendicularly with line symmetry.
- A figure is point symmetrical when it is rotate 180^0 with respect to point and the shape exactly matches the original.

Unit 1

Unit: Symmetry

Sub-unit: 3. Polygons and Symmetry

Lesson 1 of 2

Textbook Page : 014
Actual Lesson 008

Sub-unit Objective

- To observe the basic shapes with line symmetry and point symmetry.

Lesson Objective

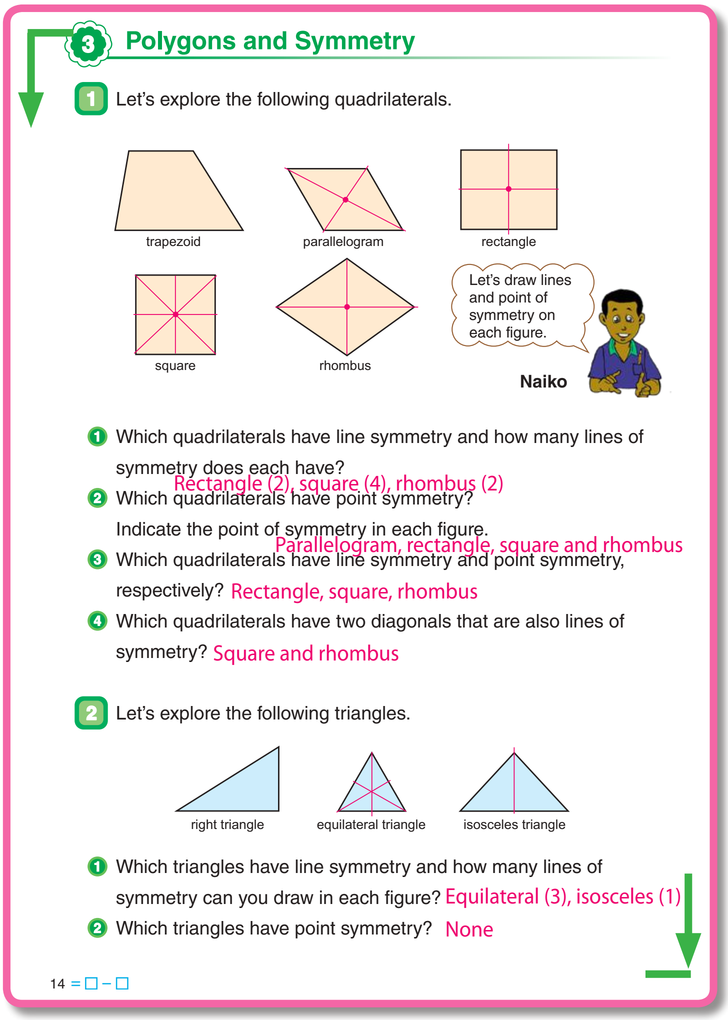
- To explore and find the line of symmetry or point of symmetry by observing the basic shapes.

Prior Knowledge

- Characteristics of line symmetry
- Characteristics of point symmetry

Preparation

- 5 basic shapes of quadrilaterals



③ Polygons and Symmetry

1 Let's explore the following quadrilaterals.

trapezoid parallelogram rectangle

square rhombus

① Which quadrilaterals have line symmetry and how many lines of symmetry does each have? Rectangle (2), square (4), rhombus (2)

② Which quadrilaterals have point symmetry?
Indicate the point of symmetry in each figure. Parallelogram, rectangle, square and rhombus

③ Which quadrilaterals have line symmetry and point symmetry, respectively? Rectangle, square, rhombus

④ Which quadrilaterals have two diagonals that are also lines of symmetry? Square and rhombus

2 Let's explore the following triangles.

right triangle equilateral triangle isosceles triangle

① Which triangles have line symmetry and how many lines of symmetry can you draw in each figure? Equilateral (3), isosceles (1)

② Which triangles have point symmetry? None

14 = □ − □

Assessment

- Investigate line and point of symmetry on the basic shapes. F
- Identify and confirm the line and point of symmetry on the basic shapes. S

Teacher's Notes

Know that polygons like trapezoids and parallelograms do not have line symmetry. Prove these by folding actual cut out figures.

Symmetric axis of regular polygon

- A symmetric axis of odd number regular polygon connects the vertices and the midpoints of the opposite sides.
- A symmetric axis of even number regular polygon connects the vertices and opposite vertices or connects midpoints of opposite sides.
- The number of symmetric axes of N sides of a regular polygon is N.

Lesson flow

1 Review the previous lesson.

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

2 Explore and categorise the quadrilaterals.

T/S 1 Read and understand the given situation.

T Display the 5 quadrilaterals on the blackboard and ask students to explore.

S Explore the 5 different quadrilateral and identify the number of line and point symmetry for each quadrilateral.

T ① Which quadrilaterals have line symmetry and how many lines of symmetry does each have?

S Draw lines to identify number of symmetry for each shape.
Answers: Parallelogram (2), rhombus (2), rectangle (2) and square (4).

T ② Which quadrilaterals have point symmetry? Indicate the point symmetry in each figure.

S Use the properties of point symmetry to identify the quadrilaterals that have point symmetry.
Answers: Parallelogram, rectangle, square and rhombus.

T ③ Which quadrilateral have line symmetry and point symmetry, respectively?

S Categorise quadrilaterals into line symmetry and point symmetry.
Answers: Parallelogram, rhombus, rectangle and square.

T ④ Which quadrilaterals have two diagonals that are also lines of symmetry?

S Identify quadrilaterals that have two diagonals that are also lines of symmetry.
Answers: Parallelogram, rhombus and square

3 Explore the 3 types of triangles.

T 2 Display the 3 types of triangles on the blackboard and ask students to explore their line and point of symmetry.

S Explore the 3 different triangles and identify the number of line of symmetry for each triangle.

T ① Which triangles have line symmetry and how many lines of symmetry can you draw in each figure?

S Draw lines to identify number of symmetry for each triangle.
Answer: Equilateral (3) and isosceles (1)

T ② Which triangles have point symmetry?.

S Use the properties of point symmetry to identify the triangles. Answer: Equilateral triangle.

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.

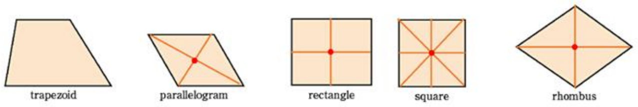
Sample Blackboard Plan

Date: Chapter 1: Symmetry Sub-Chapter/Topic 3: Polygons and Symmetry. Lesson: 1 of 2

Main Task: Let's explore different Quadrilaterals and Triangles.

MT

1 Let's explore different Quadrilaterals.



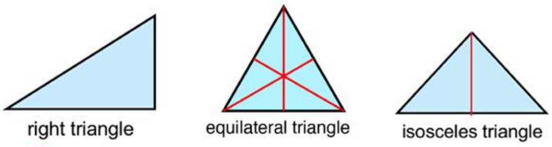
① Rhombus and rectangles have 2 line symmetries and Square has 4 line symmetries.

② Rhombus, Rectangle and square have point symmetry.

③ Rhombus, Rectangle and square.

④ Rhombus and square.

4 Let's explore different Triangles.



① Equilateral have 3 lines of symmetries and Isosceles Triangles have 1.

② None

Summary

Not all quadrilaterals and triangles have line of symmetry nor point of symmetry.

Unit 1

Unit: Symmetry

Sub-unit: 3. Polygons and Symmetry

Lesson 2 of 2

Textbook Pages : 015 and 016
Actual Lesson 009

Lesson Objective

- To explore regular polygons and identify their line of symmetry and point of symmetry.

Prior Knowledge

- Properties of line and point of symmetry in polygons.

Preparation

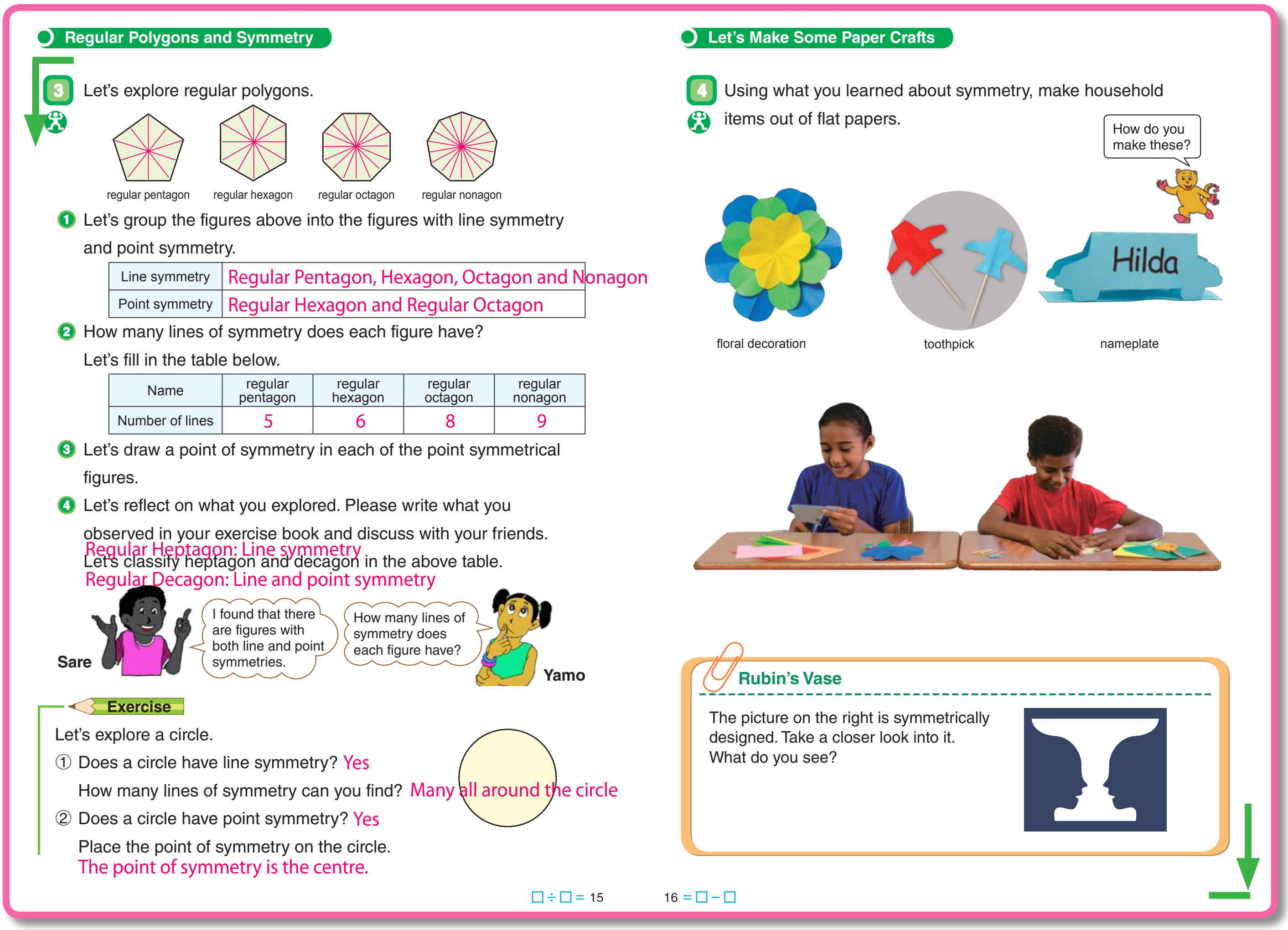
- Coloured papers and table for regular polygons to be categorised.

Assessment

- Explore and identify line and point of symmetry of regular polygons. **F**
- Solve the exercise correctly. **S**

Teacher's Notes

- Regular polygons with even number of sides have both point and line symmetry while polygons with odd number of sides have line symmetry but not point symmetry because when rotating 180, the corresponding points,sides and angles do not match. The lines of symmetry pass through the point of symmetry. In the case of circles, they have a point of symmetry and unlimited lines of symmetry.



Regular Polygons and Symmetry

3 Let's explore regular polygons.

regular pentagon | regular hexagon | regular octagon | regular nonagon

① Let's group the figures above into the figures with line symmetry and point symmetry.

Line symmetry	Regular Pentagon, Hexagon, Octagon and Nonagon
Point symmetry	Regular Hexagon and Regular Octagon

② How many lines of symmetry does each figure have?
Let's fill in the table below.

Name	regular pentagon	regular hexagon	regular octagon	regular nonagon
Number of lines	5	6	8	9

③ Let's draw a point of symmetry in each of the point symmetrical figures.

④ Let's reflect on what you explored. Please write what you observed in your exercise book and discuss with your friends.

Let's classify heptagon and decagon in the above table.
Regular Heptagon: Line symmetry
Regular Decagon: Line and point symmetry

Sare: I found that there are figures with both line and point symmetries.

Yamo: How many lines of symmetry does each figure have?

Exercise

Let's explore a circle.

① Does a circle have line symmetry? Yes
How many lines of symmetry can you find? Many all around the circle

② Does a circle have point symmetry? Yes
Place the point of symmetry on the circle.
The point of symmetry is the centre.

Let's Make Some Paper Crafts

4 Using what you learned about symmetry, make household items out of flat papers.

How do you make these?

floral decoration | toothpick | nameplate

Rubin's Vase

The picture on the right is symmetrically designed. Take a closer look into it. What do you see?

□ ÷ □ = 15 16 = □ − □

Lesson flow

1 Review the previous lesson.

2 3 Explore and find the line and point of symmetry.

T Introduce the main task. (Refer to the BP)

S ① Group figures into those with line symmetry and those with point symmetry.

TN Let the students notice that there are various characteristics. For example:

- There are more than one lines of symmetry in each figure.
- Regular hexagons and octagons have lines of symmetry and points of symmetry.

3 Identify the line and point of symmetry for polygons.

T ② How many lines of symmetry does each figure have?

S Identify the number of lines of symmetry for each figure.

T ③ Ask students to draw a point of symmetry for the figures with point symmetry.

T ④ What did you observe in activity ② and ③?

S Confirm that there is more than one line of symmetry for each figure and regular polygons with even sides have a point of symmetry.

4 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

5 Let's Make Some Paper Craft.

S 4 Do this task as homework or during free time and discuss the attachment of Rubin's Vase with a friend.

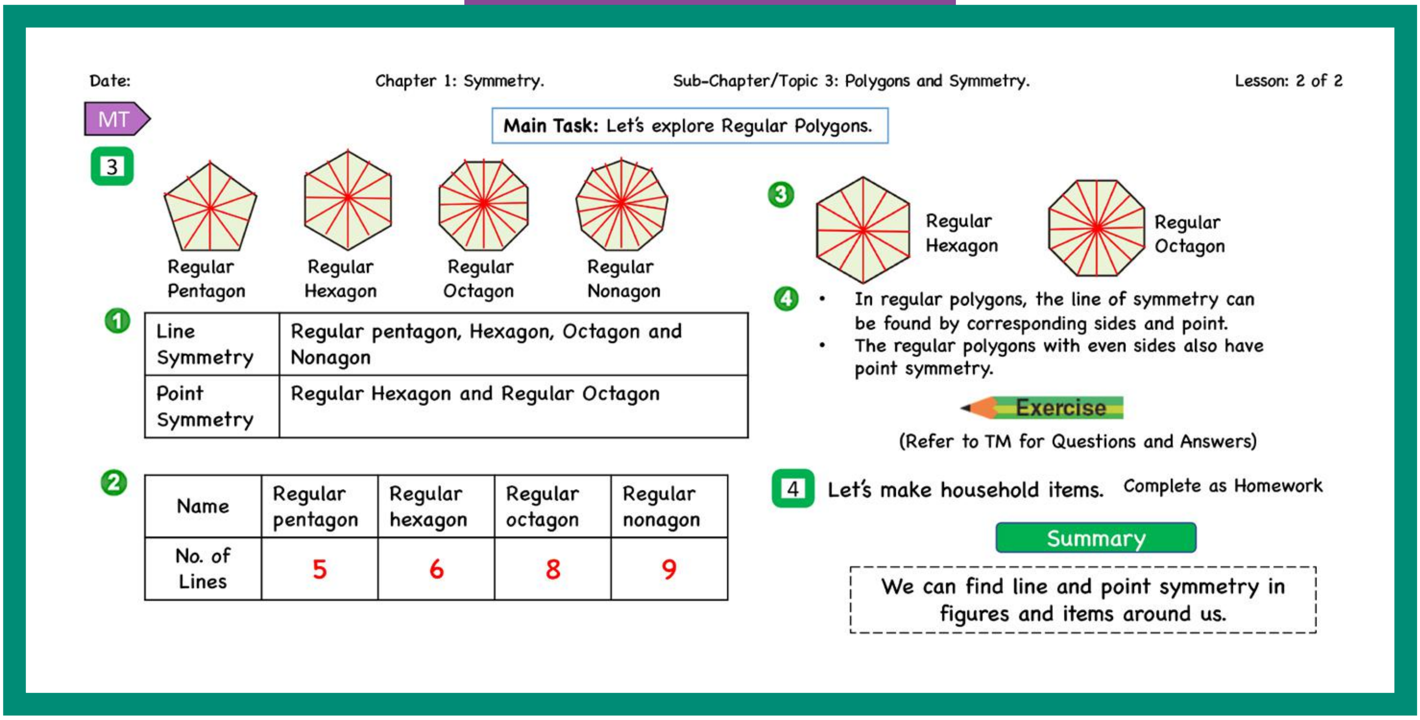
6 Summary

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 1: Symmetry. Sub-Chapter/Topic 3: Polygons and Symmetry. Lesson: 2 of 2

MT

Main Task: Let's explore Regular Polygons.

3

①

Line Symmetry	Regular pentagon, Hexagon, Octagon and Nonagon
Point Symmetry	Regular Hexagon and Regular Octagon

②

Name	Regular pentagon	Regular hexagon	Regular octagon	Regular nonagon
No. of Lines	5	6	8	9

③

④
- In regular polygons, the line of symmetry can be found by corresponding sides and point.
- The regular polygons with even sides also have point symmetry.

Exercise

(Refer to TM for Questions and Answers)

4 Let's make household items. Complete as Homework

Summary

We can find line and point symmetry in figures and items around us.

Unit 1

Unit: Symmetry
Exercises, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Pages : 017 to 019
Actual Lesson 10 and 11

Lesson Objective

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

Prior Knowledge

- All the contents in this unit

Preparation

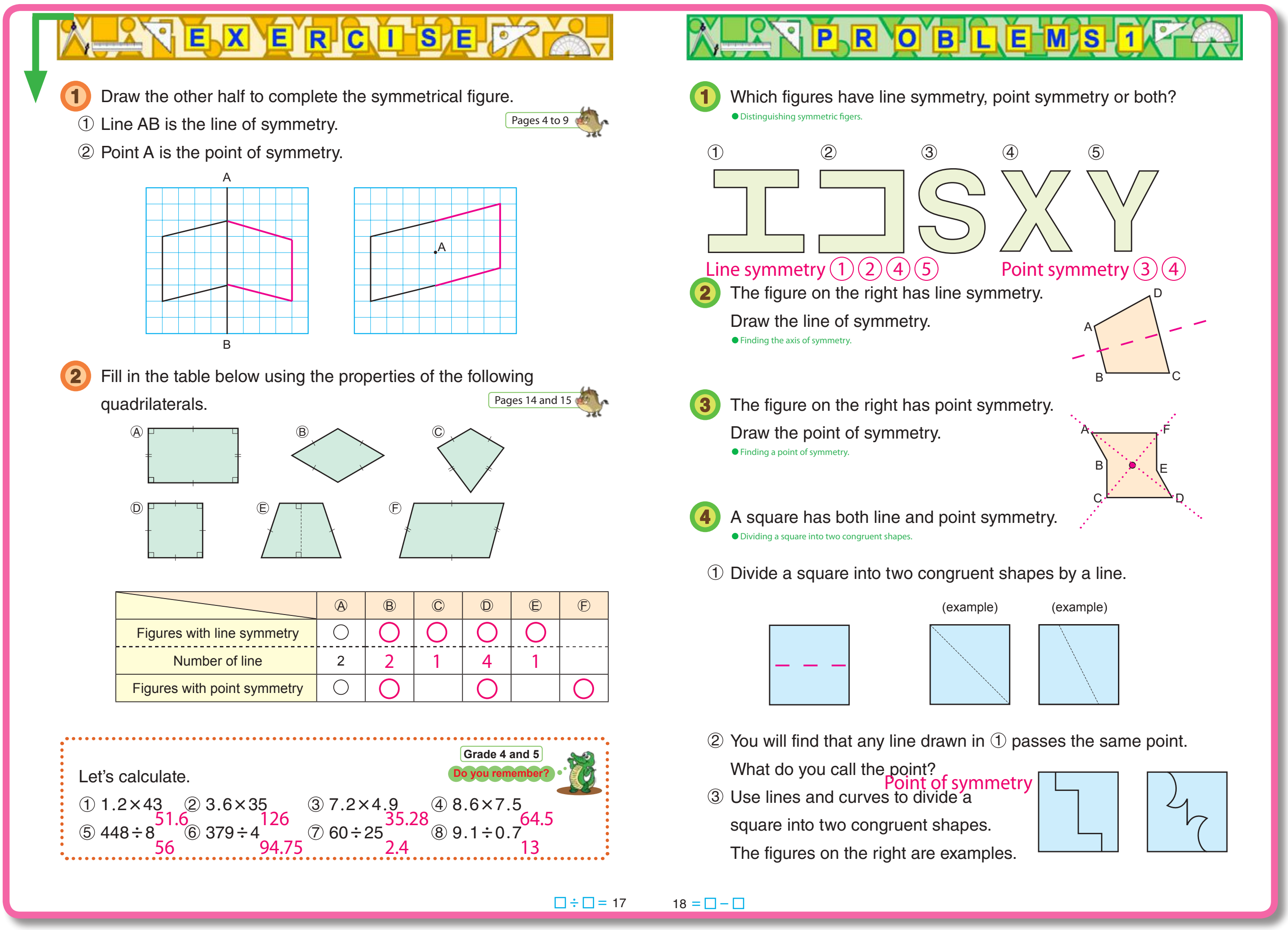
- Evaluation Test

Assessment

- Solve the exercises and problems correctly. F 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, problems and review as a seperate lesson.



EXERCISE

① Draw the other half to complete the symmetrical figure.

Pages 4 to 9

① Line AB is the line of symmetry.

② Point A is the point of symmetry.

② Fill in the table below using the properties of the following quadrilaterals.

Pages 14 and 15

	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ
Figures with line symmetry	○	○	○	○	○	
Number of line	2	2	1	4	1	
Figures with point symmetry	○	○		○		○

Grade 4 and 5
Do you remember?

Let's calculate.

① 1.2×43 51.6 ② 3.6×35 126 ③ 7.2×4.9 35.28 ④ 8.6×7.5 64.5
⑤ 448÷8 56 ⑥ 379÷4 94.75 ⑦ 60÷25 2.4 ⑧ 9.1÷0.7 13

□÷□= 17

PROBLEMS 1

① Which figures have line symmetry, point symmetry or both?

● Distinguishing symmetric figers.

Line symmetry ①②④⑤ Point symmetry ③④

② The figure on the right has line symmetry.
Draw the line of symmetry.

● Finding the axis of symmetry.

③ The figure on the right has point symmetry.
Draw the point of symmetry.

● Finding a point of symmetry.

④ A square has both line and point symmetry.

● Dividing a square into two congruent shapes.

① Divide a square into two congruent shapes by a line.

(example) (example)

② You will find that any line drawn in ① passes the same point.
What do you call the point? Point of symmetry

③ Use lines and curves to divide a square into two congruent shapes.
The figures on the right are examples.

18 = □−□

Lesson flow

1 Complete Exercises ① and ②.

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

2 Complete the Do You Remember exercise.

S Calculate the multiplication and division of decimal numbers.

3 Complete Problems 1, ① to ④.

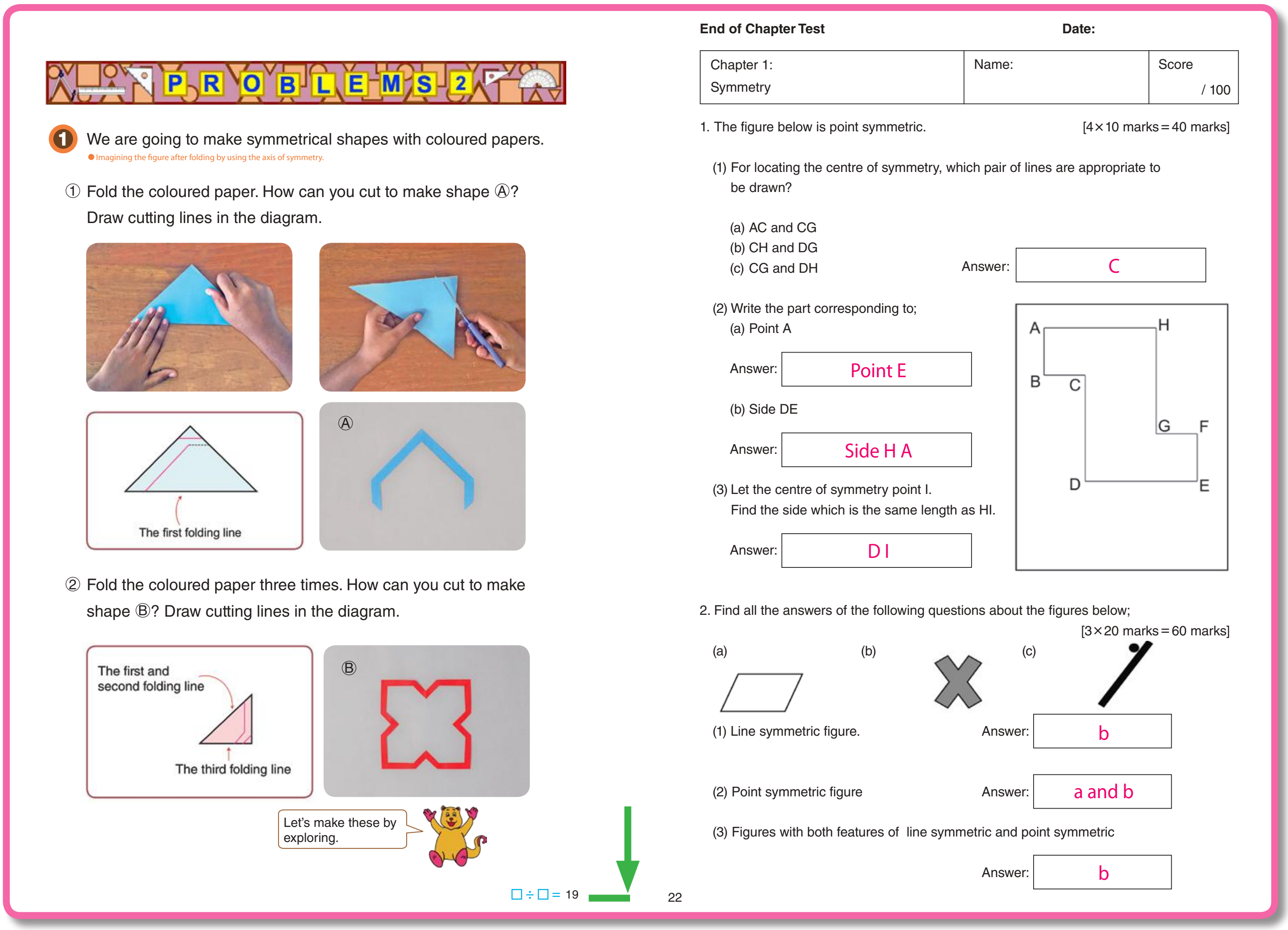
S Solve the problems.
T Confirm students' answers.

4 Complete Problems 2, ①.

S Solve the problem.
T Confirm students' answers.

5 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.



PROBLEMS 2

① We are going to make symmetrical shapes with coloured papers.
● Imagining the figure after folding by using the axis of symmetry.

① Fold the coloured paper. How can you cut to make shape Ⓐ? Draw cutting lines in the diagram.

② Fold the coloured paper three times. How can you cut to make shape Ⓑ? Draw cutting lines in the diagram.

□ ÷ □ = 19

End of Chapter Test **Date:**

Chapter 1: Symmetry	Name:	Score / 100

1. The figure below is point symmetric. [4×10 marks = 40 marks]

(1) For locating the centre of symmetry, which pair of lines are appropriate to be drawn?

(a) AC and CG
(b) CH and DG
(c) CG and DH

Answer: C

(2) Write the part corresponding to;
(a) Point A

Answer: Point E

(b) Side DE

Answer: Side H A

(3) Let the centre of symmetry point I.
Find the side which is the same length as HI.

Answer: D I

2. Find all the answers of the following questions about the figures below; [3×20 marks = 60 marks]

(1) Line symmetric figure. Answer: b

(2) Point symmetric figure Answer: a and b

(3) Figures with both features of line symmetric and point symmetric

Answer: b

22

End of Chapter Test **Date:**

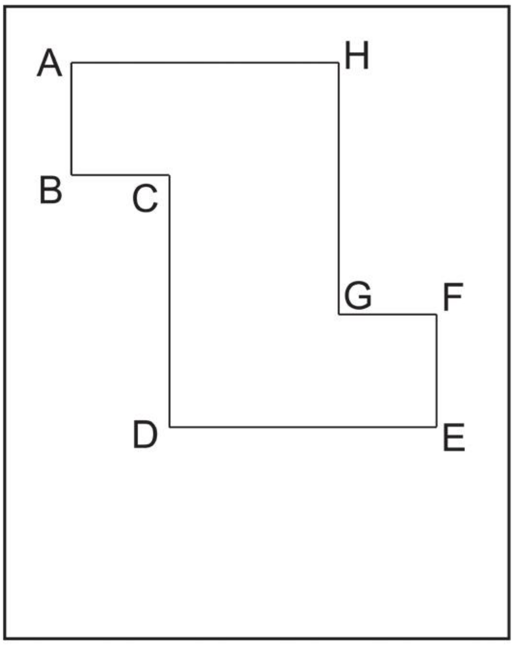
Chapter 1: Symmetry	Name:	Score / 100

1. The figure below is point symmetric. [4×10 marks = 40 marks]

(1) For locating the centre of symmetry, which pair of lines are appropriate to be drawn?

(a) AC and CG
(b) CH and DG
(c) CG and DH

Answer: ☐



(2) Write the part corresponding to;

(a) Point A

Answer: ☐

(b) Side DE

Answer: ☐

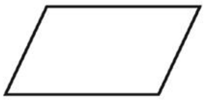
(3) Let the centre of symmetry point I.
Find the side which is the same length as HI.

Answer: ☐

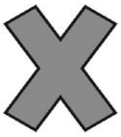
2. Find all the answers of the following questions about the figures below;

[3×20 marks = 60 marks]

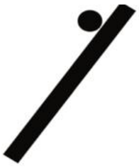
(a)



(b)



(c)



(1) Line symmetric figure. Answer: ☐

(2) Point symmetric figure Answer: ☐

(3) Figures with both features of line symmetric and point symmetric

Answer: ☐

Chapter 2 Mathematical Letters and Expressions

1. Content Standard

6.4.3. Students will be able to use mathematical letters in expressions to represent place values and interpret them.

2. Unit Objectives

- To deepen the understanding of mathematical expressions describing the relation of numbers and quantities and for making use of them.
- Use letters a and x instead of using words, or to express quantities to write mathematical expressions.
- Investigate by substituting numbers for letters.

3. Teaching Overview

Mathematical letters in expressions such as a or x tend to be psychological barrier for students to learn mathematics. Teachers should be sensitive to those psychological barriers and think how students can accept the new concepts. Remember that it students do not understand the ideas then they are not convinced.

Expressions with Letters :

First the class can recall expressions with words. Next they recall the expressions using ○ or □. Those previous learning will be developed gradually to expressions with mathematical letters. Substitution of numbers or thinking with diagrams and pictograms will help students understand.

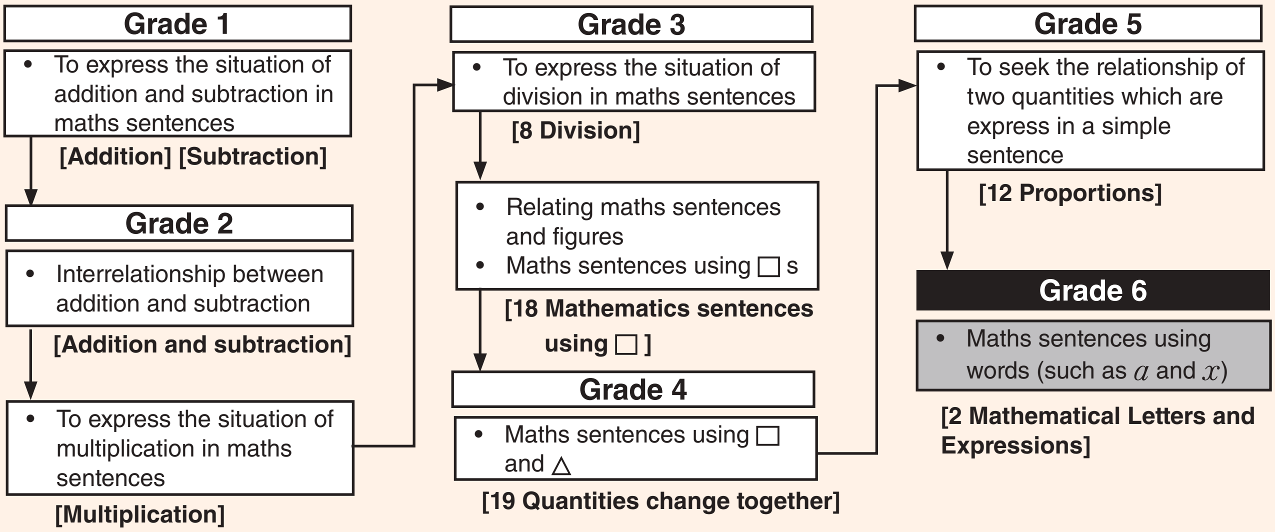
Let's Put Numbers into Mathematical Letters :

Students should find that any numbers including decimals and fractions can be substituted for letters. They should investigate the relationship among numbers in expressions by referring to diagrams, mathematical sentences with words and tables.

Interpreting Expressions :

Students are supposed to be given lots of experiences for interpreting mathematical sentences with letters. They will appreciate that mathematical sentences with letters are simple ways to express the relationship between letters through their experiences.

4. Related Learning Contents


Grade 1
• To express the situation of addition and subtraction in maths sentences
[Addition] [Subtraction]
Grade 2
• Interrelationship between addition and subtraction
[Addition and subtraction]
• To express the situation of multiplication in maths sentences
[Multiplication]
Grade 3
• To express the situation of division in maths sentences
[8 Division]
• Relating maths sentences and figures
• Maths sentences using □ s
[18 Mathematics sentences using □]
Grade 4
• Maths sentences using □ and △
[19 Quantities change together]
Grade 5
• To seek the relationship of two quantities which are express in a simple sentence
[12 Proportions]
Grade 6
• Maths sentences using words (such as a and x)
[2 Mathematical Letters and Expressions]

Unit 2

Unit: Mathematical Letters and Expressions
Sub-unit: 1. Mathematical Letters and Expressions
Lesson 1 of 2

Textbook Page : 020 and 021
Actual Lesson 012

Sub-unit Objectives

- To understand how to write mathematical expressions using x or a, apart from the symbols □ or ○.
- To find the value of a mathematical expression by substituting numbers for x.

Lesson Objective

- To understand how to write mathematical expressions using x or a instead of symbols □ or ○.

Prior Knowledge

- Proportion (Grade 5)
- Two Changing Quantities (Grade 5)

Preparation

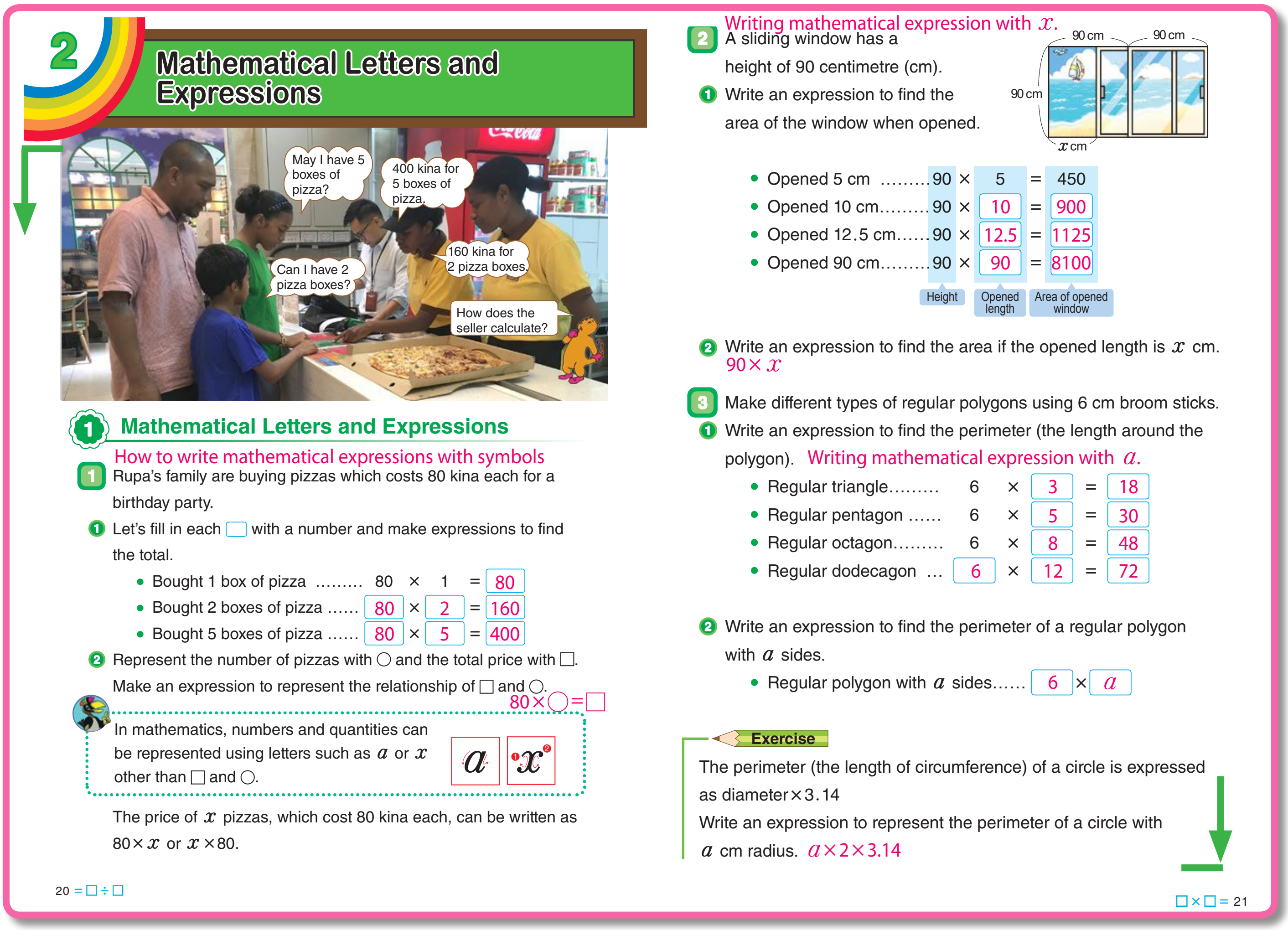
- Chart explaining the important point.
- Task 3 diagram on a chart.

Assessment

- Understand and write mathematical expressions using letters such as a or x other than □ or ○. **F**
- Solve the exercise correctly. **S**

Teacher's Notes

Do not introduce π (Pi)in this lesson but 3.14 Pi means the ratio of the circumference of the circle to its diameter.
Purpose of the lesson is for the students to understand constant and variable.
Example, $6\times a$ (6 is constant where it cannot change and a is the variable where it changes (Teacher reference only).
Perimetre = 3.14 (Constant) × d (Variable)



2 Mathematical Letters and Expressions

May I have 5 boxes of pizza?
400 kina for 5 boxes of pizza.
Can I have 2 pizza boxes?
160 kina for 2 pizza boxes.
How does the seller calculate?

① Mathematical Letters and Expressions

How to write mathematical expressions with symbols

1 Rupa's family are buying pizzas which costs 80 kina each for a birthday party.

① Let's fill in each □ with a number and make expressions to find the total.

- Bought 1 box of pizza ……… 80 × 1 = 80
- Bought 2 boxes of pizza …… 80 × 2 = 160
- Bought 5 boxes of pizza …… 80 × 5 = 400

② Represent the number of pizzas with ○ and the total price with □. Make an expression to represent the relationship of □ and ○.
80 × ○ = □

In mathematics, numbers and quantities can be represented using letters such as a or x other than □ and ○.

The price of x pizzas, which cost 80 kina each, can be written as $80\times x$ or $x\times 80$.

Writing mathematical expression with x.

2 A sliding window has a height of 90 centimetre (cm).

① Write an expression to find the area of the window when opened.

	Height		Opened length		Area of opened window
Opened 5 cm ………	90	×	5	=	450
Opened 10 cm………	90	×	10	=	900
Opened 12.5 cm……	90	×	12.5	=	1125
Opened 90 cm………	90	×	90	=	8100

② Write an expression to find the area if the opened length is x cm.
$90\times x$

3 Make different types of regular polygons using 6 cm broom sticks.

① Write an expression to find the perimeter (the length around the polygon). Writing mathematical expression with a.

- Regular triangle……… 6 × 3 = 18
- Regular pentagon …… 6 × 5 = 30
- Regular octagon……… 6 × 8 = 48
- Regular dodecagon … 6 × 12 = 72

② Write an expression to find the perimeter of a regular polygon with a sides.

- Regular polygon with a sides…… 6 × a

Exercise

The perimeter (the length of circumference) of a circle is expressed as diameter × 3.14
Write an expression to represent the perimeter of a circle with a cm radius. $a\times 2\times 3.14$

Lesson flow

1 Think about how to write mathematical expressions with symbols.

T/S Look at the picture and discuss what the situation is about.

S Discuss about the scene of the picture on page 20 and think about how the shop owner is calculating.

TN Students should pay attention to the conversation and think of how the shop owner is calculating.

T/S 1 Read and understand the given situation.

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

S Make correspondence between the phrases, i.e. 5 pizzas cost 400 kina, 2 pizzas cost 160 kina and 1 pizza cost 80 kina.

TN Help students to realise that when they put a different number 1, 2,…. for the number of pizzas, the total cost changes accordingly.

S ❶ Fill in the boxes and make expressions to find the total price.

S ❷ Make a mathematical expression using ○ and □.

2 Important Point

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

3 Understand that a or x can be used when making mathematical expressions instead of using □ or ○.

T Remind the students that they can use the letters a and x instead of □ and ○.

TN When the number of pizzas you are buying is represented as a or x, what would be the expressions to find the total price? Let's think about it?

S $80\times a$, $80\times x$.

4 Write an expression that represents the area of the opened window.

T/S 2 Read and understand the given situation.

S ❶ Study the mathematical sentence and complete the rest.

TN Multiply the height with the length of the opened window to find the area. (Height × Opened Window = Area of Opened Window)

S ❷ So, when we substitute the opened length with x, the area can be written as $90\times x$.

5 Write an expression for finding the perimetre of regular polygons.

T/S 3 Read and understand the given situation.

S ❶ Make different types of regular polygons using 6 cm broomsticks and think about an expression to find the perimeter (the length around the polygon).

S 1.) Regular triangle, $6\times3=18$
2.) Regular pentagon, $6\times5=30$
3.) Regular octagon, $6\times8=48$
4.) Regular dodecagon, $6\times12=72$

S ❷ The expression to find the perimeter of a regular polygon with a sides is $6\times a$.

6 Complete the Exercise.

S Solve the exercise.

T Confirm students' answers.

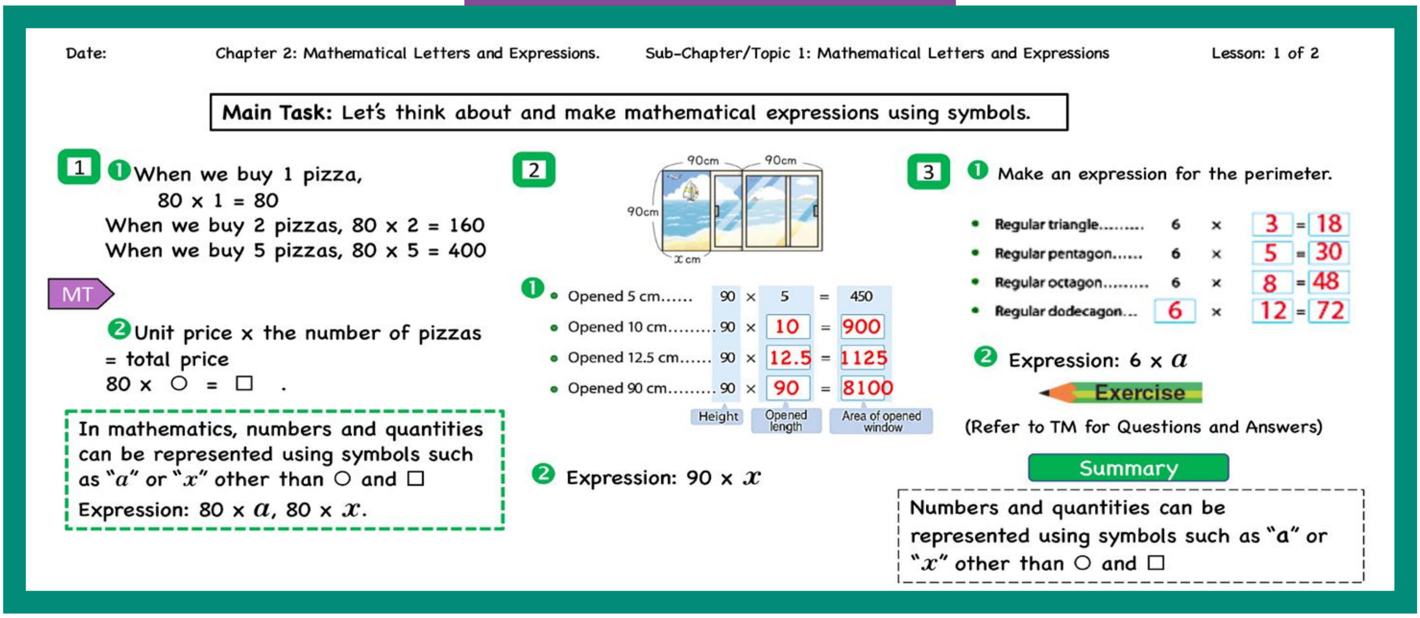
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 2: Mathematical Letters and Expressions. Sub-Chapter/Topic 1: Mathematical Letters and Expressions Lesson: 1 of 2

Main Task: Let's think about and make mathematical expressions using symbols.

1 ❶ When we buy 1 pizza,
$80\times1=80$
When we buy 2 pizzas, $80\times2=160$
When we buy 5 pizzas, $80\times5=400$

MT

❷ Unit price × the number of pizzas = total price
$80\times$ ○ = □ .

In mathematics, numbers and quantities can be represented using symbols such as "a" or "x" other than ○ and □
Expression: $80\times a$, $80\times x$.

2

❶
- Opened 5 cm…… $90\times5=450$
- Opened 10 cm……… $90\times\boxed{10}=\boxed{900}$
- Opened 12.5 cm…… $90\times\boxed{12.5}=\boxed{1125}$
- Opened 90 cm……… $90\times\boxed{90}=\boxed{8100}$

Height Opened length Area of opened window

❷ Expression: $90\times x$

3 ❶ Make an expression for the perimeter.
- Regular triangle……… $6\times\boxed{3}=\boxed{18}$
- Regular pentagon…… $6\times\boxed{5}=\boxed{30}$
- Regular octagon……… $6\times\boxed{8}=\boxed{48}$
- Regular dodecagon… $\boxed{6}\times\boxed{12}=\boxed{72}$

❷ Expression: $6\times a$

Exercise

(Refer to TM for Questions and Answers)

Summary

Numbers and quantities can be represented using symbols such as "a" or "x" other than ○ and □

Unit 2

Unit: Mathematical Letters and Expressions

Sub-unit: 1. Mathematical Letters and Expressions

Lesson 2 of 2

Textbook Page : 022
Actual Lesson 013

Lesson Objective

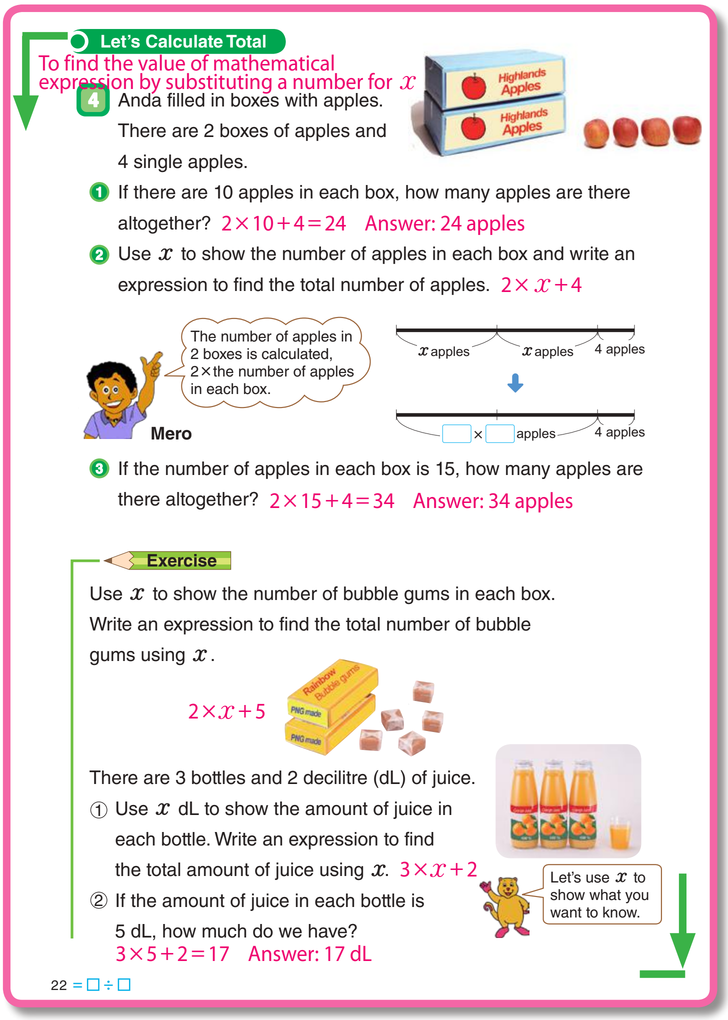
- To find the value of mathematical expressions by substituting a number for x.

Prior Knowledge

- Expressions with Symbols

Preparation

- Activity ①, ② and ③



Let's Calculate Total

To find the value of mathematical expression by substituting a number for x

4 Anda filled in boxes with apples. There are 2 boxes of apples and 4 single apples.

① If there are 10 apples in each box, how many apples are there altogether? $2\times 10+4=24$ Answer: 24 apples

② Use x to show the number of apples in each box and write an expression to find the total number of apples. $2\times x+4$

Mero: The number of apples in 2 boxes is calculated, 2×the number of apples in each box.

③ If the number of apples in each box is 15, how many apples are there altogether? $2\times 15+4=34$ Answer: 34 apples

Exercise

Use x to show the number of bubble gums in each box. Write an expression to find the total number of bubble gums using x.

$2\times x+5$

There are 3 bottles and 2 decilitre (dL) of juice.

① Use x dL to show the amount of juice in each bottle. Write an expression to find the total amount of juice using x. $3\times x+2$

② If the amount of juice in each bottle is 5 dL, how much do we have?
$3\times 5+2=17$ Answer: 17 dL

Let's use x to show what you want to know.

22 = ☐÷☐

Assessment

- Understand and write a mathematical expression using x. F
- Calculate using x to find the value of the mathematical expression. F
- Solve the exercises correctly. S

Teacher's Notes

The mathematical expression must always relate to the problem situation and make meaning out of it.

We introduce ○ and ☐ as a place – holder into which we can put any number. (In some special cases, the same number is put into such place – holders). However, once we start to use a and x instead of ○ and ☐, students may have difficulty considering such symbols a and x equally as place – holders. Some may encounter problem here.

Exercise.

S 1 Write an expression using x to find the total number of bubble gums.
Mathematical Expression: $2\times x+4$.

S 2 Write an expression using x to find the total amount of juice.
Expression is $3\times x+2$

T Confirm the expression for the situation.

S Substitute x with 5 and solve expression: $3\times x+2$, so it would be $3\times 5+2=17$
Answer: 17 dL

Lesson flow

1 Review the previous lesson.

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

2 Find the total number of apples.

T/S 4 Read and understand the given situation.

T ① Get the students to read the question and explain how to write their mathematical sentences to solve the situation.

S Each box has 10 apples, so if there are 2 boxes, then, we should calculate as 2×10 and add 4 extra apples.
2×10+4=24
Answer: 24 apples

3 ② Make an expression using x to find the total number of apples.

T Confirm with students which part of the expression changes.

S It is the number of apples in each box.

S Express the problem in words or by symbols such as x.

- In words: 2 boxes × apples and add 4 more apples
- Mathematical Expression: $2\times x+4$
- Diagram Description (Line Segment) from the text book.

S 2×the number of apples in each box+4.

4 ③ Solve the expression by substituting x with a number.

T Guide students to put the number 15 to substitute x and find the total number of apples when there are 15 apples in each box and 4 apples outside the box.

S Because x is 15, now we can rewrite the expression as $2\times 15+4=34$
Answer is 34 apples.

5 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

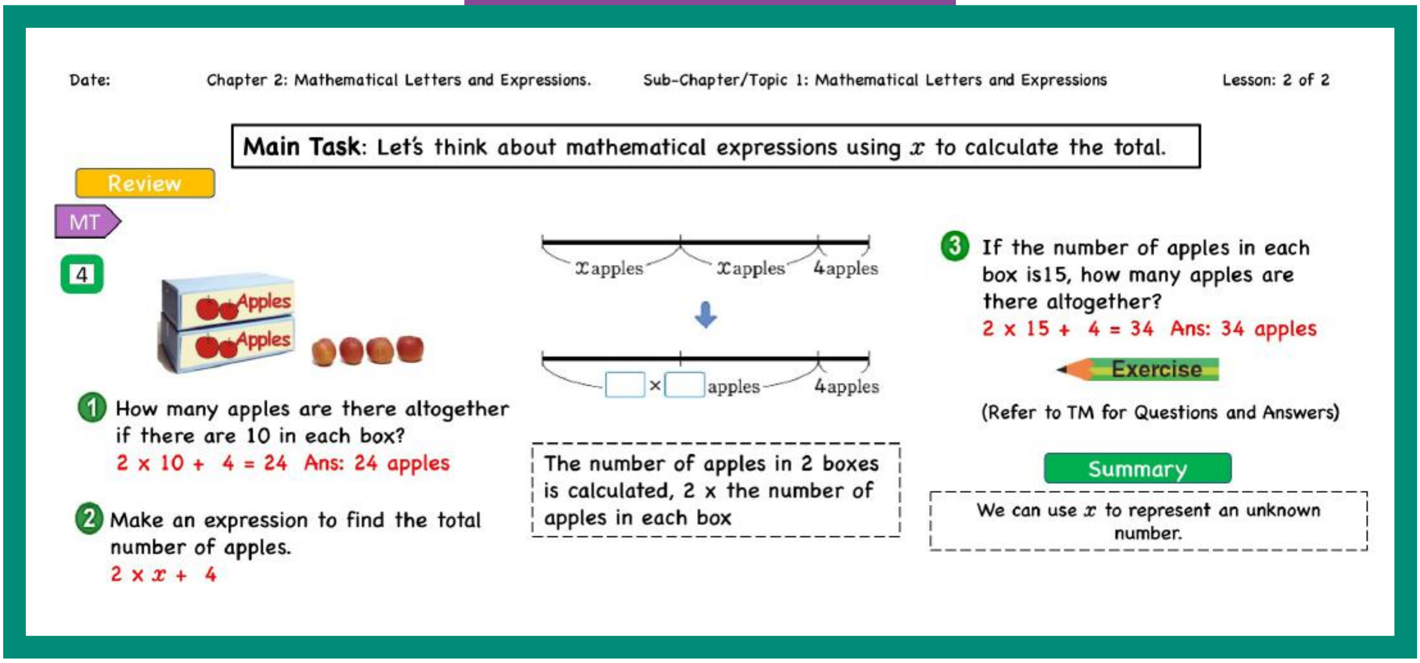
6 Summary

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 2: Mathematical Letters and Expressions. Sub-Chapter/Topic 1: Mathematical Letters and Expressions Lesson: 2 of 2

Main Task: Let's think about mathematical expressions using x to calculate the total.

Review

MT

4

① How many apples are there altogether if there are 10 in each box?
2 x 10 + 4 = 24 Ans: 24 apples

② Make an expression to find the total number of apples.
$2\times x+4$

The number of apples in 2 boxes is calculated, 2 x the number of apples in each box

③ If the number of apples in each box is 15, how many apples are there altogether?
2 x 15 + 4 = 34 Ans: 34 apples

Exercise

(Refer to TM for Questions and Answers)

Summary

We can use x to represent an unknown number.

Unit 2

Unit: Mathematical Letters and Expressions

Sub-unit: 2. Let's Put Numbers into Mathematical Sentences

Lesson 1 of 4

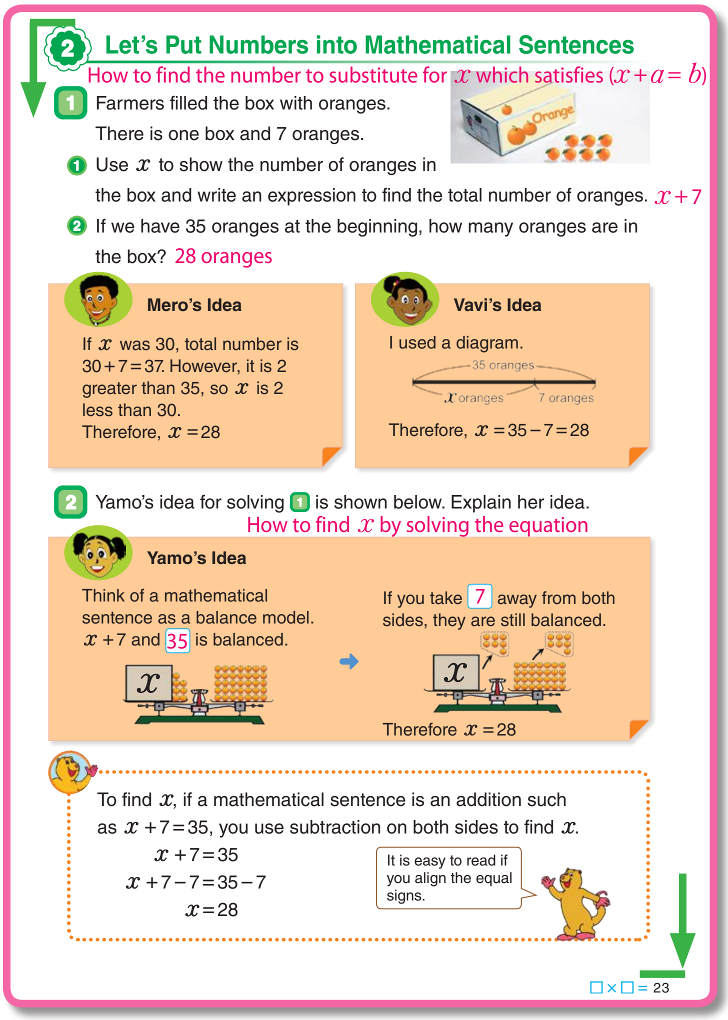
Textbook Page : 023
Actual Lesson 014

Sub-unit Objectives

- To explore various ways to identify the appropriate number or value to substitute for x in problems applying addition.
- To identify the appropriate number or value to substitute for x in problems applying multiplication.
- To identify the number or value to substitute for x in problems applying both multiplication and addition.
- To identify various mathematical expressions that represents the sum of angles in polygons. To find the appropriate value for a when the number of sides/angles is described a.

Lesson Objectives

- To explore various ways to identify the appropriate number or value to substitute for x in problems when addition is applied.
- Find the value of x.



② Let's Put Numbers into Mathematical Sentences

How to find the number to substitute for x which satisfies ($x+a=b$)

1 Farmers filled the box with oranges. There is one box and 7 oranges.

① Use x to show the number of oranges in the box and write an expression to find the total number of oranges. $x+7$

② If we have 35 oranges at the beginning, how many oranges are in the box? 28 oranges

Mero's Idea

If x was 30, total number is $30+7=37$. However, it is 2 greater than 35, so x is 2 less than 30.
Therefore, $x=28$

Vavi's Idea

I used a diagram.

Therefore, $x=35-7=28$

2 Yamo's idea for solving 1 is shown below. Explain her idea.
How to find x by solving the equation

Yamo's Idea

Think of a mathematical sentence as a balance model. $x+7$ and $\boxed{35}$ is balanced.

If you take $\boxed{7}$ away from both sides, they are still balanced.

Therefore $x=28$

To find x, if a mathematical sentence is an addition such as $x+7=35$, you use subtraction on both sides to find x.

$$\begin{aligned} x+7&=35 \\ x+7-7&=35-7 \\ x&=28 \end{aligned}$$

It is easy to read if you align the equal signs.

□×□= 23

Prior Knowledge

- Calculating total
- Expressions with Symbols

Preparation

- Chart showing students' ideas.

Assessment

- Identify various ways on how to find a number by substituting for x in a mathematical sentence of addition with x. Ⓕ
- Find x by solving the equation which satisfies the mathematical sentence. Ⓕ Ⓢ

Teacher's Notes

Yamo's idea can be considered as an advanced solution.
She looks at the given mathematical sentence as a scale and thinks $x+7$ and 35 are balanced.
She further thinks she can maintain the balance if she takes out 7 from both sides.
This is an application of the property of equations.

$$\begin{aligned} x+7&=35 \\ x+7-7&=35-7 \\ x&=28 \end{aligned}$$

Lesson flow

1 Review the previous lesson.

2 Think about how to find the total number of oranges.

T/S 1 Read and understand the given situation.

T How many oranges are there altogether in the box?

S We do not know how many oranges in the box.

T For now we do not know so, there are x number of oranges in the box with 7 extras.

S ① Discuss and write an expression by substituting x for the number of oranges in a box.

T How can we represent the number of oranges in an expression?

S The number of oranges in the box is represented by x and the oranges left is 7 so the expression would be $x+7$.

3 ② Explore various ways to determine the appropriate number or value to substitute for x.

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

T Get students to explore various ways to identify the number of oranges in the box.

S Use the expression above to think of various ways to find the appropriate number or value for x.

T Ask the students to discuss and explain the 2 ideas.

S **Mero's Idea:** Assuming that there were 30 oranges in a box, he was able to calculate $30+7=37$.
However, it can be seen that there was an increase of 2 from the 35 oranges at the beginning, so that means x is 2 less than 30.
Therefore, $x=28$.

S **Vavi'a Idea:** In the beginning there were 35 oranges, so she thought of drawing a line segment to help find the number of oranges in a box.

4 Solve the task by finding the value of x.

T/S 2 Discuss Yamo's idea by drawing the explanation of the diagram and calculation of the equation on the blackboard on making a balance following the sample in the textbook.

TN Remind students that subtraction can be used to identify the appropriate value for x.
Whatever is done on the right side of the equation must be done on the left side of the equation.

5 Important Point

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

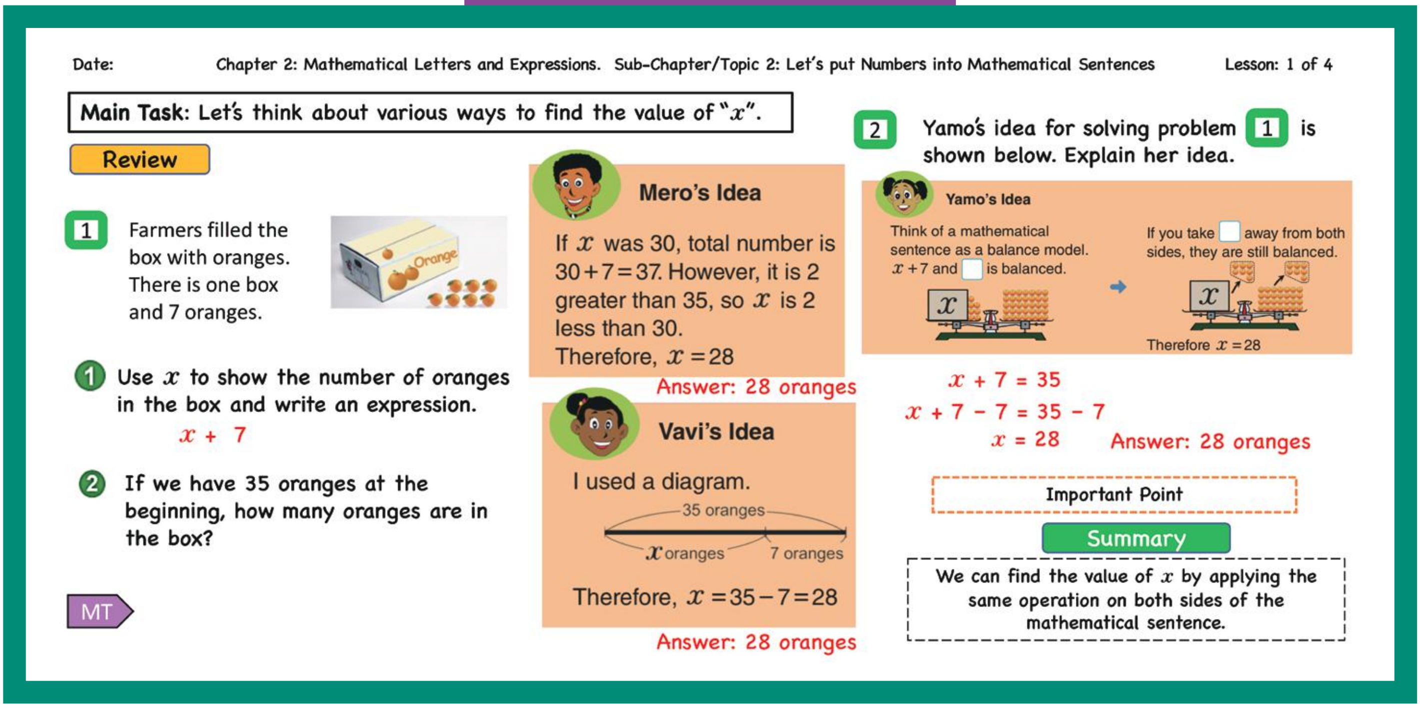
6 Summary

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: Mathematical Letters and Expressions. Sub-Chapter/Topic 2: Let's put Numbers into Mathematical Sentences Lesson: 1 of 4

Main Task: Let's think about various ways to find the value of "x".

Review

1 Farmers filled the box with oranges. There is one box and 7 oranges.

① Use x to show the number of oranges in the box and write an expression.

$x + 7$

② If we have 35 oranges at the beginning, how many oranges are in the box?

MT

Mero's Idea

If x was 30, total number is $30+7=37$. However, it is 2 greater than 35, so x is 2 less than 30.
Therefore, $x=28$

Answer: 28 oranges

Vavi's Idea

I used a diagram.

Therefore, $x=35-7=28$

Answer: 28 oranges

2 Yamo's idea for solving problem 1 is shown below. Explain her idea.

Yamo's Idea

Think of a mathematical sentence as a balance model. $x+7$ and ☐ is balanced.

If you take ☐ away from both sides, they are still balanced.

Therefore $x=28$

$$x + 7 = 35$$
$$x + 7 - 7 = 35 - 7$$
$$x = 28$$

Answer: 28 oranges

Important Point

Summary

We can find the value of x by applying the same operation on both sides of the mathematical sentence.

Unit 2

Unit: Mathematical Letters and Expressions
Sub-unit: 2. Let's Put Numbers into Mathematical Sentences
Sentences Lesson 2 of 4

Textbook Page : 024 and 025
Actual Lesson 015

Lesson Objective

- To explore various ways to identify the correct value for x in problems applying multiplication and division.

Prior Knowledge

- How to solve a math sentence using the opposite operation.
- Expressions with symbols.

Preparation

- Chart or Drawing of a parallelogram.

Assessment

- Understand how to calculate a mathematical sentence with a multiplication of x. F
- Calculate based on a mathematical sentence for a given situation. F
- Solve the exercises correctly. S

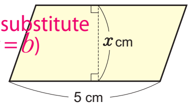
Teacher's Notes

Mathematical sentences (Equations)
In this textbook, some equation patterns are introduced; $a+x=b$, $x-a=b$, $a\times x=b$. The value for x can be identified using opposite operation on both sides of the equation. Ensure better understanding by demonstrating it with a chart or other methods. Those who do not fully understand its logic tend to make simple mistakes, i.e. to identify the value for x in an equation $a-x=b$, they writ $x=b-a$ without thinking instead of $x=a-b$. Students should be also advised to write equal signs (=) aligned with the previous sentence when rewriting their sentences when solving for x.

Students should practice identifying the appropriate values for x in mathematical sentences (addition, subtraction, and multiplication) for the exercises.

How to find the number to substitute for x which satisfies ($a\times x=b$)

3 There is a parallelogram like the figure on the right.

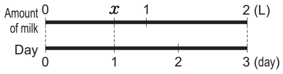


① If the area is 18 square centimetres (cm²) and height is x cm, write a mathematical sentence to find the area. $5\times x=18$

② Based on the expression in ①, find the height of the parallelogram. $x=18\div 5=3.6$ Answer: 3.6 cm

How to find the number to substitute for x which satisfies ($x\times a=b$)

4 Rodney drinks the same amount of milk everyday. He drank 2 litres (L) in 3 days.



① If he drank x L per day, write a mathematical sentence to find the total amount of milk he drank in 3 days. $x\times 3=2$

② Based on the mathematical sentence of ①, solve to find the amount of milk he drank per day.

Milk (L)	x	2
Day (day)	1	3

× 3
× 3

$x=2\div 3=\frac{2}{3}$ Answer: $\frac{2}{3}$ L

To find x, if a mathematical sentence is in multiplication such as $5\times x=18$, or $x\times 3=2$, you use division on both sides to find x.

$$\begin{aligned} 5\times x &= 18 \\ 5\times x\div 5 &= 18\div 5 \\ x &= 3.6 \end{aligned} \qquad \begin{aligned} x\times 3 &= 2 \\ x\times 3\div 3 &= 2\div 3 \\ x &= \frac{2}{3} \end{aligned}$$

Not only does x represent whole numbers (integers) but also decimals and fractions.

Thinking about why mathematical expressions using symbols as $x\times a$ are appreciated

5 You used a or x to show various quantities. Write in your exercise book about why letters are useful and discuss it with your friends.

Gawi: It is useful because we can represent quantities that changes in one letter.

Kekeni: Make a mathematical sentence which you think is easier to solve.

Exercise

Find the number for x.

① $x+4=22$ 18
② $38+x=54$ 16
③ $x-6=15$ 21
④ $x-27=18$ 45
⑤ $7\times x=5$ $\frac{5}{7}$
⑥ $x\times 4=14$ 3.5 or $\frac{7}{2}$

6 There are 2 boxes of chocolates which contain the same amount and 3 more pieces of chocolates. When you count the total, it is 23 chocolates. How many chocolates does each box have?

① If the number of chocolates per box is x, write a mathematical sentence for the total number.

☐

② By using the following table below, let's find the total number of chocolates in the case of 7, 8, 9, … for x.

x	7	8	9				
$x\times 2$	14						
$x\times 2+3$	17						

First, calculate the number of chocolates in 2 boxes and then add 3.

I could find the number for x, if the total number of chocolates is 23.

7 There are 8 stacks of coloured papers and 3 sheets.

① If 1 stack is x sheets, write a mathematical expression to find the total. ☐

② If the total is 107 sheets, how many sheets are in one stack? Try numbers 10, 11, 12 and so on for x.

Exercise

Find the number that applies for x by replacing it with 8, 9, 10, ... and so on.

① $x\times 3+4=37$
② $x\times 8+5=77$

Lesson flow

1 Review the previous lesson.

2 Find the area of a parallelogram whose height is x.

T/S ③ Read and understand the given situation.

T ① Get the students to write a mathematical sentence using the base, height and area.

S Base is 5 cm, the height is unknown and the total area is 18 cm².

TN If the area of a parallelogram is 18 cm² and the height is x cm. Use the formula to write a mathematical sentence.

S The mathematical sentence would be $5 \times x = 18$

T Confirms relationship of the diagram and mathematical sentence of the formula of the parallelogram.

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

S ② Based on the expression in Activity ①, find x and explain.

T Confirm using the idea of balancing the equation from one side with the other side. ($18 = 5 \times x$)

S $5 \times x = 18$
$5 \times x \div 5 = 18 \div 5$
$x = 3.6$
Confirmation: $5 \times 3.6 = 18$

TN Advice students to substitute x with its value to check if their answers are correct.

3 Identify the appropriate number or value for x, and write a mathematical sentence.

T/S ④ Read and understand the given situation.

S ① Write a mathematical sentence to find the total amount of milk Rodney drank in 3 days if he drank x L per day.

Identify the appropriate value for x.

S If 2 L = 3 days and x L = 1 day.
The mathematical sentence is $2 = x \times 3$

S ② Solve the amount he drank per day by writing $x \times 3 = 2$.
The value of x is $x = 2 \div 3$ or $\frac{2}{3}$ and so Answer is $x = \frac{2}{3}$ L per day.

4 Important Point

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

S Learn that when identifying the value for x, if a mathematics sentence is in such as $5 \times x = 18$, or $x \times 3 = 2$, they can use division to find x.

TN Emphasise that x does not always represent whole numbers (integers) but they can be decimals and fractions.

5 Explain the usefulness of the letters a or x in mathematical expressions.

T/S ⑤ Read and understand the given task.

S Discuss with others why letters such as a or x are useful.

T Confirm that they can use one letter to represent a variable or quantity.

6 Complete the Exercise.

S Solve the exercise.

T Confirm students' answers.

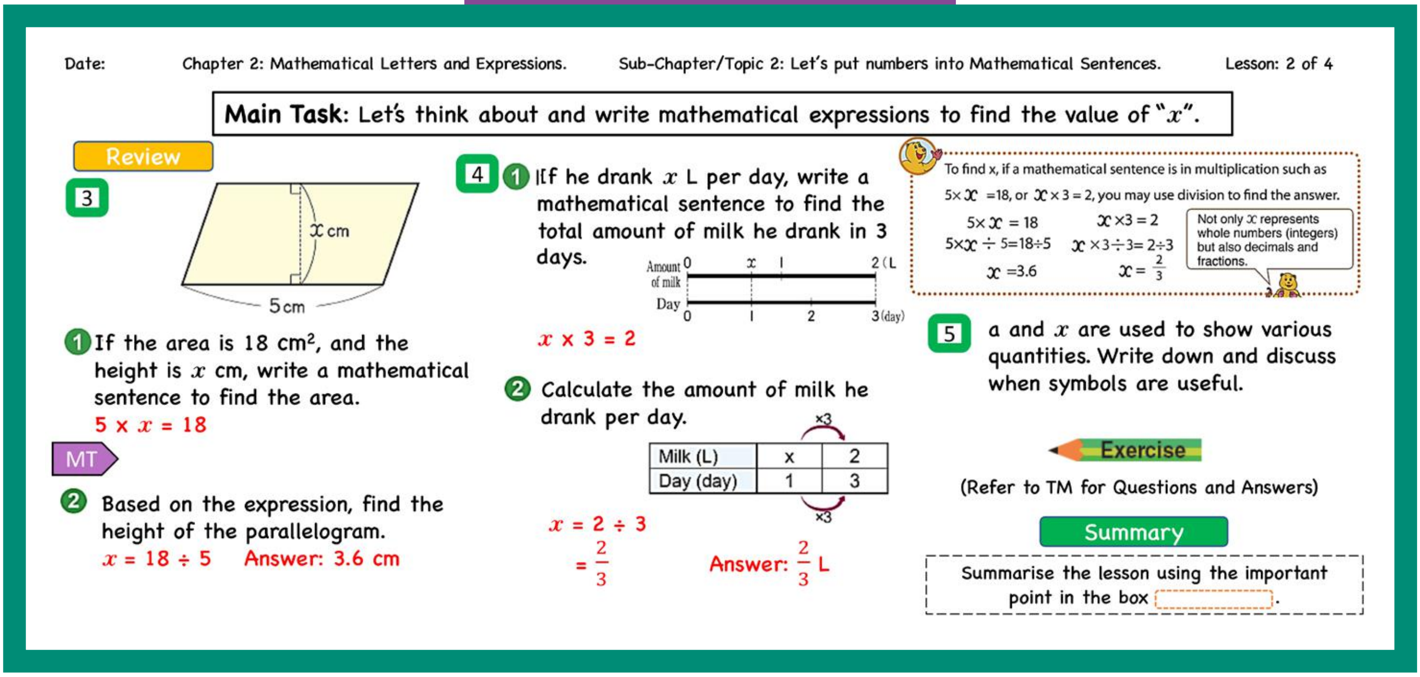
7 Summary

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



x cm
5 cm
Amount of milk
0
x
1
2 (L)
Day
0
1
2
3 (day)
×3
×3

Date: Chapter 2: Mathematical Letters and Expressions. Sub-Chapter/Topic 2: Let's put numbers into Mathematical Sentences. Lesson: 2 of 4

Main Task: Let's think about and write mathematical expressions to find the value of "x".

Review

3

① If the area is 18 cm², and the height is x cm, write a mathematical sentence to find the area.
$5 \times x = 18$

MT

② Based on the expression, find the height of the parallelogram.
$x = 18 \div 5$ Answer: 3.6 cm

4 ① If he drank x L per day, write a mathematical sentence to find the total amount of milk he drank in 3 days.

$x \times 3 = 2$

② Calculate the amount of milk he drank per day.

Milk (L)	x	2
Day (day)	1	3

$x = 2 \div 3$
$= \frac{2}{3}$ Answer: $\frac{2}{3}$ L

To find x, if a mathematical sentence is in multiplication such as $5 \times x = 18$, or $x \times 3 = 2$, you may use division to find the answer.

$5 \times x = 18$
$5 \times x \div 5 = 18 \div 5$
$x = 3.6$

$x \times 3 = 2$
$x \times 3 \div 3 = 2 \div 3$
$x = \frac{2}{3}$

Not only x represents whole numbers (integers) but also decimals and fractions.

5 a and x are used to show various quantities. Write down and discuss when symbols are useful.

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson using the important point in the box ⬚.

Unit 2

Unit: Mathematical Letters and Expressions
Sub-unit: 2. Let's Put Numbers into Mathematical Sentences Sentences Lesson 3 of 4

Textbook Page : 025
Actual Lesson 016

Lesson Objectives

- To find the number to substitute for x which satisfies ($x \times a + b = c$) where a, b and c represent known numbers.
- To write mathematical expressions with x and to find the number to substitute for x.

Prior Knowledge

- Expressions with symbols
- Solving expressions with symbols by balancing the equations.

Preparation

- Chart of table on textbook page.

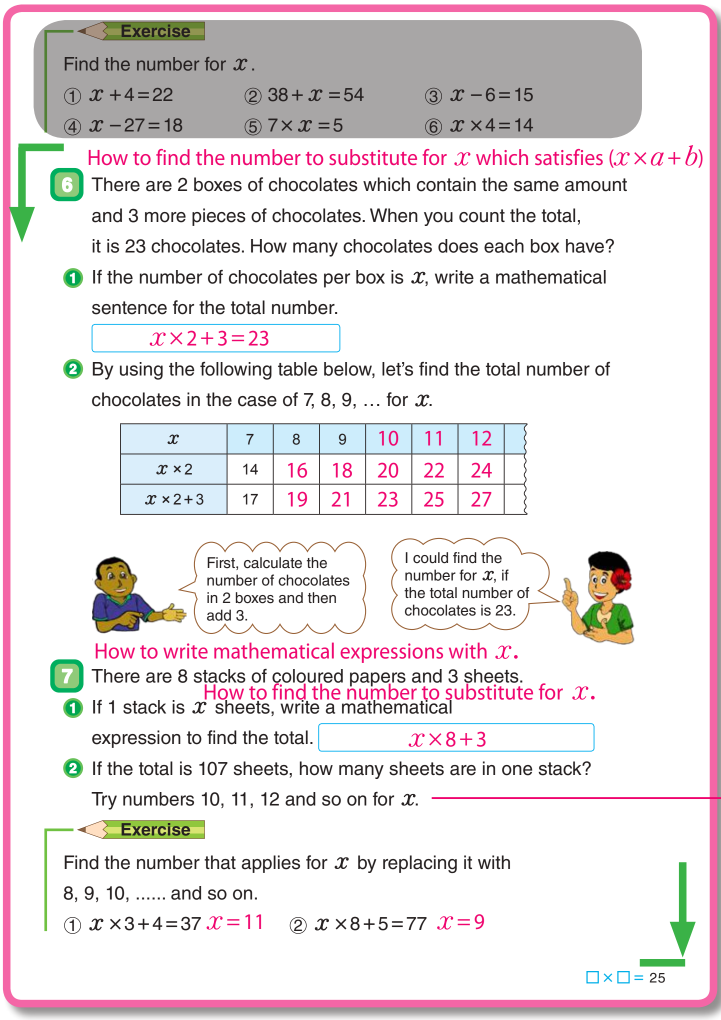
Assessment

- Write mathematical expressions for x with enjoyment and find the value of x. F
- Think about how to find the number to substitute for x which satisfies ($x \times a + b = c$) where a, b and c represent known numbers. F S

Teacher's Notes

From the table, x is represented by 7, 8, 9, etc. and it is called an Independent Variable or commonly known as x values, where it stays the same. In the same way $x \times 2$ in this case is called a dependent variable or commonly known as the y values because it depends entirely on the x (independent variable to make it change)

Recommend the idea of replacing and accept calculations as well from advanced students who use prior knowledge.



Exercise

Find the number for x.

① $x + 4 = 22$ ② $38 + x = 54$ ③ $x - 6 = 15$
④ $x - 27 = 18$ ⑤ $7 \times x = 5$ ⑥ $x \times 4 = 14$

How to find the number to substitute for x which satisfies ($x \times a + b$)

6 There are 2 boxes of chocolates which contain the same amount and 3 more pieces of chocolates. When you count the total, it is 23 chocolates. How many chocolates does each box have?

① If the number of chocolates per box is x, write a mathematical sentence for the total number.

$x \times 2 + 3 = 23$

② By using the following table below, let's find the total number of chocolates in the case of 7, 8, 9, … for x.

x	7	8	9	10	11	12	
$x \times 2$	14	16	18	20	22	24	
$x \times 2 + 3$	17	19	21	23	25	27	

First, calculate the number of chocolates in 2 boxes and then add 3.
I could find the number for x, if the total number of chocolates is 23.

How to write mathematical expressions with x.

7 There are 8 stacks of coloured papers and 3 sheets.

How to find the number to substitute for x.

① If 1 stack is x sheets, write a mathematical expression to find the total. $x \times 8 + 3$

② If the total is 107 sheets, how many sheets are in one stack? Try numbers 10, 11, 12 and so on for x.

Exercise

Find the number that applies for x by replacing it with 8, 9, 10, ... and so on.

① $x \times 3 + 4 = 37$ $x = 11$ ② $x \times 8 + 5 = 77$ $x = 9$

□×□= 25

$x \times 8 + 3 = 107$
$10 \times 8 + 3 = 83$
$11 \times 8 + 3 = 91$
$12 \times 8 + 3 = 99$
$13 \times 8 + 3 = 107$
Answer: 13 sheets

Lesson flow

1 Review the previous lesson.

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

2 6 Think about how to find the number of chocolates per box as x and write a mathematical sentence for the total.

T/S Read and understand the given situation.

S ① Read the problem and find the number to replace x.

TN Students should realise that if the number of chocolates per box is represented by x. It is written as x as the number of chocolates in one box multiplied by 2 boxes plus 3 extra chocolates outside of the box and so it will total to 23 chocolates.

S Write the mathematical sentence $x \times 2 + 3 = 23$

3 Think about how to find the number to replace x.

S ② Use the mathematical sentence from ① to complete the table by finding the total number of chocolates.

T/S Discuss and complete the first column of the table so they can complete the others.

S Copy the table and complete the table for 7, 8, 9.

T Invite students to complete the table on the board and identify patterns.

S Complete 10, 11 and 12 on the table.

T Ask students for which value of x satisfies the sentence $2 \times x + 3 = 23$.

S When x is 10

4 Write mathematical expressions using x and how to identify the appropriate number or value to substitute for x.

T/S 7 Read and understand the given situation.

T ① If 1 stack is substituted as x sheets, write a mathematical sentence to find the total.

S Follow the example from the previous task 6 and write the mathematical sentence $x \times 8 + 3 = 107$.

T Confirm the mathematical sentence of $x \times 8 + 3 = 107$.

S ② Complete the activity by finding the number of sheets in a stack.

T From the confirmed mathematical sentence $x \times 8 + 3 = 107$. Clarify that x is represented by 10, 11, 12; etc on the blackboard.

S Present their calculations to find the total which is 107 sheets.

TN Encourage students to extend their numbers to see where their answer lies in the table.

S Present their answers on the blackboard.

T Confirm their answers.

TN Students can just use the mathematical sentence to find the x value which is 13.

5 Complete the Exercises.

S Solve all the exercises.

T Confirm students' answers.

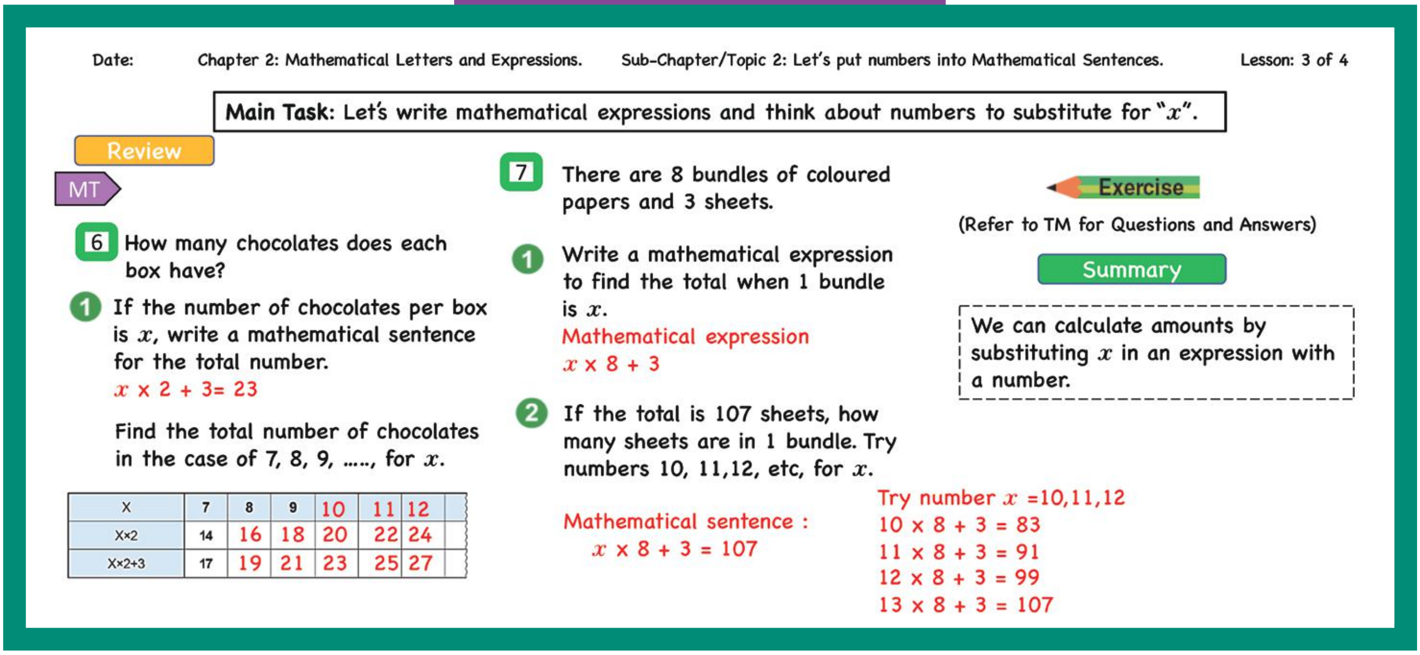
6 Summary

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 2: Mathematical Letters and Expressions. Sub-Chapter/Topic 2: Let's put numbers into Mathematical Sentences. Lesson: 3 of 4

Main Task: Let's write mathematical expressions and think about numbers to substitute for "x".

Review

MT

6 How many chocolates does each box have?

① If the number of chocolates per box is x, write a mathematical sentence for the total number.

$x \times 2 + 3 = 23$

Find the total number of chocolates in the case of 7, 8, 9, ..., for x.

X	7	8	9	10	11	12
X×2	14	16	18	20	22	24
X×2+3	17	19	21	23	25	27

7 There are 8 bundles of coloured papers and 3 sheets.

① Write a mathematical expression to find the total when 1 bundle is x.

Mathematical expression

$x \times 8 + 3$

② If the total is 107 sheets, how many sheets are in 1 bundle. Try numbers 10, 11,12, etc, for x.

Mathematical sentence :

$x \times 8 + 3 = 107$

Try number x =10,11,12

$10 \times 8 + 3 = 83$

$11 \times 8 + 3 = 91$

$12 \times 8 + 3 = 99$

$13 \times 8 + 3 = 107$

Exercise

(Refer to TM for Questions and Answers)

Summary

We can calculate amounts by substituting x in an expression with a number.

Unit 2

Unit: Mathematical Letters and Expressions
Sub-unit: 2. Let's Put Numbers into Mathematical Sentences
Lesson 4 of 4

Textbook Page : 026
Actual Lesson 017

Lesson Objective

- To think of various mathematical expressions representing the sum of the angles in a-sided polygons and determine the appropriate value for a.

Prior Knowledge

- Characteristics of triangles.
- Congruence and angles of figures
- Mathematical sentences
- Regular polygons and circles (Grade 5)

Preparation

- Drawing of two polygons on a chart.
- Tape diagram in activity ③.

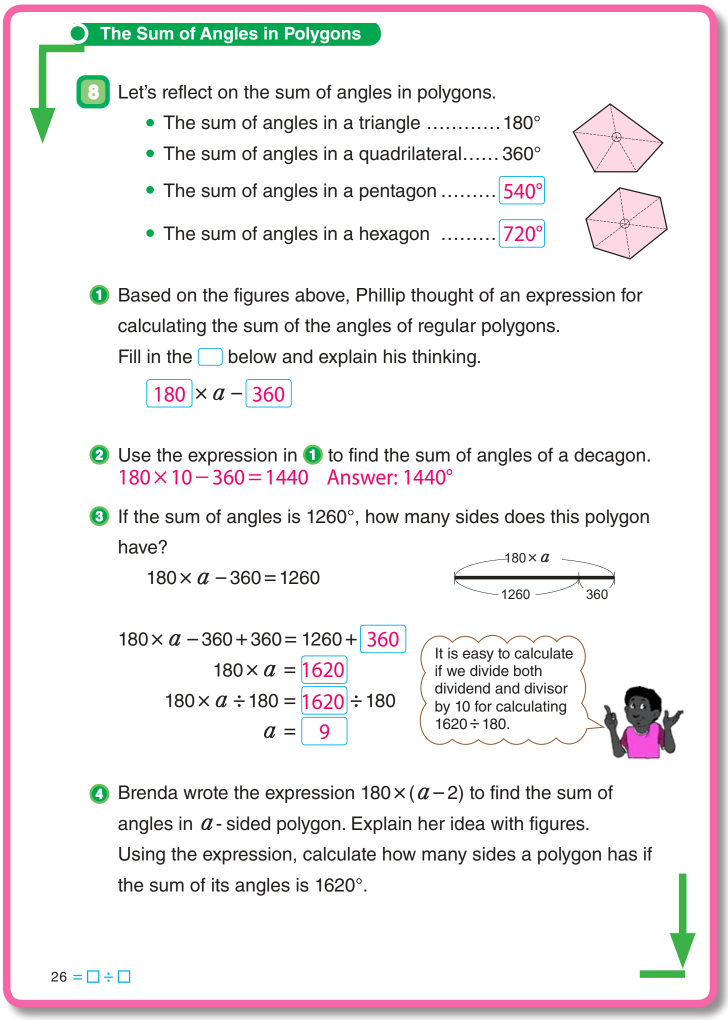
Assessment

- Think about various mathematical expressions to identify the sum of angles in polygons. Ⓕ Ⓢ

Teacher's Notes

The lesson focus is on identifying patterns and developing mathematical expressions and sentences using angle sum of regular polygons.

In the expression $180\times a-360$, we simplify the expression to $180\times(a-2)$ by taking out 180 as the common multiple.
We then find the sides of the polygon with 1620 by balancing the equation.



The Sum of Angles in Polygons

8 Let's reflect on the sum of angles in polygons.
- The sum of angles in a triangle …………180°
- The sum of angles in a quadrilateral……360°
- The sum of angles in a pentagon ……… $\boxed{540°}$
- The sum of angles in a hexagon ……… $\boxed{720°}$

① Based on the figures above, Phillip thought of an expression for calculating the sum of the angles of regular polygons.
Fill in the □ below and explain his thinking.

$\boxed{180}\times a-\boxed{360}$

② Use the expression in ① to find the sum of angles of a decagon.
$180\times10-360=1440$ Answer: 1440°

③ If the sum of angles is 1260°, how many sides does this polygon have?

$180\times a-360=1260$

$180\times a-360+360=1260+\boxed{360}$
$180\times a=\boxed{1620}$
$180\times a\div180=\boxed{1620}\div180$
$a=\boxed{9}$

180× a
1260
360
It is easy to calculate if we divide both dividend and divisor by 10 for calculating 1620 ÷ 180.

④ Brenda wrote the expression $180\times(a-2)$ to find the sum of angles in a- sided polygon. Explain her idea with figures.
Using the expression, calculate how many sides a polygon has if the sum of its angles is 1620°.

26 = □ ÷ □

Lesson flow

1 Review the previous lesson.

2 Think about various mathematical expressions to identify the angle sum of polygons.

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

T/S 8 Read and understand the given situation.

S Find the angle sum of all the polygons. (Refer to textbook)

TN Students should treat this as a review of their previous knowledge of polygons in grade 5.

T ① Based on the figure above how did Philip think of an expression to calculate? Please explain his thinking.

S A pentagon makes 5 triangles.
$180 \times 5 = 900°$ (the angle sum is too large)
So, $900 - 360 = 540°$ (angle in the centre)
$180 \times 5 - 360 = 540°$
Expression: $180 \times a - 360$

3 Use the expression to find the angle sum of a decagon.

T ② Using the expression in ①, find the sum of angles of a decagon.

S 180 is multiplied by10 (triangles) in a decagon and subtract 360 to get the answer 1440.
($180 \times 10 - 360 = 1440$) Answer: 1440°

T ③ Sum of angles is 1260°.
Use the same expression in ① to find how many sides this polygon has.

S Write a sentence, $180 \times a - 360 = 1260°$ and solve.

TN When identifying the appropriate value for a, that is a question of how many sides the polygon has in ③ to solve.

S Think about it based on the line diagram.
$180 \times a - 360 = 1260°$ Answer: $a = 9$

4 ④ Making a math sentence based on a figure.

T Get students to explain how Brenda is thinking.

S Draw figures of polygons; quadrilateral, pentagon and hexagon to determine that the number of triangles is the number of sides - 2.

TN $a - 2$ represents the number of triangles she found in the polygon.

T Put the identified answer into an equation to check the answer.

S Calculate $180\ (a - 2) = 1620$
$180\ (a - 2) \div 180 = 1620 \div 180$
$a - 2 + 2 = 9 + 2$
$a = 11$

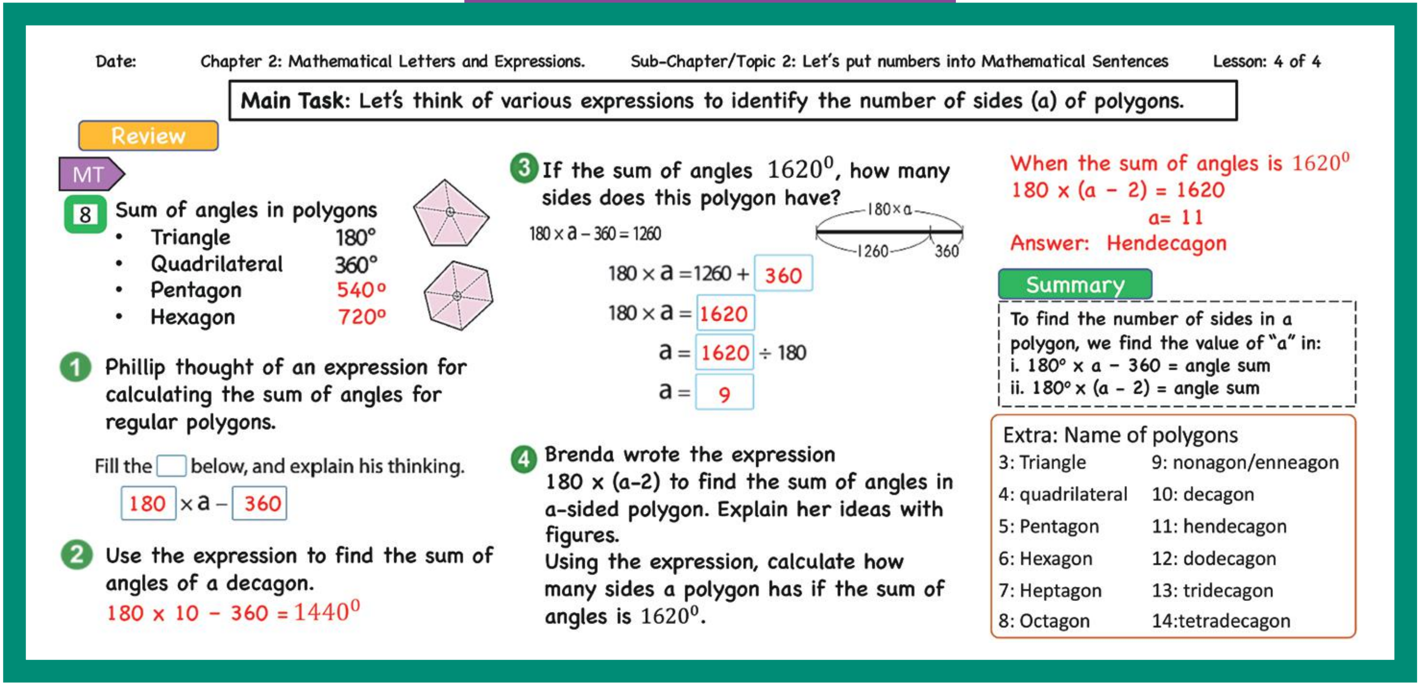
5 Summary

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: Mathematical Letters and Expressions. Sub-Chapter/Topic 2: Let's put numbers into Mathematical Sentences Lesson: 4 of 4

Main Task: Let's think of various expressions to identify the number of sides (a) of polygons.

Review

MT

8 Sum of angles in polygons

Triangle	180°
Quadrilateral	360°
Pentagon	540°
Hexagon	720°

① Phillip thought of an expression for calculating the sum of angles for regular polygons.

Fill the ☐ below, and explain his thinking.

$\boxed{180} \times a - \boxed{360}$

② Use the expression to find the sum of angles of a decagon.

$180 \times 10 - 360 = 1440^0$

③ If the sum of angles 1620^0, how many sides does this polygon have?

$180 \times a - 360 = 1260$

$180 \times a = 1260 + \boxed{360}$

$180 \times a = \boxed{1620}$

$a = \boxed{1620} \div 180$

$a = \boxed{9}$

④ Brenda wrote the expression $180 \times (a-2)$ to find the sum of angles in a-sided polygon. Explain her ideas with figures.
Using the expression, calculate how many sides a polygon has if the sum of angles is 1620^0.

When the sum of angles is 1620^0
$180 \times (a - 2) = 1620$
$a = 11$
Answer: Hendecagon

Summary

To find the number of sides in a polygon, we find the value of "a" in:
i. $180° \times a - 360 = \text{angle sum}$
ii. $180° \times (a - 2) = \text{angle sum}$

Extra: Name of polygons

3: Triangle
4: quadrilateral
5: Pentagon
6: Hexagon
7: Heptagon
8: Octagon
9: nonagon/enneagon
10: decagon
11: hendecagon
12: dodecagon
13: tridecagon
14:tetradecagon

Unit
2

Unit: Mathematical Letters and Expressions
Sub-unit: 3. Reading Expressions
Lesson 1 of 1

Textbook Page : 027
Actual Lesson 018

Sub-unit Objective

- To read a mathematical expression and identify what it represents.

Lesson Objective

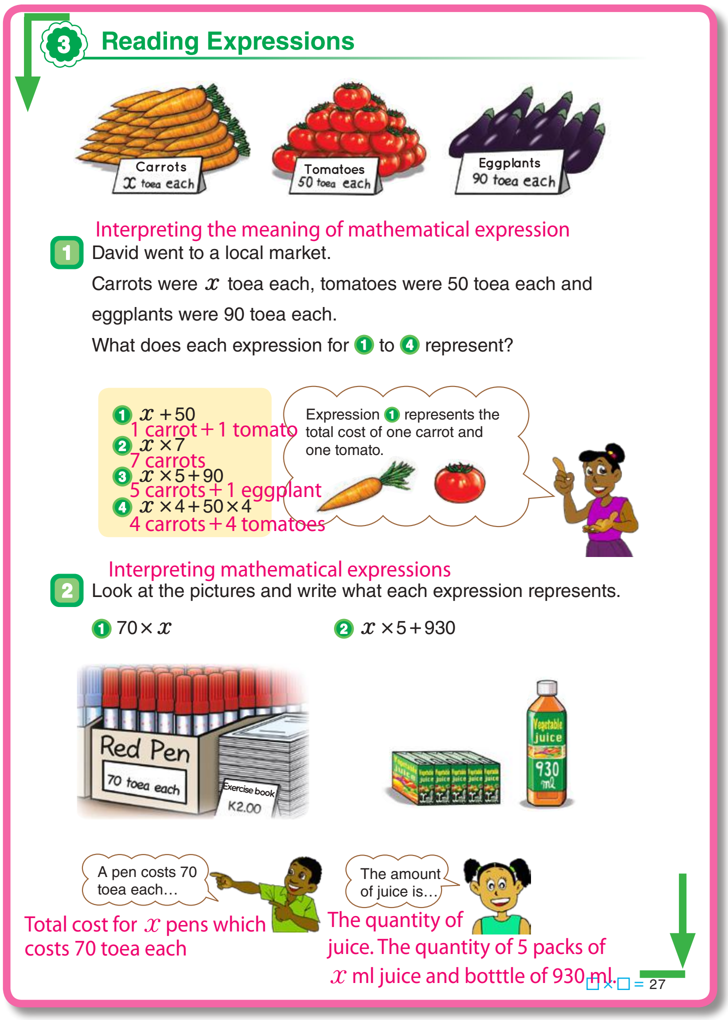
- To read a mathematical expression and identify what it represents.

Prior Knowledge

- Expressions with Symbols

Preparation

- Chart showing the cost for each vegetable



③ Reading Expressions

Interpreting the meaning of mathematical expression

1 David went to a local market.

Carrots were x toea each, tomatoes were 50 toea each and eggplants were 90 toea each.

What does each expression for ① to ④ represent?

① $x+50$
1 carrot + 1 tomato
② $x\times7$
7 carrots
③ $x\times5+90$
5 carrots + 1 eggplant
④ $x\times4+50\times4$
4 carrots + 4 tomatoes

Expression ① represents the total cost of one carrot and one tomato.

Interpreting mathematical expressions

2 Look at the pictures and write what each expression represents.

① $70\times x$

② $x\times5+930$

A pen costs 70 toea each…

Total cost for x pens which costs 70 toea each

The amount of juice is…

The quantity of juice. The quantity of 5 packs of x ml juice and botttle of 930 ml.

□×□ = 27

Assessment

- Calculate by reading the expressions. F
- Interpret and appreciate what mathematical expressions represent. F S

Teacher's Notes

Mathematical Expressions Represents Relations of Numbers/Quantities.

In this unit, teacher needs to carry out effective teaching and learning activities for students to understand what they mean by mathematical expressions of numbers or quantities.

Encourage and involve students in activities that are not only to make mathematical expressions using symbols but also to read expressions in depth.

There are various ways to read expressions in depth, some of which would include the following:

- To read an expression and contextualize it with concrete situations accordingly;
- To consider a wide range of numbers and apply them to an expression; and
- To read an expression in accordance with a visualised model such as a line diagram; and the table to help them solve accurately.

Lesson flow

1 Review the previous lesson.

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

2 Intepret the meaning of mathematical expressions in the given problems.

T/S ① Read and understand the given situation.

T Get the students to discuss and make meaning out of each expression ① to ④.

S ① $x+50$, represents total cost of 1 carrot and 1 tomato
② $x\times7$, represents total cost of 7 carrots
③ $x\times5+90$, represents total cost of 5 carrots and 1 eggplant
④ $x\times4+50\times4$, represents total cost of 4 carrots and 4 tomatoes.

3 ② Look at the pictures and think about what each expression represents.

T What do you think each of the expression represents?

S ① The red pen costs 70 toea each.
So, $70\times x$ represents the total cost of x number of red pens.

S ② 930 ml is the amount of juice in a bottle.
There are 5 packed juices in the picture, so x in the expression $x\times5+930$ represents the total amount of x mL times 5 packs and 930 mL bottle of juice.

S Therefore, representation says that there is x ml of juice in a pack times 5 plus 930 ml of bottled juice.

TN Encourage students to think and realise what x represents by associating the pictures with the given expressions.

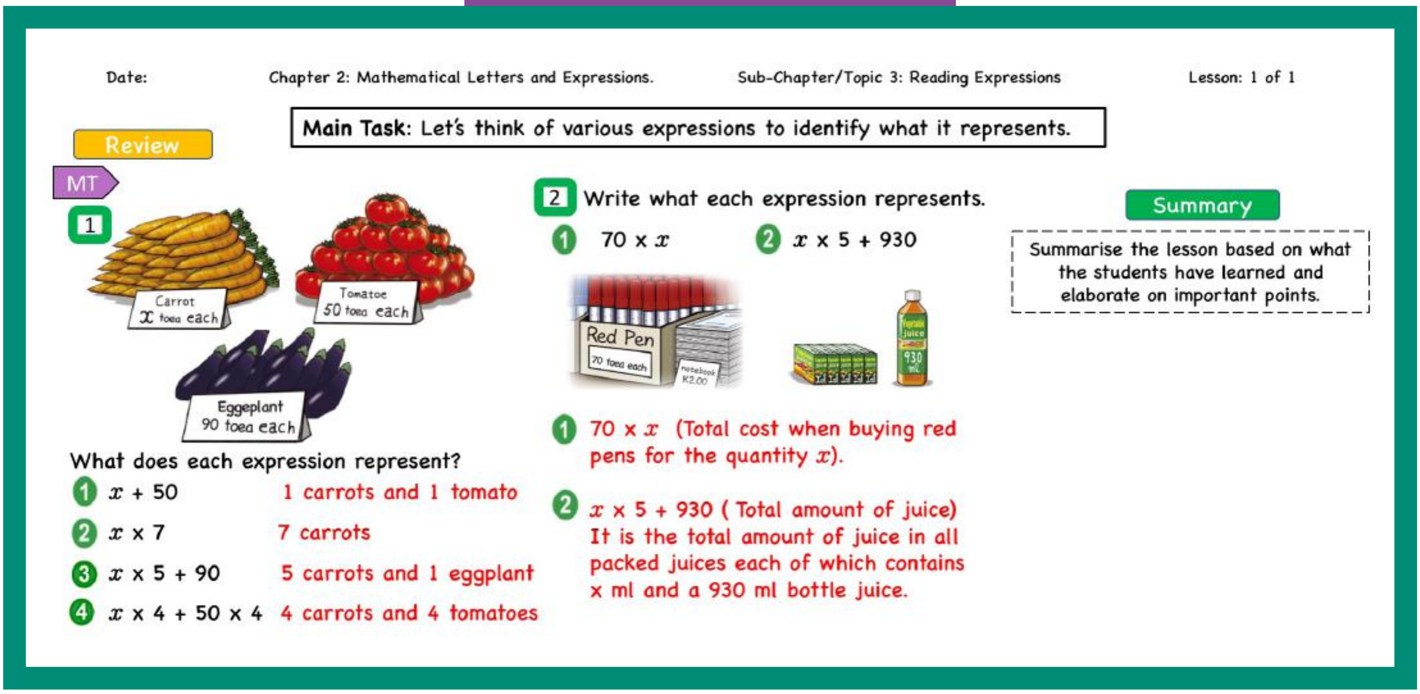
4 Summary.

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: Mathematical Letters and Expressions. Sub-Chapter/Topic 3: Reading Expressions Lesson: 1 of 1

Main Task: Let's think of various expressions to identify what it represents.

Review

MT

1

What does each expression represent?

① $x + 50$	1 carrots and 1 tomato
② $x \times 7$	7 carrots
③ $x \times 5 + 90$	5 carrots and 1 eggplant
④ $x \times 4 + 50 \times 4$	4 carrots and 4 tomatoes

2 Write what each expression represents.

① $70 \times x$ ② $x \times 5 + 930$

① $70 \times x$ (Total cost when buying red pens for the quantity x).

② $x \times 5 + 930$ (Total amount of juice) It is the total amount of juice in all packed juices each of which contains x ml and a 930 ml bottle juice.

Summary

Summarise the lesson based on what the students have learned and elaborate on important points.

Unit
2

Unit: Mathematical Letters and Expressions
Exercise, Problems, Review and Evaluation
Lesson: 1 and 2 of 2

Textbook Page :
028 and 029
Actual Lesson 019 & 020

Lesson Objective

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

Prior Knowledge

- All the contents learned in the unit.

Preparation

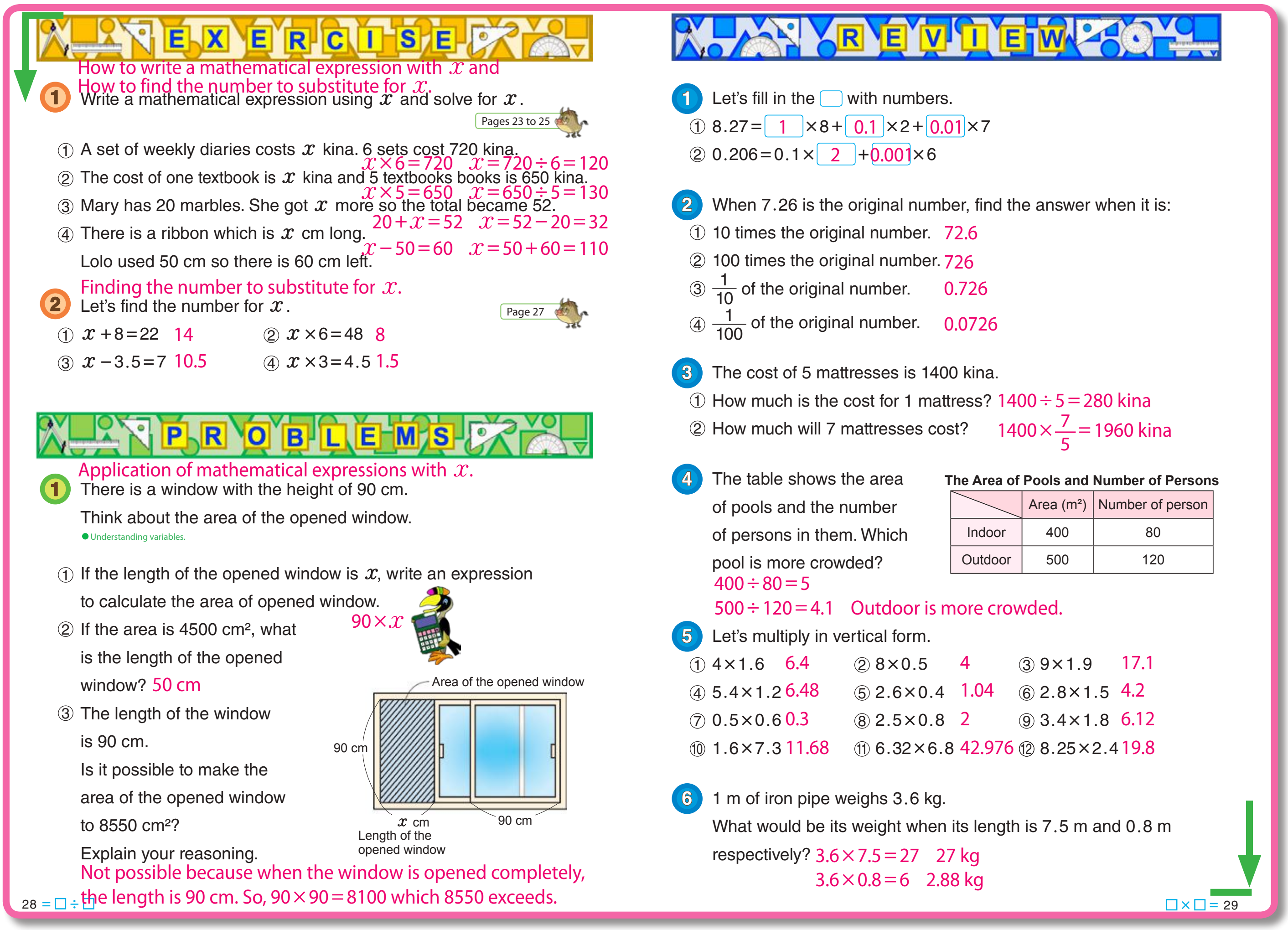
- Evaluation Test

Assessment

- Solve the exercises correctly by confirming what they learned in the unit. F 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, problems and review as a seperate lesson.



EXERCISE

How to write a mathematical expression with x and How to find the number to substitute for x.

① Write a mathematical expression using x and solve for x.

Pages 23 to 25

① A set of weekly diaries costs x kina. 6 sets cost 720 kina. $x\times6=720$ $x=720\div6=120$

② The cost of one textbook is x kina and 5 textbooks books is 650 kina. $x\times5=650$ $x=650\div5=130$

③ Mary has 20 marbles. She got x more so the total became 52. $20+x=52$ $x=52-20=32$

④ There is a ribbon which is x cm long. Lolo used 50 cm so there is 60 cm left. $x-50=60$ $x=50+60=110$

Finding the number to substitute for x.

② Let's find the number for x.

Page 27

① $x+8=22$ 14
② $x\times6=48$ 8
③ $x-3.5=7$ 10.5
④ $x\times3=4.5$ 1.5

PROBLEMS

Application of mathematical expressions with x.

① There is a window with the height of 90 cm. Think about the area of the opened window.

● Understanding variables.

① If the length of the opened window is x, write an expression to calculate the area of opened window. $90\times x$

② If the area is 4500 cm², what is the length of the opened window? 50 cm

③ The length of the window is 90 cm. Is it possible to make the area of the opened window to 8550 cm²? Explain your reasoning.

Not possible because when the window is opened completely, the length is 90 cm. So, $90\times90=8100$ which 8550 exceeds.

Area of the opened window
90 cm
x cm
Length of the opened window
90 cm

28 = □ ÷ □

REVIEW

① Let's fill in the ☐ with numbers.

① $8.27=\boxed{1}\times8+\boxed{0.1}\times2+\boxed{0.01}\times7$

② $0.206=0.1\times\boxed{2}+\boxed{0.001}\times6$

② When 7.26 is the original number, find the answer when it is:

① 10 times the original number. 72.6

② 100 times the original number. 726

③ $\frac{1}{10}$ of the original number. 0.726

④ $\frac{1}{100}$ of the original number. 0.0726

③ The cost of 5 mattresses is 1400 kina.

① How much is the cost for 1 mattress? $1400\div5=280$ kina

② How much will 7 mattresses cost? $1400\times\frac{7}{5}=1960$ kina

④ The table shows the area of pools and the number of persons in them. Which pool is more crowded?

The Area of Pools and Number of Persons

	Area (m²)	Number of person
Indoor	400	80
Outdoor	500	120

$400\div80=5$
$500\div120=4.1$ Outdoor is more crowded.

⑤ Let's multiply in vertical form.

① 4×1.6 6.4
② 8×0.5 4
③ 9×1.9 17.1
④ 5.4×1.2 6.48
⑤ 2.6×0.4 1.04
⑥ 2.8×1.5 4.2
⑦ 0.5×0.6 0.3
⑧ 2.5×0.8 2
⑨ 3.4×1.8 6.12
⑩ 1.6×7.3 11.68
⑪ 6.32×6.8 42.976
⑫ 8.25×2.4 19.8

⑥ 1 m of iron pipe weighs 3.6 kg. What would be its weight when its length is 7.5 m and 0.8 m respectively? $3.6\times7.5=27$ 27 kg
$3.6\times0.8=6$ 2.88 kg

□ × □ = 29

Lesson flow

1 Complete Exercise ① and ②.

S Read the Question ① to ④ from the textbook.
Write a mathematical expression using x and solve for x.

S Read Questions ① to ④ from the textbook and find the number for x.

T Confirm students' answers.

2 Complete Problem ①.

S Solve the problem by answering question ① to ③.

T Confirm students' answers.

3 Complete Review ① to ⑥.

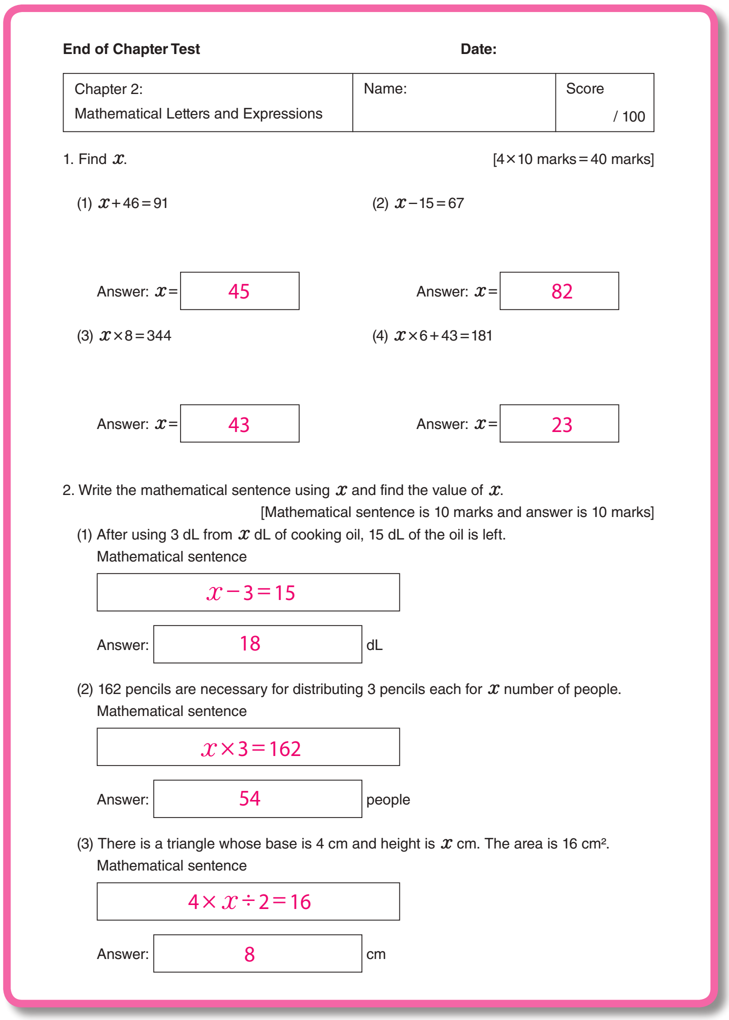
S Solve the review questions.

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, problems and review as a seperate lesson.

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 2: Mathematical Letters and Expressions	Name:	Score / 100

1. Find x. [4×10 marks = 40 marks]

(1) $x+46=91$

Answer: $x=$ 45

(2) $x-15=67$

Answer: $x=$ 82

(3) $x\times 8=344$

Answer: $x=$ 43

(4) $x\times 6+43=181$

Answer: $x=$ 23

2. Write the mathematical sentence using x and find the value of x.
[Mathematical sentence is 10 marks and answer is 10 marks]

(1) After using 3 dL from x dL of cooking oil, 15 dL of the oil is left.

Mathematical sentence

$x-3=15$

Answer: 18 dL

(2) 162 pencils are necessary for distributing 3 pencils each for x number of people.

Mathematical sentence

$x\times 3=162$

Answer: 54 people

(3) There is a triangle whose base is 4 cm and height is x cm. The area is 16 cm².

Mathematical sentence

$4\times x\div 2=16$

Answer: 8 cm

End of Chapter Test **Date:**

Chapter 2: Mathematical Letters and Expressions	Name:	Score / 100

1. Find x. [4×10 marks = 40 marks]

(1) $x+46=91$

Answer: $x=$

(2) $x-15=67$

Answer: $x=$

(3) $x\times 8=344$

Answer: $x=$

(4) $x\times 6+43=181$

Answer: $x=$

2. Write the mathematical sentence using x and find the value of x.

[Mathematical sentence is 10 marks and answer is 10 marks]

(1) After using 3 dL from x dL of cooking oil, 15 dL of the oil is left.

Mathematical sentence

Answer: dL

(2) 162 pencils are necessary for distributing 3 pencils each for x number of people.

Mathematical sentence

Answer: people

(3) There is a triangle whose base is 4 cm and height is x cm. The area is 16 cm^2.

Mathematical sentence

Answer: cm

Chapter 3 Multiplication of Fractions

1. Content Standard

6.1.2. Students will be able to extend the multiplication and division to fractions with multipliers and divisors as fraction and do multiplication and division and appreciate the simplicity of rules.

2. Unit Objectives

- To deepen the understanding of multiplication of fractions.
- To think about how to calculate the multiplication of fraction and master the skill.
- To understand that in the case of fraction, the same rule of integers is applied.

3. Teaching Overview

Students already learned calculation of whole numbers and decimals with basic operations. They also did fraction multiplied/divided by a whole number and how to think about it with area diagram. Based on the previous learning, this unit is meant for learning fraction × fraction.

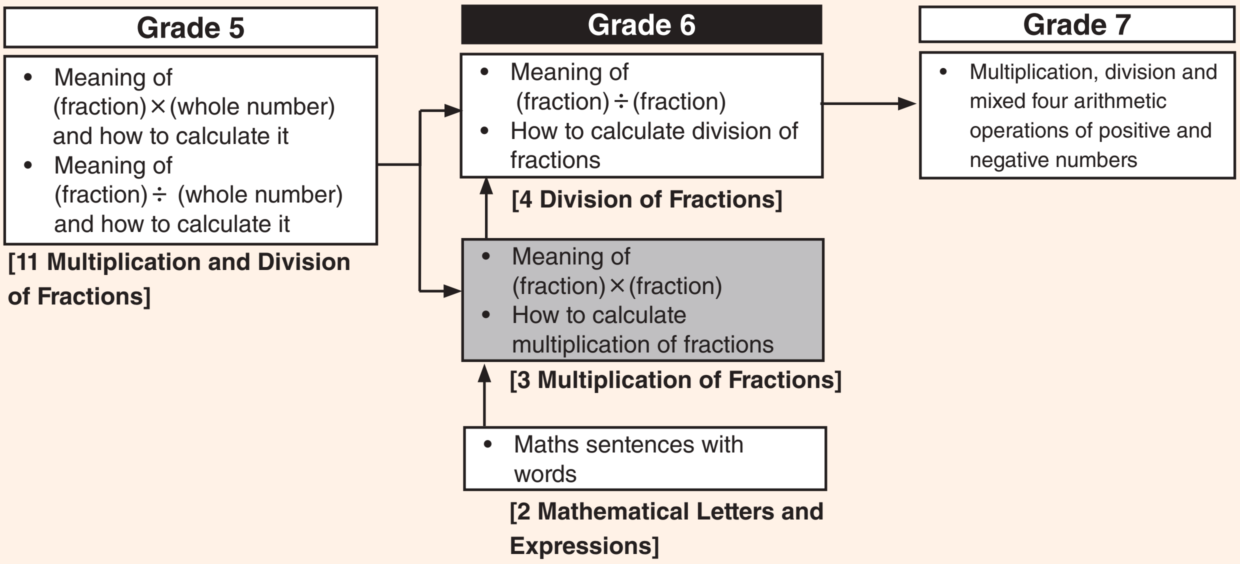
Calculation of Fraction × Fraction :

First, students are supposed to understand the situation and understand the mathematical expression. Then they strategise how to solve it.
They will think with an area diagram and think how many unit fractions are found as the answer.

Inverse of a number :

They should firstly read and understand the definition of multiplicative inverse.
Then they also should understand that there are also multiplicative inverse of whole numbers and decimals through many practice of finding them based on the definition.

4. Related Learning Contents



Grade 5

- Meaning of (fraction) × (whole number) and how to calculate it
- Meaning of (fraction) ÷ (whole number) and how to calculate it

[11 Multiplication and Division of Fractions]

Grade 6

- Meaning of (fraction) ÷ (fraction)
- How to calculate division of fractions

[4 Division of Fractions]

- Meaning of (fraction) × (fraction)
- How to calculate multiplication of fractions

[3 Multiplication of Fractions]

- Maths sentences with words

[2 Mathematical Letters and Expressions]

Grade 7

- Multiplication, division and mixed four arithmetic operations of positive and negative numbers

Unit 3

Unit: Multiplication of Fractions

Sub-unit: 1. Operation of Fractions × Fractions

Lesson 1 of 5

Textbook Pages : 030 to 032
Actual Lesson 021

Sub-unit Objective

- To understand how to multiply fraction.

Lesson Objectives

- Make mathematical expressions by understanding the meaning of multiplication of fractions.
- Think about and understand how to calculate multiplication of fractions.

Prior Knowledge

- Multiplication of integers
- When multiplying a proper fraction by a whole number, multiply the numerator by the whole number and leave the denominator as it is.
- Unit fraction

Preparation

- Tape diagrams, tables and area diagrams

Assessment

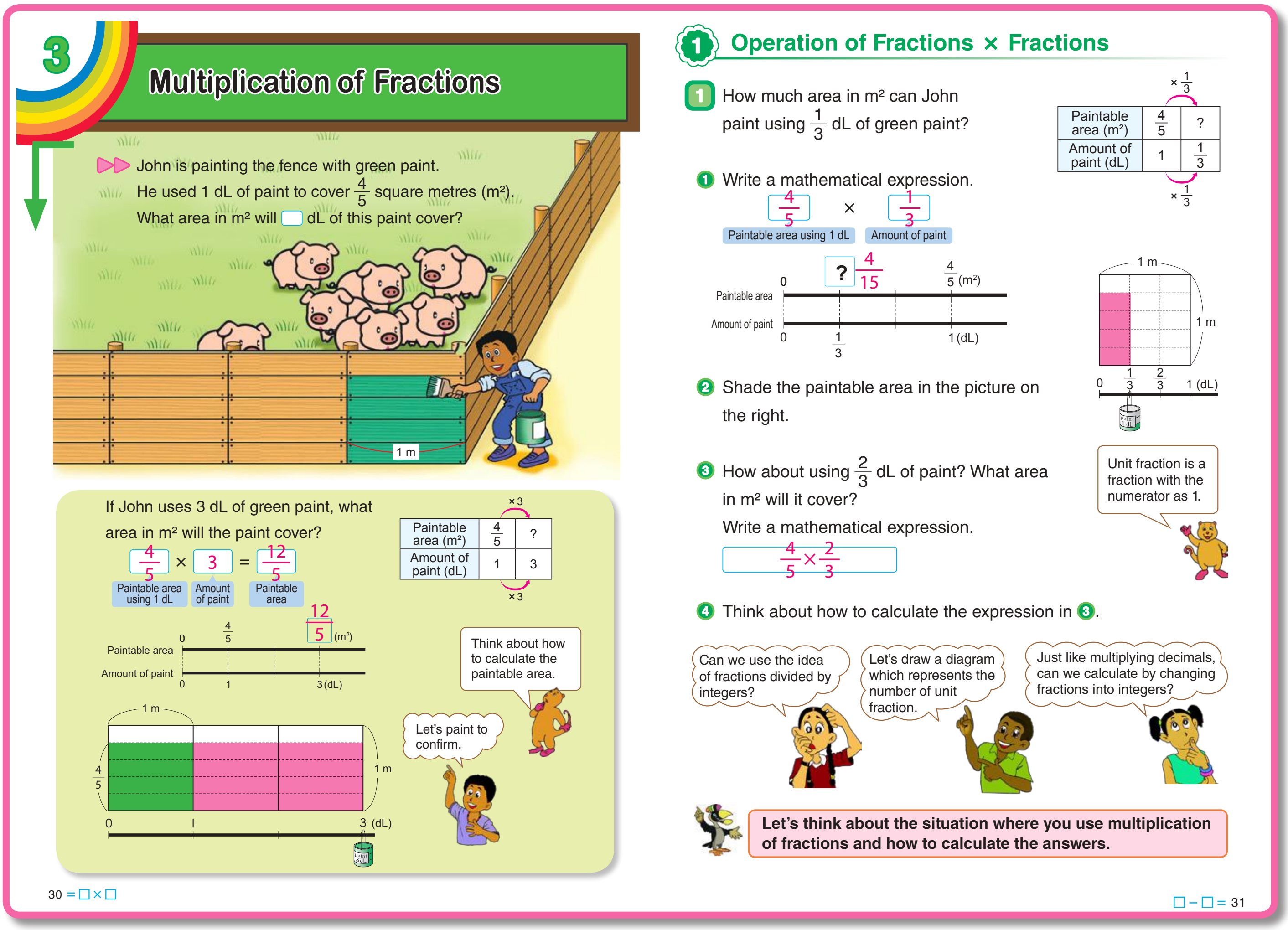
- Think about and write mathematical expressions for the multiplication of fraction. **F**
- Explain how to calculate multiplication of fraction. **S**

Teacher's Notes

This lesson is focused on the meaning of calculation of fraction × fraction and doing calculation with answers. The students need to understand and make meaning from the representations. From the understanding and meaning they will be able to write mathematical expression.

Paintable area means the area to be painted.

Refer to the teacher's notes in the next lesson as well.



3 Multiplication of Fractions

▷▷ John is painting the fence with green paint.
He used 1 dL of paint to cover $\frac{4}{5}$ square metres (m²).
What area in m² will ☐ dL of this paint cover?

If John uses 3 dL of green paint, what area in m² will the paint cover?

$\boxed{\frac{4}{5}} \times \boxed{3} = \boxed{\frac{12}{5}}$

Paintable area using 1 dL × Amount of paint = Paintable area

Paintable area (m²)	$\frac{4}{5}$	?
Amount of paint (dL)	1	3

① Operation of Fractions × Fractions

1 How much area in m² can John paint using $\frac{1}{3}$ dL of green paint?

Paintable area (m²)	$\frac{4}{5}$	?
Amount of paint (dL)	1	$\frac{1}{3}$

① Write a mathematical expression.

$\boxed{\frac{4}{5}} \times \boxed{\frac{1}{3}}$

Paintable area using 1 dL × Amount of paint

② Shade the paintable area in the picture on the right.

③ How about using $\frac{2}{3}$ dL of paint? What area in m² will it cover?
Write a mathematical expression.

$\boxed{\frac{4}{5} \times \frac{2}{3}}$

④ Think about how to calculate the expression in ③.

Can we use the idea of fractions divided by integers?
Let's draw a diagram which represents the number of unit fraction.
Just like multiplying decimals, can we calculate by changing fractions into integers?

Let's think about the situation where you use multiplication of fractions and how to calculate the answers.

30 = ☐ × ☐

☐ − ☐ = 31

Lesson flow

1 Understand the meaning of fractions × fractions.

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

T/S Read and understand the given situation.

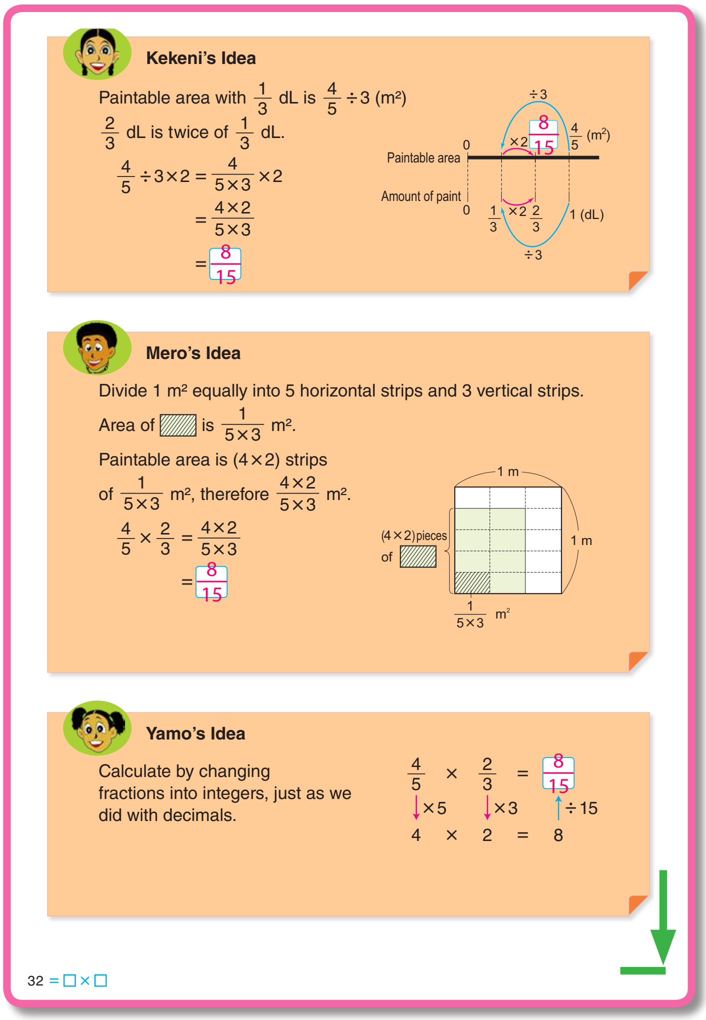
T ▶▶ Ask the students to observe the picture and have 1 - 2 minutes discussion about the picture.

TN Focus on the paintable area using 1 dL. The amount of paint used for 1 m², students think about the situation and write a mathematical sentence.

S Think about how to write the mathematical sentence by filling in the ☐.
Answer: $\frac{4}{5} \times 3 = \frac{12}{5}$

T Ask the students to relate their mathematical sentence to the answers to the table, number line and think about how to calculate the paintable area using the diagram representation.

S Relate their mathematical sentence to the answers to the table, number line and think about how to represent the paintable area using the diagram and present their answers.



Kekeni's Idea

Paintable area with $\frac{1}{3}$ dL is $\frac{4}{5} \div 3$ (m²)

$\frac{2}{3}$ dL is twice of $\frac{1}{3}$ dL.

$$\frac{4}{5} \div 3 \times 2 = \frac{4}{5 \times 3} \times 2 = \frac{4 \times 2}{5 \times 3} = \boxed{\frac{8}{15}}$$

Mero's Idea

Divide 1 m² equally into 5 horizontal strips and 3 vertical strips.

Area of ▨ is $\frac{1}{5 \times 3}$ m².

Paintable area is (4 × 2) strips of $\frac{1}{5 \times 3}$ m², therefore $\frac{4 \times 2}{5 \times 3}$ m².

$$\frac{4}{5} \times \frac{2}{3} = \frac{4 \times 2}{5 \times 3} = \boxed{\frac{8}{15}}$$

Yamo's Idea

Calculate by changing fractions into integers, just as we did with decimals.

$$\frac{4}{5} \times \frac{2}{3} = \boxed{\frac{8}{15}}$$

2 Think about how to make a mathematical expression.

T/S ① Read and understand the given situation.

T Ask students to use their prior knowledge of fraction multiplied by whole number to write the mathematical expression for the given situation.

S Do activity ① by relating to the table and the number line.

S ② Shade the paintable area using the area diagram.

S ③ Read and understand the situation and write the mathematical expression.

3 ④ Think about how to calculate the expression in ③.

T Get the students to discuss the ideas in the bubbles.

S Use the bubbles to think about how to calculate and suggest ideas.

4 Using the ideas.

T Go through Kekeni's, Mero's and Yamo's ideas.

S Explain each idea about how they calculate $\frac{4}{3} \times \frac{2}{3}$.

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 022 Sample Blackboard Plan is on page 45.

Unit 3

Unit: Multiplication of Fractions

Sub-unit: 1. Operation of Fractions × Fractions

Lesson 2 of 5

Textbook Pages : 033
Actual Lesson 022

Lesson Objectives

- To think about how to explain the calculation of fraction multipied by a fraction.
- To simplify fractions during calculation of fraction multiplied by a fraction.

Assessment

- Calculate fraction × fraction and simplify its answer. **F**
- Solve the exercises correctly. **S**

Prior Knowledge

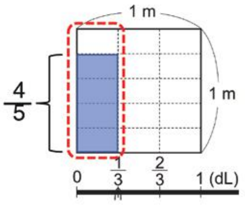
- 1 dL of paint will cover $\frac{4}{5}$ m².
- Representation of $\frac{1}{3}$ dL and $\frac{2}{3}$ dL showing the amount of paintable area in m².

Preparation

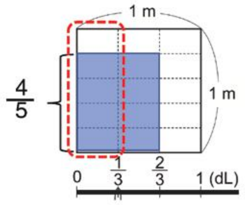
- Tape diagrams, tables and area diagrams.

Teacher's Notes

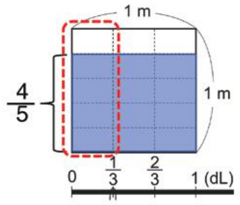
From the first lesson to this second lesson students may be able to observe and compare the paintable area and amount of paint in dL used. The amount of paint in dL went from $\frac{1}{3}$ to $\frac{4}{3}$.



$$\frac{4}{5}\times\frac{1}{3}=\frac{4\times1}{5\times3}=\frac{4}{15}\quad \text{ans: } \frac{4}{15}\text{m}^2$$

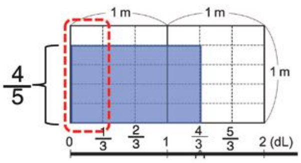


$$\frac{4}{5}\times\frac{2}{3}=\frac{4\times2}{5\times3}=\frac{8}{15}\quad \text{ans: } \frac{8}{15}\text{m}^2$$



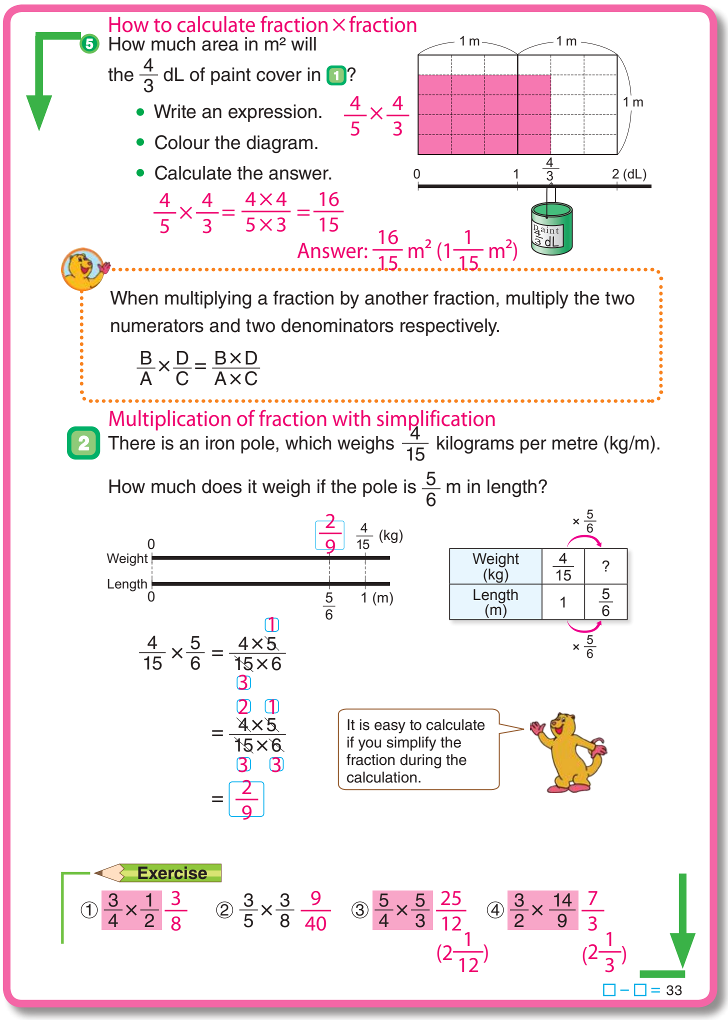
$$\frac{4}{5}\times1=\frac{4\times1}{5\times1}=\frac{4}{5}\quad \text{ans: } \frac{4}{5}\text{m}^2$$

$$\frac{4}{5}\times\frac{3}{3}=\frac{4\times3}{5\times3}=\frac{12}{15}\quad \text{ans: } \frac{4}{5}\text{m}^2$$



$$\frac{4}{5}\times\frac{4}{3}=\frac{4\times4}{5\times3}=\frac{16}{15}$$

$$\text{ans: } \frac{16}{15}\text{m}^2 \text{ or } 1\frac{1}{15}\text{m}^2$$



How to calculate fraction × fraction

⑤ How much area in m² will the $\frac{4}{3}$ dL of paint cover in 1?

- Write an expression. $\frac{4}{5}\times\frac{4}{3}$
- Colour the diagram.
- Calculate the answer.

1 m
1 m
1 m
0
1
4/3
2 (dL)
Paint 4/3 dL

$$\frac{4}{5}\times\frac{4}{3}=\frac{4\times4}{5\times3}=\frac{16}{15}$$

Answer: $\frac{16}{15}$ m² ($1\frac{1}{15}$ m²)

When multiplying a fraction by another fraction, multiply the two numerators and two denominators respectively.

$$\frac{B}{A}\times\frac{D}{C}=\frac{B\times D}{A\times C}$$

Multiplication of fraction with simplification

2 There is an iron pole, which weighs $\frac{4}{15}$ kilograms per metre (kg/m).

How much does it weigh if the pole is $\frac{5}{6}$ m in length?

Weight (kg)	$\frac{4}{15}$	?
Length (m)	1	$\frac{5}{6}$

$$\frac{4}{15}\times\frac{5}{6}=\frac{4\times\overset{1}{\cancel{5}}}{\underset{3}{\cancel{15}}\times6}$$

$$=\frac{\overset{2}{\cancel{4}}\times\overset{1}{\cancel{5}}}{\underset{3}{\cancel{15}}\times\underset{3}{\cancel{6}}}$$

$$=\boxed{\frac{2}{9}}$$

It is easy to calculate if you simplify the fraction during the calculation.

Exercise

① $\frac{3}{4}\times\frac{1}{2}$ $\frac{3}{8}$ ② $\frac{3}{5}\times\frac{3}{8}$ $\frac{9}{40}$ ③ $\frac{5}{4}\times\frac{5}{3}$ $\frac{25}{12}$ ($2\frac{1}{12}$) ④ $\frac{3}{2}\times\frac{14}{9}$ $\frac{7}{3}$ ($2\frac{1}{3}$)

□ − □ = 33

Lesson flow

1 Review the previous lesson.

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

2 ① Solve the activity and summarise how to calculate.

S ⑤ Read the situation and think about the paintable area using $\frac{4}{3}$ dL.

S Complete the activity by:

- Writing the expression. ($\frac{4}{5}\times\frac{4}{3}$)
- Colouring the diagram
- Calculating the answer. ($1\frac{1}{5}$)

TN Refer to Teacher's Notes for explanations.

T Give ample time to students to complete their activity.

S Complete tasks and share answers with explanations.

3 Important Point

T/S Explain the important point in the ⬚.

4 ② Calculating fraction × fraction.

S Use the same idea and process for the previous activity and the summary to understand the situation to calculate by filling in the ☐.

TN Advice students to simplify the fractions during the calculation.

S Present answers on the board.

T Confirm and emphasise the concept of multiplying fraction × fraction.

5 Complete the Exercise.

S Solve the selected exercises.

T Confirm students' answers.

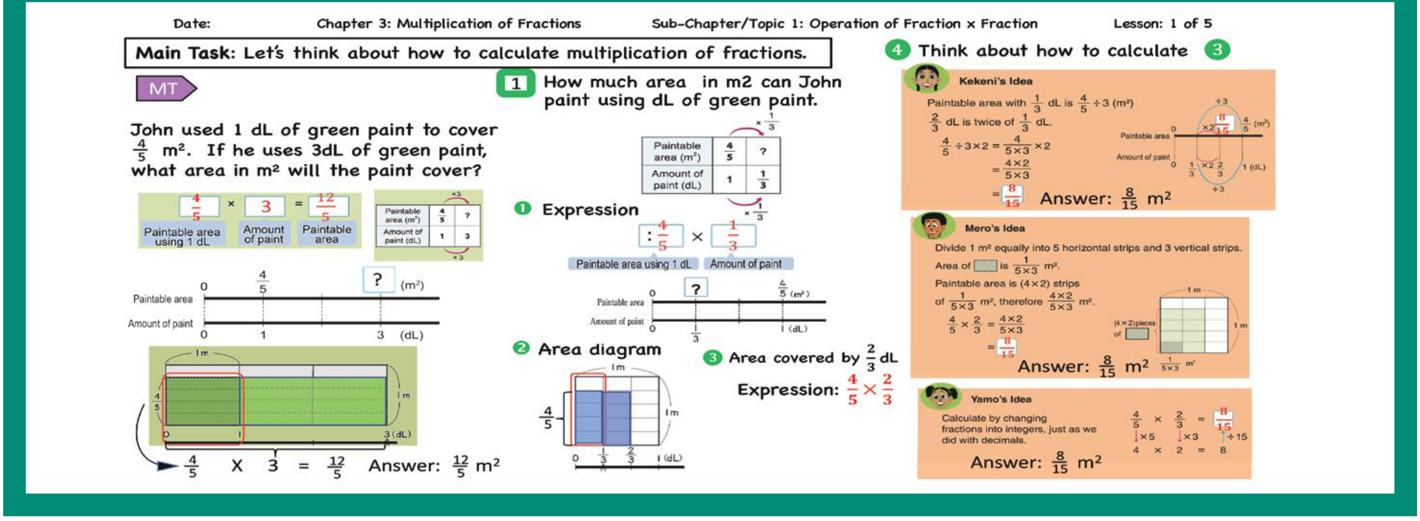
6 Summary

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 21)



Date: Chapter 3: Multiplication of Fractions Sub-Chapter/Topic 1: Operation of Fraction x Fraction Lesson: 1 of 5

Main Task: Let's think about how to calculate multiplication of fractions.

MT

John used 1 dL of green paint to cover $\frac{4}{5}$ m². If he uses 3dL of green paint, what area in m² will the paint cover?

$\frac{4}{5}\times 3=\frac{12}{5}$

Paintable area using 1 dL, Amount of paint, Paintable area

Paintable area (m²)	$\frac{4}{5}$	?
Amount of paint (dL)	1	3

$\frac{4}{5}$ X 3 = $\frac{12}{5}$ Answer: $\frac{12}{5}$ m²

1 How much area in m2 can John paint using dL of green paint.

Paintable area (m²)	$\frac{4}{5}$	?
Amount of paint (dL)	1	$\frac{1}{3}$

① Expression

$\frac{4}{5}\times\frac{1}{3}$

Paintable area using 1 dL, Amount of paint

② Area diagram

③ Area covered by $\frac{2}{3}$ dL

Expression: $\frac{4}{5}\times\frac{2}{3}$

④ Think about how to calculate ③

Kekeni's Idea

Paintable area with $\frac{1}{3}$ dL is $\frac{4}{5}\div 3$ (m²)

$\frac{2}{3}$ dL is twice of $\frac{1}{3}$ dL.

$$\frac{4}{5}\div 3\times 2=\frac{4}{5\times 3}\times 2=\frac{4\times 2}{5\times 3}=\boxed{\frac{8}{15}}$$

Answer: $\frac{8}{15}$ m²

Mero's Idea

Divide 1 m² equally into 5 horizontal strips and 3 vertical strips.

Area of ▨ is $\frac{1}{5\times 3}$ m².

Paintable area is (4×2) strips of $\frac{1}{5\times 3}$ m², therefore $\frac{4\times 2}{5\times 3}$ m².

$$\frac{4}{5}\times\frac{2}{3}=\frac{4\times 2}{5\times 3}=\boxed{\frac{8}{15}}$$

Answer: $\frac{8}{15}$ m²

Yamo's Idea

Calculate by changing fractions into integers, just as we did with decimals.

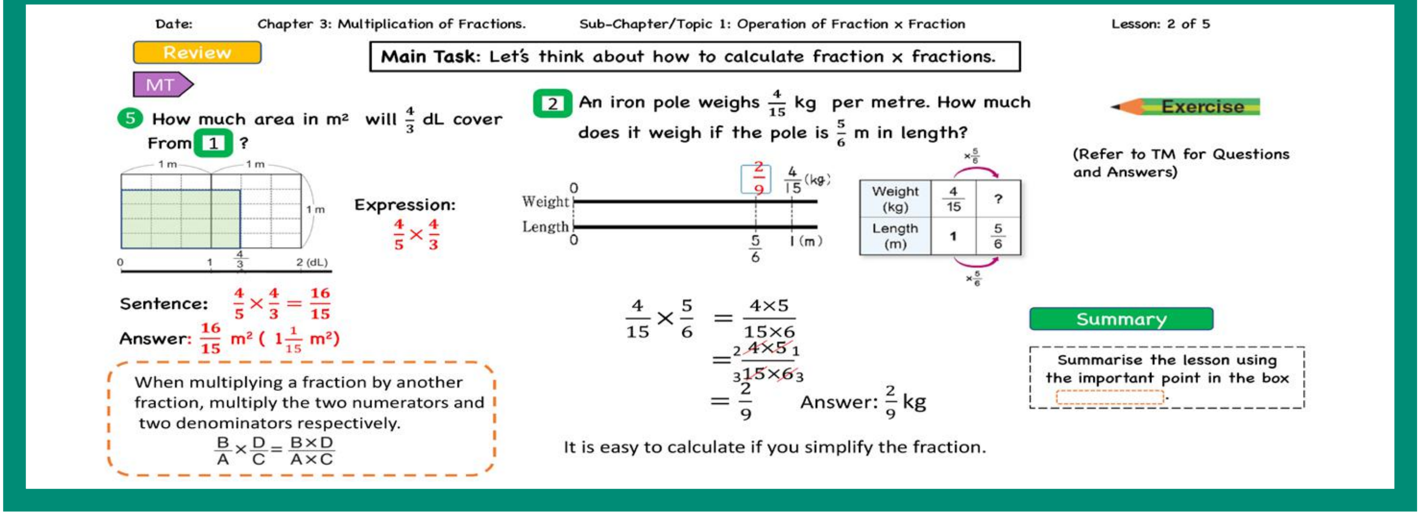
$$\frac{4}{5}\times\frac{2}{3}=\boxed{\frac{8}{15}}$$

×5, ×3, ÷15

4 × 2 = 8

Answer: $\frac{8}{15}$ m²

Sample Blackboard Plan (Lesson 22)



Date: Chapter 3: Multiplication of Fractions. Sub-Chapter/Topic 1: Operation of Fraction x Fraction Lesson: 2 of 5

Review

MT

Main Task: Let's think about how to calculate fraction x fractions.

⑤ How much area in m² will $\frac{4}{3}$ dL cover From 1 ?

Expression: $\frac{4}{5}\times\frac{4}{3}$

Sentence: $\frac{4}{5}\times\frac{4}{3}=\frac{16}{15}$

Answer: $\frac{16}{15}$ m² ($1\frac{1}{15}$ m²)

When multiplying a fraction by another fraction, multiply the two numerators and two denominators respectively.

$$\frac{B}{A}\times\frac{D}{C}=\frac{B\times D}{A\times C}$$

2 An iron pole weighs $\frac{4}{15}$ kg per metre. How much does it weigh if the pole is $\frac{5}{6}$ m in length?

Weight (kg)	$\frac{4}{15}$	?
Length (m)	1	$\frac{5}{6}$

$$\frac{4}{15}\times\frac{5}{6}=\frac{4\times 5}{15\times 6}=\frac{{}^{2}\cancel{4}\times\cancel{5}^{1}}{{}_{3}\cancel{15}\times\cancel{6}_{3}}=\frac{2}{9}$$

Answer: $\frac{2}{9}$ kg

It is easy to calculate if you simplify the fraction.

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson using the important point in the box ⬚.

Unit 3

Unit: Multiplication of Fractions
Sub-unit: 1. Operation of Fractions × Fractions
Lesson 3 of 5

Textbook Page : 034
Actual Lesson 023

Lesson Objective

- To think about and identify the relationship amongst whole number × fraction, fraction × whole number and fraction × fraction.

Prior Knowledge

- How to calculate fraction × fraction. (Multiply the two numerators and two denominators.)

Preparation

- Area diagrams in task 4

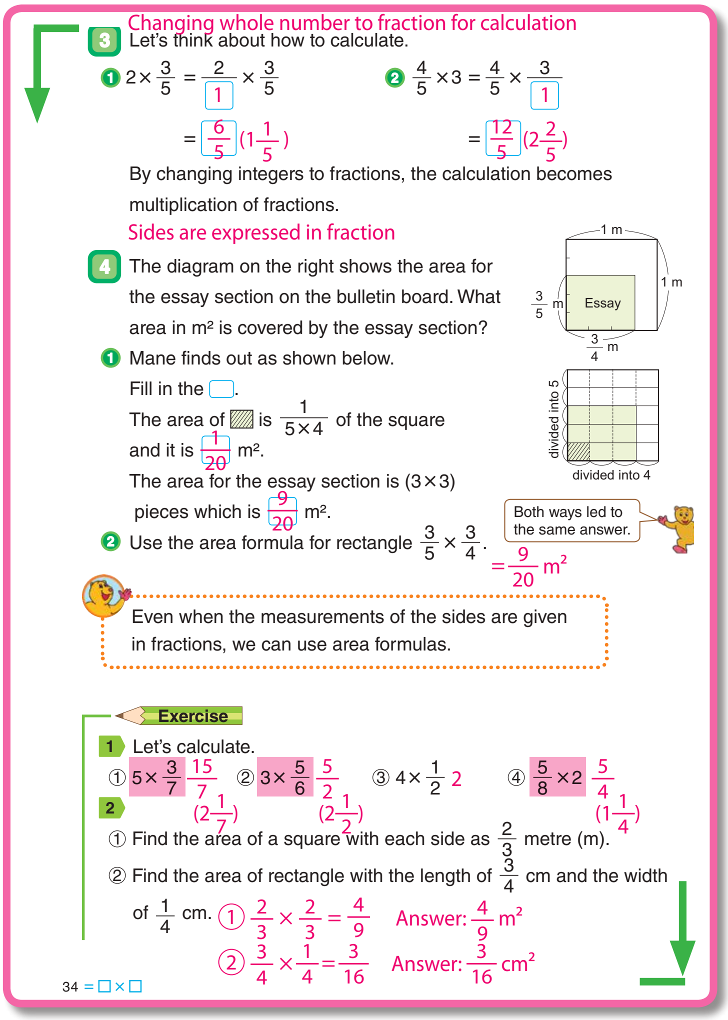
Assessment

- Think about how to multiply whole number by fraction. F
- Multiply fraction by fraction using area formula. F
- Solve the exercises correctly. S

Teacher's Notes

Apply the formula for calculating the area as A = L × W to calculate the length and width expressed in fraction.

It is difficult for children to understand the meaning of multiplying fractions.
Because they understand multiplication as the meaning of continuous addition.
Therefore, they can understand easily the meaning of '$\frac{2}{3}\times 2$', however, they cannot understand $\frac{1}{2}\times\frac{2}{3}$.
In these lessons, it is good for the students to think about the meaning of multiplication of fractions recalling the multiplication of decimal numbers as follows.
Base amount × proportion = amount of corresponded proportion



Changing whole number to fraction for calculation

3 Let's think about how to calculate.

① $2\times\frac{3}{5}=\frac{2}{\boxed{1}}\times\frac{3}{5}=\boxed{\frac{6}{5}}\left(1\frac{1}{5}\right)$

② $\frac{4}{5}\times 3=\frac{4}{5}\times\frac{3}{\boxed{1}}=\boxed{\frac{12}{5}}\left(2\frac{2}{5}\right)$

By changing integers to fractions, the calculation becomes multiplication of fractions.

Sides are expressed in fraction

4 The diagram on the right shows the area for the essay section on the bulletin board. What area in m² is covered by the essay section?

① Mane finds out as shown below.
Fill in the ☐.
The area of ▨ is $\frac{1}{5\times 4}$ of the square and it is $\boxed{\frac{1}{20}}$ m².
The area for the essay section is (3×3) pieces which is $\boxed{\frac{9}{20}}$ m².

② Use the area formula for rectangle $\frac{3}{5}\times\frac{3}{4}$. $=\frac{9}{20}$ m²

Both ways led to the same answer.

Even when the measurements of the sides are given in fractions, we can use area formulas.

Exercise

1 Let's calculate.

① $5\times\frac{3}{7}$ $\frac{15}{7}$ $\left(2\frac{1}{7}\right)$ ② $3\times\frac{5}{6}$ $\frac{5}{2}$ $\left(2\frac{1}{2}\right)$ ③ $4\times\frac{1}{2}$ 2 ④ $\frac{5}{8}\times 2$ $\frac{5}{4}$ $\left(1\frac{1}{4}\right)$

2
① Find the area of a square with each side as $\frac{2}{3}$ metre (m).
② Find the area of rectangle with the length of $\frac{3}{4}$ cm and the width of $\frac{1}{4}$ cm.

① $\frac{2}{3}\times\frac{2}{3}=\frac{4}{9}$ Answer: $\frac{4}{9}$ m²
② $\frac{3}{4}\times\frac{1}{4}=\frac{3}{16}$ Answer: $\frac{3}{16}$ cm²

34 = ☐ × ☐

Lesson flow

1 Review the previous lesson.

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

2 Whole Number multiplied by Fractions.

T 3 Have the students to study activity ① and ② and think about how to calculate.

TN Students should understand that integers or whole numbers should be converted to fractions so it becomes multiplication of fraction × fraction where they multiply the two numerators and two denominators.

S Complete activity ① and ② by filling in the boxes ☐.

3 Use the formula for Area to calculate using fractions.

T/S 4 Read and understand the given situation.

T Get the students to use the diagram representation to explain the situation.

S Fill in the boxes ☐ in activity ①.

S Apply the formula for calculating area to calculate the width and length given in fractions in the activity ② by multiplying fraction × fraction.

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.

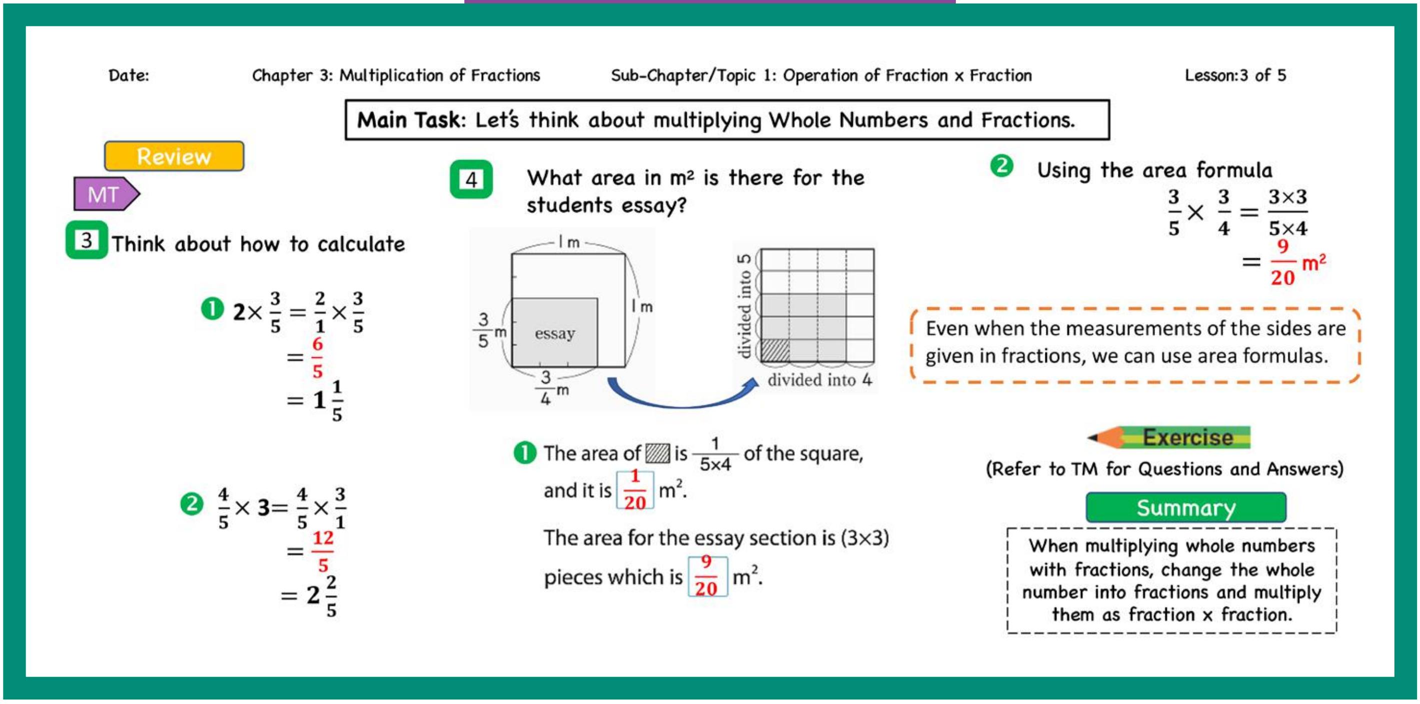
6 Summary

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: Chapter 3: Multiplication of Fractions Sub-Chapter/Topic 1: Operation of Fraction x Fraction Lesson:3 of 5

Main Task: Let's think about multiplying Whole Numbers and Fractions.

Review

MT

3 Think about how to calculate

① $2\times\frac{3}{5}=\frac{2}{1}\times\frac{3}{5}$
$=\frac{6}{5}$
$=1\frac{1}{5}$

② $\frac{4}{5}\times 3=\frac{4}{5}\times\frac{3}{1}$
$=\frac{12}{5}$
$=2\frac{2}{5}$

4 What area in m² is there for the students essay?

① The area of ▨ is $\frac{1}{5\times4}$ of the square, and it is $\boxed{\frac{1}{20}}$ m².

The area for the essay section is (3×3) pieces which is $\boxed{\frac{9}{20}}$ m².

② Using the area formula

$\frac{3}{5}\times\frac{3}{4}=\frac{3\times3}{5\times4}$
$=\frac{9}{20}$ m²

Even when the measurements of the sides are given in fractions, we can use area formulas.

Exercise

(Refer to TM for Questions and Answers)

Summary

When multiplying whole numbers with fractions, change the whole number into fractions and multiply them as fraction x fraction.

Unit 3

Unit: Multiplication of Fractions

Sub-unit: 1. Operation of Fractions × Fractions

Lesson 4 of 5

Textbook Page : 035
Actual Lesson 024

Lesson Objective

- To think about how to calculate multiplication of mixed fractions.

Prior Knowledge

- Multiplication of fraction × fraction and whole number × fraction

Preparation

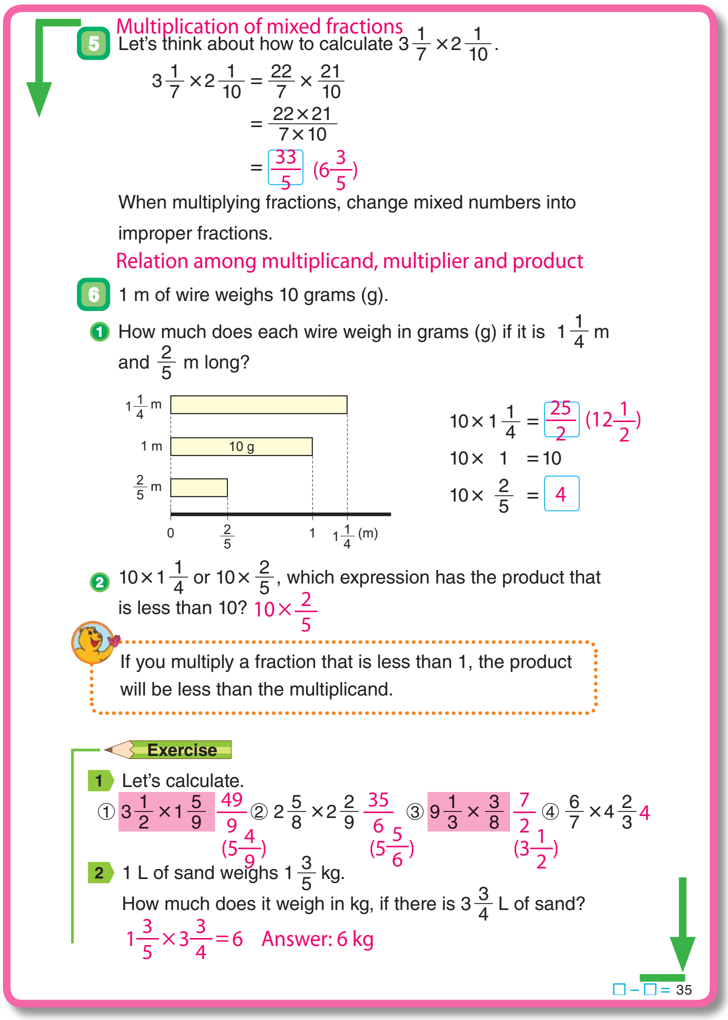
- Tape diagram in task 6

Assessment

- Think about how to calculate multiplication of mixed fraction. F
- Understand the relationship between the multiplicand, multiplier and the product. S
- Solve the exercises correctly. S

Teacher's Notes

Multiplication of mixed fraction:
When multiplying fractions, change mixed numbers into improper fractions, then calculate.



Multiplication of mixed fractions

5 Let's think about how to calculate $3\frac{1}{7}\times 2\frac{1}{10}$.

$$3\frac{1}{7}\times 2\frac{1}{10}=\frac{22}{7}\times\frac{21}{10}$$
$$=\frac{22\times 21}{7\times 10}$$
$$=\boxed{\frac{33}{5}}\ (6\frac{3}{5})$$

When multiplying fractions, change mixed numbers into improper fractions.

Relation among multiplicand, multiplier and product

6 1 m of wire weighs 10 grams (g).

① How much does each wire weigh in grams (g) if it is $1\frac{1}{4}$ m and $\frac{2}{5}$ m long?

$10\times 1\frac{1}{4}=\boxed{\frac{25}{2}}\ (12\frac{1}{2})$
$10\times 1=10$
$10\times\frac{2}{5}=\boxed{4}$

② $10\times 1\frac{1}{4}$ or $10\times\frac{2}{5}$, which expression has the product that is less than 10? $10\times\frac{2}{5}$

If you multiply a fraction that is less than 1, the product will be less than the multiplicand.

Exercise

1 Let's calculate.

① $3\frac{1}{2}\times 1\frac{5}{9}$ $\frac{49}{9}$ $(5\frac{4}{9})$ ② $2\frac{5}{8}\times 2\frac{2}{9}$ $\frac{35}{6}$ $(5\frac{5}{6})$ ③ $9\frac{1}{3}\times\frac{3}{8}$ $\frac{7}{2}$ $(3\frac{1}{2})$ ④ $\frac{6}{7}\times 4\frac{2}{3}$ 4

2 1 L of sand weighs $1\frac{3}{5}$ kg.
How much does it weigh in kg, if there is $3\frac{3}{4}$ L of sand?
$1\frac{3}{5}\times 3\frac{3}{4}=6$ Answer: 6 kg

□ − □ = 35

Lesson flow

1 Review the previous lesson.

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

2 Multiplication of mixed fractions.

T 5 Ask the students to think about how to calculate the multiplication of mixed fraction in the task.

S Observe the calculation and identify that when multiplying mixed fractions, change into improper fractions before calculating to find the answer.

TN Remind students to simplify fractions for easier calculations.

3 6 Relationship between the multiplicand, multiplier and product.

T/S Read and understand the given situation.

S Find the answers to activity ① by comparing the weight of 3 different wires with different lengths.

T Ask students to determine which expression has a product less than 10.

S Calculate the expressions in activity ② to confirm that $10\times\frac{2}{5}$ will have a product less than 10.

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: Chapter 3: Multiplication of Fractions Sub-Chapter/Topic 1: Operation of Fraction x Fraction Lesson: 4 of 5

Main Task: Let's think about multiplying Mixed Fractions.

Review

MT

5 Think about how to calculate

$$3\frac{1}{7}\times2\frac{1}{10}$$

$$3\frac{1}{7}\times2\frac{1}{10}=\frac{22}{7}\times\frac{21}{10}$$

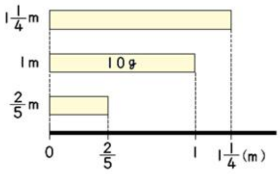
$$=\frac{{}^{11}\cancel{22}\times\cancel{21}^{3}}{{}_{1}\cancel{7}\times\cancel{10}_{5}}$$

$$=\frac{33}{5}\ (6\frac{3}{5})$$

When multiplying , change mixed numbers into improper fractions.

6 1 m of wire weighs 10g.

① How much does each wire weigh in grams if it is $1\frac{1}{4}$ m and $\frac{2}{5}$ m long?



$10\times1\frac{1}{4}=\frac{25}{2}\ (12\frac{1}{2})$

$10\times1=10$

$10\times\frac{2}{5}=4$

② Which one of $10\times\frac{1}{4}$ or $10\times\frac{2}{5}$ has a product less than 10? $10\times\frac{2}{5}$

If you multiply a fraction that is less than 1, the product will be less than the multiplicand.

Exercise

(Refer to TM for Questions and Answers)

Summary

When multiplying mixed fractions, change the mixed numbers into improper fractions and multiply as fraction x fraction.

Unit 3

Unit: Multiplication of Fractions

Sub-unit: 1. Operation of Fractions × Fractions

Lesson 5 of 5

Textbook Page : 036
Actual Lesson 025

Lesson Objectives

- To understand the rules of calculation can be applied to fractions.
- Apply rules of calculation to calculate fractions.

Prior Knowledge

- Rules of calculation (Grade 5)
- Basic rules of calculation in the operation of whole numbers.
- Multiplication of fraction

Preparation

- Rules of Calculation on a chart
- Diagrams for ❶ and ❷

Assessment

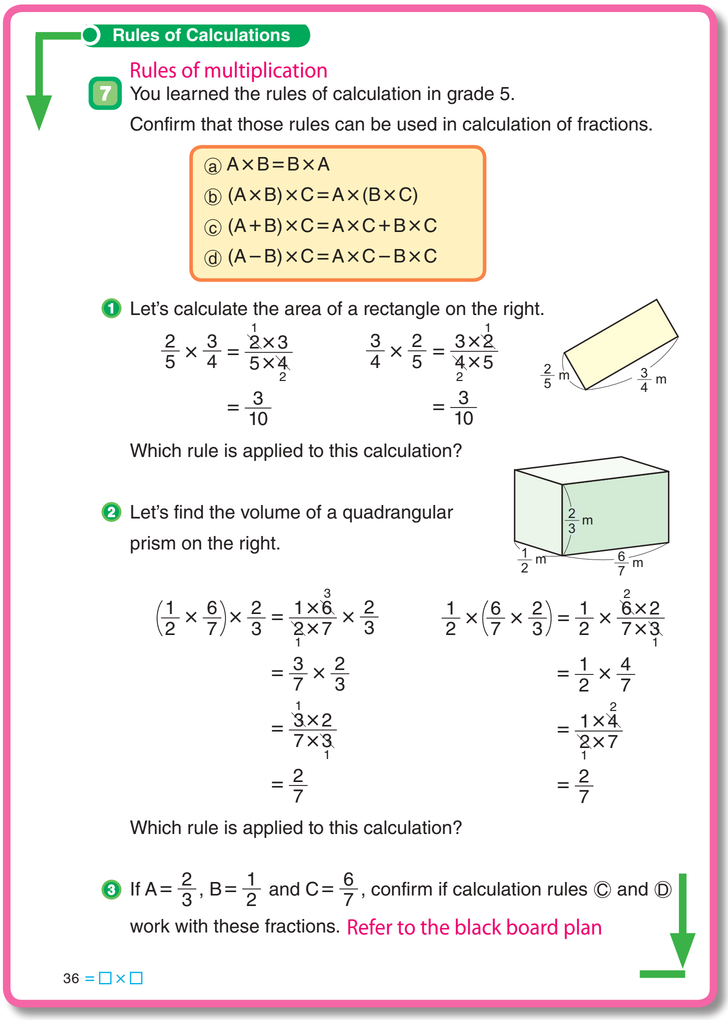
- Apply the rules of calculation to multiply fractions. Ⓕ Ⓢ

Teacher's Notes

Students have to understand that the rules of calculation can be applied to fractions.
Basic rules of calculation.

ⓐ A × B = B × A
ⓑ (A × B) × C = A × (B × C)
ⓒ (A + B) × C = A × C + B × C
ⓓ (A − B) × C = A × C − B × C

Summary
Review the calculation rules and its application to fractions to conclude the lesson.



Rules of Calculations

Rules of multiplication

7 You learned the rules of calculation in grade 5.
Confirm that those rules can be used in calculation of fractions.

ⓐ A×B=B×A
ⓑ (A×B)×C=A×(B×C)
ⓒ (A+B)×C=A×C+B×C
ⓓ (A−B)×C=A×C−B×C

❶ Let's calculate the area of a rectangle on the right.

$$\frac{2}{5}\times\frac{3}{4}=\frac{\overset{1}{\cancel{2}}\times3}{5\times\underset{2}{\cancel{4}}}=\frac{3}{10}\qquad\frac{3}{4}\times\frac{2}{5}=\frac{3\times\overset{1}{\cancel{2}}}{\underset{2}{\cancel{4}}\times5}=\frac{3}{10}$$

Which rule is applied to this calculation?

❷ Let's find the volume of a quadrangular prism on the right.

$$\left(\frac{1}{2}\times\frac{6}{7}\right)\times\frac{2}{3}=\frac{1\times\overset{3}{\cancel{6}}}{\underset{1}{\cancel{2}}\times7}\times\frac{2}{3}=\frac{3}{7}\times\frac{2}{3}=\frac{\overset{1}{\cancel{3}}\times2}{7\times\underset{1}{\cancel{3}}}=\frac{2}{7}$$

$$\frac{1}{2}\times\left(\frac{6}{7}\times\frac{2}{3}\right)=\frac{1}{2}\times\frac{\overset{2}{\cancel{6}}\times2}{7\times\underset{1}{\cancel{3}}}=\frac{1}{2}\times\frac{4}{7}=\frac{1\times\overset{2}{\cancel{4}}}{\underset{1}{\cancel{2}}\times7}=\frac{2}{7}$$

Which rule is applied to this calculation?

❸ If $A=\frac{2}{3}$, $B=\frac{1}{2}$ and $C=\frac{6}{7}$, confirm if calculation rules Ⓒ and Ⓓ work with these fractions. Refer to the black board plan

36 = □ × □

Lesson flow

1 Review the previous lesson.

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

2 Confirm the rules of multiplication.

T/S 7 Revise the rules of calculation ⓐ ⓑ ⓒ ⓓ based on previous knowledge through discussion.
T Ask the students to study activity ① to confirm which rule it applies to.
S Confirm that Rule ⓐ can be applied when multiplying fractions.
T Get the students to study activity ② and identify which calculation rule is applied.
S Calculate the volume of the quadrangular prism and confirm that Rule ⓑ is applicable in this case.

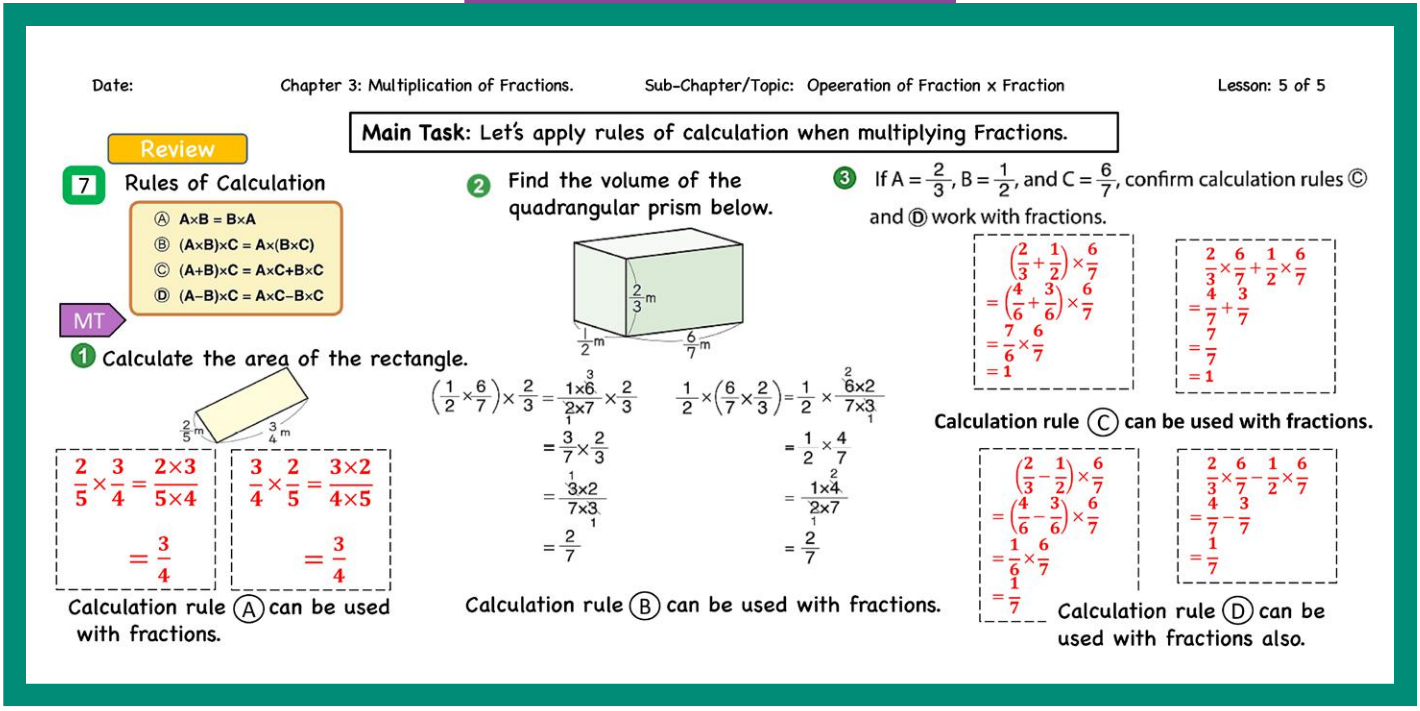
3 Apply the rules of calculation.

S ③ Complete the activity to confirm rule ⓒ ⓓ.
TN Give ample time and allow students to present their calculations and discuss with others.
Confirm the students' calculations and discussion with reference to the black board plan.
(Do not write the calculation on the board prior to students work. Write the calculation after their presentation and discussion so you are able to confirm their calculation and discussion.)

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 3: Multiplication of Fractions. Sub-Chapter/Topic: Opeeration of Fraction x Fraction Lesson: 5 of 5

Main Task: Let's apply rules of calculation when multiplying Fractions.

Review

7 Rules of Calculation

Ⓐ A×B = B×A
Ⓑ (A×B)×C = A×(B×C)
Ⓒ (A+B)×C = A×C+B×C
Ⓓ (A−B)×C = A×C−B×C

MT

① Calculate the area of the rectangle.

$\frac{2}{5}\times\frac{3}{4}=\frac{2\times3}{5\times4}$

$=\frac{3}{4}$

$\frac{3}{4}\times\frac{2}{5}=\frac{3\times2}{4\times5}$

$=\frac{3}{4}$

Calculation rule Ⓐ can be used with fractions.

② Find the volume of the quadrangular prism below.

$\left(\frac{1}{2}\times\frac{6}{7}\right)\times\frac{2}{3}=\frac{1\times\overset{3}{\cancel{6}}}{\underset{1}{\cancel{2}}\times7}\times\frac{2}{3}$

$=\frac{3}{7}\times\frac{2}{3}$

$=\frac{\overset{1}{\cancel{3}}\times2}{7\times\underset{1}{\cancel{3}}}$

$=\frac{2}{7}$

$\frac{1}{2}\times\left(\frac{6}{7}\times\frac{2}{3}\right)=\frac{1}{2}\times\frac{\overset{2}{\cancel{6}}\times2}{7\times\underset{1}{\cancel{3}}}$

$=\frac{1}{2}\times\frac{4}{7}$

$=\frac{1\times\overset{2}{\cancel{4}}}{\underset{1}{\cancel{2}}\times7}$

$=\frac{2}{7}$

Calculation rule Ⓑ can be used with fractions.

③ If $A=\frac{2}{3}$, $B=\frac{1}{2}$, and $C=\frac{6}{7}$, confirm calculation rules Ⓒ and Ⓓ work with fractions.

$\left(\frac{2}{3}+\frac{1}{2}\right)\times\frac{6}{7}$
$=\left(\frac{4}{6}+\frac{3}{6}\right)\times\frac{6}{7}$
$=\frac{7}{6}\times\frac{6}{7}$
$=1$

$\frac{2}{3}\times\frac{6}{7}+\frac{1}{2}\times\frac{6}{7}$
$=\frac{4}{7}+\frac{3}{7}$
$=\frac{7}{7}$
$=1$

Calculation rule Ⓒ can be used with fractions.

$\left(\frac{2}{3}-\frac{1}{2}\right)\times\frac{6}{7}$
$=\left(\frac{4}{6}-\frac{3}{6}\right)\times\frac{6}{7}$
$=\frac{1}{6}\times\frac{6}{7}$
$=\frac{1}{7}$

$\frac{2}{3}\times\frac{6}{7}-\frac{1}{2}\times\frac{6}{7}$
$=\frac{4}{7}-\frac{3}{7}$
$=\frac{1}{7}$

Calculation rule Ⓓ can be used with fractions also.

Unit 3

Unit: Multiplication of Fractions

Sub-unit: 2. Inverse of a number

Lesson 1 of 1

Textbook Page : 037
Actual Lesson 026

Sub-unit Objective

- To understand the meaning of inverse numbers.

Lesson Objective

- To understand the meaning of inverse numbers.

Prior Knowledge

- Multiplication of Proper factions, Improper fractions and mixed numbers.

Preparation

- 18 cards with numbers 1 – 9. Two cards for each number.

1	1	2	2	3	3	4	4	5	5
6	6	7	7	8	8	9	9		

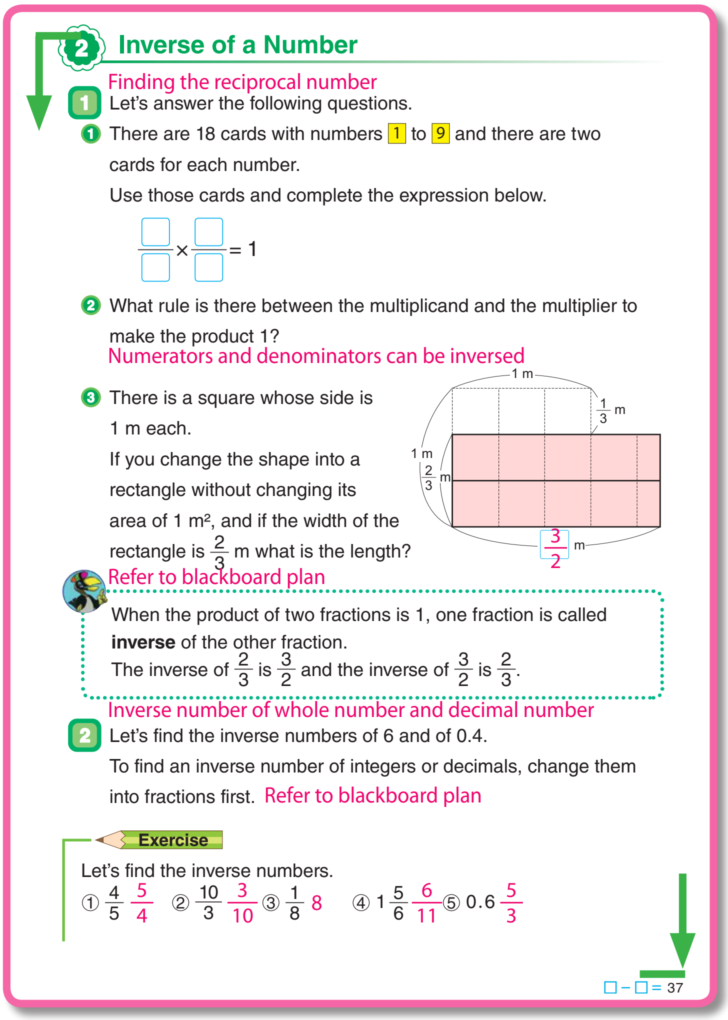
Assessment

- Understand the meaning of inverse numbers. F
- Identify the inverse of intergers, decimals and fractions. F S
- Solve the exercises correctly. S

Teacher's Notes

Task 2 is a special case. The whole number and decimal number changes into fraction first before finding a reciprocal or inverse of numbers.

Whole Number or Decimal Number	Fraction	Inverse Number
6	$\frac{6}{1}$	$\frac{1}{6}$
0.4	$\frac{4}{10}=\frac{2}{5}$	$\frac{5}{2}=2\frac{1}{2}=2.5$



2 Inverse of a Number

Finding the reciprocal number

1 Let's answer the following questions.

① There are 18 cards with numbers 1 to 9 and there are two cards for each number.

Use those cards and complete the expression below.

$$\frac{\square}{\square}\times\frac{\square}{\square}=1$$

② What rule is there between the multiplicand and the multiplier to make the product 1?

Numerators and denominators can be inversed

③ There is a square whose side is 1 m each.

If you change the shape into a rectangle without changing its area of 1 m², and if the width of the rectangle is $\frac{2}{3}$ m what is the length?

Refer to blackboard plan

When the product of two fractions is 1, one fraction is called **inverse** of the other fraction.
The inverse of $\frac{2}{3}$ is $\frac{3}{2}$ and the inverse of $\frac{3}{2}$ is $\frac{2}{3}$.

Inverse number of whole number and decimal number

2 Let's find the inverse numbers of 6 and of 0.4.

To find an inverse number of integers or decimals, change them into fractions first. Refer to blackboard plan

Exercise

Let's find the inverse numbers.

① $\frac{4}{5}$ $\frac{5}{4}$ ② $\frac{10}{3}$ $\frac{3}{10}$ ③ $\frac{1}{8}$ 8 ④ $1\frac{5}{6}$ $\frac{6}{11}$ ⑤ 0.6 $\frac{5}{3}$

$\square-\square=37$

Lesson flow

1 Review the previous lesson.

2 Think about multiplications of fractions where the product becomes 1.

T/S ① Read and understand activity ❶ using numbered cards.

S Think freely using cards 1 – 9 and display their answers.

TN Students should be able to manipulate the cards in different ways so that the product is 1. They will realise that the multiplier will be the inverse of the multiplicand.

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

S Discuss the rule in activity ❷ after completing activity ❶.
The multiplier and the multiplicand are inverse of the same fractions.

T/S ❸ Read and understand the given situation.

S Think about the problem and solve its.

3 Important Point

T/S Explain the important point in the ⬚ .

4 Inverse of intergers (whole numbers) and decimal numbers.

T ② Explain that to find a inverse of an integer or a decimal, change them into a fraction first.
Pose the discussion questions.

T/S ① What will be the fraction for the whole number or integer 6? $\frac{6}{1}$

② The fraction for the whole number or integer 6 is $\frac{6}{1}$ what is the inverse number to that fraction? $\frac{1}{6}$

③ What fraction is 0.4? $\frac{4}{10}$

④ When the fraction for 0.4 is reduced or simplified what is the fraction or answer? $\frac{2}{5}$

⑤ What will be the inverse number?
$\frac{5}{2}=2\frac{1}{2}=2.5$

5 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

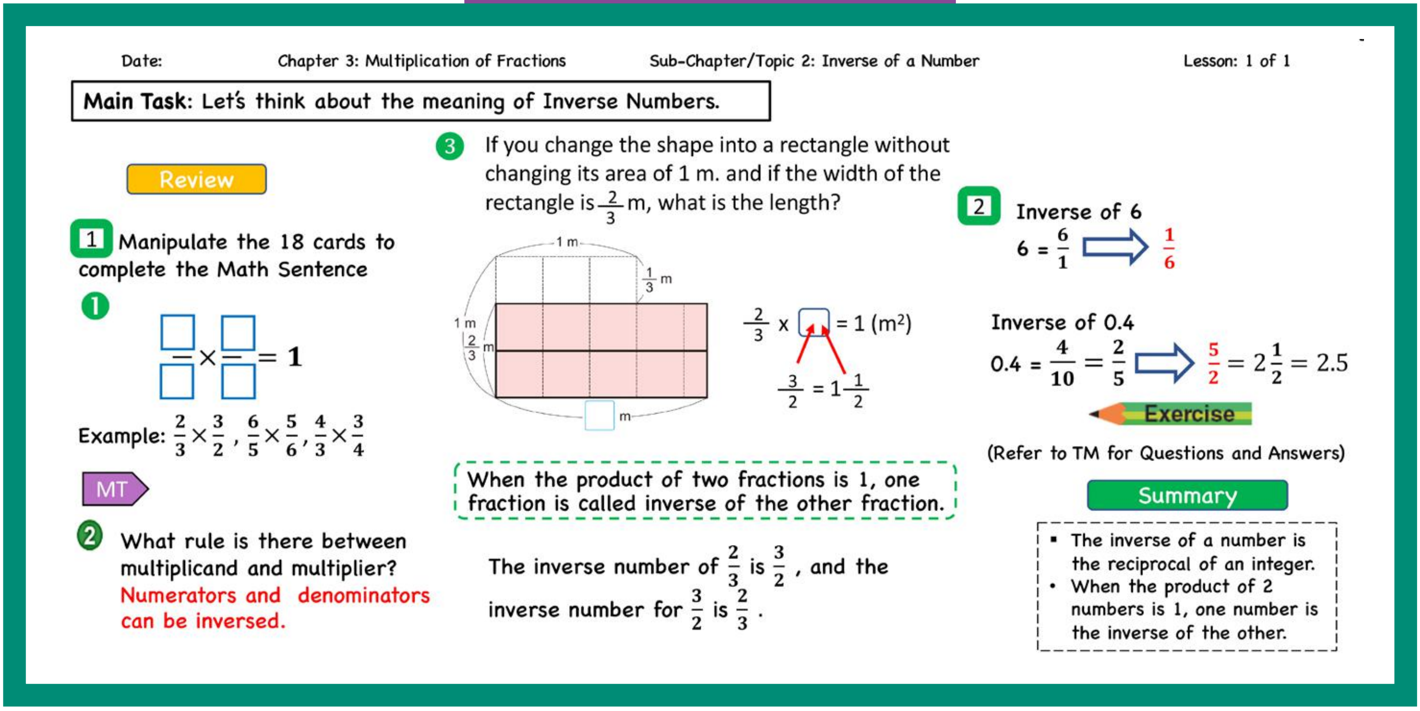
6 Summary

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


1 m
$\frac{1}{3}$ m
1 m
$\frac{2}{3}$ m
m

Date: Chapter 3: Multiplication of Fractions Sub-Chapter/Topic 2: Inverse of a Number Lesson: 1 of 1

Main Task: Let's think about the meaning of Inverse Numbers.

Review

1 Manipulate the 18 cards to complete the Math Sentence

❶ $\frac{\square}{\square} \times \frac{\square}{\square} = 1$

Example: $\frac{2}{3}\times\frac{3}{2}$, $\frac{6}{5}\times\frac{5}{6}$, $\frac{4}{3}\times\frac{3}{4}$

MT

❷ What rule is there between multiplicand and multiplier?
Numerators and denominators can be inversed.

❸ If you change the shape into a rectangle without changing its area of 1 m. and if the width of the rectangle is $\frac{2}{3}$ m, what is the length?

$\frac{2}{3} \times \square = 1\ (m^2)$

$\frac{3}{2} = 1\frac{1}{2}$

When the product of two fractions is 1, one fraction is called inverse of the other fraction.

The inverse number of $\frac{2}{3}$ is $\frac{3}{2}$, and the inverse number for $\frac{3}{2}$ is $\frac{2}{3}$.

2 Inverse of 6

$6 = \frac{6}{1} \Rightarrow \frac{1}{6}$

Inverse of 0.4

$0.4 = \frac{4}{10} = \frac{2}{5} \Rightarrow \frac{5}{2} = 2\frac{1}{2} = 2.5$

Exercise

(Refer to TM for Questions and Answers)

Summary

- The inverse of a number is the reciprocal of an integer.
- When the product of 2 numbers is 1, one number is the inverse of the other.

Unit 3

Unit: Multiplication of Fractions
Exercises, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 038
Actual Lesson 027 & 028

Lesson Objective

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

Prior Knowledge

- Multiplication of fractions
- Inverse numbers
- Calculating the area with fractions.
- Making multiplication of fractions.

Preparation

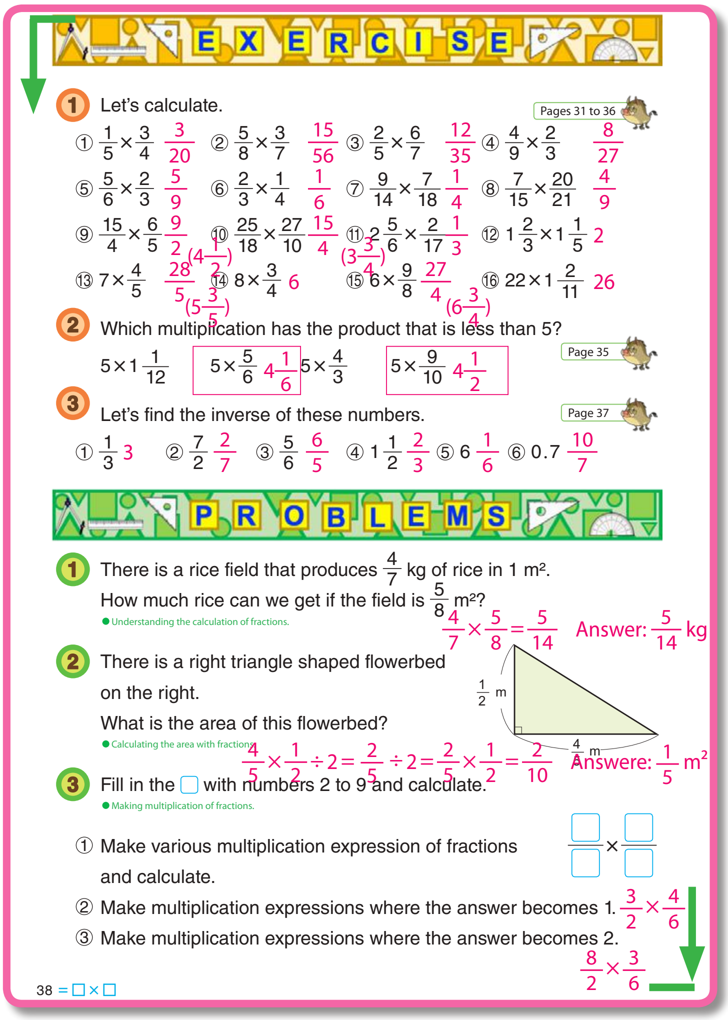
- Evaluation Test

Assessment

- Solve the exercises and problems correctly. F 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, problems and review as a seperate lesson.



EXERCISE

① Let's calculate. Pages 31 to 36

① $\frac{1}{5}\times\frac{3}{4}$ $\frac{3}{20}$ ② $\frac{5}{8}\times\frac{3}{7}$ $\frac{15}{56}$ ③ $\frac{2}{5}\times\frac{6}{7}$ $\frac{12}{35}$ ④ $\frac{4}{9}\times\frac{2}{3}$ $\frac{8}{27}$

⑤ $\frac{5}{6}\times\frac{2}{3}$ $\frac{5}{9}$ ⑥ $\frac{2}{3}\times\frac{1}{4}$ $\frac{1}{6}$ ⑦ $\frac{9}{14}\times\frac{7}{18}$ $\frac{1}{4}$ ⑧ $\frac{7}{15}\times\frac{20}{21}$ $\frac{4}{9}$

⑨ $\frac{15}{4}\times\frac{6}{5}$ $\frac{9}{2}$ $(4\frac{1}{2})$ ⑩ $\frac{25}{18}\times\frac{27}{10}$ $\frac{15}{4}$ $(3\frac{3}{4})$ ⑪ $2\frac{5}{6}\times\frac{2}{17}$ $\frac{1}{3}$ ⑫ $1\frac{2}{3}\times1\frac{1}{5}$ 2

⑬ $7\times\frac{4}{5}$ $\frac{28}{5}$ $(5\frac{3}{5})$ ⑭ $8\times\frac{3}{4}$ 6 ⑮ $6\times\frac{9}{8}$ $\frac{27}{4}$ $(6\frac{3}{4})$ ⑯ $22\times1\frac{2}{11}$ 26

② Which multiplication has the product that is less than 5? Page 35

$5\times1\frac{1}{12}$ $\boxed{5\times\frac{5}{6}\ \ 4\frac{1}{6}}$ $5\times\frac{4}{3}$ $\boxed{5\times\frac{9}{10}\ \ 4\frac{1}{2}}$

③ Let's find the inverse of these numbers. Page 37

① $\frac{1}{3}$ 3 ② $\frac{7}{2}$ $\frac{2}{7}$ ③ $\frac{5}{6}$ $\frac{6}{5}$ ④ $1\frac{1}{2}$ $\frac{2}{3}$ ⑤ 6 $\frac{1}{6}$ ⑥ 0.7 $\frac{10}{7}$

PROBLEMS

① There is a rice field that produces $\frac{4}{7}$ kg of rice in 1 m². How much rice can we get if the field is $\frac{5}{8}$ m²?

● Understanding the calculation of fractions.

$\frac{4}{7}\times\frac{5}{8}=\frac{5}{14}$ Answer: $\frac{5}{14}$ kg

② There is a right triangle shaped flowerbed on the right. What is the area of this flowerbed?

● Calculating the area with fractions.

$\frac{4}{5}\times\frac{1}{2}\div2=\frac{2}{5}\div2=\frac{2}{5}\times\frac{1}{2}=\frac{2}{10}$ Answere: $\frac{1}{5}$ m²

③ Fill in the □ with numbers 2 to 9 and calculate.

● Making multiplication of fractions.

① Make various multiplication expression of fractions and calculate. $\frac{\square}{\square}\times\frac{\square}{\square}$

② Make multiplication expressions where the answer becomes 1. $\frac{3}{2}\times\frac{4}{6}$

③ Make multiplication expressions where the answer becomes 2. $\frac{8}{2}\times\frac{3}{6}$

38 = □ × □

Lesson flow

1 Complete Exercise ①.

S Solve activity 1 to16.

T Confirm students' answers.

2 Complete Exercise ② and ③.

S Solve the exercises.

T Confirm students' answers.

3 Complete Problems ① to ③.

S Solve problems 1, 2 and 3.

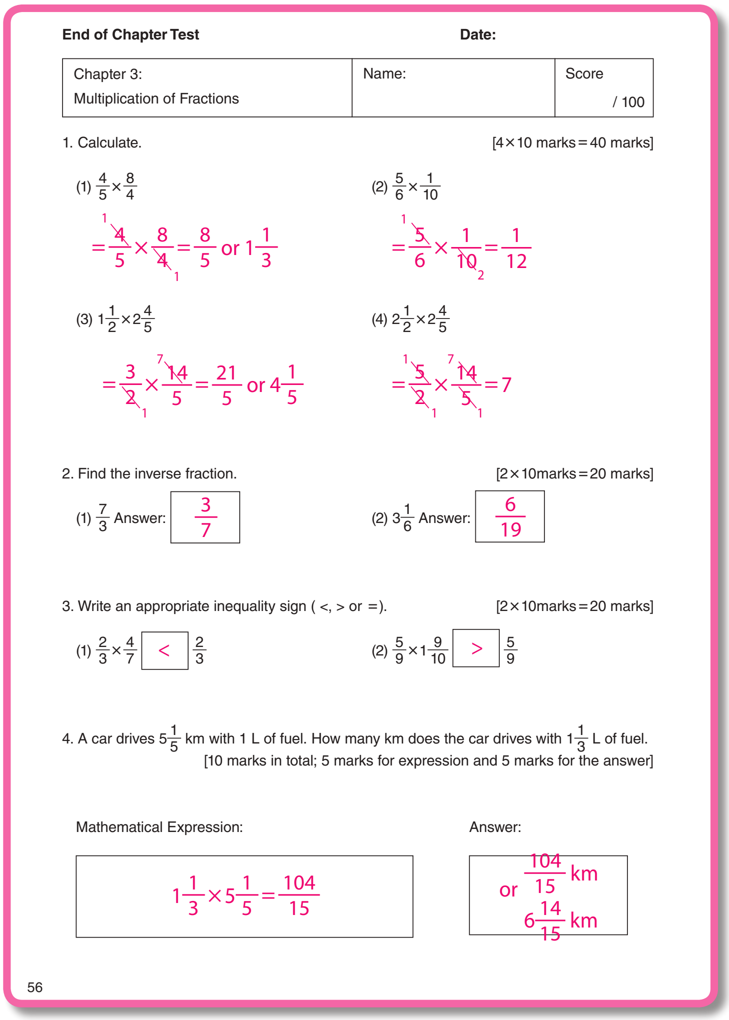
T Confirm students' answers.

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.

Copy of the Evaluation Test is found after Unit 5



End of Chapter Test **Date:**

Chapter 3: Multiplication of Fractions	Name:	Score / 100

1. Calculate. [4×10 marks = 40 marks]

(1) $\frac{4}{5}\times\frac{8}{4}$

$=\frac{\overset{1}{\cancel{4}}}{5}\times\frac{8}{\underset{1}{\cancel{4}}}=\frac{8}{5}$ or $1\frac{1}{3}$

(2) $\frac{5}{6}\times\frac{1}{10}$

$=\frac{\overset{1}{\cancel{5}}}{6}\times\frac{1}{\underset{2}{\cancel{10}}}=\frac{1}{12}$

(3) $1\frac{1}{2}\times2\frac{4}{5}$

$=\frac{3}{\underset{1}{\cancel{2}}}\times\frac{\overset{7}{\cancel{14}}}{5}=\frac{21}{5}$ or $4\frac{1}{5}$

(4) $2\frac{1}{2}\times2\frac{4}{5}$

$=\frac{\overset{1}{\cancel{5}}}{\underset{1}{\cancel{2}}}\times\frac{\overset{7}{\cancel{14}}}{\underset{1}{\cancel{5}}}=7$

2. Find the inverse fraction. [2×10marks = 20 marks]

(1) $\frac{7}{3}$ Answer: $\boxed{\frac{3}{7}}$

(2) $3\frac{1}{6}$ Answer: $\boxed{\frac{6}{19}}$

3. Write an appropriate inequality sign (<, > or =). [2×10marks = 20 marks]

(1) $\frac{2}{3}\times\frac{4}{7}\ \boxed{<}\ \frac{2}{3}$

(2) $\frac{5}{9}\times1\frac{9}{10}\ \boxed{>}\ \frac{5}{9}$

4. A car drives $5\frac{1}{5}$ km with 1 L of fuel. How many km does the car drives with $1\frac{1}{3}$ L of fuel.
[10 marks in total; 5 marks for expression and 5 marks for the answer]

Mathematical Expression:

$\boxed{1\frac{1}{3}\times5\frac{1}{5}=\frac{104}{15}}$

Answer:

$\frac{104}{15}$ km or $6\frac{14}{15}$ km

56

End of Chapter Test **Date:**

Chapter 3: Multiplication of Fractions	Name:	Score / 100

1. Calculate. [4×10 marks = 40 marks]

(1) $\frac{4}{5}\times\frac{8}{4}$

(2) $\frac{5}{6}\times\frac{1}{10}$

(3) $1\frac{1}{2}\times2\frac{4}{5}$

(4) $2\frac{1}{2}\times2\frac{4}{5}$

2. Find the inverse fraction. [2×10marks = 20 marks]

(1) $\frac{7}{3}$ Answer: ☐

(2) $3\frac{1}{6}$ Answer: ☐

3. Write an appropriate inequality sign (<, > or =). [2×10marks = 20 marks]

(1) $\frac{2}{3}\times\frac{4}{7}\ \square\ \frac{2}{3}$

(2) $\frac{5}{9}\times1\frac{9}{10}\ \square\ \frac{5}{9}$

4. A car drives $5\frac{1}{5}$ km with 1 L of fuel. How many km does the car drives with $1\frac{1}{3}$ L of fuel.
[10 marks in total; 5 marks for expression and 5 marks for the answer]

Mathematical Expression: ☐

Answer: ☐

Chapter 4 Division of Fractions

1. Content Standard

6.1.2. Students will be able to extend the multiplication and division to fractions with multipliers and divisors as fraction and do multiplication and division and appreciate the simplicity of rules.

2. Unit Objectives

- To deepen the understanding of Fractions ÷ Fractions.
- To think about how to calculate Fractions ÷ Fractions.
- To master the skill of calculating Fractions ÷ Fractions.

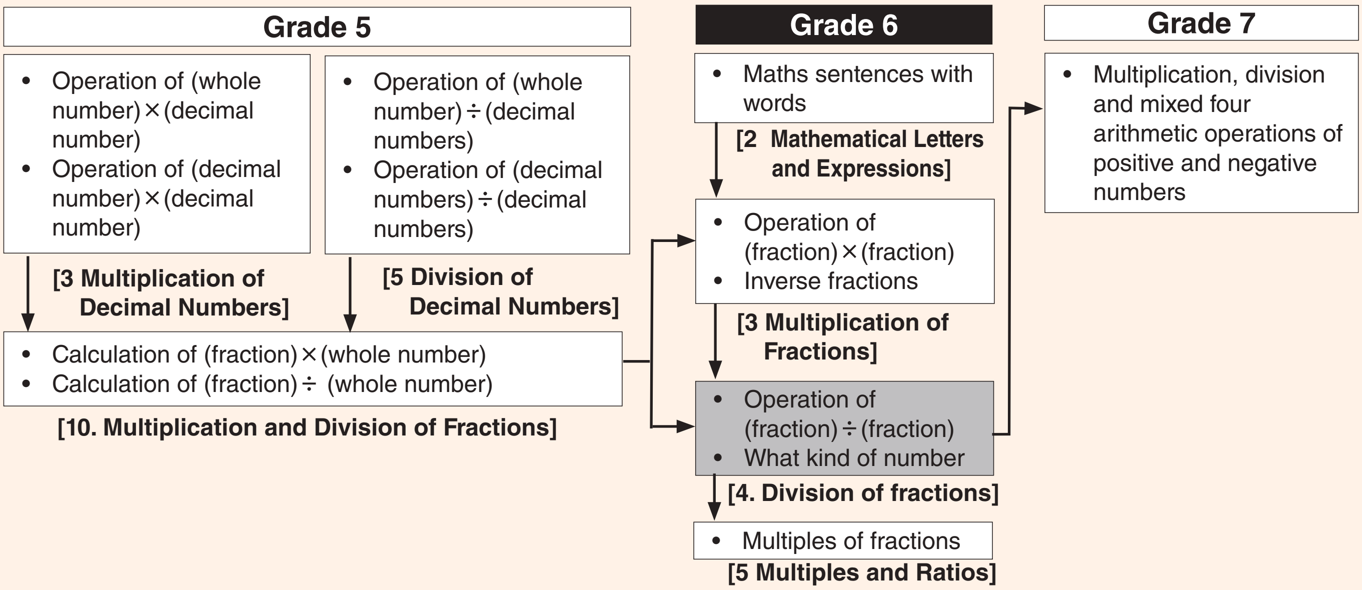
3. Teaching Overview

This unit is meant as a summary for 4 operations of whole numbers, decimals and fractions.

Calculation of Fraction ÷ Fraction : Firstly students should understand the situation and why they are dividing by a fraction. Then they should strategise how to calculate it using their previous learning.

What Kind of Expression Will It Become : Students are required to grasp situations of multiplication or division of fractions and identify a mathematical expression with drawing a number line diagram or replacing by simple numbers.

4. Related Learning Contents



Grade 5

- Operation of (whole number) × (decimal number)
- Operation of (decimal number) × (decimal number)

[3 Multiplication of Decimal Numbers]

- Operation of (whole number) ÷ (decimal numbers)
- Operation of (decimal numbers) ÷ (decimal numbers)

[5 Division of Decimal Numbers]

- Calculation of (fraction) × (whole number)
- Calculation of (fraction) ÷ (whole number)

[10. Multiplication and Division of Fractions]

Grade 6

- Maths sentences with words

[2 Mathematical Letters and Expressions]

- Operation of (fraction) × (fraction)
- Inverse fractions

[3 Multiplication of Fractions]

- Operation of (fraction) ÷ (fraction)
- What kind of number

[4. Division of fractions]

- Multiples of fractions

[5 Multiples and Ratios]

Grade 7

- Multiplication, division and mixed four arithmetic operations of positive and negative numbers

Chapter 5 Multiples and Rate

1. Content Standards

6.4.2. Students will be able to appraise the proportional relationship between two numbers or quantities in various simultaneous expression approaches and appreciate their usefulness in daily life.

2. Unit Objectives

To deepen the understanding of rate. To use rate to describe proportional relationships between various quantities. To understand how to express rate as a fraction and how to find a compared quantity as well as abasic quantity.

3. Teaching Overview

Students already learned how many times a whole in whole number such as 1 time, 2 times, etc and in decimal numbers such as 0.4 times, 1.2 times, etc. In this topic, students will learn how many times a whole in fractions. “How many times” is also a relative amount when we compare a value with a base of value and take the base as 1.

Unit
4

Unit: Division of Fractions
Sub-unit: 1. Operation of Fractions ÷ Fractions
Lesson 1 of 4

Textbook Page : 039 to 041
Actual Lesson 029

Sub-unit Objective

- To understand how to calculate fractions ÷ fractions.

Lesson Objective

- To think about how to explain the calculation of fractions ÷ fractions.

Prior Knowledge

- Multiplication and division of fractions with whole numbers
- Fractions × fractions
- Inverse Numbers

Preparation

- Area diagrams

Assessment

- Represent the calculation of fraction ÷ fraction on an area diagram. **F**
- Demonstrate how to calculate fraction ÷ fraction. **S**

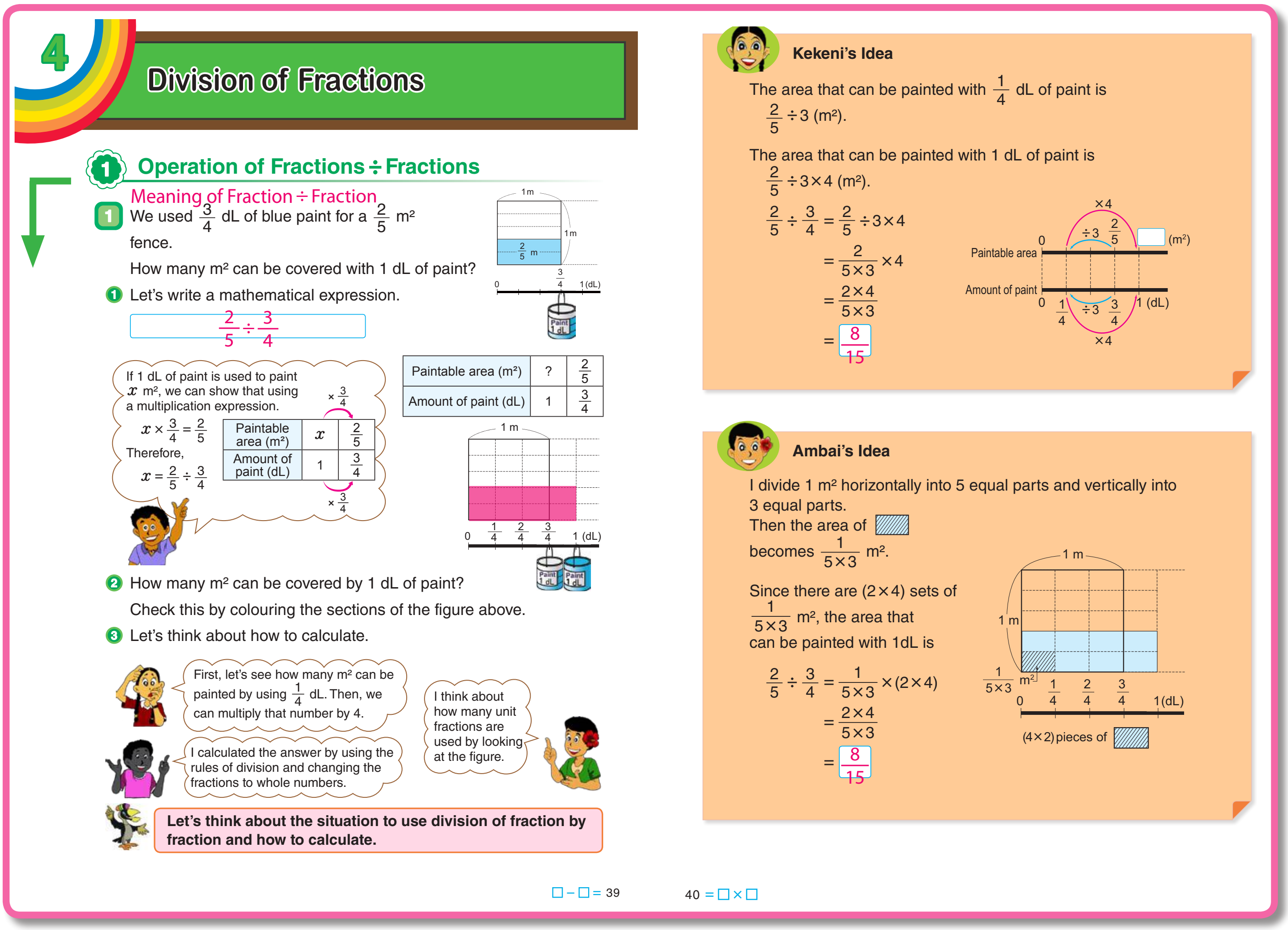
Teacher’s Notes

When calculating fractions ÷ fractions, we can utilise the properties of division and think ofWe can conclude that the inverse of the divisor fraction is used to multiply the dividend.

$\frac{2}{5} \div \frac{3}{4}$ as:

i. $\frac{2}{5} \div \frac{3}{4} = \left(\frac{2}{5} \times 4\right) \div \left(\frac{3}{4} \times 4\right) = \left(\frac{2}{5} \times 4\right) \div 3 = \frac{2\times4}{5\times3} = \frac{8}{15}$

ii. $\frac{2}{5} \div \frac{3}{4} = \left(\frac{2}{5} \times \frac{4}{3}\right) \div \left(\frac{3}{4} \times \frac{4}{3}\right) = \left(\frac{2}{5} \times \frac{4}{3}\right) = \frac{2\times4}{5\times3} = \frac{8}{15}$



4 **Division of Fractions**

1 **Operation of Fractions ÷ Fractions**

Meaning of Fraction ÷ Fraction

1 We used $\frac{3}{4}$ dL of blue paint for a $\frac{2}{5}$ m² fence.

How many m² can be covered with 1 dL of paint?

① Let’s write a mathematical expression.

$\frac{2}{5} \div \frac{3}{4}$

If 1 dL of paint is used to paint x m², we can show that using a multiplication expression.

$x \times \frac{3}{4} = \frac{2}{5}$

Therefore,

$x = \frac{2}{5} \div \frac{3}{4}$

Paintable area (m²)	x	$\frac{2}{5}$
Amount of paint (dL)	1	$\frac{3}{4}$

Paintable area (m²)	?	$\frac{2}{5}$
Amount of paint (dL)	1	$\frac{3}{4}$

② How many m² can be covered by 1 dL of paint?

Check this by colouring the sections of the figure above.

③ Let’s think about how to calculate.

First, let’s see how many m² can be painted by using $\frac{1}{4}$ dL. Then, we can multiply that number by 4.

I calculated the answer by using the rules of division and changing the fractions to whole numbers.

I think about how many unit fractions are used by looking at the figure.

Let’s think about the situation to use division of fraction by fraction and how to calculate.

□ − □ = 39

Kekeni’s Idea

The area that can be painted with $\frac{1}{4}$ dL of paint is $\frac{2}{5} \div 3$ (m²).

The area that can be painted with 1 dL of paint is $\frac{2}{5} \div 3 \times 4$ (m²).

$$\frac{2}{5} \div \frac{3}{4} = \frac{2}{5} \div 3 \times 4$$
$$= \frac{2}{5\times3} \times 4$$
$$= \frac{2\times4}{5\times3}$$
$$= \boxed{\frac{8}{15}}$$

Ambai’s Idea

I divide 1 m² horizontally into 5 equal parts and vertically into 3 equal parts.
Then the area of ▨
becomes $\frac{1}{5\times3}$ m².

Since there are (2×4) sets of $\frac{1}{5\times3}$ m², the area that can be painted with 1dL is

$$\frac{2}{5} \div \frac{3}{4} = \frac{1}{5\times3} \times (2\times4)$$
$$= \frac{2\times4}{5\times3}$$
$$= \boxed{\frac{8}{15}}$$

40 = □ × □

Lesson Flow

1 Understanding the meaning of fraction ÷ fractions.

T/S ① Read and understand the given situation.

S Think about the problem and relate to the area diagram that represents the situation.

T Remind the students to think about the relationship of multiplying and dividing to find an unknown quantity using the given tables.

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

S ❶ Write an expression representing the given situation to find the unknown area.

2 Representing fractions ÷ fraction using area diagrams.

T Let the students study the area diagram and discuss how they can find the answer using the area diagram.

S Think about how to shade in the area diagram to represent the answer of the division.

S ❷ Shade in the area diagram to represent the answer to the problem.

3 Calculate fraction ÷ fractions.

S ❸ Discuss the three ideas and compare how each one has found the answer.

i. Kekeni's Idea ($\frac{1}{4}$ of the area times 4 = 1 dL)

ii. Ambai's Idea (unit fraction times the total area painted)

iii. Sare's Idea (Fraction × Inverse fraction)

T Allow students to explain their ideas based on their understanding before explaining the 3 ideas on the board.

TN Students should be led to discover that in all 3 ideas, the inverse of the divisor fraction is used to multiply the dividend.

4 Important Point.

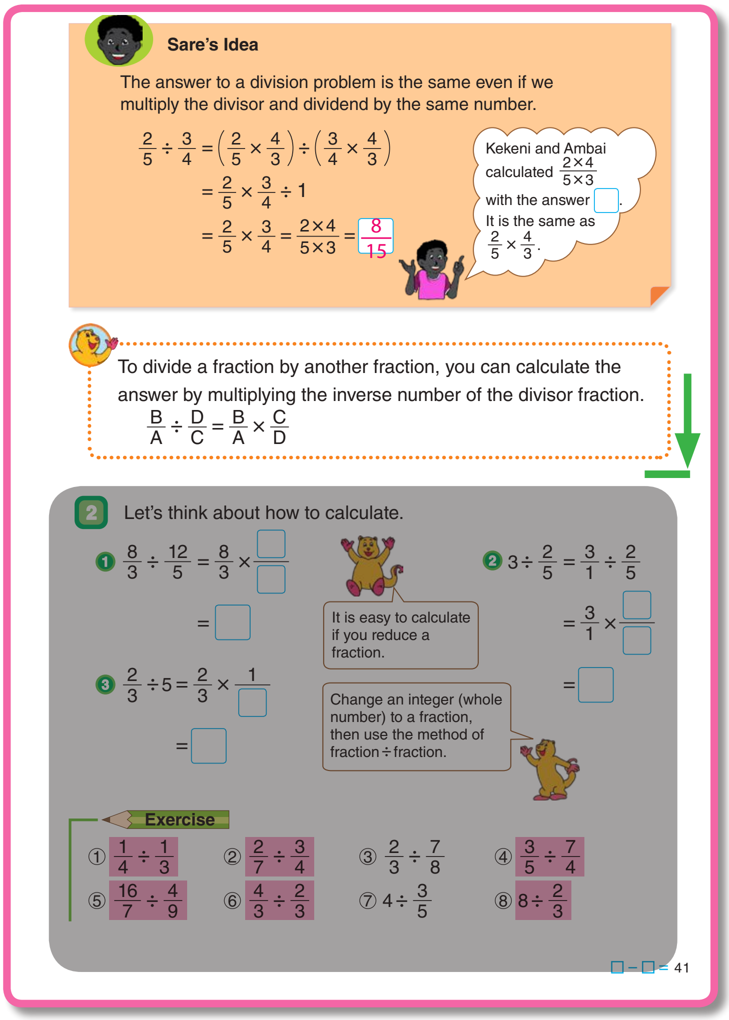
T/S Explain the important point in the box ⬚.

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.



Sare's Idea

The answer to a division problem is the same even if we multiply the divisor and dividend by the same number.

$$\frac{2}{5} \div \frac{3}{4} = \left(\frac{2}{5} \times \frac{4}{3}\right) \div \left(\frac{3}{4} \times \frac{4}{3}\right)$$

$$= \frac{2}{5} \times \frac{3}{4} \div 1$$

$$= \frac{2}{5} \times \frac{3}{4} = \frac{2 \times 4}{5 \times 3} = \boxed{\frac{8}{15}}$$

Kekeni and Ambai calculated $\frac{2\times4}{5\times3}$ with the answer $\square$. It is the same as $\frac{2}{5} \times \frac{4}{3}$.

To divide a fraction by another fraction, you can calculate the answer by multiplying the inverse number of the divisor fraction.

$$\frac{B}{A} \div \frac{D}{C} = \frac{B}{A} \times \frac{C}{D}$$

② Let's think about how to calculate.

❶ $\frac{8}{3} \div \frac{12}{5} = \frac{8}{3} \times \frac{\square}{\square}$

$= \square$

❷ $3 \div \frac{2}{5} = \frac{3}{1} \div \frac{2}{5}$

$= \frac{3}{1} \times \frac{\square}{\square}$

$= \square$

❸ $\frac{2}{3} \div 5 = \frac{2}{3} \times \frac{1}{\square}$

$= \square$

It is easy to calculate if you reduce a fraction.
Change an integer (whole number) to a fraction, then use the method of fraction ÷ fraction.

Exercise

① $\frac{1}{4} \div \frac{1}{3}$ ② $\frac{2}{7} \div \frac{3}{4}$ ③ $\frac{2}{3} \div \frac{7}{8}$ ④ $\frac{3}{5} \div \frac{7}{4}$

⑤ $\frac{16}{7} \div \frac{4}{9}$ ⑥ $\frac{4}{3} \div \frac{2}{3}$ ⑦ $4 \div \frac{3}{5}$ ⑧ $8 \div \frac{2}{3}$

$\square - \square =$ 41

Sample Blackboard Plan

Lesson 29 Sample Blackboard Plan is on page 61.

Unit 4

Unit: Division of Fractions

Sub-unit: 1. Operation of Fractions ÷ Fractions

Lesson 2 of 4

Textbook Page : 041
Actual Lesson 030

Lesson Objectives

- To think about how to calculate fractions ÷ fractions by reducing or simplifying.
- To understand how to divide fractions and whole Numbers.

Prior Knowledge

- Addition and subtraction of fractions
- Multiplication and division of fractions with whole numbers
- Fractions × fractions

Preparation

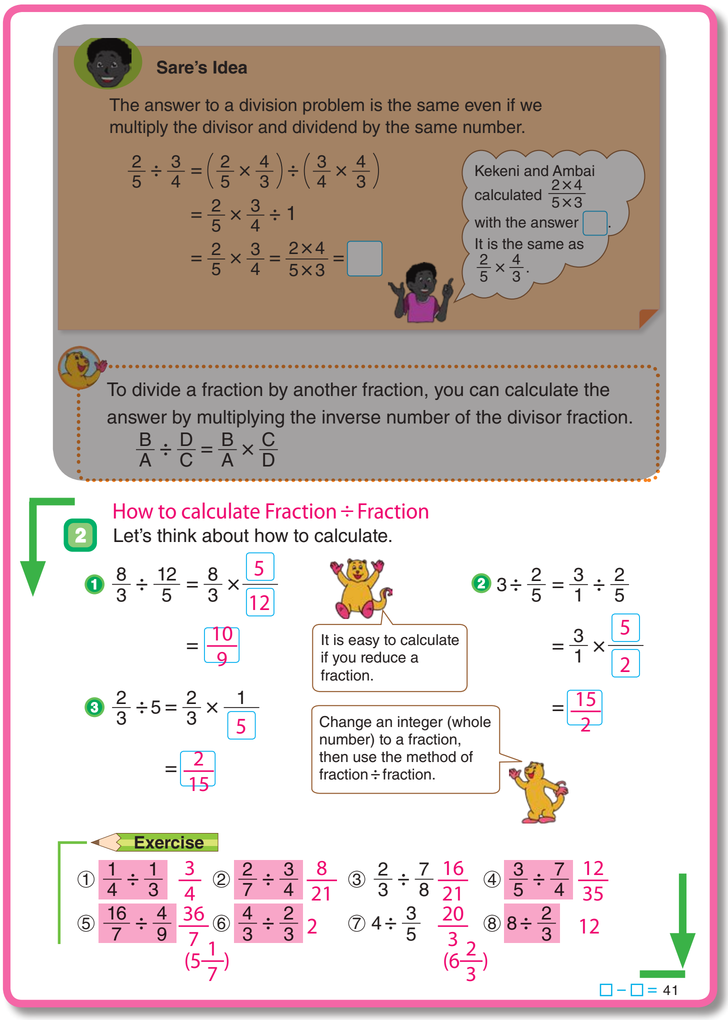
- Answers to calculations

Assessment

- Think about how to reduce fractions before calculating. F S
- Demonstrate the understanding on how to divide fractions and whole numbers. F S
- Solve the exercises correctly. S

Teacher's Notes

Students should be able to expand on the 3 ideas from the previous lesson when dividing fractions.



Sare's Idea

The answer to a division problem is the same even if we multiply the divisor and dividend by the same number.

$$\frac{2}{5} \div \frac{3}{4} = \left(\frac{2}{5} \times \frac{4}{3}\right) \div \left(\frac{3}{4} \times \frac{4}{3}\right)$$
$$= \frac{2}{5} \times \frac{3}{4} \div 1$$
$$= \frac{2}{5} \times \frac{3}{4} = \frac{2\times4}{5\times3} = \boxed{}$$

Kekeni and Ambai calculated $\frac{2\times4}{5\times3}$ with the answer $\boxed{}$. It is the same as $\frac{2}{5} \times \frac{4}{3}$.

To divide a fraction by another fraction, you can calculate the answer by multiplying the inverse number of the divisor fraction.

$$\frac{B}{A} \div \frac{D}{C} = \frac{B}{A} \times \frac{C}{D}$$

How to calculate Fraction ÷ Fraction

2 Let's think about how to calculate.

① $\frac{8}{3} \div \frac{12}{5} = \frac{8}{3} \times \frac{\boxed{5}}{\boxed{12}}$

$= \boxed{\frac{10}{9}}$

② $3 \div \frac{2}{5} = \frac{3}{1} \div \frac{2}{5}$

$= \frac{3}{1} \times \frac{\boxed{5}}{\boxed{2}}$

$= \boxed{\frac{15}{2}}$

③ $\frac{2}{3} \div 5 = \frac{2}{3} \times \frac{1}{\boxed{5}}$

$= \boxed{\frac{2}{15}}$

It is easy to calculate if you reduce a fraction.

Change an integer (whole number) to a fraction, then use the method of fraction ÷ fraction.

Exercise

① $\frac{1}{4} \div \frac{1}{3}$ $\frac{3}{4}$
② $\frac{2}{7} \div \frac{3}{4}$ $\frac{8}{21}$
③ $\frac{2}{3} \div \frac{7}{8}$ $\frac{16}{21}$
④ $\frac{3}{5} \div \frac{7}{4}$ $\frac{12}{35}$
⑤ $\frac{16}{7} \div \frac{4}{9}$ $\frac{36}{7}$ $(5\frac{1}{7})$
⑥ $\frac{4}{3} \div \frac{2}{3}$ 2
⑦ $4 \div \frac{3}{5}$ $\frac{20}{3}$ $(6\frac{2}{3})$
⑧ $8 \div \frac{2}{3}$ 12

□ − □ = 41

Lesson Flow

1 Review the previous lesson.

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

2 Think about how to calculate fractions ÷ fractions by reducing.

S ② Calculate the answer to activity ① as a review of the rule learnt in the previous lesson.

T Ask students if they found any interesting ideas.

S Realise that the fractions can be calculated easily when the fractions are reduced by a common factor.

T Emphasise the idea of reducing fractions as an easier way to calculate fractions ÷ fractions.

3 Discuss and calculate fraction ÷ fraction involving whole numbers.

T Activity ② and ③. Ask the students about how they can calculate when dealing with fractions and whole numbers.

S Calculate by changing the whole numbers into fractions before dividing.

T Check and confirm students' answers.

4 Complete the Exercise.

S Solve the selected exercises.

T Confirm students' answers.

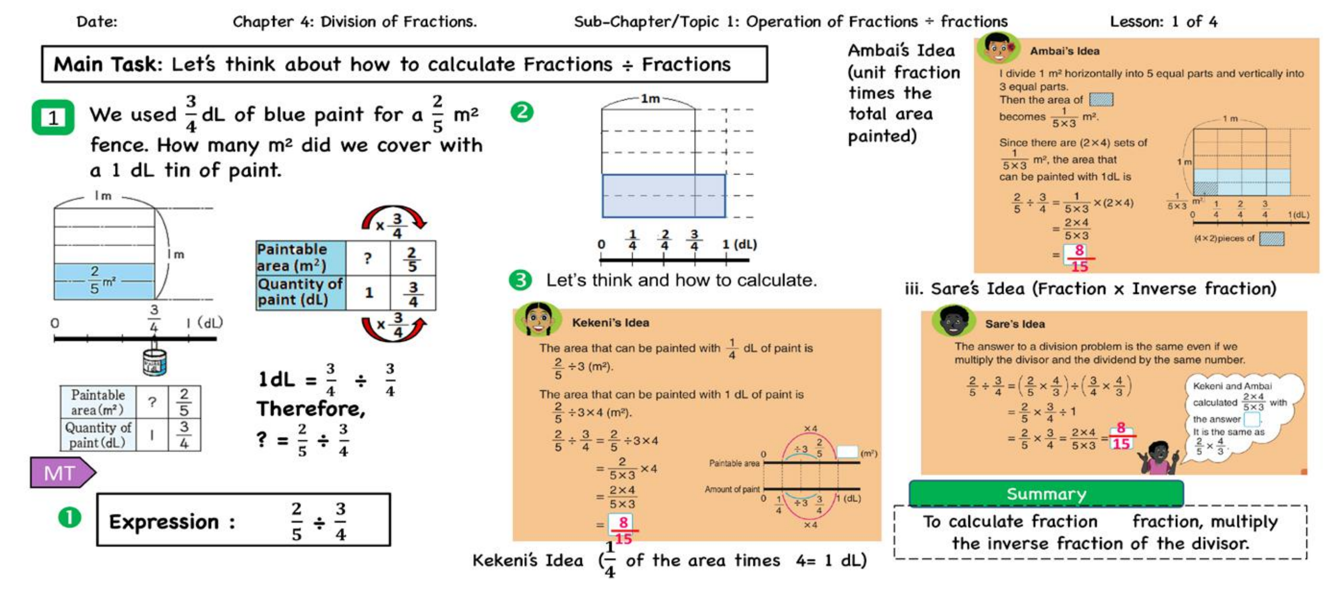
5 Summary

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 29)



Date: Chapter 4: Division of Fractions. Sub-Chapter/Topic 1: Operation of Fractions ÷ fractions Lesson: 1 of 4

Main Task: Let's think about how to calculate Fractions ÷ Fractions

1 We used $\frac{3}{4}$ dL of blue paint for a $\frac{2}{5}$ m² fence. How many m² did we cover with a 1 dL tin of paint.

Paintable area (m²)	?	$\frac{2}{5}$
Quantity of paint (dL)	1	$\frac{3}{4}$

Paintable area (m²)	?	$\frac{2}{5}$
Quantity of paint (dL)	1	$\frac{3}{4}$

1dL = $\frac{3}{4} \div \frac{3}{4}$

Therefore,

? = $\frac{2}{5} \div \frac{3}{4}$

MT

① Expression : $\frac{2}{5} \div \frac{3}{4}$

②

③ Let's think and how to calculate.

Kekeni's Idea

The area that can be painted with $\frac{1}{4}$ dL of paint is $\frac{2}{5} \div 3$ (m²).

The area that can be painted with 1 dL of paint is $\frac{2}{5} \div 3 \times 4$ (m²).

$$\frac{2}{5} \div \frac{3}{4} = \frac{2}{5} \div 3 \times 4 = \frac{2}{5 \times 3} \times 4 = \frac{2 \times 4}{5 \times 3} = \boxed{\frac{8}{15}}$$

Kekeni's Idea ($\frac{1}{4}$ of the area times 4= 1 dL)

Ambai's Idea (unit fraction times the total area painted)

Ambai's Idea

I divide 1 m² horizontally into 5 equal parts and vertically into 3 equal parts.
Then the area of ▨ becomes $\frac{1}{5 \times 3}$ m².

Since there are (2×4) sets of $\frac{1}{5 \times 3}$ m², the area that can be painted with 1dL is

$$\frac{2}{5} \div \frac{3}{4} = \frac{1}{5 \times 3} \times (2 \times 4) = \frac{2 \times 4}{5 \times 3} = \boxed{\frac{8}{15}}$$

iii. Sare's Idea (Fraction x Inverse fraction)

Sare's Idea

The answer to a division problem is the same even if we multiply the divisor and the dividend by the same number.

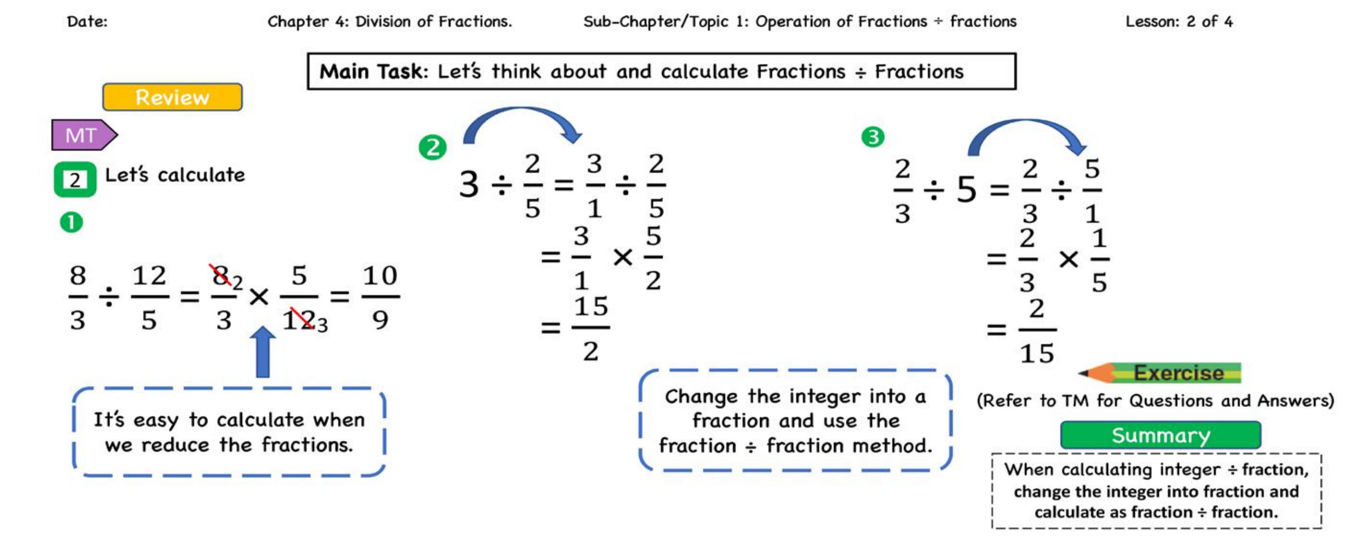
$$\frac{2}{5} \div \frac{3}{4} = \left(\frac{2}{5} \times \frac{4}{3}\right) \div \left(\frac{3}{4} \times \frac{4}{3}\right) = \frac{2}{5} \times \frac{3}{4} \div 1 = \frac{2}{5} \times \frac{3}{4} = \frac{2 \times 4}{5 \times 3} = \boxed{\frac{8}{15}}$$

Kekeni and Ambai calculated $\frac{2 \times 4}{5 \times 3}$ with the answer ☐. It is the same as $\frac{2}{5} \times \frac{4}{3}$.

Summary

To calculate fraction fraction, multiply the inverse fraction of the divisor.

Sample Blackboard Plan (Lesson 30)



Date: Chapter 4: Division of Fractions. Sub-Chapter/Topic 1: Operation of Fractions ÷ fractions Lesson: 2 of 4

Main Task: Let's think about and calculate Fractions ÷ Fractions

Review

MT

2 Let's calculate

①

$$\frac{8}{3} \div \frac{12}{5} = \frac{\cancel{8}^{2}}{3} \times \frac{5}{\cancel{12}_{3}} = \frac{10}{9}$$

It's easy to calculate when we reduce the fractions.

②

$$3 \div \frac{2}{5} = \frac{3}{1} \div \frac{2}{5} = \frac{3}{1} \times \frac{5}{2} = \frac{15}{2}$$

Change the integer into a fraction and use the fraction ÷ fraction method.

③

$$\frac{2}{3} \div 5 = \frac{2}{3} \div \frac{5}{1} = \frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$$

Exercise

(Refer to TM for Questions and Answers)

Summary

When calculating integer ÷ fraction, change the integer into fraction and calculate as fraction ÷ fraction.

Unit
4

Unit: Division of Fractions

Sub-unit: 1. Operation of Fractions ÷ Fractions

Lesson 3 of 4

Textbook Page : 042
Actual Lesson 031

Lesson Objective

- To explain and calculate fraction ÷ mixed fractions.

Prior Knowledge

- Multiplication and division of fractions with whole numbers.
- Fractions × fractions

Preparation

- Area diagram and table (Refer to blackboard plan)

Assessment

- Explain and calculate fractions ÷ mixed numbers. F
- Solve the exercises correctly. S

Teacher's Notes

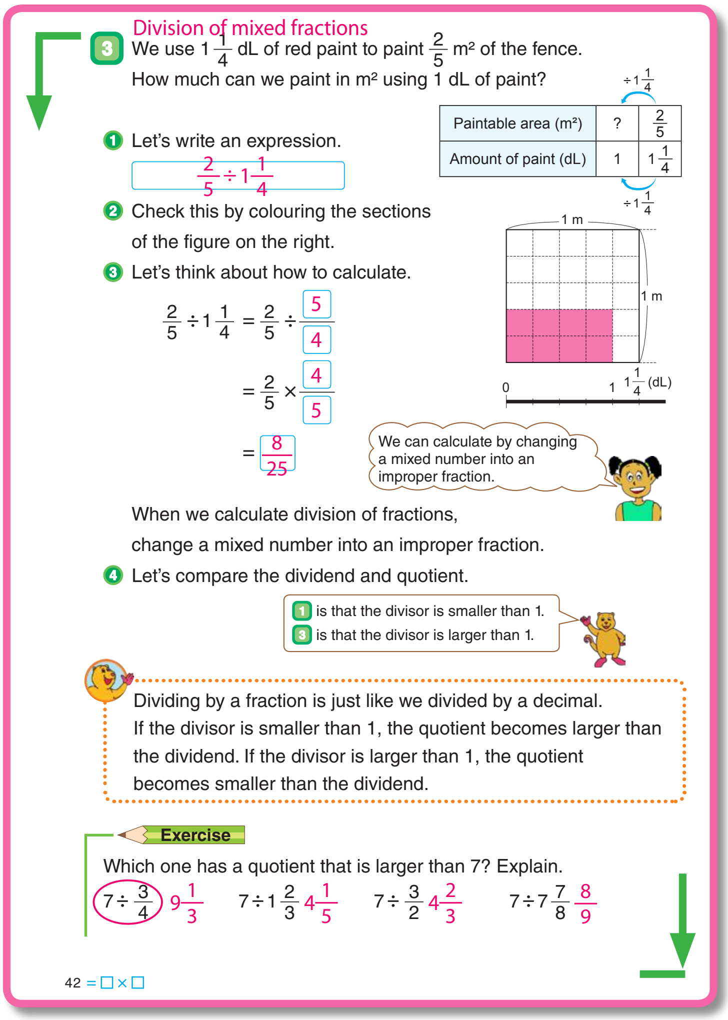
Students should be able to utilize what has been learned previously to do calculations and understand the method of Fraction ÷ Fraction by;

- Fraction ÷ Fraction after changing Mixed Numbers into Fractions

$$\begin{aligned}\frac{2}{5} \div 1\frac{1}{4} &= \frac{2}{5} \div \frac{5}{4}\\ &= \frac{2}{5} \times \frac{4}{5}\\ &= \frac{8}{25}\end{aligned}$$

- Using the unit fraction

$$\begin{aligned}\frac{2}{5} \div 1\frac{1}{4} &= \boxed{\frac{1}{5\times5}} \times (2\times4)\\ &= \frac{2\times4}{5\times5}\\ &= \frac{8}{25}\end{aligned}$$



Division of mixed fractions

3 We use $1\frac{1}{4}$ dL of red paint to paint $\frac{2}{5}$ m² of the fence.
How much can we paint in m² using 1 dL of paint?

Paintable area (m²)	?	$\frac{2}{5}$
Amount of paint (dL)	1	$1\frac{1}{4}$

① Let's write an expression.

$\boxed{\frac{2}{5} \div 1\frac{1}{4}}$

② Check this by colouring the sections of the figure on the right.

③ Let's think about how to calculate.

$$\begin{aligned}\frac{2}{5} \div 1\frac{1}{4} &= \frac{2}{5} \div \frac{\boxed{5}}{\boxed{4}}\\ &= \frac{2}{5} \times \frac{\boxed{4}}{\boxed{5}}\\ &= \boxed{\frac{8}{25}}\end{aligned}$$

We can calculate by changing a mixed number into an improper fraction.

When we calculate division of fractions, change a mixed number into an improper fraction.

④ Let's compare the dividend and quotient.

1 is that the divisor is smaller than 1.
3 is that the divisor is larger than 1.

Dividing by a fraction is just like we divided by a decimal.
If the divisor is smaller than 1, the quotient becomes larger than the dividend. If the divisor is larger than 1, the quotient becomes smaller than the dividend.

Exercise

Which one has a quotient that is larger than 7? Explain.

$\boxed{7 \div \frac{3}{4}}$ $9\frac{1}{3}$ $7 \div 1\frac{2}{3}$ $4\frac{1}{5}$ $7 \div \frac{3}{2}$ $4\frac{2}{3}$ $7 \div 7\frac{7}{8}$ $\frac{8}{9}$

42 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Division of mixed fraction.

T/S 3 Read and understand the given situation.
T Introduce the Main Task. (Refer to the BP)
T Allow the students to study the table and ask them to write an expression to solve the problem.
S ① Write an expression for the problem using the information from the table.

3 Represent Fractions ÷ Mixed Numbers using an area diagram.

T Let the students study the area diagram and discuss how they can find the answer using the area diagram.
S Think about how to represent the answer of the division.
S ② Shade in the sections on the area diagram to represent the answer to the problem.
T Allow some students to present their answers with explanation.

4 Think about how to calculate Fraction ÷ Mixed Numbers.

T "How can we calculate to find the answer using the Fraction ÷ Fraction method?"
S "Change the mixed numbers to improper fractions"
S ③ Change the mixed numbers to improper fractions and calculate using the method of fraction ÷ fraction.
TN Appreciate students ideas when they use the idea of unit fractions.

5 Comparing the dividend and the quotient.

T ④ Get the students to compare the dividends and quotients of the two problems in 1 and 3 to find the difference.
S Realise that in task:
1, the divisor is smaller than 1.
3, the divisor is larger than 1

6 Important Point

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

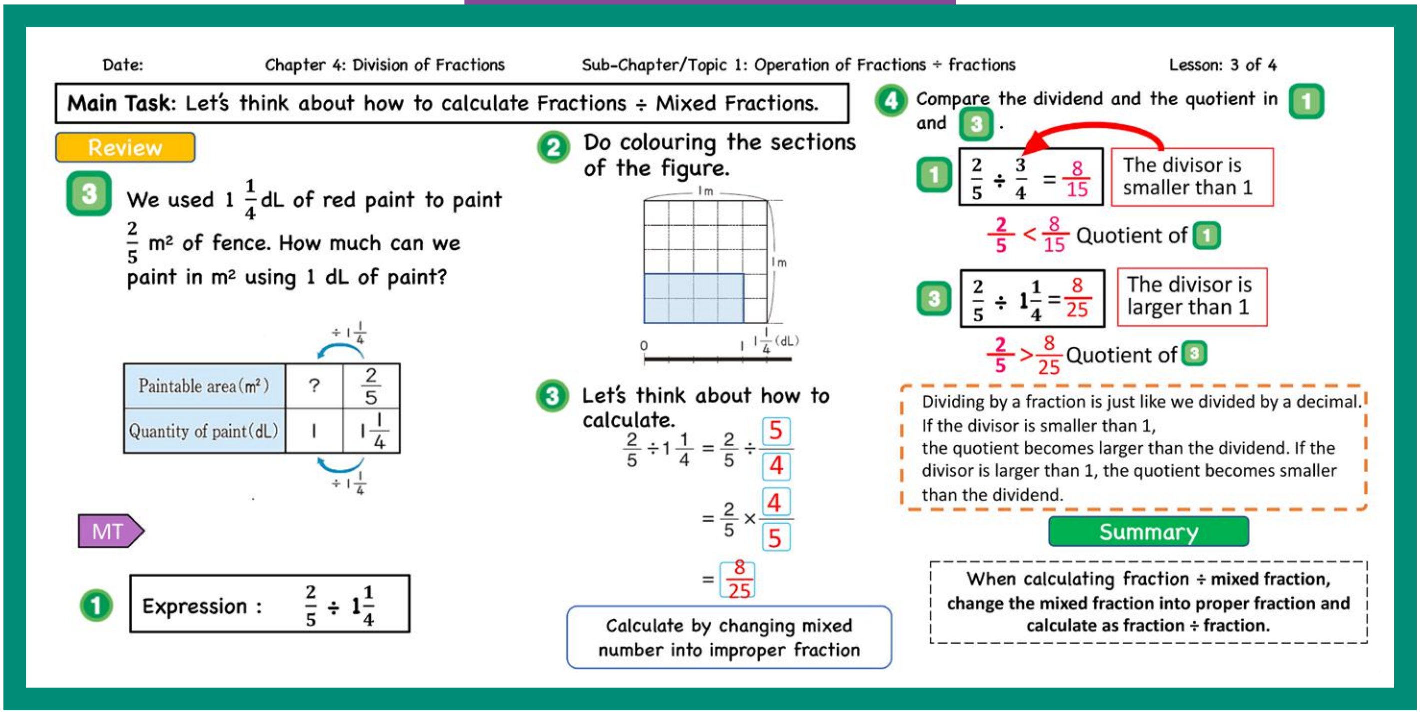
7 Complete the Exercises.

S Solve the 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


1m
1m
0
1
$1\frac{1}{4}$ (dL)
$\div 1\frac{1}{4}$
$\div 1\frac{1}{4}$
MT

Date: Chapter 4: Division of Fractions Sub-Chapter/Topic 1: Operation of Fractions ÷ fractions Lesson: 3 of 4

Main Task: Let's think about how to calculate Fractions ÷ Mixed Fractions.

Review

3 We used $1\frac{1}{4}$ dL of red paint to paint $\frac{2}{5}$ m² of fence. How much can we paint in m² using 1 dL of paint?

Paintable area (m²)	?	$\frac{2}{5}$
Quantity of paint (dL)	1	$1\frac{1}{4}$

① Expression : $\frac{2}{5} \div 1\frac{1}{4}$

② Do colouring the sections of the figure.

③ Let's think about how to calculate.

$$\frac{2}{5} \div 1\frac{1}{4} = \frac{2}{5} \div \frac{\boxed{5}}{\boxed{4}}$$
$$= \frac{2}{5} \times \frac{\boxed{4}}{\boxed{5}}$$
$$= \boxed{\frac{8}{25}}$$

Calculate by changing mixed number into improper fraction

④ Compare the dividend and the quotient in 1 and 3.

1 $\frac{2}{5} \div \frac{3}{4} = \frac{8}{15}$ The divisor is smaller than 1

$\frac{2}{5} < \frac{8}{15}$ Quotient of 1

3 $\frac{2}{5} \div 1\frac{1}{4} = \frac{8}{25}$ The divisor is larger than 1

$\frac{2}{5} > \frac{8}{25}$ Quotient of 3

Dividing by a fraction is just like we divided by a decimal. If the divisor is smaller than 1, the quotient becomes larger than the dividend. If the divisor is larger than 1, the quotient becomes smaller than the dividend.

Summary

When calculating fraction ÷ mixed fraction, change the mixed fraction into proper fraction and calculate as fraction ÷ fraction.

Unit 4

Unit: Division of Fractions

Sub-unit: 1. Operation of Fractions ÷ Fractions

Lesson 4 of 4

Textbook Page : 043
Actual Lesson 032

Lesson Objective

- To solve various problems on Division of Fractions.

Prior Knowledge

- Multiplication and division of fractions with whole numbers and mixed fractions
- Fractions × fractions

Preparation

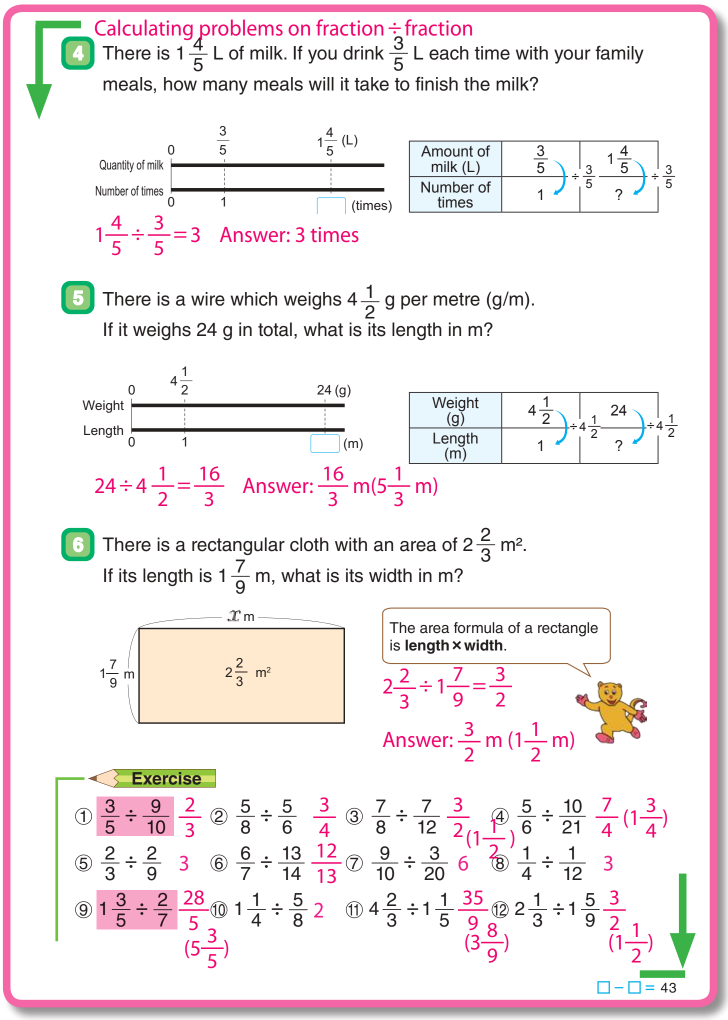
- Tape diagrams and tables for task 4 and 5

Assessment

- Solve various problems involving fractions, integers and mixed numbers. F
- Solve the exercises correctly. S

Teacher's Notes

Students should be able to solve problems that involve mixed fractions ÷ proper fractions, intergers ÷ mixed fractions and mixed fractions ÷ mixed fractions.
Review of main concepts from previous lessons may be required.
Many children have difficulty understanding that the quotient is less than the dividend when dividing a number by a fraction less than 1. This is because they assume that the quotient is always smaller than the dividend. It is good to explain using the diagram for taking away the misunderstanding.



Calculating problems on fraction ÷ fraction

4 There is $1\frac{4}{5}$ L of milk. If you drink $\frac{3}{5}$ L each time with your family meals, how many meals will it take to finish the milk?

Quantity of milk
Number of times
0
$\frac{3}{5}$
$1\frac{4}{5}$ (L)
0
1
(times)

Amount of milk (L)	$\frac{3}{5}$	$1\frac{4}{5}$
Number of times	1	?

$\div\frac{3}{5}$ $\div\frac{3}{5}$

$1\frac{4}{5}\div\frac{3}{5}=3$ Answer: 3 times

5 There is a wire which weighs $4\frac{1}{2}$ g per metre (g/m).
If it weighs 24 g in total, what is its length in m?

Weight (g)	$4\frac{1}{2}$	24
Length (m)	1	?

$\div4\frac{1}{2}$ $\div4\frac{1}{2}$

$24\div4\frac{1}{2}=\frac{16}{3}$ Answer: $\frac{16}{3}$ m($5\frac{1}{3}$ m)

6 There is a rectangular cloth with an area of $2\frac{2}{3}$ m².
If its length is $1\frac{7}{9}$ m, what is its width in m?

The area formula of a rectangle is **length × width**.

$2\frac{2}{3}\div1\frac{7}{9}=\frac{3}{2}$

Answer: $\frac{3}{2}$ m ($1\frac{1}{2}$ m)

Exercise

① $\frac{3}{5}\div\frac{9}{10}$ $\frac{2}{3}$
② $\frac{5}{8}\div\frac{5}{6}$ $\frac{3}{4}$
③ $\frac{7}{8}\div\frac{7}{12}$ $\frac{3}{2}$ ($1\frac{1}{2}$)
④ $\frac{5}{6}\div\frac{10}{21}$ $\frac{7}{4}$ ($1\frac{3}{4}$)
⑤ $\frac{2}{3}\div\frac{2}{9}$ 3
⑥ $\frac{6}{7}\div\frac{13}{14}$ $\frac{12}{13}$
⑦ $\frac{9}{10}\div\frac{3}{20}$ 6
⑧ $\frac{1}{4}\div\frac{1}{12}$ 3
⑨ $1\frac{3}{5}\div\frac{2}{7}$ $\frac{28}{5}$ ($5\frac{3}{5}$)
⑩ $1\frac{1}{4}\div\frac{5}{8}$ 2
⑪ $4\frac{2}{3}\div1\frac{1}{5}$ $\frac{35}{9}$ ($3\frac{8}{9}$)
⑫ $2\frac{1}{3}\div1\frac{5}{9}$ $\frac{3}{2}$ ($1\frac{1}{2}$)

□ − □ = 43

Lesson Flow

1 Review the previous lesson.

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

2 Calculate Mixed Numbers ÷ Proper Fraction.

T/S ④ Read and understand the given situation.

T Allow students to study the table and ask them to write an expression.

S Write an expression using the information from the table.

S Solve the problem by changing the mixed number into fraction and calculate as fraction ÷ fraction.

S Present and explain their answers.

T Confirm students' answers.

3 Calculate Integers ÷ Mixed Fractions.

T/S ⑤ Read and understand the given situation.

T Allow the students to study the table and write an expression.

S Write an expression and solve the problem.

TN Ensure that students follow the correct methods to change the integer into fraction and mixed number into fraction to calculate fraction ÷ fraction.

T Ask students to present and explain their answers.

4 Calculate Mixed Numbers ÷ Mixed Numbers.

T/S ⑥ Read and understand the given situation.

T Allow the students to study the rectangular cloth and write an expression.

S Write an expression and solve the problem.

TN Ensure that students follow the correct methods to change the mixed numbers into fractions and calculate as fraction ÷ fraction.

T Confirm students' answers as they present and explain their answers.

5 Complete the Exercise.

S Solve the selected exercises.

T Confirm students' answers.

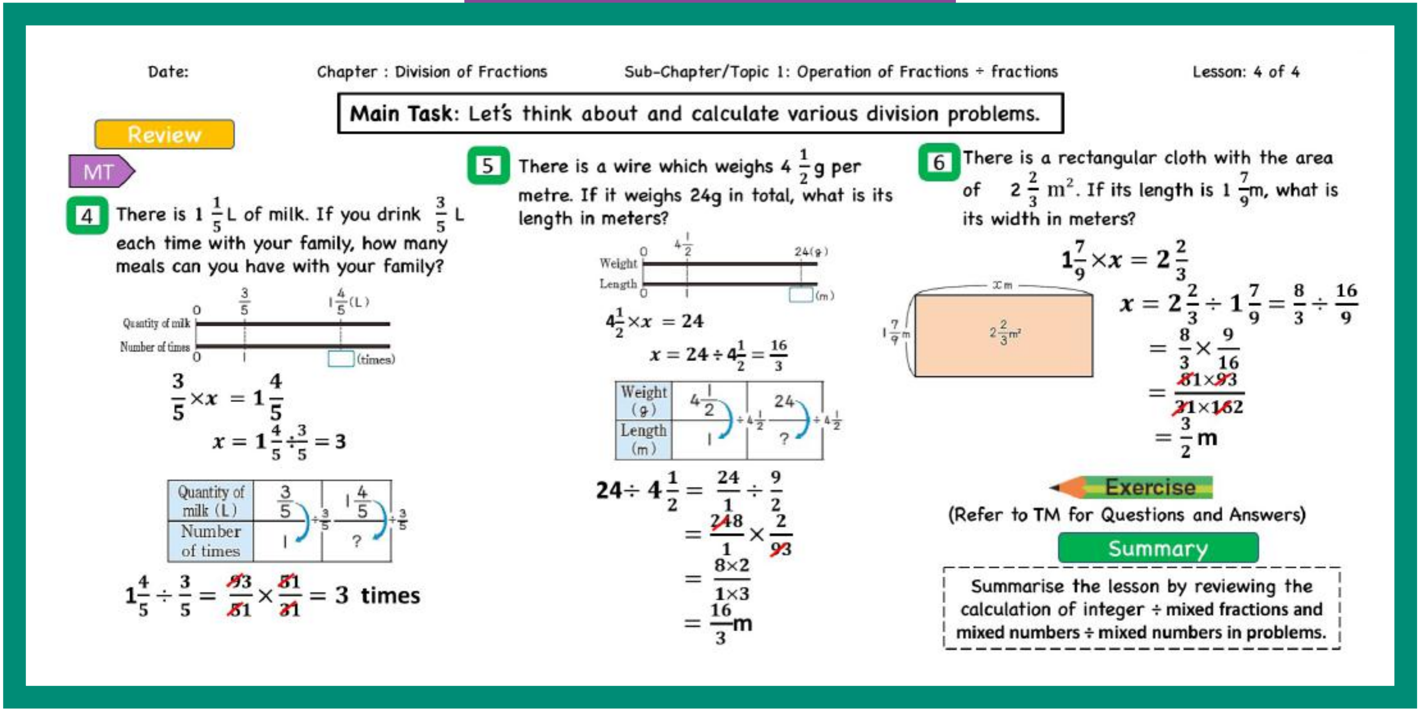
6 Summary

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 : Division of Fractions

Sub-Chapter/Topic 1: Operation of Fractions ÷ fractions

Lesson: 4 of 4

Main Task: Let's think about and calculate various division problems.

Review

MT

④ There is $1\frac{1}{5}$ L of milk. If you drink $\frac{3}{5}$ L each time with your family, how many meals can you have with your family?

$$\frac{3}{5}\times x = 1\frac{4}{5}$$

$$x = 1\frac{4}{5}\div\frac{3}{5} = 3$$

Quantity of milk (L)	$\frac{3}{5}$	$1\frac{4}{5}$
Number of times	1	?

$$1\frac{4}{5}\div\frac{3}{5} = \frac{\cancel{9}3}{\cancel{5}1}\times\frac{\cancel{5}1}{\cancel{3}1} = 3 \text{ times}$$

⑤ There is a wire which weighs $4\frac{1}{2}$ g per metre. If it weighs 24g in total, what is its length in meters?

$$4\frac{1}{2}\times x = 24$$

$$x = 24\div 4\frac{1}{2} = \frac{16}{3}$$

Weight (g)	$4\frac{1}{2}$	24
Length (m)	1	?

$$24\div 4\frac{1}{2} = \frac{24}{1}\div\frac{9}{2} = \frac{\cancel{24}8}{1}\times\frac{2}{\cancel{9}3} = \frac{8\times 2}{1\times 3} = \frac{16}{3}\text{m}$$

⑥ There is a rectangular cloth with the area of $2\frac{2}{3}$ m². If its length is $1\frac{7}{9}$m, what is its width in meters?

$$1\frac{7}{9}\times x = 2\frac{2}{3}$$

$$x = 2\frac{2}{3}\div 1\frac{7}{9} = \frac{8}{3}\div\frac{16}{9} = \frac{8}{3}\times\frac{9}{16} = \frac{\cancel{8}1\times\cancel{9}3}{\cancel{3}1\times\cancel{16}2} = \frac{3}{2}\text{m}$$

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson by reviewing the calculation of integer ÷ mixed fractions and mixed numbers ÷ mixed numbers in problems.

Unit 4

Unit: Division of Fractions

Sub-unit: 2. What kind of Expression will it Become?

Lesson 1 of 1

Textbook Page : 044
Actual Lesson 033

Sub-unit Objective

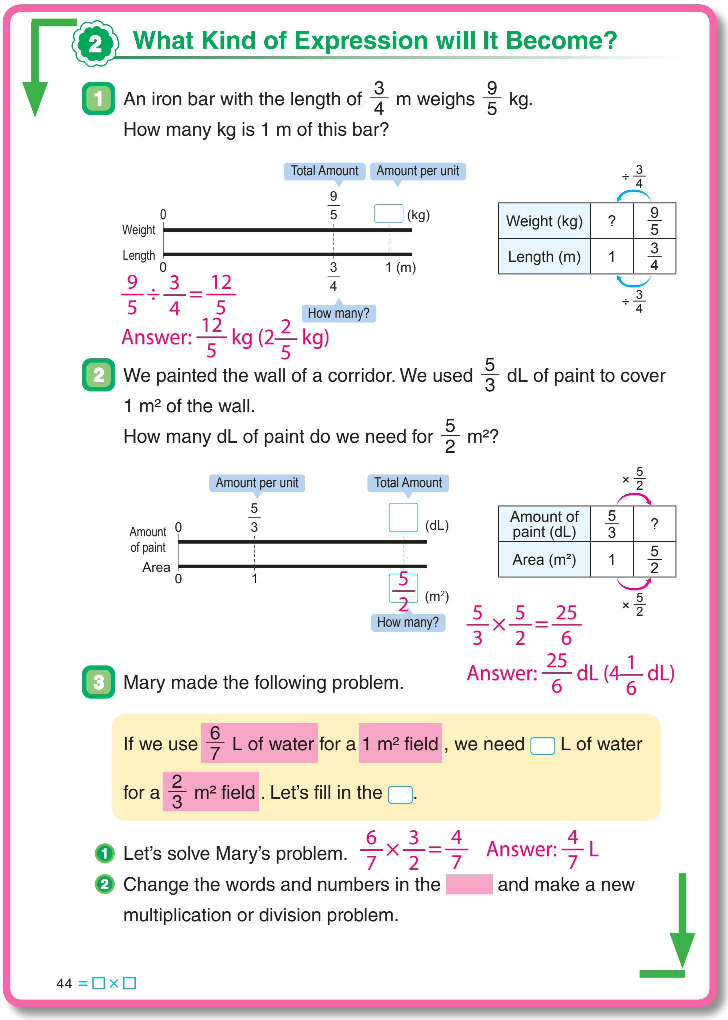
- To think about and understand how to calculate fractions when dividing.

Lesson Objectives

- To think about which operation is used to solve a given problem.
- Make a word problem of Division or Multiplication of fractions.
- To enjoy solving problems made by themselves.

Prior Knowledge

- Multiplication and Division of Fractions with Whole Numbers and Mixed Numbers
- Fractions × fractions, Fractions × mixed number and Intergers × mixed numbers



② What Kind of Expression will It Become?

1 An iron bar with the length of $\frac{3}{4}$ m weighs $\frac{9}{5}$ kg.
How many kg is 1 m of this bar?

Weight (kg)	?	$\frac{9}{5}$
Length (m)	1	$\frac{3}{4}$

$\frac{9}{5} \div \frac{3}{4} = \frac{12}{5}$

Answer: $\frac{12}{5}$ kg ($2\frac{2}{5}$ kg)

2 We painted the wall of a corridor. We used $\frac{5}{3}$ dL of paint to cover 1 m² of the wall.
How many dL of paint do we need for $\frac{5}{2}$ m²?

Amount of paint (dL)	$\frac{5}{3}$	?
Area (m²)	1	$\frac{5}{2}$

$\frac{5}{3} \times \frac{5}{2} = \frac{25}{6}$

Answer: $\frac{25}{6}$ dL ($4\frac{1}{6}$ dL)

3 Mary made the following problem.

If we use $\frac{6}{7}$ L of water for a 1 m² field, we need ☐ L of water for a $\frac{2}{3}$ m² field. Let's fill in the ☐.

① Let's solve Mary's problem. $\frac{6}{7} \times \frac{3}{2} = \frac{4}{7}$ Answer: $\frac{4}{7}$ L

② Change the words and numbers in the ▨ and make a new multiplication or division problem.

44 = ☐ × ☐

Preparation

- Tape diagrams and tables for task 1 and 2.

Assessment

- Differentiate between multiplication and division of fraction problems. F S
- Make their own multiplication or division problems of fractions and solve. S

Teacher's Notes

All contents learned in the Unit of Fractions will be used in this lesson when creating and solving problems.
In 3, encourage students to explore the options of doing calculations.

Example:
If we use L of water for a $\frac{3}{8}$ g spice, we need ☐ L of water for $\frac{3}{5}$ g of spice.
Calculation:
$\frac{3}{8} \div \frac{1}{4} = \frac{3}{8} \times \frac{4}{1} = \frac{3}{2}$

Therefore, $\frac{3}{2} \times \frac{3}{5} = \frac{9}{10}$ L

Lesson Flow

1 Think about which operation to use and how to solve the problem.

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

T/S ① Read and understand the given situation.

S Think about how to solve it, either by multiplying or dividing.

T Ask the students to analyse the problem and identify whether to divide or multiply.

S Discuss and identify the operation and solve the problem.

TN Ensure students solve the problem by dividing $\frac{9}{5} \div \frac{3}{4}$ using the Fraction ÷ Fraction method.

T Confirm students' answers as they present and explain their answers.

2 Think about which operation to use and how to solve the problem.

T/S ② Read and understand the given situation.

S Think about solving it either by multiplying or dividing.

T Ask the students to analyse the problem and identify whether to divide or multiply.

S Discuss and identify the operation and solve the problem.

TN Ensure that students solve the problem by multiplying $\frac{5}{3} \times \frac{5}{2}$ using the Fraction × Fraction method.

T Confirm students' answers as they present and explain their answers.

3 Think about Mary's problem and complete the following activities.

T/S ③ Read and understand the given situation.

S ❶ Solve Mary's problem by multiplying $\frac{6}{7} \times \frac{2}{3}$

T Get a few students to present their answers and correct it together.

TN Allow students to use diagrams if necessary for better understanding.

T Ask the class to change the words and fractions from Mary's problem to create their own division or multiplication problems.

S ❷ Make their own problems using Mary's idea and try to solve them as well.

T Check to ensure that students have correctly written and solved their own problems.

TN Encourage students to try fractions instead of 1 so that there is division involved. (see Teacher's Notes)

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

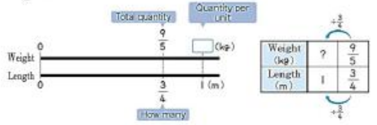
Date: Chapter 4: Division of Fractions Sub-Chapter/Topic 2: What Kind of Expression will it Become? Lesson: 1 of 1

Main Task: Let's think about and make division and multiplication problems.

Review

MT

1 An iron bar with the length of $\frac{3}{4}$m weighs $\frac{9}{5}$kg. How many kg is 1m of this bar?



i. $\frac{9}{5} \div \frac{3}{4} = \frac{9}{5} \times \frac{4}{3}$

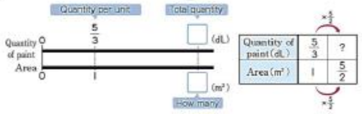
$= \frac{\cancel{9}3}{5} \times \frac{4}{\cancel{3}1} = \frac{12}{5}$kg

ii. $x \times \frac{3}{4} = \frac{9}{5}$

$\frac{9}{5} \div \frac{3}{4} = \frac{9}{5} \times \frac{4}{3}$

$= \frac{\cancel{9}3}{5} \times \frac{4}{\cancel{3}1} = \frac{12}{5}$kg

2 We painted the wall of a corridor. We used $\frac{5}{3}$ dL of paint to cover 1m². How many dL of paint do we need for $\frac{5}{2}$ m²?



i. $\frac{5}{3} \times \frac{5}{2} = \frac{25}{6}$ dL

ii. $\frac{5}{3} \times \frac{5}{2} = x$

$x = \frac{5}{3} \times \frac{5}{2} = \frac{25}{6}$dL

3 If we used $\frac{6}{7}$L of water for a 1m² field, we need $\frac{4}{7}$L for a $\frac{2}{3}$ m² field.

❶ i. $\frac{\cancel{6}2}{7} \times \frac{2}{\cancel{3}1} = \frac{4}{7}$ L

ii. $\frac{6}{7} \times \frac{2}{3} = x$

$x = \frac{6}{7} \times \frac{2}{3} = \frac{4}{7}$L

❷ Students problems will vary
(Allow students to present their problems and calculations)

Summary

We can write mathematical expressions using word problems and solve by calculating using division and multiplication of fractions..

Unit 4

Unit: Division of Fractions

Exercise, Problems and Evaluation

Lesson 1 and 2 of 2

Textbook Page : 045 and 046
Actual Lesson 34 & 35

Lesson Objective

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

Prior Knowledge

- Multiplication and Division of Fractions with whole numbers
- Fractions × Fractions

Preparation

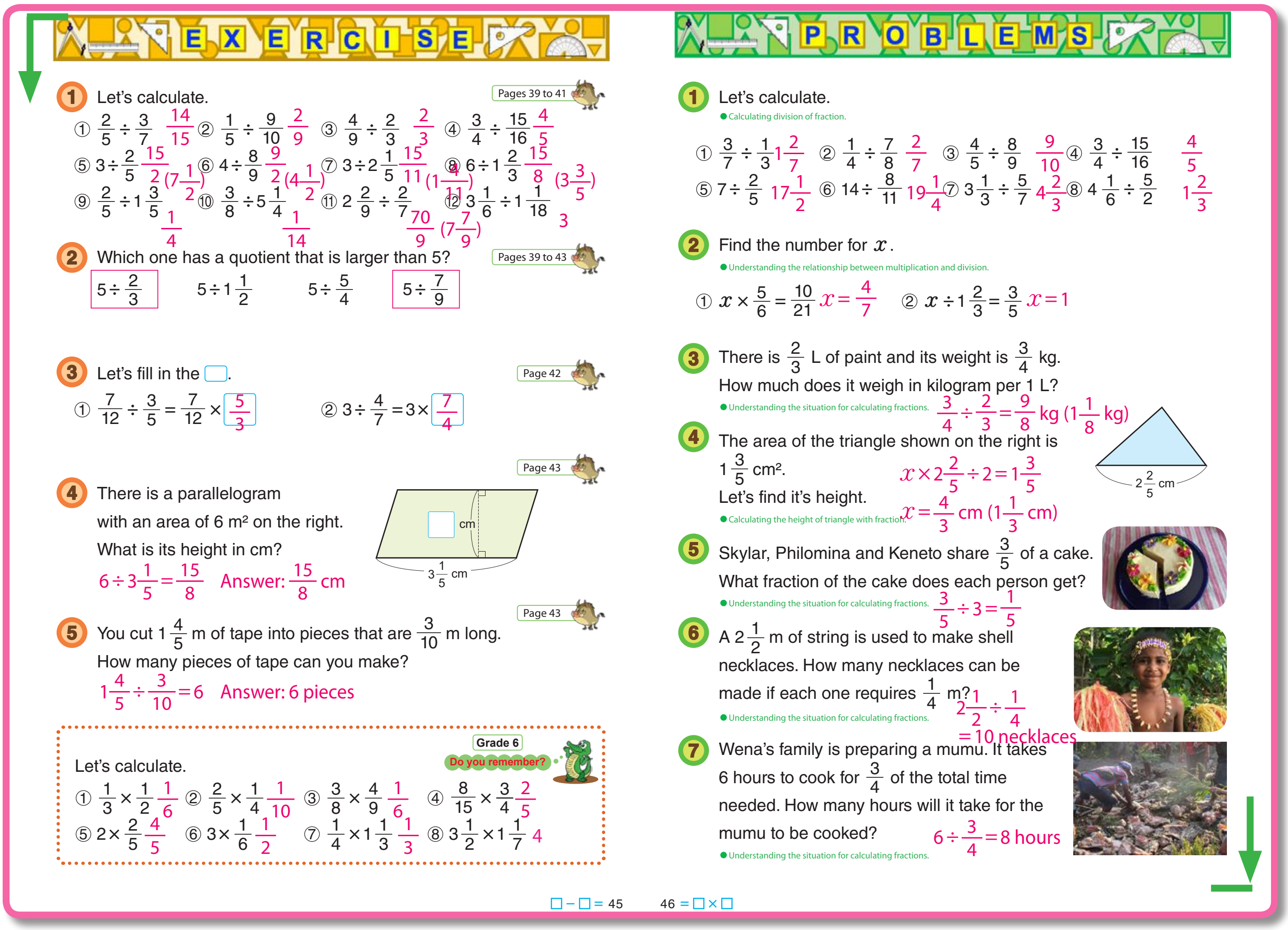
- Evaluation test

Assessment

- Solve the exercises and problems correctly. F 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, problems and review as a seperate lesson.



EXERCISE

① Let's calculate. Pages 39 to 41

① $\frac{2}{5}\div\frac{3}{7}$ $\frac{14}{15}$ ② $\frac{1}{5}\div\frac{9}{10}$ $\frac{2}{9}$ ③ $\frac{4}{9}\div\frac{2}{3}$ $\frac{2}{3}$ ④ $\frac{3}{4}\div\frac{15}{16}$ $\frac{4}{5}$

⑤ $3\div\frac{2}{5}$ $\frac{15}{2}$ $(7\frac{1}{2})$ ⑥ $4\div\frac{8}{9}$ $\frac{9}{2}$ $(4\frac{1}{2})$ ⑦ $3\div2\frac{1}{5}$ $\frac{15}{11}$ $(1\frac{4}{11})$ ⑧ $6\div1\frac{2}{3}$ $\frac{15}{8}$ $(3\frac{3}{5})$

⑨ $\frac{2}{5}\div1\frac{3}{5}$ $\frac{1}{4}$ ⑩ $\frac{3}{8}\div5\frac{1}{4}$ $\frac{1}{14}$ ⑪ $2\frac{2}{9}\div\frac{2}{7}$ $\frac{70}{9}$ $(7\frac{7}{9})$ ⑫ $3\frac{1}{6}\div1\frac{1}{18}$ 3

② Which one has a quotient that is larger than 5? Pages 39 to 43

$\boxed{5\div\frac{2}{3}}$ $5\div1\frac{1}{2}$ $5\div\frac{5}{4}$ $\boxed{5\div\frac{7}{9}}$

③ Let's fill in the ☐. Page 42

① $\frac{7}{12}\div\frac{3}{5}=\frac{7}{12}\times\boxed{\frac{5}{3}}$ ② $3\div\frac{4}{7}=3\times\boxed{\frac{7}{4}}$

④ There is a parallelogram with an area of 6 m² on the right. What is its height in cm? Page 43

$6\div3\frac{1}{5}=\frac{15}{8}$ Answer: $\frac{15}{8}$ cm

☐ cm
$3\frac{1}{5}$ cm

⑤ You cut $1\frac{4}{5}$ m of tape into pieces that are $\frac{3}{10}$ m long. How many pieces of tape can you make? Page 43

$1\frac{4}{5}\div\frac{3}{10}=6$ Answer: 6 pieces

Grade 6 Do you remember?

Let's calculate.

① $\frac{1}{3}\times\frac{1}{2}$ $\frac{1}{6}$ ② $\frac{2}{5}\times\frac{1}{4}$ $\frac{1}{10}$ ③ $\frac{3}{8}\times\frac{4}{9}$ $\frac{1}{6}$ ④ $\frac{8}{15}\times\frac{3}{4}$ $\frac{2}{5}$

⑤ $2\times\frac{2}{5}$ $\frac{4}{5}$ ⑥ $3\times\frac{1}{6}$ $\frac{1}{2}$ ⑦ $\frac{1}{4}\times1\frac{1}{3}$ $\frac{1}{3}$ ⑧ $3\frac{1}{2}\times1\frac{1}{7}$ 4

☐ − ☐ = 45

PROBLEMS

① Let's calculate.
● Calculating division of fraction.

① $\frac{3}{7}\div\frac{1}{3}$ $1\frac{2}{7}$ ② $\frac{1}{4}\div\frac{7}{8}$ $\frac{2}{7}$ ③ $\frac{4}{5}\div\frac{8}{9}$ $\frac{9}{10}$ ④ $\frac{3}{4}\div\frac{15}{16}$ $\frac{4}{5}$

⑤ $7\div\frac{2}{5}$ $17\frac{1}{2}$ ⑥ $14\div\frac{8}{11}$ $19\frac{1}{4}$ ⑦ $3\frac{1}{3}\div\frac{5}{7}$ $4\frac{2}{3}$ ⑧ $4\frac{1}{6}\div\frac{5}{2}$ $1\frac{2}{3}$

② Find the number for x.
● Understanding the relationship between multiplication and division.

① $x\times\frac{5}{6}=\frac{10}{21}$ $x=\frac{4}{7}$ ② $x\div1\frac{2}{3}=\frac{3}{5}$ $x=1$

③ There is $\frac{2}{3}$ L of paint and its weight is $\frac{3}{4}$ kg. How much does it weigh in kilogram per 1 L?
● Understanding the situation for calculating fractions. $\frac{3}{4}\div\frac{2}{3}=\frac{9}{8}$ kg $(1\frac{1}{8}$ kg$)$

④ The area of the triangle shown on the right is $1\frac{3}{5}$ cm². Let's find it's height.
● Calculating the height of triangle with fraction.

$x\times2\frac{2}{5}\div2=1\frac{3}{5}$
$x=\frac{4}{3}$ cm $(1\frac{1}{3}$ cm$)$

$2\frac{2}{5}$ cm

⑤ Skylar, Philomina and Keneto share $\frac{3}{5}$ of a cake. What fraction of the cake does each person get?
● Understanding the situation for calculating fractions. $\frac{3}{5}\div3=\frac{1}{5}$

⑥ A $2\frac{1}{2}$ m of string is used to make shell necklaces. How many necklaces can be made if each one requires $\frac{1}{4}$ m? $2\frac{1}{2}\div\frac{1}{4}$ $=10$ necklaces
● Understanding the situation for calculating fractions.

⑦ Wena's family is preparing a mumu. It takes 6 hours to cook for $\frac{3}{4}$ of the total time needed. How many hours will it take for the mumu to be cooked? $6\div\frac{3}{4}=8$ hours
● Understanding the situation for calculating fractions.

46 = ☐ × ☐

Lesson Flow

1 Complete Exercise ①.

S Division of fractions using fraction ÷ fraction method.

T Confirm students' answers.

2 Complete Exercise ②

S Comparing to identify which quotient is larger.

T Confirm students' answers.

3 Complete Exercise ③.

S Filling in the spaces to make the inverse of fractions when dividing.

T Confirm students' answers.

4 Complete Exercise ④.

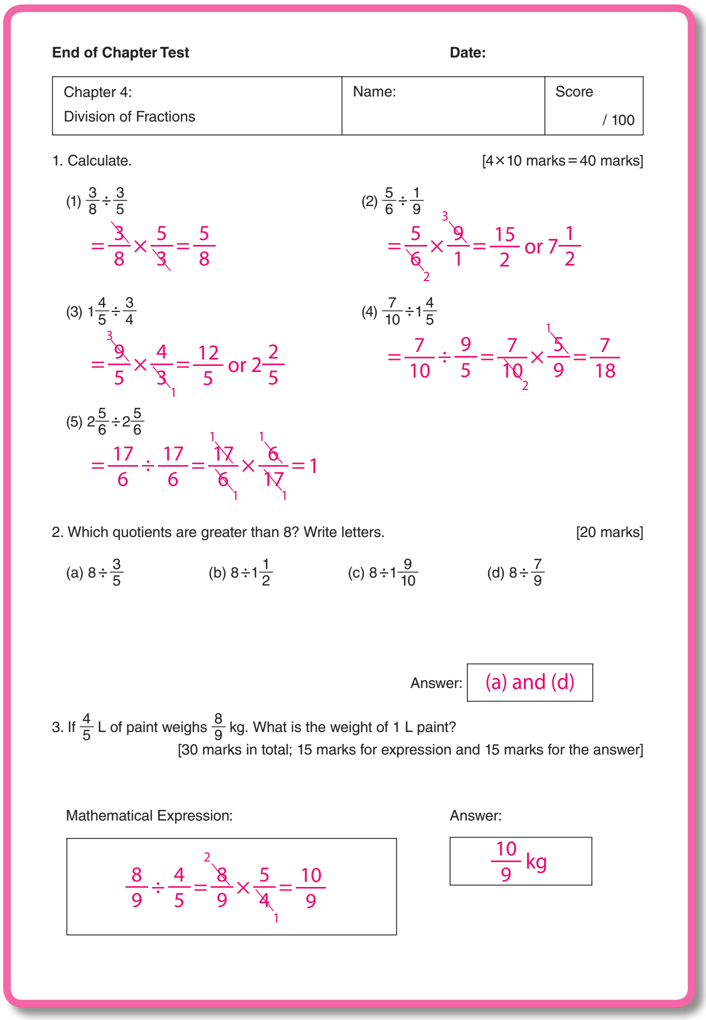
S Solve the presented problem to find the height of a parallelogram.

T Confirm students' answers.

5 Complete Exercise ⑤.

S Solve the division word problem.

T Confirm students' answers.



End of Chapter Test **Date:**

Chapter 4: Division of Fractions	Name:	Score / 100

1. Calculate. [4×10 marks = 40 marks]

(1) $\frac{3}{8}\div\frac{3}{5}$

$=\frac{\cancel{3}}{8}\times\frac{5}{\cancel{3}}=\frac{5}{8}$

(2) $\frac{5}{6}\div\frac{1}{9}$

$=\frac{5}{\underset{2}{\cancel{6}}}\times\frac{\overset{3}{\cancel{9}}}{1}=\frac{15}{2}$ or $7\frac{1}{2}$

(3) $1\frac{4}{5}\div\frac{3}{4}$

$=\frac{\overset{3}{\cancel{9}}}{5}\times\frac{4}{\underset{1}{\cancel{3}}}=\frac{12}{5}$ or $2\frac{2}{5}$

(4) $\frac{7}{10}\div1\frac{4}{5}$

$=\frac{7}{10}\div\frac{9}{5}=\frac{7}{\underset{2}{\cancel{10}}}\times\frac{\overset{1}{\cancel{5}}}{9}=\frac{7}{18}$

(5) $2\frac{5}{6}\div2\frac{5}{6}$

$=\frac{17}{6}\div\frac{17}{6}=\frac{\overset{1}{\cancel{17}}}{\underset{1}{\cancel{6}}}\times\frac{\overset{1}{\cancel{6}}}{\underset{1}{\cancel{17}}}=1$

2. Which quotients are greater than 8? Write letters. [20 marks]

(a) $8\div\frac{3}{5}$ (b) $8\div1\frac{1}{2}$ (c) $8\div1\frac{9}{10}$ (d) $8\div\frac{7}{9}$

Answer: (a) and (d)

3. If $\frac{4}{5}$ L of paint weighs $\frac{8}{9}$ kg. What is the weight of 1 L paint?
[30 marks in total; 15 marks for expression and 15 marks for the answer]

Mathematical Expression:

$\frac{8}{9}\div\frac{4}{5}=\frac{\overset{2}{\cancel{8}}}{9}\times\frac{5}{\underset{1}{\cancel{4}}}=\frac{10}{9}$

Answer: $\frac{10}{9}$ kg

6 Complete the Do You Remember exercise.

S Calculate the multiplication of fractions.

7 Complete Problem ①.

S Calculate and solve the division problems (1) to (8).

T Confirm students' answers.

8 Complete Problem ②.

S Solve (1) and (2) by finding the value of x.

T Confirm students' answers.

9 Complete Problems ③ to ⑦.

S Read each problem and write mathematical expressions before solving them to find the answers.

T Confirm students' answers.

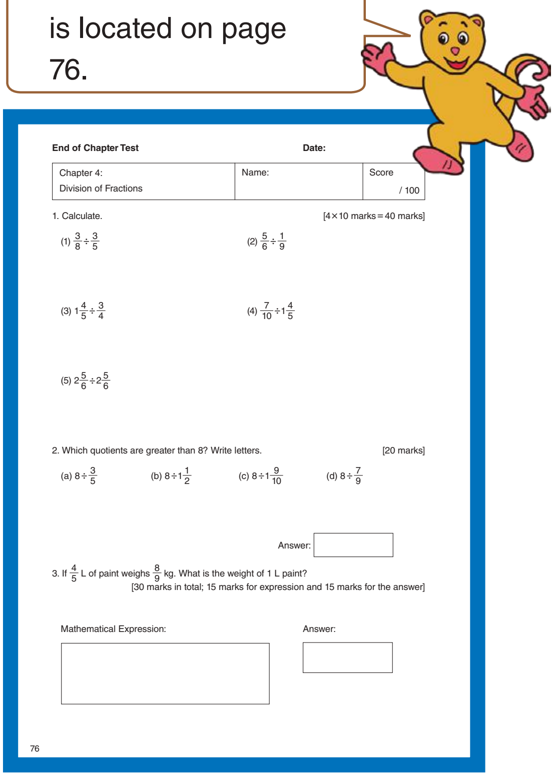
10 Complete the Evaluation Test.

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

TN The test copy for this Unit is attached at the end of Unit 5.

S Complete the Evaluation Test.

The Evaluation Test is located on page 76.



End of Chapter Test **Date:**

Chapter 4: Division of Fractions	Name:	Score / 100

1. Calculate. [4×10 marks = 40 marks]

(1) $\frac{3}{8}\div\frac{3}{5}$ (2) $\frac{5}{6}\div\frac{1}{9}$

(3) $1\frac{4}{5}\div\frac{3}{4}$ (4) $\frac{7}{10}\div1\frac{4}{5}$

(5) $2\frac{5}{6}\div2\frac{5}{6}$

2. Which quotients are greater than 8? Write letters. [20 marks]

(a) $8\div\frac{3}{5}$ (b) $8\div1\frac{1}{2}$ (c) $8\div1\frac{9}{10}$ (d) $8\div\frac{7}{9}$

Answer:

3. If $\frac{4}{5}$ L of paint weighs $\frac{8}{9}$ kg. What is the weight of 1 L paint?
[30 marks in total; 15 marks for expression and 15 marks for the answer]

Mathematical Expression: Answer:

76

Unit 5

Unit: Multiples and Rates
Sub-unit: Multiples and Rates
Lesson 1 of 3

Textbook Page : 047
Actual Lesson 036

Sub-unit Objectives

- To deepen the understanding of rate.
- To use rate to describe proportional relationships between various quantities.
- To understand how to express rate as a fraction and how to find a compared quantity as well as a basic quantity.

Lesson Objectives

- To understand the rate of two quantities that are in a proportional relationship.
- To understand that there are cases when a rate is described using multiples.

Prior Knowledge

- Amount per unit quantity. (Grade 5)
- Mathematical symbols and expression. (Grade 6)
- Multiples and divisors

Preparation

- Table for task 1.

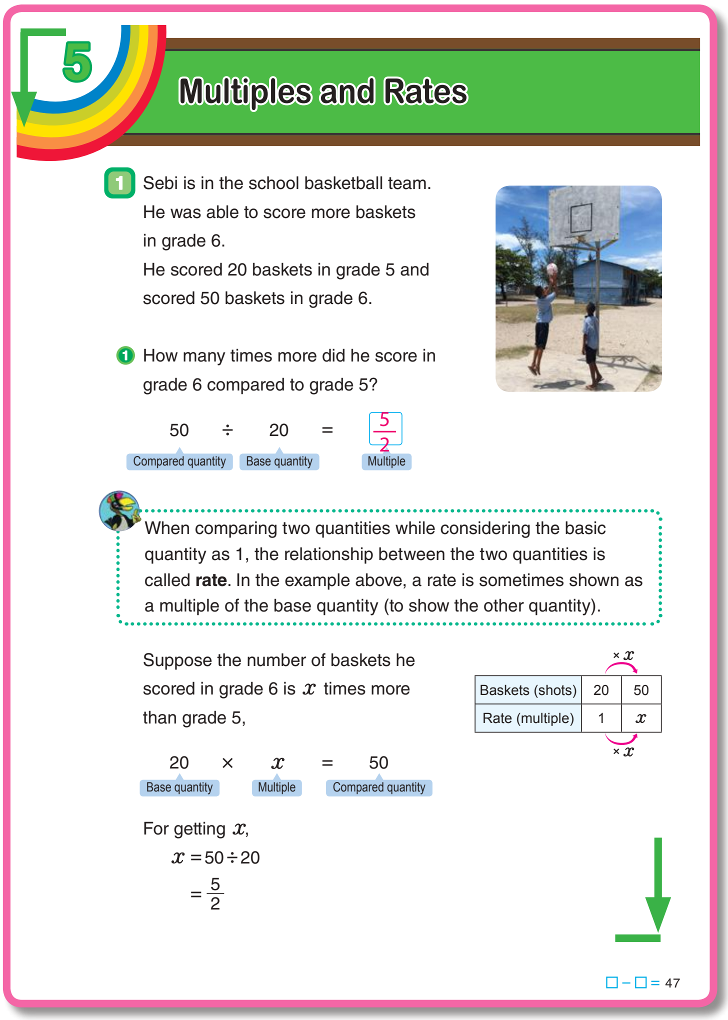
Assessment

- Think about how to show a relation using rate from a given situation. F
- Understand the meaning of the word rate. S

Teacher's Notes

Students should use prior knowledge of finding the value of x in a mathematical sentence to find the multiple of the basic quantity and the compared quantity.

$50 \div 20 = \frac{5}{2}$



5 Multiples and Rates

1 Sebi is in the school basketball team.
He was able to score more baskets in grade 6.
He scored 20 baskets in grade 5 and scored 50 baskets in grade 6.

① How many times more did he score in grade 6 compared to grade 5?

$$\underbrace{50}_{\text{Compared quantity}} \div \underbrace{20}_{\text{Base quantity}} = \underbrace{\boxed{\frac{5}{2}}}_{\text{Multiple}}$$

When comparing two quantities while considering the basic quantity as 1, the relationship between the two quantities is called **rate**. In the example above, a rate is sometimes shown as a multiple of the base quantity (to show the other quantity).

Suppose the number of baskets he scored in grade 6 is x times more than grade 5,

Baskets (shots)	20	50
Rate (multiple)	1	x

$$\underbrace{20}_{\text{Base quantity}} \times \underbrace{x}_{\text{Multiple}} = \underbrace{50}_{\text{Compared quantity}}$$

For getting x,

$$x = 50 \div 20$$
$$= \frac{5}{2}$$

□ − □ = 47

Lesson Flow

1 Understanding the relationship of basic quantity and compared quantity as a rate.

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

T/S 1 Read and understand the given situation.

T/S ① Discuss how many more times Sebi scored in Grade 6 compared to Grade 5.

S $50 \div 20 = \frac{5}{2}$ as a fraction and 2.5 as a decimal.

T Emphasise what the basic quantity and compared quantities are.

TN Help students to realise that the rate of the number of baskets he scored in Grade 6 (compared quantity) compared to the number of baskets he scored in Grade 5 (basic quantity) is considered as 1.

2 Important Point

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

3 Understand rate as multiples of two numbers.

T Direct students' attention to the table to find how many times more.

S By applying × to show the rate, students make the equation:
basic quantity × rate = compared quantity.

S Find the appropriate value for × and express it as a fraction or decimal.
$x = 50 \div 20 = \frac{5}{2}$

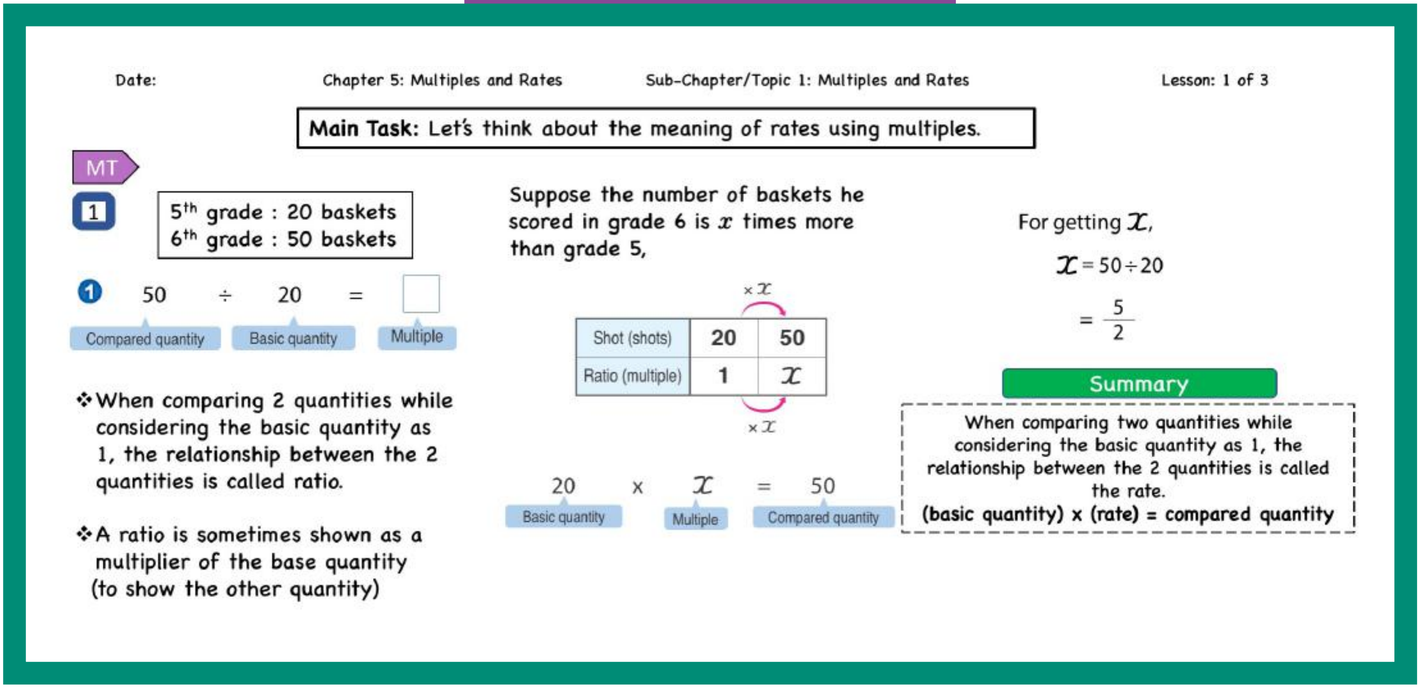
4 Summary

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 5: Multiples and Rates Sub-Chapter/Topic 1: Multiples and Rates Lesson: 1 of 3

Main Task: Let's think about the meaning of rates using multiples.

MT

1 5th grade : 20 baskets
6th grade : 50 baskets

① 50 ÷ 20 = ☐
Compared quantity Basic quantity Multiple

❖ When comparing 2 quantities while considering the basic quantity as 1, the relationship between the 2 quantities is called ratio.

❖ A ratio is sometimes shown as a multiplier of the base quantity (to show the other quantity)

Suppose the number of baskets he scored in grade 6 is x times more than grade 5,

×x

Shot (shots)	20	50
Ratio (multiple)	1	x

×x

$20 \times x = 50$
Basic quantity Multiple Compared quantity

For getting x,

$x = 50 \div 20$

$= \frac{5}{2}$

Summary

When comparing two quantities while considering the basic quantity as 1, the relationship between the 2 quantities is called the rate.
(basic quantity) x (rate) = compared quantity

Unit 5

Unit: Multiples and Rates
Sub-unit: Multiple and Rates
Lesson 2 of 3

Textbook Page : 048
Actual Lesson 037

Lesson Objective

- To express rates with fractions.

Prior Knowledge

- Measurement per unit quantity. (Grade 5)
- Mathematical symbol and expression. (Grade 6)
- Meaning of rate. (Previous lesson)

Preparation

- Tape diagrams and tables

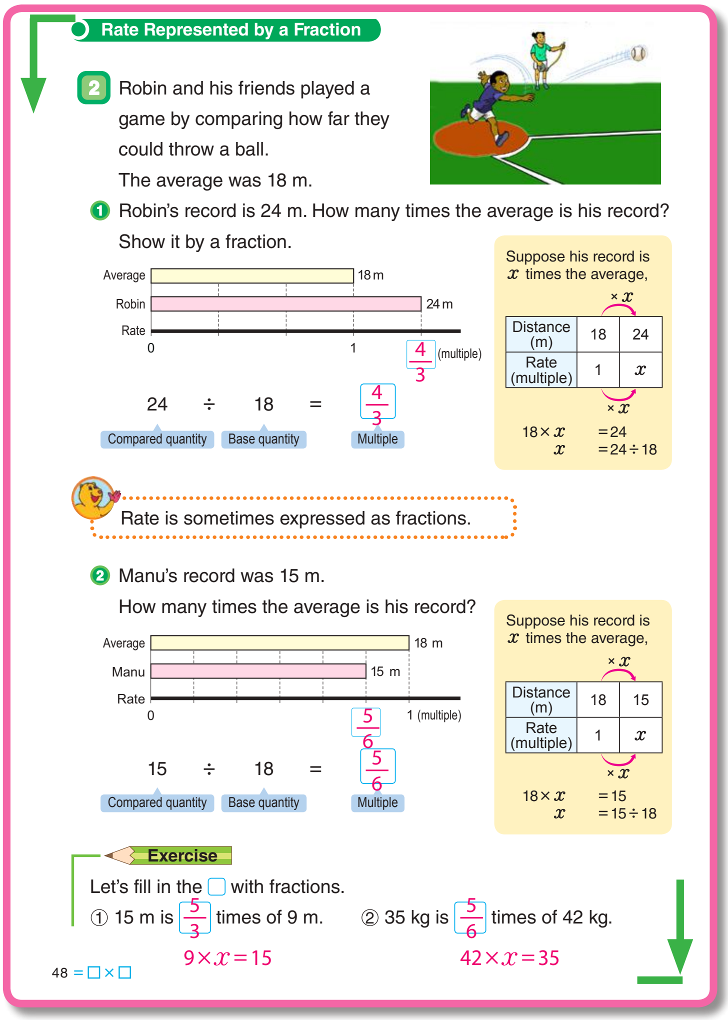
Assessment

- Think about how to express the rate of two quantities. Ⓕ
- Solve the exercise correctly. Ⓢ

Teacher's Notes

Emphasise using the example that rate can be expressed as a fraction.

$$\begin{aligned}18\times x &= 24\\ &= 24\div 18\\ &= \frac{24}{18}\\ &= \frac{4}{3}\end{aligned}$$



Rate Represented by a Fraction

2 Robin and his friends played a game by comparing how far they could throw a ball.
The average was 18 m.

① Robin's record is 24 m. How many times the average is his record?
Show it by a fraction.

Average 18 m
Robin 24 m
Rate 0 1 $\boxed{\frac{4}{3}}$ (multiple)

$24 \div 18 = \boxed{\frac{4}{3}}$

Compared quantity, Base quantity, Multiple

Suppose his record is x times the average,

Distance (m)	18	24
Rate (multiple)	1	x

× x

$18\times x = 24$
$x = 24\div 18$

Rate is sometimes expressed as fractions.

② Manu's record was 15 m.
How many times the average is his record?

Average 18 m
Manu 15 m
Rate 0 $\boxed{\frac{5}{6}}$ 1 (multiple)

$15 \div 18 = \boxed{\frac{5}{6}}$

Compared quantity, Base quantity, Multiple

Suppose his record is x times the average,

Distance (m)	18	15
Rate (multiple)	1	x

× x

$18\times x = 15$
$x = 15\div 18$

Exercise

Let's fill in the □ with fractions.

① 15 m is $\boxed{\frac{5}{3}}$ times of 9 m.
$9\times x=15$

② 35 kg is $\boxed{\frac{5}{6}}$ times of 42 kg.
$42\times x=35$

48 = □ × □

Lesson Flow

1 Review the previous lesson.

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

2 Expressing rate using multiples.

T/S ② Read and understand the given situation.

T ① How many times is Robin's recorded distance compared to the average.

TN Ask the students to look at the figure and identify what is the basic and compared quantity in this problem.

S Basic quantity = 18 m.
Compared quantity = 24 m.

TN By looking at the figure, make sure that if the rate is x times, the distance should also be x times.

T Ask students to complete the mathematical sentence.

S Complete the mathematical sentence and find the answer.

3 Important Point

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

4 ② Find how many times Manu's record distance is compared to the average.

T Make sure that the compared quantity (Manu's record in this case) is shorter than the basic quantity.

TN From the figure, make sure that if the rate is x times, the distance should also be x times.

S Complete the mathematic al sentence.

5 Complete the Exercise.

S Solve the selected exercises.

T Confirm students' answers.

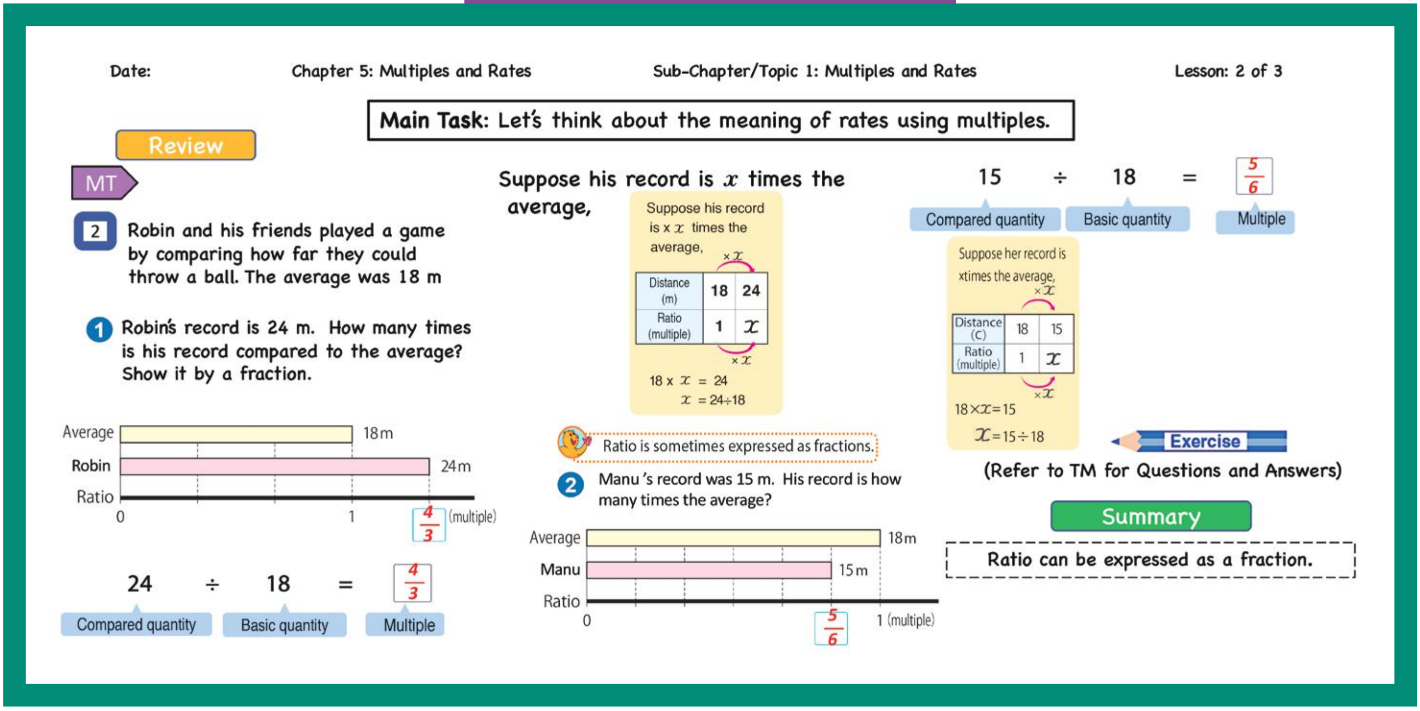
6 Summary

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 5: Multiples and Rates Sub-Chapter/Topic 1: Multiples and Rates Lesson: 2 of 3

Main Task: Let's think about the meaning of rates using multiples.

Review

MT

2 Robin and his friends played a game by comparing how far they could throw a ball. The average was 18 m

① Robin's record is 24 m. How many times is his record compared to the average? Show it by a fraction.

$24 \div 18 = \boxed{\frac{4}{3}}$

Compared quantity, Basic quantity, Multiple

Suppose his record is x times the average,

Suppose his record is x x times the average,

Distance (m)	18	24
Ratio (multiple)	1	x

×x

18 x x = 24

x = 24÷18

Ratio is sometimes expressed as fractions.

② Manu 's record was 15 m. His record is how many times the average?

$15 \div 18 = \boxed{\frac{5}{6}}$

Compared quantity, Basic quantity, Multiple

Suppose her record is xtimes the average,

Distance (C)	18	15
Ratio (multiple)	1	x

×x

$18 \times x = 15$

$x = 15 \div 18$

Exercise

(Refer to TM for Questions and Answers)

Summary

Ratio can be expressed as a fraction.

Unit 5

Unit: Multiples and Rates

Sub-unit: Multiple and Rates

Lesson 3 of 3

Textbook Page : 049
Actual Lesson 038

Lesson Objective

- To identify the base quantity and compared quantity based on the given value of rate in which two quantities are expressed as fractions.

Assessment

- Identify the base quantity and compared quantity based on the given rate. **F**
- Solve the exercise correctly. **S**

Prior Knowledge

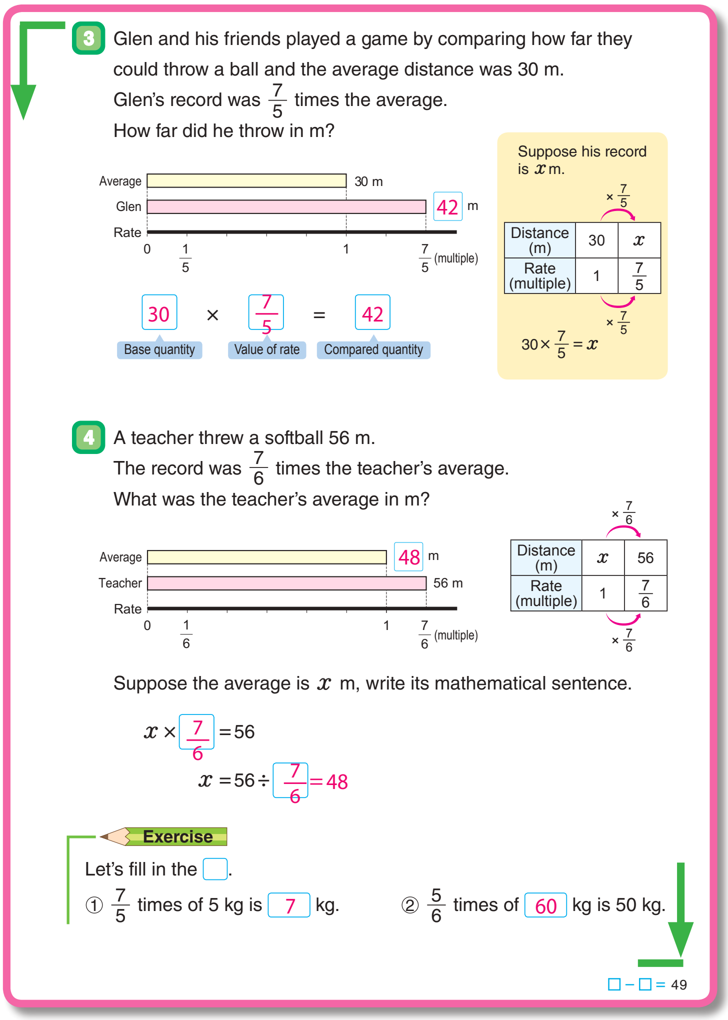
- Measurement per unit quantity. (Grade 5)
- Mathematical symbol and expression. (Grade 6)
- Meaning of rate. (Previous lesson)
- Expressing rate as a fraction.

Teacher's Notes

In this lesson, ensure students relate the information from the tape diagram and the table to find the unknown values to determine the base quanity, value of rate and the multiple.

Preparation

- Tape diagrams and tables



3 Glen and his friends played a game by comparing how far they could throw a ball and the average distance was 30 m.
Glen's record was $\frac{7}{5}$ times the average.
How far did he throw in m?

$\boxed{30} \times \boxed{\frac{7}{5}} = \boxed{42}$

Base quantity, Value of rate, Compared quantity

Suppose his record is x m.

Distance (m)	30	x
Rate (multiple)	1	$\frac{7}{5}$

$30 \times \frac{7}{5} = x$

4 A teacher threw a softball 56 m.
The record was $\frac{7}{6}$ times the teacher's average.
What was the teacher's average in m?

Distance (m)	x	56
Rate (multiple)	1	$\frac{7}{6}$

Suppose the average is x m, write its mathematical sentence.

$x \times \boxed{\frac{7}{6}} = 56$

$x = 56 \div \boxed{\frac{7}{6}} = 48$

Exercise

Let's fill in the ☐.

① $\frac{7}{5}$ times of 5 kg is $\boxed{7}$ kg.
② $\frac{5}{6}$ times of $\boxed{60}$ kg is 50 kg.

☐ − ☐ = 49

Lesson Flow

1 Review the previous lesson.

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

2 Expressing rate as a fraction.

T/S ③ Read and understand the given situation.

T/S Discuss and confirm what they already know and what they need to find out.

S Identify that;

- Base quantity is 30 m
- Value of rate is $\frac{7}{5}$

We need to find the compared quantity which is x metre.

3 Complete the mathematical sentence.

T Remind students of the sentence:
(Base Quantity) × (Value of rates)
= (Compared Quantity)

S Think about what quantities they should put in to complete the sentence with the correct answer.

4 Applying rate as a fraction.

T/S ④ Read and understand the given situation.

T Discuss and confirm what they already know and what they need to find out.

S Identify that:

- Compared quantity is 56 m
- Value of rate is $\frac{7}{6}$

We need to find the basic quantity which is x metre.

5 Complete the mathematical sentence.

S Use x for the average and make a mathematical sentence based on
(Base Quantity) × (Value of rates)
= (Compared Quantity).

6 Complete the Exercise.

S Solve the selected exercises.

T Confirm students' answers.

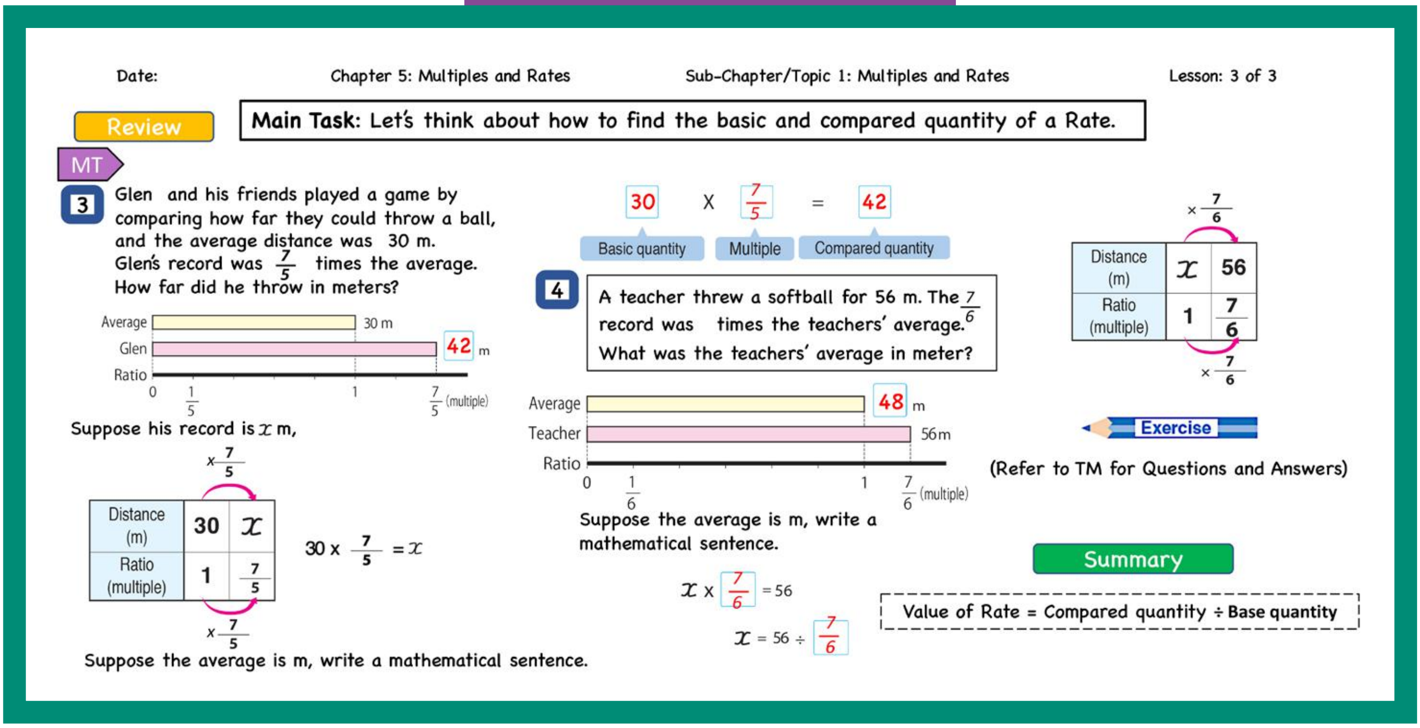
7 Summary

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 5: Multiples and Rates Sub-Chapter/Topic 1: Multiples and Rates Lesson: 3 of 3

Review

Main Task: Let's think about how to find the basic and compared quantity of a Rate.

MT

3 Glen and his friends played a game by comparing how far they could throw a ball, and the average distance was 30 m. Glen's record was $\frac{7}{5}$ times the average. How far did he throw in meters?

Average
30 m
Glen
42 m
Ratio
0
$\frac{1}{5}$
1
$\frac{7}{5}$ (multiple)

Suppose his record is x m,

$\times\frac{7}{5}$

Distance (m)	30	x
Ratio (multiple)	1	$\frac{7}{5}$

$\times\frac{7}{5}$

$30 \times \frac{7}{5} = x$

Suppose the average is m, write a mathematical sentence.

$\boxed{30} \times \boxed{\frac{7}{5}} = \boxed{42}$

Basic quantity Multiple Compared quantity

4 A teacher threw a softball for 56 m. The record was $\frac{7}{6}$ times the teachers' average. What was the teachers' average in meter?

Suppose the average is m, write a mathematical sentence.

$x \times \boxed{\frac{7}{6}} = 56$

$x = 56 \div \boxed{\frac{7}{6}}$

$\times\frac{7}{6}$

Distance (m)	x	56
Ratio (multiple)	1	$\frac{7}{6}$

$\times\frac{7}{6}$

Exercise

(Refer to TM for Questions and Answers)

Summary

Value of Rate = Compared quantity ÷ Base quantity

End of Chapter Test **Date:**

Chapter 4: Division of Fractions	Name:	Score / 100

1. Calculate. [4×10 marks = 40 marks]

(1) $\frac{3}{8} \div \frac{3}{5}$

(2) $\frac{5}{6} \div \frac{1}{9}$

(3) $1\frac{4}{5} \div \frac{3}{4}$

(4) $\frac{7}{10} \div 1\frac{4}{5}$

(5) $2\frac{5}{6} \div 2\frac{5}{6}$

2. Which quotients are greater than 8? Write letters. [20 marks]

(a) $8 \div \frac{3}{5}$

(b) $8 \div 1\frac{1}{2}$

(c) $8 \div 1\frac{9}{10}$

(d) $8 \div \frac{7}{9}$

Answer:

3. If $\frac{4}{5}$ L of paint weighs $\frac{8}{9}$ kg. What is the weight of 1 L paint?

[30 marks in total; 15 marks for expression and 15 marks for the answer]

Mathematical Expression:

Answer:

Chapter 6 Operation of Decimals and Fractions

1. Content Standard

6.1.3. Students will be able to demonstrate the proficiency in calculation of four arithmetic operations with fractions and decimals and be confident in using them.

2. Unit Objective

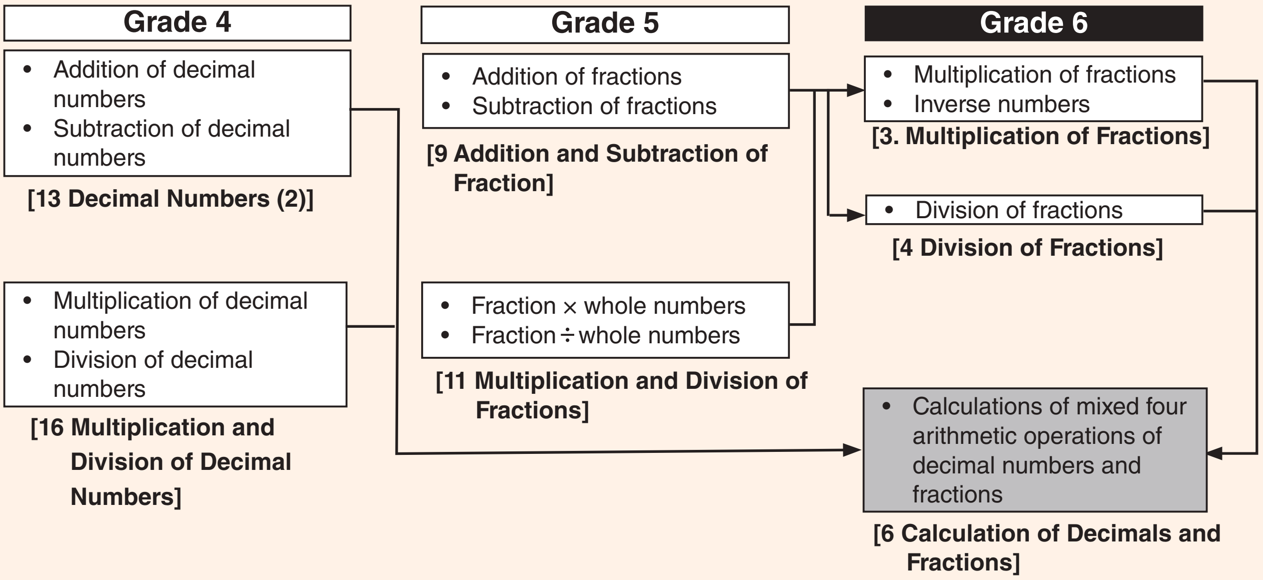
- To improve basic calculation skill concerning decimal numbers and fractions.

3. Teaching Overview

In this topic, students are supposed to master calculation of whole numbers, decimals and fractions with all 4 operations combined. As they get used to any calculations found in their daily lives, they will fully appreciate mathematics.

Students are supposed to be given as many situations as possible to form mathematical expressions and find the answers and think the meaning of the answers.

4. Related Learning Contents


Grade 4
Grade 5
Grade 6
• Addition of decimal numbers
• Subtraction of decimal numbers
[13 Decimal Numbers (2)]
• Multiplication of decimal numbers
• Division of decimal numbers
[16 Multiplication and Division of Decimal Numbers]
• Addition of fractions
• Subtraction of fractions
[9 Addition and Subtraction of Fraction]
• Fraction × whole numbers
• Fraction ÷ whole numbers
[11 Multiplication and Division of Fractions]
• Multiplication of fractions
• Inverse numbers
[3. Multiplication of Fractions]
• Division of fractions
[4 Division of Fractions]
• Calculations of mixed four arithmetic operations of decimal numbers and fractions
[6 Calculation of Decimals and Fractions]

Unit 6

Unit: Operation of Decimals and Fractions

Sub-unit: 1. Operation of Decimals

Lesson 1 of 3

Textbook Page : 050
Actual Lesson 039

Sub-unit Objectives

- To solve the problems of decimal numbers.
- To apply the knowledge of decimal numbers to daily life.

Lesson Objective

- To solve various problems involving decimal numbers.

Prior Knowledge

- Calculation of decimal numbers using the 4 operations.

Preparation

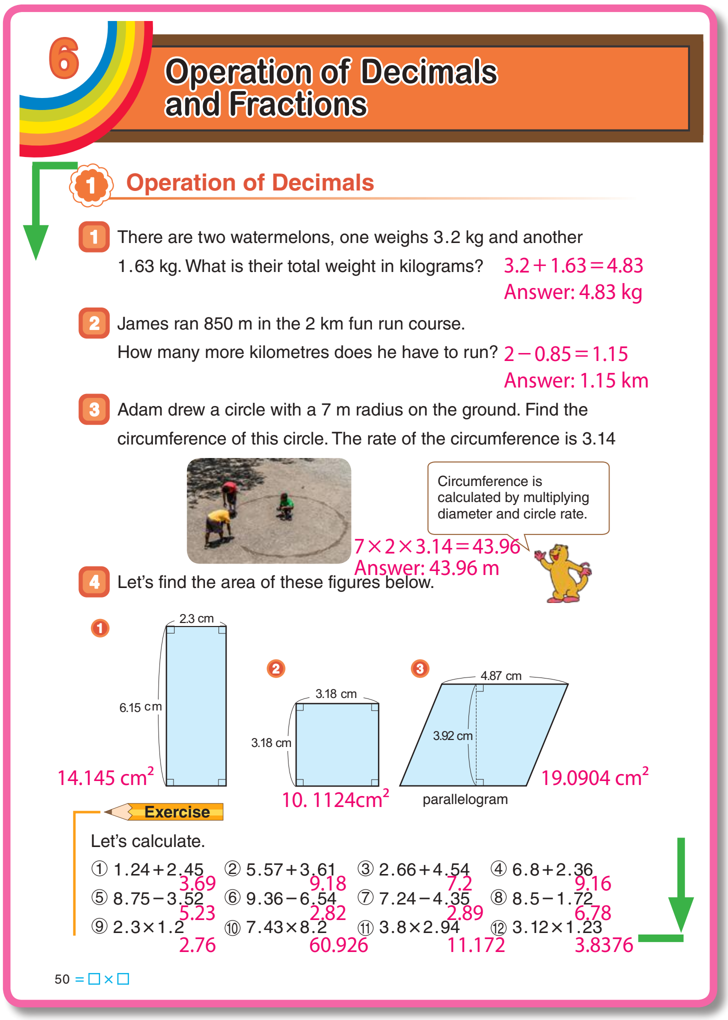
- Diagrams for task 4.

Assessment

- Solve various problems involving length, weight and area in decimal numbers. F S

Teacher's Notes

Using prior knowledge, the students should identify the operation and the unit for calculation.
Encourage the students to use vertical calculation, giving emphasis on place values.



6 Operation of Decimals and Fractions

① Operation of Decimals

1 There are two watermelons, one weighs 3.2 kg and another 1.63 kg. What is their total weight in kilograms?

3.2 + 1.63 = 4.83
Answer: 4.83 kg

2 James ran 850 m in the 2 km fun run course. How many more kilometres does he have to run?

2 − 0.85 = 1.15
Answer: 1.15 km

3 Adam drew a circle with a 7 m radius on the ground. Find the circumference of this circle. The rate of the circumference is 3.14

Circumference is calculated by multiplying diameter and circle rate.

7 × 2 × 3.14 = 43.96
Answer: 43.96 m

4 Let's find the area of these figures below.

① 2.3 cm, 6.15 cm — 14.145 cm²

② 3.18 cm, 3.18 cm — 10. 1124cm²

③ 4.87 cm, 3.92 cm, parallelogram — 19.0904 cm²

Exercise

Let's calculate.

① 1.24 + 2.45 3.69
② 5.57 + 3.61 9.18
③ 2.66 + 4.54 7.2
④ 6.8 + 2.36 9.16
⑤ 8.75 − 3.52 5.23
⑥ 9.36 − 6.54 2.82
⑦ 7.24 − 4.35 2.89
⑧ 8.5 − 1.72 6.78
⑨ 2.3 × 1.2 2.76
⑩ 7.43 × 8.2 60.926
⑪ 3.8 × 2.94 11.172
⑫ 3.12 × 1.23 3.8376

50 = □ × □

Lesson Flow

1 Addition of decimal numbers.

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

T/S ① Read and understand the given situation.

S Make a mathematical expression and solve it by finding the total weight.

2 Subtraction of decimal numbers.

T/S ② Read and understand the given situation.

S Make a mathematical expression and solve it by finding the difference.

TN 850m has to be changed to 0.85 km to calculate.

3 Multiplication of decimal numbers.

T/S ③ Read and understand the given situation.

S Make a mathematical expression and solve the problem.

TN Confirm the formula for finding circumference of a circle (C = radius × 2 × 3.14)

4 ④ Find the area of figures ①, ② and ③.

S Find the area of each shape by applying the formula.

5 Complete the Exercise.

S Solve the selected Exercises.

T Confirm students' answers.

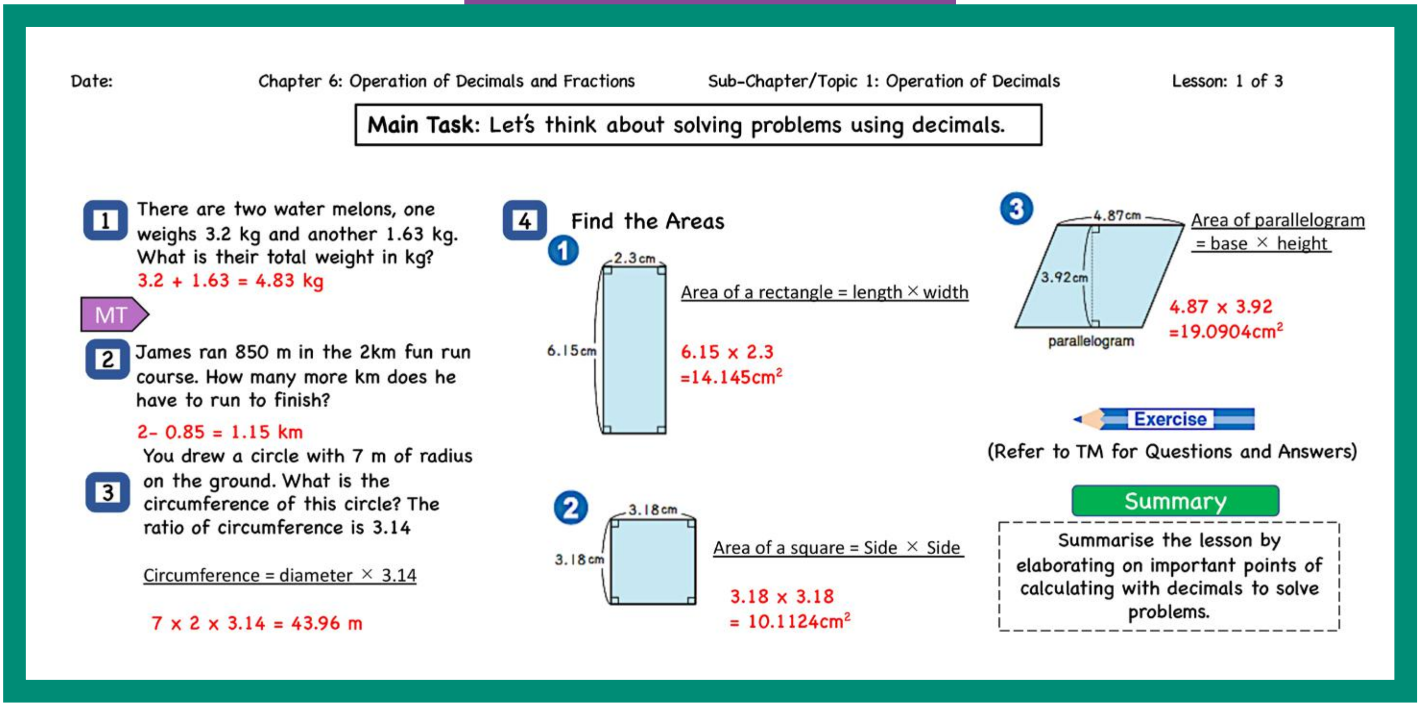
6 Summary

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 6: Operation of Decimals and Fractions Sub-Chapter/Topic 1: Operation of Decimals Lesson: 1 of 3

Main Task: Let's think about solving problems using decimals.

1 There are two water melons, one weighs 3.2 kg and another 1.63 kg. What is their total weight in kg?

3.2 + 1.63 = 4.83 kg

2 James ran 850 m in the 2km fun run course. How many more km does he have to run to finish?

2- 0.85 = 1.15 km

3 You drew a circle with 7 m of radius on the ground. What is the circumference of this circle? The ratio of circumference is 3.14

Circumference = diameter × 3.14

7 x 2 x 3.14 = 43.96 m

4 Find the Areas

① Area of a rectangle = length × width

6.15 x 2.3
=14.145cm^2

② Area of a square = Side × Side

3.18 x 3.18
= 10.1124cm^2

③ Area of parallelogram
= base × height

4.87 x 3.92
=19.0904cm^2

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson by elaborating on important points of calculating with decimals to solve problems.

Unit 6

Unit: Operation of Decimals and Fractions

Sub-unit: 1. Operation of Decimals

Lesson 2 of 3

Textbook Page : 051
Actual Lesson 040

Lesson Objective

- To solve problems of decimal numbers in daily life.

Prior Knowledge

- Calculation of decimal numbers using the 4 operations.

Preparation

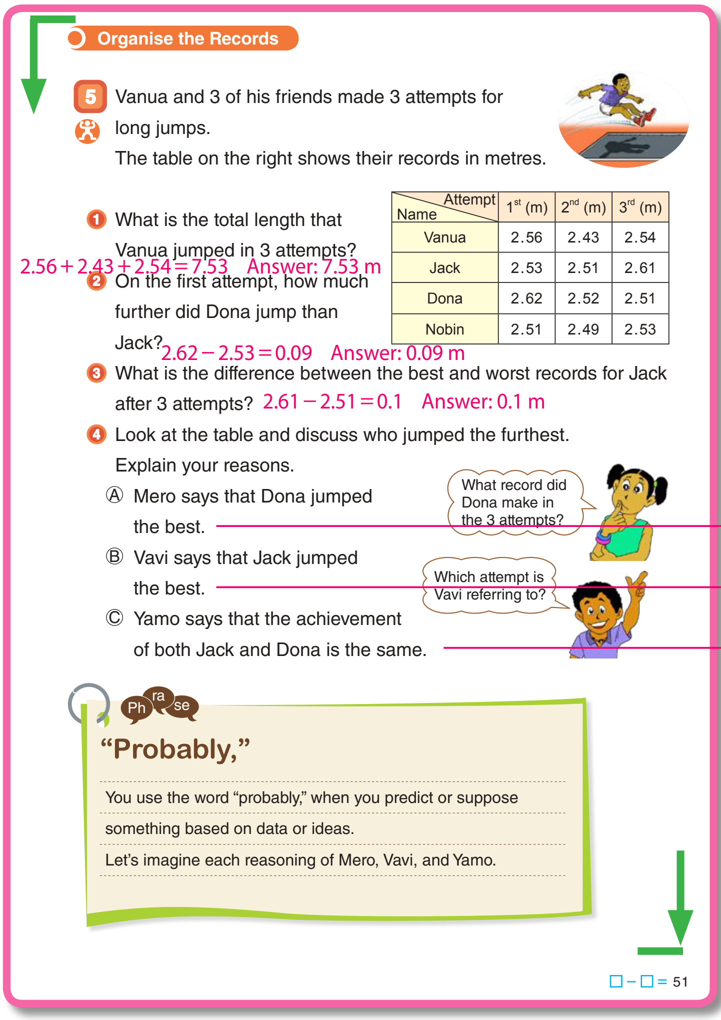
- Table of results.

Assessment

- Solve problems involving estimation and comparing using decimal numbers. F S

Teacher's Notes

While using the table, the students may have their different reasons for choosing certain answers.
Encourage students to use the word probably when predicting their answers. For example; Mero said that Dona jumped the best probably because he based his answer on the 1st attempt.



Organise the Records

5 Vanua and 3 of his friends made 3 attempts for long jumps.
The table on the right shows their records in metres.

Attempt / Name	1st (m)	2nd (m)	3rd (m)
Vanua	2.56	2.43	2.54
Jack	2.53	2.51	2.61
Dona	2.62	2.52	2.51
Nobin	2.51	2.49	2.53

① What is the total length that Vanua jumped in 3 attempts?
2.56 + 2.43 + 2.54 = 7.53 Answer: 7.53 m

② On the first attempt, how much further did Dona jump than Jack? 2.62 − 2.53 = 0.09 Answer: 0.09 m

③ What is the difference between the best and worst records for Jack after 3 attempts? 2.61 − 2.51 = 0.1 Answer: 0.1 m

④ Look at the table and discuss who jumped the furthest. Explain your reasons.

Ⓐ Mero says that Dona jumped the best.

Ⓑ Vavi says that Jack jumped the best.

Ⓒ Yamo says that the achievement of both Jack and Dona is the same.

What record did Dona make in the 3 attempts?
Which attempt is Vavi referring to?
Ph ra se

"Probably,"

You use the word "probably," when you predict or suppose something based on data or ideas.
Let's imagine each reasoning of Mero, Vavi, and Yamo.

□ − □ = 51

i. Probably Mero compared the first jumps.
ii. Probably he compared Dona and Vanua.
iii. Probably he compared Dona and Nobin.

i. Probably Vavi compared the 3rd attempts.
ii. Probably she compare Jack and Nobin's Jumps only.

i. Probably she compared their totals.
ii. Probably she compared Jack's 2nd attempt with Dona's 3rd attempt.

Lesson Flow

1 Review the previous lesson.

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

2 ⑤ Interpreting decimal records on a table.

T/S Read and understand the given situation.

TN Discuss with students about the table of records. Students should intepret the information in the table to write mathematical expressions.

S Make mathematical expressions and find the answers.

① $2.56+2.43+2.54=7.53$ 7.53 m

② $2.62-2.53=0.09$ 0.09 m

③ $2.61-2.51=0.1$ 0.1 m (Confirm that 0.10 is expressed as 0.1)

3 ④ Look at the table and discuss who jumped the furthest. Explain reasons.

T Allow the students to discuss the reason for Ⓐ, Ⓑ and Ⓒ

S Ⓐ Probably she jumped the furthest in her 1st attempt.

S Ⓑ Probably Vavi compared to his 3rd attempt.

S Ⓒ Probably their totals are the same.

TN Students' reasons may vary according to how they understand. Encourage them to use the word **probably** when they are not sure.

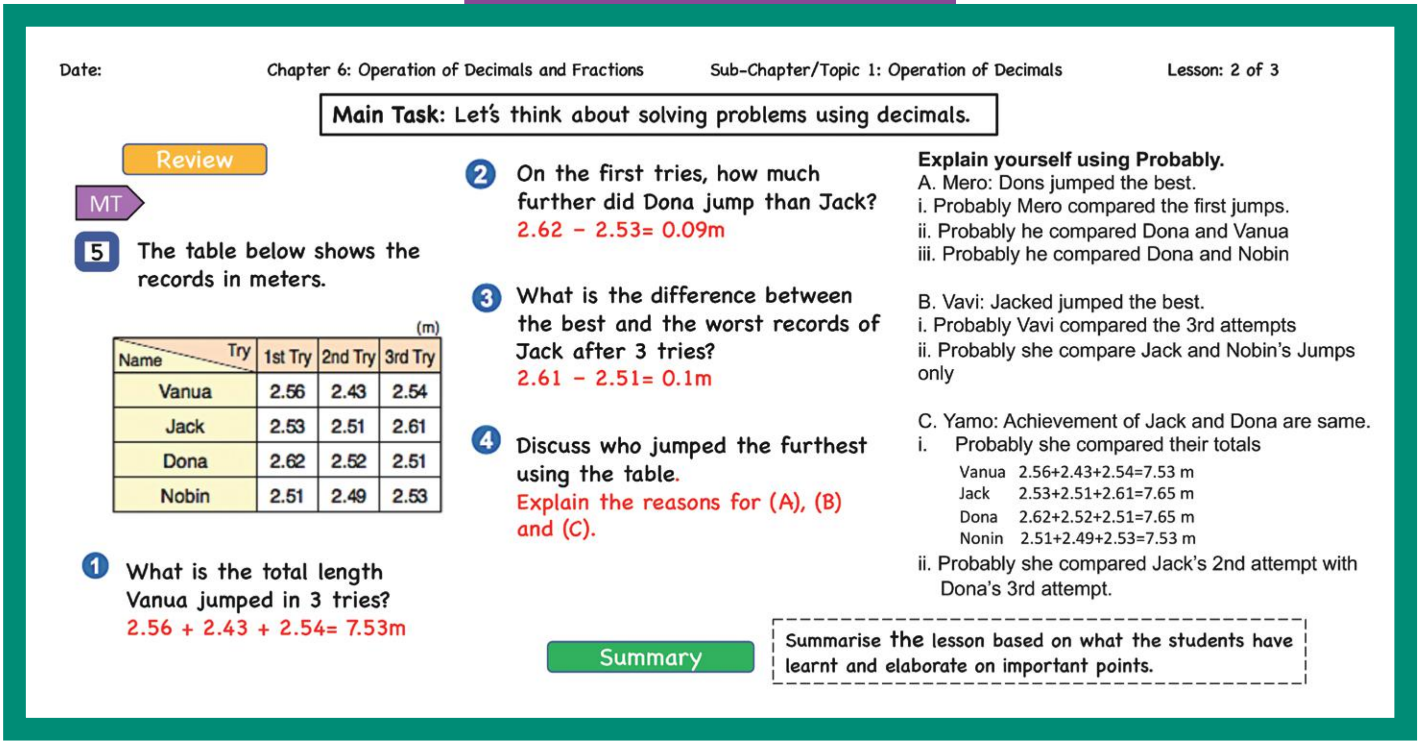
4 Summary

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: Operation of Decimals and Fractions Sub-Chapter/Topic 1: Operation of Decimals Lesson: 2 of 3

Main Task: Let's think about solving problems using decimals.

Review

MT

5 The table below shows the records in meters.

(m)

Name \ Try	1st Try	2nd Try	3rd Try
Vanua	2.56	2.43	2.54
Jack	2.53	2.51	2.61
Dona	2.62	2.52	2.51
Nobin	2.51	2.49	2.53

① What is the total length Vanua jumped in 3 tries?
2.56 + 2.43 + 2.54= 7.53m

② On the first tries, how much further did Dona jump than Jack?
2.62 – 2.53= 0.09m

③ What is the difference between the best and the worst records of Jack after 3 tries?
2.61 – 2.51= 0.1m

④ Discuss who jumped the furthest using the table.
Explain the reasons for (A), (B) and (C).

Explain yourself using Probably.

A. Mero: Dons jumped the best.
i. Probably Mero compared the first jumps.
ii. Probably he compared Dona and Vanua
iii. Probably he compared Dona and Nobin

B. Vavi: Jacked jumped the best.
i. Probably Vavi compared the 3rd attempts
ii. Probably she compare Jack and Nobin's Jumps only

C. Yamo: Achievement of Jack and Dona are same.
i. Probably she compared their totals

Vanua	2.56+2.43+2.54=7.53 m
Jack	2.53+2.51+2.61=7.65 m
Dona	2.62+2.52+2.51=7.65 m
Nonin	2.51+2.49+2.53=7.53 m

ii. Probably she compared Jack's 2nd attempt with Dona's 3rd attempt.

Summary

Summarise the lesson based on what the students have learnt and elaborate on important points.

Unit: Operation of Decimals and Fractions

Sub-unit: 1. Operation of Decimals

Lesson 3 of 3

Textbook Page : 052
Actual Lesson 041

Lesson Objective

- To solve various problems of decimal numbers.

Prior Knowledge

- Calculation of decimal numbers using the 4 operations.

Preparation

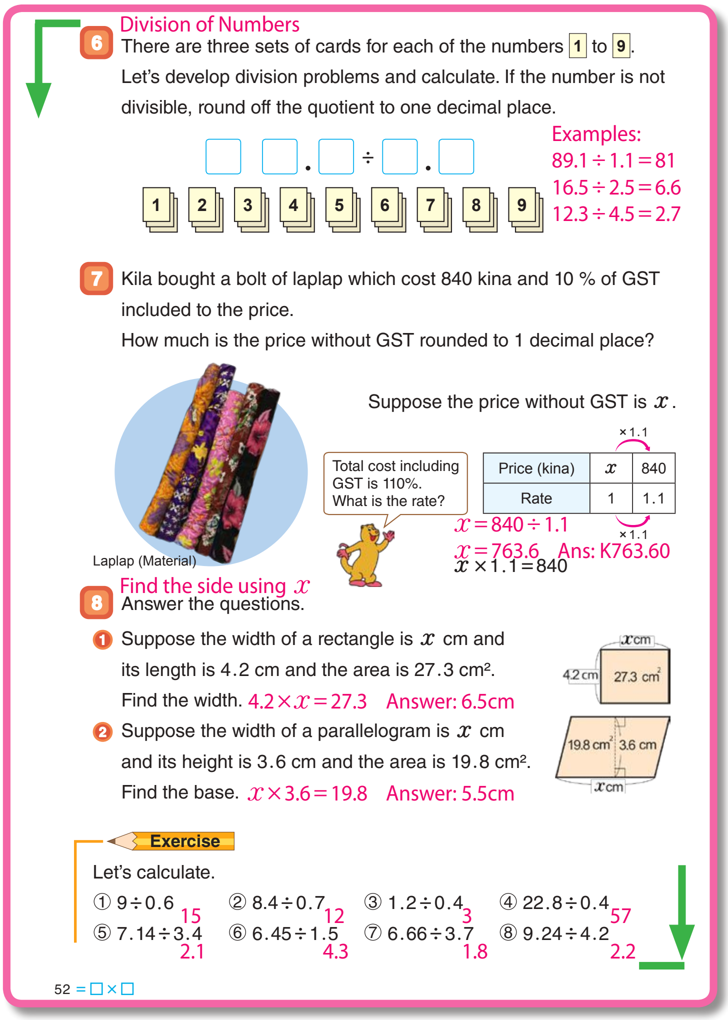
- 3 sets of numbered cards from 1 to 9.

Assessment

- Solve various problems concerning decimal numbers. F S

Teacher's Notes

6 is an ice breaking activity where the students pick any numbers from 1 to 9. They may use the same number 3 times to substitute into the divisional expression and find their answers.
7 is about calculation of 10% GST. The cost with GST is 840 kina. Students are asked to find the price without GST. Therefore, they use the table to establish the relationship with x to calculate the answer by finding the value of x.



Division of Numbers

6 There are three sets of cards for each of the numbers 1 to 9. Let's develop division problems and calculate. If the number is not divisible, round off the quotient to one decimal place.

$\square\ \square.\square \div \square.\square$

1 2 3 4 5 6 7 8 9

Examples:
$89.1 \div 1.1 = 81$
$16.5 \div 2.5 = 6.6$
$12.3 \div 4.5 = 2.7$

7 Kila bought a bolt of laplap which cost 840 kina and 10 % of GST included to the price.
How much is the price without GST rounded to 1 decimal place?

Laplap (Material)

Suppose the price without GST is x.

Total cost including GST is 110%. What is the rate?

Price (kina)	x	840
Rate	1	1.1

×1.1

$x = 840 \div 1.1$
$x = 763.6$ Ans: K763.60
$x \times 1.1 = 840$

Find the side using x

8 Answer the questions.

① Suppose the width of a rectangle is x cm and its length is 4.2 cm and the area is 27.3 cm². Find the width. $4.2 \times x = 27.3$ Answer: 6.5cm

② Suppose the width of a parallelogram is x cm and its height is 3.6 cm and the area is 19.8 cm². Find the base. $x \times 3.6 = 19.8$ Answer: 5.5cm

Exercise

Let's calculate.

① $9 \div 0.6$ 15
② $8.4 \div 0.7$ 12
③ $1.2 \div 0.4$ 3
④ $22.8 \div 0.4$ 57
⑤ $7.14 \div 3.4$ 2.1
⑥ $6.45 \div 1.5$ 4.3
⑦ $6.66 \div 3.7$ 1.8
⑧ $9.24 \div 4.2$ 2.2

52 = □ × □

Lesson Flow

1 Review the previous lesson.

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

2 Division of decimal numbers.

T/S 6 Read and understand the given situation.

T Ask students to make division problems of decimal numbers.

TN Allow students to use number cards from 1 to 9 to make division problems.
Remind them that each number can be used up to 3 times.

S Make any division problem using the number cards.

TN Examples: $81.1 \div 1.1$
$38.4 \div 1.2$

3 Solving problems involving decimal numbers by finding the value of x.

T/S 7 Read and understand the given situation.

T Allow students to discuss and make expressions.

S Make a mathematical sentence to find the value of x.

TN $x = 840 \div 1.1$
$x = 763.6363$
Rounded to: 763.6 (1 decimal place)
Answer: K763.60

4 8 Solve the area problems using decimal numbers.

T/S Read and understand the given situation.

T ① How can we find the width of the rectangle using the length and area?

S $4.2 \times x = 27.3$, $x = 6.5$
Answer: 6.5 cm

T ② How can we find the base of the parallelogram using the height and area?

S $x \times 3.6 = 19.8$
Answer: 5.5 cm

5 Complete the Exercise.

S Solve the Exercises.

T Confirm students' answers.

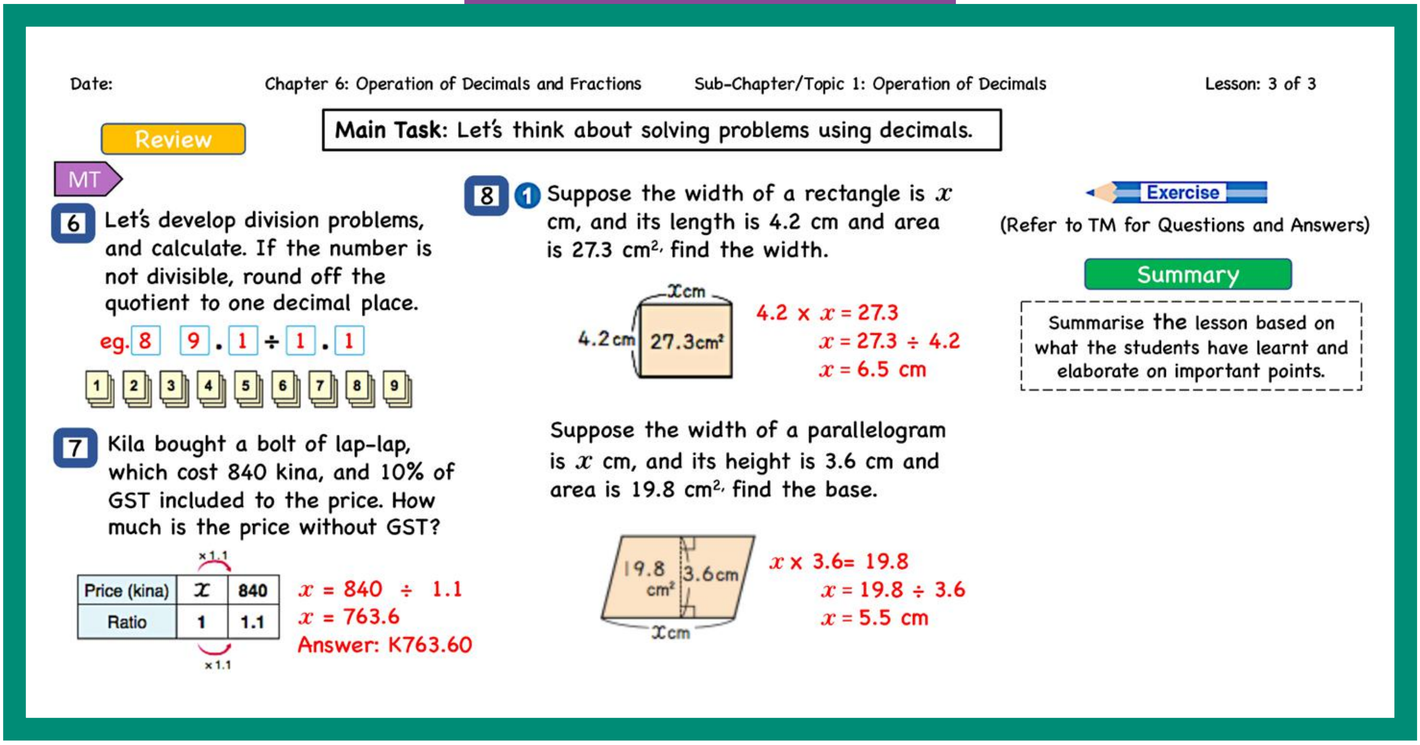
6 Summary

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 6: Operation of Decimals and Fractions Sub-Chapter/Topic 1: Operation of Decimals Lesson: 3 of 3

Main Task: Let's think about solving problems using decimals.

Review

MT

6 Let's develop division problems, and calculate. If the number is not divisible, round off the quotient to one decimal place.

eg. 8 9 . 1 ÷ 1 . 1

1 2 3 4 5 6 7 8 9

7 Kila bought a bolt of lap-lap, which cost 840 kina, and 10% of GST included to the price. How much is the price without GST?

Price (kina)	x	840
Ratio	1	1.1

×1.1
×1.1

$x = 840 \div 1.1$
$x = 763.6$
Answer: K763.60

8 ① Suppose the width of a rectangle is x cm, and its length is 4.2 cm and area is 27.3 cm^{2,} find the width.

$4.2 \times x = 27.3$
$x = 27.3 \div 4.2$
$x = 6.5$ cm

Suppose the width of a parallelogram is x cm, and its height is 3.6 cm and area is 19.8 cm^{2,} find the base.

$x \times 3.6 = 19.8$
$x = 19.8 \div 3.6$
$x = 5.5$ cm

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson based on what the students have learnt and elaborate on important points.

Unit 6

Unit: Operation of Decimals and Fractions

Sub-unit: 2. Operation of Fractions

Lesson 1 of 3

Textbook Page : 053
Actual Lesson 042

Sub-unit Objectives

- To solve various problems of fractions.
- To apply fraction problems to daily life.

Lesson Objective

- To solve various problems of fractions.

Prior Knowledge

- Calculation of fractios using the 4 operations.

Preparation

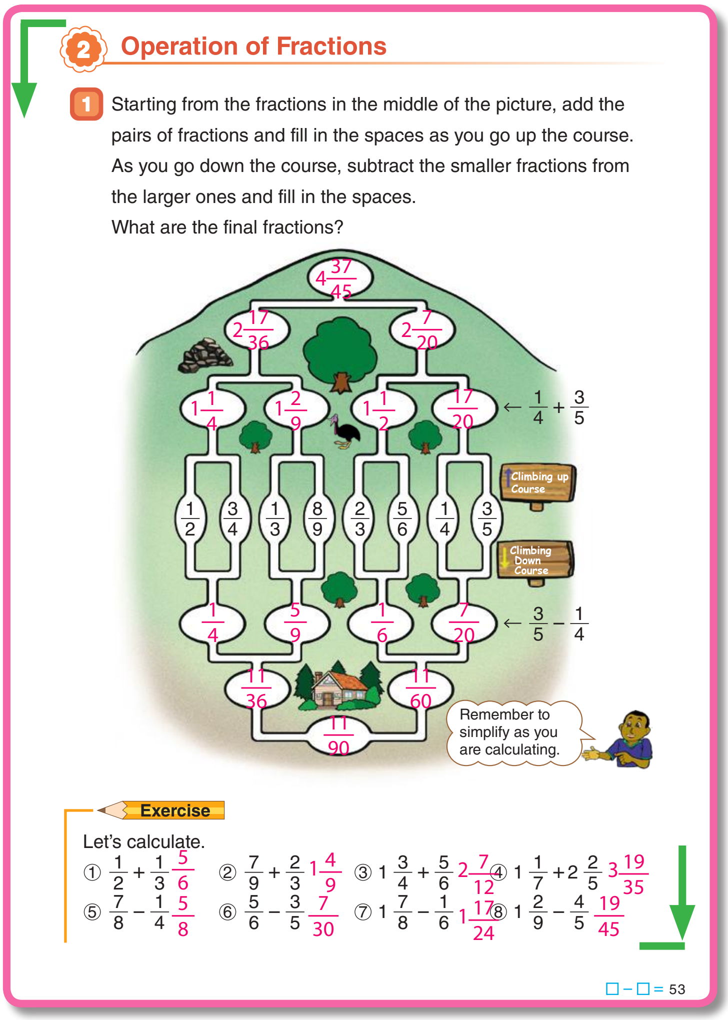
- Enlarged image of the course.

Assessment

- Solve problems by adding, subtracting and simplifying fractions. F
- Solve the exercises correctly. S

Teacher’s Notes

This activity is an interesting activity if students try to solve it as a competition and complete.
The students should use their prior knowledge and where possible they should try to simplify before calculating.
Let the children work together as a team or individually.



② Operation of Fractions

1 Starting from the fractions in the middle of the picture, add the pairs of fractions and fill in the spaces as you go up the course. As you go down the course, subtract the smaller fractions from the larger ones and fill in the spaces.
What are the final fractions?

Exercise

Let’s calculate.

① $\frac{1}{2}+\frac{1}{3}$ $\frac{5}{6}$ ② $\frac{7}{9}+\frac{2}{3}$ $1\frac{4}{9}$ ③ $1\frac{3}{4}+\frac{5}{6}$ $2\frac{7}{12}$ ④ $1\frac{1}{7}+2\frac{2}{5}$ $3\frac{19}{35}$

⑤ $\frac{7}{8}-\frac{1}{4}$ $\frac{5}{8}$ ⑥ $\frac{5}{6}-\frac{3}{5}$ $\frac{7}{30}$ ⑦ $1\frac{7}{8}-\frac{1}{6}$ $1\frac{17}{24}$ ⑧ $1\frac{2}{9}-\frac{4}{5}$ $\frac{19}{45}$

□ − □ = 53

Lesson Flow

1 Review the previous lesson.

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

2 ① Do addition of fraction for the climbing course.

T/S Read and understand the given situation.

S Do the addition of fractions with different denominators.

TN Treat this as a race where students try to complete the course as fast as they can and confirm the answer.

3 Do subtraction for the climbing down course.

T Concerning $\frac{1}{2}$ and $\frac{3}{4}$, how can we do the subtraction?

S Subtract smaller fraction from the larger fraction.

T Compare the two fractions and subtract from the larger fraction.

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

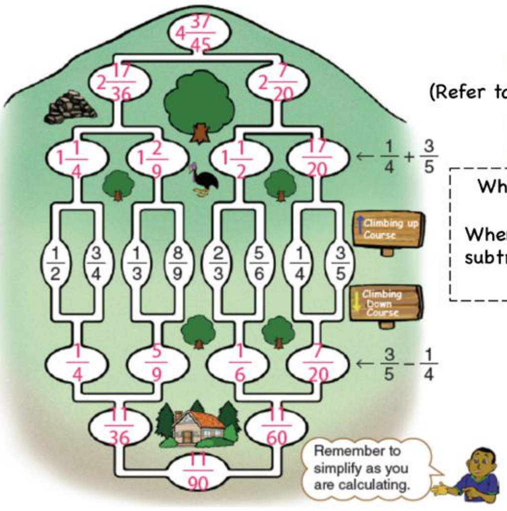
Date: Chapter 6: Operation of Decimals and Fractions. Sub-Chapter/Topic 2: Operation of Fractions Lesson: 1 of 3

Main Task: Let's think about adding and subtracting fractions.

Review

MT

① Starting from the fractions in the middle of the picture, as you go up the course, add the fractions. As you go down the course, subtract the smaller fractions from the larger ones. What are the final fractions?



Exercise

(Refer to TM for Questions and Answers)

Summary

When going up, we can add the pairs of fractions easily. When going down, we identify and subtract the smaller fraction from the larger one.

Unit 6

Unit: Operation of Decimals and Fractions

Sub-unit: 2. Operation of Fraction

Lesson 2 of 3

Textbook Page : 054
Actual Lesson 043

Lesson Objective

- To apply fractions to daily life.

Prior Knowledge

- Calculation of decimal numbers using the 4 operations.

Preparation

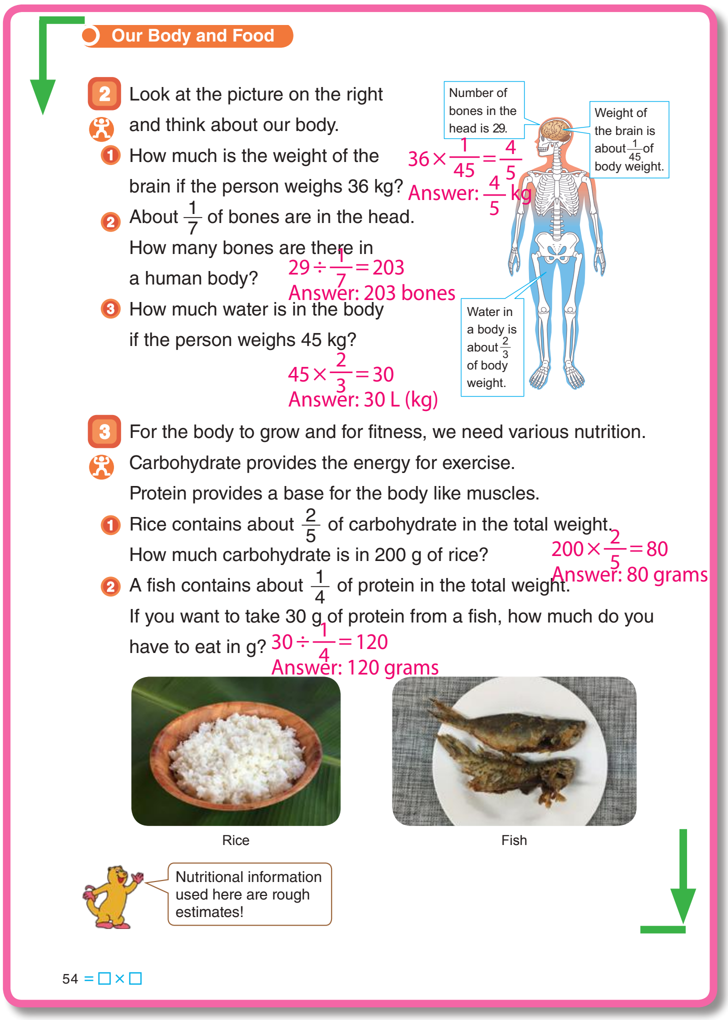
- Enlarged diagram of the skeleton

Assessment

- Solve various problems by multipying, dividing and simplifying fractions. F S

Teacher's Notes

The students will find the lessons interesting as it deals with their body.
They will also discover an interesting fact about their bones and that is, not all Human beings have 206 bones.
Some human beings may have about 203 bones or so.



Our Body and Food

2 Look at the picture on the right and think about our body.

① How much is the weight of the brain if the person weighs 36 kg? $36 \times \frac{1}{45} = \frac{4}{5}$ Answer: $\frac{4}{5}$ kg

② About $\frac{1}{7}$ of bones are in the head. How many bones are there in a human body? $29 \div \frac{1}{7} = 203$ Answer: 203 bones

③ How much water is in the body if the person weighs 45 kg? $45 \times \frac{2}{3} = 30$ Answer: 30 L (kg)

Number of bones in the head is 29.

Weight of the brain is about $\frac{1}{45}$ of body weight.

Water in a body is about $\frac{2}{3}$ of body weight.

3 For the body to grow and for fitness, we need various nutrition. Carbohydrate provides the energy for exercise. Protein provides a base for the body like muscles.

① Rice contains about $\frac{2}{5}$ of carbohydrate in the total weight. How much carbohydrate is in 200 g of rice? $200 \times \frac{2}{5} = 80$ Answer: 80 grams

② A fish contains about $\frac{1}{4}$ of protein in the total weight. If you want to take 30 g of protein from a fish, how much do you have to eat in g? $30 \div \frac{1}{4} = 120$ Answer: 120 grams

Rice

Fish

Nutritional information used here are rough estimates!

54 = □ × □

Lesson Flow

1 Review the previous lesson.

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

2 Multiplication and division of fractions in problems.

T/S ② Read and understand the given situation.
S ① Make a mathematical expression and answer the question.
T Remind students to answer the question in fractions and in decimals when necessary.
S ② Make a mathematical expression and answer the question.
S ③ Make a mathematical expression and answer the question.

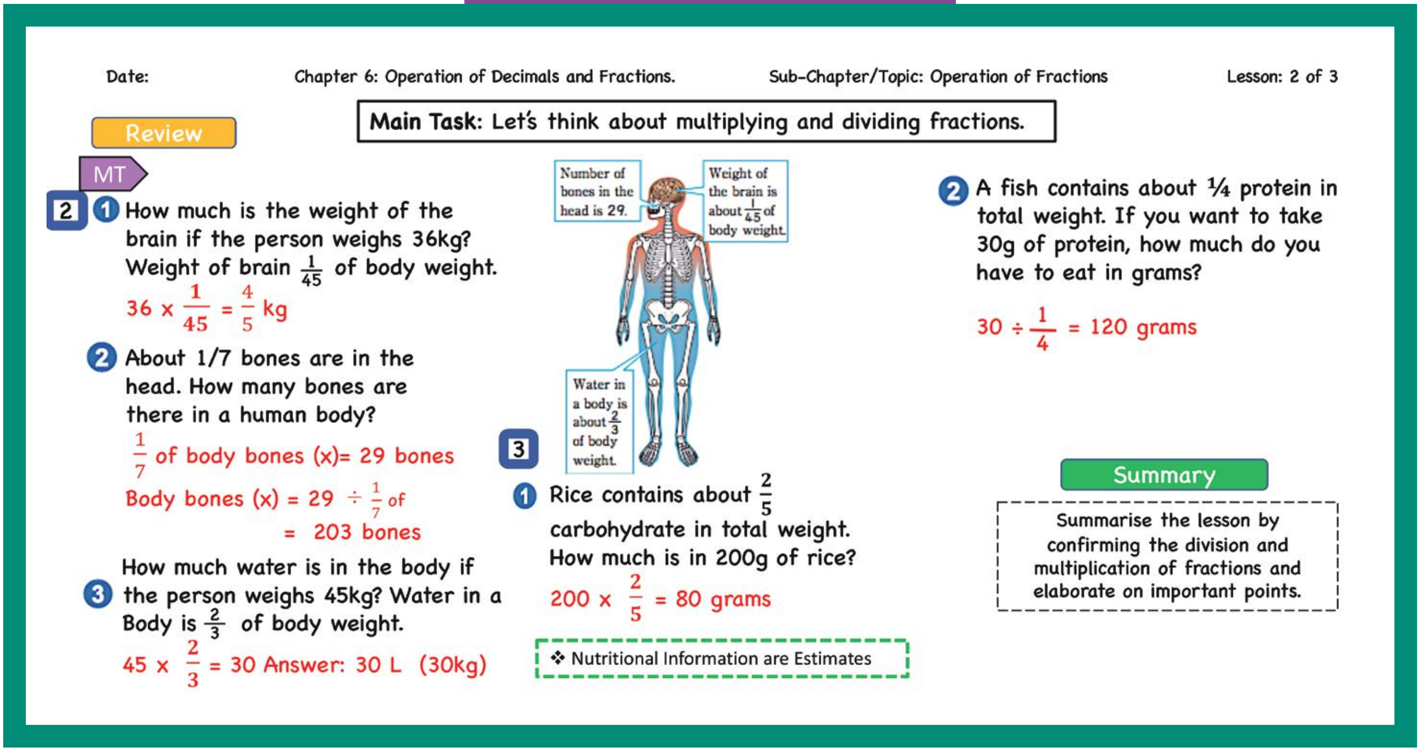
3 Multiplication and division of fractions in problems.

T/S ③ Read and understand the given given situation.
S ① Make a mathematical expression and answer the question.
T Remind students to answer the question in fractions and in decimals when necessary.
S ② Make a mathematical expression and answer the question.
TN Students should be aware of the weight composition of food which they eat every day.

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: Operation of Decimals and Fractions. Sub-Chapter/Topic: Operation of Fractions Lesson: 2 of 3

Main Task: Let's think about multiplying and dividing fractions.

Review

MT

2 ① How much is the weight of the brain if the person weighs 36kg? Weight of brain $\frac{1}{45}$ of body weight.

$36 \times \frac{1}{45} = \frac{4}{5}$ kg

② About 1/7 bones are in the head. How many bones are there in a human body?

$\frac{1}{7}$ of body bones (x)= 29 bones

Body bones (x) = 29 $\div \frac{1}{7}$ of

= 203 bones

③ How much water is in the body if the person weighs 45kg? Water in a Body is $\frac{2}{3}$ of body weight.

$45 \times \frac{2}{3} = 30$ Answer: 30 L (30kg)

Number of bones in the head is 29.

Weight of the brain is about $\frac{1}{45}$ of body weight.

Water in a body is about $\frac{2}{3}$ of body weight.

3 ① Rice contains about $\frac{2}{5}$ carbohydrate in total weight. How much is in 200g of rice?

$200 \times \frac{2}{5} = 80$ grams

❖ Nutritional Information are Estimates

② A fish contains about ¼ protein in total weight. If you want to take 30g of protein, how much do you have to eat in grams?

$30 \div \frac{1}{4} = 120$ grams

Summary

Summarise the lesson by confirming the division and multiplication of fractions and elaborate on important points.

Unit
6

Unit: Operation of Decimals and Fractions
Sub-unit: 2. Operation of Fraction
Lesson 3 of 3

Textbook Page : 055
Actual Lesson 044

Lesson Objective

- To calculate time and duration using fractions.

Prior Knowledge

- Knowledge of time and duration

Preparation

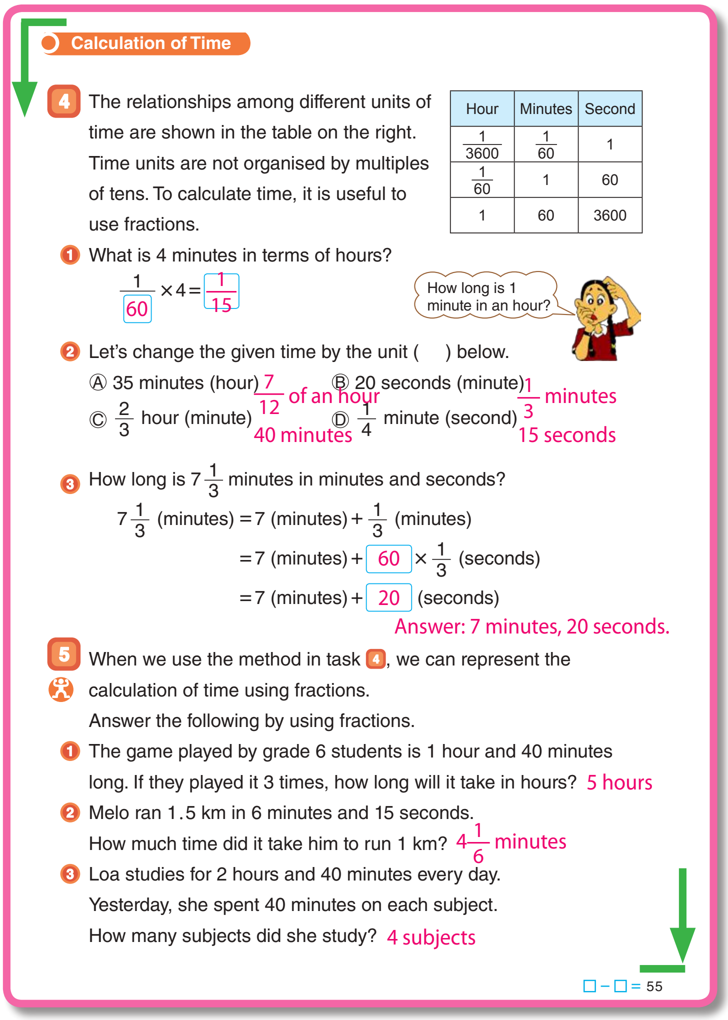
- Time conversion table.

Assessment

- Solve various fraction problems involving time and duration correctly. F S

Teacher's Notes

In this lesson, the emphasis of calculating time using fractions should be made clear to the students before solving the tasks.



Calculation of Time

4 The relationships among different units of time are shown in the table on the right. Time units are not organised by multiples of tens. To calculate time, it is useful to use fractions.

Hour	Minutes	Second
$\frac{1}{3600}$	$\frac{1}{60}$	1
$\frac{1}{60}$	1	60
1	60	3600

① What is 4 minutes in terms of hours?

$$\frac{1}{\boxed{60}} \times 4 = \boxed{\frac{1}{15}}$$

How long is 1 minute in an hour?

② Let's change the given time by the unit (   ) below.

Ⓐ 35 minutes (hour) $\frac{7}{12}$ of an hour
Ⓑ 20 seconds (minute) $\frac{1}{3}$ minutes
Ⓒ $\frac{2}{3}$ hour (minute) 40 minutes
Ⓓ $\frac{1}{4}$ minute (second) 15 seconds

③ How long is $7\frac{1}{3}$ minutes in minutes and seconds?

$$\begin{aligned} 7\tfrac{1}{3} \text{ (minutes)} &= 7 \text{ (minutes)} + \tfrac{1}{3} \text{ (minutes)} \\ &= 7 \text{ (minutes)} + \boxed{60} \times \tfrac{1}{3} \text{ (seconds)} \\ &= 7 \text{ (minutes)} + \boxed{20} \text{ (seconds)} \end{aligned}$$

Answer: 7 minutes, 20 seconds.

5 When we use the method in task **4**, we can represent the calculation of time using fractions.
Answer the following by using fractions.

① The game played by grade 6 students is 1 hour and 40 minutes long. If they played it 3 times, how long will it take in hours? 5 hours

② Melo ran 1.5 km in 6 minutes and 15 seconds.
How much time did it take him to run 1 km? $4\frac{1}{6}$ minutes

③ Loa studies for 2 hours and 40 minutes every day.
Yesterday, she spent 40 minutes on each subject.
How many subjects did she study? 4 subjects

□ − □ = 55

Lesson Flow

1 Review the previous lesson.

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

2 4 Relationship of the units of time.

T/S Read and understand the given situation.

T/S Discuss and make meaning out of the table.

T ① What is 4 minutes in seconds?

S Understand that 1 minute $= \frac{1}{60}$ hour, therefore the answer can be found using $4 \times \frac{1}{60}$.

3 Converting units of time using fractions.

T ② Let's change the given time by the unit in brackets.

S Solve using the information on the table.

Ⓐ $\frac{35}{60}$ hour is equal to $\frac{7}{12}$ hour.

Ⓑ $\frac{20}{60}$ minute is equal to $\frac{1}{3}$ minute.

Ⓒ 1 hour is 60 minutes,

so $\frac{2}{3}$ hour $= 60 \times \frac{2}{3} = 40$ minutes

Ⓓ 1 minute is 60 seconds,

so $\frac{1}{4}$ minute $= 60$ seconds $\times \frac{1}{4} = 15$ seconds

S ③ Express $7\frac{1}{3}$ minutes in minutes and seconds.

4 5 Solving problems using fractions to calculate time.

T Let students to solve activities ①, ② and ③ using the methods used in 4.

S ① Change 1 hour 40 minutes to fraction before calculating.

1 hour 40 minutes is equal to $1\frac{2}{3}$ minute.

② 6 minutes 15 seconds is equal to $6\frac{1}{4}$ minutes. Find a unit (1 hour) quantity.

③ 2 hours 40 minutes is equal to $2\frac{2}{3}$ hours. 40 minutes is equal to $\frac{2}{3}$ minutes.

Find a unit (1 hour) quantity.

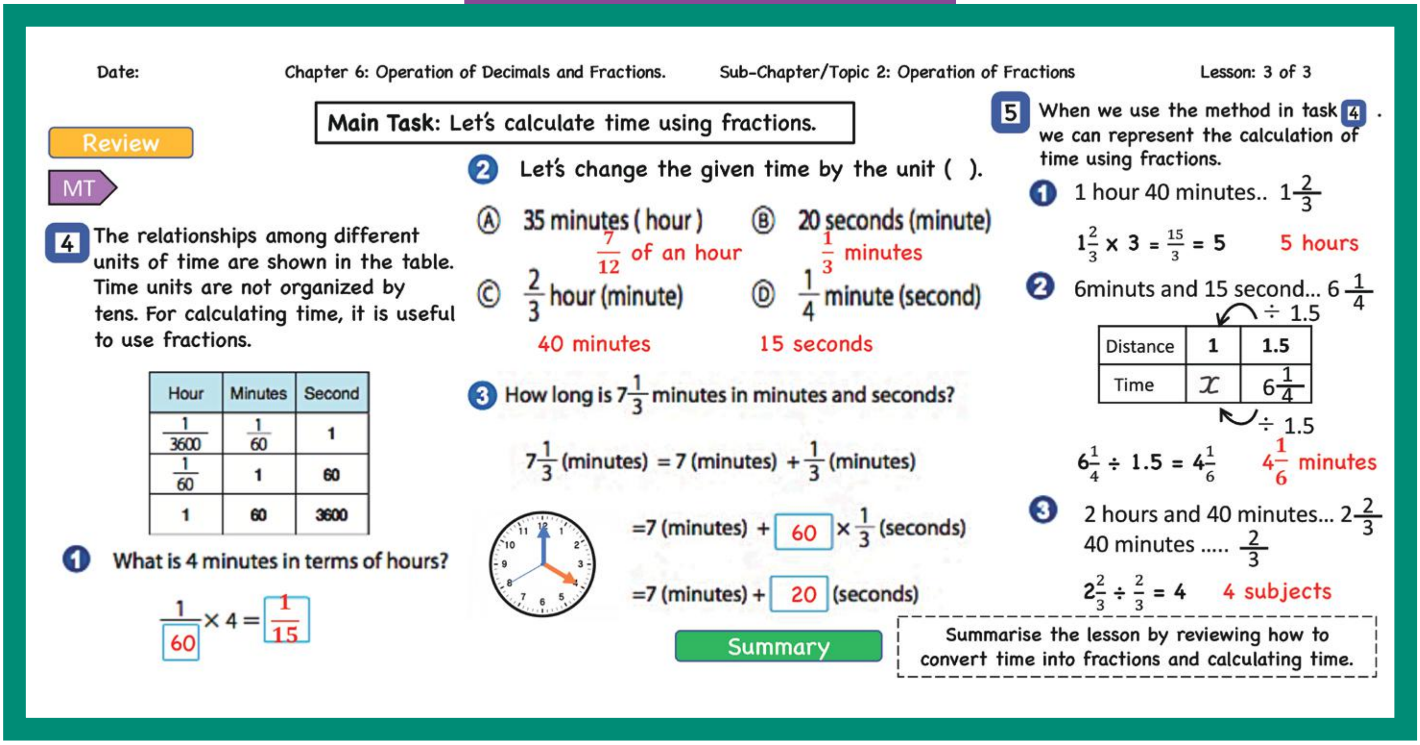
5 Summary

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: Operation of Decimals and Fractions. Sub-Chapter/Topic 2: Operation of Fractions Lesson: 3 of 3

Main Task: Let's calculate time using fractions.

Review

MT

4 The relationships among different units of time are shown in the table. Time units are not organized by tens. For calculating time, it is useful to use fractions.

Hour	Minutes	Second
$\frac{1}{3600}$	$\frac{1}{60}$	1
$\frac{1}{60}$	1	60
1	60	3600

① What is 4 minutes in terms of hours?

$\frac{1}{\boxed{60}} \times 4 = \boxed{\frac{1}{15}}$

② Let's change the given time by the unit ( ).

Ⓐ 35 minutes (hour) $\frac{7}{12}$ of an hour

Ⓑ 20 seconds (minute) $\frac{1}{3}$ minutes

Ⓒ $\frac{2}{3}$ hour (minute) 40 minutes

Ⓓ $\frac{1}{4}$ minute (second) 15 seconds

③ How long is $7\frac{1}{3}$ minutes in minutes and seconds?

$7\frac{1}{3}$ (minutes) $= 7$ (minutes) $+ \frac{1}{3}$ (minutes)

$= 7$ (minutes) $+ \boxed{60} \times \frac{1}{3}$ (seconds)

$= 7$ (minutes) $+ \boxed{20}$ (seconds)

Summary

5 When we use the method in task 4 . we can represent the calculation of time using fractions.

① 1 hour 40 minutes.. $1\frac{2}{3}$

$1\frac{2}{3} \times 3 = \frac{15}{3} = 5$ 5 hours

② 6minuts and 15 second... $6\frac{1}{4}$

÷ 1.5

Distance	1	1.5
Time	x	$6\frac{1}{4}$

÷ 1.5

$6\frac{1}{4} \div 1.5 = 4\frac{1}{6}$ $4\frac{1}{6}$ minutes

③ 2 hours and 40 minutes... $2\frac{2}{3}$
40 minutes ..... $\frac{2}{3}$

$2\frac{2}{3} \div \frac{2}{3} = 4$ 4 subjects

Summarise the lesson by reviewing how to convert time into fractions and calculating time.

Unit 6

Unit: Operation of Decimals and Fractions
Sub-unit: 3. Operation of Decimals and Fractions
Lesson 1 of 1

Textbook Page : 056 and 057
Actual Lesson 045

Sub-unit Objective

- To calculate mixed decimal numbers and fraction using the 4 operations.

Lesson Objective

- To understand how to calculate addition and subtraction of decimal numbers and fractions.

Prior Knowledge

- Calculation of decimal numbers and fractions using the 4 operations.

Preparation

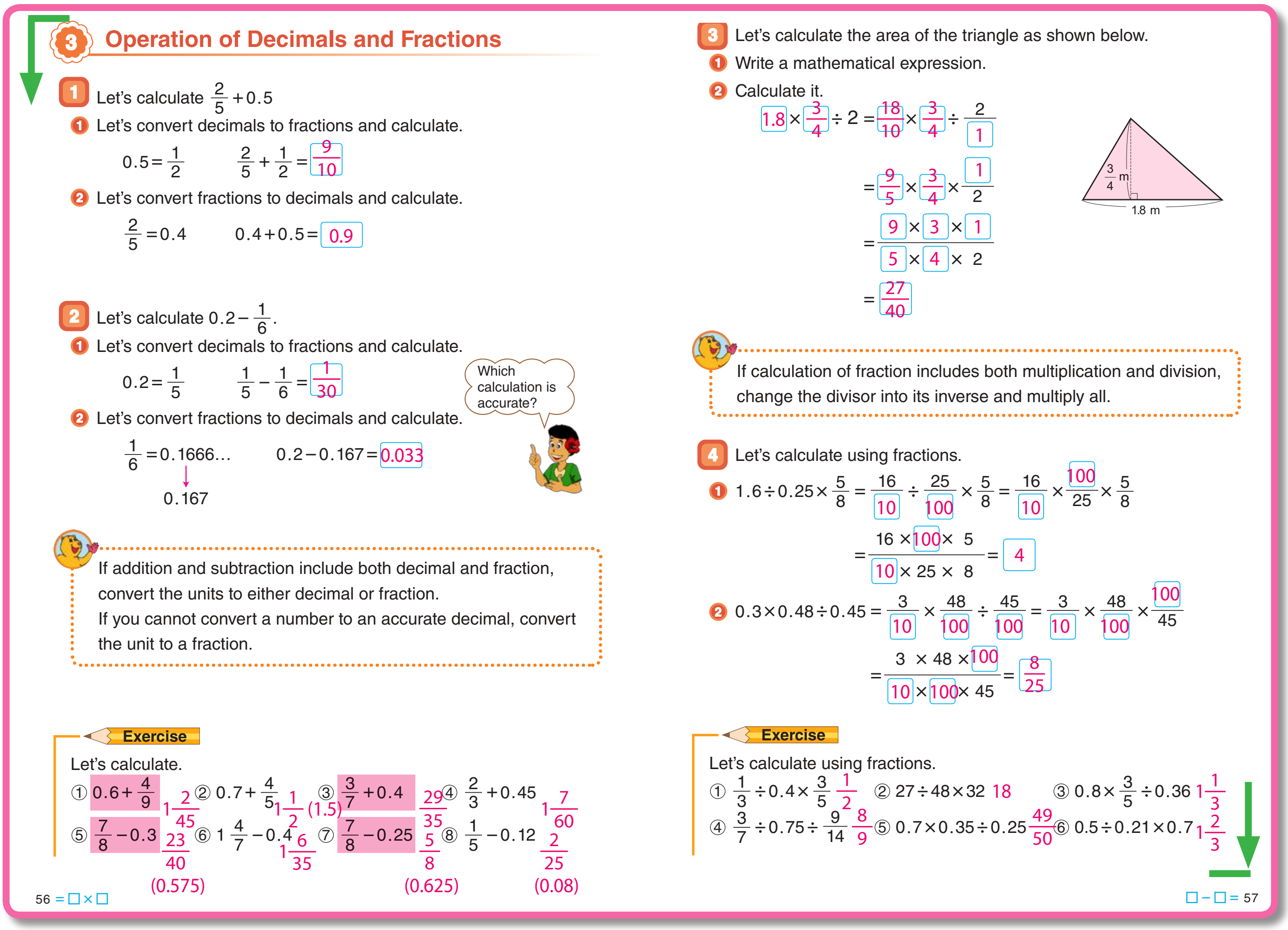
- Prepare answers for the tasks.

Assessment

- Think about how to calculate addition and subtraction of mixed decimal numbers and fraction. **F**
- Think about how to calculate multiplication and division of mixed decimal numbers and fraction. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

- When addition and subtraction include a decimals and fractions or vice versa, convert one of the unit either to a fraction or a decimal to make it easy to add or subtract.
- If you cannot convert a number to an accurte decimal, convert to a fraction for an accurate calculation.
- When the calculation includes both multiplication and division, convert the decimals to fractions and change the divisor to its inverse and multiply.



③ Operation of Decimals and Fractions

1 Let's calculate $\frac{2}{5}+0.5$

① Let's convert decimals to fractions and calculate.

$0.5=\frac{1}{2}$ $\quad \frac{2}{5}+\frac{1}{2}=\boxed{\frac{9}{10}}$

② Let's convert fractions to decimals and calculate.

$\frac{2}{5}=0.4$ $\quad 0.4+0.5=\boxed{0.9}$

2 Let's calculate $0.2-\frac{1}{6}$.

① Let's convert decimals to fractions and calculate.

$0.2=\frac{1}{5}$ $\quad \frac{1}{5}-\frac{1}{6}=\boxed{\frac{1}{30}}$

② Let's convert fractions to decimals and calculate.

$\frac{1}{6}=0.1666\ldots \downarrow 0.167$ $\quad 0.2-0.167=\boxed{0.033}$

Which calculation is accurate?

If addition and subtraction include both decimal and fraction, convert the units to either decimal or fraction.
If you cannot convert a number to an accurate decimal, convert the unit to a fraction.

Exercise

Let's calculate.

① $0.6+\frac{4}{9}$ $1\frac{2}{45}$ ② $0.7+\frac{4}{5}$ $1\frac{1}{2}$ (1.5) ③ $\frac{3}{7}+0.4$ $\frac{29}{35}$ ④ $\frac{2}{3}+0.45$ $1\frac{7}{60}$

⑤ $\frac{7}{8}-0.3$ $\frac{23}{40}$ (0.575) ⑥ $1\frac{4}{7}-0.4$ $1\frac{6}{35}$ ⑦ $\frac{7}{8}-0.25$ $\frac{5}{8}$ (0.625) ⑧ $\frac{1}{5}-0.12$ $\frac{2}{25}$ (0.08)

56 = □ × □

3 Let's calculate the area of the triangle as shown below.

① Write a mathematical expression.

② Calculate it.

$$\boxed{1.8}\times\boxed{\frac{3}{4}}\div 2=\boxed{\frac{18}{10}}\times\boxed{\frac{3}{4}}\div\frac{2}{\boxed{1}}$$
$$=\boxed{\frac{9}{5}}\times\boxed{\frac{3}{4}}\times\frac{\boxed{1}}{2}$$
$$=\frac{\boxed{9}\times\boxed{3}\times\boxed{1}}{\boxed{5}\times\boxed{4}\times 2}$$
$$=\boxed{\frac{27}{40}}$$

$\frac{3}{4}$ m

1.8 m

If calculation of fraction includes both multiplication and division, change the divisor into its inverse and multiply all.

4 Let's calculate using fractions.

① $1.6\div0.25\times\frac{5}{8}=\frac{16}{\boxed{10}}\div\frac{25}{\boxed{100}}\times\frac{5}{8}=\frac{16}{\boxed{10}}\times\frac{\boxed{100}}{25}\times\frac{5}{8}$

$$=\frac{16\times\boxed{100}\times 5}{\boxed{10}\times 25\times 8}=\boxed{4}$$

② $0.3\times0.48\div0.45=\frac{3}{\boxed{10}}\times\frac{48}{\boxed{100}}\div\frac{45}{\boxed{100}}=\frac{3}{\boxed{10}}\times\frac{48}{\boxed{100}}\times\frac{\boxed{100}}{45}$

$$=\frac{3\times 48\times\boxed{100}}{\boxed{10}\times\boxed{100}\times 45}=\boxed{\frac{8}{25}}$$

Exercise

Let's calculate using fractions.

① $\frac{1}{3}\div0.4\times\frac{3}{5}$ $\frac{1}{2}$ ② $27\div48\times32$ 18 ③ $0.8\times\frac{3}{5}\div0.36$ $1\frac{1}{3}$

④ $\frac{3}{7}\div0.75\div\frac{9}{14}$ $\frac{8}{9}$ ⑤ $0.7\times0.35\div0.25$ $\frac{49}{50}$ ⑥ $0.5\div0.21\times0.7$ $1\frac{2}{3}$

□ − □ = 57

Lesson Flow

1 Review the previous lesson.

2 $\boxed{1}$ Think about how to calculate $\frac{2}{5}+0.5$

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

T Let the students think about how to solve the expression.

S Change fraction to decimal number or decimal number to fraction.

S ① Confirm that $0.5=\frac{1}{2}$ $\frac{2}{5}+\frac{1}{2}=\frac{9}{10}$

S ② Confirm that $\frac{2}{5}=0.4$. $0.5+0.4=0.9$

3 $\boxed{2}$ Think about how to calculate $0.2-\frac{1}{6}$.

S ① Change 0.2 to fraction and calculate

S ② Change $\frac{1}{6}$ to decimal number to calculate. But, $\frac{1}{6}$ is not divisible so it has to be rounded up to the thousandths place.

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 $\boxed{3}$ Find the area of triangle.

T What is the mathematical expression?

S $1.8\times\frac{3}{4}\div2$

T How are we going to calculate?

S Change 1.8 to fraction.

7 Important Point

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

8 $\boxed{4}$ Solve various calculation using inverse fractions.

T Let students notice that in ① ②, calculating by fraction using inverse number is easier than calculating by decimals.

9 Complete the Exercis.

S Solve the Exercises.

T Confirm students' answers.

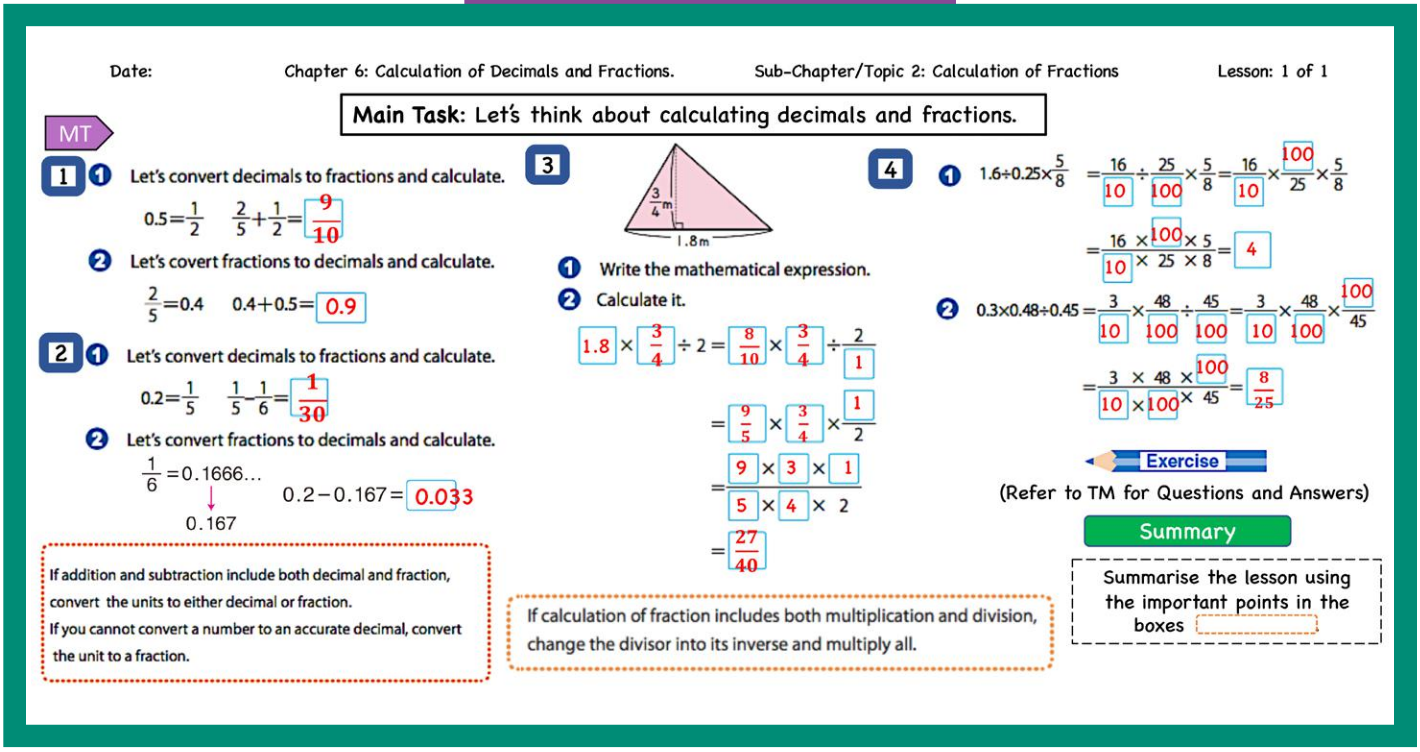
10 Summary

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: Calculation of Decimals and Fractions. Sub-Chapter/Topic 2: Calculation of Fractions Lesson: 1 of 1

Main Task: Let's think about calculating decimals and fractions.

MT

1 ① Let's convert decimals to fractions and calculate.

$0.5=\frac{1}{2}$ $\frac{2}{5}+\frac{1}{2}=\boxed{\frac{9}{10}}$

② Let's covert fractions to decimals and calculate.

$\frac{2}{5}=0.4$ $0.4+0.5=\boxed{0.9}$

2 ① Let's convert decimals to fractions and calculate.

$0.2=\frac{1}{5}$ $\frac{1}{5}-\frac{1}{6}=\boxed{\frac{1}{30}}$

② Let's convert fractions to decimals and calculate.

$\frac{1}{6}=0.1666\ldots \downarrow 0.167$ $0.2-0.167=\boxed{0.033}$

If addition and subtraction include both decimal and fraction, convert the units to either decimal or fraction.
If you cannot convert a number to an accurate decimal, convert the unit to a fraction.

3

$\frac{3}{4}$m

1.8m

① Write the mathematical expression.

② Calculate it.

$$\boxed{1.8}\times\boxed{\frac{3}{4}}\div2=\boxed{\frac{8}{10}}\times\boxed{\frac{3}{4}}\div\frac{2}{\boxed{1}}$$
$$=\boxed{\frac{9}{5}}\times\boxed{\frac{3}{4}}\times\frac{\boxed{1}}{2}$$
$$=\frac{\boxed{9}\times\boxed{3}\times\boxed{1}}{\boxed{5}\times\boxed{4}\times2}$$
$$=\boxed{\frac{27}{40}}$$

If calculation of fraction includes both multiplication and division, change the divisor into its inverse and multiply all.

4 ① $1.6\div0.25\times\frac{5}{8}=\frac{16}{\boxed{10}}\div\frac{25}{\boxed{100}}\times\frac{5}{8}=\frac{16}{\boxed{10}}\times\frac{\boxed{100}}{25}\times\frac{5}{8}$

$=\frac{16\times\boxed{100}\times5}{\boxed{10}\times25\times8}=\boxed{4}$

② $0.3\times0.48\div0.45=\frac{3}{\boxed{10}}\times\frac{48}{\boxed{100}}\div\frac{45}{\boxed{100}}=\frac{3}{\boxed{10}}\times\frac{48}{\boxed{100}}\times\frac{\boxed{100}}{45}$

$=\frac{3\times48\times\boxed{100}}{\boxed{10}\times\boxed{100}\times45}=\boxed{\frac{8}{25}}$

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson using the important points in the boxes ⬚.

Unit 6

Unit: Operation of Decimals and Fractions

Exercises and Evaluation

Lesson 1 and 2 of 2

Textbook Page : 058
Actual Lesson 46 &47

Lesson Objective

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

Prior Knowledge

- All the contents learned in the unit.

Preparation

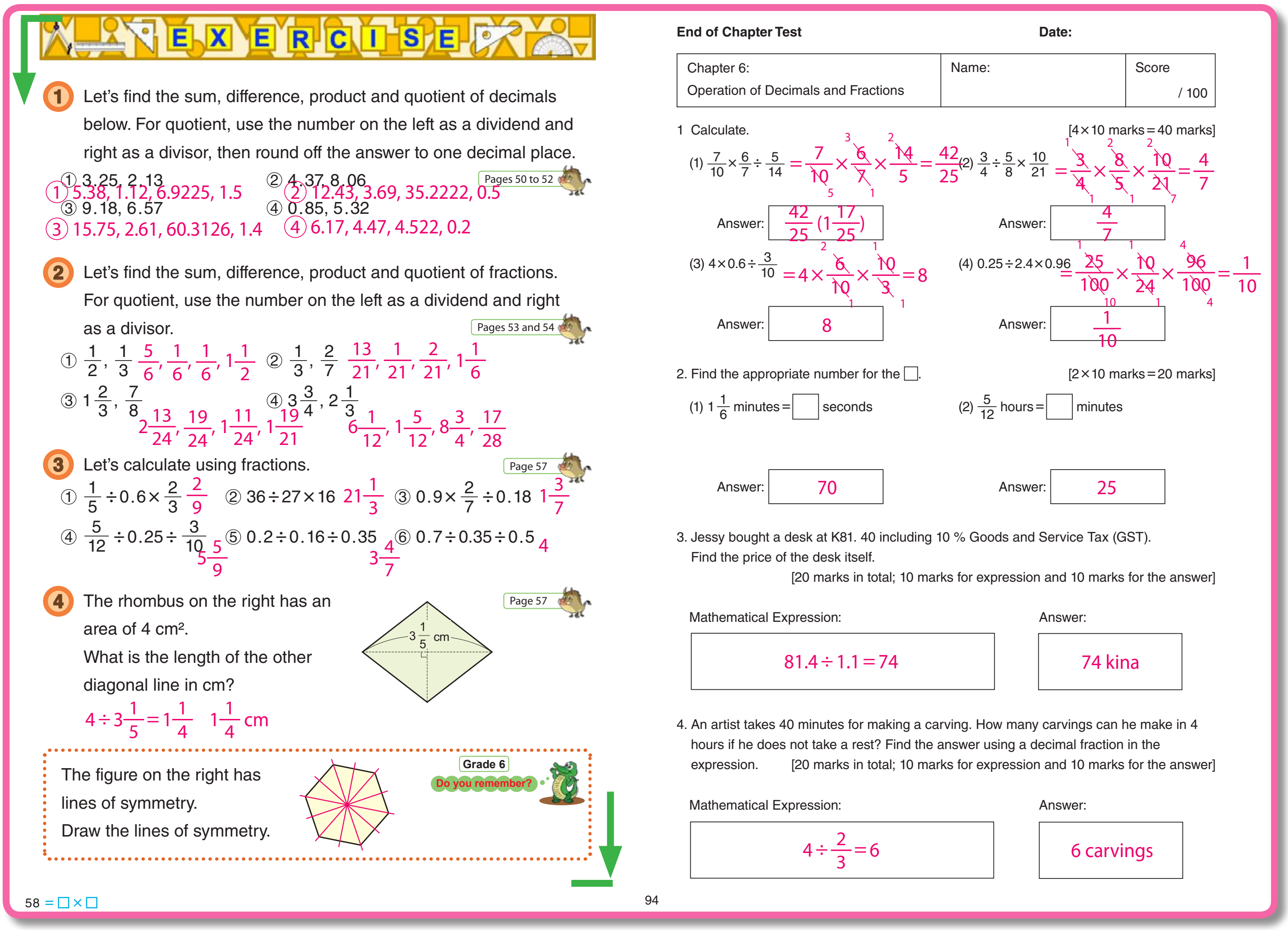
- Evaluation Test.

Assessment

- Solve the exercises correctly. F 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 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, problems and review as a seperate lesson.



EXERCISE

① Let's find the sum, difference, product and quotient of decimals below. For quotient, use the number on the left as a dividend and right as a divisor, then round off the answer to one decimal place.

Pages 50 to 52

① 3.25, 2.13　② 4.37, 8.06
① 5.38, 1.12, 6.9225, 1.5　② 12.43, 3.69, 35.2222, 0.5
③ 9.18, 6.57　④ 0.85, 5.32
③ 15.75, 2.61, 60.3126, 1.4　④ 6.17, 4.47, 4.522, 0.2

② Let's find the sum, difference, product and quotient of fractions. For quotient, use the number on the left as a dividend and right as a divisor.

Pages 53 and 54

① $\frac{1}{2}, \frac{1}{3}$　$\frac{5}{6}, \frac{1}{6}, \frac{1}{6}, 1\frac{1}{2}$　② $\frac{1}{3}, \frac{2}{7}$　$\frac{13}{21}, \frac{1}{21}, \frac{2}{21}, 1\frac{1}{6}$

③ $1\frac{2}{3}, \frac{7}{8}$　$2\frac{13}{24}, \frac{19}{24}, 1\frac{11}{24}, 1\frac{19}{21}$　④ $3\frac{3}{4}, 2\frac{1}{3}$　$6\frac{1}{12}, 1\frac{5}{12}, 8\frac{3}{4}, \frac{17}{28}$

③ Let's calculate using fractions.

Page 57

① $\frac{1}{5}\div0.6\times\frac{2}{3}$　$\frac{2}{9}$　② $36\div27\times16$　$21\frac{1}{3}$　③ $0.9\times\frac{2}{7}\div0.18$　$1\frac{3}{7}$

④ $\frac{5}{12}\div0.25\div\frac{3}{10}$　$5\frac{5}{9}$　⑤ $0.2\div0.16\div0.35$　$3\frac{4}{7}$　⑥ $0.7\div0.35\div0.5$　4

④ The rhombus on the right has an area of 4 cm².
What is the length of the other diagonal line in cm?

Page 57

$3\frac{1}{5}$ cm

$4\div3\frac{1}{5}=1\frac{1}{4}$　$1\frac{1}{4}$ cm

The figure on the right has lines of symmetry.
Draw the lines of symmetry.

Grade 6
Do you remember?

58 = □×□

End of Chapter Test　　**Date:**

Chapter 6: Operation of Decimals and Fractions	Name:	Score / 100

1 Calculate.　[4×10 marks = 40 marks]

(1) $\frac{7}{10}\times\frac{6}{7}\div\frac{5}{14}=\frac{7}{\underset{5}{\cancel{10}}}\times\frac{\overset{3}{\cancel{6}}}{\underset{1}{\cancel{7}}}\times\frac{\overset{2}{\cancel{14}}}{5}=\frac{42}{25}$

Answer: $\frac{42}{25}\ (1\frac{17}{25})$

(2) $\frac{3}{4}\div\frac{5}{8}\times\frac{10}{21}=\frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{4}}}\times\frac{\overset{2}{\cancel{8}}}{\underset{1}{\cancel{5}}}\times\frac{\overset{2}{\cancel{10}}}{\underset{7}{\cancel{21}}}=\frac{4}{7}$

Answer: $\frac{4}{7}$

(3) $4\times0.6\div\frac{3}{10}=4\times\frac{\overset{2}{\cancel{6}}}{\underset{1}{\cancel{10}}}\times\frac{\overset{1}{\cancel{10}}}{\underset{1}{\cancel{3}}}=8$

Answer: 8

(4) $0.25\div2.4\times0.96=\frac{\overset{1}{\cancel{25}}}{\underset{10}{\cancel{100}}}\times\frac{\overset{1}{\cancel{10}}}{\underset{1}{\cancel{24}}}\times\frac{\overset{4}{\cancel{96}}}{\underset{4}{\cancel{100}}}=\frac{1}{10}$

Answer: $\frac{1}{10}$

2. Find the appropriate number for the □.　[2×10 marks = 20 marks]

(1) $1\frac{1}{6}$ minutes = □ seconds　Answer: 70

(2) $\frac{5}{12}$ hours = □ minutes　Answer: 25

3. Jessy bought a desk at K81. 40 including 10 % Goods and Service Tax (GST).
Find the price of the desk itself.
[20 marks in total; 10 marks for expression and 10 marks for the answer]

Mathematical Expression: $81.4\div1.1=74$

Answer: 74 kina

4. An artist takes 40 minutes for making a carving. How many carvings can he make in 4 hours if he does not take a rest? Find the answer using a decimal fraction in the expression.　[20 marks in total; 10 marks for expression and 10 marks for the answer]

Mathematical Expression: $4\div\frac{2}{3}=6$

Answer: 6 carvings

94

Lesson Flow

1 Complete Exercise ① ① to ④.

S Read the Questions and find the sum, difference, product, and quotient of the decimal numbers.

T Confirm students' answers.

2 Complete Exercise ② ① to ④.

S Read the Question and find the sum, difference, product and quotient of fractions.

T Confirm students' answers.

3 Complete Exercise ③ ① to ⑥.

S Calculate the problems using fractions.

T Confirm students' answers.

4 Complete Exercise ④.

S Solve the problem by finding the length of the other diagonal line in the Rhombus.

T Confirm students' answers.

5 Complete the Do You Remember excercise.

S Draw lines of symmetry for the given figure.

6 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 6: Operation of Decimals and Fractions	Name:	Score / 100

1 Calculate. [4×10 marks = 40 marks]

(1) $\frac{7}{10} \times \frac{6}{7} \div \frac{5}{14}$

Answer:

(2) $\frac{3}{4} \div \frac{5}{8} \times \frac{10}{21}$

Answer:

(3) $4 \times 0.6 \div \frac{3}{10}$

Answer:

(4) $0.25 \div 2.4 \times 0.96$

Answer:

2. Find the appropriate number for the □. [2×10 marks = 20 marks]

(1) $1\frac{1}{6}$ minutes = □ seconds

Answer:

(2) $\frac{5}{12}$ hours = □ minutes

Answer:

3. Jessy bought a desk at K81. 40 including 10 % Goods and Service Tax (GST).
Find the price of the desk itself.
[20 marks in total; 10 marks for expression and 10 marks for the answer]

Mathematical Expression:

Answer:

4. An artist takes 40 minutes for making a carving. How many carvings can he make in 4 hours if he does not take a rest? Find the answer using a decimal fraction in the expression. [20 marks in total; 10 marks for expression and 10 marks for the answer]

Mathematical Expression:

Answer:

Chapter 7 Calculating the Area of Various Figures

1. Content Standard

6. 2. 1. Students will be able to explore the area of various shapes such as a circle and measure their area and attain expected level of proficiency and appreciation power of the formula.

2. Unit Objectives

- To determine the area of geometrical figures by calculation.
- To determine the area of circle by transforming it into another basic shape with the same area.
- To estimate the area of figures in their surroundings by approximating them with familiar geometrical figures.

3. Teaching Overview

In Grade 3, students learn circles and their centres, diametres and radii.
In Grade 5, they learn circumference and the rate of circumference to its diameter.
In this unit, they learn areas of circles.

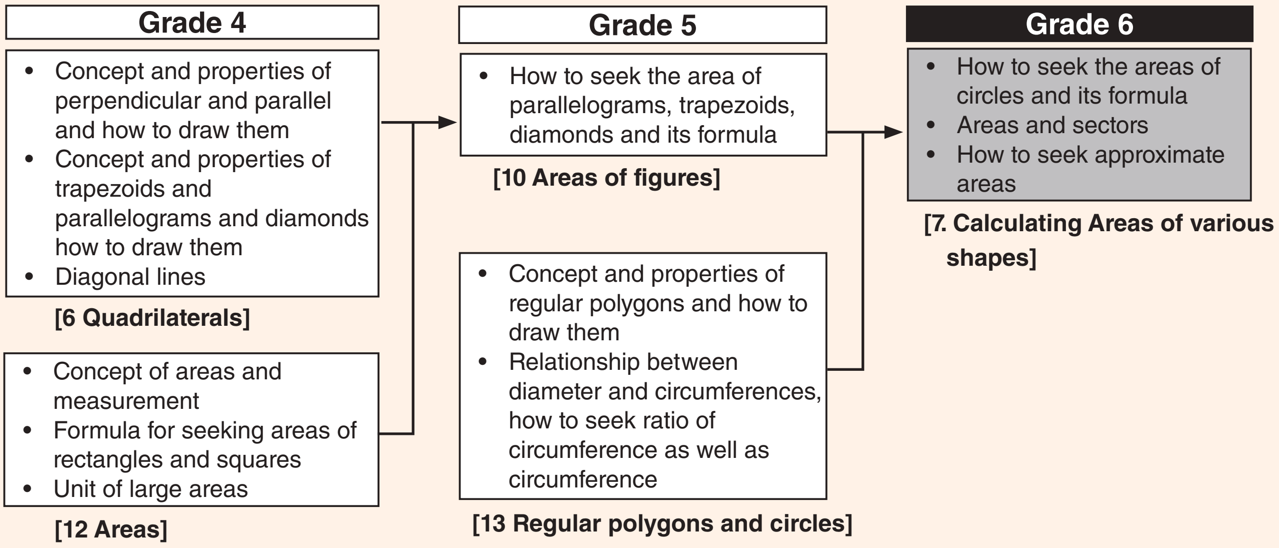
The area of a Circle :

The first way to estimate the area of a circle is to count the number of 1cm squares.
Then change and transform the shape of a circle to a known shape, a rectangle.
The new idea introduced here is to approximate the shape of combined sectors of a circle for a rectangle by cutting into many tiny sectors.

Approximate Area :

This topic is very useful for daily life. There are so many situations to approximate the area by approximating a shape to a known shape.

4. Related Learning Contents



Grade 4

- Concept and properties of perpendicular and parallel and how to draw them
- Concept and properties of trapezoids and parallelograms and diamonds how to draw them
- Diagonal lines

[6 Quadrilaterals]

- Concept of areas and measurement
- Formula for seeking areas of rectangles and squares
- Unit of large areas

[12 Areas]

Grade 5

- How to seek the area of parallelograms, trapezoids, diamonds and its formula

[10 Areas of figures]

- Concept and properties of regular polygons and how to draw them
- Relationship between diameter and circumferences, how to seek ratio of circumference as well as circumference

[13 Regular polygons and circles]

Grade 6

- How to seek the areas of circles and its formula
- Areas and sectors
- How to seek approximate areas

[7. Calculating Areas of various shapes]

Unit 7

Unit: Calculating the Area of Various Figures

Sub-unit: 1. The Area of a Circle

Lesson 1 of 4

Textbook Page : 059 and 060
Actual Lesson 048

Sub-unit Objectives

- To understand how to determine the area of circle by transforming it to other basic figures that have been already learned.
- To make a formula for the area of incomplete cells in a grid.

Lesson Objectives

- To think about ways to determine the area of a circle with a grid.
- To think about ways to identify the area of incomplete cells in a grid.

Prior Knowledge

- Circles and Spheres (Grade 3)
- Area (Grade 4)
- Regular polygons and circles (Grade 5)
- Diameters and circumferences (Grade 5)

Preparation

- 1 cm grid paper, compasses, enlarged picture of a quarter of a circle as shown in the textbook.

Assessment

- Think about ways to determine the area of a circle with a grid. F
- Think about ways to identify the area of incomplete cells in a grid. S

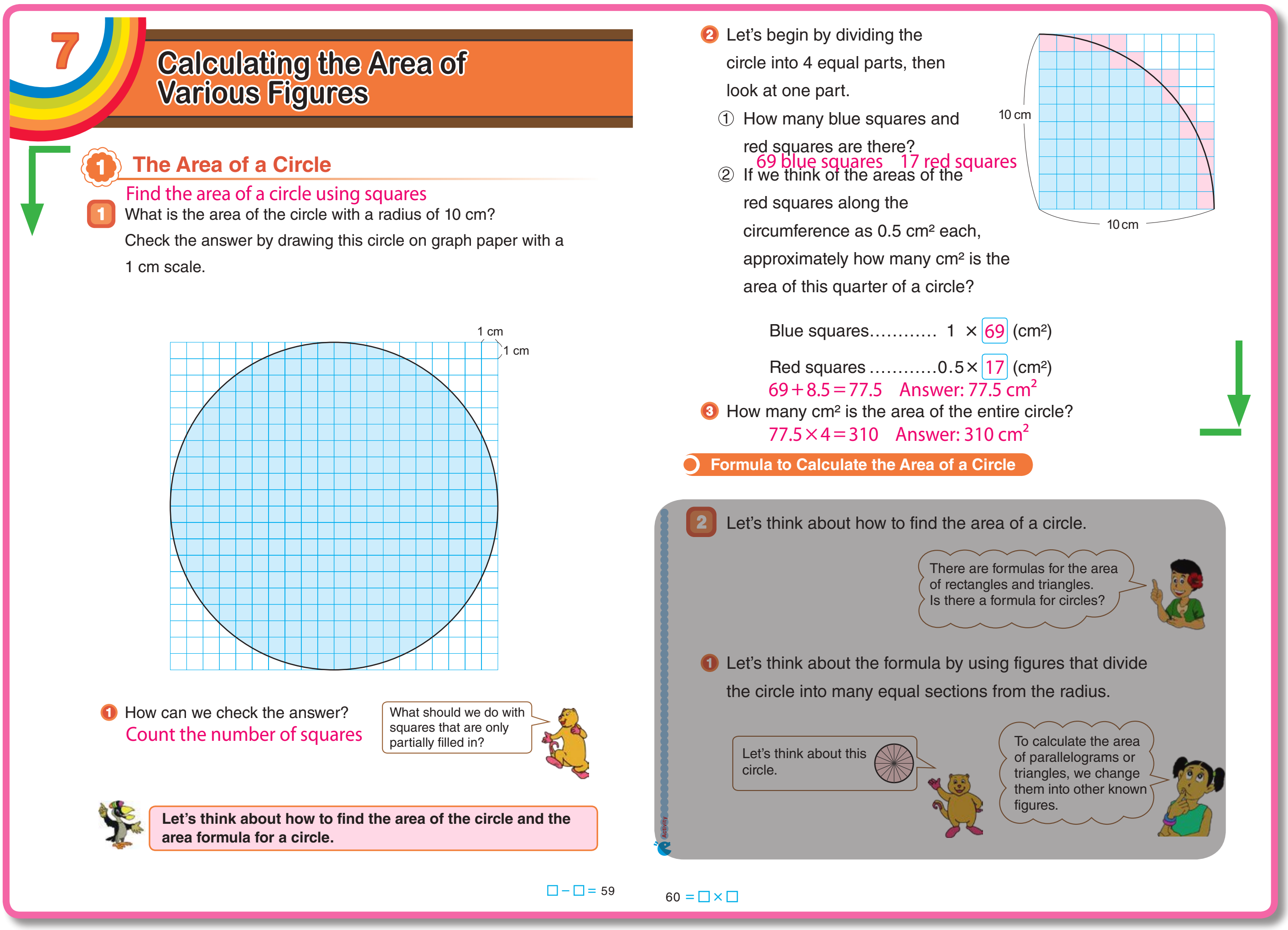
Teacher's Notes

How to determine the area of a circle with a grid.Counting the number of cells in a grid is the process of finding out the total number of units (1 cm²), as this is the basic in learning and determining the area of shapes.

In a circle placed on a grid, there are complete cells and incomplete cells as the shape of a circle is round.

Those incomplete cells can be counted as 0.5 cm².

This is one of the ways often used in finding the area of irregular shapes.



7

Calculating the Area of Various Figures

① The Area of a Circle

Find the area of a circle using squares

1 What is the area of the circle with a radius of 10 cm? Check the answer by drawing this circle on graph paper with a 1 cm scale.

① How can we check the answer?
Count the number of squares

What should we do with squares that are only partially filled in?

Let's think about how to find the area of the circle and the area formula for a circle.

□ − □ = 59

② Let's begin by dividing the circle into 4 equal parts, then look at one part.

① How many blue squares and red squares are there?
69 blue squares 17 red squares

② If we think of the areas of the red squares along the circumference as 0.5 cm² each, approximately how many cm² is the area of this quarter of a circle?

Blue squares………… 1 × $\boxed{69}$ (cm²)

Red squares …………0.5× $\boxed{17}$ (cm²)

$69+8.5=77.5$ Answer: 77.5 cm^2

③ How many cm² is the area of the entire circle?
$77.5\times4=310$ Answer: 310 cm^2

Formula to Calculate the Area of a Circle

2 Let's think about how to find the area of a circle.

There are formulas for the area of rectangles and triangles. Is there a formula for circles?

① Let's think about the formula by using figures that divide the circle into many equal sections from the radius.

Let's think about this circle.

To calculate the area of parallelograms or triangles, we change them into other known figures.

60 = □ × □

Lesson Flow

1 Find the area of the circle with its radius of 10 cm.

T/S ❶ Read and understand the given situation.

S Draw a circle with the radius of 10 cm on a graph paper with a 1 cm scale.

T Let students check the answer by doing activity ❶ using prior knowledge.

S Explain how they got their answers with others.

TN The circle on the grid comprises of complete and incompete squares because the shape of a circle is round where incomplete squares can be counted as 0.5 cm².
This is one of the ways often used in finding the area of irregular shapes.

T Ask students to prepare their ideas to compare with the next activity.

T Introduce the Main Task. (Refer to BP)

2 Find the area of the circle and the formula.

TN The quarter- circle can be drawn on a large chart for students to see clearly.

T Ask the students to observe the quarter- circle and do the activity ❷ ① and ②

S The area of blue squares is 69 cm² and the area for red squares is 8.5 cm².
The total area for blue squares and red squares is 69 + 8.5 = 77.5 Therefore the area of the quarter of the circle is approximately 77.5 cm².

T Confirm the students' answers.

3 How many cm² is the area of the entire circle?

T Ask students to find the answer to activity ❸ and share with other students.

S Find the area of the entire circle Area of entire circle: 77.5 × 4 = 310 that is 310 cm² (77.5 cm² is the area of the quarter circle).

T Confirm the answer by explaining the area using squares.

S Compare their answers from activity ❶ to see if their answers are close.

T Remind the students that the area they find in this manner is an approximate area.

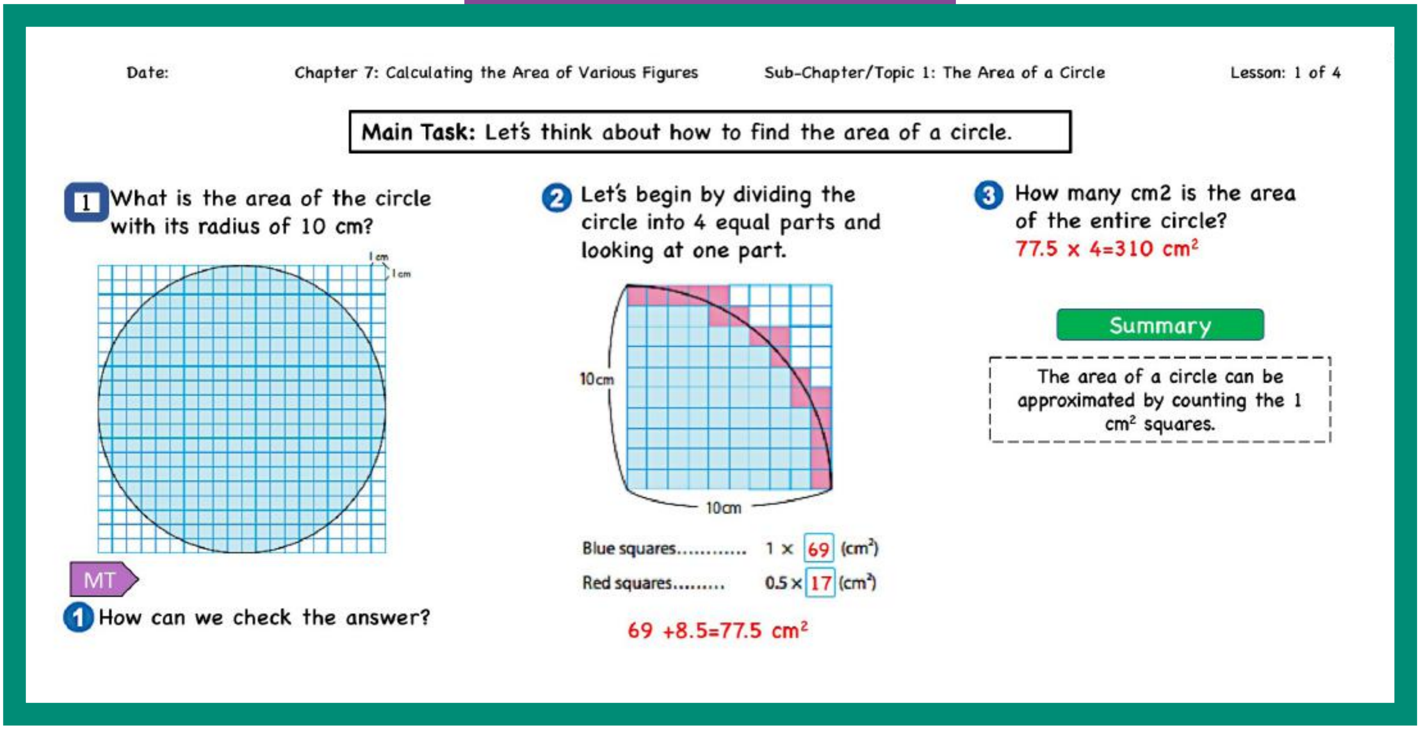
4 Summary.

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 7: Calculating the Area of Various Figures Sub-Chapter/Topic 1: The Area of a Circle Lesson: 1 of 4

Main Task: Let's think about how to find the area of a circle.

1 What is the area of the circle with its radius of 10 cm?

MT

❶ How can we check the answer?

❷ Let's begin by dividing the circle into 4 equal parts and looking at one part.

Blue squares............ 1 × 69 (cm²)

Red squares......... 0.5 × 17 (cm²)

69 +8.5=77.5 cm²

❸ How many cm2 is the area of the entire circle?

77.5 x 4=310 cm²

Summary

The area of a circle can be approximated by counting the 1 cm² squares.

Unit 7

Unit: Calculating the Area of Various Figures

Sub-unit: 1. The Area of a Circle

Lesson 2 of 4

Textbook Page : 060 to 062
Actual Lesson 049

Lesson Objectives

- To think about ways to determine the area of a circle.
- To transform it into other known figures to find the area of the circle.
- To think about a formula to calculate the area of a circle.

Prior Knowledge

- Area of triangle and rectangle, properties of circles, ratio of circumference (3.14).

Preparation

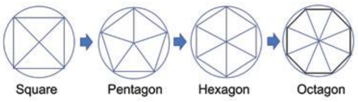
- Pictures of circles in Textbook (circle split into 16 pieces and 32 pieces), calculators.

Assessment

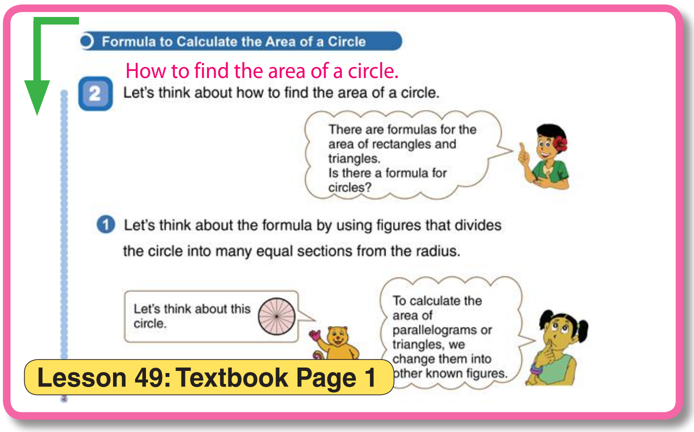
- Transform the circle into other known figures to find the area. F
- Identify the formula to calculate the area of a circle. F S

Teacher's Notes

In flow 4, ② ③ If students cannot reach that conclusion teacher needs to offer explanation that they can apply Ambai's idea to make the formula. Making the formula for the area of a circle based on the area of regular polygons.



Teacher should help students realise that as the number of sides in regular polygons increases, the shape looks more like a circle.
Therefore, the area of the circle is an equivalent to the total area of all triangles, each of which is formed with two vertices and the centre of circles.



Formula to Calculate the Area of a Circle

How to find the area of a circle.

2 Let's think about how to find the area of a circle.

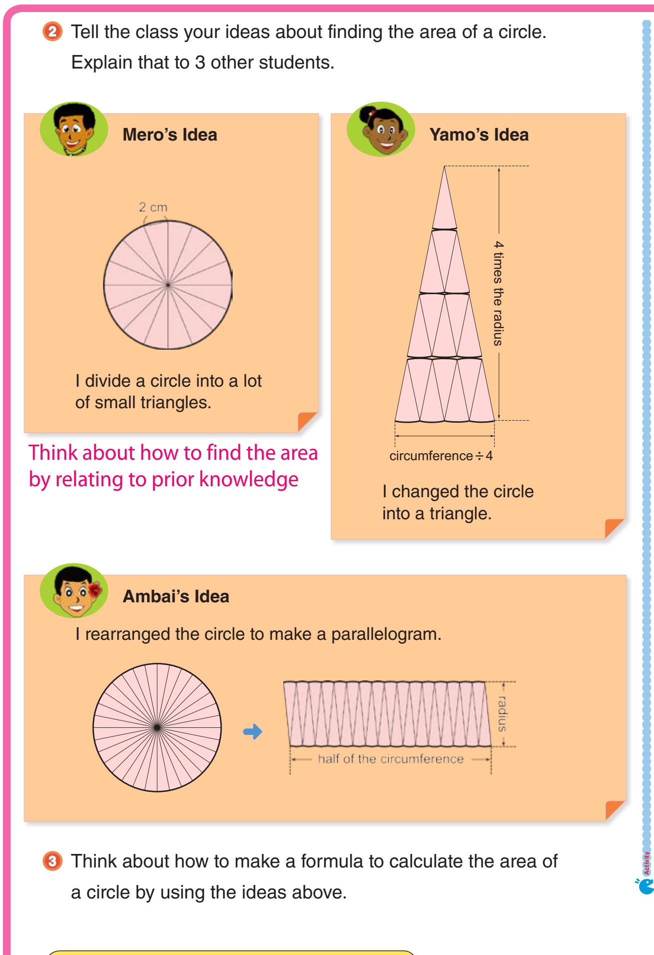
There are formulas for the area of rectangles and triangles. Is there a formula for circles?

① Let's think about the formula by using figures that divides the circle into many equal sections from the radius.

Let's think about this circle.

To calculate the area of parallelograms or triangles, we change them into other known figures.

Lesson 49: Textbook Page 1



② Tell the class your ideas about finding the area of a circle. Explain that to 3 other students.

Mero's Idea

I divide a circle into a lot of small triangles.

Think about how to find the area by relating to prior knowledge

Yamo's Idea

I changed the circle into a triangle.

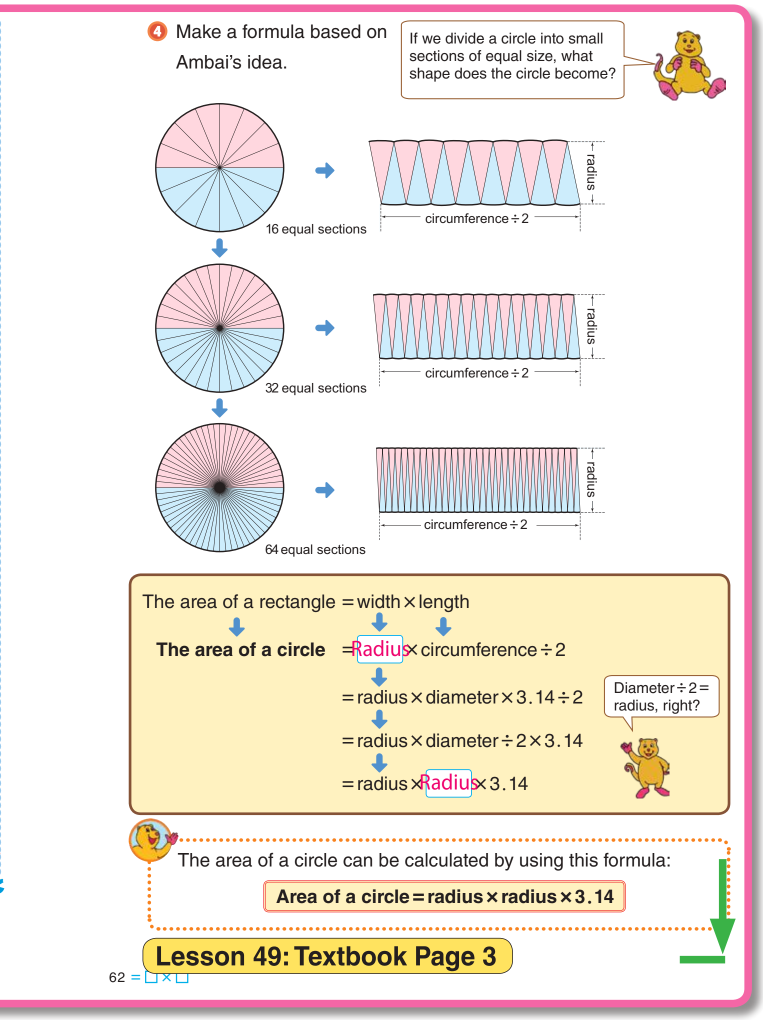
Ambai's Idea

I rearranged the circle to make a parallelogram.

③ Think about how to make a formula to calculate the area of a circle by using the ideas above.

Lesson 49: Textbook Page 2

□ − □ = 61



④ Make a formula based on Ambai's idea.

If we divide a circle into small sections of equal size, what shape does the circle become?

The area of a rectangle = width × length

The area of a circle = Radius × circumference ÷ 2
= radius × diameter × 3.14 ÷ 2
= radius × diameter ÷ 2 × 3.14
= radius × Radius × 3.14

Diameter ÷ 2 = radius, right?

The area of a circle can be calculated by using this formula:

Area of a circle = radius × radius × 3.14

Lesson 49: Textbook Page 3

62 = □ × □

Lesson Flow

1 Review the previous lesson.

T Display a chart of a circle without the grid on the board and ask students to think about how to find the area of a circle without counting squares.

S Think about and share their ideas on how to find the area.

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

2 2 Let's think about how to find the area of the circle

T Read the bubble…. There are formulas for the area of rectangles and triangles.
Is there a formula for area of circles?

S ① Think about how to find the formula for the area of a circle by relating to known shapes.

TN Draw students' attention to think about the segments of the given circle and come up with ideas to find a formula for the area.

3 ② Explain the 3 ideas in the textbook.

T If we can rearrange the circle split into pieces and make other shapes such as a parallelogram and triangle whose idea is better to find the area of a circle?

S Discuss the 3 ideas presented by Mero, Yamo and Ambai.

S Discuss their own ideas together with the ideas of Mero, Yamo and Ambai and explain.

4 ③ Compare the idea they should consider in making a formula to find the area.

T Whose idea do you think we can use?

S Identify that Ambai's idea is easier to use.

5 ④ Using Ambai's idea to find the formula for the area of a circle.

T As we split the circle into smaller pieces from 16 to 32 and 64 pieces, what can be observed in the kind of shape formed?

S The shapes first looked like a parallelogram and started to look more like a rectangle.

T Ask the following questions while using the figure and guide students in making the formula.
Which part of the circle is the length of the rectangle? Which part of the circle is the width of a rectangle?

S Answer the questions and follow the teacher to complete the formula in the box.

6 Important Point

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

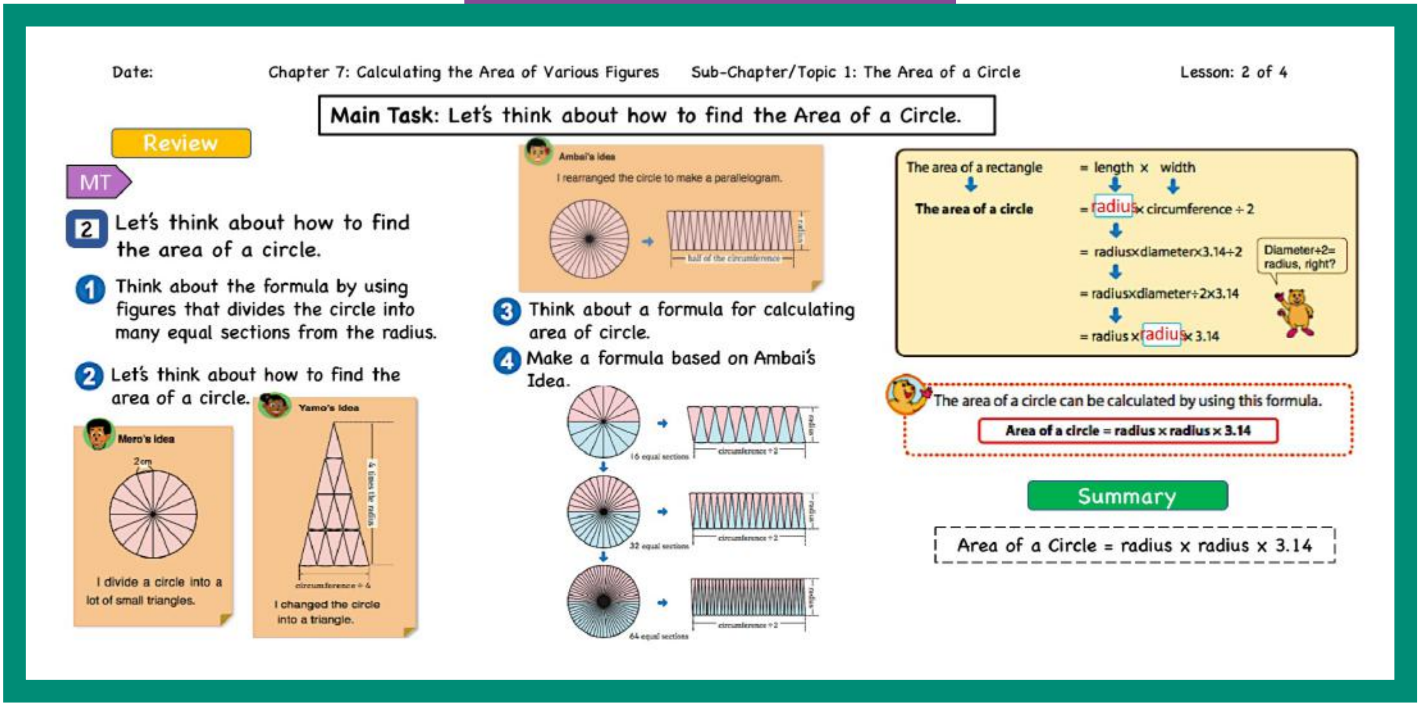
7 Summary

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 7: Calculating the Area of Various Figures Sub-Chapter/Topic 1: The Area of a Circle Lesson: 2 of 4

Main Task: Let's think about how to find the Area of a Circle.

Review

MT

2 Let's think about how to find the area of a circle.

① Think about the formula by using figures that divides the circle into many equal sections from the radius.

② Let's think about how to find the area of a circle.

Mero's idea

I divide a circle into a lot of small triangles.

Yamo's idea

I changed the circle into a triangle.

Ambai's idea

I rearranged the circle to make a parallelogram.

③ Think about a formula for calculating area of circle.

④ Make a formula based on Ambai's Idea.

The area of a rectangle = length × width

The area of a circle = radius × circumference ÷ 2

= radius×diameter×3.14÷2

= radius×diameter÷2×3.14

= radius × radius × 3.14

Diameter÷2= radius, right?

The area of a circle can be calculated by using this formula.

Area of a circle = radius × radius × 3.14

Summary

Area of a Circle = radius × radius × 3.14

Unit 7

Unit: Calculating the Area of Various Figures

Sub-unit: 1. The Area of a Circle

Lesson 3 of 4

Textbook Page : 063
Actual Lesson 050

Lesson Objectives

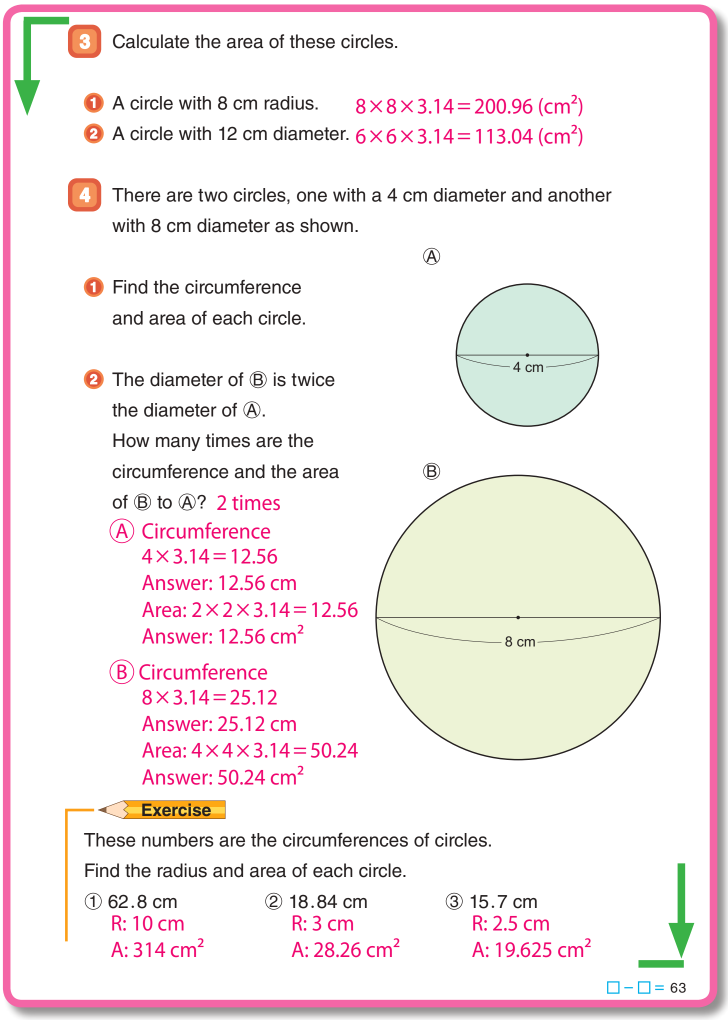
- To find the area of a circle using the formula.
- To compare two circles and examine how many times the circumference and area of one circle is to the other and when the diameter of the circle is twice the other.

Prior Knowledge

- The formula for calculating the area of a circle. Area of Circle = Radius × radius × 3.14

Preparation

- Draw the two circles on the textbook page on a chart or the blackboard.



3 Calculate the area of these circles.

① A circle with 8 cm radius. $8\times8\times3.14=200.96$ (cm^2)

② A circle with 12 cm diameter. $6\times6\times3.14=113.04$ (cm^2)

4 There are two circles, one with a 4 cm diameter and another with 8 cm diameter as shown.

① Find the circumference and area of each circle.

② The diameter of Ⓑ is twice the diameter of Ⓐ. How many times are the circumference and the area of Ⓑ to Ⓐ? 2 times

Ⓐ Circumference
$4\times3.14=12.56$
Answer: 12.56 cm
Area: $2\times2\times3.14=12.56$
Answer: 12.56 cm^2

Ⓑ Circumference
$8\times3.14=25.12$
Answer: 25.12 cm
Area: $4\times4\times3.14=50.24$
Answer: 50.24 cm^2

Exercise

These numbers are the circumferences of circles.
Find the radius and area of each circle.

① 62.8 cm	② 18.84 cm	③ 15.7 cm
R: 10 cm	R: 3 cm	R: 2.5 cm
A: 314 cm^2	A: 28.26 cm^2	A: 19.625 cm^2

□－□＝63

Assessment

- Use the area formula to calculate the area of given circles. F S
- Examine and compare two circles using their circumference and area. F

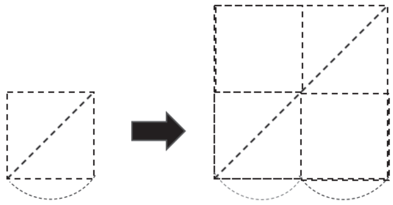
Teacher's Notes

In 4 ② students will find that when the diameter is twice the original, the circumference also becomes twice the original. However they will find that the area becomes four times larger than the original. Students may question why it is this way. This is similar to the question they had in the unit of Area in the 4th grade where they wondered why 1 m² = 10 000 cm² while 1 m = 100 cm.

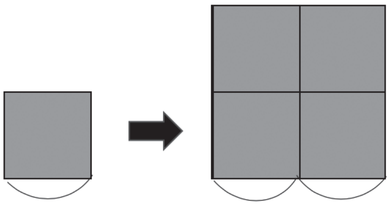
In such a case teacher can ask them to examine if the diameter becomes three times longer than the original, how about circumference and the area? and What if the diameter is half the original? and help them generalise the results.

Show the figures below.

Students can see in a square that when the length of a diagonal line and a side becomes twice the original, the area becomes four times larger than the original.



Side / Diagonal Line (Length)



Area

Lesson Flow

1 Review the previous lesson.

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

2 3 Calculate the area of the given circles using the formula.

T Revise the formula for calculating the area of the circle.

S Calculate the area of the given circles ① and ② based on the radii and diameters.

TN Students may use calculators for the rest of the calculations.

T Advice students to divide the diameter of a circle by 2 to get its radius and put it into the formula.

3 4 Finding the circumference and the area of each circle based on its diameter.

T Ask the students to solve ① and ②.

S ① Find the circumference and the area of each circle based on its diameter.

② Compare the circumference and area of circles Ⓐ and Ⓑ knowing that the diameter of circle Ⓑ is twice the diameter of circle Ⓐ.

T Make sure that students use the diameter to find the circumference and radius to find the area.

TN Since the diameter of Ⓑ is twice the diameter of Ⓐ, the circumference and area for Ⓑ will also be twice that of Ⓐ.

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 7: Calculating the Area of Various Figures Sub-Chapter/Topic 1: The Area of a Circle Lesson: 3 of 4

Main Task: Let's think about finding the Area and Circumference of Circles using formula.

Review

MT

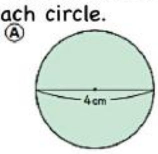
3 Calculate the area of these circles..

① A circle with 8 cm radius.
8 x 8 x 3.14=200.96 cm^2

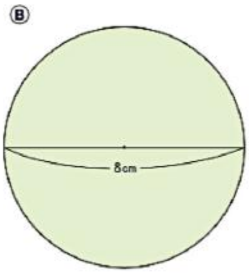
② A circle with 12 cm diameter.
6 x 6 x 3.14=113.04 cm^2

4 There are circles with 4 cm diameter and another with 8 cm diameter shown.

① Find the circumference and area of each circle.



(A) Circumference: 4 x 3.14=12.56 cm
Area: 2 x 2 x 3.14=12.56 cm^2



(B) Circumference: 8 x 3.14=25.12 cm
Area: 4 x 4 x 3.14=50.24 cm^2

② The diameter of Ⓑ is twice the diameter of Ⓐ. How many times are the circumference and the area of Ⓑ is to Ⓐ?
2 times

Exercise

(Refer to TM for Questions and Answers)

Summary

We can calculate the area and circumference of a circle using the diameter or radius of the circle.
Area = radius x radius x 3.14
Diameter = diameter x 3.14

Unit
7

Unit: Calculating the Area of Various Figures
Sub-unit: 1. The Area of a Circle
Lesson 4 of 4

Textbook Page : 064
Actual Lesson 051

Lesson Objective

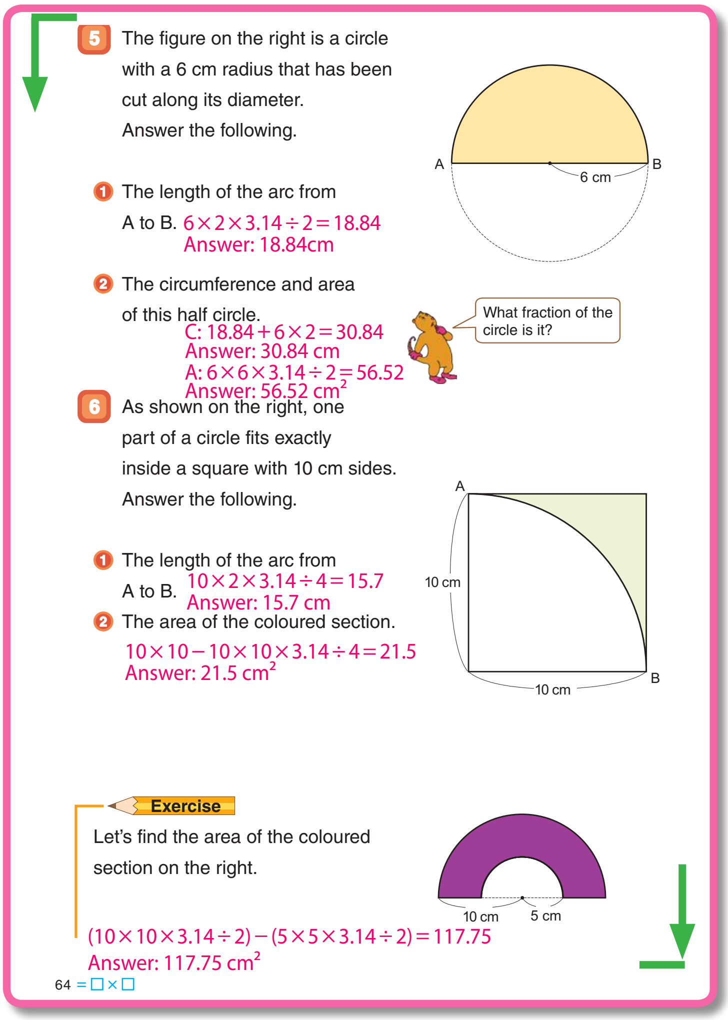
- To apply the formula of calculating area of a circle to the problems which involve half circles, squares and quarter circles.

Prior Knowledge

- The formula for calculating the area of a circle
  Area of Circle = radius × radius × 3.14

Preparation

- Enlarged figures for Task 5 and 6.



5 The figure on the right is a circle with a 6 cm radius that has been cut along its diameter. Answer the following.

① The length of the arc from A to B. $6\times2\times3.14\div2=18.84$
Answer: 18.84cm

② The circumference and area of this half circle.
C: $18.84+6\times2=30.84$
Answer: 30.84 cm
A: $6\times6\times3.14\div2=56.52$
Answer: 56.52 cm^2

What fraction of the circle is it?

6 As shown on the right, one part of a circle fits exactly inside a square with 10 cm sides. Answer the following.

① The length of the arc from A to B. $10\times2\times3.14\div4=15.7$
Answer: 15.7 cm

② The area of the coloured section.
$10\times10-10\times10\times3.14\div4=21.5$
Answer: 21.5 cm^2

Exercise

Let's find the area of the coloured section on the right.

$(10\times10\times3.14\div2)-(5\times5\times3.14\div2)=117.75$
Answer: 117.75 cm^2

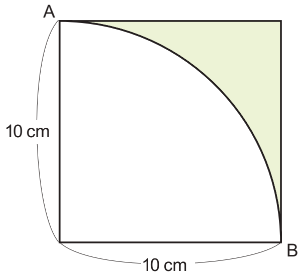
64 = □ × □

Assessment

- Apply the area formula to calculate area of half circle, square and quarter circle. F S

Teacher's Notes

While solving problems in the exercise, students may find math expressions to be very lengthy which are often difficult to understand.
You can suggest the following.



- Calculate section by section in order.
  $10\times10\times3.14\div2=157$ …. A
  $5\times5\times3.14\div2=39.25$ ….. B
  A − B $157-39.25=117.75$
  Answer: 117.75cm²

- Making one math expression and calculating it efficiently.
  $10\times10\times3.14\div2-5\times5\times3.14\div2$
  $=(10\times10-5\times5)\times3.14\div2$
  $=75\times3.14\div2=117.75$
  Answer: 117.75cm²

The **arc** of a circle refers to part of the circumference of the circle which forms a curve.
The curved line A to B in the diagram above is an arc.

Lesson Flow

1 Review the previous lesson.

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

2 5 Find the length of the arc, circumference and the area of the half circle.

T/S Read and understand the given situation.

S Find the circumference and the area of the circle by completing ① and ②.

TN Help and guide the students using the 3 bullet points.

- Calculate the circumference of the circle and find half of it to get the length of the arc.
- When trying to calculate the circumference of the half circle, add the arc length and diameter.
- When calculating area of half the circle, find the area of the full circle and divide by 2.

3 Find the length of the arc and coloured area of the quarter circle.

T/S 6 Read and understand the given situation.

S Find the length of the arc and the area of the coloured section of the quarter circle by completing ① and ②.

T Help and guide the students using the following;

- Calculate the Circumference of the full circle and divide by 4 to get the Arc length AB.
- Calculate the area of the quarter circle by calculating the area of the full circle and divide by 4.
- Let students understand that the area of the coloured section can be found by subtracting the area of the quarter circle from the square. (Refer to Teacher's Notes).
- Calculate the area of square side × side and find the area of the quarter circle by calculating radius × radius × 3.14 ÷ 4.
  Then further find the area of the coloured section based on these two answers.

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

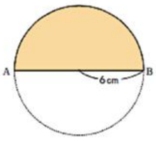
Date: Chapter 7: Calculating the Area of Various Figures Sub-Chapter/Topic 1: The Area of a Circle Lesson: 4 of 4

Main Task: Let's think about calculating the area and circumference of part of a circle.

Review

MT

5 The figure on the right is a circle with 6 cm radius that has been cut along its diameter.



What fraction of a circle is this?

① The length of the arc from A to B.

Circumference = diameter × 3.14

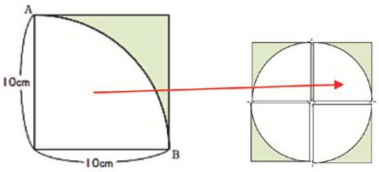
6 × 2 × 3.14 ÷ 2 = 18.84 cm

② The circumference and area of this half circle.

Circumference: 18.84 + 6 × 2 = 30.84 cm

Area : 6 × 6 × 3.14 ÷ 2 = 56.52 cm²

6 Part of a circle fits exactly inside a square with 10 cm sides.



① The length of the arc from A to B.

10 × 2 × 3.14 ÷ 4 = 15.7 cm

② The area of the coloured section.

10 × 10 − 10 × 10 × 3.14 ÷ 4

=21.5 cm²

Exercise

(Refer to TM for Questions and Answers)

Summary

The area of $\frac{1}{2}$ and $\frac{1}{4}$ of a circle can be calculated by dividing the area of the full circle by 2 or 4.

Unit
7

Unit: Calculating the Area of Various Figures

Sub-unit: 2. Approximate Area

Lesson 1 of 1

Textbook Page : 065
Actual Lesson 052

Sub-unit Objective

- To understand how to determine the area of figures by working out ways to identify the area of incomplete cells in a grid

Lesson Objective

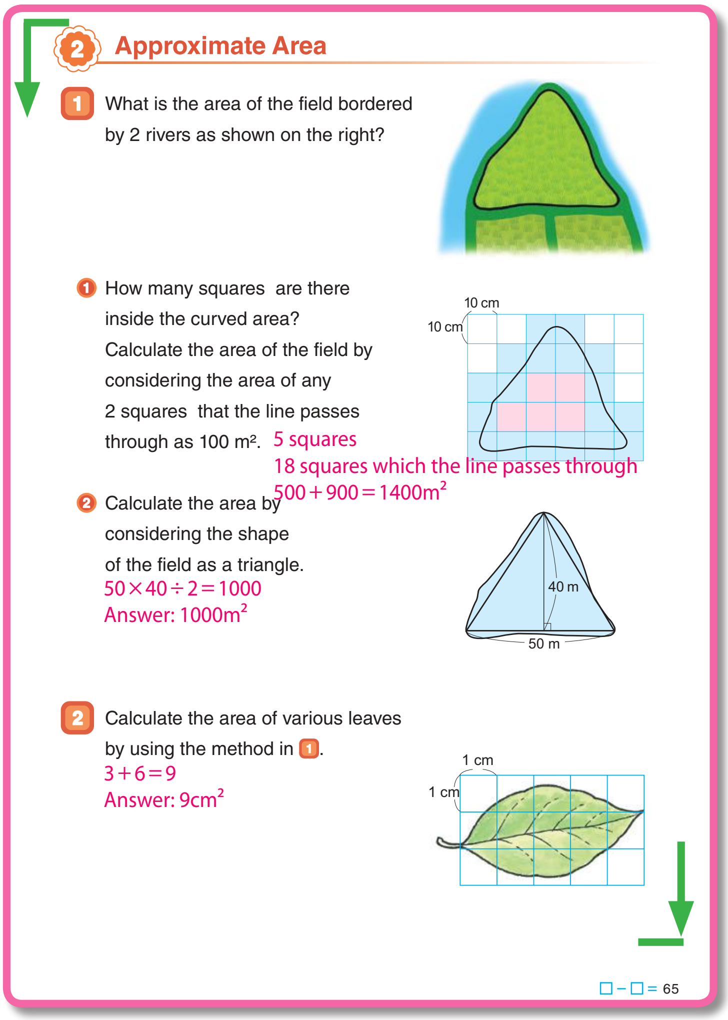
- To think about how to approximate area of figures by applying basic mathematical rules.

Prior Knowledge

- Finding the area of circle using square grids.
- The incomplete cells in a grid is counted as 0.5 cm^2.

Preparation

- Students to bring a leaf each.
- Diagram for Task 2



2 Approximate Area

1 What is the area of the field bordered by 2 rivers as shown on the right?

① How many squares are there inside the curved area? Calculate the area of the field by considering the area of any 2 squares that the line passes through as 100 m^2. 5 squares
18 squares which the line passes through
$500+900=1400\text{m}^2$

② Calculate the area by considering the shape of the field as a triangle.
$50\times40\div2=1000$
Answer: 1000m^2

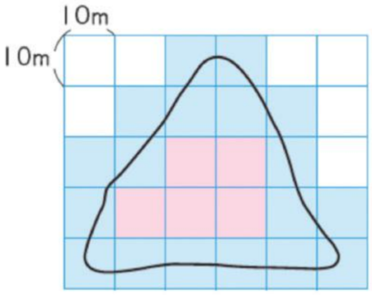
2 Calculate the area of various leaves by using the method in 1.
$3+6=9$
Answer: 9cm^2

Assessment

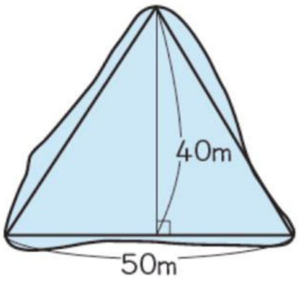
- Think about how to approximate area of figures by applying basic mathematical rules. F S

Teacher's Notes

1

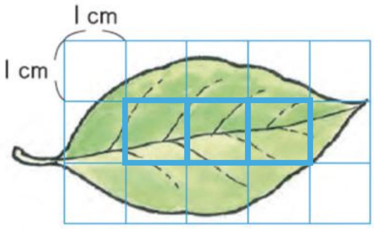


🟥 Complete squares: 5
🟦 Incomplete squares: 18
$5\times100=500$
$18\times100\div2=900$
$500+900=1400$
Answer: 1400 cm^2



Use the triangle formula: $A=bh\div2$
$50\times40\div2=1000$
Answer: 1000 cm^2

2



Complete squares: 3
Incomplete squares: 12
$12\div2=6$
$3+6=9$
Answer: 9 cm^2

Lesson Flow

1 Review the previous lesson.

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

2 Calculating the approximate area of a field.

T/S ① Read and understand the given situation.

TN Allow the students to think about how to calculate the area of the figure.

S Observe the figure and calculate the area using square grid in ①.

S Calculate the area by considering the shape of the field as a triangle in ②.

TN Students should use their prior knowledge to find the area of triangles. Incomplete squares are counted as 0.5 cm² which is the same as $\frac{1}{2}$ cm² and the formula for calculating the area of a triangle is **b × h ÷ 2**.

3 ② Calculating the area of various leaves using incomplete cells as 0.5 cm² which is cm² in square grids.

T Organise students to collect a leaf for this task.

S Calculate the area of the leaf displayed on the square grid by applying the knowledge of incomplete cells as 0.5 cm² which is $\frac{1}{2}$ cm² added to the complete squares to get the total area of the leaf.

S Apply the same idea using the leaves they have collected.

TN Students 'answers will vary based on the size and shape of the leaves they collect. Check thoroughly when confirming their answers.

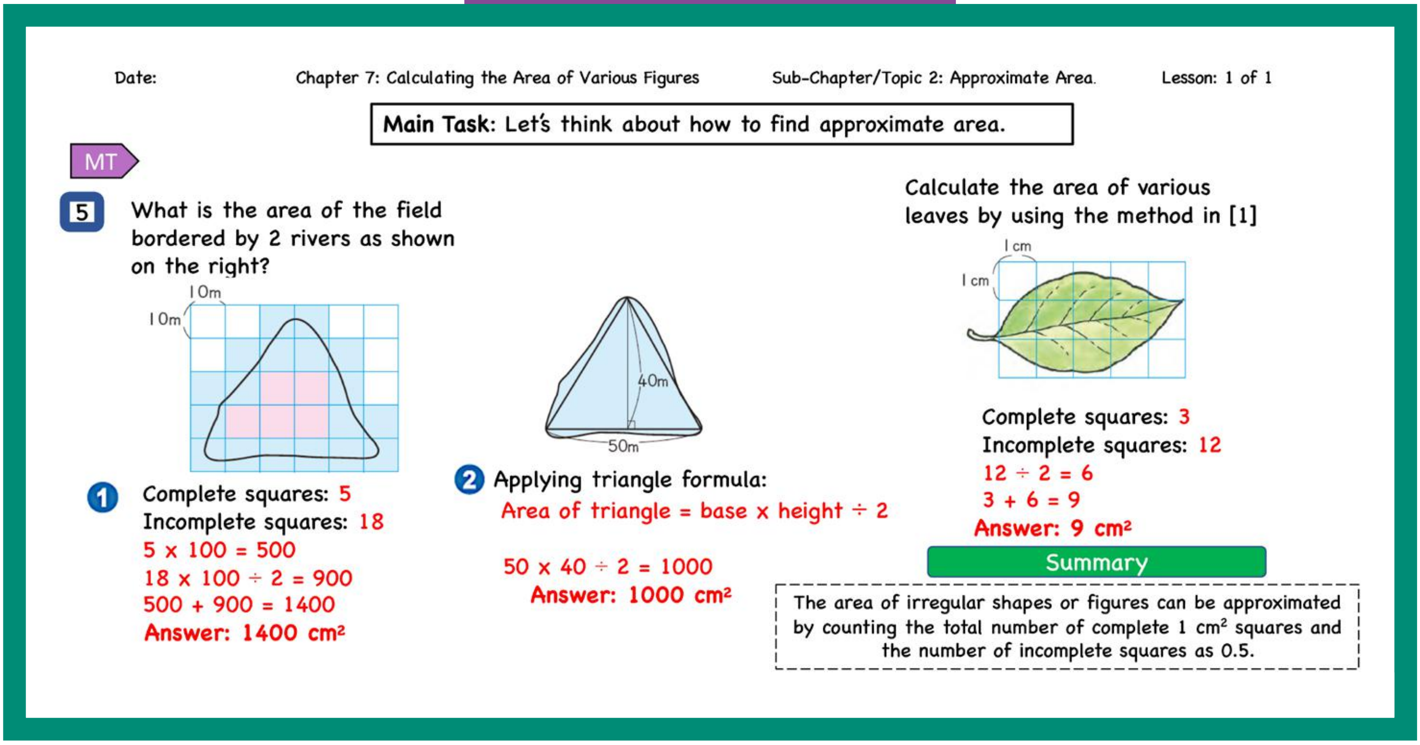
4 Summary.

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: Chapter 7: Calculating the Area of Various Figures Sub-Chapter/Topic 2: Approximate Area. Lesson: 1 of 1

Main Task: Let's think about how to find approximate area.

MT

5 What is the area of the field bordered by 2 rivers as shown on the right?

① Complete squares: 5
Incomplete squares: 18
5 × 100 = 500
18 × 100 ÷ 2 = 900
500 + 900 = 1400
Answer: 1400 cm²

② Applying triangle formula:
Area of triangle = base × height ÷ 2

50 × 40 ÷ 2 = 1000
Answer: 1000 cm²

Calculate the area of various leaves by using the method in [1]

Complete squares: 3
Incomplete squares: 12
12 ÷ 2 = 6
3 + 6 = 9
Answer: 9 cm²

Summary

The area of irregular shapes or figures can be approximated by counting the total number of complete 1 cm² squares and the number of incomplete squares as 0.5.

Unit
7

Unit: Calculating the Area of Various
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page :
066 and 067
Actual Lesson 53 & 54

Lesson Objective

- To confirm and consolidate what students learned in the unit.

Prior Knowledge

- All the contents learned in the unit on Calculating Area.

Preparation

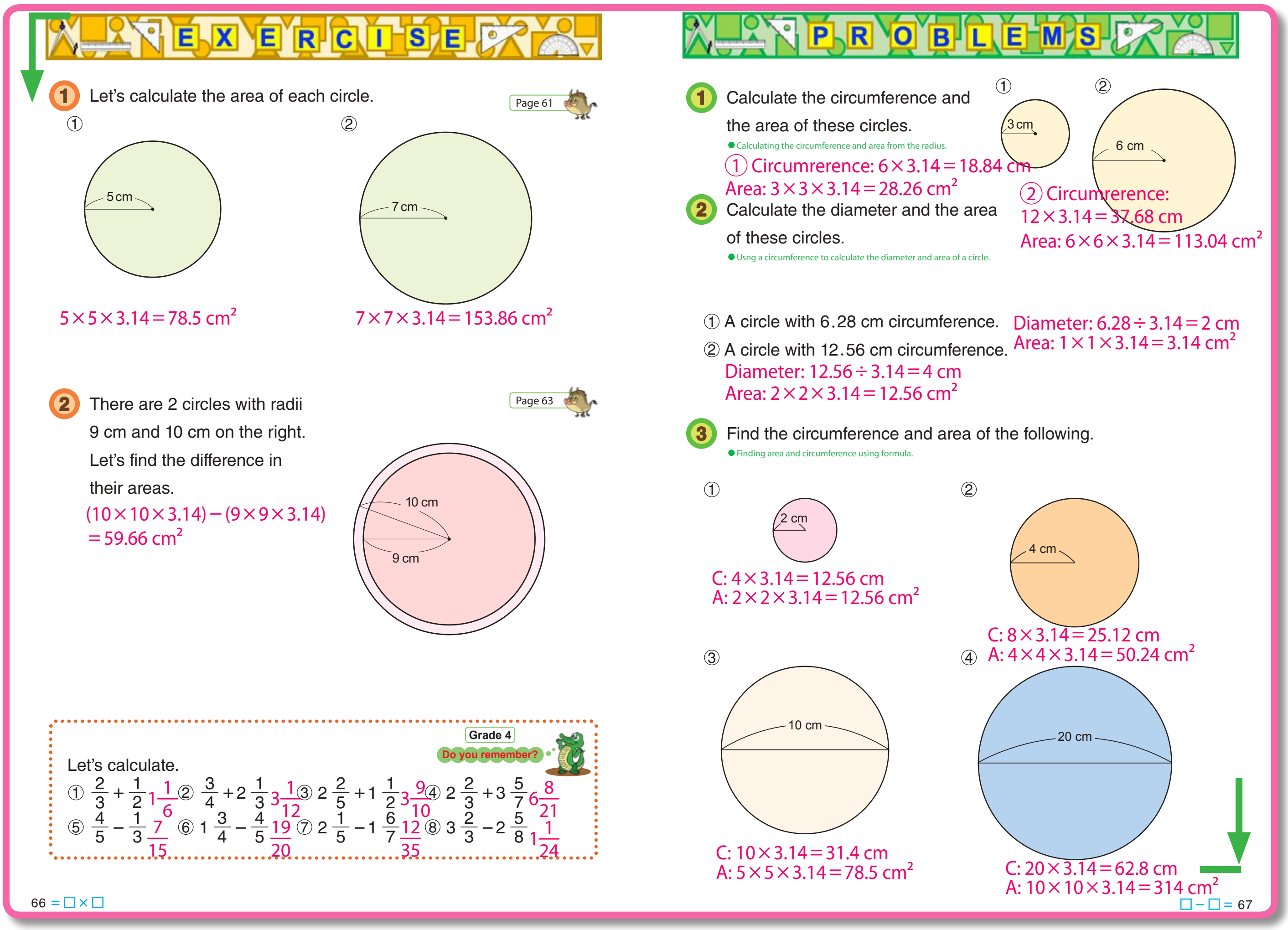
- Evaluation Test.

Assessment

- Solve the exercises correctly to confirm what they learned in this unit. F S

Teacher's Notes

This is the last lesson of Chapter 7. Students should be encouraged to use the necessary skills and ideas learnt in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. 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 the area of each circle. Page 61

$5\times5\times3.14=78.5\ cm^2$ $7\times7\times3.14=153.86\ cm^2$

② There are 2 circles with radii 9 cm and 10 cm on the right. Let's find the difference in their areas. Page 63

$(10\times10\times3.14)-(9\times9\times3.14)$
$=59.66\ cm^2$

Grade 4
Do you remember?

Let's calculate.

① $\frac{2}{3}+\frac{1}{2}$ $1\frac{1}{6}$ ② $\frac{3}{4}+2\frac{1}{3}$ $3\frac{1}{12}$ ③ $2\frac{2}{5}+1\frac{1}{2}$ $3\frac{9}{10}$ ④ $2\frac{2}{3}+3\frac{5}{7}$ $6\frac{8}{21}$

⑤ $\frac{4}{5}-\frac{1}{3}$ $\frac{7}{15}$ ⑥ $1\frac{3}{4}-\frac{4}{5}$ $\frac{19}{20}$ ⑦ $2\frac{1}{5}-1\frac{6}{7}$ $\frac{12}{35}$ ⑧ $3\frac{2}{3}-2\frac{5}{8}$ $1\frac{1}{24}$

66 = □ × □

PROBLEMS

1 Calculate the circumference and the area of these circles.

● Calculating the circumference and area from the radius.

① Circumrerence: $6\times3.14=18.84$ cm
Area: $3\times3\times3.14=28.26\ cm^2$

② Circumrerence:
$12\times3.14=37.68$ cm
Area: $6\times6\times3.14=113.04\ cm^2$

2 Calculate the diameter and the area of these circles.

● Usng a circumference to calculate the diameter and area of a circle.

① A circle with 6.28 cm circumference.
Diameter: $6.28\div3.14=2$ cm
Area: $1\times1\times3.14=3.14\ cm^2$

② A circle with 12.56 cm circumference.
Diameter: $12.56\div3.14=4$ cm
Area: $2\times2\times3.14=12.56\ cm^2$

3 Find the circumference and area of the following.

● Finding area and circumference using formula.

① C: $4\times3.14=12.56$ cm
A: $2\times2\times3.14=12.56\ cm^2$

② C: $8\times3.14=25.12$ cm
A: $4\times4\times3.14=50.24\ cm^2$

③ C: $10\times3.14=31.4$ cm
A: $5\times5\times3.14=78.5\ cm^2$

④ C: $20\times3.14=62.8$ cm
A: $10\times10\times3.14=314\ cm^2$

□ − □ = 67

Lesson Flow

1 Complete Exercise ①.

S Calculate the area for circle ① and ②.

T Confirm students' answers.

2 Complete Exercise ②.

S Solve by calculating to find the area and circumference of the given circles.

T Confirm students' answers.

3 Complete the DO YOU REMEBER? exercise.

S Solve by adding and subtracting the mixed fractions.

4 Complete Problem ①.

S Solve by calculating to find the circumference and area of circle ① and ② using the given radii.

T Confirm students' answers.

5 Complete Problem ②.

S Use the given circumferences of circles to calculate the diameter and area of ① and ②.

T Confirm students' answers.

6 Complete Problem ③

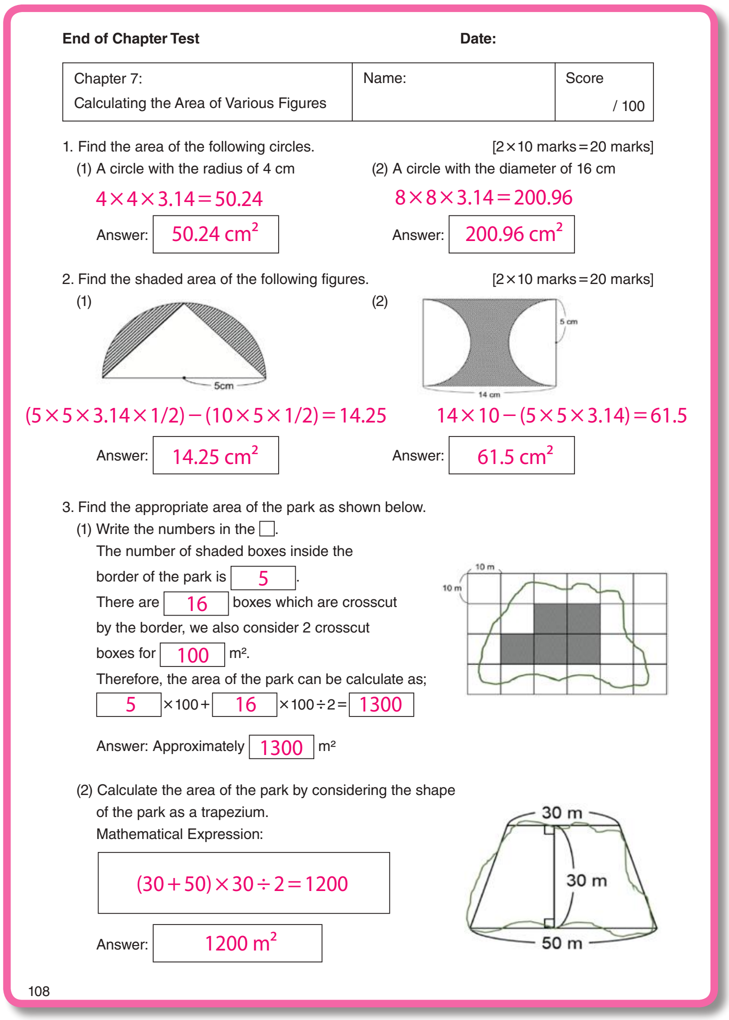
S Calculate the circumference and area of circles ① to ④ using the given radii and diameters.

T Confirm students' answers.

7 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: Calculating the Area of Various Figures	Name:	Score / 100

1. Find the area of the following circles. [2×10 marks = 20 marks]

(1) A circle with the radius of 4 cm

$4 \times 4 \times 3.14 = 50.24$

Answer: 50.24 cm^2

(2) A circle with the diameter of 16 cm

$8 \times 8 \times 3.14 = 200.96$

Answer: 200.96 cm^2

2. Find the shaded area of the following figures. [2×10 marks = 20 marks]

(1)

$(5 \times 5 \times 3.14 \times 1/2) - (10 \times 5 \times 1/2) = 14.25$

Answer: 14.25 cm^2

(2)

$14 \times 10 - (5 \times 5 \times 3.14) = 61.5$

Answer: 61.5 cm^2

3. Find the appropriate area of the park as shown below.

(1) Write the numbers in the □.

The number of shaded boxes inside the border of the park is 5.

There are 16 boxes which are crosscut by the border, we also consider 2 crosscut boxes for 100 m².

Therefore, the area of the park can be calculate as;

$\boxed{5} \times 100 + \boxed{16} \times 100 \div 2 = \boxed{1300}$

Answer: Approximately 1300 m²

(2) Calculate the area of the park by considering the shape of the park as a trapezium.

Mathematical Expression:

$(30 + 50) \times 30 \div 2 = 1200$

Answer: 1200 m^2

End of Chapter Test **Date:**

Chapter 7: Calculating the Area of Various Figures	Name:	Score / 100

1. Find the area of the following circles. [2 × 10 marks = 20 marks]

(1) A circle with the radius of 4 cm

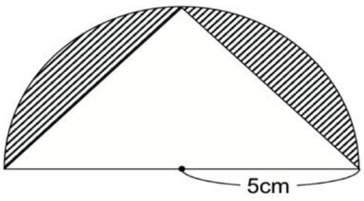
Answer: □

(2) A circle with the diameter of 16 cm

Answer: □

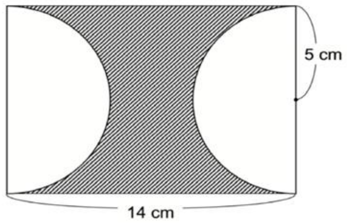
2. Find the shaded area of the following figures. [2 × 10 marks = 20 marks]

(1)



Answer: □

(2)



Answer: □

3. Find the appropriate area of the park as shown below.

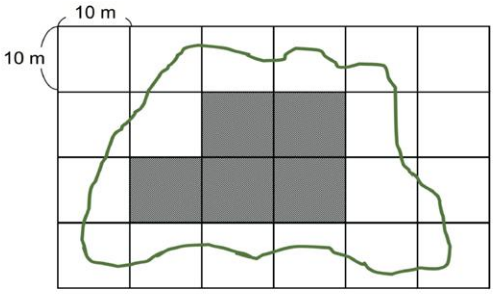
(1) Write the numbers in the □.

The number of shaded boxes inside the border of the park is □.

There are □ boxes which are crosscut by the border, we also consider 2 crosscut boxes for □ m².

Therefore, the area of the park can be calculate as;

□ × 100 + □ × 100 ÷ 2 = □

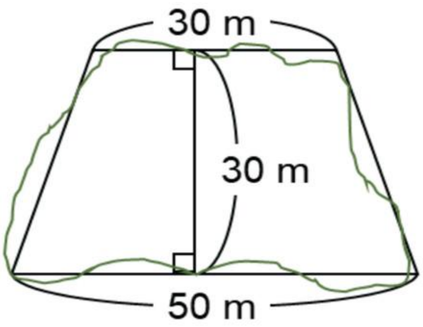


Answer: Approximately □ m²

(2) Calculate the area of the park by considering the shape of the park as a trapezium.

Mathematical Expression:

□



Answer: □

Chapter 8 Orders and Combinations

1. Content Standard

6.4.5. Students will be able to critique possible outcomes from appropriate viewpoints and be able to figure out, sort and organize viewpoints systematically with confidence.

2. Unit Objectives

- To systematically analyze and examine possible cases in actual events which are relatively simple and easy to cope with.
- To analyze systematically the order and combination of various things using figures and tables with careful attention to avoid duplication and overlooking.
- To understand ways to examine and identify the number of cases based on ways to make figures and charts.

3. Teaching Overview

Students seek efficient ways of counting all ways of ordering and finding combinations in efficient ways without dropping or double-counting any ways.

Ordering :

Teachers should not just teach how to count ordering efficiently.
Students should shown more effort to find out the most efficient way through discussions as a class.

Combination :

Students are supposed to be able to explain why the way of counting all combinations can avoid double-counting or dropping.
All questions should be well-discussed by students such as “Can we use the same card twice?” etc, so that students’ understanding of the given situations will be deepen.

4. Related Learning Contents

Grade 4

- Categorize and organize data using figures and tables from a certain prospective
- Two dimensional table and binary classification

[Arrangement of Data]

→

Grade 6

- Meaning of the arrangement of orders and combinations, how to arrange orders and combinations
- How to seek total ways of arranging orders combinations

[8 Orders and Combinations]

→

Grade 7

- To seek all the possible cases of uncertain phenomena and probability using a tree diagram

Unit
8

Unit: Orders and Combinations
Sub-unit: 1. Ordering
Lesson 1of 2

Textbook Page :
068 to 070
Actual Lesson 056

Sub-unit Objectives

- Think about ways to examine and identify the different orders without repetition.
- To understand ways to examine and identify the order of things based on tables and figures.
- To think about how many different orders there can be when certain conditions are given.

Lesson Objectives

- To think about ways to examine and identify different orders without repetition.
- To understand ways to examine and identify the order of things based on tables and figures.

Prior Knowledge

- Organising data
- Making table

Preparation

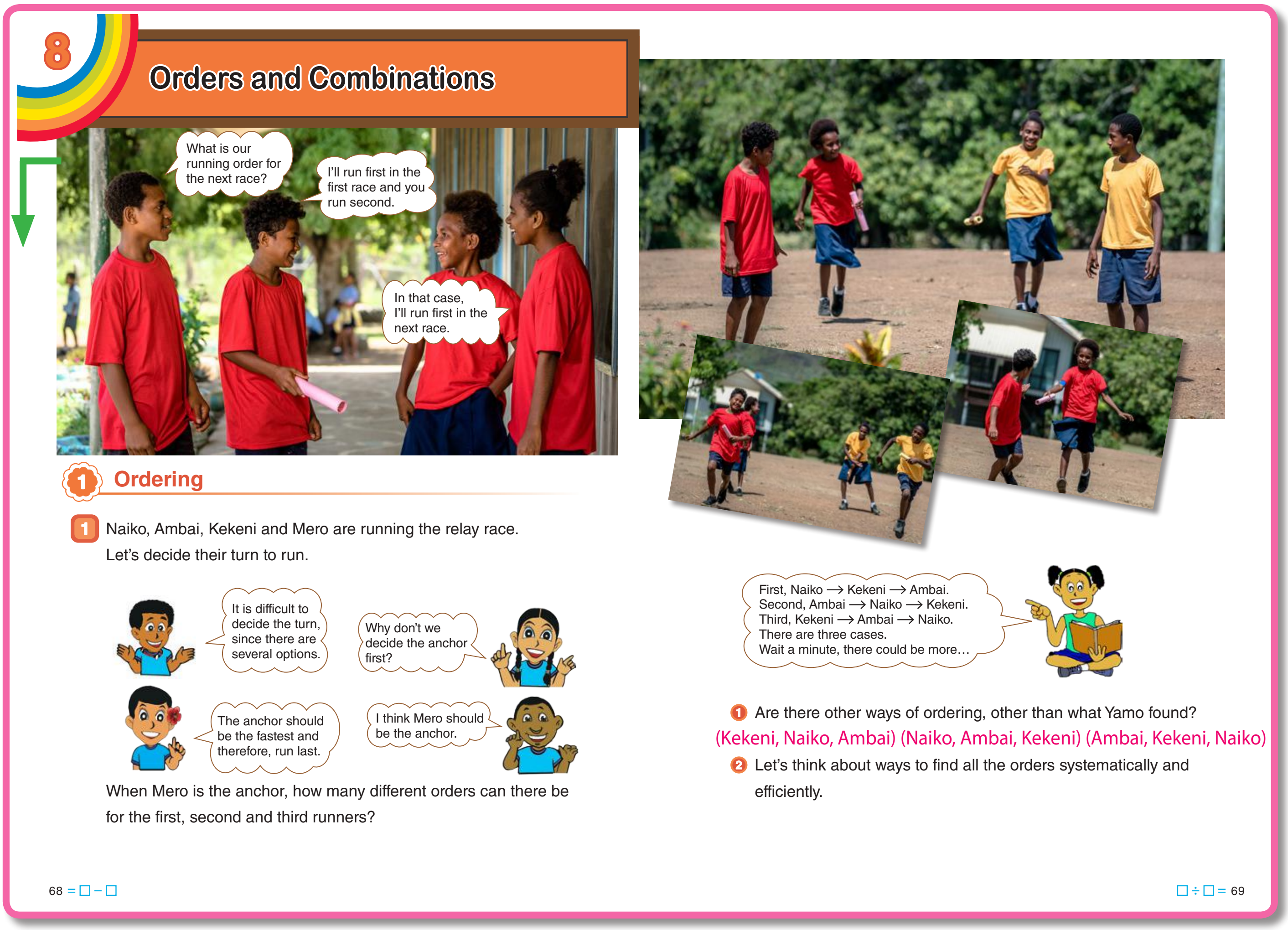
- Table and Tree diagram

Assessment

- Think about ways to examine and identify the numbers of different orders without repetition. F
- Understand ways to examine and identify the order of things using tables and diagrams. S

Teacher's Notes

It is important to let students experience the usefulness of tables and figures in avoiding repetition and omission when examining the orders.



8 Orders and Combinations

What is our running order for the next race?

I'll run first in the first race and you run second.

In that case, I'll run first in the next race.

① Ordering

1 Naiko, Ambai, Kekeni and Mero are running the relay race.
Let's decide their turn to run.

It is difficult to decide the turn, since there are several options.

Why don't we decide the anchor first?

The anchor should be the fastest and therefore, run last.

I think Mero should be the anchor.

When Mero is the anchor, how many different orders can there be for the first, second and third runners?

First, Naiko → Kekeni → Ambai.
Second, Ambai → Naiko → Kekeni.
Third, Kekeni → Ambai → Naiko.
There are three cases.
Wait a minute, there could be more…

① Are there other ways of ordering, other than what Yamo found?
(Kekeni, Naiko, Ambai) (Naiko, Ambai, Kekeni) (Ambai, Kekeni, Naiko)

② Let's think about ways to find all the orders systematically and efficiently.

68 =□−□

□÷□= 69

Lesson Flow

1 Think about the ordering of 4 runners.

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

T/S 1 Read and understand the given situation.

TN Explain to students that the anchor in a relay race is usually the final runner who finishes the race.

S ① Write the orders in their exercise books.

T Ask students to give answers and comment positively on their answers when they use symbols (i.e. simple initials) or tables and figures.

T Are there any other orders?

S ② Think about ways to find all the orders.

TN Teacher should also check with students to see how many orders in total there can be.

T ③ Introduce the methods.

S ④ Count how many orders there are when Naiko is the anchor.

2 2 Think about how many 4 - digit numbers there are in total.

T/S Read and understand the given situation.

TN Read and understand the given situation.

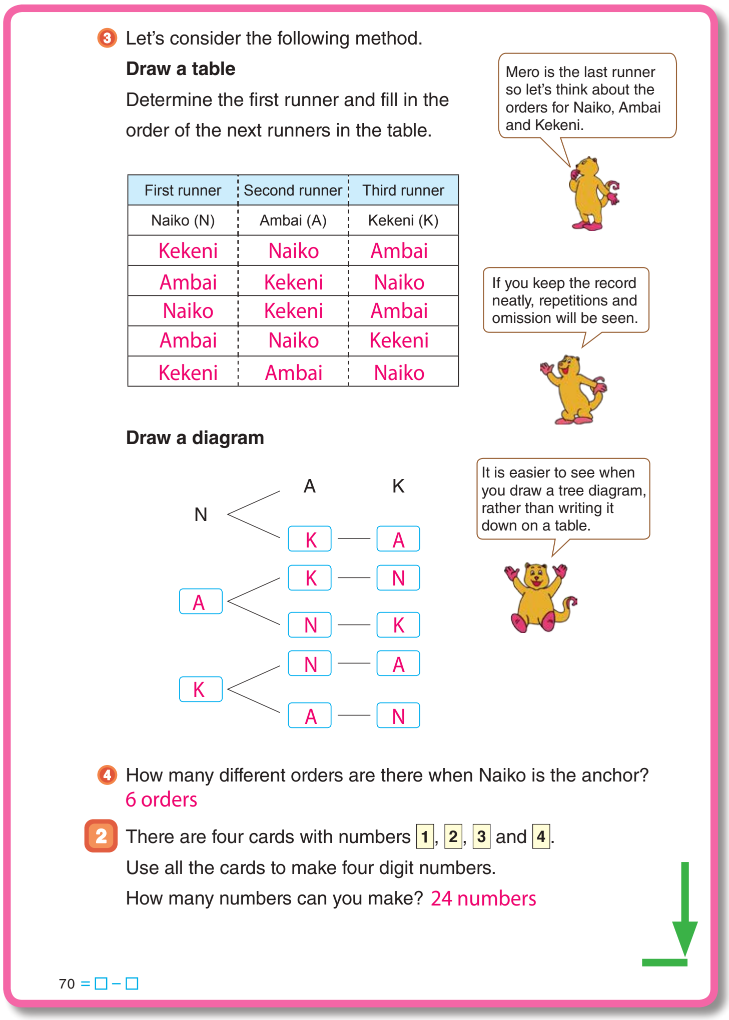
S Use tables and figures to help them find out that there are 24 numbers.

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.



③ Let's consider the following method.

Draw a table

Determine the first runner and fill in the order of the next runners in the table.

First runner	Second runner	Third runner
Naiko (N)	Ambai (A)	Kekeni (K)
Kekeni	Naiko	Ambai
Ambai	Kekeni	Naiko
Naiko	Kekeni	Ambai
Ambai	Naiko	Kekeni
Kekeni	Ambai	Naiko

Mero is the last runner so let's think about the orders for Naiko, Ambai and Kekeni.

If you keep the record neatly, repetitions and omission will be seen.

Draw a diagram

It is easier to see when you draw a tree diagram, rather than writing it down on a table.

④ How many different orders are there when Naiko is the anchor? 6 orders

2 There are four cards with numbers 1, 2, 3 and 4. Use all the cards to make four digit numbers. How many numbers can you make? 24 numbers

70 = □ − □

Sample Blackboard Plan

Lesson 55 Sample Blackboard Plan is on page 113

Unit
8

Unit: Orders and Combinations
Sub-unit: 1. Ordering
Lesson 2 of 2

Textbook Page :
071
Actual Lesson 056

Lesson Objective

- To think about how many different orders there can be on given conditions.

Prior Knowledge

- Identifying the number of orders based on tables and tree diagrams. (Previous lesson)

Preparation

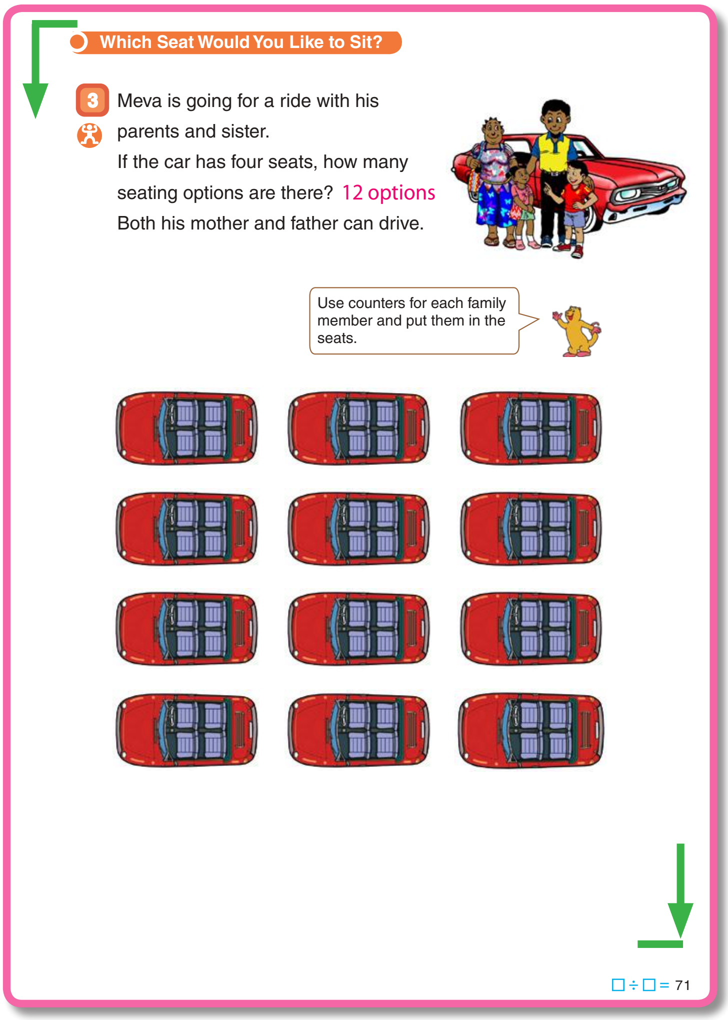
- Square boxes to represent the car.

Assessment

- Think about how many different orders there can be on given conditions by constructing diagrams.
F S

Teacher's Notes

See samples of different ways of ordering in the previous lesson and refer to the sample blackboard plan.



Which Seat Would You Like to Sit?

3 Meva is going for a ride with his parents and sister.
If the car has four seats, how many seating options are there? 12 options
Both his mother and father can drive.

Use counters for each family member and put them in the seats.

□÷□= 71

Lesson Flow

1 Review the previous lesson

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

2 Investigate the number of seating options.

T/S ③ Read and understand the given situation.

S Think based on the pictures in the textbook and discuss what the situation is talking about.

T Give enough time for students to write different orders in their exercise books.

TN Provide useful ideas such as replacing each family member with a marble with different colors or using symbols such as F (for father), M (for mother), S (for sister) and B (for Meva).

S Present ideas and identify good aspects in each presented idea.

TN Assist students to realise that when setting the father as a driver, all they have to do is to think about the seating options of the remaining three people, namely the mother, sister and Meva himself.

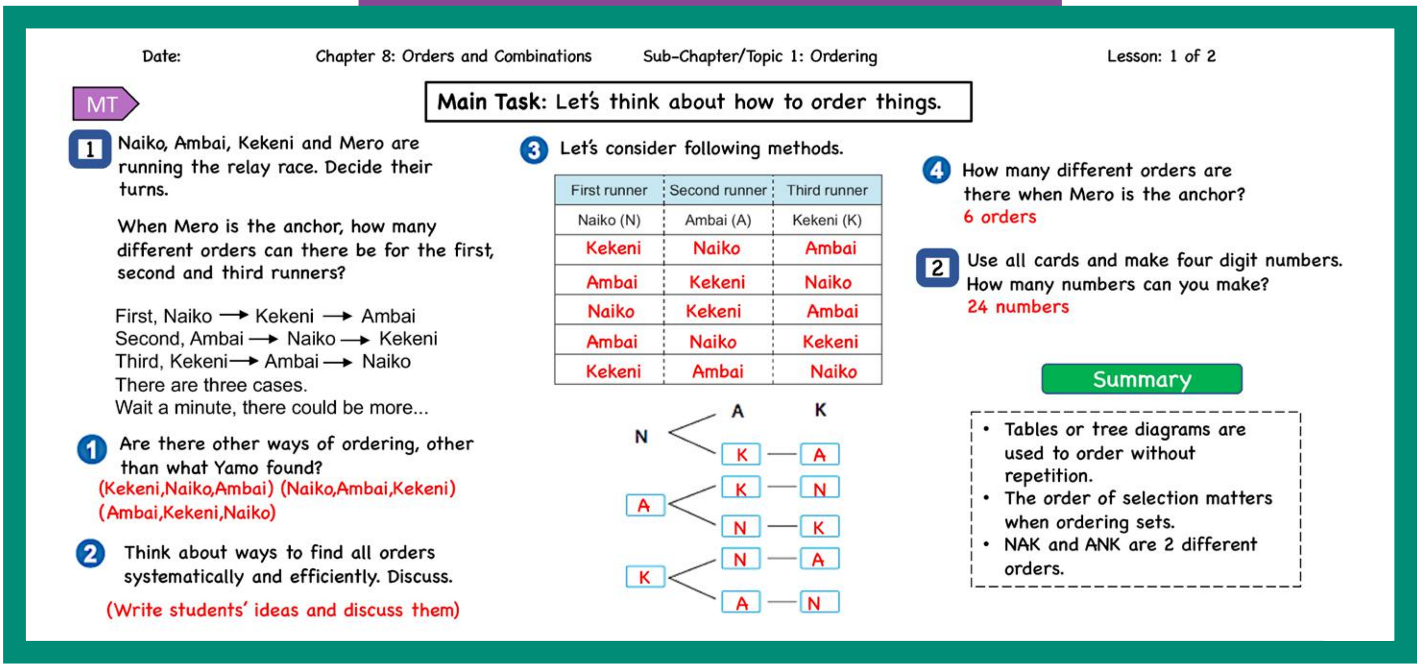
3 Summary

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 (Lesson 55)



Date: Chapter 8: Orders and Combinations Sub-Chapter/Topic 1: Ordering Lesson: 1 of 2

MT

Main Task: Let's think about how to order things.

1 Naiko, Ambai, Kekeni and Mero are running the relay race. Decide their turns.

When Mero is the anchor, how many different orders can there be for the first, second and third runners?

First, Naiko → Kekeni → Ambai
Second, Ambai → Naiko → Kekeni
Third, Kekeni → Ambai → Naiko
There are three cases.
Wait a minute, there could be more...

① Are there other ways of ordering, other than what Yamo found?
(Kekeni,Naiko,Ambai) (Naiko,Ambai,Kekeni) (Ambai,Kekeni,Naiko)

② Think about ways to find all orders systematically and efficiently. Discuss.
(Write students' ideas and discuss them)

③ Let's consider following methods.

First runner	Second runner	Third runner
Naiko (N)	Ambai (A)	Kekeni (K)
Kekeni	Naiko	Ambai
Ambai	Kekeni	Naiko
Naiko	Kekeni	Ambai
Ambai	Naiko	Kekeni
Kekeni	Ambai	Naiko

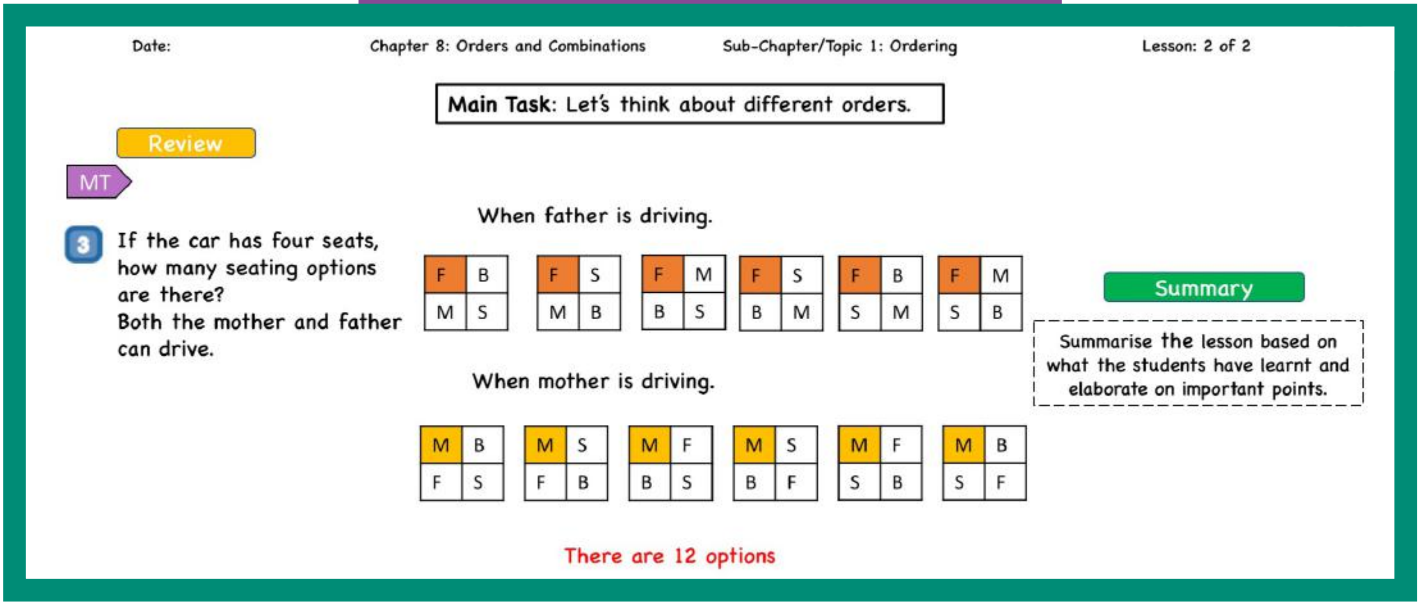
④ How many different orders are there when Mero is the anchor?
6 orders

2 Use all cards and make four digit numbers. How many numbers can you make?
24 numbers

Summary

- Tables or tree diagrams are used to order without repetition.
- The order of selection matters when ordering sets.
- NAK and ANK are 2 different orders.

Sample Blackboard Plan (Lesson 56)



Date: Chapter 8: Orders and Combinations Sub-Chapter/Topic 1: Ordering Lesson: 2 of 2

Main Task: Let's think about different orders.

Review

MT

③ If the car has four seats, how many seating options are there?
Both the mother and father can drive.

When father is driving.

F	B	F	S	F	M	F	S	F	B	F	M
M	S	M	B	B	S	B	M	S	M	S	B

When mother is driving.

M	B	M	S	M	F	M	S	M	F	M	B
F	S	F	B	B	S	B	F	S	B	S	F

There are 12 options

Summary

Summarise the lesson based on what the students have learnt and elaborate on important points.

Unit 8

Unit: Orders and Combinations

Sub-unit: 2. Combinations

Lesson 1 of 2

Textbook Page : 072 and 073
Actual Lesson 057

Sub-unit Objectives

- To think about combinations when selecting 2 objects from a set of 5 objects systematically.
- To think about combinations when selecting 2 objects from a set of 6 objects systematically.

Lesson Objective

- To systematically think about combinations when selecting 2 objects from a set of 5 objects.

Prior Knowledge

- Identifying the number of orders based on tables and tree diagrams.

Preparation

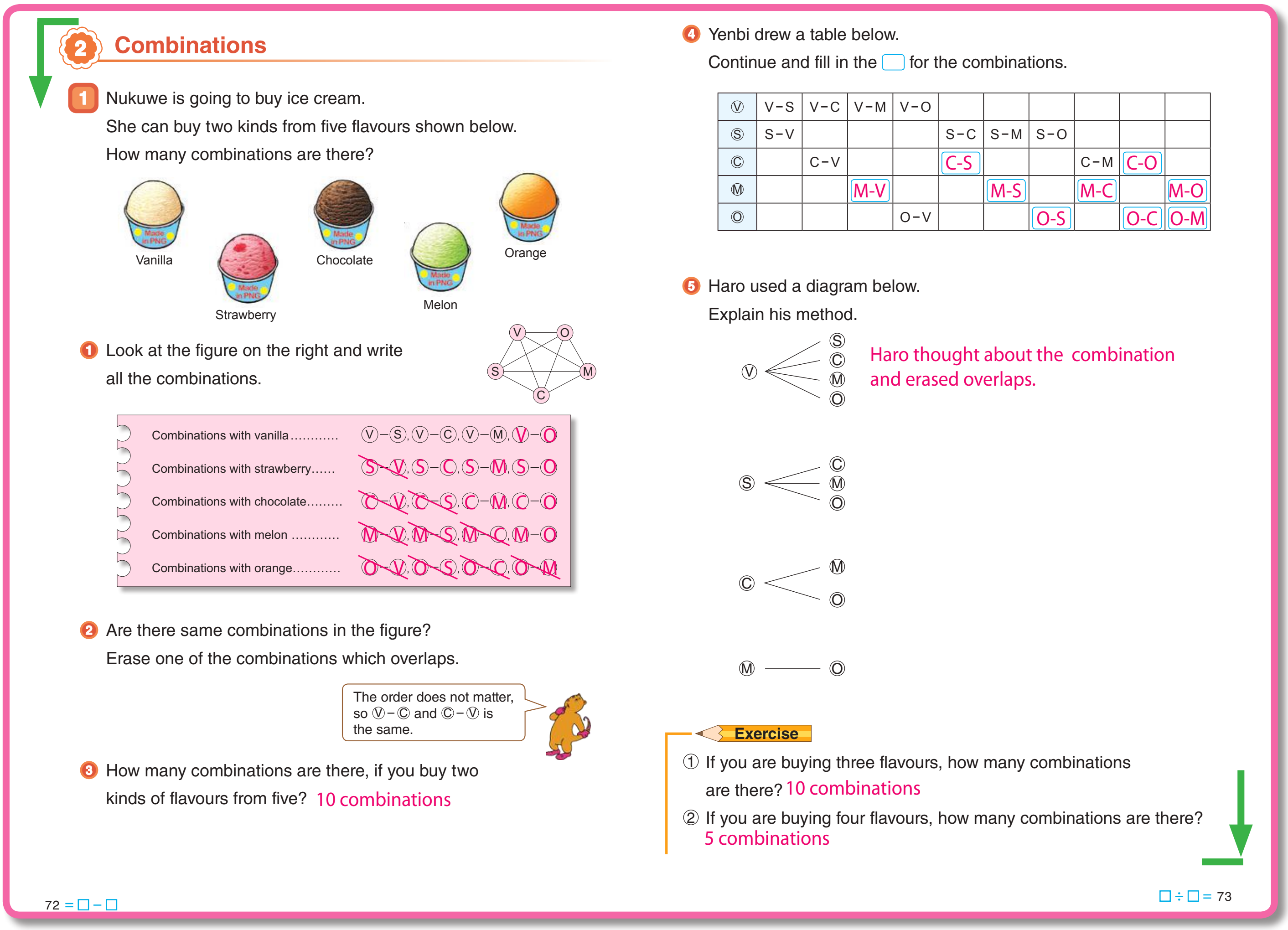
- Tables and Diagrams.

Assessment

- Determine the number of different combinations by drawing tables and diagrams. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

In this lesson, the order does not matter but similar combinations should be omitted when identified so that only one of the combinations remains to ensure that there is no repetition.



② Combinations

1 Nukuwe is going to buy ice cream.
She can buy two kinds from five flavours shown below.
How many combinations are there?

Vanilla, Strawberry, Chocolate, Melon, Orange

① Look at the figure on the right and write all the combinations.

Combinations with vanilla………… Ⓥ−Ⓢ, Ⓥ−Ⓒ, Ⓥ−Ⓜ, Ⓥ−Ⓞ
Combinations with strawberry…… ~~Ⓢ−Ⓥ~~, Ⓢ−Ⓒ, Ⓢ−Ⓜ, Ⓢ−Ⓞ
Combinations with chocolate……… ~~Ⓒ−Ⓥ~~, ~~Ⓒ−Ⓢ~~, Ⓒ−Ⓜ, Ⓒ−Ⓞ
Combinations with melon ………… ~~Ⓜ−Ⓥ~~, ~~Ⓜ−Ⓢ~~, ~~Ⓜ−Ⓒ~~, Ⓜ−Ⓞ
Combinations with orange………… ~~Ⓞ−Ⓥ~~, ~~Ⓞ−Ⓢ~~, ~~Ⓞ−Ⓒ~~, ~~Ⓞ−Ⓜ~~

② Are there same combinations in the figure?
Erase one of the combinations which overlaps.

The order does not matter, so Ⓥ−Ⓒ and Ⓒ−Ⓥ is the same.

③ How many combinations are there, if you buy two kinds of flavours from five? 10 combinations

④ Yenbi drew a table below.
Continue and fill in the ▭ for the combinations.

Ⓥ	V−S	V−C	V−M	V−O						
Ⓢ	S−V				S−C	S−M	S−O			
Ⓒ		C−V			C-S			C−M	C-O	
Ⓜ			M-V			M-S		M-C		M-O
Ⓞ				O−V			O-S		O-C	O-M

⑤ Haro used a diagram below.
Explain his method.

Ⓥ — Ⓢ, Ⓒ, Ⓜ, Ⓞ
Ⓢ — Ⓒ, Ⓜ, Ⓞ
Ⓒ — Ⓜ, Ⓞ
Ⓜ — Ⓞ

Haro thought about the combination and erased overlaps.

Exercise

① If you are buying three flavours, how many combinations are there? 10 combinations

② If you are buying four flavours, how many combinations are there?
5 combinations

72 = □ − □

□ ÷ □ = 73

Lesson Flow

1 Finding different combinations.

T/S ① Read and understand the given situation.

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

T Ask students to choose 2 flavours from the 5 and tell them to write their answers in their exercise books.
In this way, students can start understanding the meaning and the context.

S Find other combinations of the 5 flavours apart from the first two.

2 Finding other possible combinations.

S ① Look at the pentagon shown in the textbook. and think about the number of combinations of 2 flavours.

T Help students to realise that the sides and the diagonals show the combinations of 2 kinds of flavours from 5.

S Think about all the combinations by filling in the diagram.

T/S ② Discuss how to deal with similar combinations. (Refer to TN)

S Determine whether the combinations of vanilla-chocolate and chocolate - vanilla are the same or different.

TN The combination vanilla-chocolate and chocolate-vanilla are the same. Eliminate one of the same combinations.

T ③ Ask students to count how many combinations there are in total after eliminating repeated combinations.

S There are 10 combinations.

T As in the previous lessons in finding orders, get them to think again by using tables and figures for ④ and ⑤ .

S Refer to the table and figure shown in ④ and ⑤ and write their own ideas.

T Advise students to always follow a rule to check and complete the table systematically.

S Discuss the tables and completed tree diagrams.

TN Ensure that there are 10 combinations to select 2 kinds of flavours from 5.

3 Complete the Exercise.

T Based on tables and figures, get the students to think about how many combinations there will be when they select 3 kinds from 5 kinds.

S Complete the exercises.

T Confirm students' answers.

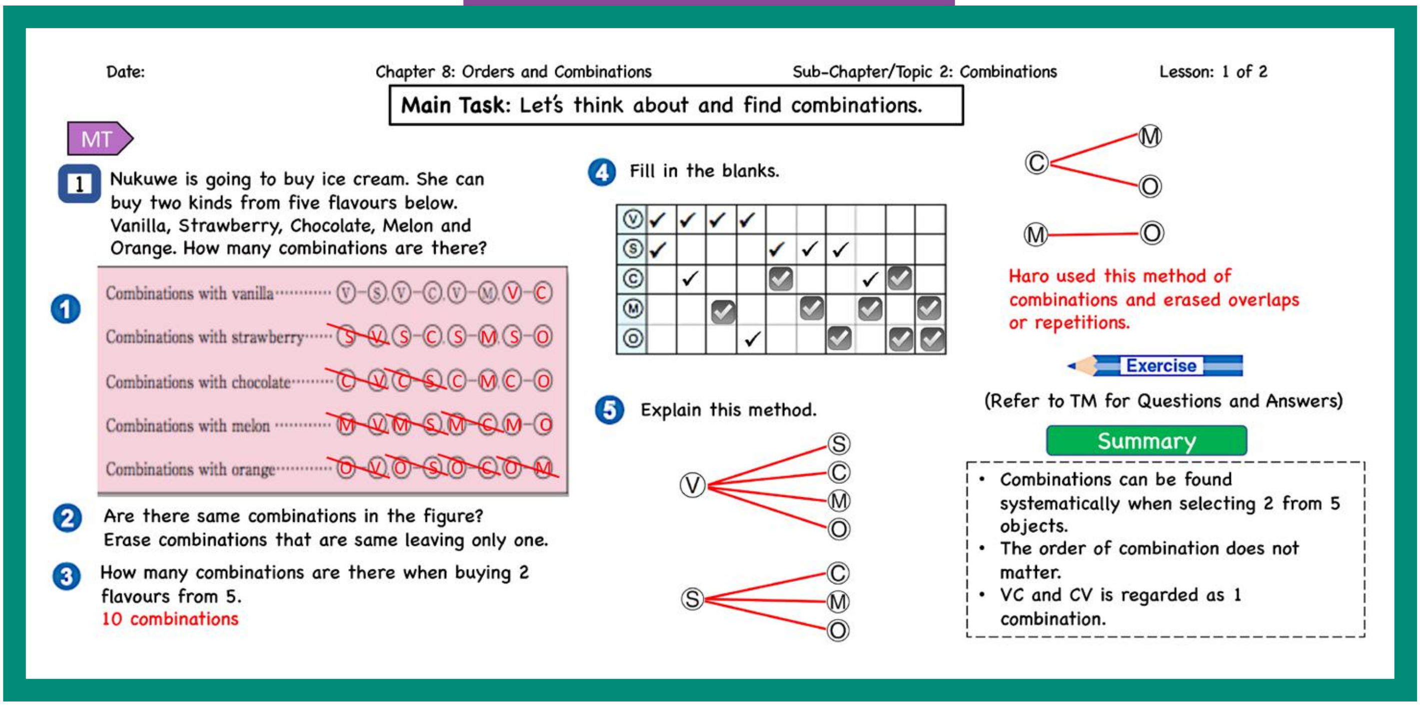
4 Summary

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:

Chapter 8: Orders and Combinations

Sub-Chapter/Topic 2: Combinations

Lesson: 1 of 2

Main Task: Let's think about and find combinations.

MT

1 Nukuwe is going to buy ice cream. She can buy two kinds from five flavours below. Vanilla, Strawberry, Chocolate, Melon and Orange. How many combinations are there?

① Combinations with vanilla………… Ⓥ-Ⓢ, Ⓥ-Ⓒ, Ⓥ-Ⓜ, Ⓥ-Ⓒ
Combinations with strawberry…… ~~Ⓢ-Ⓥ~~, Ⓢ-Ⓒ, Ⓢ-Ⓜ, Ⓢ-Ⓞ
Combinations with chocolate……… ~~Ⓒ-Ⓥ~~, ~~Ⓒ-Ⓢ~~, Ⓒ-Ⓜ, Ⓒ-Ⓞ
Combinations with melon ………… ~~Ⓜ-Ⓥ~~, ~~Ⓜ-Ⓢ~~, ~~Ⓜ-Ⓒ~~, Ⓜ-Ⓞ
Combinations with orange………… ~~Ⓞ-Ⓥ~~, ~~Ⓞ-Ⓢ~~, ~~Ⓞ-Ⓒ~~, ~~Ⓞ-Ⓜ~~

② Are there same combinations in the figure?
Erase combinations that are same leaving only one.

③ How many combinations are there when buying 2 flavours from 5.
10 combinations

④ Fill in the blanks.

Ⓥ	✓	✓	✓	✓						
Ⓢ	✓				✓	✓	✓			
Ⓒ		✓			☑			✓	☑	
Ⓜ			☑			☑		☑		☑
Ⓞ				✓			☑		☑	☑

⑤ Explain this method.

Haro used this method of combinations and erased overlaps or repetitions.

Exercise

(Refer to TM for Questions and Answers)

Summary

- Combinations can be found systematically when selecting 2 from 5 objects.
- The order of combination does not matter.
- VC and CV is regarded as 1 combination.

Unit
8

Unit: Orders and Combinations
Sub-unit: 2. Combinations
Lesson 2 of 2

Textbook Page : 074
Actual Lesson 058

Lesson Objective

- To think about combinations when selecting 2 objects from a set of 6 objects systematically.

Prior Knowledge

- Combinations when selecting 2 object from a set of 5 objects.

Preparation

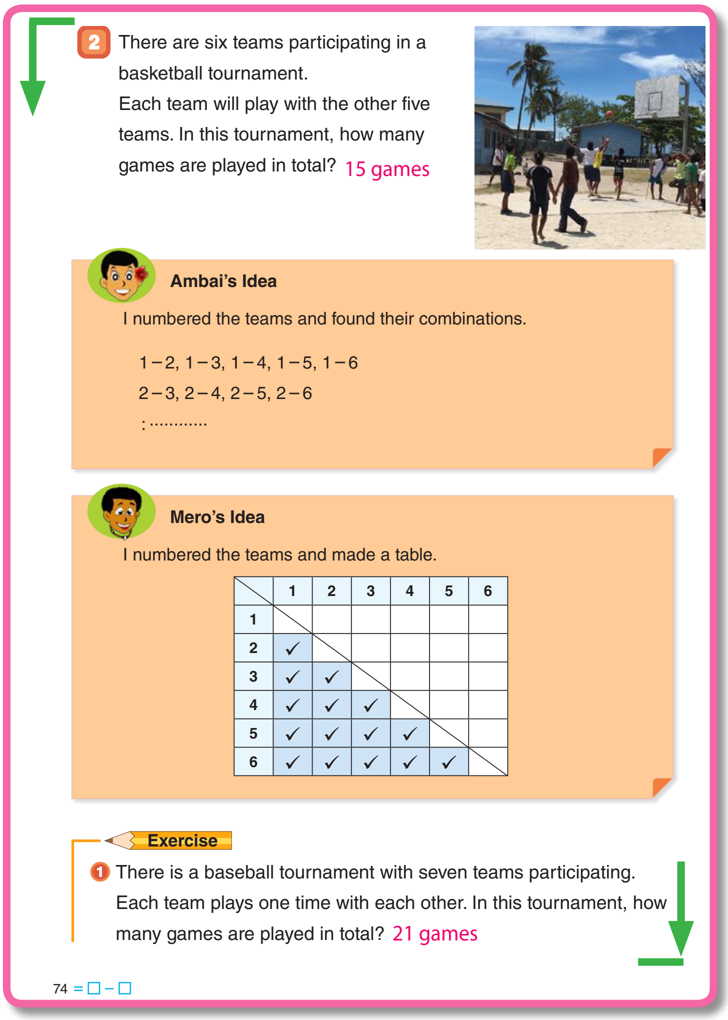
- Table on Mero's Idea

Assessment

- Think about how many combinations there are by drawing figures, tables and diagrams. F
- Solve the exercises correctly. S

Teacher's Notes

Refer to the notes for the previous lesson. Students should be reminded to use methods used to find combinations to avoid repetition.



② There are six teams participating in a basketball tournament.
Each team will play with the other five teams. In this tournament, how many games are played in total? 15 games

Ambai's Idea

I numbered the teams and found their combinations.

1 − 2, 1 − 3, 1 − 4, 1 − 5, 1 − 6
2 − 3, 2 − 4, 2 − 5, 2 − 6
: ....

Mero's Idea

I numbered the teams and made a table.

	1	2	3	4	5	6
1						
2	✓					
3	✓	✓				
4	✓	✓	✓			
5	✓	✓	✓	✓		
6	✓	✓	✓	✓	✓	

Exercise

① There is a baseball tournament with seven teams participating. Each team plays one time with each other. In this tournament, how many games are played in total? 21 games

74 = □ − □

Lesson Flow

1 Review the previous lesson.

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

2 Think about the number of games played in a tournament.

T/S ② Read and understand the given situation.
T How many games are played in total?
S Discuss and present their own ideas.
T Ask students to discuss Ambai's and Mero's ideas to find what is common between the two.
S Realise that both of them put a number for each team.
T What combinations do you find in each of the ideas?
S Ambai is using the rule of combination for one team and listing down the possibilities while Mero is using a table.

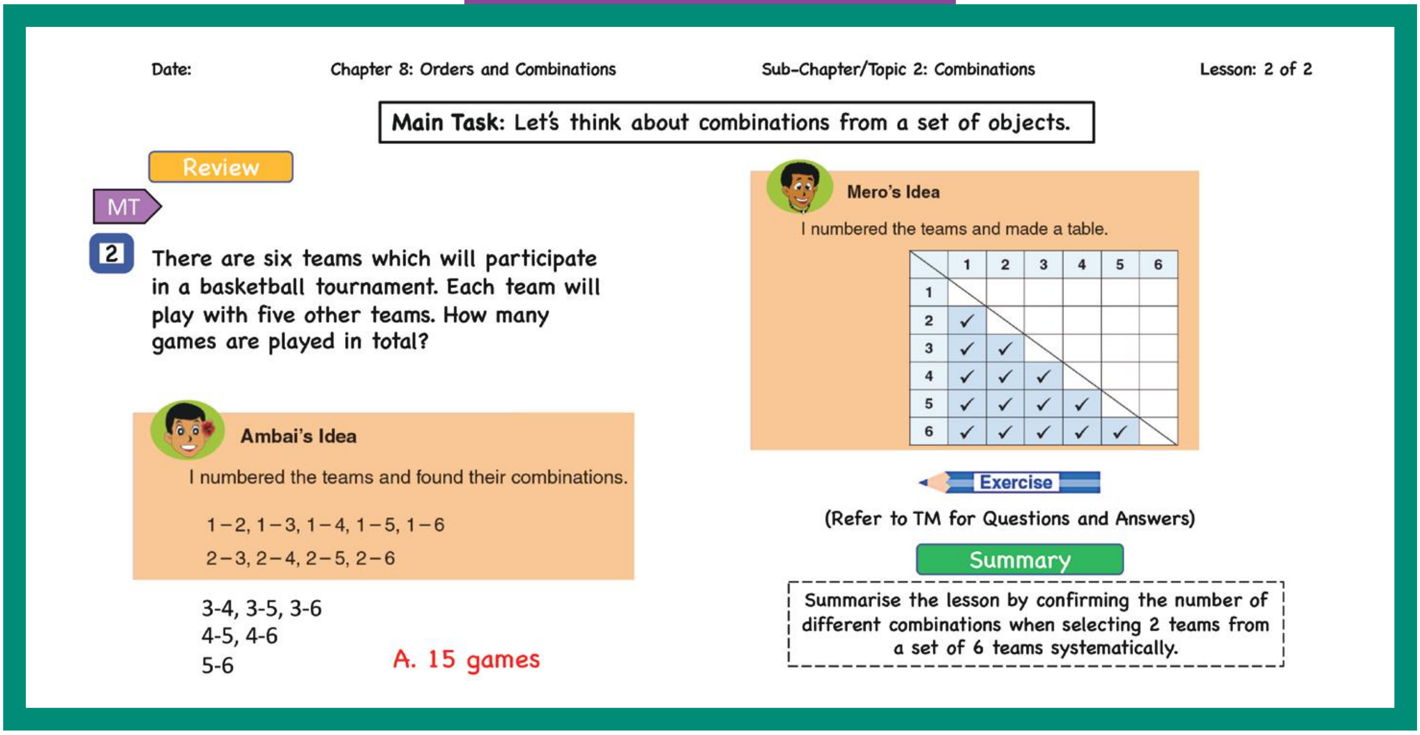
3 Complete the Exercise.

S Find the number of games played in total by utilising Ambai's and Mero's ideas.
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: Chapter 8: Orders and Combinations Sub-Chapter/Topic 2: Combinations Lesson: 2 of 2

Main Task: Let's think about combinations from a set of objects.

Review

MT

2 There are six teams which will participate in a basketball tournament. Each team will play with five other teams. How many games are played in total?

Ambai's Idea

I numbered the teams and found their combinations.

1 – 2, 1 – 3, 1 – 4, 1 – 5, 1 – 6
2 – 3, 2 – 4, 2 – 5, 2 – 6
3-4, 3-5, 3-6
4-5, 4-6
5-6

A. 15 games

Mero's Idea

I numbered the teams and made a table.

	1	2	3	4	5	6
1						
2	✓					
3	✓	✓				
4	✓	✓	✓			
5	✓	✓	✓	✓		
6	✓	✓	✓	✓	✓	

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson by confirming the number of different combinations when selecting 2 teams from a set of 6 teams systematically.

Unit 8

Unit: Orders and Combinations
Exercise, Problems, Review and Evaluation
Lesson 1 and 2 of 2

Textbook Page :
075 to 077
Actual Lesson 59 & 60

Lesson Objective

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

Assessment

- Solve the exercises correctly to confirm what they learned in this unit. F S

Prior Knowledge

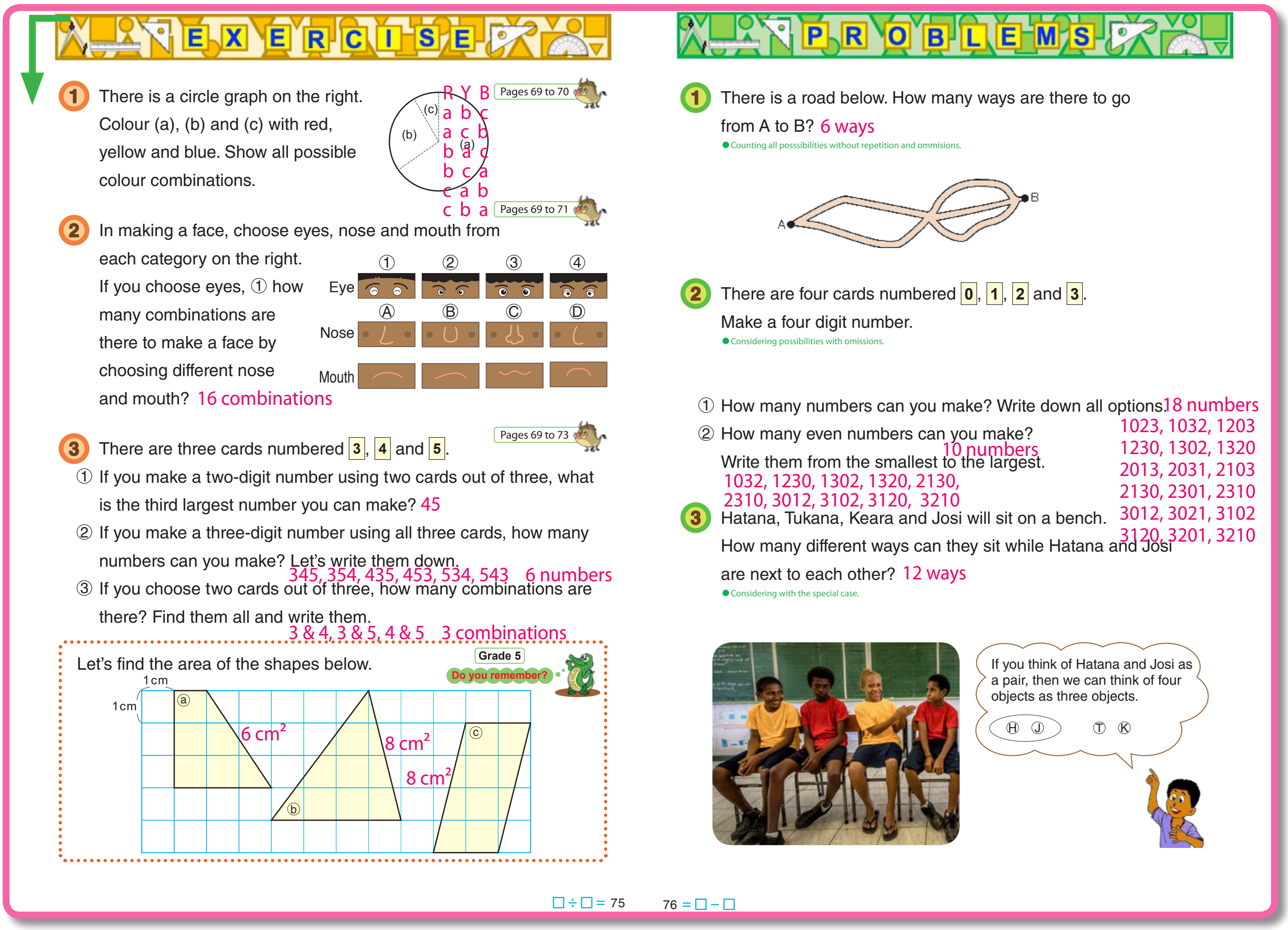
- All the contents learned in the unit on Order and Combinations.

Preparation

- Evaluation Test.

Teacher's Notes

This is the last lesson of Chapter 8.
Students should be encouraged to use the necessary skills and ideas learnt in this unit to complete all the Exercises and solve the Problems and Review in preparation for the evaluation test.
Use the attached evaluation test to conduct assessment for your class after finishing all the exercises, problems and review as a seperate lesson.



EXERCISE

① There is a circle graph on the right. Colour (a), (b) and (c) with red, yellow and blue. Show all possible colour combinations.

Pages 69 to 70

R	Y	B
a	b	c
a	c	b
b	a	c
b	c	a
c	a	b
c	b	a

Pages 69 to 71

② In making a face, choose eyes, nose and mouth from each category on the right. If you choose eyes, ① how many combinations are there to make a face by choosing different nose and mouth? 16 combinations

Pages 69 to 73

③ There are three cards numbered 3, 4 and 5.

① If you make a two-digit number using two cards out of three, what is the third largest number you can make? 45

② If you make a three-digit number using all three cards, how many numbers can you make? Let's write them down.
345, 354, 435, 453, 534, 543　6 numbers

③ If you choose two cards out of three, how many combinations are there? Find them all and write them.
3 & 4, 3 & 5, 4 & 5　3 combinations

Grade 5 Do you remember?

Let's find the area of the shapes below.

□ ÷ □ = 75

PROBLEMS

① There is a road below. How many ways are there to go from A to B? 6 ways
- Counting all posssibilities without repetition and ommisions.

② There are four cards numbered 0, 1, 2 and 3. Make a four digit number.
- Considering possibilities with omissions.

① How many numbers can you make? Write down all options. 18 numbers
1023, 1032, 1203
1230, 1302, 1320
2013, 2031, 2103
2130, 2301, 2310
3012, 3021, 3102
3120, 3201, 3210

② How many even numbers can you make? 10 numbers
Write them from the smallest to the largest.
1032, 1230, 1302, 1320, 2130,
2310, 3012, 3102, 3120, 3210

③ Hatana, Tukana, Keara and Josi will sit on a bench. How many different ways can they sit while Hatana and Josi are next to each other? 12 ways
- Considering with the special case.

If you think of Hatana and Josi as a pair, then we can think of four objects as three objects.
Ⓗ Ⓙ
Ⓣ Ⓚ

76 = □ − □

Lesson Flow

1 Complete Exercise ①.

S Identify all the colour combinations for (a), (b) and (c) in the circle.

T Confirm students' answers.

2 Complete Exercise ②.

S Solve the problem by identifying the different combinations to make a face.

T Confirm students' answers.

3 Complete Exercise ③ ① to ③.

S Find the different combinations for the cards numbered 3, 4 and 5.

T Confirm students' answers.

4 Complete the Do You Remember exercise.

S Solve the area problems.

5 Complete Problem ①.

S Solve the problem.

T Confirm students' answers.

6 Complete Problem ② ① & ②.

S Find the different combinations for the cards numbered 0, 1, 2 and 3.

T Confirm students' answers.

7 Complete Problem ③.

S Use combinations to find all the different sitting positions.

T Confirm students' answers.

8 Complete Review ①.

S Calculate the fraction problems.

T Confirm students' answers.

9 Complete Review ② to ⑤.

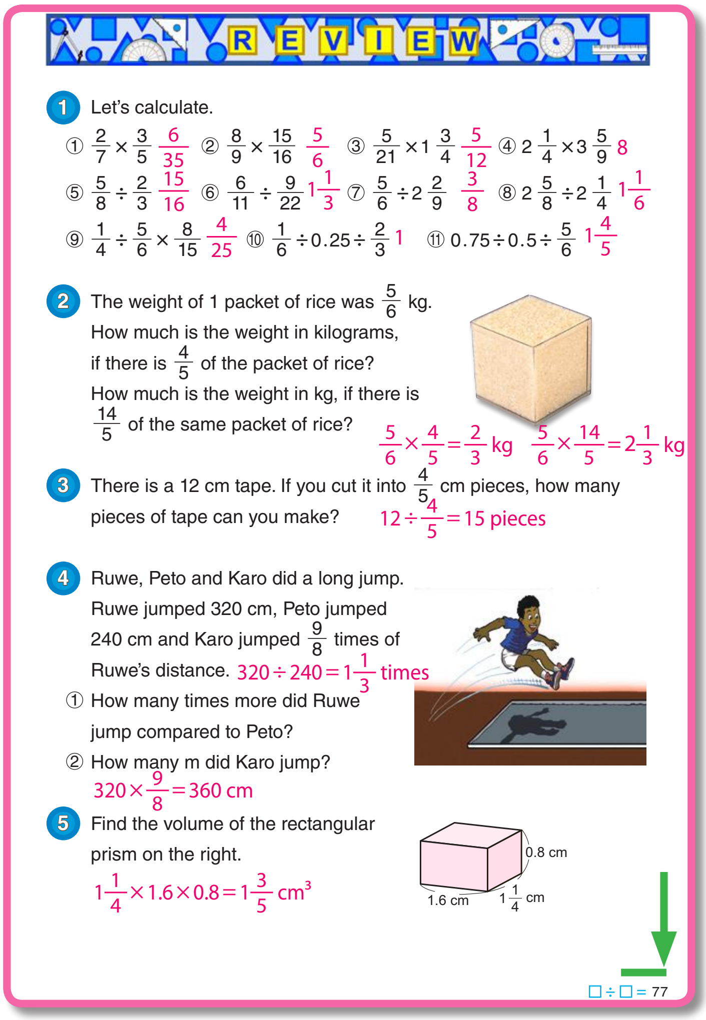
S Solve the fraction problems.

T Confirm students' answers.

10 Complete the Evaluation Test.

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

S Complete the evaluation test.



REVIEW

① Let's calculate.

① $\frac{2}{7}\times\frac{3}{5}$ $\frac{6}{35}$ ② $\frac{8}{9}\times\frac{15}{16}$ $\frac{5}{6}$ ③ $\frac{5}{21}\times1\frac{3}{4}$ $\frac{5}{12}$ ④ $2\frac{1}{4}\times3\frac{5}{9}$ 8

⑤ $\frac{5}{8}\div\frac{2}{3}$ $\frac{15}{16}$ ⑥ $\frac{6}{11}\div\frac{9}{22}$ $1\frac{1}{3}$ ⑦ $\frac{5}{6}\div2\frac{2}{9}$ $\frac{3}{8}$ ⑧ $2\frac{5}{8}\div2\frac{1}{4}$ $1\frac{1}{6}$

⑨ $\frac{1}{4}\div\frac{5}{6}\times\frac{8}{15}$ $\frac{4}{25}$ ⑩ $\frac{1}{6}\div0.25\div\frac{2}{3}$ 1 ⑪ $0.75\div0.5\div\frac{5}{6}$ $1\frac{4}{5}$

② The weight of 1 packet of rice was $\frac{5}{6}$ kg. How much is the weight in kilograms, if there is $\frac{4}{5}$ of the packet of rice? How much is the weight in kg, if there is $\frac{14}{5}$ of the same packet of rice?

$\frac{5}{6}\times\frac{4}{5}=\frac{2}{3}$ kg $\frac{5}{6}\times\frac{14}{5}=2\frac{1}{3}$ kg

③ There is a 12 cm tape. If you cut it into $\frac{4}{5}$ cm pieces, how many pieces of tape can you make? $12\div\frac{4}{5}=15$ pieces

④ Ruwe, Peto and Karo did a long jump. Ruwe jumped 320 cm, Peto jumped 240 cm and Karo jumped $\frac{9}{8}$ times of Ruwe's distance. $320\div240=1\frac{1}{3}$ times

① How many times more did Ruwe jump compared to Peto?

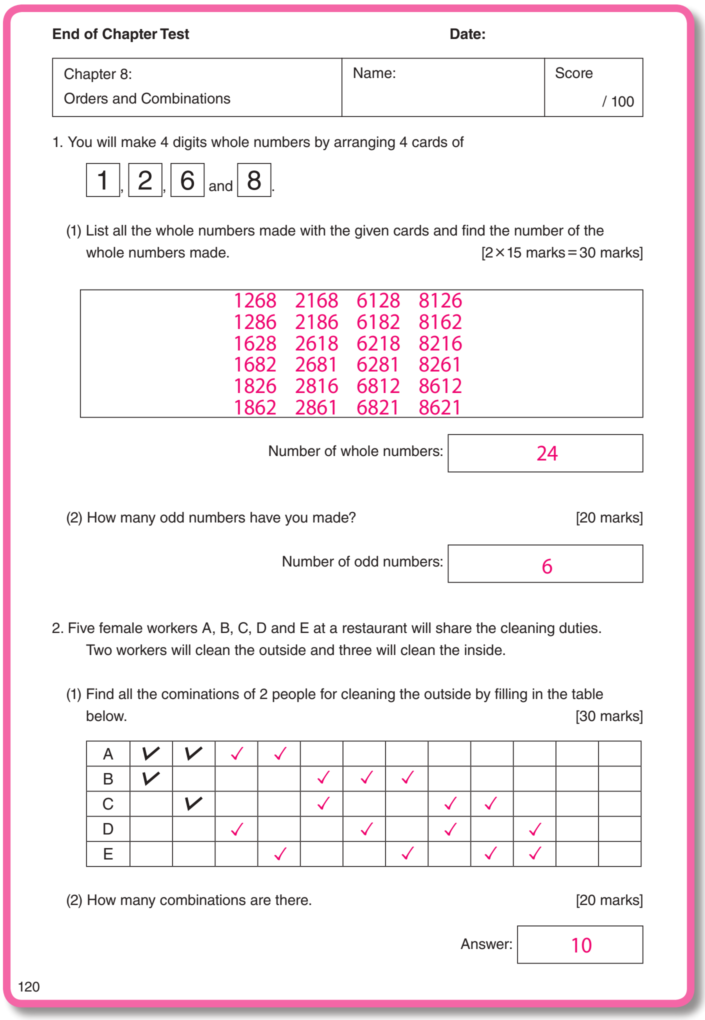
② How many m did Karo jump?

$320\times\frac{9}{8}=360$ cm

⑤ Find the volume of the rectangular prism on the right.

$1\frac{1}{4}\times1.6\times0.8=1\frac{3}{5}$ cm^3

□ ÷ □ = 77



End of Chapter Test **Date:**

Chapter 8: Orders and Combinations	Name:	Score / 100

1. You will make 4 digits whole numbers by arranging 4 cards of

1, 2, 6 and 8.

(1) List all the whole numbers made with the given cards and find the number of the whole numbers made. [2×15 marks = 30 marks]

1268	2168	6128	8126
1286	2186	6182	8162
1628	2618	6218	8216
1682	2681	6281	8261
1826	2816	6812	8612
1862	2861	6821	8621

Number of whole numbers: 24

(2) How many odd numbers have you made? [20 marks]

Number of odd numbers: 6

2. Five female workers A, B, C, D and E at a restaurant will share the cleaning duties. Two workers will clean the outside and three will clean the inside.

(1) Find all the cominations of 2 people for cleaning the outside by filling in the table below. [30 marks]

A	✓	✓	✓	✓								
B	✓				✓	✓	✓					
C		✓			✓			✓	✓			
D			✓			✓		✓		✓		
E				✓			✓		✓	✓		

(2) How many combinations are there. [20 marks]

Answer: 10

120

End of Chapter Test **Date:**

Chapter 8: Orders and Combinations	Name:	Score / 100

1. You will make 4 digits whole numbers by arranging 4 cards of

$\boxed{1}$, $\boxed{2}$, $\boxed{6}$ and $\boxed{8}$.

(1) List all the whole numbers made with the given cards and find the number of the whole numbers made. [2 × 15 marks = 30 marks]

Number of whole numbers:

(2) How many odd numbers have you made? [20 marks]

Number of odd numbers:

2. Five female workers A, B, C, D and E at a restaurant will share the cleaning duties. Two workers will clean the outside and three will clean the inside.

(1) Find all the cominations of 2 people for cleaning the outside by filling in the table below. [30 marks]

A	✓	✓										
B	✓											
C		✓										
D												
E												

(2) How many combinations are there. [20 marks]

Answer:

Chapter 9 Speed

1. Content Standard

6. 2. 2. Students will be able to comprehend speed as a ratio of time and distance and use its situation to calculate and appreciate their relationship.

2. Unit Objectives

- To understand the meaning of speed and how to express and determine speed.
- To understand relationship between speed, time and distance.

3. Teaching Overview

In Grade 5, students started learning combined quantities such as number of people in a unit area, etc. In this unit, students learn distances traveled per unit time.

Speed is a combined quantity for us to think about 2 quantities at the same time and express as a quantity. The concept is quite complicated for students.

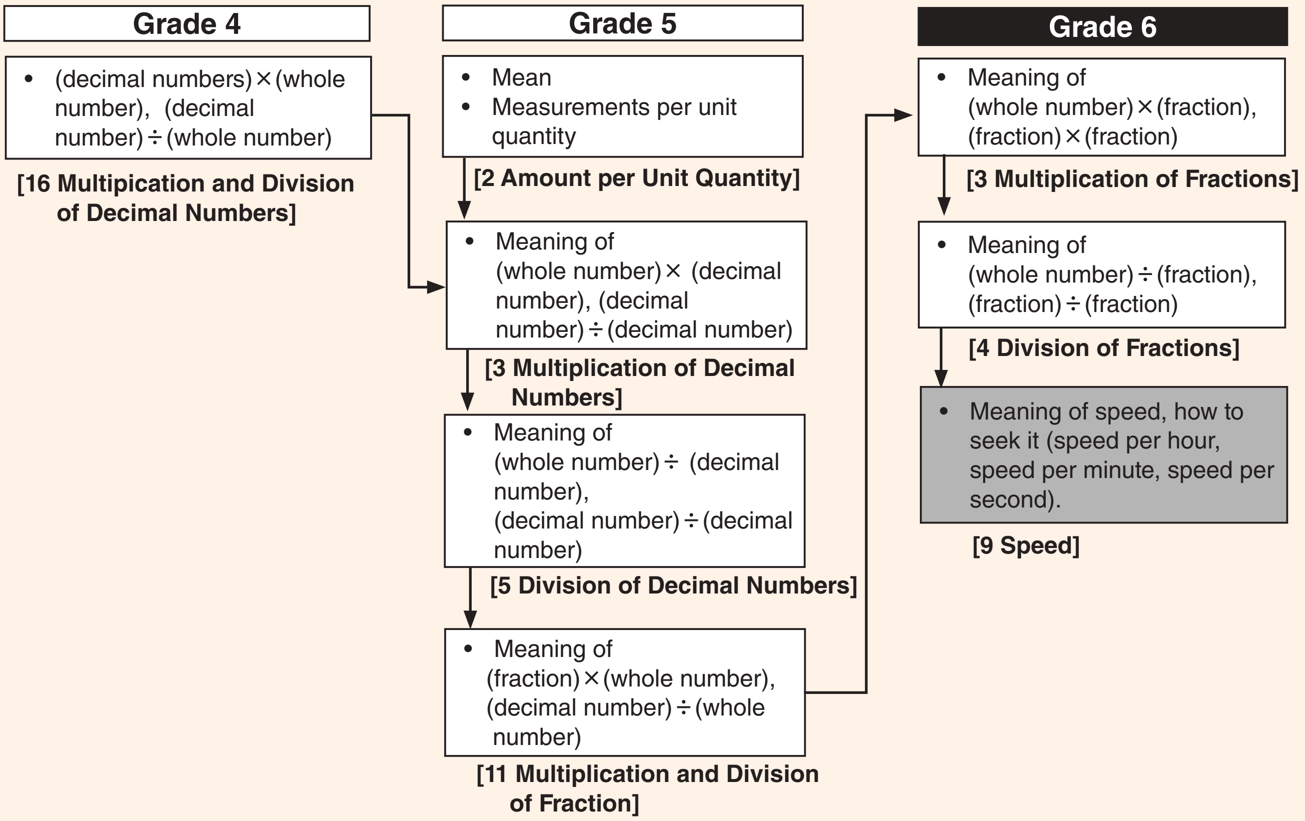
Speed :

Firstly students compare the speed for 2 different distances traveled in the same time durations. They also compare the speed for the same distances traveled in different time durations. Finally students find out that they can compare the speed even though they travel different routes in different time durations.

Speeds and Graphs :

Students need to have enough experiences to draw graphs of speed and interpreting graphs. They will appreciate that visualization of graphs will give them pictures of the travel.

4. Related Learning Contents


Grade 4
• (decimal numbers) × (whole number), (decimal number) ÷ (whole number)
[16 Multipication and Division of Decimal Numbers]
Grade 5
• Mean
• Measurements per unit quantity
[2 Amount per Unit Quantity]
• Meaning of (whole number) × (decimal number), (decimal number) ÷ (decimal number)
[3 Multiplication of Decimal Numbers]
• Meaning of (whole number) ÷ (decimal number), (decimal number) ÷ (decimal number)
[5 Division of Decimal Numbers]
• Meaning of (fraction) × (whole number), (decimal number) ÷ (whole number)
[11 Multiplication and Division of Fraction]
Grade 6
• Meaning of (whole number) × (fraction), (fraction) × (fraction)
[3 Multiplication of Fractions]
• Meaning of (whole number) ÷ (fraction), (fraction) ÷ (fraction)
[4 Division of Fractions]
• Meaning of speed, how to seek it (speed per hour, speed per minute, speed per second).
[9 Speed]

Unit 9

Unit: Speed
Sub-unit: 1. Speed
Lesson 1 of 3

Textbook Page : 078 to 080
Actual Lesson 061

Sub-unit Objectives

- To understand how to express, compare and determine speed by applying the idea of per unit quantity.
- To solve various problems by applying the relationship between speed, time and distance.

Lesson Objectives

- To think of how to compare speed by applying the idea of per unit quantity.
- To recognise the usefulness of applying the idea of per unit quantity when comparing speed.
- To understand how to find speed and realise that there are various units of speed; speed per hour, per minute and per second.

Prior Knowledge

- All contents of multiplication and division.
- Distance and time
- Per unit quantity

Preparation

- Table of distance and time
- Two charts of 'same times' and 'same distance'

Assessment

- Think about how to compare speed by applying the idea of per unit quantity. F
- Find speed by applying the idea of per unit quantity. S
- Solve the excerises correctly. S

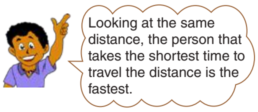
Teacher's Notes

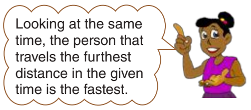
1 ② Students find the distance for each student travelling in 1 second. Table shows, student Ⓐ ran 20 m in 5 second. So students can do 20 m divided by 5 seconds to find distanec in 1 second.
Eg; Ⓐ 20 (m) ÷ 5 (s) = 4 (m) in 1 seond.
③ student find the distance each student travelling in 1 m.
Through ②, students found Ⓐ ran 4 m in 1 second.
Therefore, 4 m ÷ 4 to find time for 1 m. So students can do 1 second ÷ 4 = 0.25 second (in 1 m).

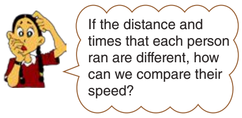
9 Speed

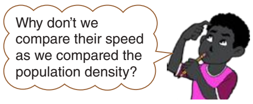
How to compare speed

▷▷ In a Physical Education class, the teacher wants to measure the running speed of individual students.
They got into two groups.
One group timed students that ran certain distances.
Another group measured the distance the students ran within a time period.
Who can run the fastest?


Looking at the same distance, the person that takes the shortest time to travel the distance is the fastest.


Looking at the same time, the person that travels the furthest distance in the given time is the fastest.


If the distance and times that each person ran are different, how can we compare their speed?


Why don't we compare their speed as we compared the population density?

① Speed

How to Express "Speed"

Meaning of speed and how to express it

1 The distance and time of the 3 students are shown in the table.

Distances and Times

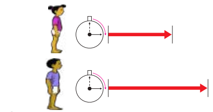
Student	Distance (m)	Time (seconds)
Ⓐ	20	5
Ⓑ	15	5
Ⓒ	15	4

① Which student is the fastest?
Compare their speed.
Comparing Ⓐ and Ⓑ → A is faster.
Comparing Ⓑ and Ⓒ → C is faster.
Comparing Ⓐ and Ⓒ → ? is faster.

Both time and distance are different

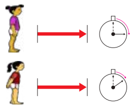
Speed can be compared if the time or the distance is the same.

Same time
The distance that the student covered in 1 minute.



Same time, different distances.

Same distance
The time needed to travel the distance.



Same distance, different times.

② Let's compare their speed by calculating how many m travelled in one second.
(A) 20 ÷ 5 = 4 (m), (B) 15 ÷ 5 = 3 (m),
(C) 15 ÷ 4 = 3.75 (m) (A) is the fastest.

③ Let's compare their speed by calculating how many seconds it took to travel in 1 m.
(A) 5 ÷ 20 = 0.25 (Second), (B) 5 ÷ 15 = 0.333... (Second)
(C) 4 ÷ 15 = 0.2666... (Second) (A) is the fastest.

If you compare the speed by distance, the shorter the time the faster the student. If you compare the speed by time, the longer the distance the faster the student.

Lesson Flow

1 ▷▷ Discuss the speed of students in different contexts.

T/S Read and understand the given situation.

T How can we compare the speed of the students?

S When the given distance is the same, the student that takes the shortest time to run the distance is the fastest. Consider also the student's ideas from the bubbles.

TN Students should realise that when the given time is the same, the student that runs the furthest distance in the given time is the fastest. (Speed of different times per distances cannot be compared)

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

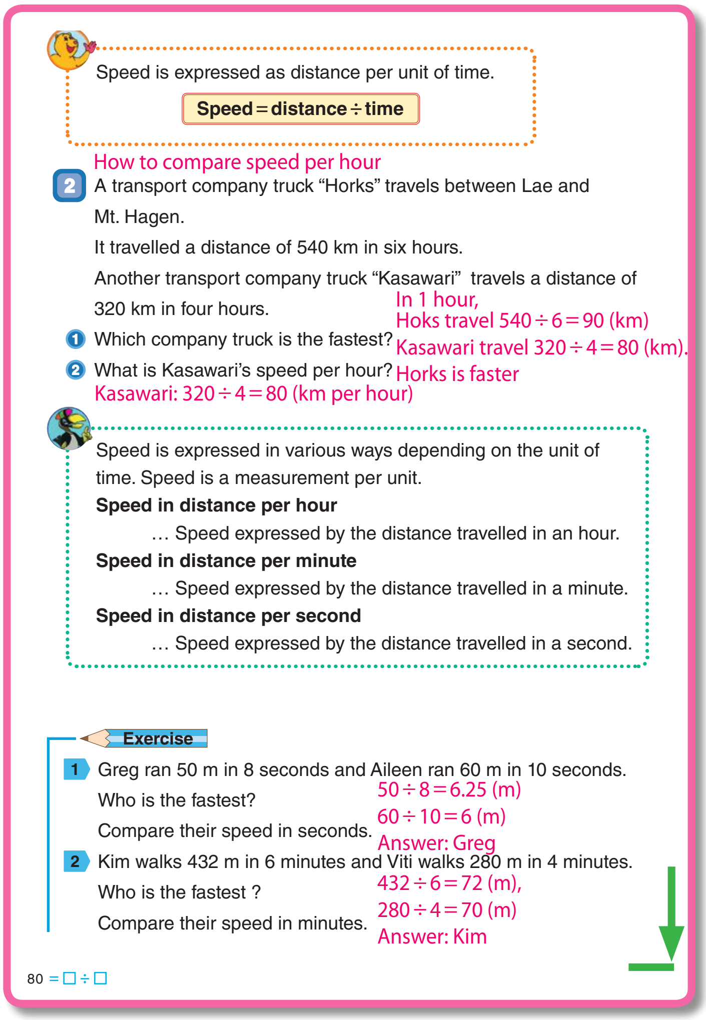
2 Comparing the speed of students.

T/S 1 Read and understand the given situation.

T ① Let's look at the table. Which student is the fastest from the result?

S Ⓐ is faster than Ⓑ because Ⓐ travelled further even though the time is the same for both.

S Ⓒ is faster than Ⓑ because Ⓒ travelled the distance in a shorter time even though the distance is the same for both.



Speed is expressed as distance per unit of time.

Speed = distance ÷ time

How to compare speed per hour

2 A transport company truck "Horks" travels between Lae and Mt. Hagen.

It travelled a distance of 540 km in six hours.

Another transport company truck "Kasawari" travels a distance of 320 km in four hours.

In 1 hour,
Hoks travel 540 ÷ 6 = 90 (km)
Kasawari travel 320 ÷ 4 = 80 (km).
Horks is faster

① Which company truck is the fastest?

② What is Kasawari's speed per hour?

Kasawari: 320 ÷ 4 = 80 (km per hour)

Speed is expressed in various ways depending on the unit of time. Speed is a measurement per unit.

Speed in distance per hour
… Speed expressed by the distance travelled in an hour.

Speed in distance per minute
… Speed expressed by the distance travelled in a minute.

Speed in distance per second
… Speed expressed by the distance travelled in a second.

Exercise

1 Greg ran 50 m in 8 seconds and Aileen ran 60 m in 10 seconds.
Who is the fastest?
Compare their speed in seconds.

50 ÷ 8 = 6.25 (m)
60 ÷ 10 = 6 (m)
Answer: Greg

2 Kim walks 432 m in 6 minutes and Viti walks 280 m in 4 minutes.
Who is the fastest ?
Compare their speed in minutes.

432 ÷ 6 = 72 (m),
280 ÷ 4 = 70 (m)
Answer: Kim

80 = ☐ ÷ ☐

3 Important Point

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

T Explain the ideas about 'same time' and 'same distance' using the charts.

4 Comparing speed using Per Unit Quantity.

T ② Let's compare their speed by calculating how many m traveled in 1 second.

S Distance each student travels in 1 second;
Ⓐ 20 ÷ 5 = 4 (m), Ⓑ 15 ÷ 5 = 3 (m),
Ⓒ 15 ÷ 4 = 3.75 (m) Answer: Ⓐ is the fastest.

S ③ Time each student takes to travel 1 metre;
Ⓐ 5 ÷ 20 = 0.25 (second), Ⓑ 5 ÷ 15 = 0.33333.. (second) and Ⓒ 4 ÷ 15 = 0.2666.... (second)
Answer: Ⓐ is the fastest.

5 Important Point

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

6 Comparing speed per hour.

T/S 2 ① Read and understand the given situation.

S What we know: Horks goes 540 km in 6 hours and Kasawari goes 320 km in 4 hours.

T Which company truck is the fastest?

S Find out the distance that each company truck travels in 1 hour and compare the result.
In 1 hour, Horks travel: 540 ÷ 6 = 90 (km),
Kasawari travel: 320 ÷ 4 = 80 (km)

S Horks is faster because Horks can travel longer distance than Kasawari in 1 hour.

T ② Ask students to find speed of Kasawari truck.

S Kasawari's speed is 320 ÷ 4 = 80 (km per hour).

7 Important Point

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

8 Complete the Exercise.

S Solve the exercises.

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

Lesson 61 Sample Blackboard Plan is on page 125.

Unit 9

Unit: Speed

Sub-unit: 1. Speed

Lesson 2 of 3

Textbook Page : 081
Actual Lesson 062

Lesson Objective

- To understand and explain the relationship amongst speed per hour, speed per minute and speed per second.

Prior Knowledge

- How to find speed
- Various unit of speed
- Per unit quantity

Preparation

- Tape diagram
- Conversion of time in seconds, minutes and hours.

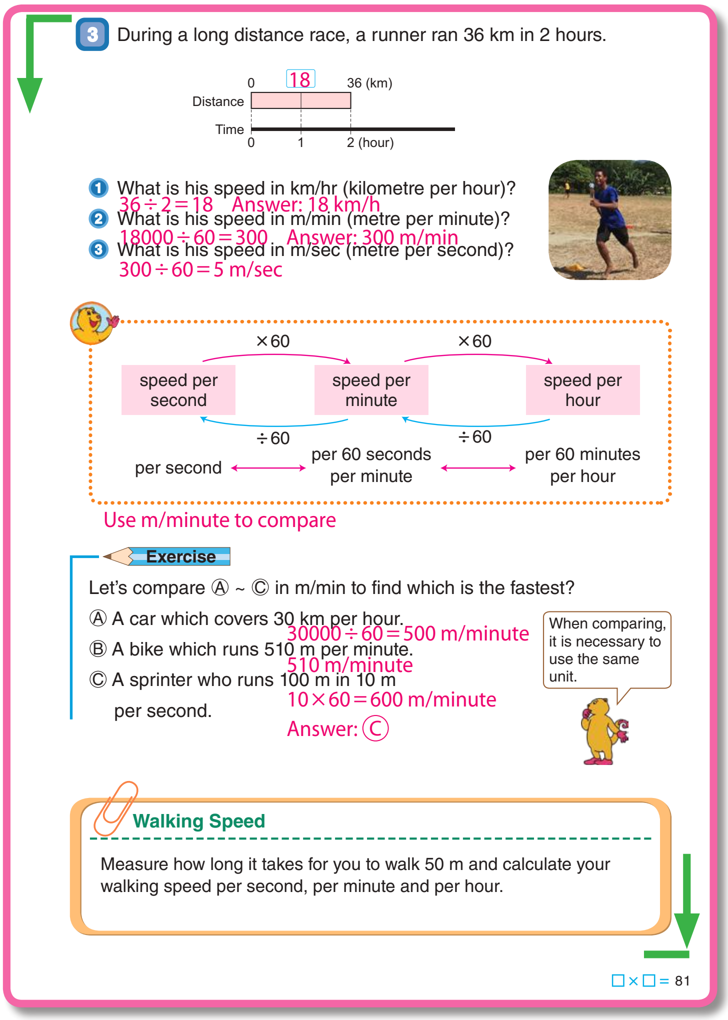
Assessment

- Explain the relationship amongst speed per hour, speed per minute and speed per second. F
- Solve the exercises correctly. S

Teacher's Notes

The speed in m/h shows the distance travelled in 1 hour meaning 60 minutes.
Therefore, the distance traveled in 1 minute can be calculated based on this, where the speed in metres per minute can be found

Guide students to take the same logical steps to change from speed per minute to speed per second and solve the problem on their own.



3 During a long distance race, a runner ran 36 km in 2 hours.

Distance 0 18 36 (km)
Time 0 1 2 (hour)

① What is his speed in km/hr (kilometre per hour)?
36 ÷ 2 = 18 Answer: 18 km/h
② What is his speed in m/min (metre per minute)?
18000 ÷ 60 = 300 Answer: 300 m/min
③ What is his speed in m/sec (metre per second)?
300 ÷ 60 = 5 m/sec

speed per second ×60 → speed per minute ×60 → speed per hour
speed per hour ÷60 → speed per minute ÷60 → speed per second
per second ↔ per 60 seconds per minute ↔ per 60 minutes per hour

Use m/minute to compare

Exercise

Let's compare Ⓐ ~ Ⓒ in m/min to find which is the fastest?
Ⓐ A car which covers 30 km per hour.
30000 ÷ 60 = 500 m/minute
Ⓑ A bike which runs 510 m per minute.
510 m/minute
Ⓒ A sprinter who runs 100 m in 10 m per second.
10 × 60 = 600 m/minute
Answer: Ⓒ

When comparing, it is necessary to use the same unit.

Walking Speed

Measure how long it takes for you to walk 50 m and calculate your walking speed per second, per minute and per hour.

□ × □ = 81

Lesson Flow

1 Review the previous lesson.

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

2 3 Solve the problem by calculating speed in various ways.

T/S Read and understand the given situation.

S Solve ①: 36 ÷ 2 = 18 Answer: 18 km/h

T Confirm students' answers using 3 chart.

T ② Change km/h to m/min.

S Solve: 18 km: 18 × 100 = 18000 m, 1 hour = 60 mins, 18000 ÷ 60 = 300
Answer: 300 m/min

S Solve ③, convert 300 m/min to m/sec.
1 minute = 60 sec.
300 ÷ 60 = 5 Answer: 5 m/sec

TN Change the speed per hour to speed per minute for ② and speed per minute to speed per second for and ③ to find the 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 Walking Speed

T/S Read and understand the given situation. Do activity during recess time.

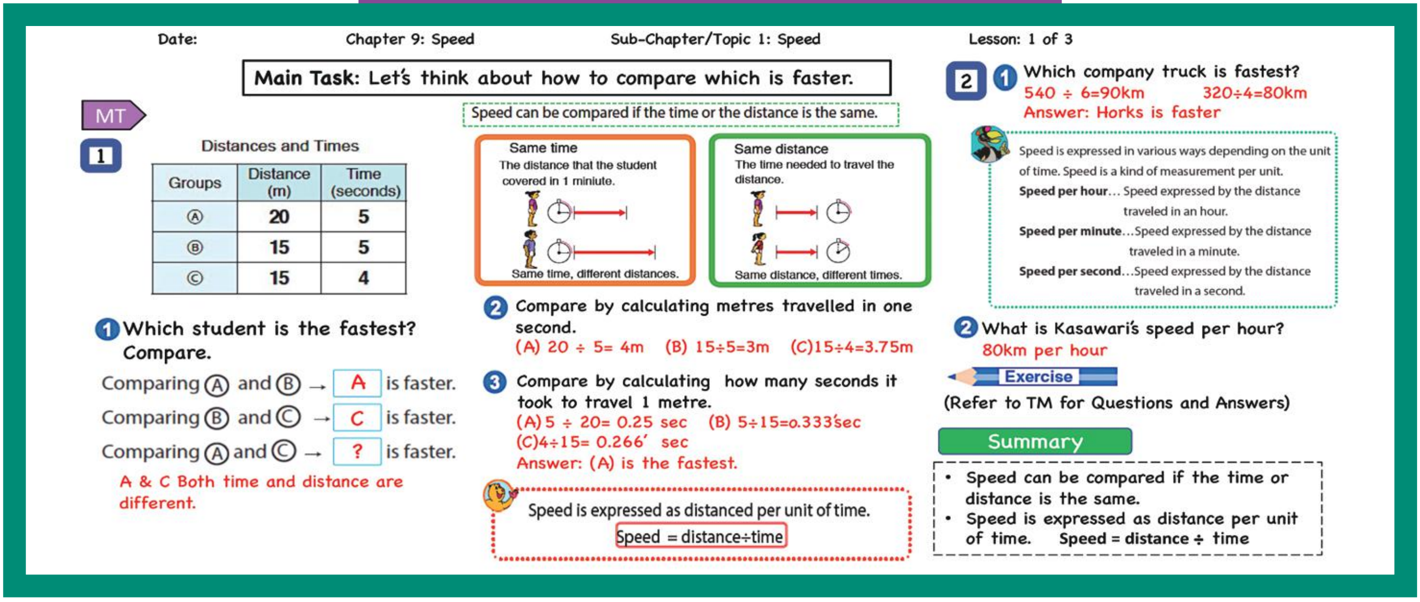
6 Summary

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 9: Speed Sub-Chapter/Topic 1: Speed Lesson: 1 of 3

Main Task: Let's think about how to compare which is faster.

MT

1

Distances and Times

Groups	Distance (m)	Time (seconds)
Ⓐ	20	5
Ⓑ	15	5
Ⓒ	15	4

① Which student is the fastest? Compare.

Comparing Ⓐ and Ⓑ → A is faster.

Comparing Ⓑ and Ⓒ → C is faster.

Comparing Ⓐ and Ⓒ → ? is faster.

A & C Both time and distance are different.

Speed can be compared if the time or the distance is the same.

Same time
The distance that the student covered in 1 miniute.
Same time, different distances.

Same distance
The time needed to travel the distance.
Same distance, different times.

② Compare by calculating metres travelled in one second.
(A) 20 ÷ 5= 4m (B) 15÷5=3m (C)15÷4=3.75m

③ Compare by calculating how many seconds it took to travel 1 metre.
(A) 5 ÷ 20= 0.25 sec (B) 5÷15=0.333̇sec
(C)4÷15= 0.266̇ sec
Answer: (A) is the fastest.

Speed is expressed as distanced per unit of time.
Speed = distance÷time

2 ① Which company truck is fastest?
540 ÷ 6=90km 320÷4=80km
Answer: Horks is faster

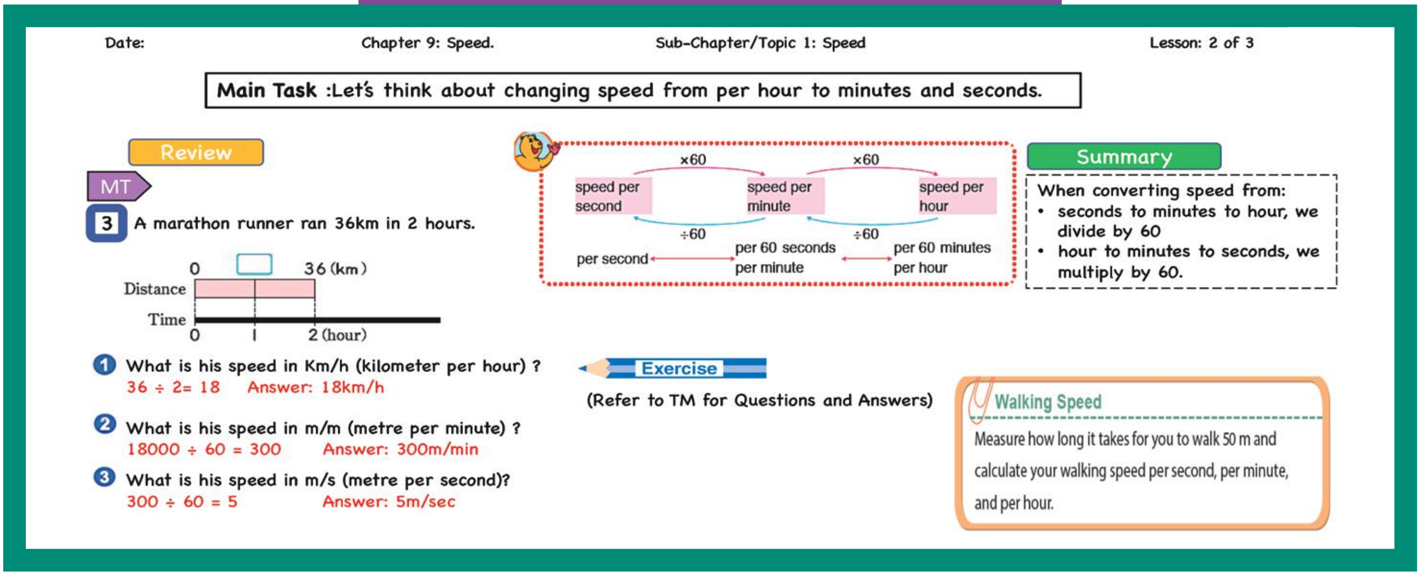
Speed is expressed in various ways depending on the unit of time. Speed is a kind of measurement per unit.
Speed per hour… Speed expressed by the distance traveled in an hour.
Speed per minute…Speed expressed by the distance traveled in a minute.
Speed per second…Speed expressed by the distance traveled in a second.

② What is Kasawari's speed per hour?
80km per hour

Exercise
(Refer to TM for Questions and Answers)

Summary
- Speed can be compared if the time or distance is the same.
- Speed is expressed as distance per unit of time. Speed = distance ÷ time

Sample Blackboard Plan (Lesson 62)



Date: Chapter 9: Speed. Sub-Chapter/Topic 1: Speed Lesson: 2 of 3

Main Task :Let's think about changing speed from per hour to minutes and seconds.

Review

MT

3 A marathon runner ran 36km in 2 hours.

0
36 (km)
Distance
Time
0
1
2 (hour)

① What is his speed in Km/h (kilometer per hour) ?
36 ÷ 2= 18 Answer: 18km/h

② What is his speed in m/m (metre per minute) ?
18000 ÷ 60 = 300 Answer: 300m/min

③ What is his speed in m/s (metre per second)?
300 ÷ 60 = 5 Answer: 5m/sec

Exercise
(Refer to TM for Questions and Answers)

Summary
When converting speed from:
- seconds to minutes to hour, we divide by 60
- hour to minutes to seconds, we multiply by 60.

Walking Speed
Measure how long it takes for you to walk 50 m and calculate your walking speed per second, per minute, and per hour.

Unit 9

Unit: Speed
Sub-unit: 1. Speed
Lesson 3 of 3

Textbook Page : 082
Actual Lesson 063

Lesson Objectives

- To think about and calculate distance when speed and time are given.
- To think about and calculate time when speed and distance are given.

Assessment

- Find the distance or time when the other two quantities are known. F
- Solve the exercises correctly. S

Prior Knowledge

- How to find speed.
- Various unit of speed

Preparation

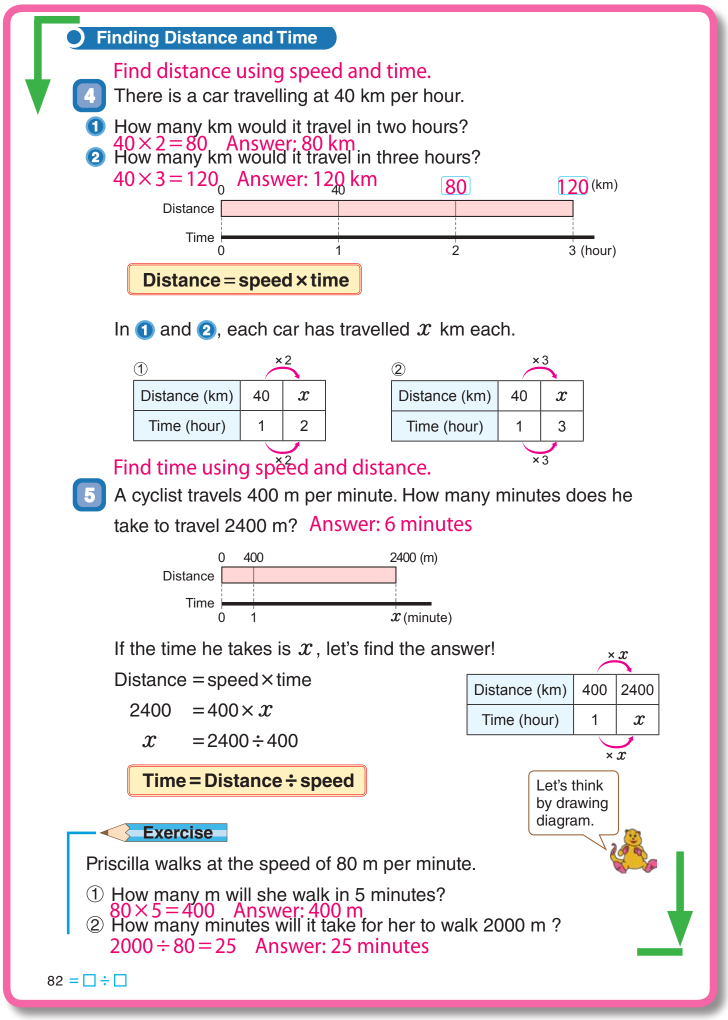
- Tape diagrams and tables

Teacher's Notes

Students should be able to understand the derivation of speed, distance and time using the formula:

Speed = Distance ÷ Time
Distance = Speed × Time
Time = Distance ÷ Speed

It is also important for the students to understand the meaning of formulas. Remind them that If the distance is the same, the shorter time is faster, and if the time is the same, the longer distance is faster.



Finding Distance and Time

Find distance using speed and time.

4 There is a car travelling at 40 km per hour.

① How many km would it travel in two hours?
$40 \times 2 = 80$ Answer: 80 km

② How many km would it travel in three hours?
$40 \times 3 = 120$ Answer: 120 km

Distance = speed × time

In ① and ②, each car has travelled x km each.

①

Distance (km)	40	x
Time (hour)	1	2

②

Distance (km)	40	x
Time (hour)	1	3

Find time using speed and distance.

5 A cyclist travels 400 m per minute. How many minutes does he take to travel 2400 m? Answer: 6 minutes

If the time he takes is x, let's find the answer!

Distance = speed × time
2400 $= 400 \times x$
x $= 2400 \div 400$

Distance (km)	400	2400
Time (hour)	1	x

Time = Distance ÷ speed

Exercise

Priscilla walks at the speed of 80 m per minute.

① How many m will she walk in 5 minutes?
$80 \times 5 = 400$ Answer: 400 m

② How many minutes will it take for her to walk 2000 m ?
$2000 \div 80 = 25$ Answer: 25 minutes

82 = □ ÷ □

Lesson Flow

1 Review the previous lesson.

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

2 Finding distance using speed and time.

T/S ④ Read and understand the given situation.

TN Use the tape diagram and the table to find the known and unknown quantities.

T ① How many km would it travel in two hours?

S $40 \times 2 = 80$, Answer: 80 km

T ② How many km would it travel in three hours?

S $40 \times 3 = 120$, Answer: 120 km

T Confirm students' answers using the formula; Distance = Speed × Time

3 Finding time using speed and distance.

T ⑤ Read and understand the given situation.

TN Use the tape diagram and the table to find the known and unknown x values.

S Find the answer based on the given figures and tables.
$x = 2400 \div 400$, $x = 6$
Answer: 6 minutes

T Confirm students' answers using the formula Time = Distance ÷ Speed

4 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

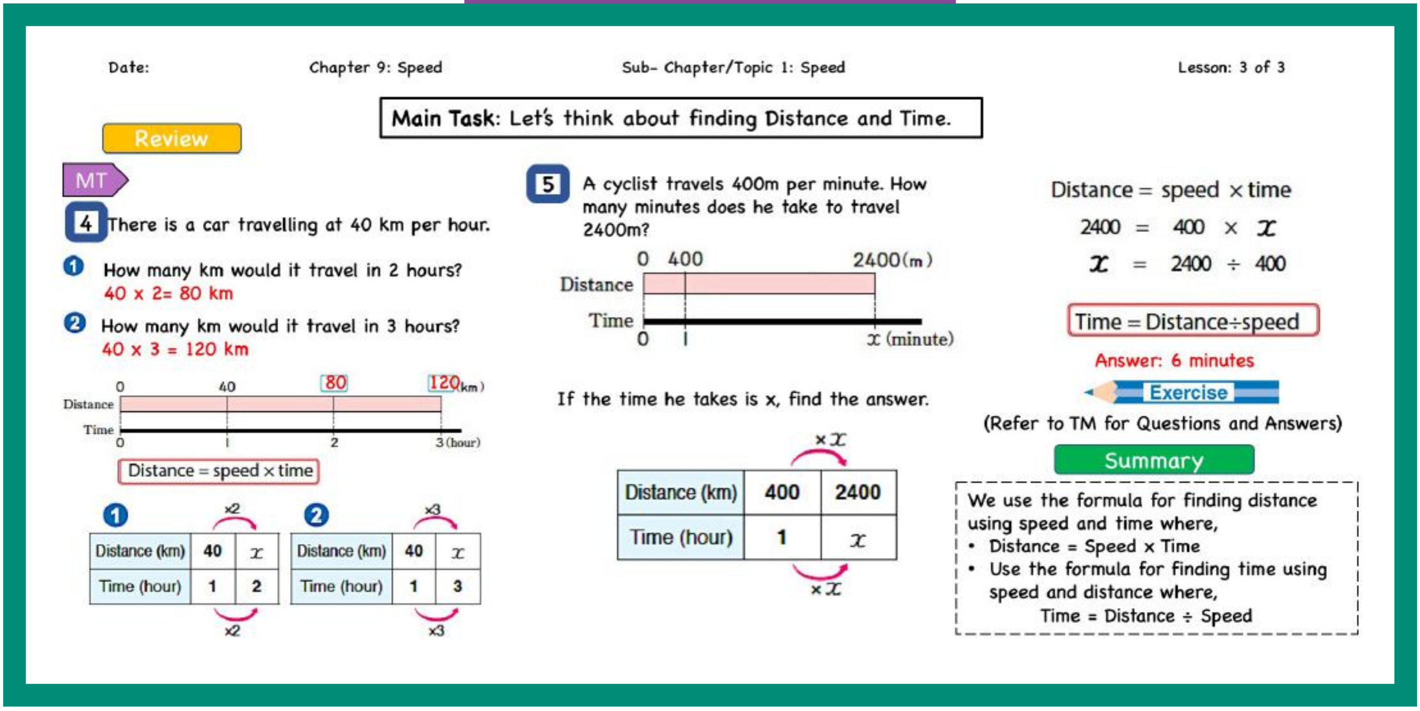
5 Summary

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: Chapter 9: Speed Sub- Chapter/Topic 1: Speed Lesson: 3 of 3

Main Task: Let's think about finding Distance and Time.

Review

MT

4 There is a car travelling at 40 km per hour.

① How many km would it travel in 2 hours?
$40 \times 2 = 80$ km

② How many km would it travel in 3 hours?
$40 \times 3 = 120$ km

0
40
80
120(km)
Distance
Time
0
1
2
3 (hour)

Distance = speed × time

①

$$\begin{array}{|l|c|c|} \hline \text{Distance (km)} & 40 & x \\ \hline \text{Time (hour)} & 1 & 2 \\ \hline \end{array}$$

×2 ×2

②

$$\begin{array}{|l|c|c|} \hline \text{Distance (km)} & 40 & x \\ \hline \text{Time (hour)} & 1 & 3 \\ \hline \end{array}$$

×3 ×3

5 A cyclist travels 400m per minute. How many minutes does he take to travel 2400m?

If the time he takes is x, find the answer.

$$\begin{array}{|l|c|c|} \hline \text{Distance (km)} & 400 & 2400 \\ \hline \text{Time (hour)} & 1 & x \\ \hline \end{array}$$

×x ×x

Distance = speed × time

$2400 = 400 \times x$

$x = 2400 \div 400$

Time = Distance÷speed

Answer: 6 minutes

Exercise

(Refer to TM for Questions and Answers)

Summary

We use the formula for finding distance using speed and time where,
- Distance = Speed x Time
- Use the formula for finding time using speed and distance where,
  Time = Distance ÷ Speed

Unit
9

Unit: Speed

Sub-unit: 2. Speed and Graphs

Lesson 1 of 1

Textbook Page : 083
Actual Lesson 064

Sub-unit Objective

- To solve word problems on speed by completing tables or graphs.

Lesson Objective

- To solve word problems on speed by completing tables or graphs.

Prior Knowledge

- How to find speed, time and distance.
- Various unit of speed

Preparation

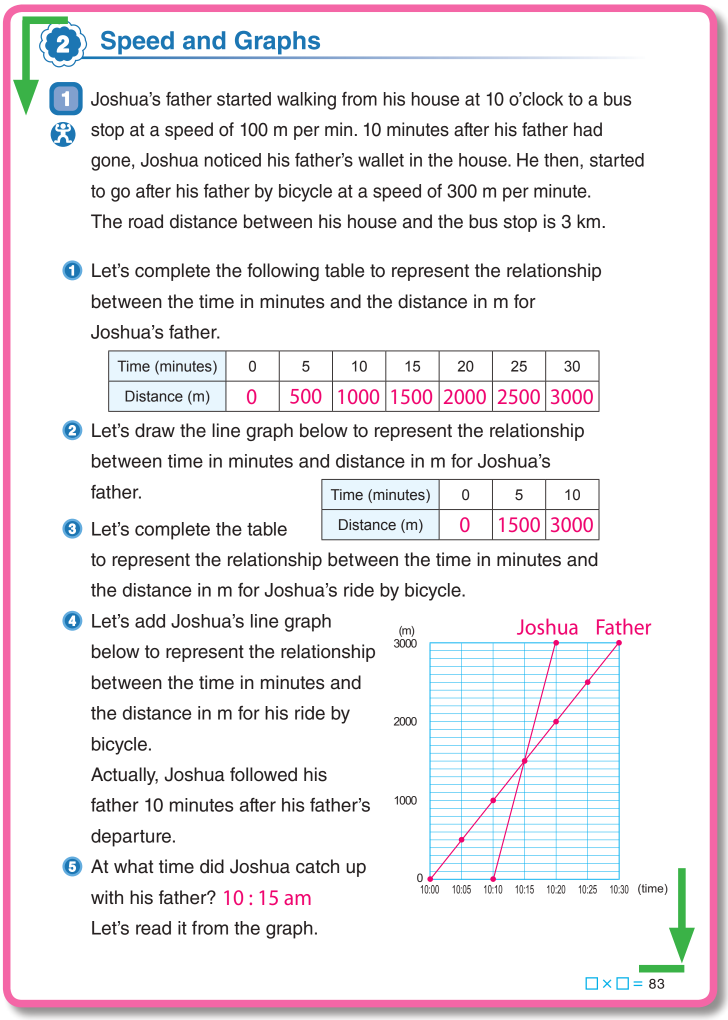
- Graph papers and Table

Assessment

- Solve word problems on speed by completing tables or graphs considering the relationship between distance and time. F S
- Solve the exercises correctly. S

Teacher’s Notes

In this lesson, students should be able to confidently find the distance and time travelled using the given speed to complete tables and represent the information on a graph to solve problems.
Students should be able to use the distance and times as the cordinates to plot and complete their graphs.



2 Speed and Graphs

1 Joshua’s father started walking from his house at 10 o’clock to a bus stop at a speed of 100 m per min. 10 minutes after his father had gone, Joshua noticed his father’s wallet in the house. He then, started to go after his father by bicycle at a speed of 300 m per minute. The road distance between his house and the bus stop is 3 km.

① Let’s complete the following table to represent the relationship between the time in minutes and the distance in m for Joshua’s father.

Time (minutes)	0	5	10	15	20	25	30
Distance (m)	0	500	1000	1500	2000	2500	3000

② Let’s draw the line graph below to represent the relationship between time in minutes and distance in m for Joshua’s father.

③ Let’s complete the table to represent the relationship between the time in minutes and the distance in m for Joshua’s ride by bicycle.

Time (minutes)	0	5	10
Distance (m)	0	1500	3000

④ Let’s add Joshua’s line graph below to represent the relationship between the time in minutes and the distance in m for his ride by bicycle.
Actually, Joshua followed his father 10 minutes after his father’s departure.

⑤ At what time did Joshua catch up with his father? 10 : 15 am
Let’s read it from the graph.

□ × □ = 83

Lesson Flow

1 Review the previous lesson.

2 Representing the speed for Joshua's father on a table and graph.

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

T/S 1 Read and understand the given situation.

T ① Ask the students to complete the table using the speed of 100 m/min .

S Complete the table.

T ② Ask the students to draw the line graph representing Joshua's father's speed.

S Draw the line graph.

T Confirm students' answers.

3 Representing the speed for Joshua's bike ride on a table and graph.

T ③ Ask the students to complete the table using the speed of 300 m/min.

S Complete the table with answers.

T ④ Ask the students to draw the line graph representing Joshua's speed on the same graph.

S Draw the graph representing Joshua's speed.

TN Joshua's graph will start at 10:10 am because he left 10 minutes after his father's departure.

4 Identifying the point of intersection as the meeting point.

T ⑤ Ask students to find the time when Joshua caught up with his father using the graph?

TN The point where the two lines cross or intersect is the time when Joshua caught up with his father.

This happened 5 minutes after Joshua departed.

S Locate the point of intersection as the meeting point.

Answer: 10:15 am.

T Confirm students' answer on the graph.

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 9: Speed Sub- Chapter/Topic: Speed and Graphs Lesson: 1 of 1

Main Task: Let's solve word problems using tables and graphs.

Review

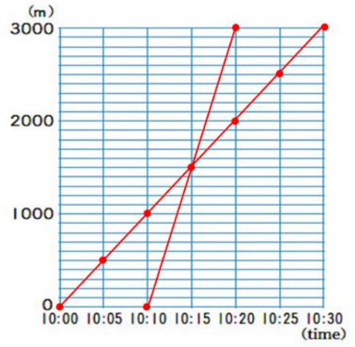
MT

Joshua's father started walking from his house at 10:00 to a bus stop. Speed: 100 m /min.
10 minutes after, Joshua started to go by bicycle. Speed: 300 m / min.
The road distance between his house and the bus stop is 3 km.

1 ① Complete the table to represent the relationship between time and distance for Joshua's father.

Time (minutes)	0	5	10	15	20	25	30
Distance (m)	0	500	1000	1500	2000	2500	3000

② Draw the line graph representing the relationship between time in minutes and distance in metres for Joshua's father.



③ Complete the table to represent the relationship between time in minutes and distance in meters for Joshua's bike ride.

Time (minutes)	0	5	10
Distance (m)	0	1500	3000

④ Add Joshua's line graph to represent the relationship between time and distance for his ride. Actually, Joshua followed his father 10 minutes after his his father's departure at 10 o'clock.

⑤ At what time did Joshua catch up with his father? Answer: 10:15 am

Summary

- We compare the relationship between time and distance to find speed.
- A line graph is used to represent speed appropriately.
- The point of intersection is where two lines on a graph intersect or cross each other.

Unit 9

Unit: Speed
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 084 and 085
Actual Lesson 65 and 66

Lesson Objective

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

Prior Knowledge

- All the contents learned in this unit.

Preparation

- Evaluation Test

Assessment

- Solve the exercises and problems correctly. F 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 finishing 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 A blue PMV truck travels the distance of 210 km in 3 hours, and a maroon PMV truck travels the distance of 160 km in 2 hours.

Page 80

① What is the speed of the blue PMV truck in km per hour? 70 km/h

② What is the speed of the maroon PMV truck in km per hour? 80 km/h

② Let's fill in the blanks in the table below and compare their speed.

Pages 80 and 81

	The speed per hour	The speed per minute	The speed per second
Small airplane	270 km	4.5 km	75m
Racing car	240 km	4 km	$66\frac{2}{3}$ m
Sound	1224 km	20.4 km	340 m

③ It takes 4 minutes for a car travelling at a speed of 48 km per hour to pass the Highway.

Page 82

① What is the speed of the car per minute? $48 \div 60 = 0.8$ 0.8 km/min (800 m/min)

② What is the length of the highway in m? $4 \times 0.8 = 3.2$ 3.2 km (3200 m)

Grade 6
Do you remember?

Let's calculate the area of the circles.

① Radius 3 cm 28.26 cm^2 ② Radius 20 cm 1256 cm^2
③ Diameter 10 cm 78.5 cm^2 ④ Diameter 40 cm 1256 cm^2

PROBLEMS

① It takes 3 and half hours between Port Moresby and Brisbane airports by flight. The distance between the 2 Airports is 2100 km. How many km per hour does the airplane travel?

● Calculating speed.

$2100 \div 2\frac{1}{2} = 840$ km/h

② A train is travelling at 1.8 km per minute and another train travelling at 100 km per hour. Which is faster?

● Changing the denomination of speed.

$1.8 \times 60 = 108$ km/h Answer: 1.8 km/h is faster

③ A cyclone is moving at 25 km per hour.

● Knowng distance, speed and time.

① How many km will the cyclone travel in 12 hours? $25 \times 12 = 300$ km

② If the speed of the cyclone does not change, how many hours will it take to move 400 km away? $400 \div 25 = 16$ hours

④ Kali takes 12 minutes to walk from her house to the school. Her speed is 70 m per minute. How far is the distance from her house to the school in km?

● Getting the distance.

$70 \times 12 = 840$ Answer: 840 metres

⑤ Salomie's walking speed is 60 m per minute.

● Knowng distance, speed and time.

① How many m can she walk in 15 minutes if she maintains this speed? $60 \times 15 = 900$ Answer: 900 metres

② How many kilometres per hour (km/h) can she walk? $60 \times 60 = 3600$ Answer: 3.6 km

③ The distance between Salomie and her aunty's house is 16.2 km. How many hours and minutes will it take for her to get to her aunty's house? $16200 \div 60 = 270$ mins
Answer: 4 hours 30 minutes

Lesson Flow

1 Complete Exercise ① ① and ②.

S Calculate the speed for bus A and B.
T Confirm students' answers.

2 Complete Exercise ②.

S Calculate speed to complete filling in the table and compare them.
T Confirm students' answers.

3 Complete Exercise ③ ① and ②.

S Answer the questions by calculating the speed and distance.
T Confirm students' answers.

4 Complete Problem ①.

S Read and understand the problem and solve it by calculating the speed.
T Confirm students' answers.

5 Complete Problem ②.

S Solve the problem by comparing speed to find which train is faster.
T Confirm students' answers.

6 Complete Problem ③ ① and ②.

S Read and understand the problem and solve questions ① and ②.
T Confirm students' answers.

7 Complete Problem ④.

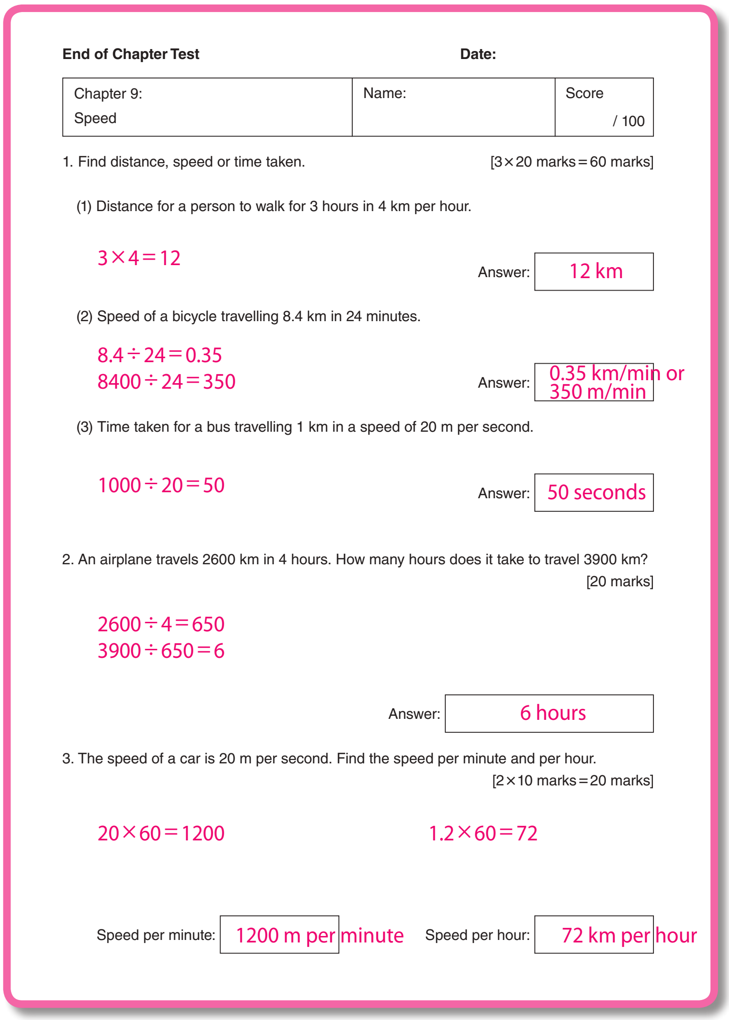
S Solve the problem.
T Confirm students' answers.

8 Complete Problem ⑤ ① to ③.

S Read and understand the problem and solve the question.
T Confirm students' answers.

9 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: Speed	Name:	Score / 100

1. Find distance, speed or time taken. [3×20 marks＝60 marks]

(1) Distance for a person to walk for 3 hours in 4 km per hour.

3×4＝12

Answer: 12 km

(2) Speed of a bicycle travelling 8.4 km in 24 minutes.

8.4÷24＝0.35
8400÷24＝350

Answer: 0.35 km/min or 350 m/min

(3) Time taken for a bus travelling 1 km in a speed of 20 m per second.

1000÷20＝50

Answer: 50 seconds

2. An airplane travels 2600 km in 4 hours. How many hours does it take to travel 3900 km? [20 marks]

2600÷4＝650
3900÷650＝6

Answer: 6 hours

3. The speed of a car is 20 m per second. Find the speed per minute and per hour. [2×10 marks＝20 marks]

20×60＝1200 1.2×60＝72

Speed per minute: 1200 m per minute Speed per hour: 72 km per hour

End of Chapter Test **Date:**

Chapter 9: Speed	Name:	Score / 100

1. Find distance, speed or time taken. [3 × 20 marks = 60 marks]

(1) Distance for a person to walk for 3 hours in 4 km per hour.

Answer:

(2) Speed of a bicycle travelling 8.4 km in 24 minutes.

Answer:

(3) Time taken for a bus travelling 1 km in a speed of 20 m per second.

Answer:

2. An airplane travels 2600 km in 4 hours. How many hours does it take to travel 3900 km?
[20 marks]

Answer:

3. The speed of a car is 20 m per second. Find the speed per minute and per hour.
[2 × 10 marks = 20 marks]

Speed per minute:

Speed per hour:

Chapter 10 Volume

1. Content Standard

6. 2. 4. Students will be able to investigate the process of calculating the volume of prisms and cylinders using other perimeters and find the volume and have confidence using the formula.

2. Unit Objectives

- To calculate volume of solid shapes.
- To think about how to find the volume of prisms and cylinders.
- To determine the volume of a prism and cylinder by calculation of base and height.

3. Teaching Overview

Students learned the formula to find the volumes of cubes and quadrangular prisms.
In this unit, students will learn generalization of finding the volume of solids.

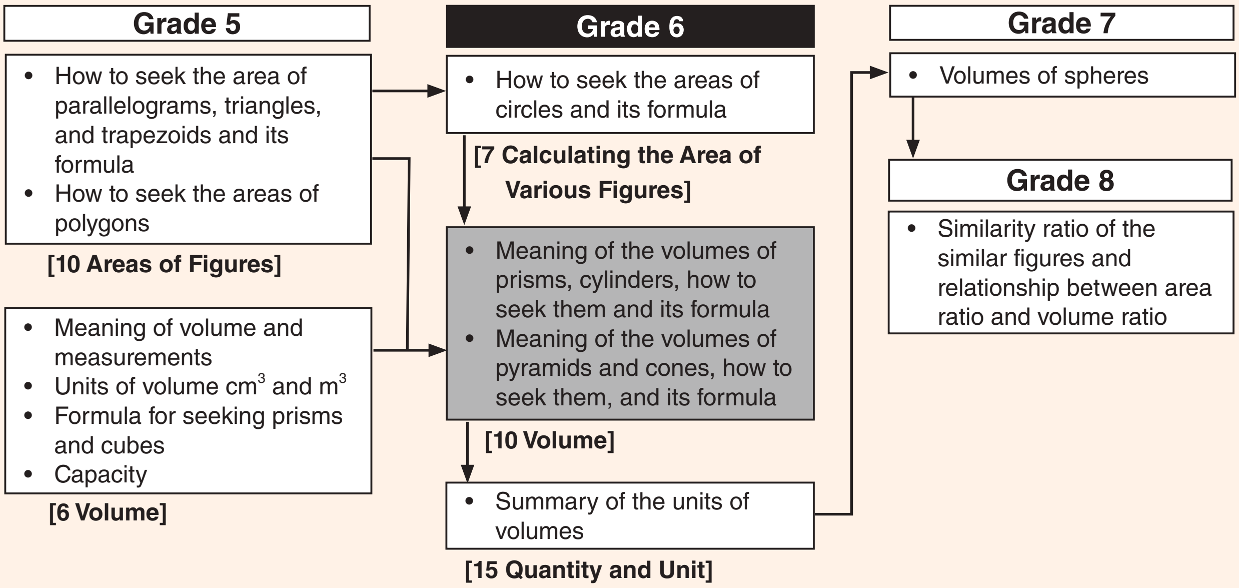
Volume of Prisms :

Students already learned the formula for finding the volume of a prism as length × width × height.
In this topic, it will be generalised as base area × height.

Volume of Cylinders :

Students are to find out that the way of interpreting the formula for finding the area of prisms will be applied for cylinders.

4. Related Learning Contents



Grade 5

- How to seek the area of parallelograms, triangles, and trapezoids and its formula
- How to seek the areas of polygons

[10 Areas of Figures]

- Meaning of volume and measurements
- Units of volume cm^3 and m^3
- Formula for seeking prisms and cubes
- Capacity

[6 Volume]

Grade 6

- How to seek the areas of circles and its formula

[7 Calculating the Area of Various Figures]

- Meaning of the volumes of prisms, cylinders, how to seek them and its formula
- Meaning of the volumes of pyramids and cones, how to seek them, and its formula

[10 Volume]

- Summary of the units of volumes

[15 Quantity and Unit]

Grade 7

- Volumes of spheres

Grade 8

- Similarity ratio of the similar figures and relationship between area ratio and volume ratio

Unit 10

Unit: Volume

Sub-unit: 1. Volume of a Prism

Lesson 1 of 2

Textbook Page : 086
Actual Lesson 067

Sub-unit Objective

- To understand how to find the volume of prisms.

Lesson Objective

- To find out the volume formula by applying the idea of base and their layers.

Prior Knowledge

- Formula for area and volume of cubes and quadrangular prisms.

Preparation

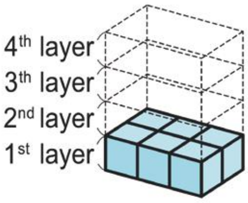
- Sample cubes and rectangular boxes.

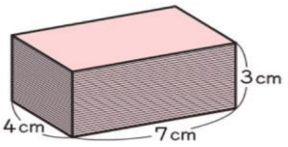
Assessment

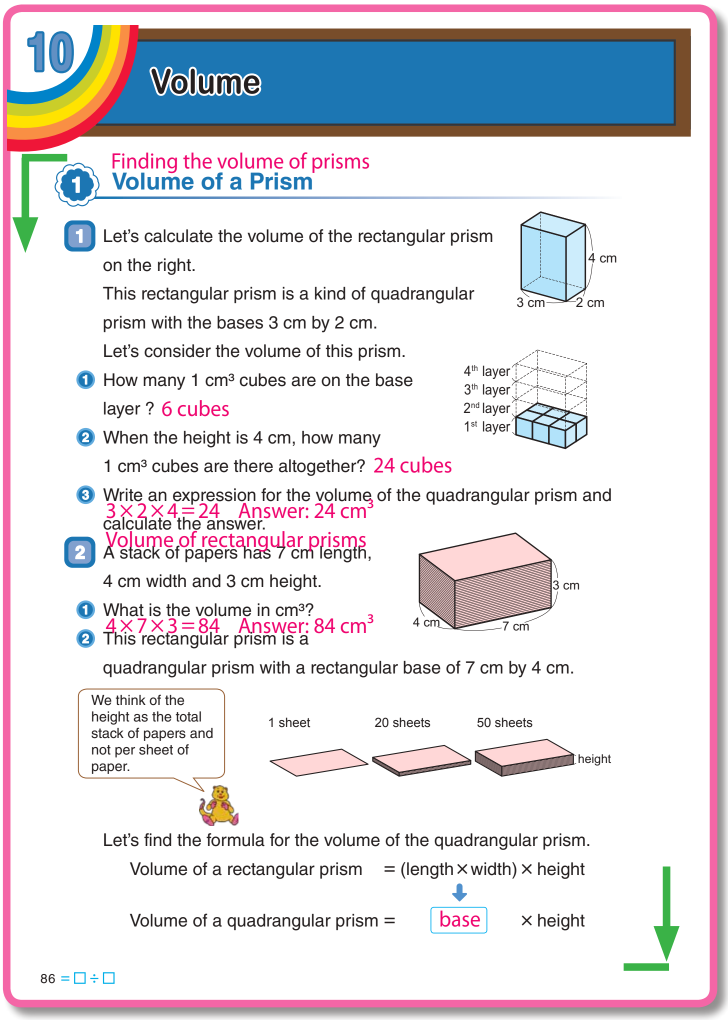
- Explain how to find the volume with base area and idea of layers. **F**
- Calculate the volume of the quadrangular prisms. **F**
- Explain the formula for finding the volume of prisms. **S**

Teacher's Notes

Quadrangular prism has quadrilateral on their base. It may be a square, rectangle or regular quadrilateral.
If the base of the prism is not a square or rectangle we cannot use the idea of unit cube, but if we use the base area, we can calculate the volume, since the area is similar to the number of cubes in the first layer.







10 **Volume**

Finding the volume of prisms
① Volume of a Prism

1. Let's calculate the volume of the rectangular prism on the right.
This rectangular prism is a kind of quadrangular prism with the bases 3 cm by 2 cm.
Let's consider the volume of this prism.

4 cm
3 cm
2 cm

① How many 1 cm³ cubes are on the base layer ? 6 cubes

4th layer
3th layer
2nd layer
1st layer

② When the height is 4 cm, how many 1 cm³ cubes are there altogether? 24 cubes

③ Write an expression for the volume of the quadrangular prism and calculate the answer.
$3 \times 2 \times 4 = 24$ Answer: 24 cm^3

Volume of rectangular prisms

2. A stack of papers has 7 cm length, 4 cm width and 3 cm height.

① What is the volume in cm³?
$4 \times 7 \times 3 = 84$ Answer: 84 cm^3

② This rectangular prism is a quadrangular prism with a rectangular base of 7 cm by 4 cm.

We think of the height as the total stack of papers and not per sheet of paper.

Let's find the formula for the volume of the quadrangular prism.

Volume of a rectangular prism = (length × width) × height

Volume of a quadrangular prism = $\boxed{\text{base}}$ × height

86 = □ ÷ □

Lesson Flow

1 Find the volume of prisms by using the idea of unit cube.

T/S ① Read and understand the given situation.

TN Find the volume of prism by using the idea of unit cube.

T ① Let students to explain how to find the volume of the first layer of cubes.

S Number of cubes in the base first layer is 6.

T ② Ask students how to find the total number of 1 cm^3 cubes when the height is 4 cm.

S Think of the height as the total number of layers.
Volume of 1st layer is $2 \times 3 = 6$ cubes.
There are 4 layers. 6 cubes × 4 layers = 24 cubes.
Volume of rectangular prism is 24 cm^3 .

T ③ Ask students to write an expression for the volume of a quadrangular prism.

S Think about the mathematical expression of volume of the quadrangular prism.
Number of cm^3 in the base layer × number of layers.
Expected Expressions: number of cubics in base layer × number of layers.

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

2 Think about how to find the volume of a quadrangular prism.

T/S ② Read and understand the given situation.

S ① What is the volume in cm^3?

TN Explain what is quadrangular prism.
Refer to the teacher's notes.

S Calculate $4 \times 7 \times 3 = 84$ cm^3.

T ② What is the relationship between the 1st layer and the area of base?

S The relationship between the 1st layer and the area of base is the same.

T Confirm the area by multiplying the **base area×height** to calculate the volume for the given stacks.
1 sheet, 20 sheets and 50 sheets.

S Write the formula for rectangular prism.
Volume = length × width × height
Volume of Quadrangular prism,
V = base × height

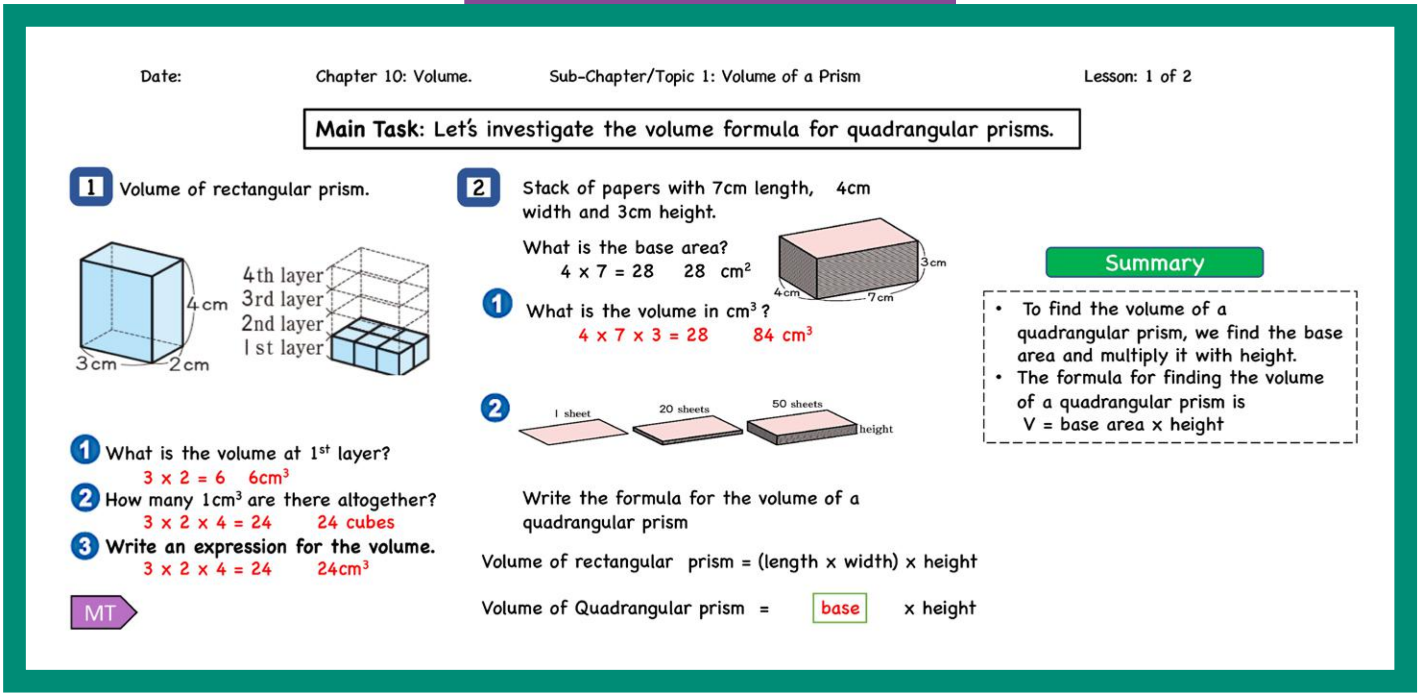
3 Summary

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


4cm
3cm
2cm
4th layer
3rd layer
2nd layer
I st layer
3cm
4cm
7cm
I sheet
20 sheets
50 sheets
height
MT

Date: Chapter 10: Volume. Sub-Chapter/Topic 1: Volume of a Prism Lesson: 1 of 2

Main Task: Let's investigate the volume formula for quadrangular prisms.

1 Volume of rectangular prism.

① What is the volume at 1st layer?
$3 \times 2 = 6$ 6cm^3
② How many 1cm^3 are there altogether?
$3 \times 2 \times 4 = 24$ 24 cubes
③ **Write an expression for the volume.**
$3 \times 2 \times 4 = 24$ 24cm^3

2 Stack of papers with 7cm length, 4cm width and 3cm height.

What is the base area?
$4 \times 7 = 28$ 28 cm^2
① What is the volume in cm^3 ?
$4 \times 7 \times 3 = 28$ 84 cm^3

②

Write the formula for the volume of a quadrangular prism

Volume of rectangular prism = (length x width) x height

Volume of Quadrangular prism = base x height

Summary

- To find the volume of a quadrangular prism, we find the base area and multiply it with height.
- The formula for finding the volume of a quadrangular prism is
V = base area x height

Unit 10

Unit: Volume

Sub-unit: 1. Volume of a Prism

Lesson 2 of 2

Textbook Page : 087
Actual Lesson 068

Lesson Objective

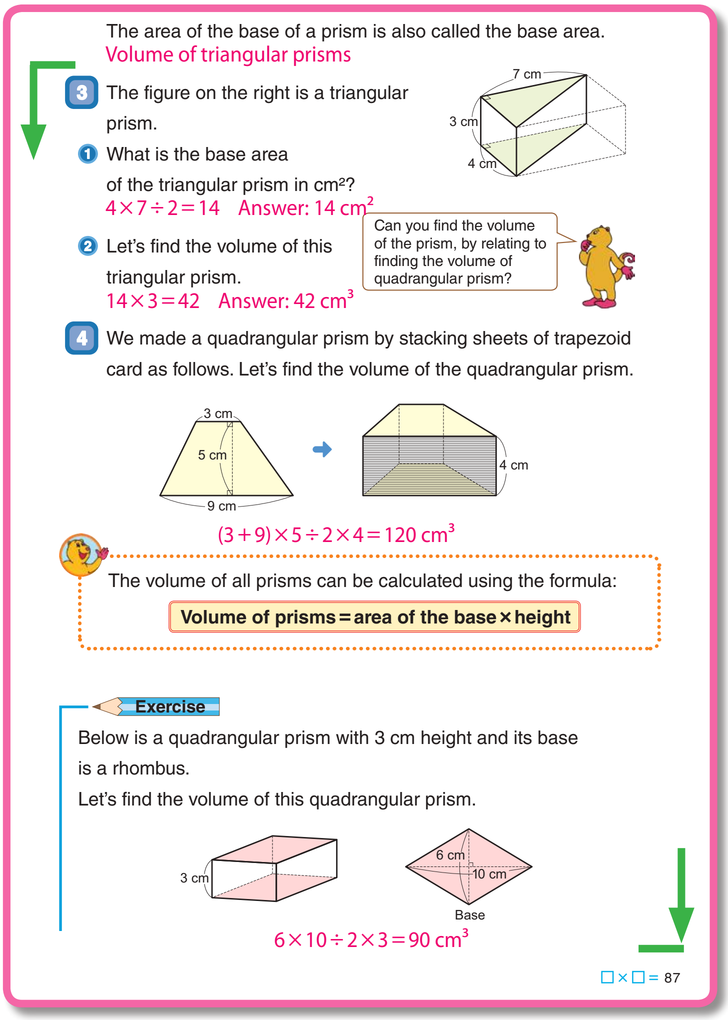
- Think about and find the volume of triangular prisms or various prisms based on the quadrangular prism.

Prior Knowledge

- How to find the area of the triangle and trapezoid.
- How to find the volume of the quadrangular prisms.

Preparation

- Diagrams of Prisms



The area of the base of a prism is also called the base area.

Volume of triangular prisms

3 The figure on the right is a triangular prism.

① What is the base area of the triangular prism in cm^2?

$4 \times 7 \div 2 = 14$ Answer: $14\ \text{cm}^2$

② Let's find the volume of this triangular prism.

$14 \times 3 = 42$ Answer: $42\ \text{cm}^3$

Can you find the volume of the prism, by relating to finding the volume of quadrangular prism?

4 We made a quadrangular prism by stacking sheets of trapezoid card as follows. Let's find the volume of the quadrangular prism.

$(3 + 9) \times 5 \div 2 \times 4 = 120\ \text{cm}^3$

The volume of all prisms can be calculated using the formula:

Volume of prisms = area of the base × height

Exercise

Below is a quadrangular prism with 3 cm height and its base is a rhombus.

Let's find the volume of this quadrangular prism.

$6 \times 10 \div 2 \times 3 = 90\ \text{cm}^3$

□×□= 87

Assessment

- Find the volume of triangular prism. **F**
- Find the volume of various prisms by applying the formula of quadrangular prisms. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

Task 3 can be solved by applying volume of triangular prism with the triangle as the Area of Base.
Students apply the formula for area of rectangles as the area of base then half the volume of the quadrangular prism.
Task 4 and the exercises both have a quadrangular base.
It is easier to find the volume when the area of base is found.

Students should understand the following as a prior knowledge for learning this content

- Meaning of formula for area of triangle in Grade 5.
  The bottom of the triangular prism and the side of the quadrangular pyramid are triangular shape.
  Methods for determining the area of a square or polygon is based on the method for finding the area of a triangle.
- Identifying a triangle height correctly without any misunderstanding
  Capturing the height in a solid accurately is the basis for determining the volume.
- Finding an area of circle correctly using formula.

Lesson Flow

1 Review the previous lesson.

2 Find the volume of the triangular prism.

T/S ③ Read and understand the given situation.

T Ask students to observe the shape and name the shape and the shape of its base.

S The base shape is a triangle therefore it is a triangular prism.

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

T ① What is the base area of the triangular prism in cm^2?

S $(7 \times 4) \div 2 = 14$
Answer 14 cm^2

T ② What is the volume of this triangular prism?

S It is the same as the volume of the quadrangular prism which is base area × height.
Answer: $14 \times 3 = 42$ 42 cm^3

TN Refer to the Kapul to relate when finding the volume of the quadrangular prism.

S From the drawing, the volume of the triangular prism is half of quadrangular prism.

S Base area × height $= (4 \times 7) \times 3 = 84$ (cm^3)
Triangular prism is a half of it.
$84 \div 2 = 42$, Answer is 42 cm^3 is the same as the **base area × height**.

3 ④ Find the volume of the quadrangular prism with a trapezoid base.

T/S Read and understand the given situation.

T How can we find the volume?

S It's the same as task 3, Base area × height.

T How can we find the area of trapezoid?

S (Upper base + lower base) × height ÷ 2

S The area of base of trapezoid is
$(3 + 9) \times 5 \div 2 = 30$ 30 cm^2,
The volume is $30 \times 4 = 120$
Answer: 120 cm^3

4 Important Point

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

5 Complete the Exercise.

S Complete the exercise.

T Confirm students' answers.

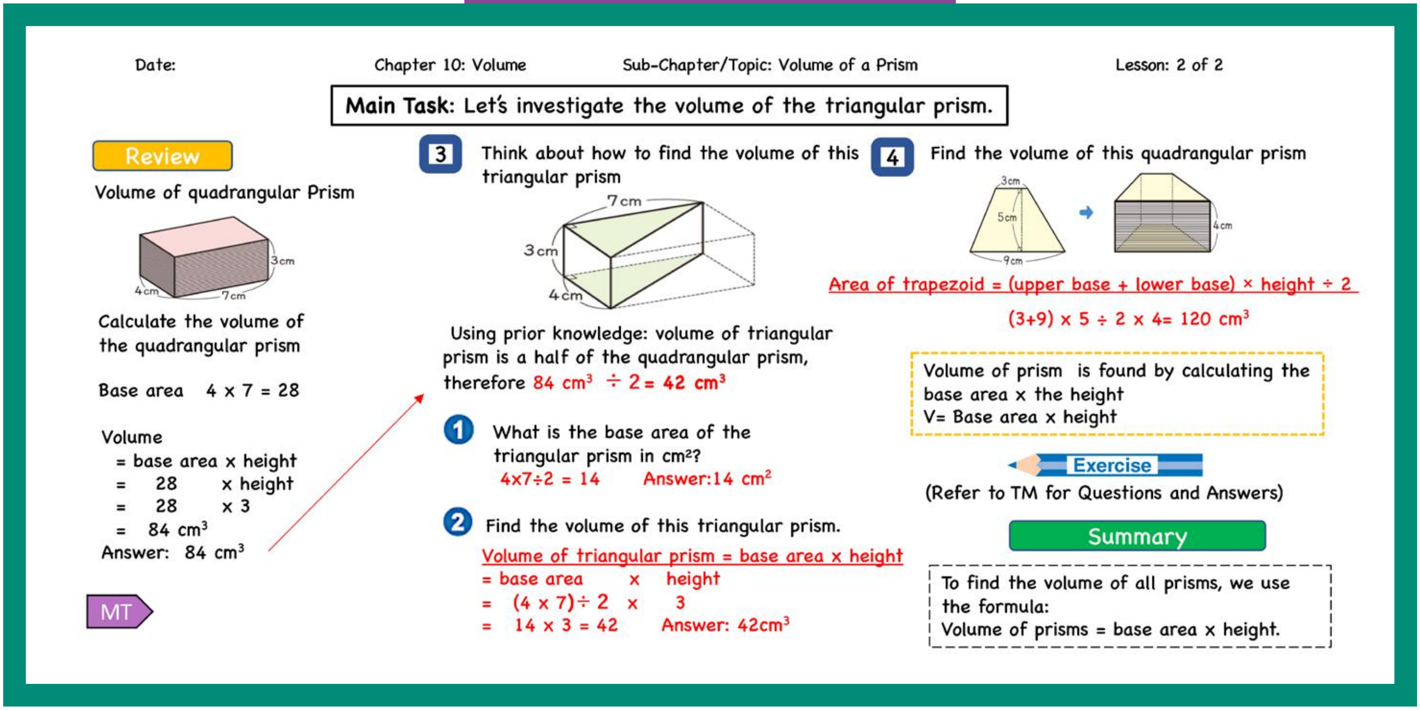
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 10: Volume Sub-Chapter/Topic: Volume of a Prism Lesson: 2 of 2

Main Task: Let's investigate the volume of the triangular prism.

Review

Volume of quadrangular Prism

Calculate the volume of the quadrangular prism

Base area $4 \times 7 = 28$

Volume
$= $ base area × height
$= 28 \times$ height
$= 28 \times 3$
$= 84$ cm^3
Answer: 84 cm^3

MT

3 Think about how to find the volume of this triangular prism

Using prior knowledge: volume of triangular prism is a half of the quadrangular prism, therefore 84 cm^3 $\div 2 = 42$ cm^3

① What is the base area of the triangular prism in cm^2?
$4 \times 7 \div 2 = 14$ Answer: 14 cm^2

② Find the volume of this triangular prism.
Volume of triangular prism = base area x height
= base area × height
$= (4 \times 7) \div 2 \times 3$
$= 14 \times 3 = 42$ Answer: 42cm^3

4 Find the volume of this quadrangular prism

Area of trapezoid = (upper base + lower base) × height ÷ 2

$(3+9) \times 5 \div 2 \times 4 = 120$ cm^3

Volume of prism is found by calculating the base area x the height
V= Base area x height

Exercise

(Refer to TM for Questions and Answers)

Summary

To find the volume of all prisms, we use the formula:
Volume of prisms = base area x height.

Unit 10

Unit: Volume

Sub-unit: 2. Volume of a Cylinder

Lesson 1of 2

Textbook Page : 088
Actual Lesson 069

Lesson Objectives

- To find out the volume formula of cylinder by applying the idea of unit cube and the layers made.
- Calculate the volume of cylinder using volume formula V = area of base × height.

Prior Knowledge

- Formula for volume of prism is often written as V = base area × height.
- How to calculate volumes of rectangular prisms.

Preparation

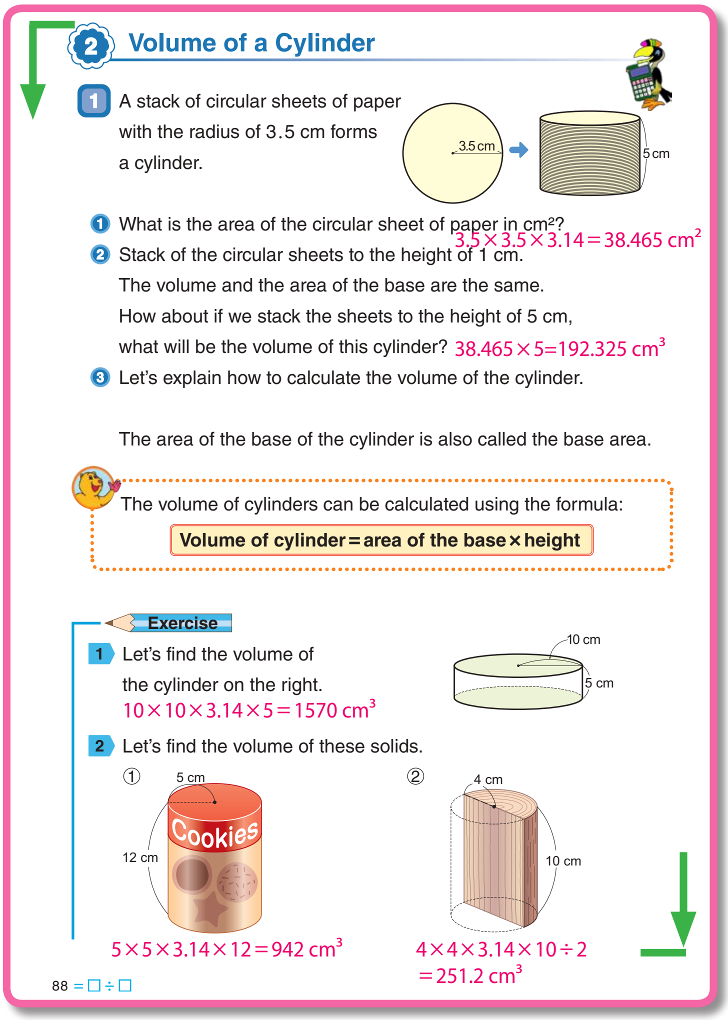
- Diagram for task 1
- Stack of the circular sheet

Assessment

- Find the base area of the cylinder by determining its radius and height. F
- Calculate the volume of a cylinder by applying the formula base area × height. F S
- Solve the exercises correctly. S

Teacher's Notes

For students to understand how to find the volume of a cylinder, the key focus should be to determine the base area in the bottom layer and the height.
The base is a circle.
The formula is $A = \pi r^2$.
It's necessary to help and confirm thoroughly with them to correctly calculate it.



2 Volume of a Cylinder

1 A stack of circular sheets of paper with the radius of 3.5 cm forms a cylinder.

① What is the area of the circular sheet of paper in cm²?
$3.5 \times 3.5 \times 3.14 = 38.465$ cm^2

② Stack of the circular sheets to the height of 1 cm.
The volume and the area of the base are the same.
How about if we stack the sheets to the height of 5 cm, what will be the volume of this cylinder? $38.465 \times 5 = 192.325$ cm^3

③ Let's explain how to calculate the volume of the cylinder.

The area of the base of the cylinder is also called the base area.

The volume of cylinders can be calculated using the formula:

Volume of cylinder = area of the base × height

Exercise

1 Let's find the volume of the cylinder on the right.
$10 \times 10 \times 3.14 \times 5 = 1570$ cm^3

2 Let's find the volume of these solids.

① $5 \times 5 \times 3.14 \times 12 = 942$ cm^3

② $4 \times 4 \times 3.14 \times 10 \div 2$
$= 251.2$ cm^3

88 = □ ÷ □

Lesson Flow

1 Review the previous lesson.

2 Think about how to find out the volume of a cylinder.

T/S 1 Read and understand the given situation.

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

T "If we build up many circular sheets of paper, what can we form?" Demonstrate how to stack sheets of paper.

S Build a cylinder.

T ① What is the area of the circular sheet of paper with a radius of 3.5 cm.

S Area of a circle = radius × radius × 3.14
= 3.5 × 3.5 × 3.14
= 38.465 (cm^2)

T ② Ask the students how much is the volume if they build the sheets up to the height of 5 cm.

S 38.465 × 5 = 192.325
Answer: 192.325 cm^3

3 ③ Think about how to calculate the volume of a cylinder.

T Confirm students' calculation results and how to find the volume of a cylinder.

S We can find the volume of a cylinder using same way of finding quadrilateral prism.
(V) = base area (circle) × height

4 Important Point

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

5 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

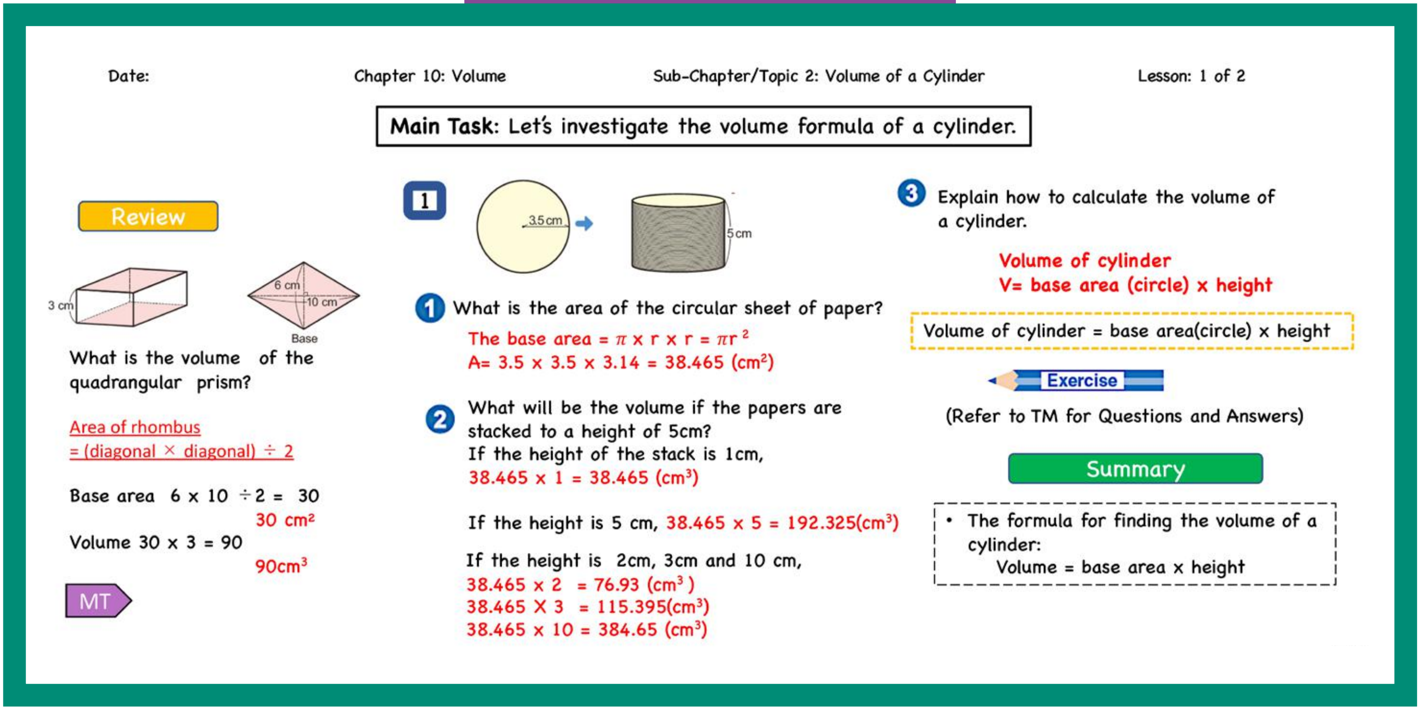
6 Summary

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


Review
3 cm
6 cm
10 cm
Base
MT
1
3.5 cm
5 cm
Exercise
Summary

Date:

Chapter 10: Volume

Sub-Chapter/Topic 2: Volume of a Cylinder

Lesson: 1 of 2

Main Task: Let's investigate the volume formula of a cylinder.

What is the volume of the quadrangular prism?

Area of rhombus
= (diagonal × diagonal) ÷ 2

Base area 6 x 10 ÷ 2 = 30
30 cm^2

Volume 30 x 3 = 90
90 cm^3

① What is the area of the circular sheet of paper?
The base area = π x r x r = πr^2
A= 3.5 x 3.5 x 3.14 = 38.465 (cm^2)

② What will be the volume if the papers are stacked to a height of 5cm?
If the height of the stack is 1cm,
38.465 x 1 = 38.465 (cm^3)

If the height is 5 cm, 38.465 x 5 = 192.325(cm^3)

If the height is 2cm, 3cm and 10 cm,
38.465 x 2 = 76.93 (cm^3)
38.465 X 3 = 115.395(cm^3)
38.465 x 10 = 384.65 (cm^3)

③ Explain how to calculate the volume of a cylinder.

Volume of cylinder
V= base area (circle) x height

Volume of cylinder = base area(circle) x height

(Refer to TM for Questions and Answers)

- The formula for finding the volume of a cylinder:
  Volume = base area x height

Unit 10

Unit: Volume

Sub-unit: 2. Volume of a Cylinder

Lesson 2 of 2

Textbook Page : 089
Actual Lesson 070

Lesson Objective

- To investigate the volume of cylinder and pyramid.

Prior Knowledge

- Formula for volume of a cylinder

Preparation

- Images for blackboard displays

Assessment

- Investigate the volume of cones and pyramids by comparing to a cylinder and prism. F
- Explain the formula for the volume of the cone and pyramids. S

Teacher's Notes

Students should understand how to find the volume of a pyramid and cone by investigating how to derive the formulae.

The volume of pyramid or cone is $\frac{1}{3}$ times the volume of a prism or cylinder.

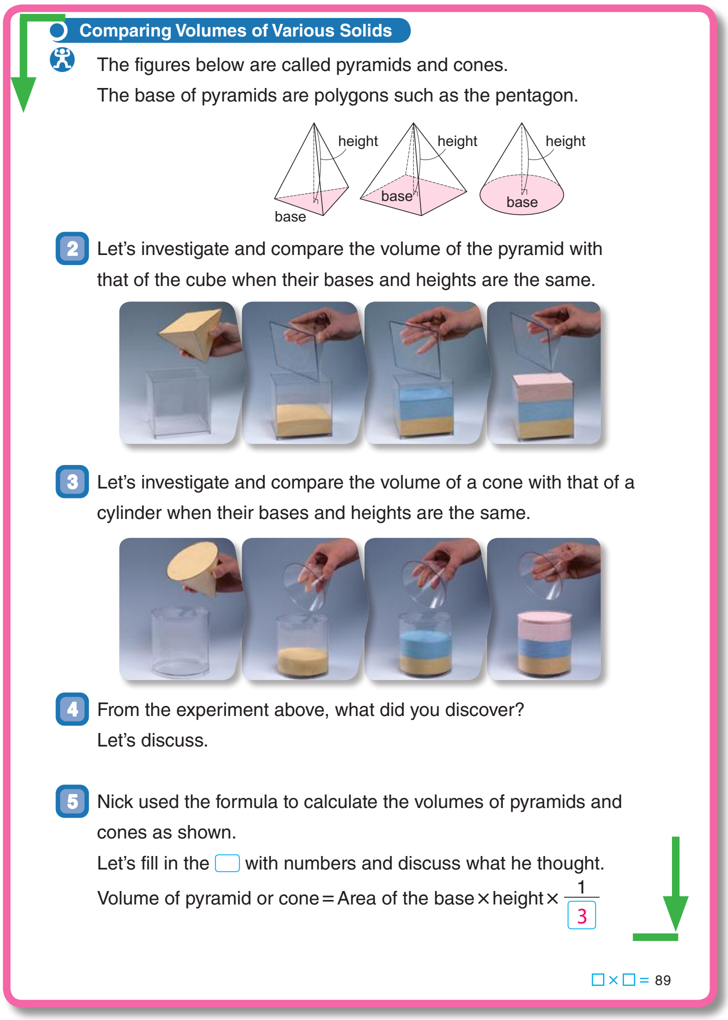
Volume of:

Cone $= \frac{1}{3} \times 3.14 \times r \times r \times h$

Pyramid $= \frac{1}{3} \times$ base area $\times$ height

It is good to encourage students to think about how to experiment regardless of whether you can actually implement it or not. Students will suggest various ideas such as using clay, using soil and so on.

It may also be good to try it as homework.



Comparing Volumes of Various Solids

The figures below are called pyramids and cones.
The base of pyramids are polygons such as the pentagon.

2 Let's investigate and compare the volume of the pyramid with that of the cube when their bases and heights are the same.

3 Let's investigate and compare the volume of a cone with that of a cylinder when their bases and heights are the same.

4 From the experiment above, what did you discover? Let's discuss.

5 Nick used the formula to calculate the volumes of pyramids and cones as shown.
Let's fill in the □ with numbers and discuss what he thought.
Volume of pyramid or cone = Area of the base × height × $\frac{1}{\boxed{3}}$

□×□= 89

Lesson Flow

1 Review the previous lesson.

2 Comparing volumes of the shapes of pyramids and cones.

T/S Read and understand the given situation.

T Describe the pyramid and cone by referring to the pictures in the textbook.

S Understand the shape of pyramids and cones.

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

3 2 Compare the volume of pyramid and the cube.

S Observe the textbook and think about what is happening.

TN The base and height must be the same for comparison.

T How are they comparing?

S Fill sand in the pyramid and transfer the sand to the cube. Count how many times they can be able to pour sand into the cube to fill it up.

T How many times more is the size of the cube compared to the size of pyramid?

S 3 times.

4 3 Compare the volume of cone and cylinder.

S Observe the textbook and think about what is happening.

TN The base and height must be same in comparison.

T How are they comparing?

S Fill sand in the cone and transfer the sand to the pyramid. Count how many times they can be able to pour sand into the cylinder to fill it up .

T How many times more is the size of the cylinder compared to the size of cone?

S 3 times.

5 4 Discuss the findings.

S Discuss their findings and share with the class.

S The volume of the prism and cylinder is 3 times more than the pyramid and cone.
The volume of both the pyramid and the cone is $\frac{1}{3}$ the volume of prism and cylinder.

6 5 Understanding the formula for the volume of pyramid and cone.

T/S Conclude that the volume of pyramid or cone is as follows.
Volume of pyramid or cone = area of the base × height × $\frac{1}{3}$.

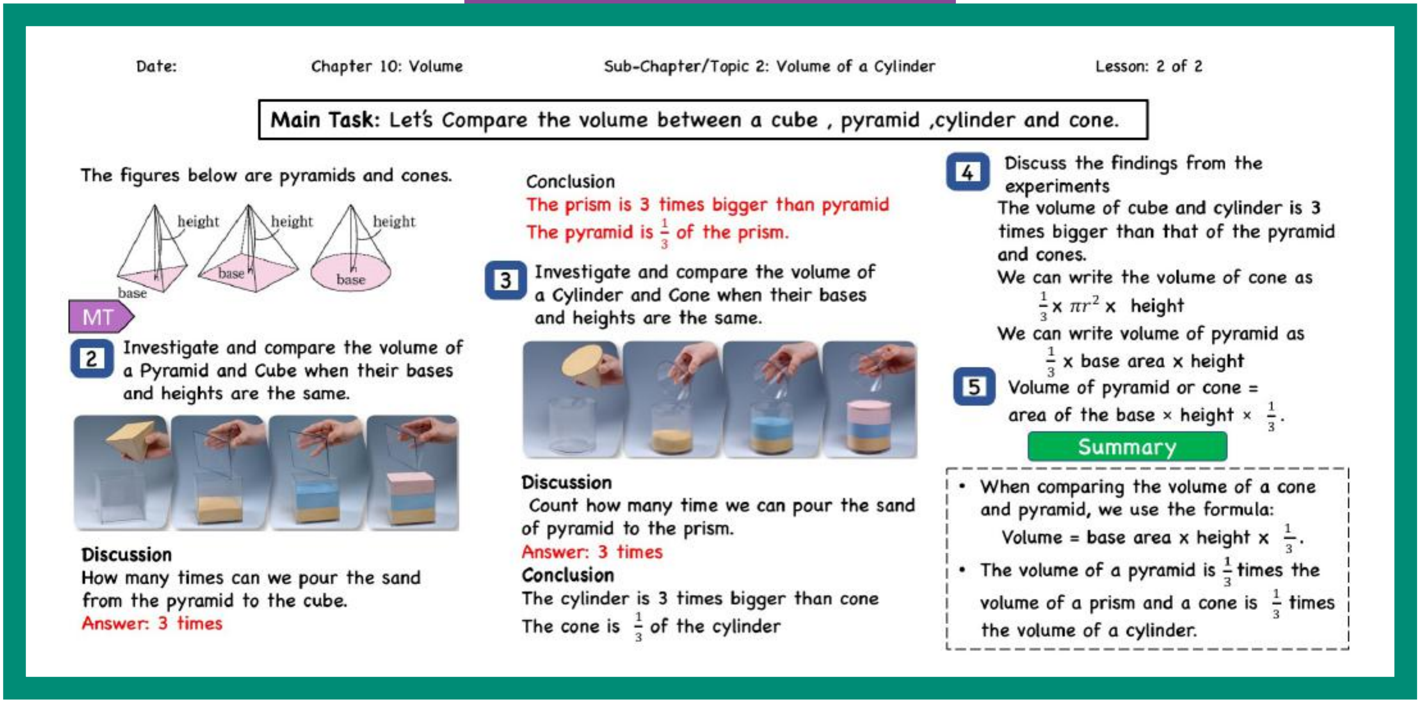
7 Summary

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 10: Volume Sub-Chapter/Topic 2: Volume of a Cylinder Lesson: 2 of 2

Main Task: Let's Compare the volume between a cube , pyramid ,cylinder and cone.

The figures below are pyramids and cones.

height
height
height
base
base
base
MT

2 Investigate and compare the volume of a Pyramid and Cube when their bases and heights are the same.

Discussion
How many times can we pour the sand from the pyramid to the cube.
Answer: 3 times

Conclusion
The prism is 3 times bigger than pyramid
The pyramid is $\frac{1}{3}$ of the prism.

3 Investigate and compare the volume of a Cylinder and Cone when their bases and heights are the same.

Discussion
Count how many time we can pour the sand of pyramid to the prism.
Answer: 3 times

Conclusion
The cylinder is 3 times bigger than cone
The cone is $\frac{1}{3}$ of the cylinder

4 Discuss the findings from the experiments
The volume of cube and cylinder is 3 times bigger than that of the pyramid and cones.
We can write the volume of cone as
$\frac{1}{3} \times \pi r^2 \times$ height
We can write volume of pyramid as
$\frac{1}{3} \times$ base area × height

5 Volume of pyramid or cone = area of the base × height × $\frac{1}{3}$.

Summary

- When comparing the volume of a cone and pyramid, we use the formula:
  Volume = base area × height × $\frac{1}{3}$.
- The volume of a pyramid is $\frac{1}{3}$ times the volume of a prism and a cone is $\frac{1}{3}$ times the volume of a cylinder.

Unit 10

Unit: Volume

Exercise, Problems and Evaluation

Lesson 1 and 2 of 2

Textbook Page : 090 and 091
Actual Lesson 71 and 72

Lesson Objective

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

Prior Knowledge

- All the contents learned in this unit of Volume.

Preparation

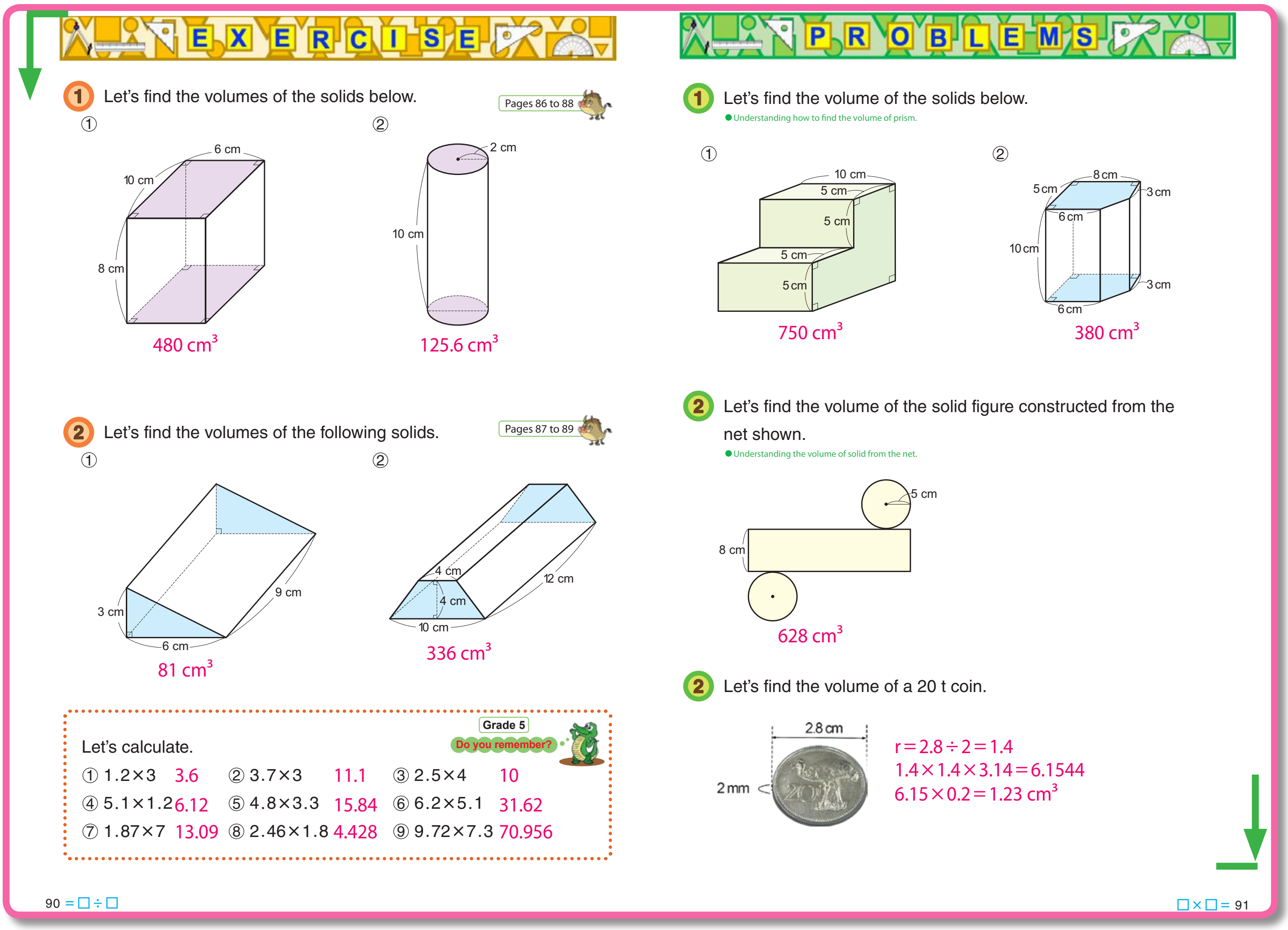
- Evaluation Test.

Assessment

- Solve the exercises and problems correctly. F S

Teacher's Notes

This is the last lesson of Chapter 10. Students should be encouraged to use the necessary skills learnt 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 finishing all the exercises.
Use the attached evaluation test to conduct assessment for your class after finishing all the exercises, problems and review as a seperate lesson.



EXERCISE

① Let's find the volumes of the solids below. Pages 86 to 88

① 480 cm^3

② 125.6 cm^3

② Let's find the volumes of the following solids. Pages 87 to 89

① 81 cm^3

② 336 cm^3

Grade 5 Do you remember?

Let's calculate.

① 1.2×3 3.6 ② 3.7×3 11.1 ③ 2.5×4 10
④ 5.1×1.2 6.12 ⑤ 4.8×3.3 15.84 ⑥ 6.2×5.1 31.62
⑦ 1.87×7 13.09 ⑧ 2.46×1.8 4.428 ⑨ 9.72×7.3 70.956

PROBLEMS

① Let's find the volume of the solids below.
● Understanding how to find the volume of prism.

① 750 cm^3

② 380 cm^3

② Let's find the volume of the solid figure constructed from the net shown.
● Understanding the volume of solid from the net.

628 cm^3

② Let's find the volume of a 20 t coin.

$r = 2.8 \div 2 = 1.4$
$1.4 \times 1.4 \times 3.14 = 6.1544$
$6.15 \times 0.2 = 1.23$ cm^3

90 = □ ÷ □

□ × □ = 91

Lesson Flow

1 Complete Exercise ① and ②.

S Calculate the volume for the solids ① and ②

2 Complete the Do You Remember exercise.

S Calculate the Decimal number × Whole number, Decimal number × Decimal number.

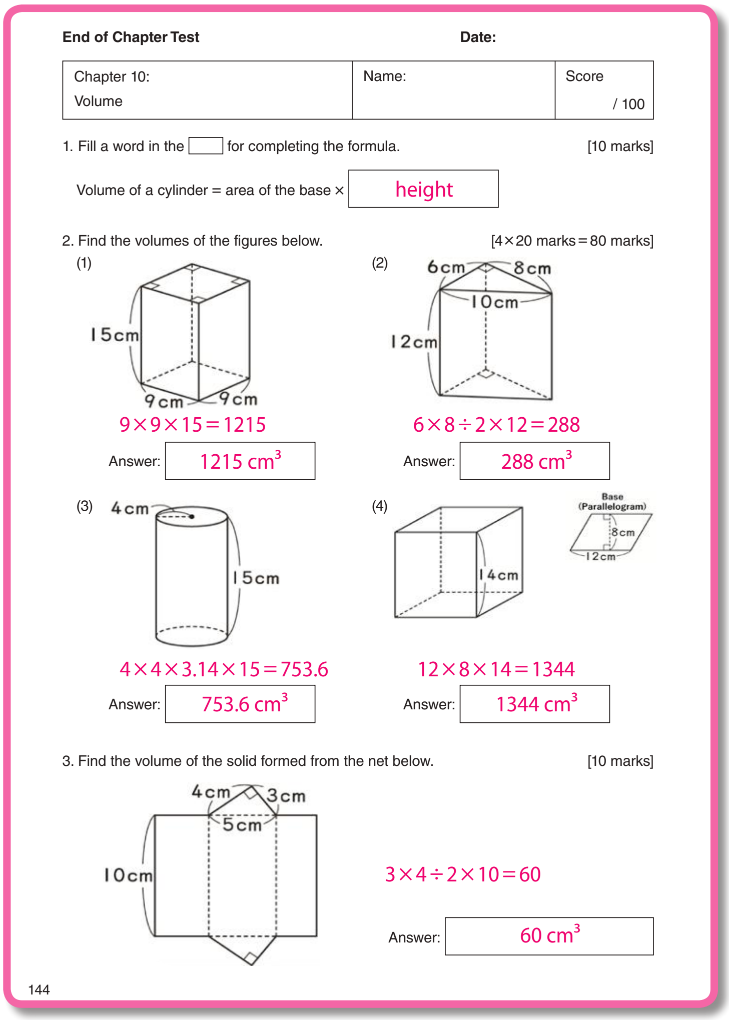
3 Solve Problems ① to ③.

S ① Solve the problems by finding the volume of solids ① and ②.
② Solve the problem by studying the net of the solid and calculate the volume.
③ Solve the problems by finding the volume of solids.

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 10: Volume	Name:	Score / 100

1. Fill a word in the ☐ for completing the formula. [10 marks]

Volume of a cylinder = area of the base × height

2. Find the volumes of the figures below. [4×20 marks = 80 marks]

(1)

9×9×15 = 1215

Answer: 1215 cm^3

(2)

6×8÷2×12 = 288

Answer: 288 cm^3

(3)

4×4×3.14×15 = 753.6

Answer: 753.6 cm^3

(4)

12×8×14 = 1344

Answer: 1344 cm^3

3. Find the volume of the solid formed from the net below. [10 marks]

3×4÷2×10 = 60

Answer: 60 cm^3

144

End of Chapter Test **Date:**

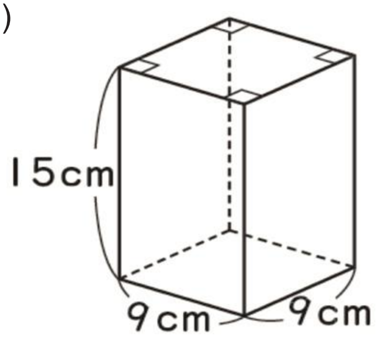
Chapter 10: Volume	Name:	Score / 100

1. Fill a word in the ☐ for completing the formula. [10 marks]

Volume of a cylinder = area of the base × ☐

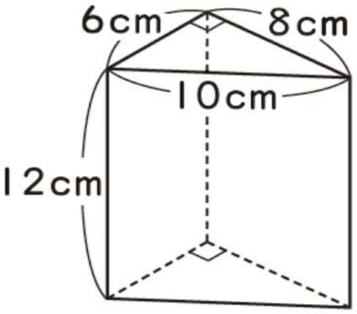
2. Find the volumes of the figures below. [4×20 marks = 80 marks]

(1)



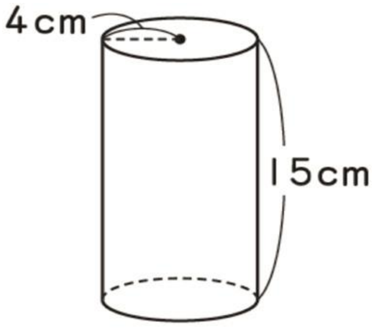
Answer:

(2)



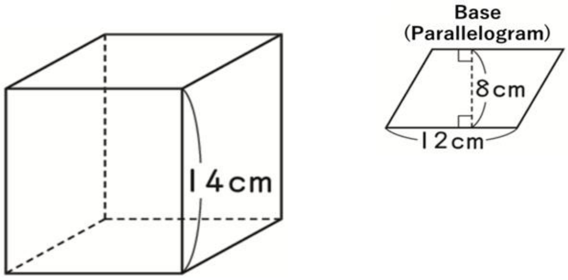
Answer:

(3)



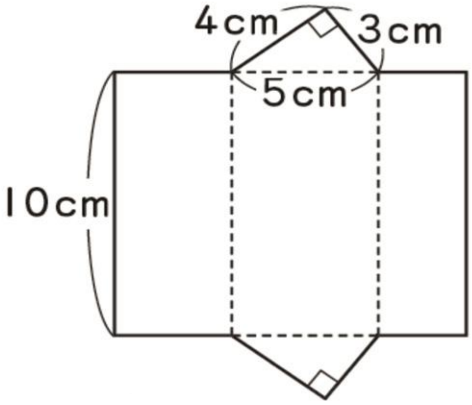
Answer:

(4)



Answer:

3. Find the volume of the solid formed from the net below. [10 marks]



Answer:

Chapter 11 Ratio and Its Application

1. Content Standard

6.4.1. Students will be able to define ratio and use it in various situations and appreciate its usefulness in daily life.

2. Unit Objectives

- To understand the meaning of ratio and apply it.
- To understand the meaning of equal ratio.

3. Teaching Overview

Students learned rate which is the amount compared to the base amount when taking the base as 1. Students learn another way of expressing relationship between 2 quantities in this topic. Ratio does not require to make the base amount 1, however, we can use a pair of simple quantities.

Ratio :

The relations students already learned such as relative amounts, how many times and percentages can be represented as a value. Ratio can be represented as a pair of numbers. It is also represented as a pair of simple whole numbers or quantities.

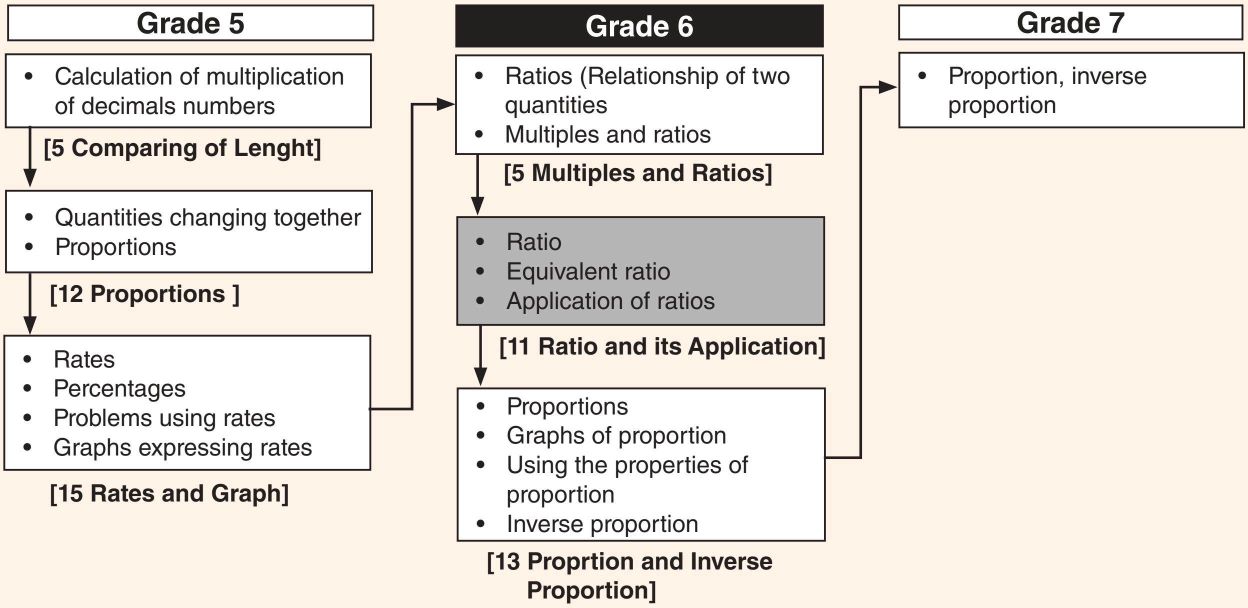
Equivalent Ratio :

They learn the features of equivalent ratios. We can multiply the pair of numbers as a ratio by the same number, or divide by the same number and the ratio given by the calculation is still equivalent to the original ratio. Students should investigate it using many numbers.

Application of Ratio :

Since ratios can represent relationship between 2 quantities, we can find another quantity when we know one quantity and ratio. Students also learn distribution ratio for distributing something in a ratio of A : B.

4. Related Learning Contents



Grade 5

- Calculation of multiplication of decimals numbers

[5 Comparing of Lenght]

- Quantities changing together
- Proportions

[12 Proportions]

- Rates
- Percentages
- Problems using rates
- Graphs expressing rates

[15 Rates and Graph]

Grade 6

- Ratios (Relationship of two quantities
- Multiples and ratios

[5 Multiples and Ratios]

- Ratio
- Equivalent ratio
- Application of ratios

[11 Ratio and its Application]

- Proportions
- Graphs of proportion
- Using the properties of proportion
- Inverse proportion

[13 Proprtion and Inverse Proportion]

Grade 7

- Proportion, inverse proportion

Unit 11

Unit: Ratio and Its Application

Sub-unit: 1. Ratio

Lesson 1 of 1

Textbook Page :
092 to 094
Actual Lesson 073

Sub-unit Objective

- To understand the meaning and how to express ratio.

Lesson Objective

- To understand the meaning of ratio and how to express it.

Prior Knowledge

- Proportions (Grade 5)
- Multiples and Ratios (Grade 6)

Preparation

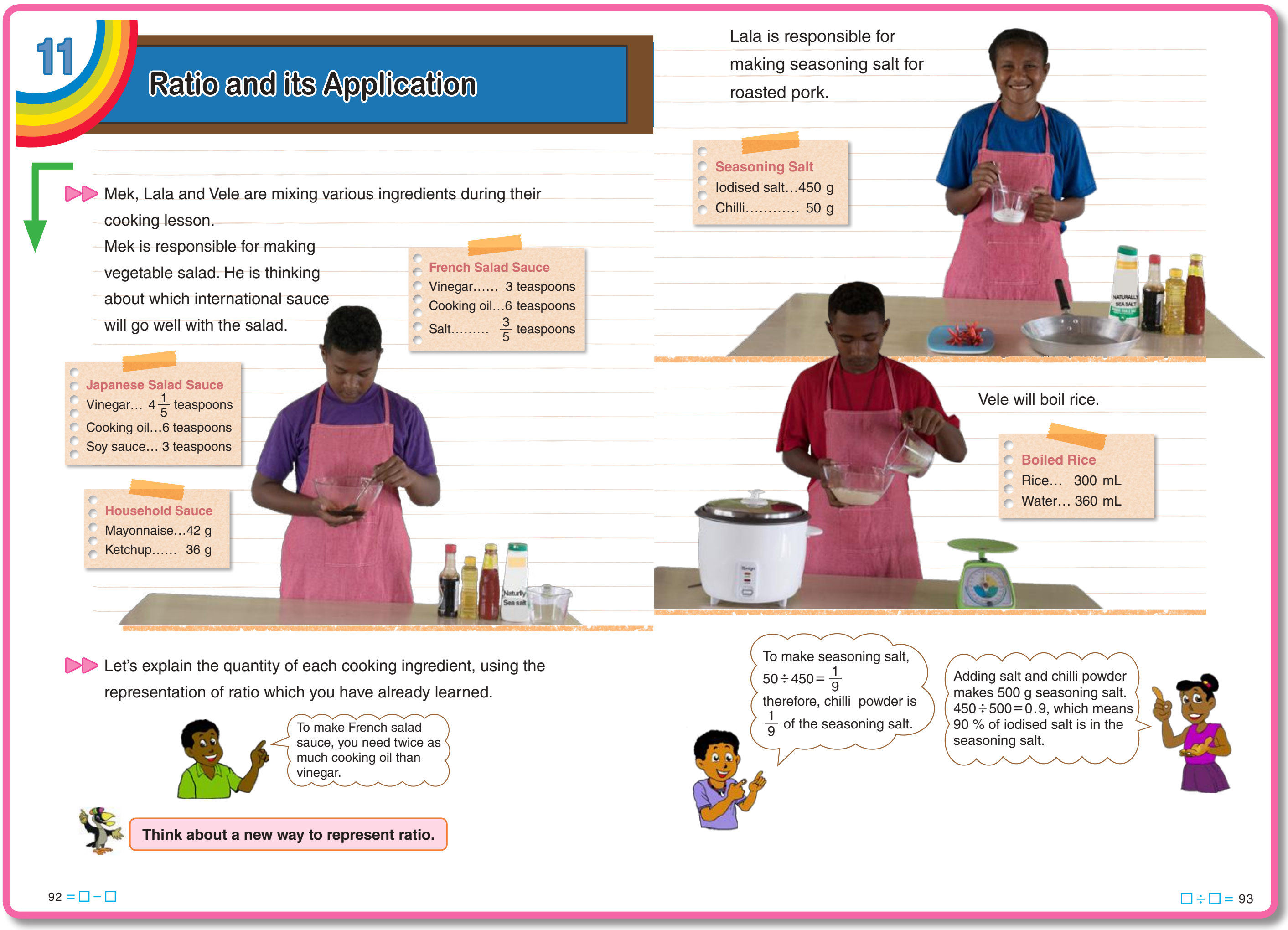
- Copy of each sauce recipe for Blackboard

Assessment

- Define ratio and explain its meaning based on real life situations. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

- The colon symbol ':' is used to represent ratio and read as "is to".



11

Ratio and its Application

▷▷ Mek, Lala and Vele are mixing various ingredients during their cooking lesson.

Mek is responsible for making vegetable salad. He is thinking about which international sauce will go well with the salad.

French Salad Sauce
Vinegar…… 3 teaspoons
Cooking oil…6 teaspoons
Salt……… $\frac{3}{5}$ teaspoons

Japanese Salad Sauce
Vinegar… $4\frac{1}{5}$ teaspoons
Cooking oil…6 teaspoons
Soy sauce… 3 teaspoons

Household Sauce
Mayonnaise…42 g
Ketchup…… 36 g

Lala is responsible for making seasoning salt for roasted pork.

Seasoning Salt
Iodised salt…450 g
Chilli………… 50 g

Vele will boil rice.

Boiled Rice
Rice… 300 mL
Water… 360 mL

▷▷ Let's explain the quantity of each cooking ingredient, using the representation of ratio which you have already learned.

To make French salad sauce, you need twice as much cooking oil than vinegar.
To make seasoning salt, $50 \div 450 = \frac{1}{9}$ therefore, chilli powder is $\frac{1}{9}$ of the seasoning salt.
Adding salt and chilli powder makes 500 g seasoning salt. $450 \div 500 = 0.9$, which means 90 % of iodised salt is in the seasoning salt.

Think about a new way to represent ratio.

92 = □ − □

□ ÷ □ = 93

Lesson Flow

1 Understand the meaning of ratio.

T/S ▶▶ Read and understand the situation by discussing the mixtures of various ingredients.

S Consider the amount of each ingredient used and explain the quantity of cooking ingredients using the representation of ratio of making the sauce.

T Confirm the students' explanations.

2 Relating ratio to fractions and percentages.

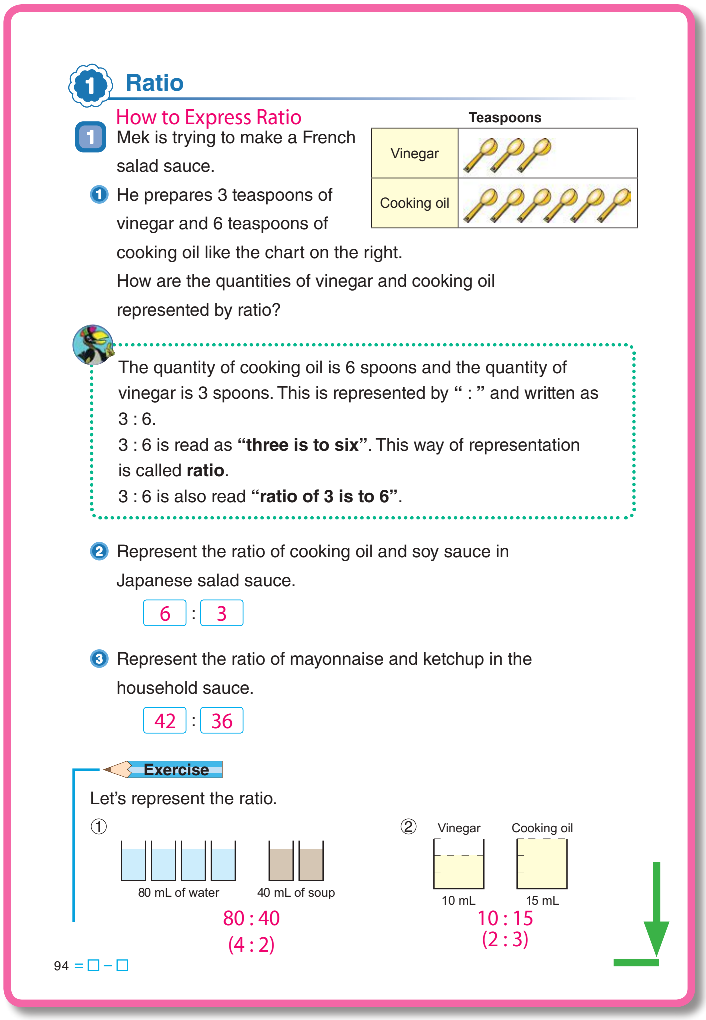
T Let students look at Lala's recipe on seasoning salt.

S Represent the ratio of iodised salt to chilli powder as a fraction.

TN $50 \div 450 = \frac{50}{450} = \frac{1}{9}$ therefore, chilli powder is $\frac{1}{9}$ of seasoning salt.

S Represent the ratio of iodised salt in seasoning salt.

TN Adding iodised salt and chilli powder makes 500 g in total for the recipe.
So, $450 \div 500 = 0.9$, $0.9 \times 100 = 90$ % of iodised salt in the seasoning salt.



① **Ratio**

How to Express Ratio

1 Mek is trying to make a French salad sauce.

① He prepares 3 teaspoons of vinegar and 6 teaspoons of cooking oil like the chart on the right.
How are the quantities of vinegar and cooking oil represented by ratio?

	Teaspoons
Vinegar	🥄🥄🥄
Cooking oil	🥄🥄🥄🥄🥄🥄

The quantity of cooking oil is 6 spoons and the quantity of vinegar is 3 spoons. This is represented by " : " and written as 3 : 6.
3 : 6 is read as **"three is to six"**. This way of representation is called **ratio**.
3 : 6 is also read **"ratio of 3 is to 6"**.

② Represent the ratio of cooking oil and soy sauce in Japanese salad sauce.

6 : 3

③ Represent the ratio of mayonnaise and ketchup in the household sauce.

42 : 36

Exercise

Let's represent the ratio.

① 80 mL of water, 40 mL of soup
80 : 40
(4 : 2)

② Vinegar 10 mL, Cooking oil 15 mL
10 : 15
(2 : 3)

94 = □ − □

S Think about new ways to represent ratio.

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

3 Definition and representation of ratio.

T/S 1 Read and understand the given situation.

T ① How are the quantities of vinegar and cooking oil represented using ratio?

S The quantity of vinegar is 3 teaspoons and cooking oil is 6 teaspoons.

4 Important Point

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

TN Students can either use the word (is to) or use colon (:) to represent ratio.

5 Representation of ratio.

S ② Represent the ratio of cooking oil and soy sauce in the Japanese salad sauce.
6 : 3

S ③ Represent the ratio of mayonnaise and ketchup in Mek's sauce.
42 : 36

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

Lesson 73 Sample Blackboard Plan
is on page 151.

Unit 11

Unit: Ratio and Its Application

Sub-unit: 2. Equivalent Ratio

Lesson 1 of 4

Textbook Page : 095 and 096
Actual Lesson 074

Sub-unit Objectives

- To understand the meaning of equal ratios and value of ratios.
- To understand how to simplify ratios.

Lesson Objectives

- To understand and represent the value of ratio .
- To understand, compare and represent the value of equal ratio.

Prior Knowledge

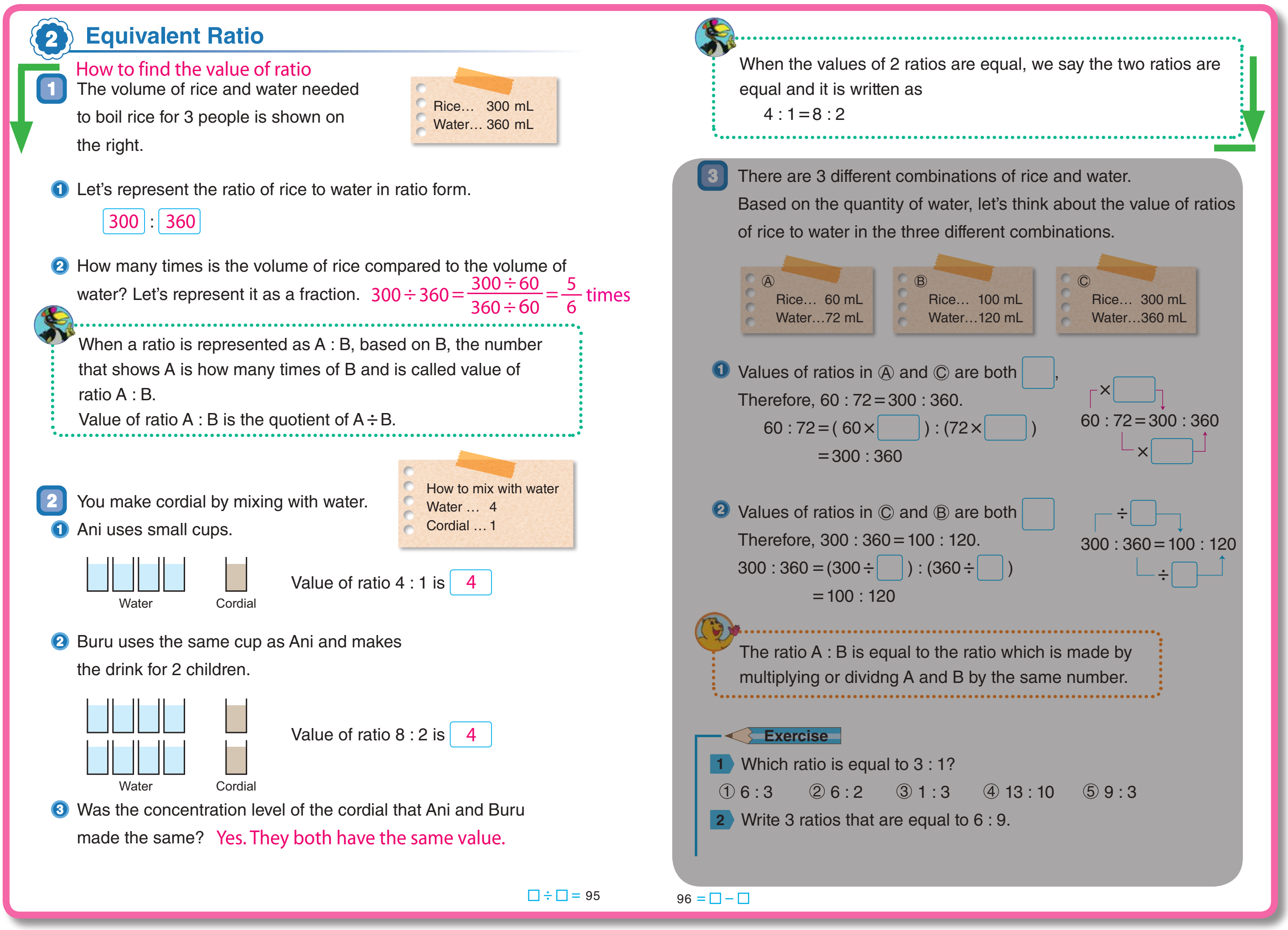
- Proportions (Grade 5)
- Ratio

Assessment

- Think about how to find the value of ratio. **F**
- Explain the definition of equal ratio. **S**

Teacher's Notes

The term concentration in this context means, how sweet the cordial is in task **2**.



② Equivalent Ratio

How to find the value of ratio

1 The volume of rice and water needed to boil rice for 3 people is shown on the right.

Rice… 300 mL
Water… 360 mL

① Let's represent the ratio of rice to water in ratio form.

$\boxed{300}$: $\boxed{360}$

② How many times is the volume of rice compared to the volume of water? Let's represent it as a fraction. $300 \div 360 = \dfrac{300 \div 60}{360 \div 60} = \dfrac{5}{6}$ times

When a ratio is represented as A : B, based on B, the number that shows A is how many times of B and is called value of ratio A : B.
Value of ratio A : B is the quotient of A ÷ B.

2 You make cordial by mixing with water.

How to mix with water
Water … 4
Cordial … 1

① Ani uses small cups.

Water Cordial

Value of ratio 4 : 1 is $\boxed{4}$

② Buru uses the same cup as Ani and makes the drink for 2 children.

Water Cordial

Value of ratio 8 : 2 is $\boxed{4}$

③ Was the concentration level of the cordial that Ani and Buru made the same? Yes. They both have the same value.

□ ÷ □ = 95

When the values of 2 ratios are equal, we say the two ratios are equal and it is written as
4 : 1 = 8 : 2

3 There are 3 different combinations of rice and water. Based on the quantity of water, let's think about the value of ratios of rice to water in the three different combinations.

Ⓐ	Ⓑ	Ⓒ
Rice… 60 mL Water…72 mL	Rice… 100 mL Water…120 mL	Rice… 300 mL Water…360 mL

① Values of ratios in Ⓐ and Ⓒ are both $\square$,
Therefore, 60 : 72 = 300 : 360.

$$60 : 72 = (60 \times \square) : (72 \times \square) = 300 : 360$$

$$60 : 72 \overset{\times \square}{=} 300 : 360$$

② Values of ratios in Ⓒ and Ⓑ are both $\square$
Therefore, 300 : 360 = 100 : 120.

$$300 : 360 = (300 \div \square) : (360 \div \square) = 100 : 120$$

$$300 : 360 \overset{\div \square}{=} 100 : 120$$

The ratio A : B is equal to the ratio which is made by multiplying or dividng A and B by the same number.

Exercise

1 Which ratio is equal to 3 : 1?
① 6 : 3 ② 6 : 2 ③ 1 : 3 ④ 13 : 10 ⑤ 9 : 3

2 Write 3 ratios that are equal to 6 : 9.

96 = □ − □

Lesson Flow

1 Review the previous lesson.

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

2 Represent ratio in ratio form and as a fraction.

T/S 1 Read and understand the given situation.

T Allow students to discuss the amount of water and rice to boil rice for 3 people.

S ① Represent the ratio of rice to water in ratio form.
300 : 360

T ② How many times is the volume of rice compared to volume of water?
Represent it as a fraction.

S Represent ratio as a fraction.
$300 \div 360 = \frac{5}{6}$

3 Important Point

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

4 Finding the value of ratio.

T/S 2 Read and understand the given situation.

S ① Look at Ani's mixing of cordial and find the value of ratio.
Value of ratio 4 : 1 is 4

S ② Study the mixing of cordial by Buru and Ani and find the value of ratio.
Value of ratio 8 : 2 is 4

S ③ Compare the concentration level that Ani and Buru made.

T Are they the same?

S Ani and Buru made the same concentration of cordial mixture because they both have the same value of ratio.

5 Important Point

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

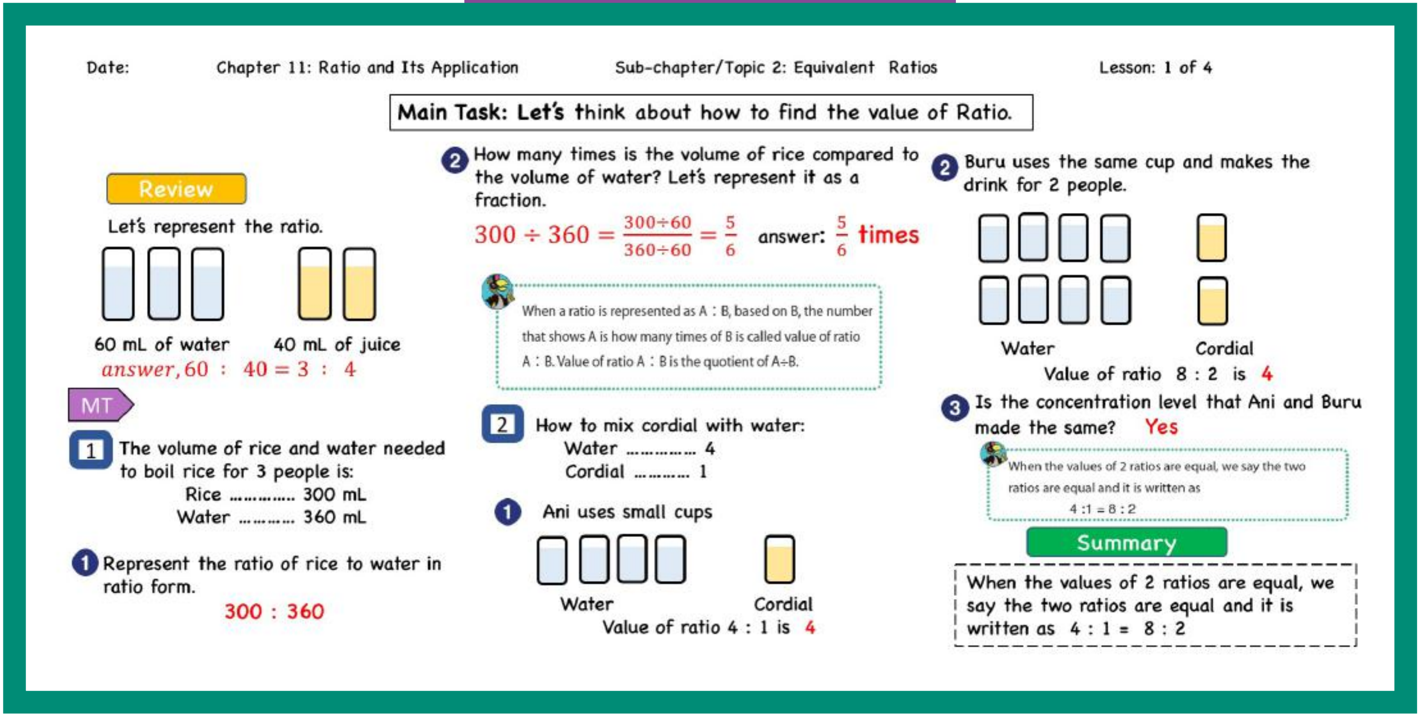
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Ratio and Its Application Sub-chapter/Topic 2: Equivalent Ratios Lesson: 1 of 4

Main Task: Let's think about how to find the value of Ratio.

Review

Let's represent the ratio.

60 mL of water 40 mL of juice

answer, 60 : 40 = 3 : 4

MT

1 The volume of rice and water needed to boil rice for 3 people is:
Rice ………….. 300 mL
Water ……….. 360 mL

① Represent the ratio of rice to water in ratio form.
300 : 360

② How many times is the volume of rice compared to the volume of water? Let's represent it as a fraction.

$300 \div 360 = \frac{300 \div 60}{360 \div 60} = \frac{5}{6}$ answer: $\frac{5}{6}$ times

When a ratio is represented as A : B, based on B, the number that shows A is how many times of B is called value of ratio A : B. Value of ratio A : B is the quotient of A÷B.

2 How to mix cordial with water:
Water …………… 4
Cordial ………… 1

① Ani uses small cups

Water Cordial
Value of ratio 4 : 1 is 4

② Buru uses the same cup and makes the drink for 2 people.

Water Cordial
Value of ratio 8 : 2 is 4

③ Is the concentration level that Ani and Buru made the same? Yes

When the values of 2 ratios are equal, we say the two ratios are equal and it is written as
4 :1 = 8 : 2

Summary

When the values of 2 ratios are equal, we say the two ratios are equal and it is written as 4 : 1 = 8 : 2

Unit
11

Unit: Ratio and Its Application
Sub-unit: 2. Equivalent Ratio
Lesson 2 of 4

Textbook Page : 096
Actual Lesson 075

Lesson Objective

- To think about multiplication and division of ratios.

Prior Knowledge

- Multiples and Rates
- Value of ratio

Preparation

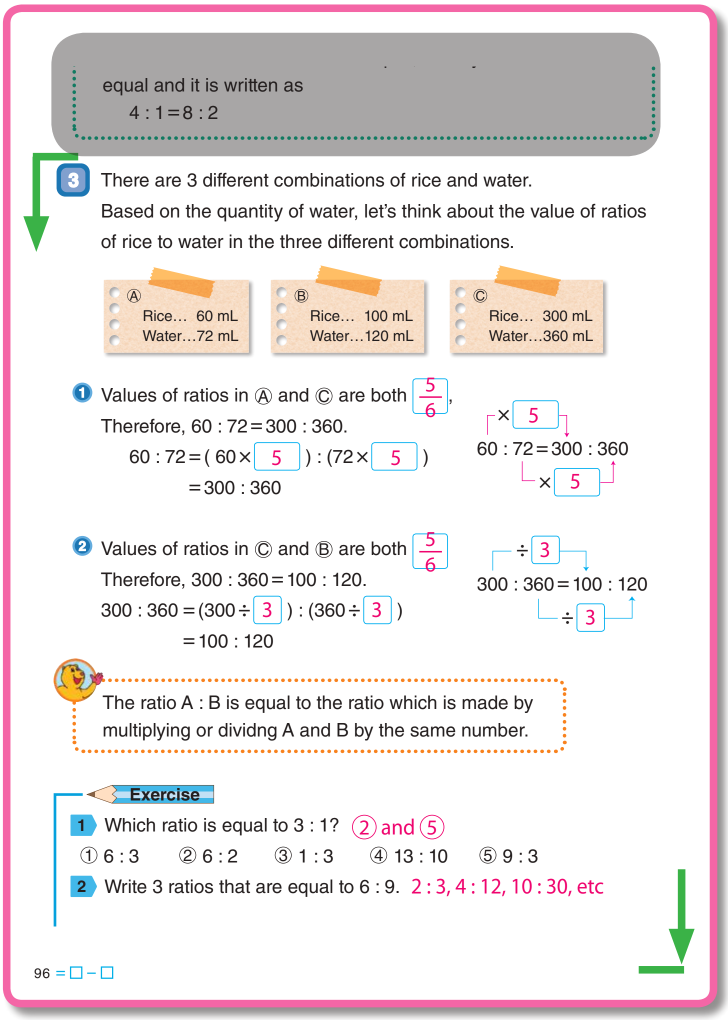
- Refer to the Blackboard Plan.

Assessment

- Think about multiplication and division of ratios by the same number. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

The ratio of A : B is equivalent to the ratio which is either multiplied (increased) or divided (reduced) by the same number.



equal and it is written as
4 : 1 = 8 : 2

3 There are 3 different combinations of rice and water.
Based on the quantity of water, let's think about the value of ratios of rice to water in the three different combinations.

Ⓐ Rice… 60 mL
Water…72 mL

Ⓑ Rice… 100 mL
Water…120 mL

Ⓒ Rice… 300 mL
Water…360 mL

① Values of ratios in Ⓐ and Ⓒ are both $\boxed{\frac{5}{6}}$,
Therefore, 60 : 72 = 300 : 360.
$60 : 72 = (60 \times \boxed{5}) : (72 \times \boxed{5})$
$= 300 : 360$

$$\underset{\times \boxed{5}}{\overset{\times \boxed{5}}{60 : 72 = 300 : 360}}$$

② Values of ratios in Ⓒ and Ⓑ are both $\boxed{\frac{5}{6}}$
Therefore, 300 : 360 = 100 : 120.
$300 : 360 = (300 \div \boxed{3}) : (360 \div \boxed{3})$
$= 100 : 120$

$$\underset{\div \boxed{3}}{\overset{\div \boxed{3}}{300 : 360 = 100 : 120}}$$

The ratio A : B is equal to the ratio which is made by multiplying or dividng A and B by the same number.

Exercise

1 Which ratio is equal to 3 : 1? ② and ⑤
① 6 : 3 ② 6 : 2 ③ 1 : 3 ④ 13 : 10 ⑤ 9 : 3

2 Write 3 ratios that are equal to 6 : 9. 2 : 3, 4 : 12, 10 : 30, etc

96 = □ − □

Lesson Flow

1 Review the previous lesson.

2 Find the value of ratio in three different combinations.

T/S 3 Read and understand the given situation.

S Share their ideas in finding the value of ratios.

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

3 Multiplying to find equivalent ratios.

S ① Think about the values of ratios for Ⓐ and Ⓒ.

T What does it mean, 60 : 72 = 300 : 360?

S The value of ratio is the same, $\frac{5}{6}$

S Fill in the blank boxes to confirm.

TN Students should understand that if multiplying A : C by the same number, it becomes the same ratio.

4 Dividing to find equivalent ratios.

S ② Think about the value of ratio for Ⓒ and Ⓑ

T What does it mean, 300 : 360 = 100 : 120?

S The value of ratio is the same, $\frac{5}{6}$

S Fill in the blank boxes to confirm.

TN Students should understand that if dividing C : B by the same number, it becomes the same ratio.

5 Important Point

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

6 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

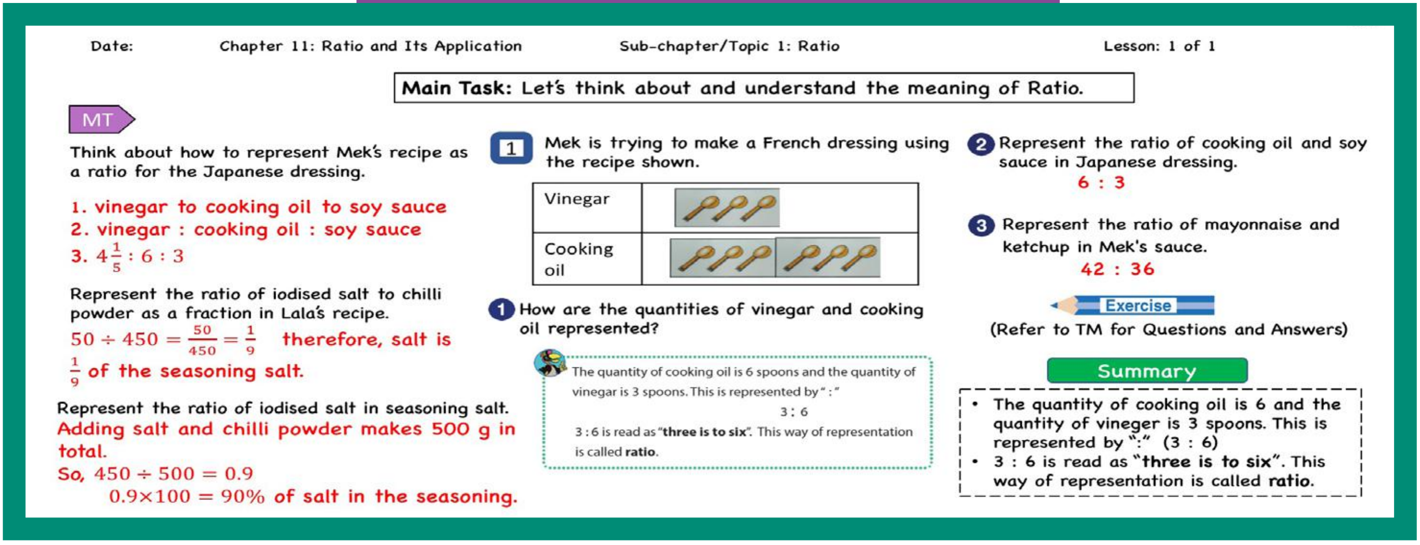
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan (Lesson 73)



Date: Chapter 11: Ratio and Its Application Sub-chapter/Topic 1: Ratio Lesson: 1 of 1

Main Task: Let's think about and understand the meaning of Ratio.

MT

Think about how to represent Mek's recipe as a ratio for the Japanese dressing.

1. vinegar to cooking oil to soy sauce
2. vinegar : cooking oil : soy sauce
3. $4\frac{1}{5} : 6 : 3$

Represent the ratio of iodised salt to chilli powder as a fraction in Lala's recipe.

$50 \div 450 = \frac{50}{450} = \frac{1}{9}$ therefore, salt is $\frac{1}{9}$ of the seasoning salt.

Represent the ratio of iodised salt in seasoning salt.

Adding salt and chilli powder makes 500 g in total.

So, $450 \div 500 = 0.9$

$0.9 \times 100 = 90\%$ of salt in the seasoning.

1 Mek is trying to make a French dressing using the recipe shown.

Vinegar	
Cooking oil	

① How are the quantities of vinegar and cooking oil represented?

The quantity of cooking oil is 6 spoons and the quantity of vinegar is 3 spoons. This is represented by " : "
3 : 6
3 : 6 is read as "**three is to six**". This way of representation is called **ratio**.

② Represent the ratio of cooking oil and soy sauce in Japanese dressing.
6 : 3

③ Represent the ratio of mayonnaise and ketchup in Mek's sauce.
42 : 36

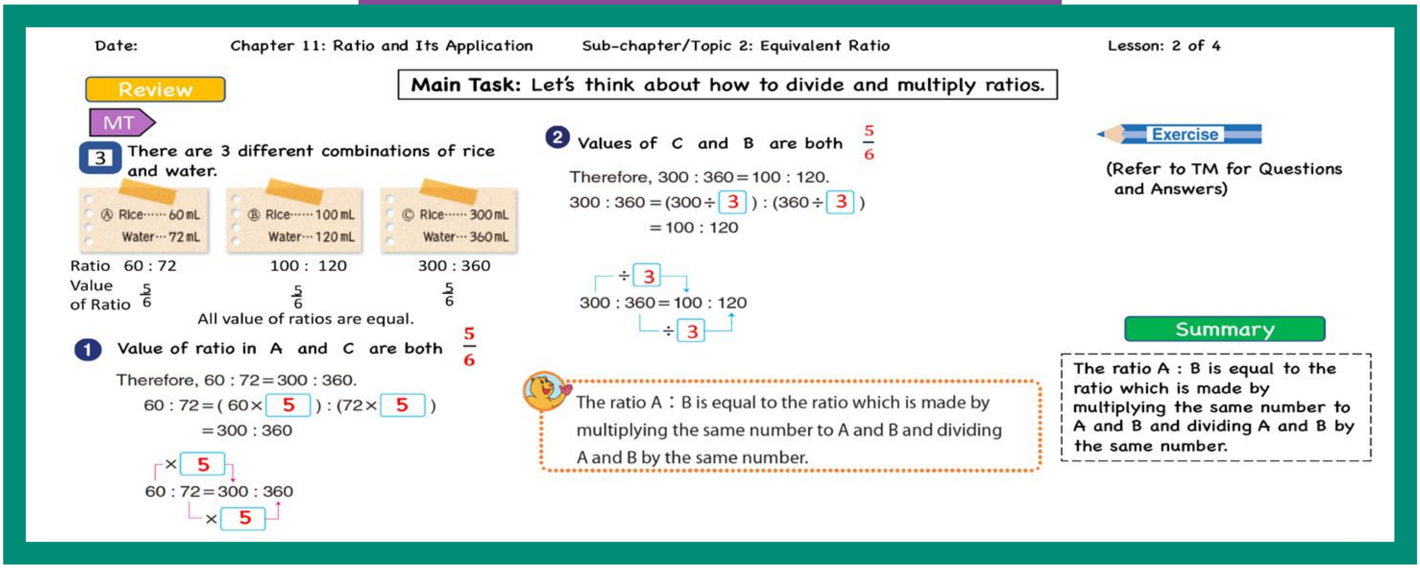
Exercise

(Refer to TM for Questions and Answers)

Summary

- The quantity of cooking oil is 6 and the quantity of vineger is 3 spoons. This is represented by ":" (3 : 6)
- 3 : 6 is read as "**three is to six**". This way of representation is called **ratio**.

Sample Blackboard Plan (Lesson 75)



Date: Chapter 11: Ratio and Its Application Sub-chapter/Topic 2: Equivalent Ratio Lesson: 2 of 4

Main Task: Let's think about how to divide and multiply ratios.

Review

MT

3 There are 3 different combinations of rice and water.

Ⓐ Rice…… 60 mL
Water… 72 mL

Ⓑ Rice…… 100 mL
Water… 120 mL

Ⓒ Rice…… 300 mL
Water… 360 mL

	Ⓐ	Ⓑ	Ⓒ
Ratio	60 : 72	100 : 120	300 : 360
Value of Ratio	$\frac{5}{6}$	$\frac{5}{6}$	$\frac{5}{6}$

All value of ratios are equal.

① Value of ratio in A and C are both $\frac{5}{6}$

Therefore, 60 : 72 = 300 : 360.

$60 : 72 = (60 \times \boxed{5}) : (72 \times \boxed{5})$
$= 300 : 360$

$$60 : 72 = 300 : 360 \quad (\times \boxed{5},\ \times \boxed{5})$$

② Values of C and B are both $\frac{5}{6}$

Therefore, 300 : 360 = 100 : 120.

$300 : 360 = (300 \div \boxed{3}) : (360 \div \boxed{3})$
$= 100 : 120$

$$300 : 360 = 100 : 120 \quad (\div \boxed{3},\ \div \boxed{3})$$

The ratio A : B is equal to the ratio which is made by multiplying the same number to A and B and dividing A and B by the same number.

Exercise

(Refer to TM for Questions and Answers)

Summary

The ratio A : B is equal to the ratio which is made by multiplying the same number to A and B and dividing A and B by the same number.

Unit
11

Unit: Ratio and Its Application
Sub-unit: 2. Equivalent Ratio
Lesson 3 of 4

Textbook Page : 097
Actual Lesson 076

Lesson Objective

- To understand how to find equal ratios through representations.

Prior Knowledge

- Multiplication and Division of Ratio.

Preparation

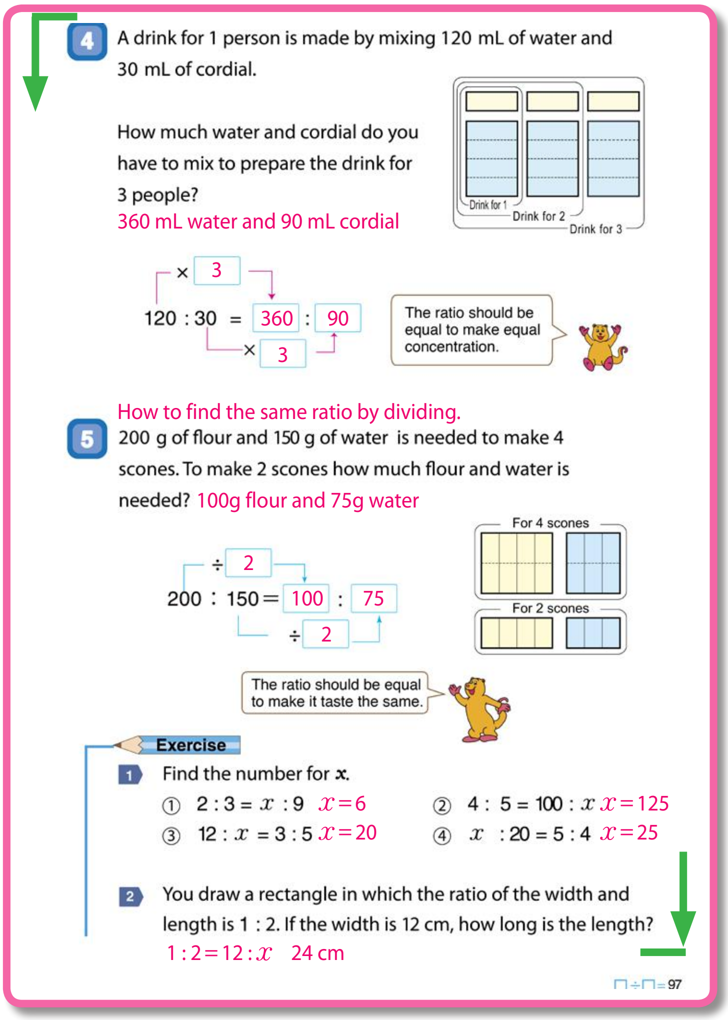
- Diagram for Task 4 and 5.

Assessment

- Use the diagram representation to find the equal ratio by multiplying and dividing. F
- Solve the exercises correctly. S

Teacher's Notes

This lesson continues from the previous lesson.
Refer to the the important points in that lesson in order to apply the same concepts.



4 A drink for 1 person is made by mixing 120 mL of water and 30 mL of cordial.

How much water and cordial do you have to mix to prepare the drink for 3 people?
360 mL water and 90 mL cordial

$$\overset{\times \boxed{3}}{120 : 30} = \boxed{360} : \boxed{90} \quad (\times \boxed{3})$$

How to find the same ratio by dividing.

5 200 g of flour and 150 g of water is needed to make 4 scones. To make 2 scones how much flour and water is needed? 100g flour and 75g water

$$\overset{\div \boxed{2}}{200 : 150} = \boxed{100} : \boxed{75} \quad (\div \boxed{2})$$

Exercise

1 Find the number for x.

① $2 : 3 = x : 9$ $x = 6$
② $4 : 5 = 100 : x$ $x = 125$
③ $12 : x = 3 : 5$ $x = 20$
④ $x : 20 = 5 : 4$ $x = 25$

2 You draw a rectangle in which the ratio of the width and length is 1 : 2. If the width is 12 cm, how long is the length?
$1 : 2 = 12 : x$ 24 cm

□÷□=97

Lesson Flow

1 Review the previous lesson.

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

2 Find the equal ratio by multiplication.

T/S ④ Read and understand the given situation.

T Allow students to discuss the amount of water to cordial to make a drink for one person.

S A drink for one person 120 : 30 = 360 : 90

T How much water and cordial do you have to prepare in order to make a drink with same concentration for 3 people?

S We have to prepare for 3 people, so multiply the ratio by 3 and fill in the boxes.

TN Find the same ratio by multiplying.

S We need 360 mL of water and 90 mL of cordial for 3 people with the same concentration.

3 Find the equal ratio by division.

T/S ⑤ Read and understand the given situation.

T Allow students to discuss amount of flour to water to make 4 scones

S 200 g of flour and 150 g of water is needed to make 4 scones.
To make 2 scones, how much flour and water is needed?

S We have to make 2, so divide the ratio by 2 and fill in the boxes.
We need 100 g of flour and 75 mL of water for 2 scones with the same taste.

TN Find the same ratio by dividing.

4 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

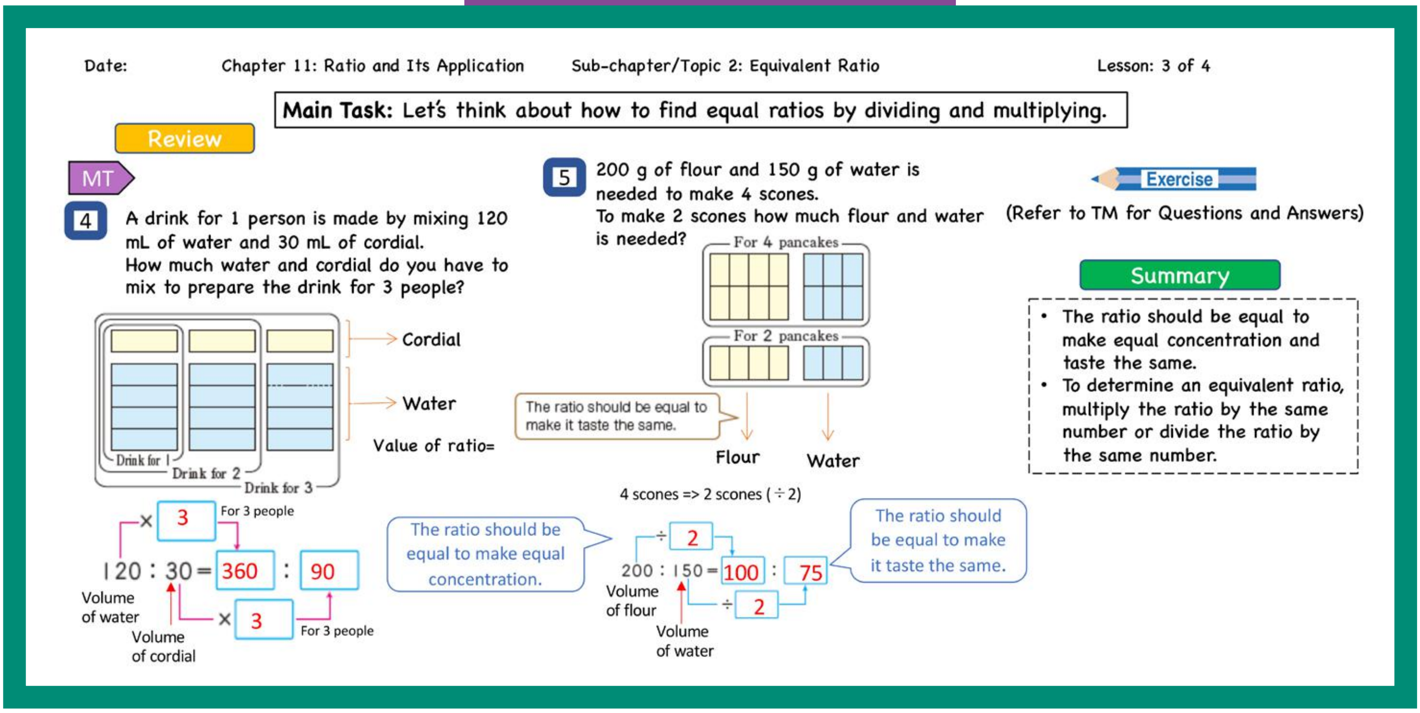
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Ratio and Its Application Sub-chapter/Topic 2: Equivalent Ratio Lesson: 3 of 4

Main Task: Let's think about how to find equal ratios by dividing and multiplying.

Review

MT

4 A drink for 1 person is made by mixing 120 mL of water and 30 mL of cordial.
How much water and cordial do you have to mix to prepare the drink for 3 people?

Value of ratio=

$120 : 30 = \boxed{360} : \boxed{90}$ (×3 for 3 people)

The ratio should be equal to make equal concentration.

5 200 g of flour and 150 g of water is needed to make 4 scones.
To make 2 scones how much flour and water is needed?

The ratio should be equal to make it taste the same.

4 scones => 2 scones (÷2)

$200 : 150 = \boxed{100} : \boxed{75}$ (÷2)

The ratio should be equal to make it taste the same.

Exercise

(Refer to TM for Questions and Answers)

Summary

- The ratio should be equal to make equal concentration and taste the same.
- To determine an equivalent ratio, multiply the ratio by the same number or divide the ratio by the same number.

Unit 11

Unit: Ratio and Its Application

Sub-unit: 2. Equivalent Ratio

Lesson 4 of 4

Textbook Page : 098
Actual Lesson 077

Lesson Objective

- To simplify ratio using the properties of ratio.

Prior Knowledge

- Equal ratio

Preparation

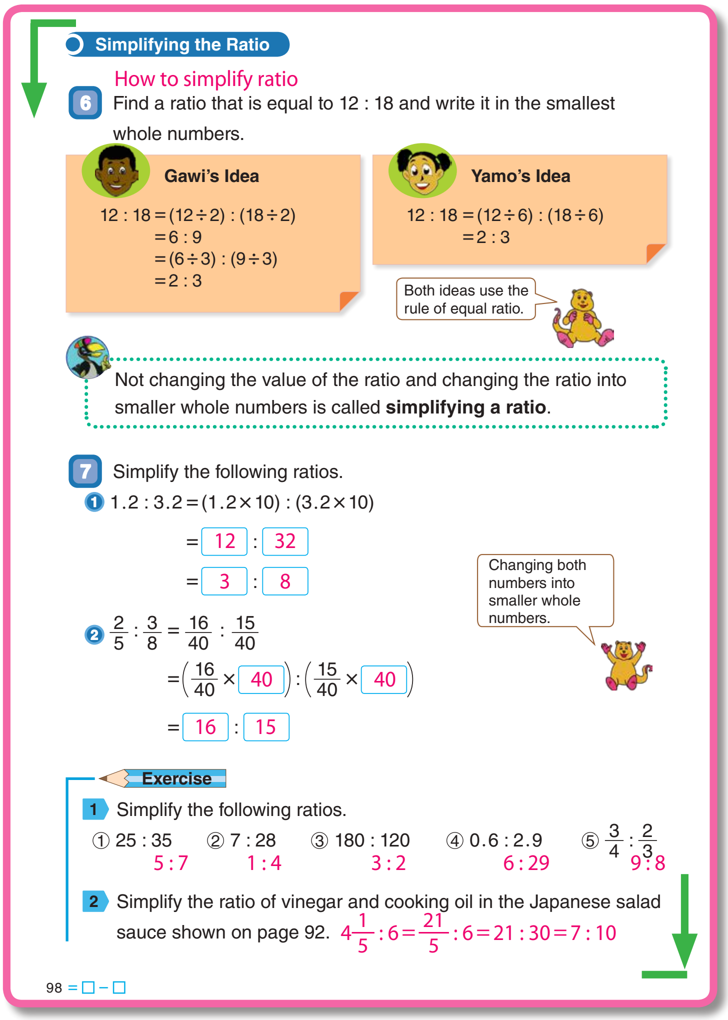
- Gawi's and Yamo's Ideas

Assessment

- Identify the method of simplifying ratio. **F**
- Use the method of simplifying ratio. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

When simplifying ratios, do not change the value of ratio but reduce it its simpest form similar to the idea of simplifying fractions.



Simplifying the Ratio

How to simplify ratio

6 Find a ratio that is equal to 12 : 18 and write it in the smallest whole numbers.

Gawi's Idea

$12 : 18 = (12 \div 2) : (18 \div 2)$
$= 6 : 9$
$= (6 \div 3) : (9 \div 3)$
$= 2 : 3$

Yamo's Idea

$12 : 18 = (12 \div 6) : (18 \div 6)$
$= 2 : 3$

Both ideas use the rule of equal ratio.

Not changing the value of the ratio and changing the ratio into smaller whole numbers is called **simplifying a ratio**.

7 Simplify the following ratios.

① $1.2 : 3.2 = (1.2 \times 10) : (3.2 \times 10)$
$= \boxed{12} : \boxed{32}$
$= \boxed{3} : \boxed{8}$

② $\frac{2}{5} : \frac{3}{8} = \frac{16}{40} : \frac{15}{40}$
$= \left(\frac{16}{40} \times \boxed{40}\right) : \left(\frac{15}{40} \times \boxed{40}\right)$
$= \boxed{16} : \boxed{15}$

Changing both numbers into smaller whole numbers.

Exercise

1 Simplify the following ratios.

① 25 : 35 — 5 : 7
② 7 : 28 — 1 : 4
③ 180 : 120 — 3 : 2
④ 0.6 : 2.9 — 6 : 29
⑤ $\frac{3}{4} : \frac{2}{3}$ — 9 : 8

2 Simplify the ratio of vinegar and cooking oil in the Japanese salad sauce shown on page 92. $4\frac{1}{5} : 6 = \frac{21}{5} : 6 = 21 : 30 = 7 : 10$

98 = □ − □

Lesson Flow

1 Review the previous lesson.

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

2 How to simplify ratios.

T/S 6 Read and understand the given situation.

T Ask the students to find a ratio that is equal to 12 : 18 in its simplest form.

S Use their prior knowledge to simplify and share their ideas.

T Direct students to the ideas in the textbook.

S Compare and discuss Gawi's and Yamo's ideas.

T Confirm that both Gawis's and Yamo's ideas use the rule of equal ratio.

T What does it mean by simplifying a ratio?

S Share their answers.

TN Confirm answers using the important point.

3 Important Point

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

4 7 Simplify ratios into smaller numbers.

S ① In the case of decimal number, change them to whole numbers first and simplify.

TN For decimals, we change them into whole numbers then we simplify using the rule of equal ratio.

T ② In the case of fractions, simplify them to whole numbers.

TN For fractions, we change the numerator into smaller whole numbers then we simplify using equal ratio.

5 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

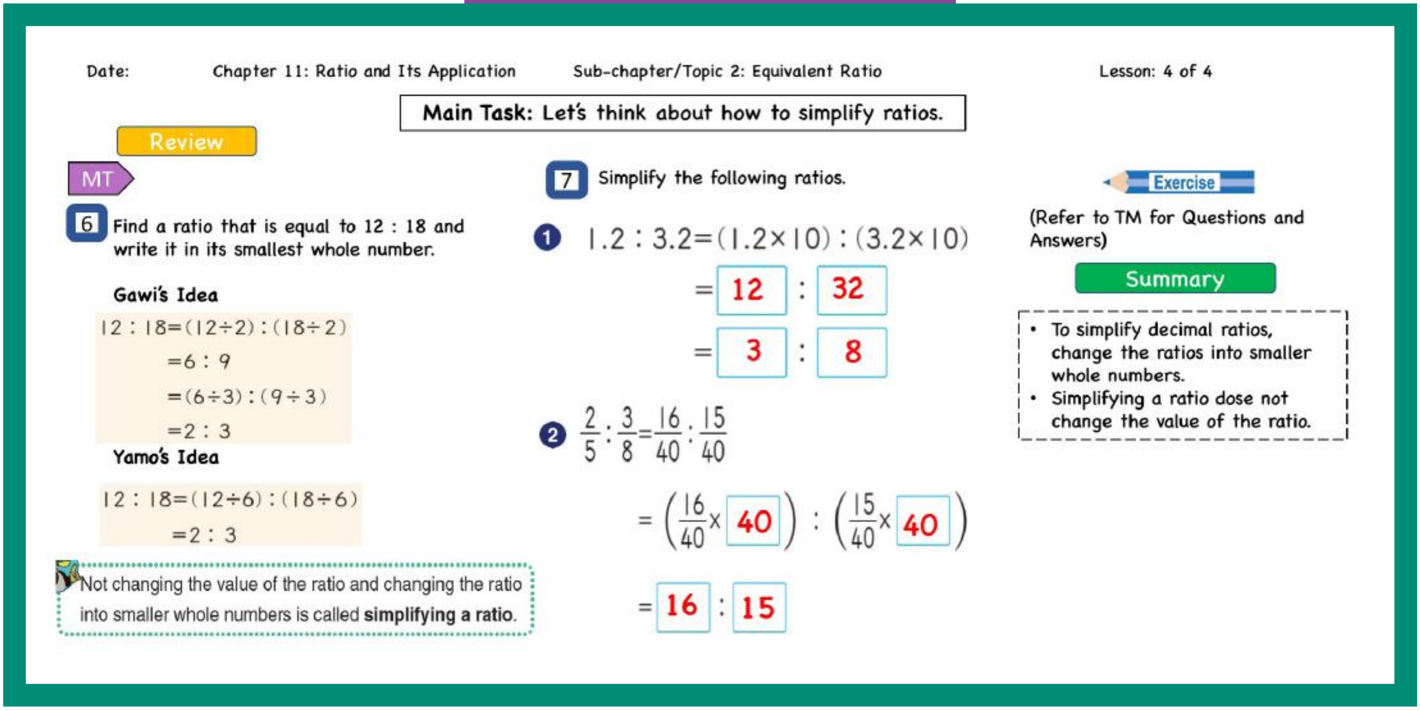
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Ratio and Its Application Sub-chapter/Topic 2: Equivalent Ratio Lesson: 4 of 4

Main Task: Let's think about how to simplify ratios.

Review

MT

6 Find a ratio that is equal to 12 : 18 and write it in its smallest whole number.

Gawi's Idea

$12 : 18 = (12 \div 2) : (18 \div 2)$

$= 6 : 9$

$= (6 \div 3) : (9 \div 3)$

$= 2 : 3$

Yamo's Idea

$12 : 18 = (12 \div 6) : (18 \div 6)$

$= 2 : 3$

Not changing the value of the ratio and changing the ratio into smaller whole numbers is called **simplifying a ratio**.

7 Simplify the following ratios.

① $1.2 : 3.2 = (1.2 \times 10) : (3.2 \times 10)$

$= \boxed{12} : \boxed{32}$

$= \boxed{3} : \boxed{8}$

② $\frac{2}{5} : \frac{3}{8} = \frac{16}{40} : \frac{15}{40}$

$= \left(\frac{16}{40} \times \boxed{40}\right) : \left(\frac{15}{40} \times \boxed{40}\right)$

$= \boxed{16} : \boxed{15}$

Exercise

(Refer to TM for Questions and Answers)

Summary

- To simplify decimal ratios, change the ratios into smaller whole numbers.
- Simplifying a ratio dose not change the value of the ratio.

Unit 11

Unit: Ratio and Its Application

Sub-unit: 3. Application of Ratio

Lesson 1 of 2

Textbook Page : 099
Actual Lesson 078

Sub-unit Objective

- To apply ratio in daily life situations.

Lesson Objective

- Solving problems by applying ratio properties.

Prior Knowledge

- Ratio and Simplifying ratio

Preparation

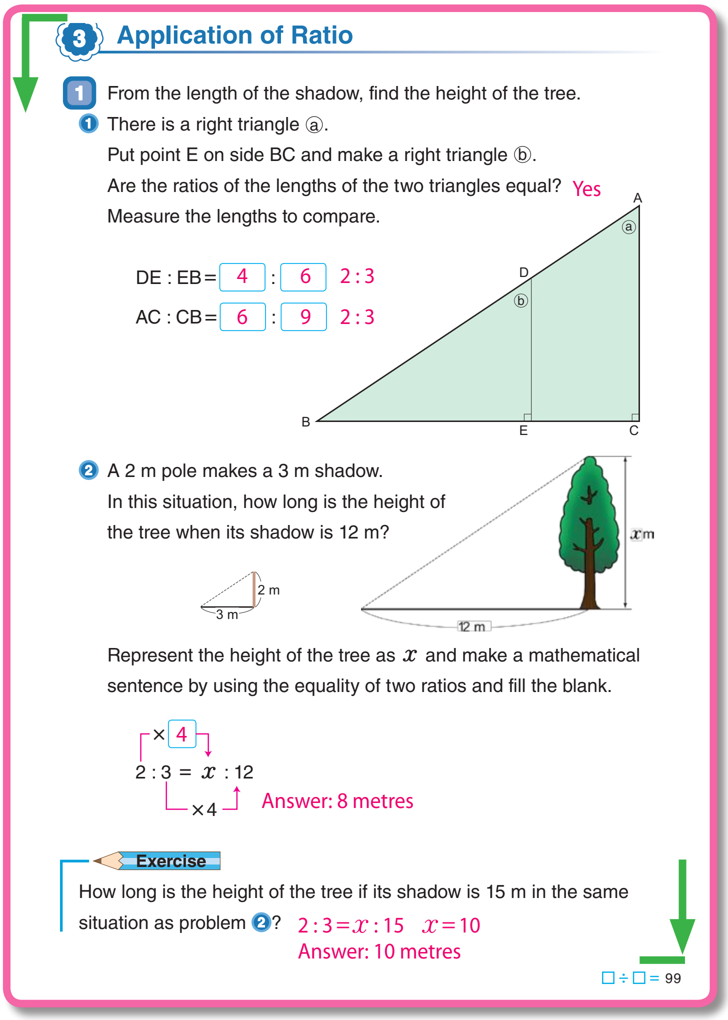
- Diagram of the Triangles
- Right triangle ruler

Assessment

- Apply ratio in daily life to solve ratio problems. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

Students will use rulers to measure the exact lengths of the triangles in the textbook to fill in the boxes in ① and compare the ratios.
For activity ②, we find the value of x by multiplying by the same number to make the equality of the ratio 2 : 3.
Therefore x is $2 \times 4 = 8$.
Ratio is used in various situations in daily life. It is also important for the students to find the use of ratio in daily life and to solve problems in various daily life problems using ratio.



③ Application of Ratio

1 From the length of the shadow, find the height of the tree.

① There is a right triangle ⓐ.
Put point E on side BC and make a right triangle ⓑ.
Are the ratios of the lengths of the two triangles equal? Yes
Measure the lengths to compare.

DE : EB = $\boxed{4}$: $\boxed{6}$ 2 : 3
AC : CB = $\boxed{6}$: $\boxed{9}$ 2 : 3

② A 2 m pole makes a 3 m shadow.
In this situation, how long is the height of the tree when its shadow is 12 m?

Represent the height of the tree as x and make a mathematical sentence by using the equality of two ratios and fill the blank.

$$\overset{\times \boxed{4}}{2 : 3 = x : 12}$$
$$\times 4$$

Answer: 8 metres

Exercise

How long is the height of the tree if its shadow is 15 m in the same situation as problem ②? $2 : 3 = x : 15$ $x = 10$
Answer: 10 metres

□ ÷ □ = 99

Lesson Flow

1 Review the previous lesson.

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

2 Application of equivalent ratio.

S 1 ① Read and understand the given situation.

S Using the right triangle ⓐ ABC, put point E on side BC and make a right triangle ⓑ.

T Are the ratio of the lengths of the two triangles equal?

S Measure the lengths as a ratio (1) DE : EB and (2) AC : CB and compare.

TN Students' will realise that the lengths are not equal but the ratio is the same.

3 Application of ratio to find the value of x.

T ② Let the students read and understand the situation.

S Work out the height of the tree in this case considering its shadow as 12 m.

S Represent the height of the tree as x and make a mathematical sentence by using the equality of two ratios and fill in the box.

4 Complete the Exercise.

S Solve the exercise.

T Confirm students' answers.

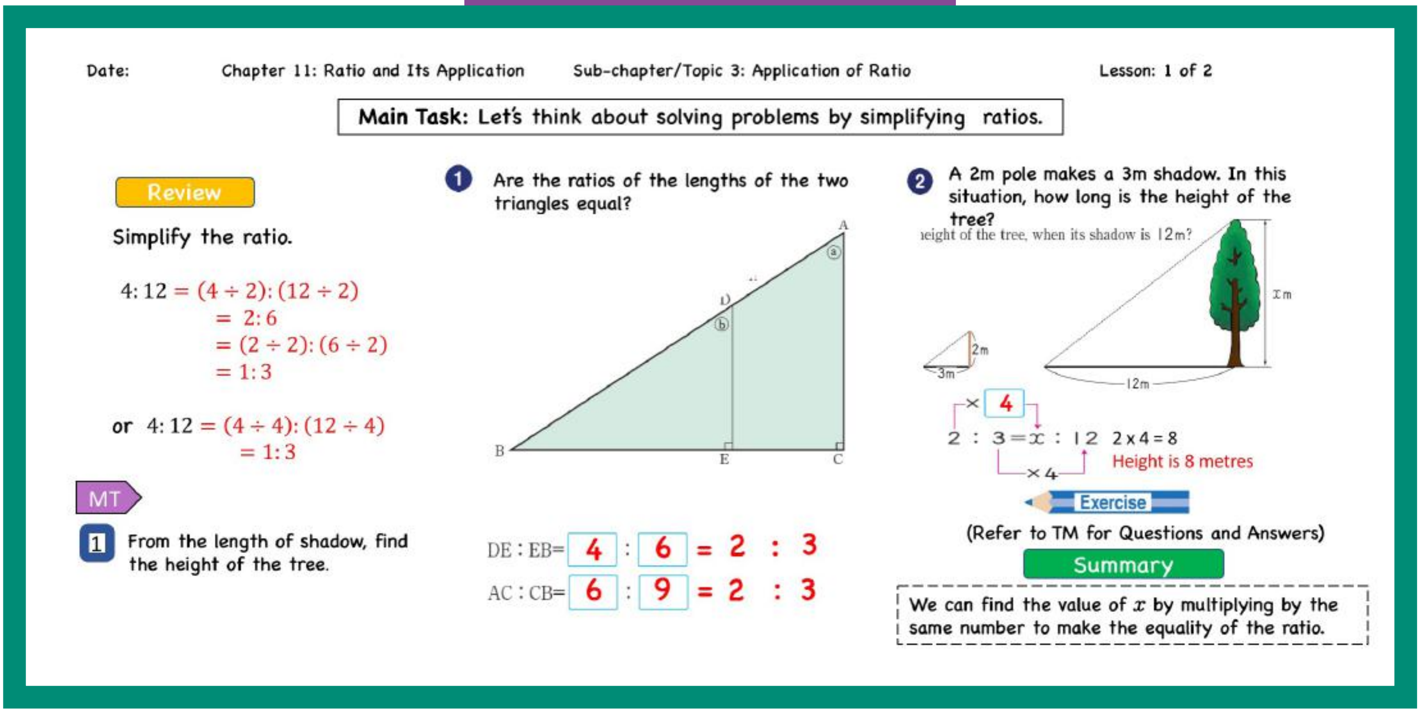
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Ratio and Its Application Sub-chapter/Topic 3: Application of Ratio Lesson: 1 of 2

Main Task: Let's think about solving problems by simplifying ratios.

Review

Simplify the ratio.

$4:12 = (4 \div 2):(12 \div 2)$
$= 2:6$
$= (2 \div 2):(6 \div 2)$
$= 1:3$

or $4:12 = (4 \div 4):(12 \div 4)$
$= 1:3$

MT

1 From the length of shadow, find the height of the tree.

① Are the ratios of the lengths of the two triangles equal?

DE : EB= $\boxed{4}$: $\boxed{6}$ = 2 : 3

AC : CB= $\boxed{6}$: $\boxed{9}$ = 2 : 3

② A 2m pole makes a 3m shadow. In this situation, how long is the height of the tree?

$\overset{\times \boxed{4}}{2 : 3 = x : 12}$ $2 \times 4 = 8$

$\times 4$

Height is 8 metres

Exercise

(Refer to TM for Questions and Answers)

Summary

We can find the value of x by multiplying by the same number to make the equality of the ratio.

Unit 11

Unit: Ratio and Its Application

Sub-unit: 3. Application of ratio

Lesson 2 of 2

Textbook Page : 100
Actual Lesson 079

Lesson Objective

- To understand how to calculate dividing by ratio.

Prior Knowledge

- Ratio, value of ratio and simplification of ratio

Preparation

- Tape diagram

Assessment

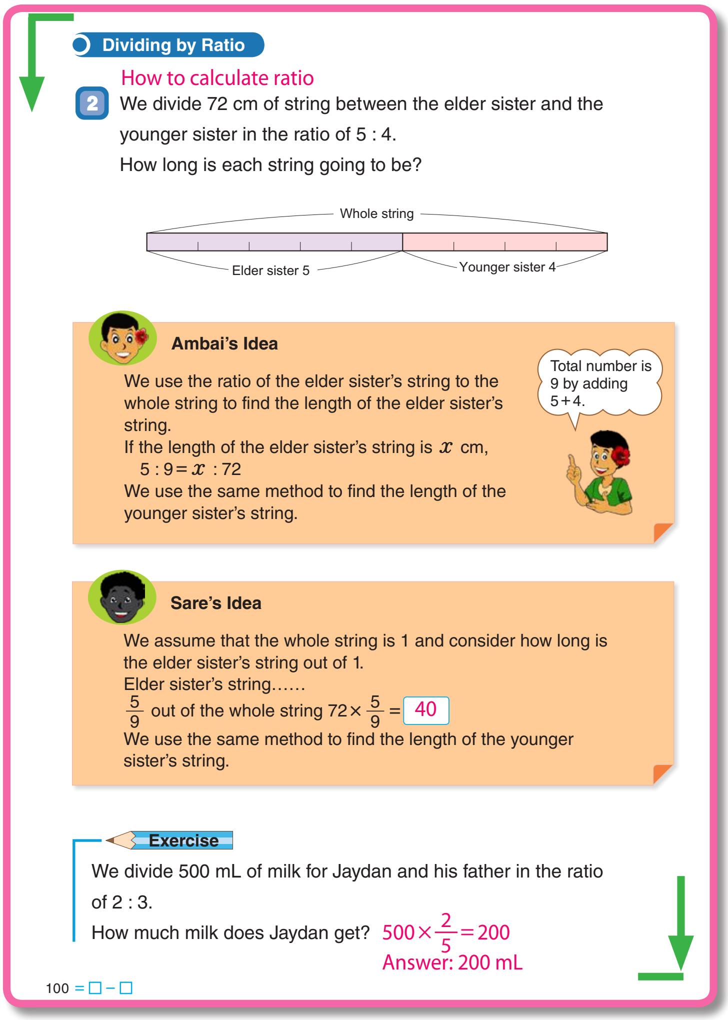
- Calculate the quantity of a ratio by dividing. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

In this lesson, students are expected to divide quantities into a given ratio.
Ambai's idea:
Making a ratio of older sister to the whole string (simplifying ratio by division).

$5 : 9 = x : 72$

Sare's Idea:
Considering the whole length as 1, calculate each part using fraction(representing ratio by fractions).



Dividing by Ratio

How to calculate ratio

2 We divide 72 cm of string between the elder sister and the younger sister in the ratio of 5 : 4.
How long is each string going to be?

Ambai's Idea

We use the ratio of the elder sister's string to the whole string to find the length of the elder sister's string.
If the length of the elder sister's string is x cm,
$5 : 9 = x : 72$
We use the same method to find the length of the younger sister's string.

Total number is 9 by adding 5+4.

Sare's Idea

We assume that the whole string is 1 and consider how long is the elder sister's string out of 1.
Elder sister's string……
$\frac{5}{9}$ out of the whole string $72 \times \frac{5}{9} = \boxed{40}$
We use the same method to find the length of the younger sister's string.

Exercise

We divide 500 mL of milk for Jaydan and his father in the ratio of 2 : 3.
How much milk does Jaydan get? $500 \times \frac{2}{5} = 200$
Answer: 200 mL

Lesson Flow

1 Review the previous lesson.

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

2 How to divide using ratio.

T/S ② Read and understand the situation and discuss the length of string divided in the ratio between the two sisters.

T Ask students to think about how long each string will be.

S Give ideas on how to solve the problem

T/S Discuss Ambai 's and Sare's ideas.

TN Refer to the Teacher's Notes for the calculation.

T/S Make comparisons with Ambai's and Sare's ideas with own ideas.

3 Complete the Exercise.

S Solve the exercise.

T Confirm students' answers.

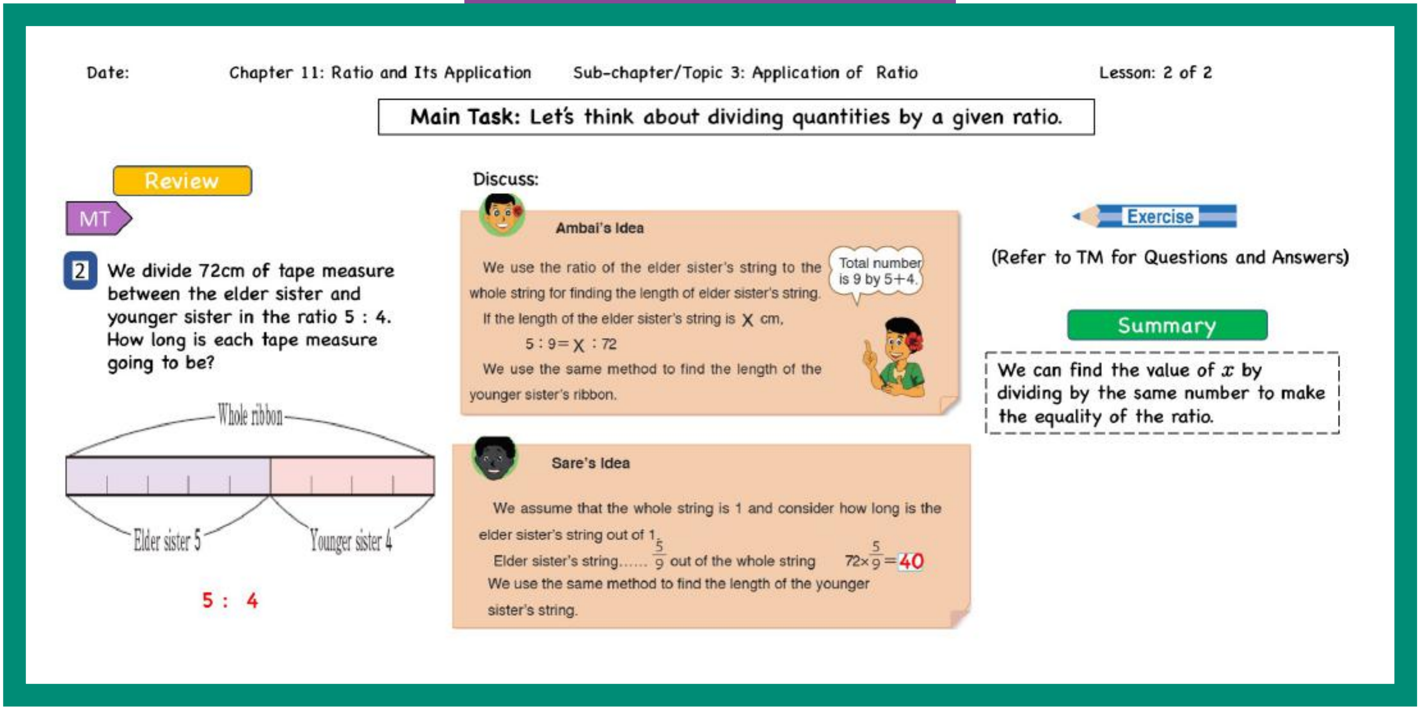
4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Ratio and Its Application Sub-chapter/Topic 3: Application of Ratio Lesson: 2 of 2

Main Task: Let's think about dividing quantities by a given ratio.

Review

MT

2 We divide 72cm of tape measure between the elder sister and younger sister in the ratio 5 : 4. How long is each tape measure going to be?

Whole ribbon
Elder sister 5
Younger sister 4
5 : 4

Discuss:

Ambai's Idea

We use the ratio of the elder sister's string to the whole string for finding the length of elder sister's string.

Total number is 9 by 5+4.

If the length of the elder sister's string is x cm,

$5 : 9 = x : 72$

We use the same method to find the length of the younger sister's ribbon.

Sare's Idea

We assume that the whole string is 1 and consider how long is the elder sister's string out of 1.

Elder sister's string…… $\frac{5}{9}$ out of the whole string $72\times\frac{5}{9}=\boxed{40}$

We use the same method to find the length of the younger sister's string.

Exercise

(Refer to TM for Questions and Answers)

Summary

We can find the value of x by dividing by the same number to make the equality of the ratio.

Unit
11

Unit: Ratio and its Application
Exercise, Problems, Evaluation and Mathematics Extra
Lesson 1 and 2 of 2

Textbook Page :
099 to 100
Actual Lesson 080 and 81

Lesson Objective

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

Prior Knowledge

- All the contents learned in this unit of Ratio.

Preparation

- Evaluation Test.

Assessment

- Solve the exercises correctly to confirm what they learned in the unit. F S

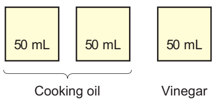
Teacher's Notes

This is the last lesson of Chapter 11.
Students should be encouraged to use the necessary skills learnt 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 finishing all the exercises.
Use the attached evaluation test to conduct assessment for your class after finishing all the exercises, problems and review as a seperate lesson.

EXERCISE

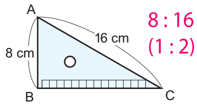
1 Let's represent the ratios for the following: Page 94

① The quantity of cooking oil and vinegar.



100 : 50
(2 : 1)

② The length of side AB and AC in a set-square.



8 : 16
(1 : 2)

2 Find the number for x. Pages 96 and 97

① $3 : 5 = x : 10$ $x = 6$
② $7 : 4 = 35 : x$ $x = 20$
③ $80 : x = 5 : 8$ $x = 128$
④ $x : 125 = 3 : 5$ $x = 75$

3 Simplify the following ratios. Page 98

① 36 : 48 3 : 4
② 800 : 1400 4 : 7
③ 1.2 : 0.8 3 : 2

4 You draw a rectangle, where the ratio of length to width is 2 : 3. If the width is 18 cm, how long is the length? Page 99

$2 : 3 = x : 18$ $x = 12$ Answer: 12 cm

Grade 5
Do you remember?

Let's calculate.

① 3.6×1.2 4.32
② $1.5 \div 2.5$ 0.6
③ 6.4×0.8 5.12
④ $4.32 \div 3.6$ 1.2
⑤ 9.43×4.1 38.663
⑥ $4.08 \div 5.1$ 0.8
⑦ $\frac{1}{6} + \frac{1}{2}$ $\frac{2}{3}$
⑧ $\frac{8}{15} - \frac{1}{3}$ $\frac{1}{5}$
⑨ $\frac{7}{12} + \frac{7}{8}$ $1\frac{11}{24}$
⑩ $1\frac{1}{2} - \frac{2}{3}$ $\frac{5}{6}$
⑪ $2\frac{1}{6} + \frac{5}{12}$ $2\frac{7}{12}$
⑫ $2\frac{3}{4} - 1\frac{3}{8}$ $1\frac{3}{8}$

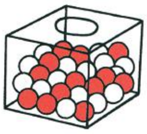
PROBLEMS

1 You need, 400 g of steamed rice and 40 g of curry to make curry rice for 4 people.

● Utilising equal ratio.

① How many g of steamed rice and curry do you need, to make curry rice for 2 people? 200 g rice 20 g curry
② How many g of steamed rice and curry do you need, to make curry rice for 8 people? 800 g rice 80 g curry
③ There is 600 g of steamed rice. If you try to make curry rice in the same ratio as the one you made for 4 people, how many g of curry do you need? 60 g

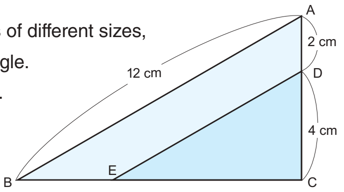
2 Ben is drawing a box which has red balls and white balls in the ratio of 3 : 4. There are 28 white balls. How many red balls should he draw?



● Representing ratio of two quantities.

21 red balls

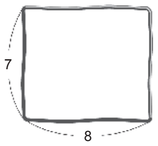
3 There are two set-squares of different sizes, overlapping at the right angle. Find the length of side DE.



● You can use equal ratio in the diagram.

$12 : 6 = x : 4$
Answer: 8 cm

4 Nason tried to make a rectangle with its length and width in the ratio of 7 : 8 using a 60 cm string. How long should the width and length of this rectangle be?



● You can use dividing by ratio.

$60 \div 2 = 30$
$30 \times \frac{7}{15} = 14$ $30 \times \frac{8}{15} = 16$
Answer: Length: 14 cm Width:16 cm

Lesson Flow

1 Complete Exercise from ① to ④.

TN ① Represent the ration for each case in ① and ②.

② Calculate the equivalent ratios for ① to ④ by finding the value of x.

③ Complete the exercise by smplifying the ratios.

④ Complete the exercise by solving the problem.

2 Complete the Do You Remember exercise.

TN Calculate the problems.

3 Complete Problems ① to ④.

TN All problems to be done for homework.

TN ① Read the problem and solve questions ① to ③.

② Use the given ratio to find the number of red balls to be drawn.

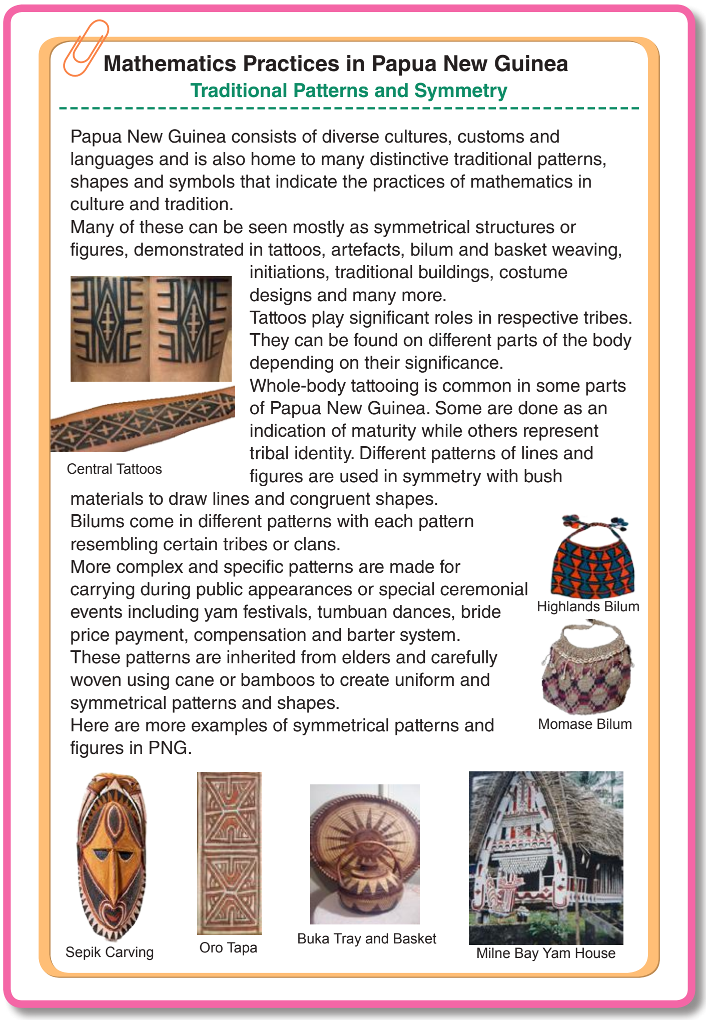
③ Study the diagram and solve the problem.

④ Solve the problem by identifying length and width using a given ratio.

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.



Mathematics Practices in Papua New Guinea

Traditional Patterns and Symmetry

Papua New Guinea consists of diverse cultures, customs and languages and is also home to many distinctive traditional patterns, shapes and symbols that indicate the practices of mathematics in culture and tradition.

Many of these can be seen mostly as symmetrical structures or figures, demonstrated in tattoos, artefacts, bilum and basket weaving, initiations, traditional buildings, costume designs and many more.

Tattoos play significant roles in respective tribes. They can be found on different parts of the body depending on their significance.

Whole-body tattooing is common in some parts of Papua New Guinea. Some are done as an indication of maturity while others represent tribal identity. Different patterns of lines and figures are used in symmetry with bush materials to draw lines and congruent shapes.

Central Tattoos

Bilums come in different patterns with each pattern resembling certain tribes or clans.

More complex and specific patterns are made for carrying during public appearances or special ceremonial events including yam festivals, tumbuan dances, bride price payment, compensation and barter system.

Highlands Bilum

These patterns are inherited from elders and carefully woven using cane or bamboos to create uniform and symmetrical patterns and shapes.

Momase Bilum

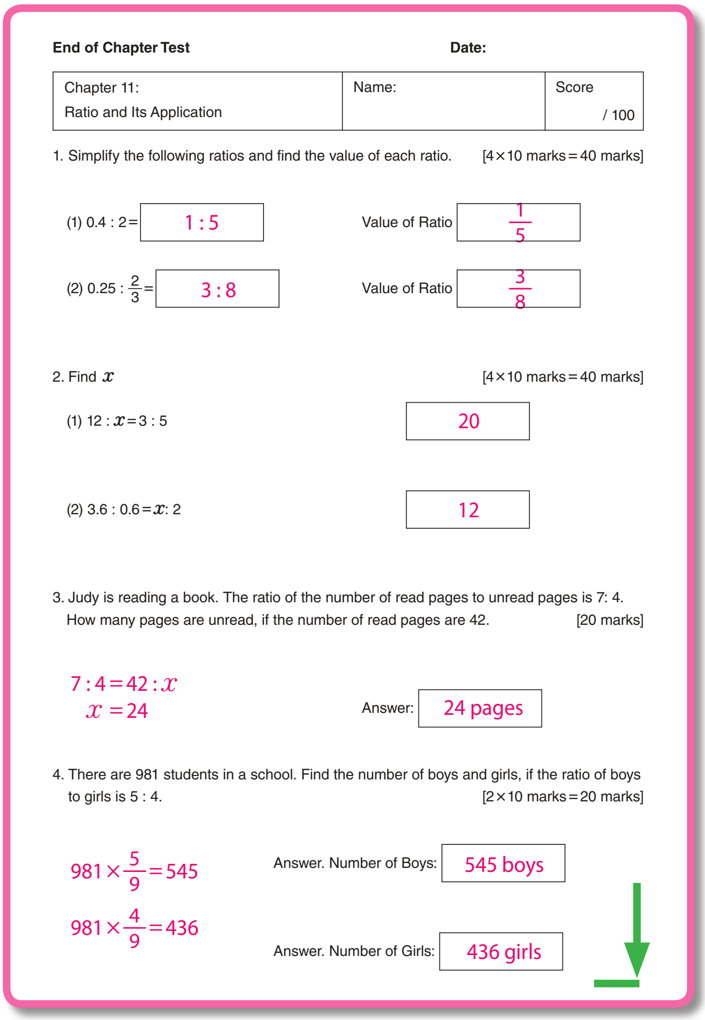
Here are more examples of symmetrical patterns and figures in PNG.

Sepik Carving

Oro Tapa

Buka Tray and Basket

Milne Bay Yam House



End of Chapter Test **Date:**

Chapter 11: Ratio and Its Application	Name:	Score / 100

1. Simplify the following ratios and find the value of each ratio. [4×10 marks＝40 marks]

(1) $0.4 : 2 =$ 1 : 5 Value of Ratio $\frac{1}{5}$

(2) $0.25 : \frac{2}{3} =$ 3 : 8 Value of Ratio $\frac{3}{8}$

2. Find x [4×10 marks＝40 marks]

(1) $12 : x = 3 : 5$ 20

(2) $3.6 : 0.6 = x : 2$ 12

3. Judy is reading a book. The ratio of the number of read pages to unread pages is 7: 4. How many pages are unread, if the number of read pages are 42. [20 marks]

$7 : 4 = 42 : x$

$x = 24$

Answer: 24 pages

4. There are 981 students in a school. Find the number of boys and girls, if the ratio of boys to girls is 5 : 4. [2×10 marks＝20 marks]

$981 \times \frac{5}{9} = 545$ Answer. Number of Boys: 545 boys

$981 \times \frac{4}{9} = 436$ Answer. Number of Girls: 436 girls

End of Chapter Test **Date:**

Chapter 11: Ratio and Its Application	Name:	Score / 100

1. Simplify the following ratios and find the value of each ratio. [4×10 marks = 40 marks]

(1) $0.4 : 2 =$ Value of Ratio

(2) $0.25 : \frac{2}{3} =$ Value of Ratio

2. Find x [4×10 marks = 40 marks]

(1) $12 : x = 3 : 5$

(2) $3.6 : 0.6 = x : 2$

3. Judy is reading a book. The ratio of the number of read pages to unread pages is 7: 4. How many pages are unread, if the number of read pages are 42. [20 marks]

Answer:

4. There are 981 students in a school. Find the number of boys and girls, if the ratio of boys to girls is 5 : 4. [2×10 marks = 20 marks]

Answer. Number of Boys:

Answer. Number of Girls:

Chapter 12 Enlargement and Reduction of Figures

1. Content Standard

6.3.2. Students will be able to expand the plane figures by enlargement and reduction and explore the properties for expansion.

2. Unit Objectives

- To deepen the understanding about plane figures through observation and drawing practice.
- To understand the enlarging and reducing properties of geometrical figure.

3. Teaching Overview

Students have some ideas of enlarged and reduced drawings in a sense. For instance, they learned that small square and large square are still squares in Grade 2.
In Grade 5, they learned congruency of figures and its definition by focusing on the sizes of corresponding angles and lengths of corresponding sides. In this topic, students broaden the perspective on observing figures with basic concepts of similarity.

Enlarging and Reducing Figures:

Students compare 2 figures looking alike and investigate by measuring sizes of angles, length of corresponding sides to find enlarged and reduced figures. Then they discuss the features of enlargement and reductions in figures.
Finally, they define enlarged and reduced figures. Further theories will be taken care of in Grade 9, however, they should know that figures with different angles are not enlarged or reduced figures.

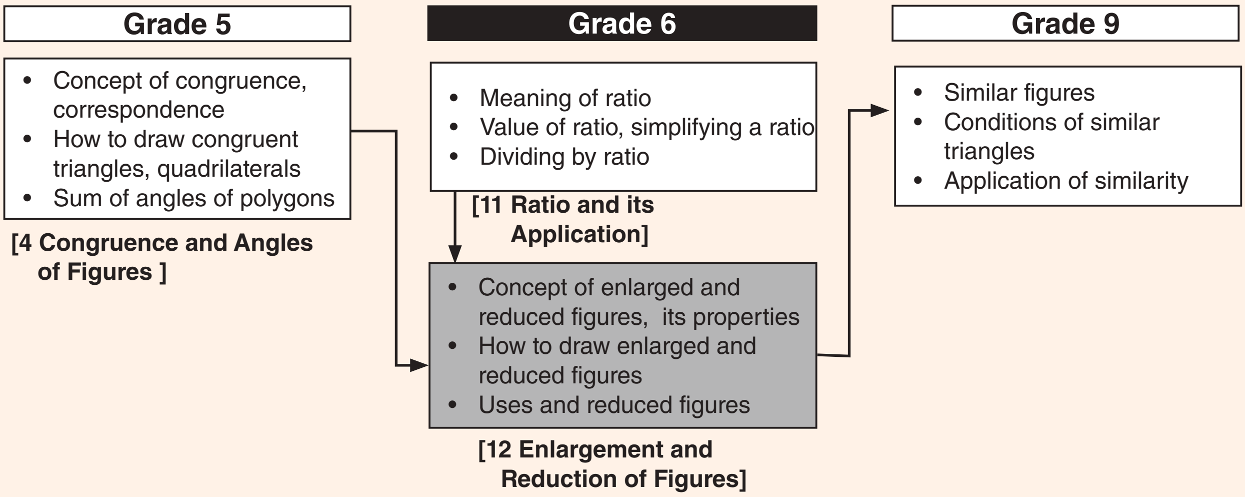
How to Draw Enlarged and Reduced Drawings:

They learn 2 methods ; using graph papers and drawing lines from an origin.

Uses of Reduced Drawings:

They utilise the concept of reduced drawings for interpreting maps.
They will get used to finding the actual distance of a segment on a map and also finding a length on a map when they know the actual distance.

4. Related Learning Contents



Grade 5

- Concept of congruence, correspondence
- How to draw congruent triangles, quadrilaterals
- Sum of angles of polygons

[4 Congruence and Angles of Figures]

Grade 6

- Meaning of ratio
- Value of ratio, simplifying a ratio
- Dividing by ratio

[11 Ratio and its Application]

- Concept of enlarged and reduced figures, its properties
- How to draw enlarged and reduced figures
- Uses and reduced figures

[12 Enlargement and Reduction of Figures]

Grade 9

- Similar figures
- Conditions of similar triangles
- Application of similarity

Unit 12

Unit: Enlargement and Reduction of Figures

Sub-unit: 1. Enlarging and Reducing Figures

Lesson 1 of 3

Textbook Page : 104 and 105
Actual Lesson 082

Sub-unit Objectives

- To understand the meaning and properties of enlarging and reducing geometrical figures.
- To understand the properties of angles and sides of enlarging and reducing figures.

Lesson Objective

- To find the meaning of similar shape by focusing on the length of the corresponding sides and the size of corresponding angles among the given figures.

Prior Knowledge

- Understand how to measure and draw lengths and angles of plane figures.

Preparation

- Diagram of the four figures in the textbook
- 30 centimetre ruler, protractor, tracing papers and a result table

Assessment

- Identify figures of similar shapes. F
- Understand and explain the meaning of similar shapes. S

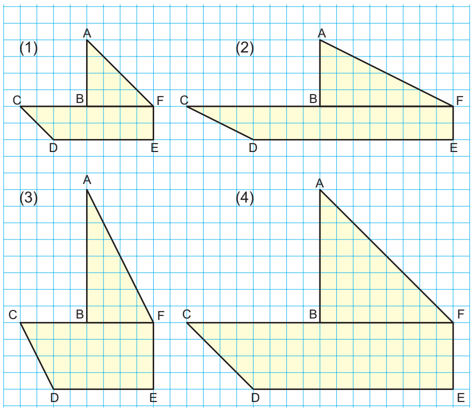
Teacher's Notes

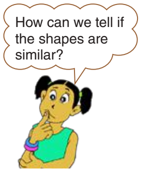
It is important for students to understand the meaning of **"similar shapes"** by measuring and comparing the length of corresponding sides and size of corresponding angles of figures correctly using a ruler and protractor.

Students are expected to discover the common ratio or relationship that exist between the lengths of all the corresponding sides of the similar shape figures.
They will also find out that the size of corresponding angles of the similar shapes are always congruent or equal.

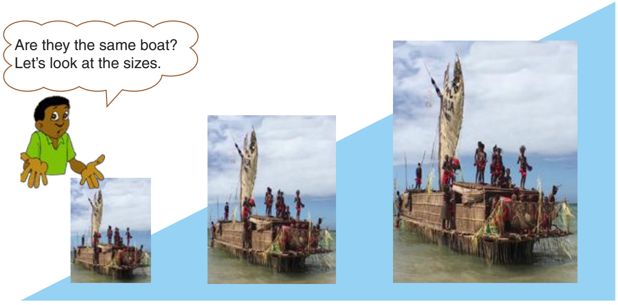
12 Enlargement and Reduction of Figures

From the shapes drawn, which one has the same shape as (1) in figure (2), (3) and (4) below?





① Enlarging and Reducing Figures



1 Let's compare shapes (1) to (4) on page104.

① Measure the lengths and angles of the 4 shapes and organise them on the table below.

	Length of side (cm)			Angle (Degree)			
	Side AB	Side CD	Side AF	Angle A	Angle C	Angle D	Angle E
(1)	2	1.4	2.8	45	45	135	90
(2)	2	2.3	4.5	63	27	153	90
(3)	4	2.3	4.5	27	63	117	90
(4)	4	2.8	5.6	45	45	135	90

② Compare the lengths of the 3 sides. Which shape has the length 2 times the length as in (1)? Shape (4)

③ Compare the size of the 4 angles. Which shape has the same size angles as in (1)? Shape (4)

Let's investigate the properties of figures with the same shape but different sizes and how to draw them.

Lesson Flow

1 Compare shapes by observation.

T ▶▶ Which of these figures (2), (3) or (4) are exactly the same as figure (1)?

S Compare the figures and explain how they are the same or different by considering the hint from the speech bubble.

S (2) looks longer horizontally compared to (1).
(3) looks longer vertically compared to (1).
(4) looks like an enlarged figure of (1).

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

2 1 Compare shapes (1) to (4) and record the results on the table.

T Give out the blank copies of the table or ask the students to draw it.

S ① Measure the length and angles of the 4 shapes and record the results on the table.

3 Understand the relationship about the lengths of corresponding sides and the size of corresponding angles of figure (1) to (4).

T Ask the students to do activity ② and ③.

S Compare the results on the table to identify any relationship among the figures to answer the questions.
Answers: ② Shape (4)
③ Shape (4)

TN Students should explain their answers and the reasons why they chose them.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

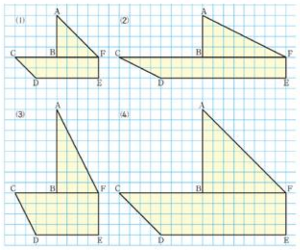
T Use students' ideas to confirm the important concepts of this lesson.

Sample Blackboard Plan

Date: Chapter 12: Enlargement and Reduction of Figures Sub-chapter/Topic 1: Enlarging and Reducing Figures Lesson: 1 of 3

Main Task: Let's think about and understand similar shapes.

▶▶ Which of the three figures (2,3 or 4) is the "**similar shape**" of figure 1



How to find out?
(i) measure the length of sides.
(ii) measure size of angles.

MT

1 Let's compare shapes 1 – 4.

① Measure the lengths and angles of the 4 shapes and organise them on the table below.

	Length of side (cm)			Angle (Degree)			
	Side AB	Side CD	Side AF	Angle A	Angle C	Angle D	Angle E
(1)	2	1.4	2.8	45	45	135	90
(2)	2	2.3	4.5	63	27	153	90
(3)	4	2.3	4.5	27	63	117	90
(4)	4	2.8	5.6	45	45	135	90

② Which shape has the length 2 times the length as in (1)? Explain.
Shape (4)

③ Which shape has the same size angles as in (1)? Explain.
Shape (4)

Exercise

(Refer to TM for Questions and Answers)

Summary

- The size of the corresponding angles of similar shapes are always equal.
- The length of corresponding sides increase or decrease in size according to the size of enlargement.

Unit
12

Unit: Enlargement and Reduction of Figures
Sub-unit: 1. Enlarging and Reducing Figures
Lesson 2 of 3

Textbook Page :
106 and 107
Actual Lesson 083

Lesson Objectives

- To investigate the characteristics of sides and angles of figures enlarged.
- To understand how to find the ratio and value of ratio between enlarged and reduced figures.

Prior Knowledge

- Understand how to measure and draw lengths and angles of plane figures.

Preparation

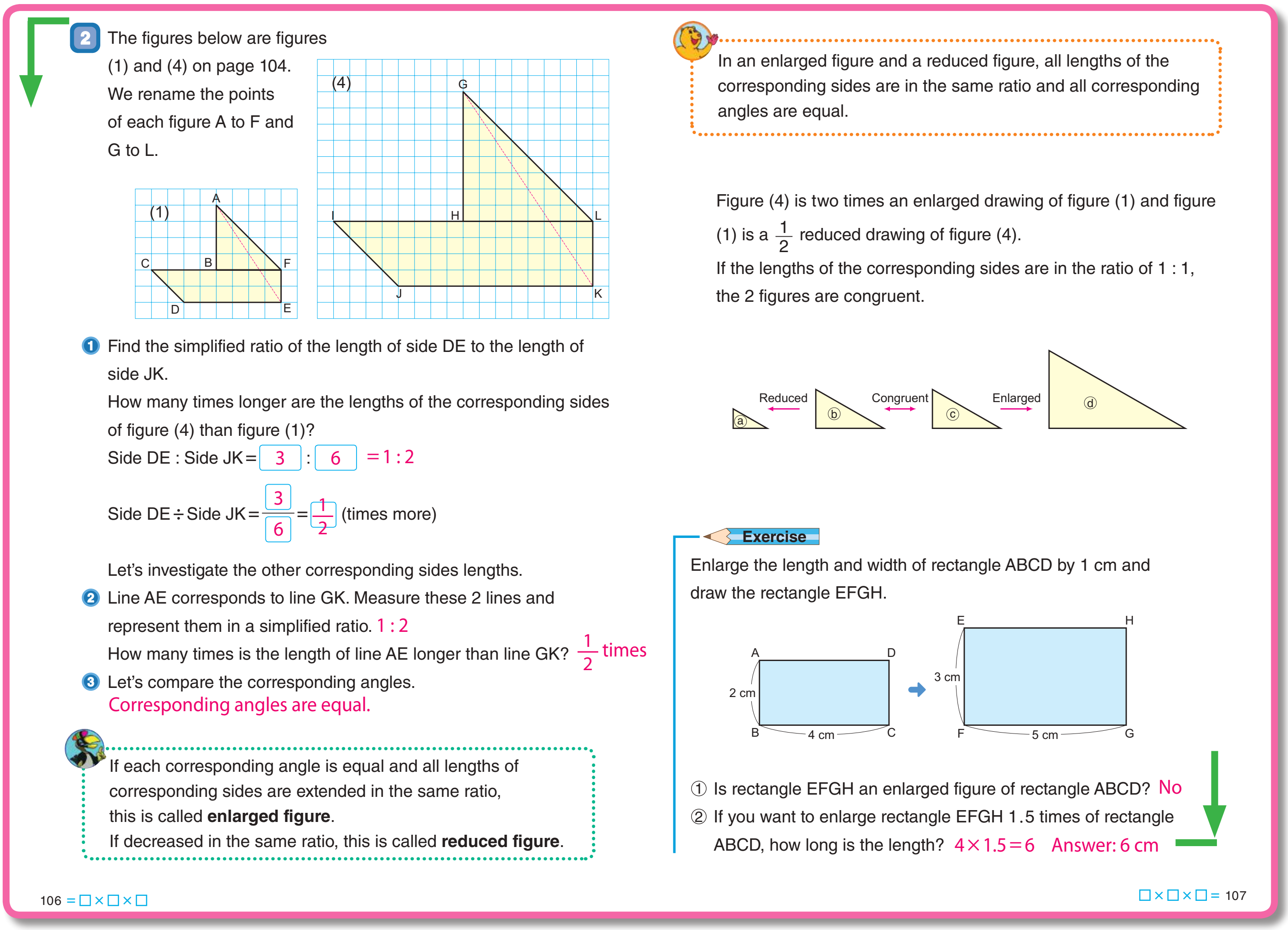
- Enlarged copy of figures in the textbook
- Ruler, protractor, compass and A4 papers

Assessment

- Understand and explain the corresponding sides and angles of enlarged and reduced figures. F
- Identify the ratio between enlarged and reduced figures. F S
- Solve the exercises correctly. S

Teacher's Notes

- It is important for students to represent and interpret lengths of corresponding sides in simplified ratio correctly.
  Students must understand that the lengths of all corresponding sides of enlarged and reduced figures share the same ratio and all their corresponding angles remain equal or congruent.
- Also, if students understand the relationship among congruent, reduced and enlarged figures, then they should be able to draw or differentiate the figures accordingly.
  It is important to note that a congruent or an enlarged figure is changed into a reduced figure by dividing the lengths of the corresponding sides by the same measure or proportion. Whereas, all lengths of corresponding sides of a congruent or reduced figure is multiplied by the same measure to make an enlarged figure.
  However, if all lengths of the corresponding sides are in the ratio 1 : 1, then the two figures are congruent.
- Corresponding angles of reduced, congruent and enlarged figures remain the same or equal.



2 The figures below are figures (1) and (4) on page 104. We rename the points of each figure A to F and G to L.

① Find the simplified ratio of the length of side DE to the length of side JK.

How many times longer are the lengths of the corresponding sides of figure (4) than figure (1)?

Side DE : Side JK = $\boxed{3}$: $\boxed{6}$ = 1 : 2

Side DE ÷ Side JK = $\frac{\boxed{3}}{\boxed{6}} = \boxed{\frac{1}{2}}$ (times more)

Let's investigate the other corresponding sides lengths.

② Line AE corresponds to line GK. Measure these 2 lines and represent them in a simplified ratio. 1 : 2

How many times is the length of line AE longer than line GK? $\frac{1}{2}$ times

③ Let's compare the corresponding angles.
Corresponding angles are equal.

If each corresponding angle is equal and all lengths of corresponding sides are extended in the same ratio, this is called **enlarged figure**.
If decreased in the same ratio, this is called **reduced figure**.

In an enlarged figure and a reduced figure, all lengths of the corresponding sides are in the same ratio and all corresponding angles are equal.

Figure (4) is two times an enlarged drawing of figure (1) and figure (1) is a $\frac{1}{2}$ reduced drawing of figure (4).

If the lengths of the corresponding sides are in the ratio of 1 : 1, the 2 figures are congruent.

Exercise

Enlarge the length and width of rectangle ABCD by 1 cm and draw the rectangle EFGH.

① Is rectangle EFGH an enlarged figure of rectangle ABCD? No

② If you want to enlarge rectangle EFGH 1.5 times of rectangle ABCD, how long is the length? 4 × 1.5 = 6 Answer: 6 cm

Lesson Flow

1 Review the previous lesson.

2 ② Investigate the ratio of the corresponding sides and length.

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

T/S Read and understand the given situation.

T What is the ratio of all the lengths of corresponding side in figure (1) and figure (4)?

S Do activity ① and ② and share their answers with the class.

3 Compare the size of corresponding angles.

T What do you notice about the size of corresponding angles of the figure (1) and (4)?

S ③ Measure and compare corresponding angles and then share their findings with the class.

4 Meaning and properties of enlarged and reduced figures.

T What do you notice about the lengths of the corresponding sides and corresponding angles of figure (1) and (4)?

S Figure out based on findings in activity ① to ③ that:
(i) ratio of sides and whether the ratio value has increased or decreased.
(ii) angles do not change.

5 Important Point

T/S Explain the important points in the boxes ⬚ and ⬚.

6 Relationship among congruent, enlarged and reduced figures.

TN Show a diagram of different sizes of reduced and enlarged figures.

T Ask students how they can be compared.

S Explain using the features of the:

- original and enlarged figures.
  Answer: The value of ratio increases but size of angles do not change.
- congruent and original figures.
  Answer: The value of ratio and size of angles do not change.
- original and reduced figures.
  Answer: The value of ratio decreases (reduced) but size of angles do not change.

7 Complete the Exercise.

S Solve the 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.

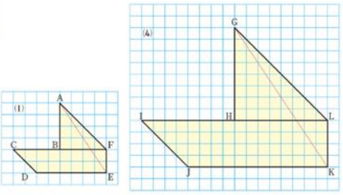
Sample Blackboard Plan

Date: Chapter 12: Enlargement and Reduction of Figures Sub-chapter/Topic 1 Enlarging and Reducing Figures Lesson: 2 of 3

Main Task: Let's investigate and understand the meaning of reduced and enlarged figures.

MT

2



① Find the simplified ratio of the length of side DE to the length of side JK. Also, how many times longer are the lengths of the corresponding sides of figure (4) than figure (1)?

Side DE : Side JK = 3 : 6 = 1 : 2

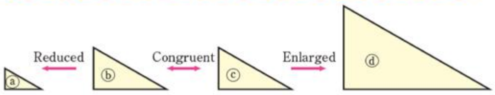
Side DE÷Side JK = $\frac{3}{6} = \frac{1}{2}$ (times more)

② How many times is the length of line AE longer than the length of line GK?
$\frac{1}{2}$ times

③ Compare the corresponding angles.(Discuss)
The corresponding angles are equal.

If each corresponding angle is equal, and all lengths of corresponding sides are extended in the same ratio, this is called **enlarged drawing**. If decreased in the same ratio, this is called **reduced drawing**.

In an enlarged figure and a reduced figure, all lengths of the corresponding sides are in the same ratio and all corresponding angles are equal.



(i) *figure (a) and original figure (b).*
- value of ratio decreased,
- angles remain the same.

(ii) *figure(b) and figure (c).*
- value of ratio remain as 1 so, no change occurs.
- angles remain the same.

iii) *figure (c) and figure(d).*
- value of ratio increased,
- angles remain the same.

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson using the important points in the boxes ⬚.

Unit 12

Unit: Enlargement and Reduction of Figures

Sub-unit: 1. Enlarging and Reducing Figures

Lesson 3 of 3

Textbook Page : 108
Actual Lesson 084

Lesson Objectives

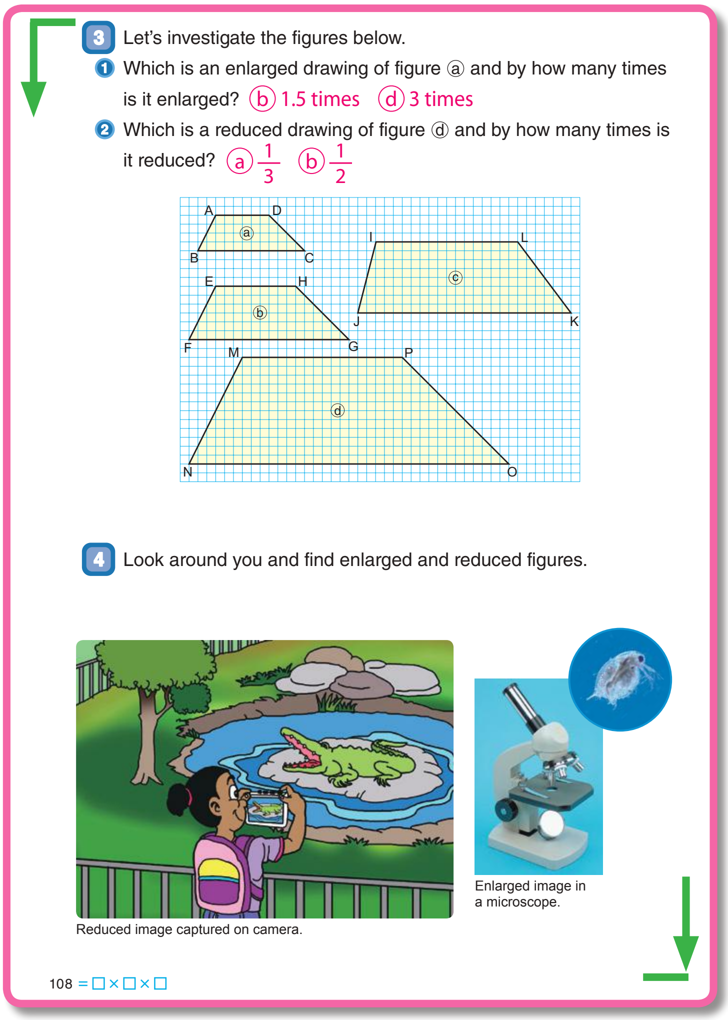
- To identify the enlarged figure or reduced figure of an original figure around them.
- To find the ratio and value of ratio by which the original figure is extended or reduced.

Prior Knowledge

- Meaning and properties of enlarged and reduced figures
- Ratio and the value of ratio between enlarged and reduced figures

Preparation

- Drawing of figures ⓐ to ⓓ , ruler, protractor, compass and tracing papers.



3 Let's investigate the figures below.

① Which is an enlarged drawing of figure ⓐ and by how many times is it enlarged? ⓑ 1.5 times ⓓ 3 times

② Which is a reduced drawing of figure ⓓ and by how many times is it reduced? ⓐ $\frac{1}{3}$ ⓑ $\frac{1}{2}$

4 Look around you and find enlarged and reduced figures.

Reduced image captured on camera.

Enlarged image in a microscope.

108 = □ × □ × □

Assessment

- Explain the ratio by which the original figure is enlarged or reduced. **F**
- Identify the ratio and value of ratio of enlarged and reduced figures. **S**

Teacher's Notes

Students need to know how to identify enlarged and reduced figures, confirming it with these two important features.
(i) congruency of all corresponding angles
(ii) similarity of the value of ratio applied to all corresponding sides of the two figures.

Moreover, students need to understand that to enlarge a figure, the ratio value is greater than 1, whereas to reduce a figure, the ratio value is less than 1. Also, students need to be aware of enlarged and reduced figures in their surroundings and also recognise its uses in their surroundings.

Lesson Flow

1 Review the previous lesson.

2 ③ Investigate and identify enlarged figures.

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

T ① Which figures (ⓑ, ⓒ or ⓓ) is an enlarged drawing of figure ⓐ and by how many times figure ⓐ is enlarged? (Give a hint such as measuring by counting units and comparing the lengths of corresponding sides.)

S Explain their answers and how to find them.
Example: Figure (b)
- FG (ⓑ's side) ÷ BC (ⓐ's side)
  18 ÷ 12 = 1.5

  Example: Figure (c)
- NO (ⓓ's side) ÷ BC (ⓐ's side)
  36 ÷ 12 = 3

3 Investigate and identify reduced figures.

T ② Which figures (ⓐ, ⓑ or ⓒ) is a reduced drawing of figure ⓓ and by how much it is reduced?

T Advice students to apply the similar way used in activity1 but this time, the length of the bigger figure will be used as a divisor.

S Explain their answers and how to find them.
Example: Figure ⓐ
- BC (ⓐ's side) ÷ NO (ⓓ's side)
  $12 \div 36 = \frac{1}{3}$

Example: Figure (b)
- FC (ⓑ's side) ÷ NO (ⓓ's side)
  $18 \div 36 = \frac{1}{2}$

4 ④ Look for enlarged and reduced figures around them.

T Refer students to the examples in the textbook.

S Name some enlarged or reduced figures around them or in their daily lives and explain why they think so with the class.

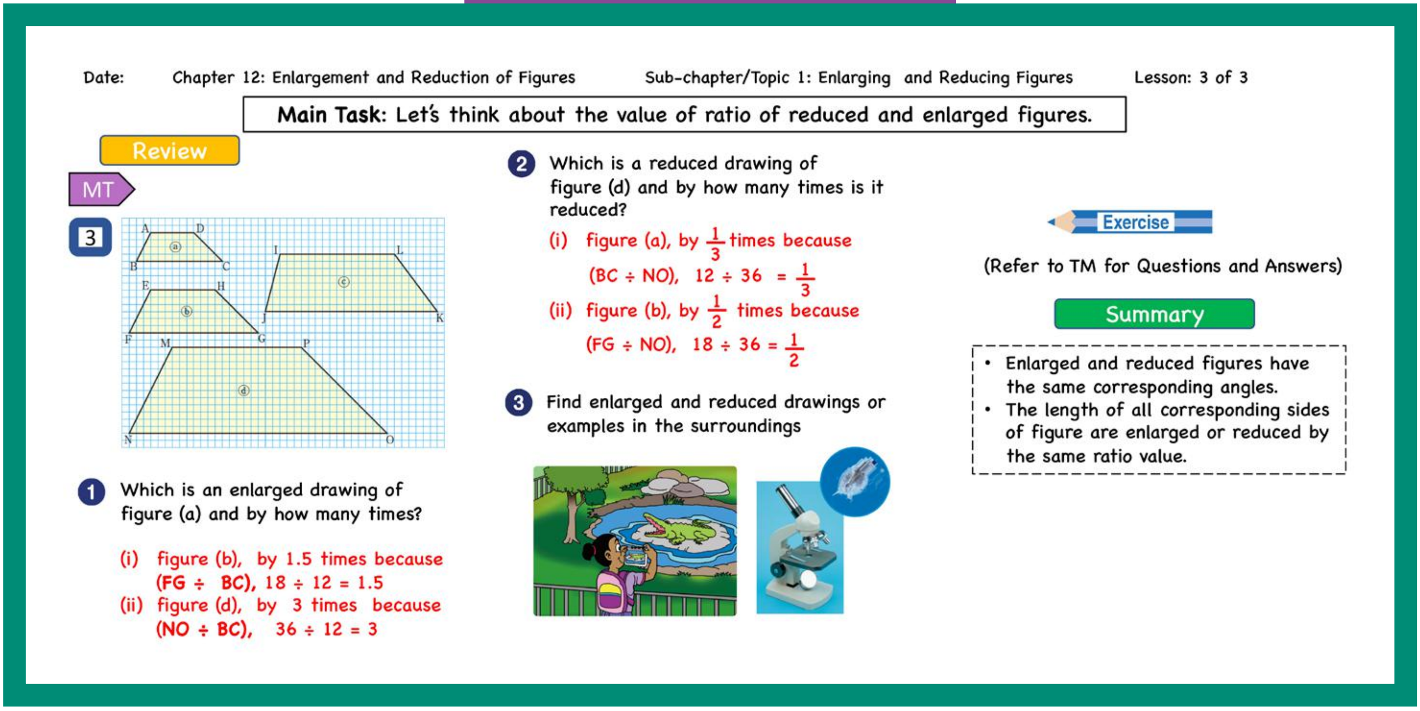
5 Summary

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 12: Enlargement and Reduction of Figures Sub-chapter/Topic 1: Enlarging and Reducing Figures Lesson: 3 of 3

Main Task: Let's think about the value of ratio of reduced and enlarged figures.

① Which is an enlarged drawing of figure (a) and by how many times?

(i) figure (b), by 1.5 times because (FG ÷ BC), 18 ÷ 12 = 1.5
(ii) figure (d), by 3 times because (NO ÷ BC), 36 ÷ 12 = 3

② Which is a reduced drawing of figure (d) and by how many times is it reduced?

(i) figure (a), by $\frac{1}{3}$ times because (BC ÷ NO), $12 \div 36 = \frac{1}{3}$
(ii) figure (b), by $\frac{1}{2}$ times because (FG ÷ NO), $18 \div 36 = \frac{1}{2}$

③ Find enlarged and reduced drawings or examples in the surroundings

Exercise

(Refer to TM for Questions and Answers)

Summary

- Enlarged and reduced figures have the same corresponding angles.
- The length of all corresponding sides of figure are enlarged or reduced by the same ratio value.

Unit 12

Unit: Enlargement and Reduction of Figures

Sub-unit: 2. How to Draw Enlarged and Reduced Figures

Lesson 1 out of 5

Textbook Page : 109 and 110
Actual Lesson 085

Sub-unit Objectives

- To draw enlarged and reduced figures using grid papers.
- To draw enlarged and reduced figures using measurement of sides, angles and ratio.
- To draw enlarged and reduced figures using the center point for construction.

Lesson Objectives

- To draw a reduced figure by counting the grids of the original figure and reducing it by $\frac{1}{2}$ to get the length of the reduced figure.
- To draw an enlarged figure by counting the grids of the original figure and doubling it to get length of enlarged figure.

Prior Knowledge

- Enlarged and reduced drawings
- How to draw figures like triangles using protractors and compass.

Preparation

- Grid paper, metre ruler, quadrilateral ABCD, Triangle ABC, protractor and compass

Assessment

- Draw an enlarged quadrilateral that is two times the original using grid paper. **F**
- Draw a reduced triangle that is $\frac{1}{2}$ times the original using grid paper. **S**

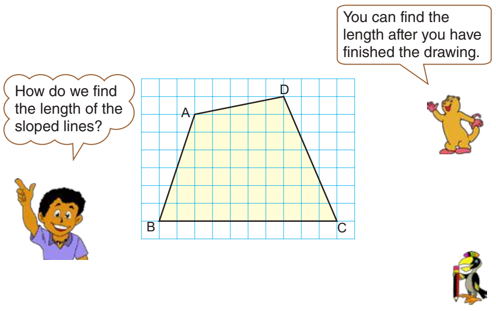
Teacher's Notes

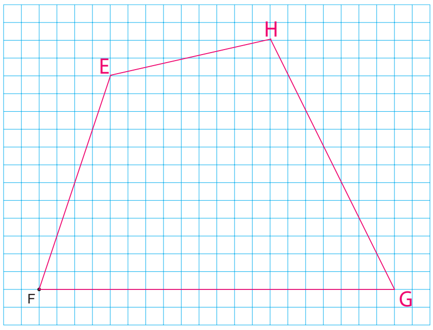
Students should be aware of how to draw figures using ratio (enlarged/reduced scale). The term "ratio", should not be used but help them to understand the meaning of enlarging and reducing by the same ratio.
It's recommended for the teacher and students to use "grid number" to explain the relationship between the original figure and enlarged or reduced figures. Common misconception is when students only increase the height by 2.
It is also important to inform the students that all the sides will increase together by the same ratio. For the triangle it is required to emphasise to the students that small grids are half of the original grid where 2 are counted as 1 square.

2 How to Draw Enlarged and Reduced Figures

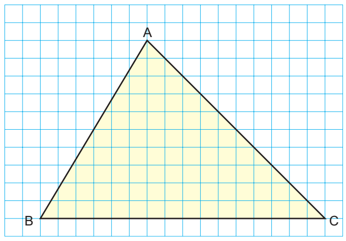
How to Draw Using Grid Paper

1 Let's think about how to draw an enlarged figure EFGH which is 2 times of the quadrilateral ABCD.
Point F is corresponding to point B and it is already drawn on the grid paper.

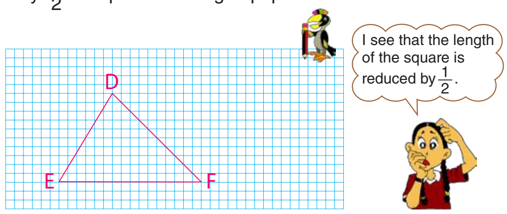

How do we find the length of the sloped lines?
A
D
B
C
You can find the length after you have finished the drawing.



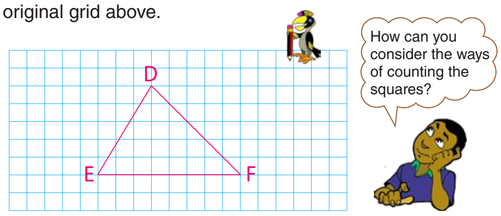
2 Draw triangle DEF which is triangle ABC reduced by $\frac{1}{2}$ on the two grid papers below.



① Draw triangle DEF, in which the side length of the square is reduced by $\frac{1}{2}$ compared to the grid paper above.


D
E
F
I see that the length of the square is reduced by $\frac{1}{2}$.

② Draw triangle DEF, in which the side length of the square is equal to the original grid above.



Lesson Flow

1 Review the previous lesson.

2 Draw an enlarged drawing from the quadrilateral ABCD.

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

T/S 1 Read and understand the given situation.

T What similar and different features do enlarged figures have in common?

S Enlarged figures have all lengths of corresponding sides in the same ratio (enlarged scale) and all corresponding angles are equal.

T Ask students to draw the enlarged quadrilateral EFGH on the grid given.

S Construct the enlarged quadrilateral;
- starting from point F
- find out all the corresponding vertices (counting grid number and finding out the positions)
- connect all the vertices to get the final drawing EFGH.

3 Explain how you drew an enlarged quadrilateral of ABCD.

T Allow students to discuss how they found the length of corresponding sides.

S Lengths of corresponding sides: 2 times, 2) Grid number used in 1 should be double in 2, 3) First draw the line FG.

T Confirm the length of sides and the size of angles for the enlarged figure.

4 Draw a reduced figure of triangle ABC by $\left(\frac{1}{2}\right)$ on two grid papers.

T/S 2 Read and understand the given situation.

T What similar and different features do reduced figures have in common?

S Reduced figures have all lengths of corresponding sides in the same ratio (reduced scale) and all corresponding angles are equal.

S Draw triangles ① and ② with the scale of $\frac{1}{2}$ on two different grid papers and explain.

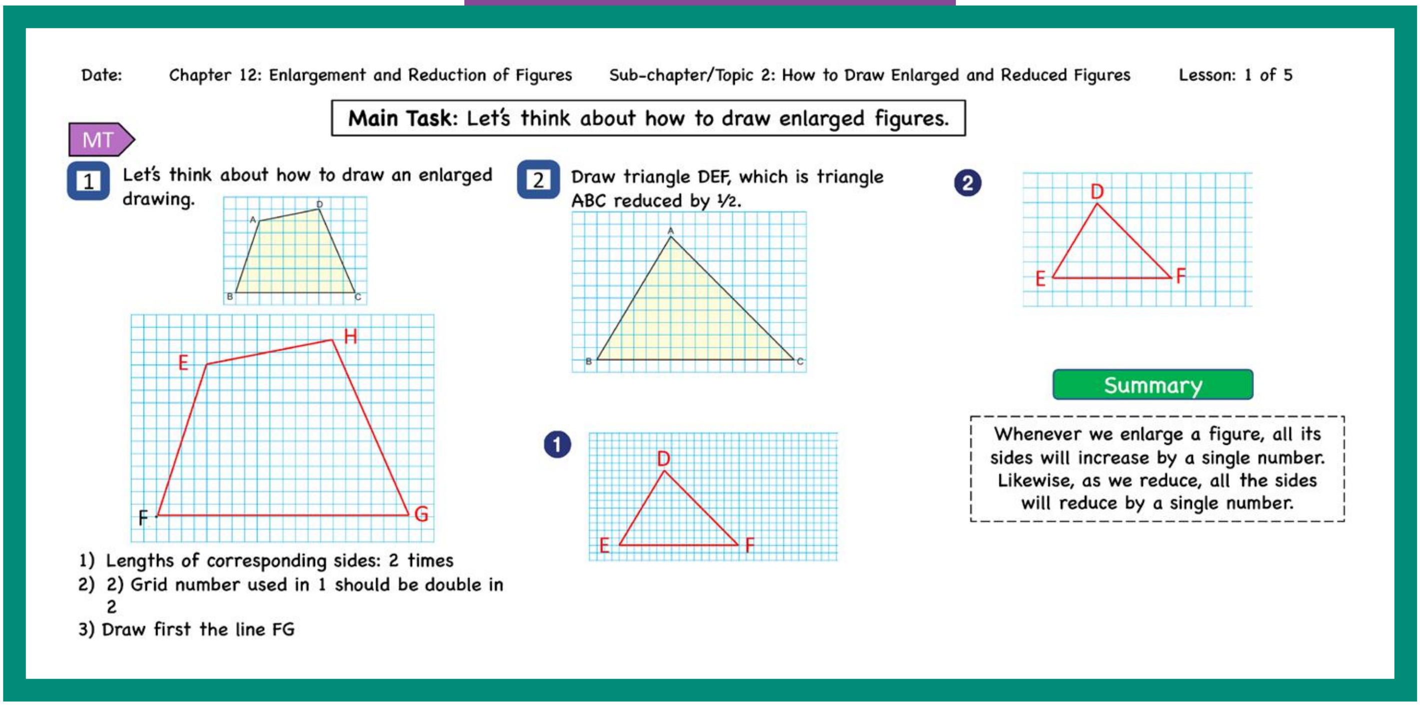
5 Summary

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 12: Enlargement and Reduction of Figures Sub-chapter/Topic 2: How to Draw Enlarged and Reduced Figures Lesson: 1 of 5

Main Task: Let's think about how to draw enlarged figures.

MT

1 Let's think about how to draw an enlarged drawing.

1) Lengths of corresponding sides: 2 times
2) 2) Grid number used in 1 should be double in 2
3) Draw first the line FG

2 Draw triangle DEF, which is triangle ABC reduced by ½.

Summary

Whenever we enlarge a figure, all its sides will increase by a single number. Likewise, as we reduce, all the sides will reduce by a single number.

Unit 12

Unit: Enlargement and Reduction of Figures

Sub-unit: 2. How to Draw Enlarged and Reduced Figures

Lesson 2 of 5

Textbook Page : 111 and 112
Actual Lesson 086

Lesson Objective

- Draw an enlarged triangle by using a compass or a protractor to measure sides and angles.

Prior Knowledge

- How to draw triangles using a protractor and a compass.
- Properties of congruent triangles

Preparation

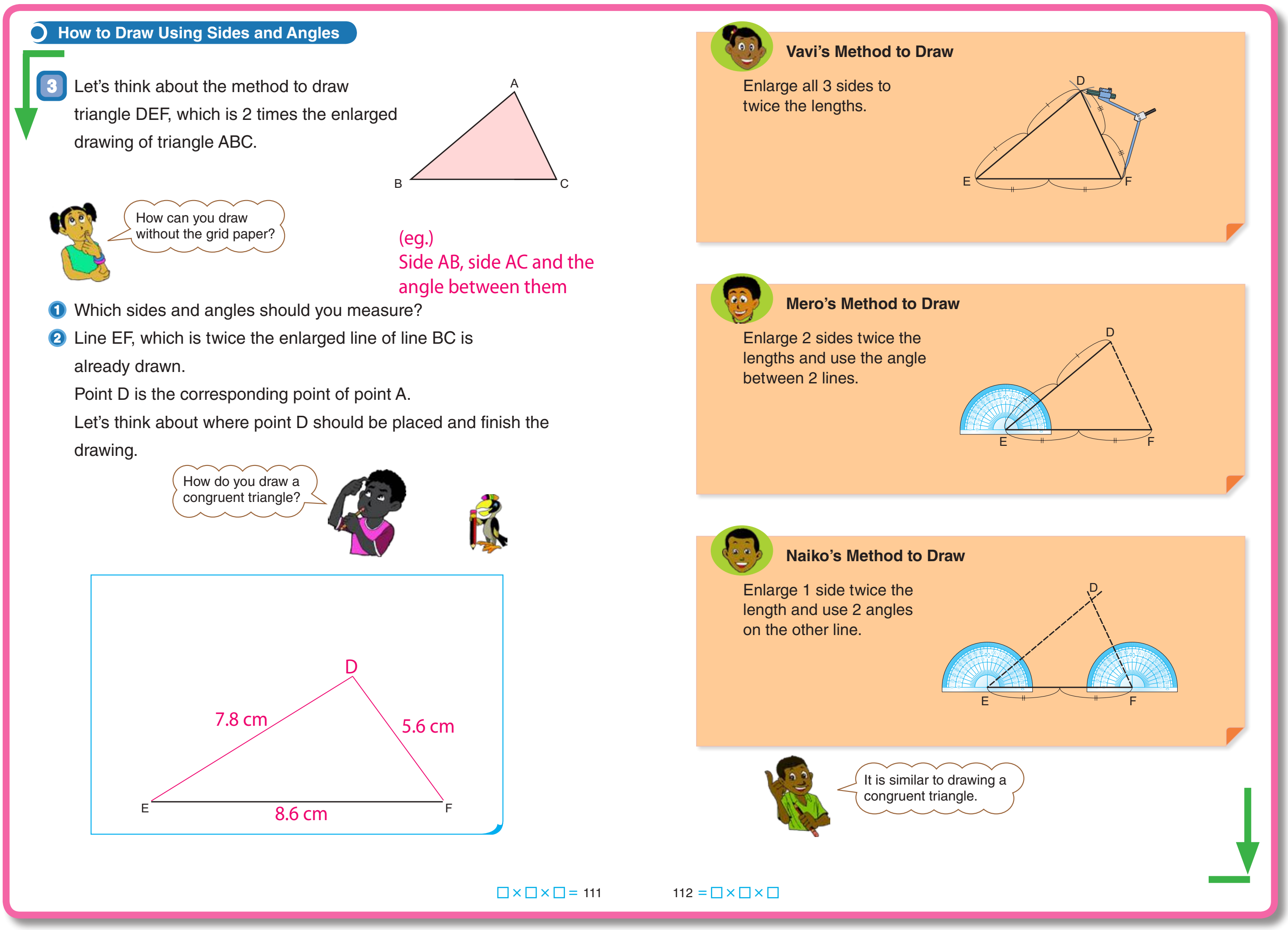
- Triangle ABC, compass, protractor, ruler, paper with line EF

Assessment

- Think about how to draw enlarged figures without using a grid paper correctly. F S
- Demonstrate how to draw an enlarged figure using a compass or a protractor. S

Teacher's Notes

This lesson is focused on drawing triangles using protractors and compasses. It is important to closely monitor the students in using mathematical tools as they easily forget how to measure sides, angles and lengths.
If students have difficulties drawing the enlarged triangle, refer them to the 3 ideas in the textbook.
Flow 4 in the lesson is an additional exercise to consolidate what they have learned.



How to Draw Using Sides and Angles

3 Let's think about the method to draw triangle DEF, which is 2 times the enlarged drawing of triangle ABC.

How can you draw without the grid paper?

(eg.)
Side AB, side AC and the angle between them

① Which sides and angles should you measure?

② Line EF, which is twice the enlarged line of line BC is already drawn.
Point D is the corresponding point of point A.
Let's think about where point D should be placed and finish the drawing.

How do you draw a congruent triangle?

Vavi's Method to Draw

Enlarge all 3 sides to twice the lengths.

Mero's Method to Draw

Enlarge 2 sides twice the lengths and use the angle between 2 lines.

Naiko's Method to Draw

Enlarge 1 side twice the length and use 2 angles on the other line.

It is similar to drawing a congruent triangle.

□×□×□= 111 112 =□×□×□

Lesson Flow

1 Review the previous lesson.

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

2 ③ Draw triangle DEF using triangle ABC and determine the position of a vertex.

T/S Read and understand the given situation.

T Refer to triangle ABC and ask students what they need to do to draw an enlarged figure (×2) of the triangle, using a ruler, a compass and a protractor.

S 1) We need to identify the position of the vertex D, 2) measure all the sides and angles of the original triangle to apply them for the enlarged figure.

T ① Which sides or angles of the triangle ABC we need to measure before we enlarge it?

S 1) Sides AB & AC
2) Sides AB & BC and the angle B
3) Angles B & C

T ② Give students work paper with line EF already drawn and ask them to draw the enlarged figure, directing their attention to vertex D which corresponds to vertex A and length of line EF which is twice the length of BC

S Use previous knowledge to construct enlarged triangle DEF and check in a pairs whether the figures are correctly drawn in terms of length of sides and size of angles.

3 Categorise and confirm students' ideas on drawing the enlarged triangle.

T Identify similar and different methods amongst students' ideas on how they are constructing triangle DEF and group them, using the 3 sample ideas on the textbook

S Display their ideas on the blackboard, based on the 3 sample ideas and explain.

T Confirm their ideas using Vavi's, Mero's and Naiko's ideas.

4 Draw enlarged triangles using different ideas

T Ask students to try to draw the same enlarged figure using ideas they have not tried yet.

S Check in pairs whether the drawn figures are congruent to the original enlarged figure or not.

S Practice to draw the enlarged figures and check in pairs for congruency.

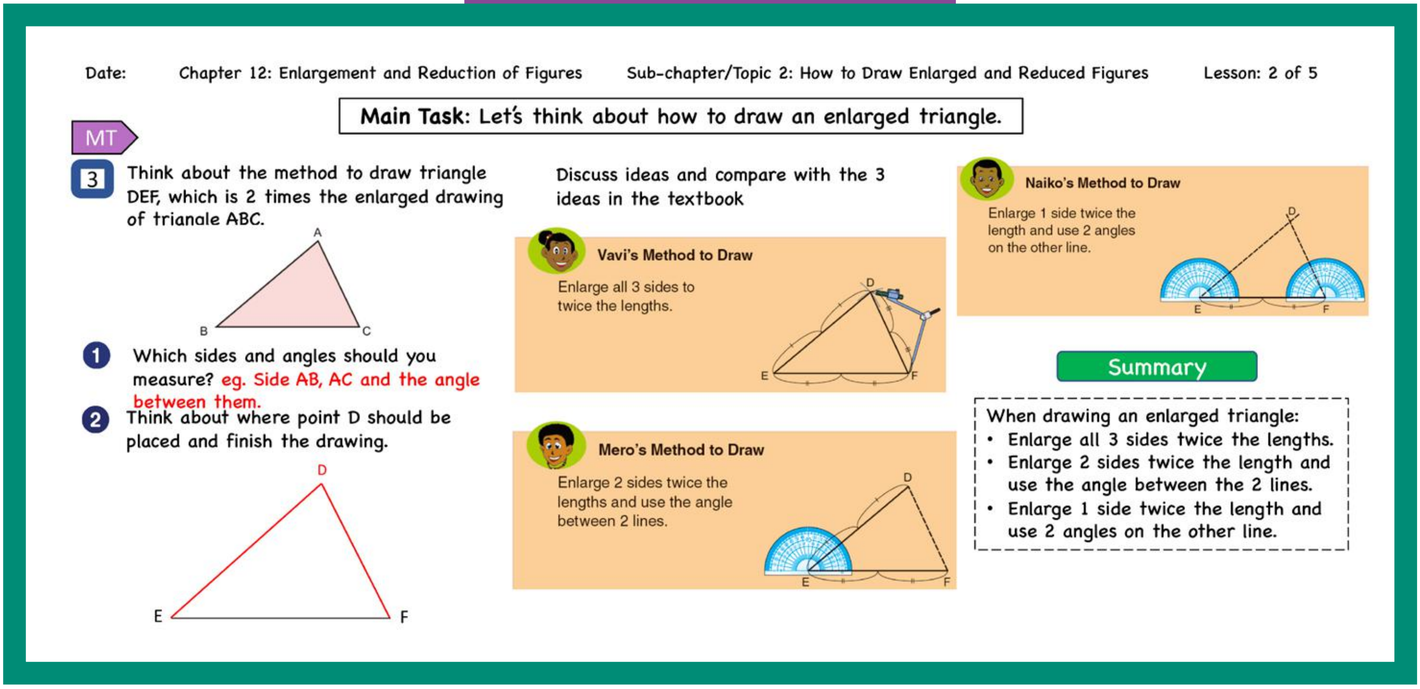
5 Summary

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 12: Enlargement and Reduction of Figures Sub-chapter/Topic 2: How to Draw Enlarged and Reduced Figures Lesson: 2 of 5

Main Task: Let's think about how to draw an enlarged triangle.

3 Think about the method to draw triangle DEF, which is 2 times the enlarged drawing of trianale ABC.

① Which sides and angles should you measure? eg. Side AB, AC and the angle between them.

② Think about where point D should be placed and finish the drawing.

Discuss ideas and compare with the 3 ideas in the textbook

Vavi's Method to Draw
Enlarge all 3 sides to twice the lengths.

Mero's Method to Draw
Enlarge 2 sides twice the lengths and use the angle between 2 lines.

Naiko's Method to Draw
Enlarge 1 side twice the length and use 2 angles on the other line.

Summary

When drawing an enlarged triangle:
- Enlarge all 3 sides twice the lengths.
- Enlarge 2 sides twice the length and use the angle between the 2 lines.
- Enlarge 1 side twice the length and use 2 angles on the other line.

Unit
12

Unit: Enlargement and Reduction of Figures
Sub-unit: 2. How to Draw Enlarged and Reduced Figures
Lesson 3 of 5

Textbook Page : 113
Actual Lesson 087

Lesson Objective

- To draw a reduced figure of a given figure by using previously learned methods.

Prior Knowledge

- Drawing triangles using a protractor and a compass.
- Properties of reduced figures and ratio (reduced scale)

Preparation

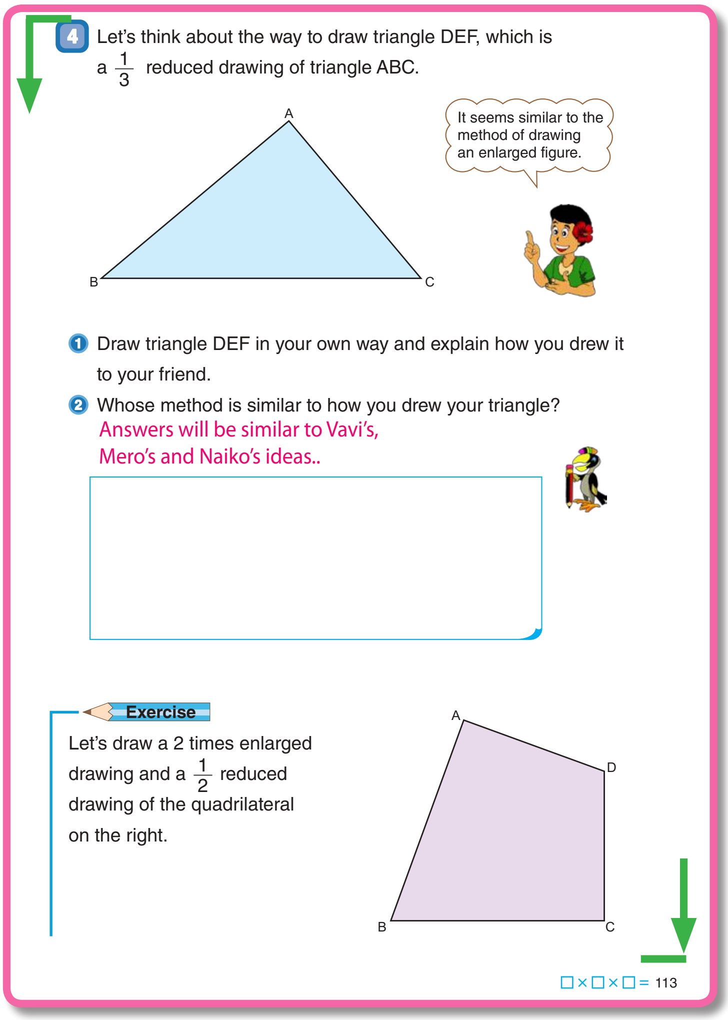
- Triangle ABC and Quadrilateral ABCD model
- meter ruler, compass, protractor

Assessment

- Draw reduced figures using various methods. F
- Demonstrate how to reduce triangle ABC by a ratio of a fraction and draw a new reduced figure. S
- Solve the exercise correctly. S

Teacher's Notes

This lesson is about drawing reduced figures using previously learned knowledge on how to construct figures.
The difficulty in this lesson is applying their knowledge of drawing triangles and quadrilaterals.
Assist students to draw or demonstrate some parts of the drawing process.
Reduced figure uses the same method of drawing enlarged figures.
The only differences are the ratio and size of the figures (length of sides and not the size of angles).



4 Let's think about the way to draw triangle DEF, which is a $\frac{1}{3}$ reduced drawing of triangle ABC.

A
B
C
It seems similar to the method of drawing an enlarged figure.

① Draw triangle DEF in your own way and explain how you drew it to your friend.

② Whose method is similar to how you drew your triangle?

Answers will be similar to Vavi's, Mero's and Naiko's ideas..

Exercise

Let's draw a 2 times enlarged drawing and a $\frac{1}{2}$ reduced drawing of the quadrilateral on the right.

□×□×□= 113

Lesson Flow

1 Review the previous lesson.

2 ④ Draw a $\frac{1}{3}$ reduced drawing of Triangle ABC.

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

T/S Read and understand the given situation.

T ① Ask students to think of ways on how to draw triangle DEF which is a $\frac{1}{3}$ reduced figure of triangle ABC.

S Use their own ideas based on what they learned from previous lessons to draw the figure and explain how they drew it to their friends.

TN For the reduced figure, the size and lengths should be drawn according to the given ratio or fraction.

S Reduced figure should be smaller than the original figure according to the ratio of $\frac{1}{3}$.

T ② Ask students to compare their ideas with Vavi's, Mero's and Naiko's methods.

S Idenitfy similar methods applied to reduce the triangle by $\frac{1}{3}$.

3 Complete the Exercise.

S Solve the exercise.

T Confirm students' answers.

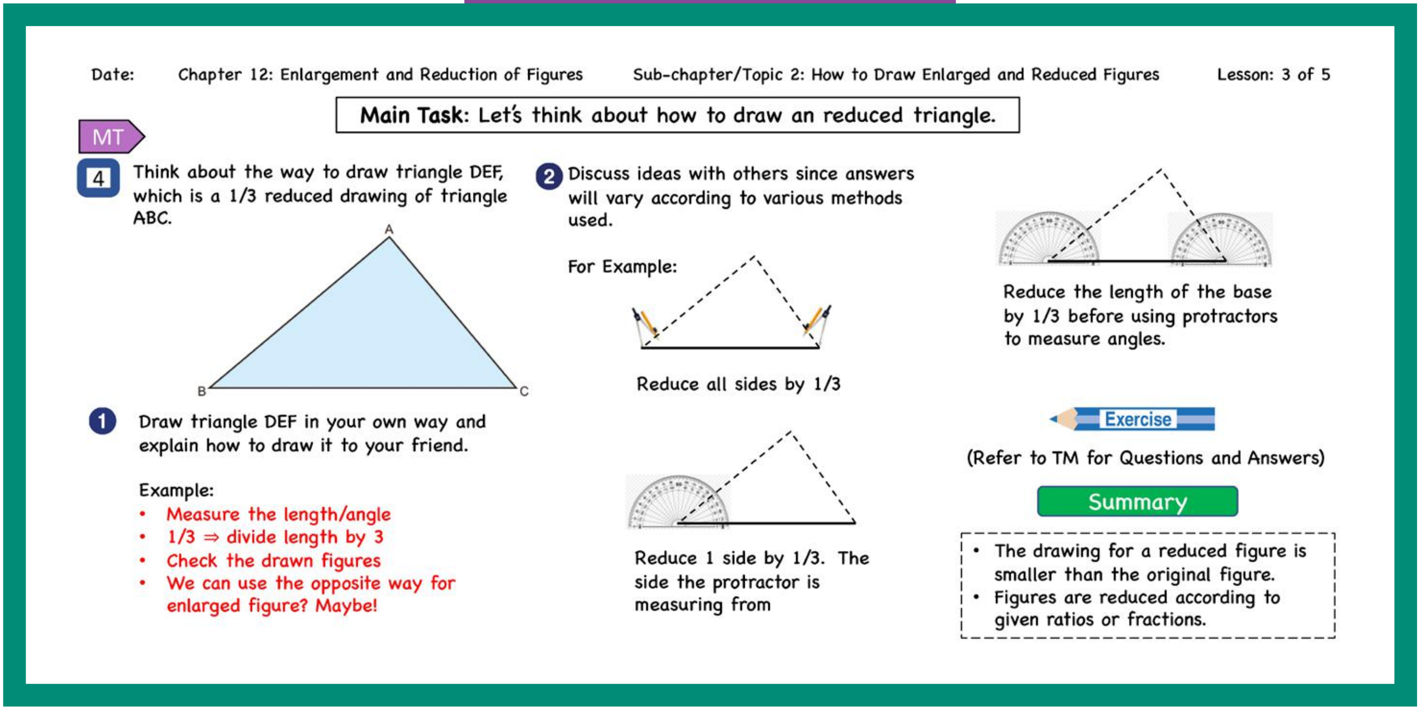
4 Summary

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: Chapter 12: Enlargement and Reduction of Figures Sub-chapter/Topic 2: How to Draw Enlarged and Reduced Figures Lesson: 3 of 5

Main Task: Let's think about how to draw an reduced triangle.

MT

4 Think about the way to draw triangle DEF, which is a 1/3 reduced drawing of triangle ABC.

① Draw triangle DEF in your own way and explain how to draw it to your friend.

Example:

- Measure the length/angle
- 1/3 ⇒ divide length by 3
- Check the drawn figures
- We can use the opposite way for enlarged figure? Maybe!

② Discuss ideas with others since answers will vary according to various methods used.

For Example:

Reduce all sides by 1/3

Reduce 1 side by 1/3. The side the protractor is measuring from

Reduce the length of the base by 1/3 before using protractors to measure angles.

Exercise

(Refer to TM for Questions and Answers)

Summary

- The drawing for a reduced figure is smaller than the original figure.
- Figures are reduced according to given ratios or fractions.

Unit 12

Unit: Enlargement and Reduction of Figures

Sub-unit: 2. How to Draw Enlarged and Reduced Figures

Lesson 4 of 5

Textbook Page : 114
Actual Lesson 088

Lesson Objective

- Draw an enlarged figure by using a vertex of the original figure as a centre point.

Prior Knowledge

- Properties of enlarged figures and the meaning of ratio (enlarged scale)

Preparation

- Triangle ABC on page 114, metre ruler, compass, protractor

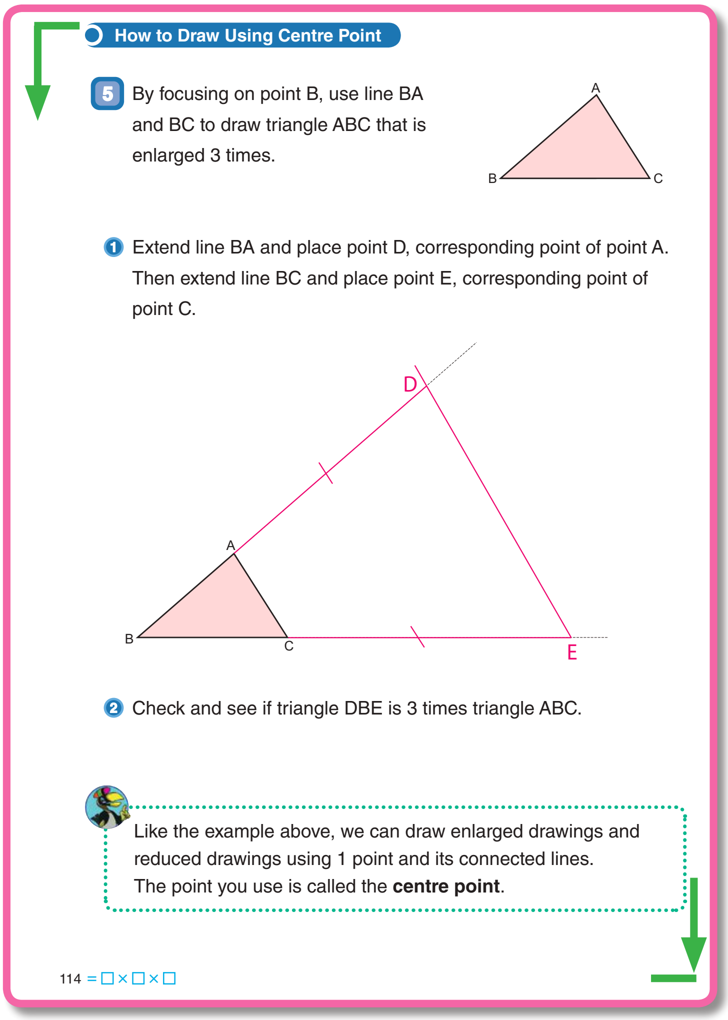
Assessment

- Draw an enlarged figure from 1 vertex of the original figure. F
- Demonstrate how to draw a reduced figure of triangle ABC by using the vertex C as the centre point. S

Teacher's Notes

Carefully check the students work if they understand enlarging or reducing a figure using a vertex and provide assistance. If students have enough time, they can try to draw the enlarged or reduced figures from different vertices.

Flow 4, 5 and 6 are additional activities to consolidate the method of enlarging and reducing from a point of reference.



How to Draw Using Centre Point

5 By focusing on point B, use line BA and BC to draw triangle ABC that is enlarged 3 times.

① Extend line BA and place point D, corresponding point of point A. Then extend line BC and place point E, corresponding point of point C.

② Check and see if triangle DBE is 3 times triangle ABC.

Like the example above, we can draw enlarged drawings and reduced drawings using 1 point and its connected lines.
The point you use is called the **centre point**.

114 = □×□×□

Lesson Flow

1 Review the previous lesson.

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

2 Enlarge drawing by focusing on one point.

T ⑤ Refer students to triangle ABC and get them to discuss how this figure can be enlarged 3 times, when line BC and BA are extended 3 times from point B?

S Discuss and share their ideas.

T/S ① Extend line BA and place point D, as the corresponding vertex A.
Then extend line BC and place point E, as corresponding vertex C.

T ② Measure and confirm all the sides as 3 times larger than the original ones and all the angles as congruent.

S Connect all the vertices or points to see if triangle DBE is 3 times triangle ABC.

TN In this case, Vertex B is used as the point of reference when drawing an enlarged or reduced figure.

3 Important Point

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

4 Comparing methods of drawing.

T What is common and different, compared with other methods?

S Similarities: The sides a of the original triangles are extended according to the ratio

S Difference: Angles are not used in this method.

5 Think about how to draw a reduced figure using the same method.

T Allow students to think about how to apply the same method to draw a reduced figure.

S Measure the sides and reduce the length of the sides BA and BC by the same ratio.

6 Draw a reduced figure by half when C is the point of reference.

S Draw a reduced figure of ABC by $\frac{1}{2}$ using C as the point of reference.

T Confirm that the 2 new vertices for the figure are middle points of the original

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

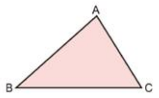
Date: Chapter 12: Enlargement and Reduction of Figures Sub-chapter/Topic 2: How to Draw Enlarged and Reduced Figures Lesson: 4 of 5

Main Task: Let's think about how to draw an enlarged triangle from one vertex.

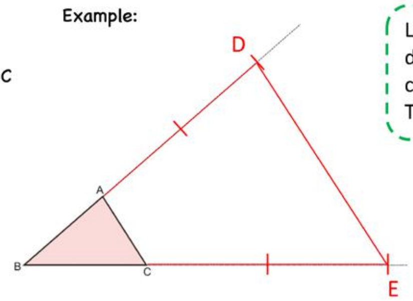
Review

MT

5 Use line BA and BC to draw triangle ABC that is enlarged 3 times.



Example:



Like the example above, we can draw enlarged drawings and reduced drawings using 1 point and its connected lines.
The point you use is called the **centre point**.

Exercise

Draw a reduced figure of ABC by 1/2 using C as the centre point.

① Extend line BA and place point D, corresponding point of point A, and extend line BC and place point E, corresponding point of point C.

② See if triangle DBE is 3 times of triangle ABC.(refer to above figure)

Summary

The vertex is used as a point of reference or centre point to draw enlarged and reduced figures by connecting lines.

Unit 12

Unit: Enlargement and Reduction of Figures

Sub-unit: 2. How to Draw Enlarged and Reduced Figures

Lesson 5 of 5

Textbook Page : 115
Actual Lesson 089

Lesson Objective

- To draw an enlarged figure by using the centre point on any part of the figure.

Prior Knowledge

- How to draw enlarged and reduced figures by using given ratios and fractions and by using the vertex.

Preparation

- Quadrilateral ABCD, metre ruler, protractor and compass

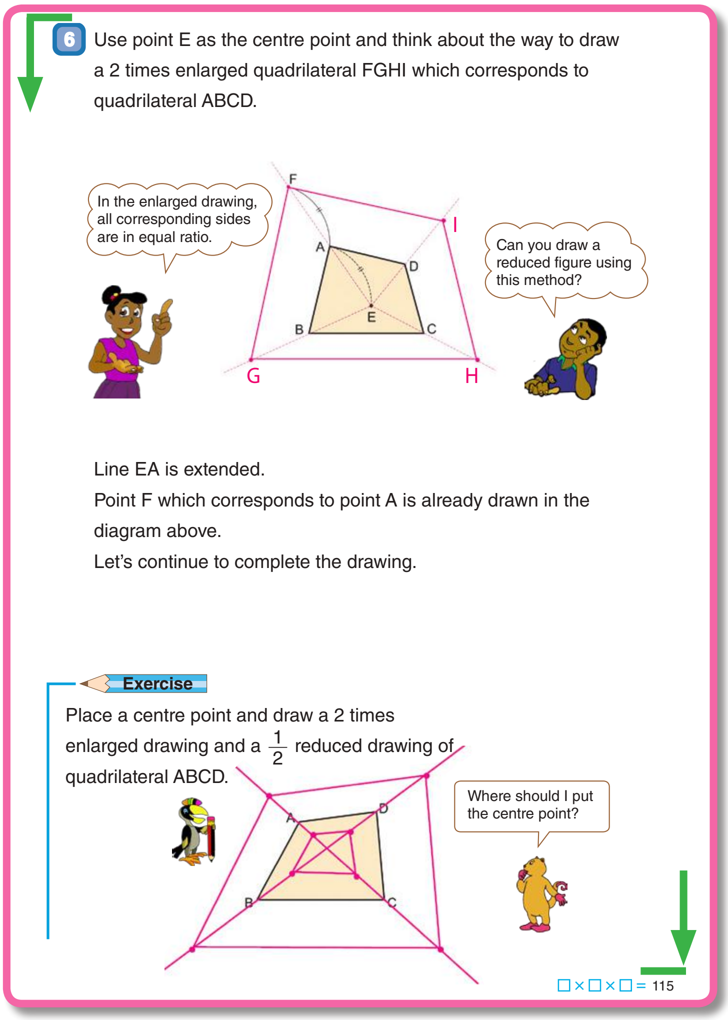
Assessment

- Draw a reduced and enlarged figure, using a centre point, which is not the vertex of the original figure. F S
- Solve the exercise correctly. S

Teacher's Notes

The lesson is focused on using centre point to enlarge and reduce figures, but not using the vertices.
Emphasise to the students on how the length is measured.
Lines should be drawn from the centre point to corresponding points (new vertices), connecting the vertices of original figure.
The length of lines should correspond with the given ratio (enlarged or reduced scale).

The 2 times enlarged drawing has double the length of each side of the original figure.
However, because the area becomes 4 times, some students misunderstand it as a 4 times enlarged drawing.
The difference between the ratio of side and a ratio of area should be understood through folding a square paper.



6 Use point E as the centre point and think about the way to draw a 2 times enlarged quadrilateral FGHI which corresponds to quadrilateral ABCD.

In the enlarged drawing, all corresponding sides are in equal ratio.
Can you draw a reduced figure using this method?
F
I
A
D
B
E
C
G
H

Line EA is extended.
Point F which corresponds to point A is already drawn in the diagram above.
Let's continue to complete the drawing.

Exercise

Place a centre point and draw a 2 times enlarged drawing and a $\frac{1}{2}$ reduced drawing of quadrilateral ABCD.

□×□×□= 115

Lesson Flow

1 Review the previous lesson.

2 Draw an enlarged figure using one point from inside of a triangle

T Using the same triangle ABC, add point D in the middle of the shape and ask students whether we can draw an enlarged triangle (×2) from this point.

TN The centre point can be placed anywhere within the figure.

S Discuss and explain such as extending the line from the centre through the vertex to the corresponding point 2 times.

S Draw a line from point D through vertex A, B and C to find the vertex of the enlarged figure.

T Let the students enlarge it 2 times.

S Extend lines and measure the length which will be 2 times longer on each side, connect all the sides and get the enlarged figure.

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

3 6 Enlarge quadrilaterals using a center point

T/S Read and understand the given situation.

T Ask the students to look at quadrilateral ABCD. Guide them to use point E as the center point to think about how to draw an enlarged quadrilateral FGHI (×2).

S Study quadrilateral ABCD and extend the lines from point E through points A B C and D and then measure the new points on the lines to get the enlarged figure.

T Confirm students drawings.

4 Complete the Exercise.

S Solve the exercise.

T Confirm students' answers.

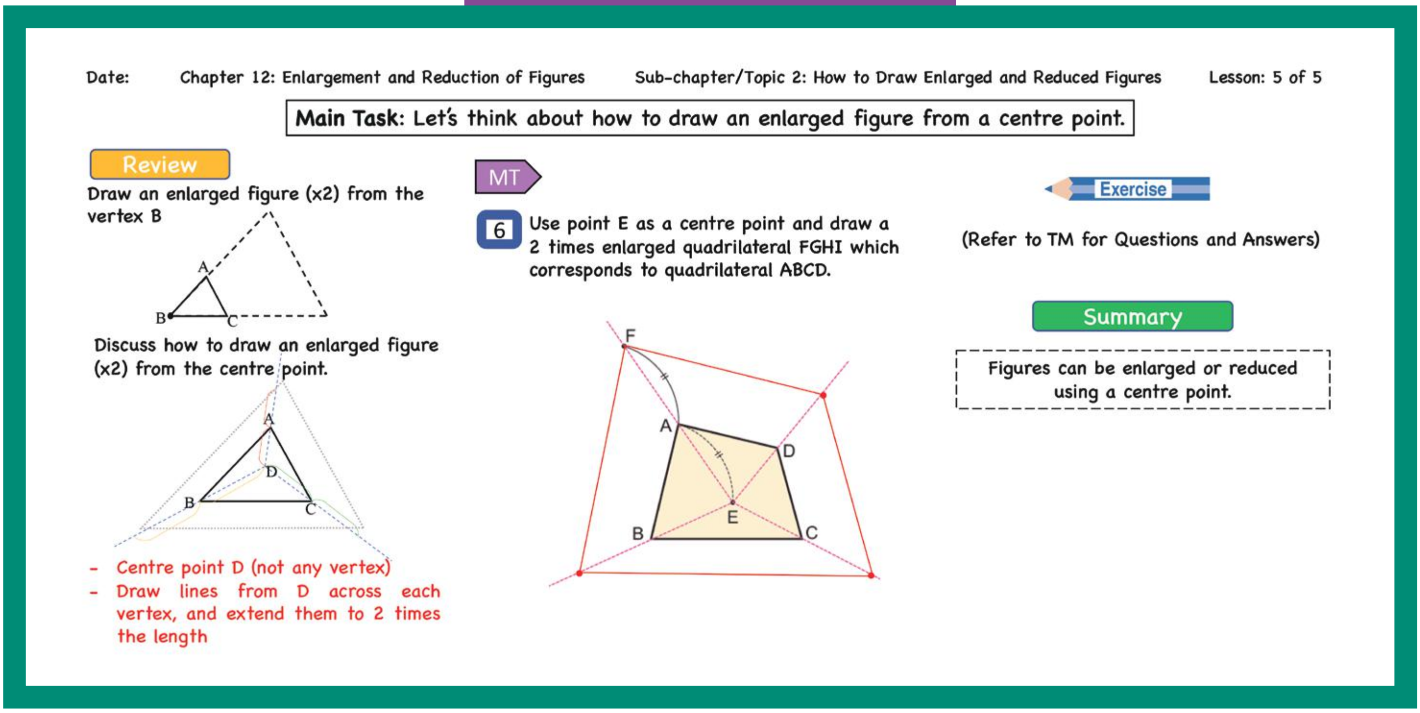
5 Summary

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: Chapter 12: Enlargement and Reduction of Figures Sub-chapter/Topic 2: How to Draw Enlarged and Reduced Figures Lesson: 5 of 5

Main Task: Let's think about how to draw an enlarged figure from a centre point.

Review

Draw an enlarged figure (x2) from the vertex B

Discuss how to draw an enlarged figure (x2) from the centre point.

- Centre point D (not any vertex)
- Draw lines from D across each vertex, and extend them to 2 times the length

MT

6 Use point E as a centre point and draw a 2 times enlarged quadrilateral FGHI which corresponds to quadrilateral ABCD.

Exercise

(Refer to TM for Questions and Answers)

Summary

Figures can be enlarged or reduced using a centre point.

Unit
12

Unit: Enlargement and Reduction of Figures
Sub-unit: 3. Uses of Reduced Figures
Lesson 1of 1

Textbook Page :
116 and 117
Actual Lesson 090

Sub-unit Objective

- To apply the reduced scale to reduced drawing and understand its meaning.

Lesson Objectives

- To understand the meaning of reduced scale and how to express it.
- To find the real length from reduced drawings.

Prior Knowledge

- Reduced scale and how to use the reduced scale.
- Difference between metre and centimetre and be able to convert centimetres to metres.
- Using centimetre ruler to find the length and width of reduced figures.

Preparation

- Diagram of Task 1, 2 and 3 on the chart or blackboard

Assessment

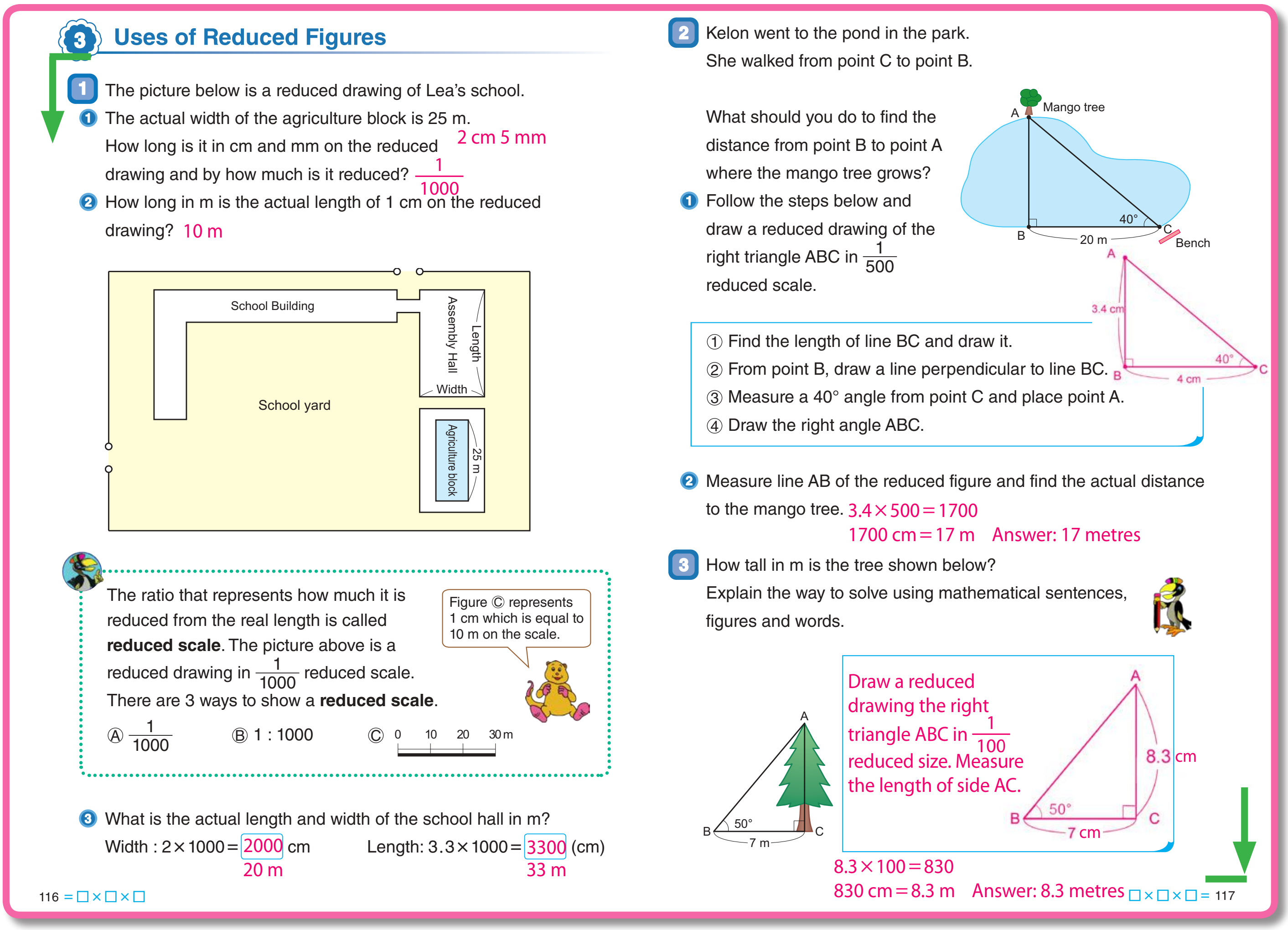
- Applying the reduced scale to real life situations. **F**
- Find the real length from the reduced scale and reduced length from the real length. **S**

Teacher's Notes

The difficulty in this lesson is:

- To use the reduced scale to draw a reduced figure.
- To apply the reduced scale to calculate the real distance,length and height of an object.

Connect figures drawn with the reduced scale, emphasise the meaning of reduced scale and showing all the process of operation and change of measurement unit (mm, cm, m,etc). Students have experienced finding the actual distance using reduced scale from social studies (Scale of Maps)



3 Uses of Reduced Figures

1 The picture below is a reduced drawing of Lea's school.

① The actual width of the agriculture block is 25 m. How long is it in cm and mm on the reduced drawing and by how much is it reduced? 2 cm 5 mm $\frac{1}{1000}$

② How long in m is the actual length of 1 cm on the reduced drawing? 10 m

The ratio that represents how much it is reduced from the real length is called **reduced scale**. The picture above is a reduced drawing in $\frac{1}{1000}$ reduced scale.
There are 3 ways to show a **reduced scale**.

Ⓐ $\frac{1}{1000}$ Ⓑ 1 : 1000 Ⓒ

Figure Ⓒ represents 1 cm which is equal to 10 m on the scale.

③ What is the actual length and width of the school hall in m?

Width : 2 × 1000 = $\boxed{2000}$ cm
20 m

Length: 3.3 × 1000 = $\boxed{3300}$ (cm)
33 m

116 = □ × □ × □

2 Kelon went to the pond in the park.
She walked from point C to point B.

What should you do to find the distance from point B to point A where the mango tree grows?

① Follow the steps below and draw a reduced drawing of the right triangle ABC in $\frac{1}{500}$ reduced scale.

① Find the length of line BC and draw it.
② From point B, draw a line perpendicular to line BC.
③ Measure a 40° angle from point C and place point A.
④ Draw the right angle ABC.

② Measure line AB of the reduced figure and find the actual distance to the mango tree. 3.4 × 500 = 1700
1700 cm = 17 m Answer: 17 metres

3 How tall in m is the tree shown below?
Explain the way to solve using mathematical sentences, figures and words.

Draw a reduced drawing the right triangle ABC in $\frac{1}{100}$ reduced size. Measure the length of side AC.

8.3 × 100 = 830
830 cm = 8.3 m Answer: 8.3 metres

□ × □ × □ = 117

Lesson Flow

1 Review the previous lesson.

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

2 Find the reduced and actual lengths on a map.

T/S 1 Read and understand the given situation.

S ① Measure the length corresponding to 25 m of width and divide it by 25 m (aligning unit of length).

T Ask the students to calculate the actual length corresponding to 1 cm on the map using the previous ideas of actual width of the Agriculture Block of 25 m being reduced, which is $\left(\frac{1}{1000}\right)$ as a reduced scale.

S ② Calculate the actual length if the reduced length is 1 cm using the reduced scale $\frac{1}{1000}$
$\frac{1000}{1} \times 1 = 1000$, $1000 \div 100 = 10$ (10 m)

3 Important Point

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

4 Calculate the actual length and width.

T ③ Ask students to calculate the actual length and width of the Assembly Hall.

S Calculate the actual length and width of the Assembly Hall.

5 Draw a reduced figure $\left(\frac{1}{500}\right)$ corresponding to the right triangle a, b, c.

T 2 Ask students to draw the reduced figure corresponding to the figure provided in the textbook.

S ① Draw the reduced figure according to the steps(1 to 4) in the textbook and explain how they find the actual length of AB if the actual length of BC is 20 m.

TN The reduced scale $\frac{1}{500}$ for AB (AB can be measured from the reduced figure drawn by the students).How to find out the actual length of AB ($3.4 \times 500 = 1700$, $1700 \div 100 = 17$, 17 m)

T Confirm students' answers.

T ② Ask students to meaure line AB of the reduced figure, then find the actual distance to the mango tree.

S Measure line AB and calculate to find the actual distance.

T Confirm students answers.

6 Find the actual height of the tree.

T 3 Ask the students to calculate the actual length (height) of the tree.

S Find the height of the tree, multiplying the reduced length corresponding to the height of the tree by $\frac{100}{1}$ (which is the reciprocal of the reduced scale).
Then, $100 \times 8.3 = 830$,
830 cm = 8.3 m.

T Confirm students' answers.

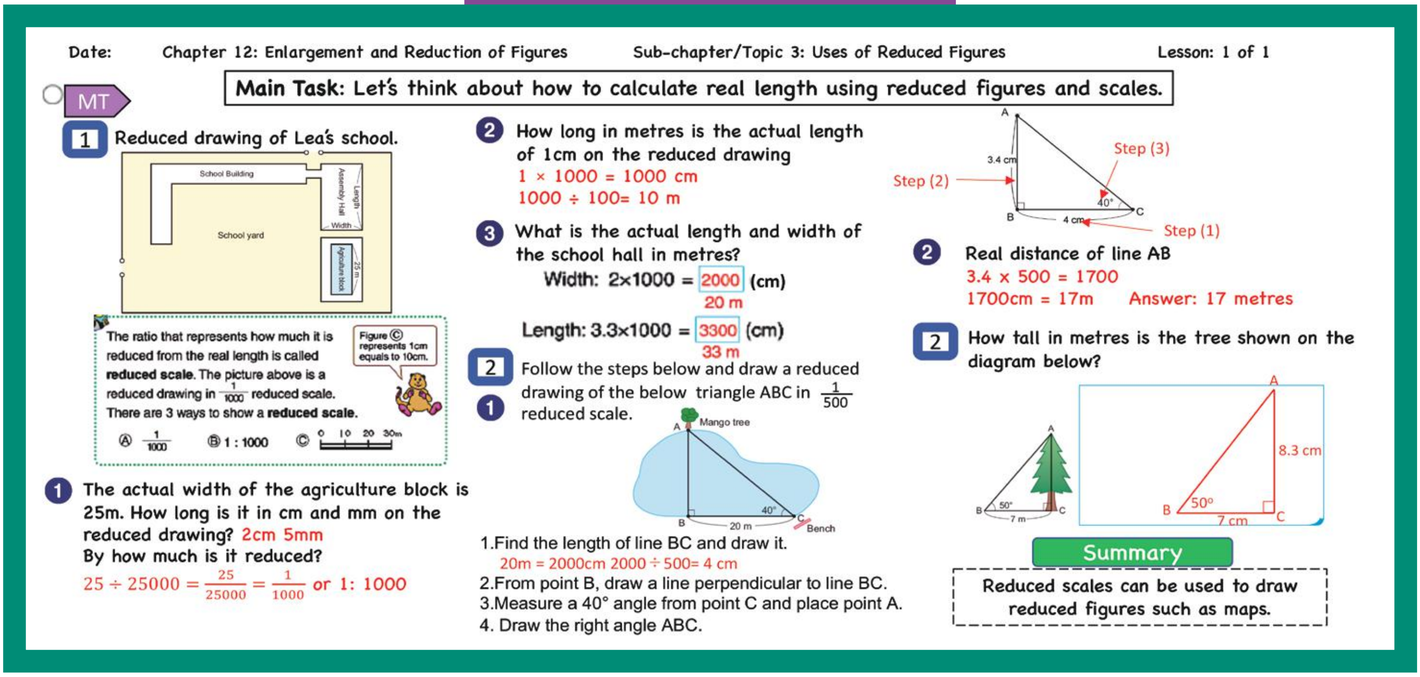
7 Summary

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 12: Enlargement and Reduction of Figures Sub-chapter/Topic 3: Uses of Reduced Figures Lesson: 1 of 1

Main Task: Let's think about how to calculate real length using reduced figures and scales.

MT

1 Reduced drawing of Lea's school.

The ratio that represents how much it is reduced from the real length is called **reduced scale**. The picture above is a reduced drawing in $\frac{1}{1000}$ reduced scale. There are 3 ways to show a **reduced scale**.

Figure © represents 1cm equals to 10cm.

Ⓐ $\frac{1}{1000}$ Ⓑ 1 : 1000 ©

① The actual width of the agriculture block is 25m. How long is it in cm and mm on the reduced drawing? 2cm 5mm
By how much is it reduced?
$25 \div 25000 = \frac{25}{25000} = \frac{1}{1000}$ or 1: 1000

② How long in metres is the actual length of 1cm on the reduced drawing
$1 \times 1000 = 1000$ cm
$1000 \div 100 = 10$ m

③ What is the actual length and width of the school hall in metres?
Width: $2 \times 1000 = \boxed{2000}$ (cm) 20 m
Length: $3.3 \times 1000 = \boxed{3300}$ (cm) 33 m

2 ① Follow the steps below and draw a reduced drawing of the below triangle ABC in $\frac{1}{500}$ reduced scale.

1.Find the length of line BC and draw it.
20m = 2000cm $2000 \div 500 = 4$ cm
2.From point B, draw a line perpendicular to line BC.
3.Measure a 40° angle from point C and place point A.
4. Draw the right angle ABC.

② Real distance of line AB
$3.4 \times 500 = 1700$
1700cm = 17m Answer: 17 metres

2 How tall in metres is the tree shown on the diagram below?

Summary

Reduced scales can be used to draw reduced figures such as maps.

Unit 12

Unit: Enlargement and Reduction of Figures
Exercises, Review and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 118 and 119
Actual Lesson 091 & 092

Lesson Objective

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

Assessment

- Solve the exercises and review exercises correctly.
F S

Prior Knowledge

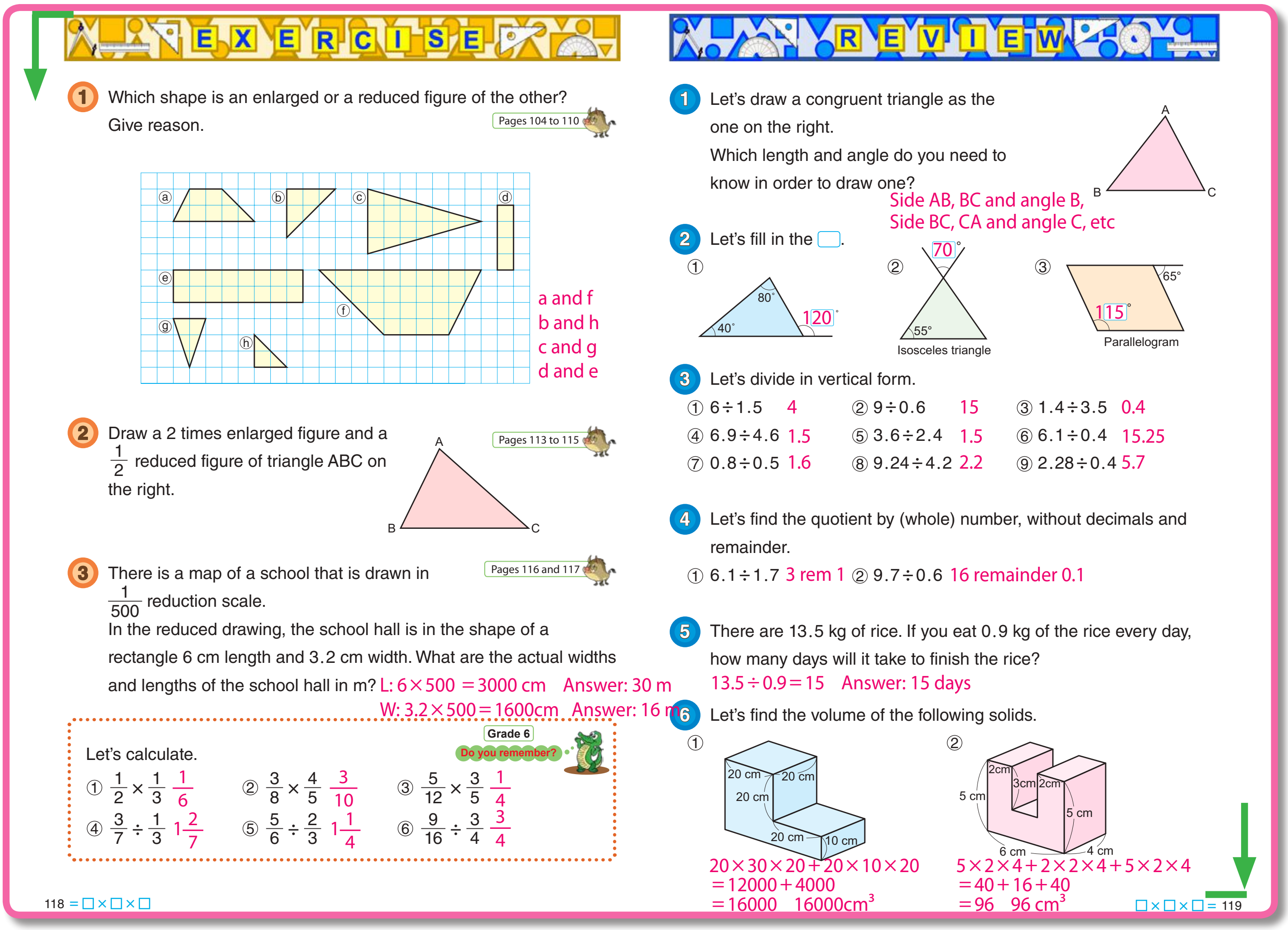
- All the contents learned in this unit on Geometrical Figures.

Preparation

- Evaluation Test

Teacher's Notes

This is the last lesson of Chapter 12.
Students should be encouraged to use the necessary skills learnt 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 finishing all the exercises.
Use the attached evaluation test to conduct assessment for your class after finishing all the exercises, problems and review as a seperate lesson.



EXERCISE

① Which shape is an enlarged or a reduced figure of the other? Give reason.
Pages 104 to 110

a and f
b and h
c and g
d and e

② Draw a 2 times enlarged figure and a $\frac{1}{2}$ reduced figure of triangle ABC on the right.
Pages 113 to 115

③ There is a map of a school that is drawn in $\frac{1}{500}$ reduction scale.
In the reduced drawing, the school hall is in the shape of a rectangle 6 cm length and 3.2 cm width. What are the actual widths and lengths of the school hall in m?
Pages 116 and 117

L: 6 × 500 = 3000 cm Answer: 30 m
W: 3.2 × 500 = 1600cm Answer: 16 m

Let's calculate.

① $\frac{1}{2} \times \frac{1}{3}$ $\frac{1}{6}$
② $\frac{3}{8} \times \frac{4}{5}$ $\frac{3}{10}$
③ $\frac{5}{12} \times \frac{3}{5}$ $\frac{1}{4}$
④ $\frac{3}{7} \div \frac{1}{3}$ $1\frac{2}{7}$
⑤ $\frac{5}{6} \div \frac{2}{3}$ $1\frac{1}{4}$
⑥ $\frac{9}{16} \div \frac{3}{4}$ $\frac{3}{4}$

REVIEW

① Let's draw a congruent triangle as the one on the right.
Which length and angle do you need to know in order to draw one?
Side AB, BC and angle B,
Side BC, CA and angle C, etc

② Let's fill in the ☐.
① 120°
② 70°
③ 115°

③ Let's divide in vertical form.

① 6 ÷ 1.5 4
② 9 ÷ 0.6 15
③ 1.4 ÷ 3.5 0.4
④ 6.9 ÷ 4.6 1.5
⑤ 3.6 ÷ 2.4 1.5
⑥ 6.1 ÷ 0.4 15.25
⑦ 0.8 ÷ 0.5 1.6
⑧ 9.24 ÷ 4.2 2.2
⑨ 2.28 ÷ 0.4 5.7

④ Let's find the quotient by (whole) number, without decimals and remainder.
① 6.1 ÷ 1.7 3 rem 1
② 9.7 ÷ 0.6 16 remainder 0.1

⑤ There are 13.5 kg of rice. If you eat 0.9 kg of the rice every day, how many days will it take to finish the rice?
13.5 ÷ 0.9 = 15 Answer: 15 days

⑥ Let's find the volume of the following solids.

①
20 × 30 × 20 + 20 × 10 × 20
= 12000 + 4000
= 16000 $16000 cm^3$

②
5 × 2 × 4 + 2 × 2 × 4 + 5 × 2 × 4
= 40 + 16 + 40
= 96 $96 cm^3$

118 = ☐ × ☐ × ☐
☐ × ☐ × ☐ = 119

Lesson Flow

1 Complete Exercise ① to ③.

S ① Identify sets of reduced and enlarged figures and explain why.
② Draw an enlarged and reduced figure of triangle ABC.
③ Read the situation and work out the actual widths and lengths from the information given.

2 Complete the Do You Remember exercise.

S Calculate multiplication of fractions and division of fractions.

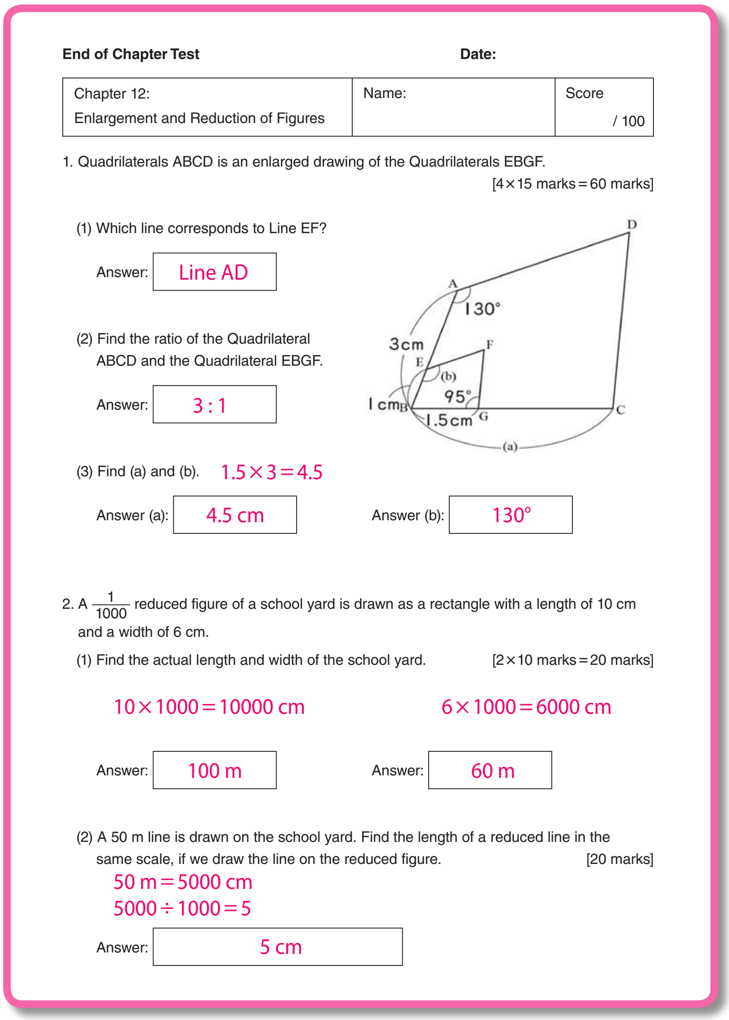
3 Solve the Review from ① to ③.

S ① Draw a congruent triangle to the one given.
② Find the unknown angles for the figures given in ① to ③.
③ Solve problems ① to ⑨ by calculating in vertical form.
④ Divide the decimal numbers to get the quotients as whole numbers.
⑤ Solve the word problem by answering the question.
⑥ Find the volume of the two solids.

4 Complete the Evaluation Test.

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

S Complete the evaluation test.



D
A
130°
3 cm
E
F
(b)
95°
1 cm
B
1.5 cm
G
C
(a)

End of Chapter Test **Date:**

Chapter 12: Enlargement and Reduction of Figures	Name:	Score / 100

1. Quadrilaterals ABCD is an enlarged drawing of the Quadrilaterals EBGF. [4×15 marks = 60 marks]

(1) Which line corresponds to Line EF?

Answer: Line AD

(2) Find the ratio of the Quadrilateral ABCD and the Quadrilateral EBGF.

Answer: 3 : 1

(3) Find (a) and (b). $1.5 \times 3 = 4.5$

Answer (a): 4.5 cm

Answer (b): 130°

2. A $\frac{1}{1000}$ reduced figure of a school yard is drawn as a rectangle with a length of 10 cm and a width of 6 cm.

(1) Find the actual length and width of the school yard. [2×10 marks = 20 marks]

$10 \times 1000 = 10000$ cm

$6 \times 1000 = 6000$ cm

Answer: 100 m

Answer: 60 m

(2) A 50 m line is drawn on the school yard. Find the length of a reduced line in the same scale, if we draw the line on the reduced figure. [20 marks]

50 m = 5000 cm

$5000 \div 1000 = 5$

Answer: 5 cm

End of Chapter Test **Date:**

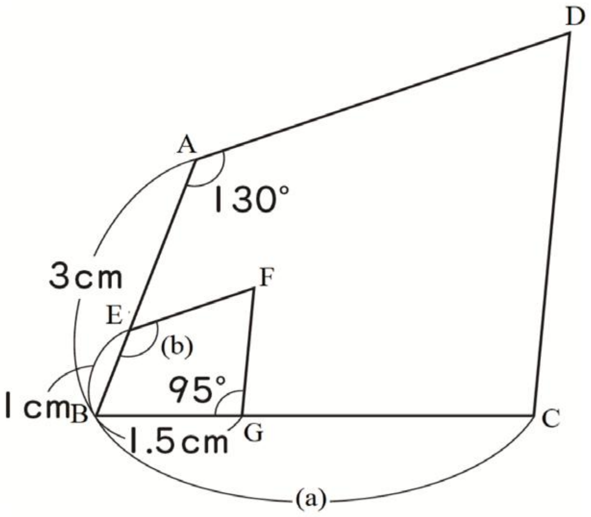
Chapter 12: Enlargement and Reduction of Figures	Name:	Score / 100

1. Quadrilaterals ABCD is an enlarged drawing of the Quadrilaterals EBGF.

[4×15 marks = 60 marks]

(1) Which line corresponds to Line EF?

Answer:



(2) Find the ratio of the Quadrilateral ABCD and the Quadrilateral EBGF.

Answer:

(3) Find (a) and (b).

Answer (a):

Answer (b):

2. A $\frac{1}{1000}$ reduced figure of a school yard is drawn as a rectangle with a length of 10 cm and a width of 6 cm.

(1) Find the actual length and width of the school yard. [2×10 marks = 20 marks]

Answer:

Answer:

(2) A 50 m line is drawn on the school yard. Find the length of a reduced line in the same scale, if we draw the line on the reduced figure. [20 marks]

Answer:

Chapter 13 Proportion and Inverse Proportion

1. Content Standard

6.4.2. Students will be able to appraise the proportional relationship between two numbers or quantities in various simultaneous expression approaches and appreciate their usefulness in daily life.

2. Unit Objectives

- To investigate the relationship of two quantities that change in a related function.
- To understand the concept of proportion. In addition, to learn its characteristics by using equations, tables and graphs.
- To solve problems by applying the relationship of proportion.
- To understand the relationship of inverse proportion.

3. Teaching Overview

Students learned simple proportional relationships in Grade 5.
This unit will be the preparation of learning linear functions in the further grades.

Proportion :

Students are to understand proportional relationship such as "One of 2 quantities changing together changes twice, thrice, 4 times, etc., another quantity changes in the same manner". They are also required to express the relationship in a mathematical sentence using × and y.

Graphs of Proportion :

Students learn how to express the relationship between 2 quantities as a graph.
They also learn how to interpret proportional graphs.

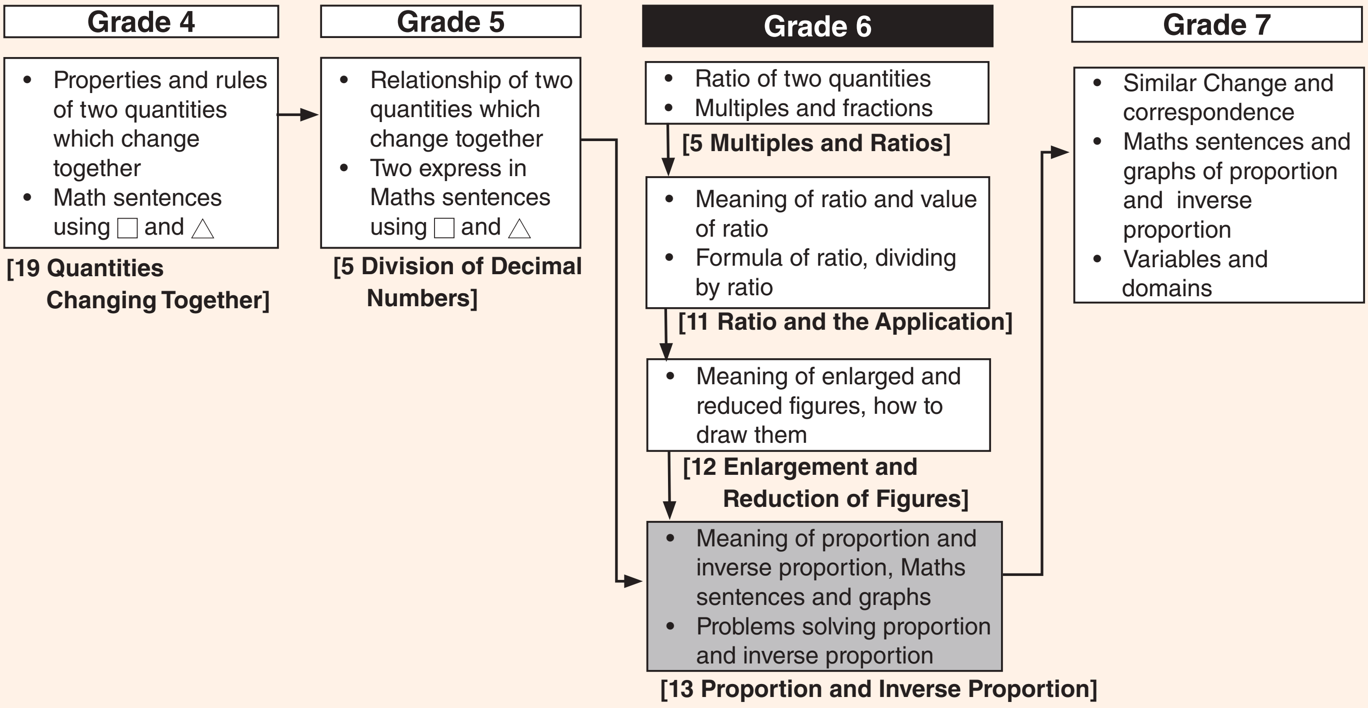
Using Properties of Proportion :

They express proportional relationships given as tables or situations as a mathematical sentence.
They should find that there is a constant condition.

Inverse Proportion :

They learn the meaning of inverse proportions, their mathematical expressions and graphs while paying attention to the differences from proportion.

4. Related Learning Contents



Grade 4

- Properties and rules of two quantities which change together
- Math sentences using □ and △

[19 Quantities Changing Together]

Grade 5

- Relationship of two quantities which change together
- Two express in Maths sentences using □ and △

[5 Division of Decimal Numbers]

Grade 6

- Ratio of two quantities
- Multiples and fractions

[5 Multiples and Ratios]

- Meaning of ratio and value of ratio
- Formula of ratio, dividing by ratio

[11 Ratio and the Application]

- Meaning of enlarged and reduced figures, how to draw them

[12 Enlargement and Reduction of Figures]

- Meaning of proportion and inverse proportion, Maths sentences and graphs
- Problems solving proportion and inverse proportion

[13 Proportion and Inverse Proportion]

Grade 7

- Similar Change and correspondence
- Maths sentences and graphs of proportion and inverse proportion
- Variables and domains

Unit 13

Unit: Proportion and Inverse Proportion

Sub-unit: 1. Proportion

Lesson 1 of 7

Textbook Page : 120 and 121
Actual Lesson 093

Sub-unit Objectives

- To understand the relationship of how two quantities change together at the same time.
- To estimate and explain the relationship of how two quantities change together.

Lesson Objectives

- To understand how two quantities change in a related manner through actual activities that shows the relationship between the number of paper and its weight and thickness.
- To estimate and explain how two quantities change in a related manner.

Prior Knowledge

- Proportion. (Grade 5)

Preparation

- Stack of paper, scale and ruler

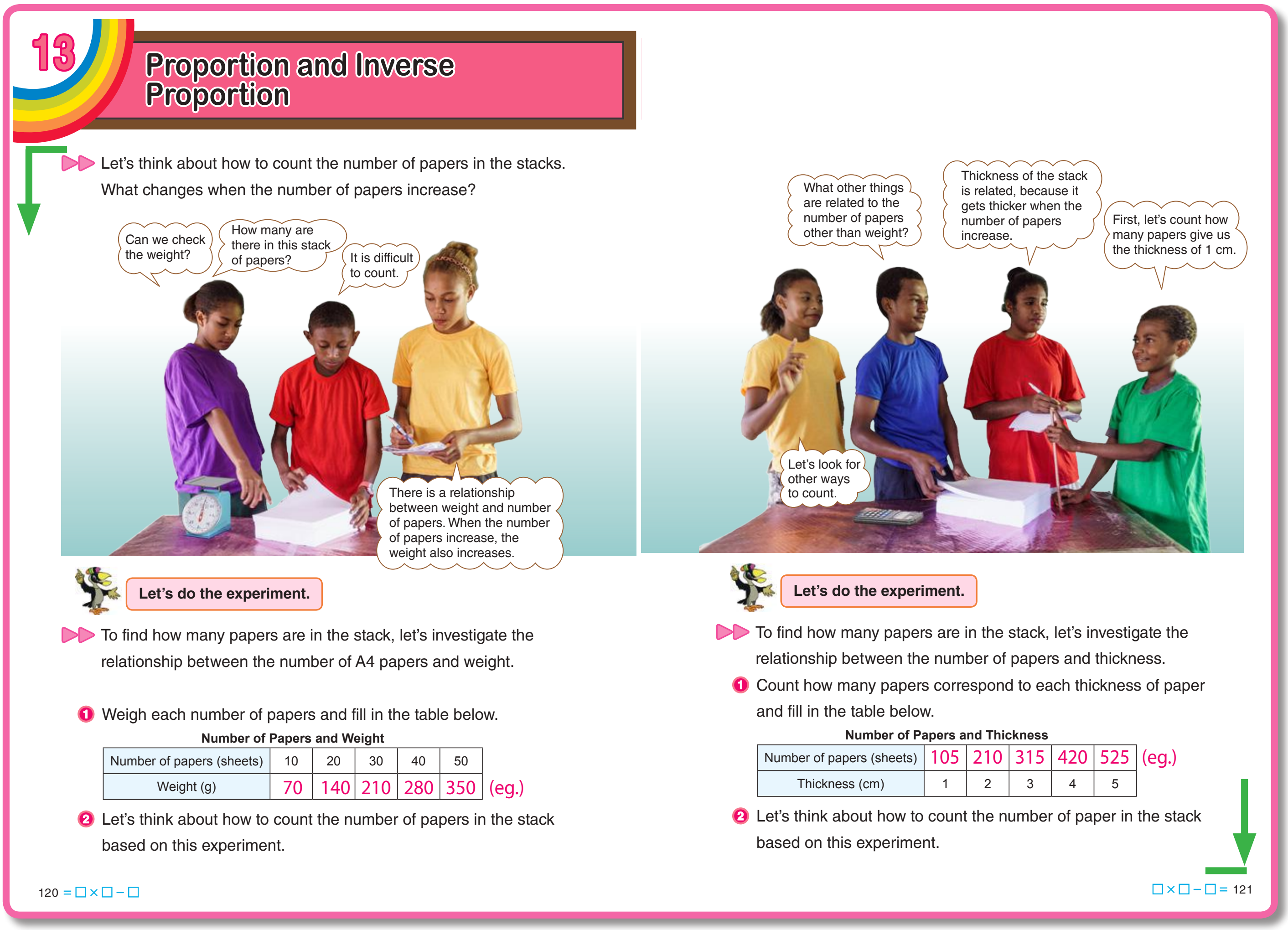
Assessment

- Investigate and explain how two quantities change relatively. F
- Explain the concept of proportion in the experiments. S

Teacher's Notes

Experiment Tips

- Before performing the experiment you should do a trial before the lesson.
- Use regular photocopy paper available in school. Weigh and measure a sheet of paper.
- Be careful that there is no dirt or air between papers before the experiment as few errors may occur.
- Advice students to measure several times until value becomes stable before filling in the table.
- Scales are required in this lesson.



13 **Proportion and Inverse Proportion**

▷▷ Let's think about how to count the number of papers in the stacks. What changes when the number of papers increase?

Can we check the weight?

How many are there in this stack of papers?

It is difficult to count.

There is a relationship between weight and number of papers. When the number of papers increase, the weight also increases.

Let's do the experiment.

▷▷ To find how many papers are in the stack, let's investigate the relationship between the number of A4 papers and weight.

① Weigh each number of papers and fill in the table below.

Number of Papers and Weight

Number of papers (sheets)	10	20	30	40	50	
Weight (g)	70	140	210	280	350	(eg.)

② Let's think about how to count the number of papers in the stack based on this experiment.

What other things are related to the number of papers other than weight?

Thickness of the stack is related, because it gets thicker when the number of papers increase.

First, let's count how many papers give us the thickness of 1 cm.

Let's look for other ways to count.

Let's do the experiment.

▷▷ To find how many papers are in the stack, let's investigate the relationship between the number of papers and thickness.

① Count how many papers correspond to each thickness of paper and fill in the table below.

Number of Papers and Thickness

Number of papers (sheets)	105	210	315	420	525	(eg.)
Thickness (cm)	1	2	3	4	5	

② Let's think about how to count the number of paper in the stack based on this experiment.

120 = □×□−□

□×□−□= 121

Lesson Flow

1 To know about the number of papers in stacks without counting.

T ▶▶ Ask students to discuss about the picture on the left and the speech bubbles.

S Realise that it is difficult to count the papers one by one and think of other methods of finding the number without counting.

T Introduce the main task and present a stack of A4 papers and ask students to think of ways on how to count them.

2 Discuss the method to use.

T What changes when the number of paper increases?

S Possible student responses:
- As the number of papers increase the pile becomes thicker.
- As the number of papers increase, the pile becomes heavier.

T Confirm students responses and emphasise the relationship between weight and the number of papers and thickness and the number of papers.

3 ▶▶ Do Experiment No.1 in groups.

T/S ① Weigh each number of papers and fill in the table.

S Experiment 1: In small groups weigh the number of papers and fill in the table.

4 ② Think about how to determine the relationship between the number of papers and the weight.

T What is the weight of 10 sheets of paper?

S 70 g.

TN Out of curiosity students may want to find the weight of 1 sheet of paper.

T What is the weight of 20 sheets of paper?

S 140 g.

T What changes when the number of papers increase?

S When the number of sheets of paper increases, its weight increases as well.

T Ask one or two groups to share their findings to the class.

TN Let students find out the relationships of what they have learned and lead them to think of more ideas on changing quantities.

5 Examine the relationship between the number of sheets of paper and its thickness.

T ▶▶ Ask students to discuss about the picture on the right and speech bubbles.

S ① Experiment 2: Count how many papers correspond to each thickness of paper and fill in the table.

T/S In small groups measure the thickness of the number of papers and fill in the table.

6 ② Think about how to determine the number of sheets of paper in their groups.

T How many sheets of paper make 1 cm?

S 105 sheets of paper.

TN For different types of papers when the thickness is 1 cm, the measured value becomes 90 - 110 sheets of papers depending on the paper type.

T How many sheets of paper make 2 cm?

S 210 sheets of paper.

T What changes when the thickness increases?

S The number of sheets of paper increases, as the thickness increases.

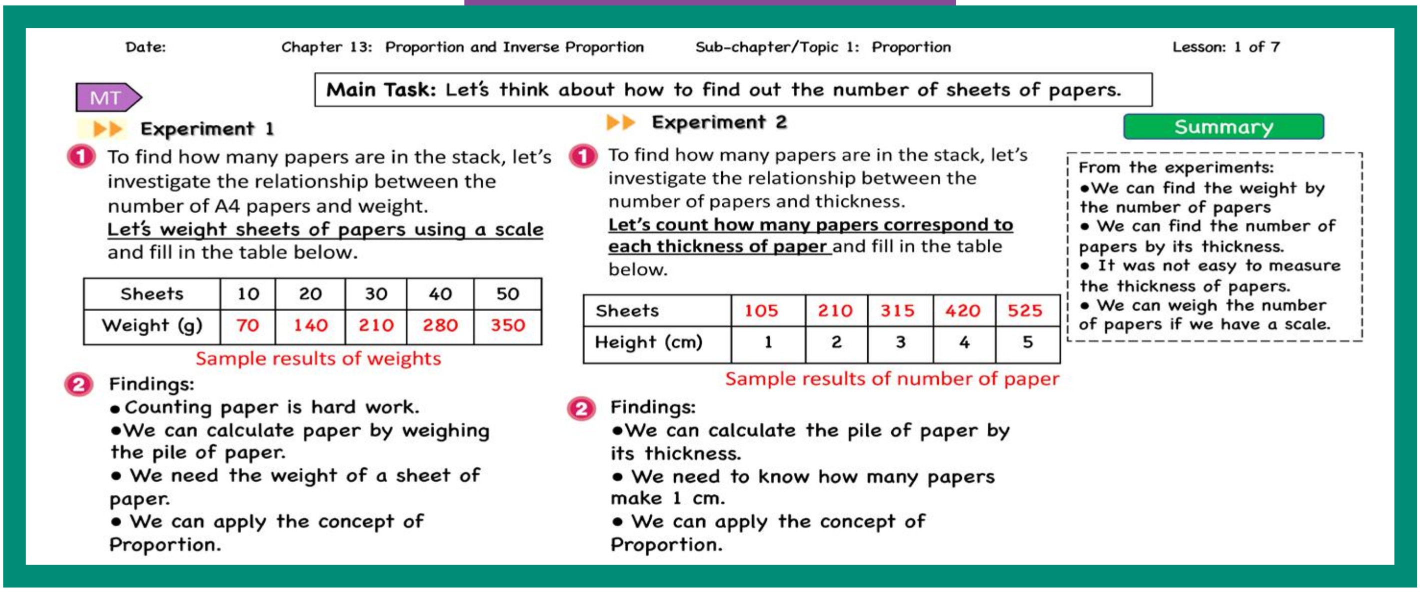
7 Summary

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 13: Proportion and Inverse Proportion Sub-chapter/Topic 1: Proportion Lesson: 1 of 7

MT **Main Task:** Let's think about how to find out the number of sheets of papers.

▶▶ **Experiment 1**

① To find how many papers are in the stack, let's investigate the relationship between the number of A4 papers and weight.
Let's weight sheets of papers using a scale and fill in the table below.

Sheets	10	20	30	40	50
Weight (g)	70	140	210	280	350

Sample results of weights

② Findings:
- Counting paper is hard work.
- We can calculate paper by weighing the pile of paper.
- We need the weight of a sheet of paper.
- We can apply the concept of Proportion.

▶▶ **Experiment 2**

① To find how many papers are in the stack, let's investigate the relationship between the number of papers and thickness.
Let's count how many papers correspond to each thickness of paper and fill in the table below.

Sheets	105	210	315	420	525
Height (cm)	1	2	3	4	5

Sample results of number of paper

② Findings:
- We can calculate the pile of paper by its thickness.
- We need to know how many papers make 1 cm.
- We can apply the concept of Proportion.

Summary

From the experiments:
- We can find the weight by the number of papers
- We can find the number of papers by its thickness.
- It was not easy to measure the thickness of papers.
- We can weigh the number of papers if we have a scale.

Unit
13

Unit: Proportion and Inverse Proportion
Sub-unit: 1. Proportion
Lesson 2 of 7

Textbook Pages : 122 and 123
Actual Lesson 094

Lesson Objective

- To determine the relationship between how the number of sheets of paper and its weight change together.

Prior Knowledge

- Experiments on number of sheets of paper and weight from previous lesson

Preparation

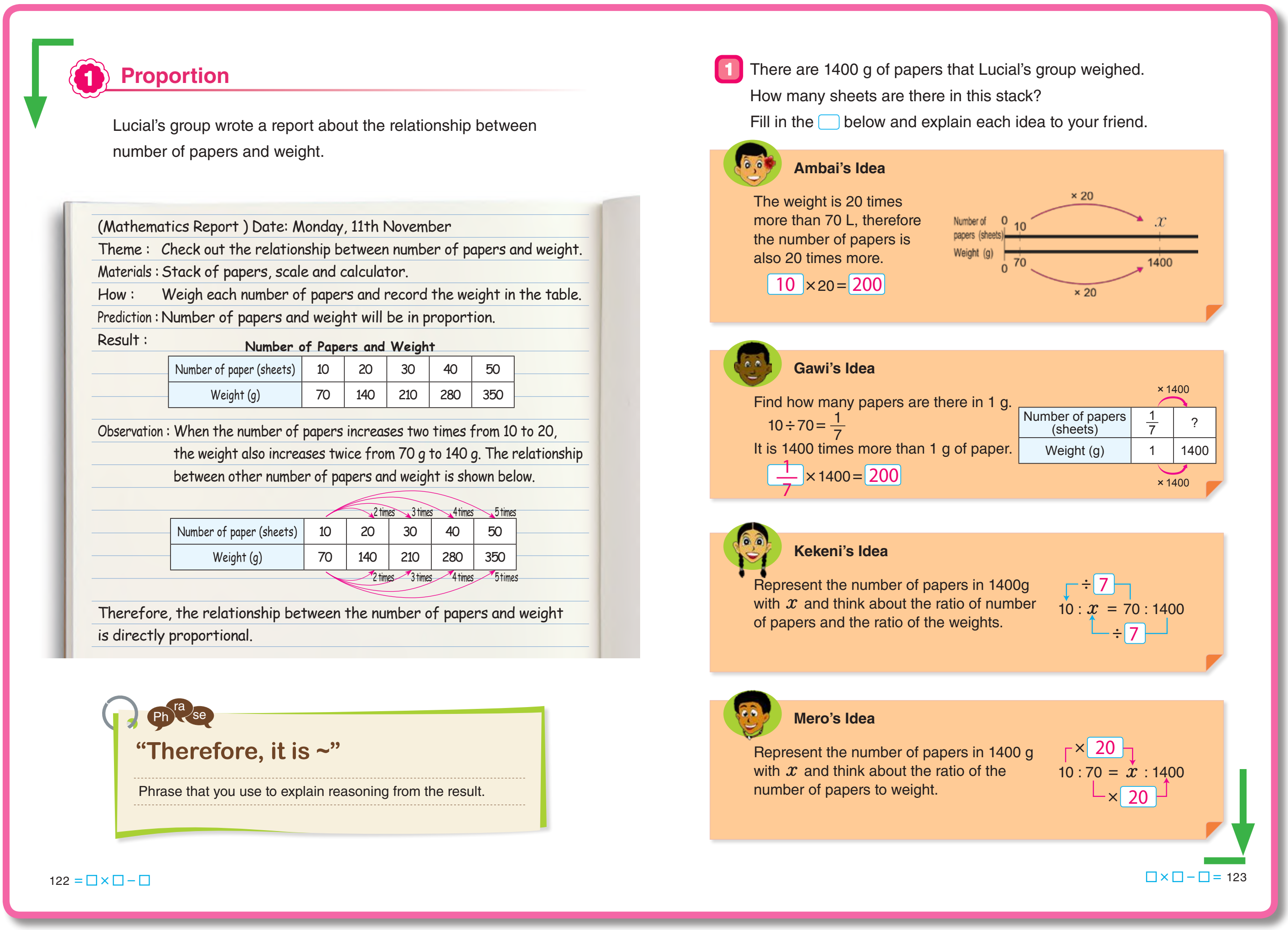
- Copy of the report on a chart, four ideas on the chart

Assessment

- Explain the relationship of how paper and weight change together. F
- Understand the meaning of proportion. S

Teacher's Notes

It is easier to find the rule between two numbers of objects by making a table that shows the set of two numbers of objects that change together.
Have the students to use the term "therefore" when they explain the reason from the result.



① Proportion

Lucial's group wrote a report about the relationship between number of papers and weight.

(Mathematics Report) Date: Monday, 11th November
Theme : Check out the relationship between number of papers and weight.
Materials : Stack of papers, scale and calculator.
How : Weigh each number of papers and record the weight in the table.
Prediction : Number of papers and weight will be in proportion.
Result :

Number of Papers and Weight

Number of paper (sheets)	10	20	30	40	50
Weight (g)	70	140	210	280	350

Observation : When the number of papers increases two times from 10 to 20, the weight also increases twice from 70 g to 140 g. The relationship between other number of papers and weight is shown below.

	2 times	3 times	4 times	5 times	
Number of paper (sheets)	10	20	30	40	50
Weight (g)	70	140	210	280	350
	2 times	3 times	4 times	5 times	

Therefore, the relationship between the number of papers and weight is directly proportional.

Phrase
"Therefore, it is ~"
Phrase that you use to explain reasoning from the result.

122 = □×□−□

1 There are 1400 g of papers that Lucial's group weighed.
How many sheets are there in this stack?
Fill in the □ below and explain each idea to your friend.

Ambai's Idea

The weight is 20 times more than 70 L, therefore the number of papers is also 20 times more.

$\boxed{10} \times 20 = \boxed{200}$

Gawi's Idea

Find how many papers are there in 1 g.

$10 \div 70 = \frac{1}{7}$

It is 1400 times more than 1 g of paper.

$\boxed{\frac{1}{7}} \times 1400 = \boxed{200}$

	× 1400	
Number of papers (sheets)	$\frac{1}{7}$	?
Weight (g)	1	1400
	× 1400	

Kekeni's Idea

Represent the number of papers in 1400g with x and think about the ratio of number of papers and the ratio of the weights.

$$\underbrace{\overbrace{10 : x = 70 : 1400}^{\div \boxed{7}}}_{\div \boxed{7}}$$

Mero's Idea

Represent the number of papers in 1400 g with x and think about the ratio of the number of papers to weight.

$$\underbrace{\overbrace{10 : 70 = x : 1400}^{\times \boxed{20}}}_{\times \boxed{20}}$$

□×□−□= 123

Lesson Flow

1 Review the previous lesson.

2 Think about and discuss how the number of sheets of paper and weight are related.

T Ask students to look at the table of Experiment 1 and think about how the weight of paper changes when the number of sheets of paper increases twice, three times, four times,...etc.

T As one quantity increases, how does the other quantity change?

S The weight of the paper increases with the number of sheets of paper.

T What kind of relationship is found in the way the two quantities change?

S As the sheets of paper increased by 2 times, the weight also increased by 2 times.

T Introduce the phrase Therefore, it is...

3 Understand the meaning of Proportion.

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

T/S ① Read and understand the given situation.

T Allow students to read through the textbook individually and study the ideas.

TN From what the students had learned, they may give the following ideas:

T How many sheets of paper are there?

S Since 10 sheets of paper weigh 70 g, 1 sheet of paper weigh 7 g.
For 1400 g, $1400 \div 7 = 200$ (sheets)

S Since weight 1400 g is twenty times more than 70 g, the number of sheets of paper has become 20 times more as well.
$10 \times 20 = 200$ (sheets)

S Find out the number of sheets per 1 g.
$\frac{10}{70} = \frac{1}{7}$ and so $\frac{1}{7} \times 1400 = 200$ (sheets)

S Apply concept of ratio when 1400 g is given in x set of papers.
Then $10 : x = 70 : 1400$ so $x = 20$.

S Apply one of the ideas in the textbook to their experiment.

4 Compare and share their ideas in their small groups.

S Therefore, the relationship between the numbers of papers and weight is directly proportional.

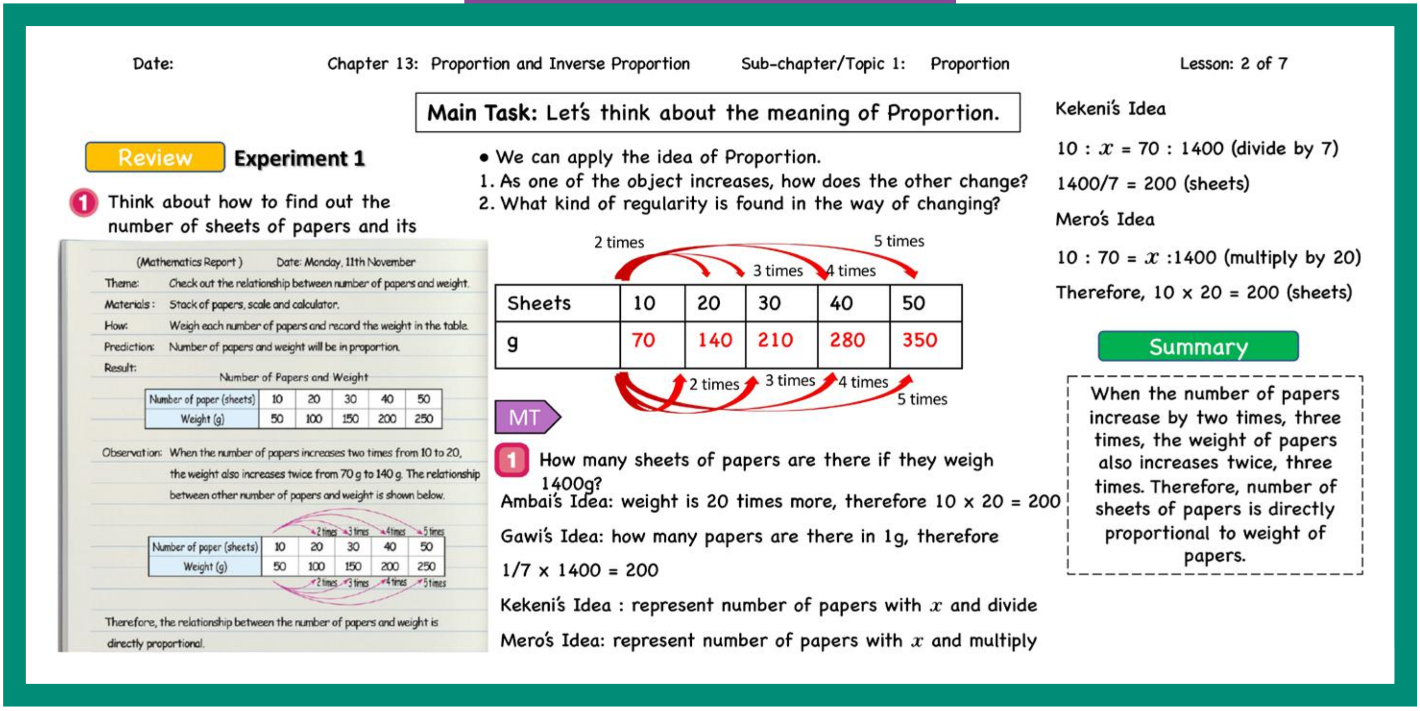
5 Summary

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 13: Proportion and Inverse Proportion Sub-chapter/Topic 1: Proportion Lesson: 2 of 7

Main Task: Let's think about the meaning of Proportion.

Review **Experiment 1**

① Think about how to find out the number of sheets of papers and its

(Mathematics Report) Date: Monday, 11th November

Theme: Check out the relationship between number of papers and weight.

Materials: Stack of papers, scale and calculator.

How: Weigh each number of papers and record the weight in the table.

Prediction: Number of papers and weight will be in proportion.

Result:

Number of Papers and Weight

Number of paper (sheets)	10	20	30	40	50
Weight (g)	50	100	150	200	250

Observation: When the number of papers increases two times from 10 to 20, the weight also increases twice from 70 g to 140 g. The relationship between other number of papers and weight is shown below.

Number of paper (sheets)	10	20	30	40	50
Weight (g)	50	100	150	200	250

Therefore, the relationship between the number of papers and weight is directly proportional.

- We can apply the idea of Proportion.

1. As one of the object increases, how does the other change?
2. What kind of regularity is found in the way of changing?

Sheets	10	20	30	40	50
g	70	140	210	280	350

MT

① How many sheets of papers are there if they weigh 1400g?

Ambai's Idea: weight is 20 times more, therefore $10 \times 20 = 200$

Gawi's Idea: how many papers are there in 1g, therefore

$1/7 \times 1400 = 200$

Kekeni's Idea : represent number of papers with x and divide

Mero's Idea: represent number of papers with x and multiply

Kekeni's Idea

$10 : x = 70 : 1400$ (divide by 7)

$1400/7 = 200$ (sheets)

Mero's Idea

$10 : 70 = x : 1400$ (multiply by 20)

Therefore, $10 \times 20 = 200$ (sheets)

Summary

When the number of papers increase by two times, three times, the weight of papers also increases twice, three times. Therefore, number of sheets of papers is directly proportional to weight of papers.

Unit 13

Unit: Proportion and Inverse Proportion

Sub-unit: 1. Proportion

Lesson 3 of 7

Textbook Page : 124
Actual Lesson 095

Lesson Objective

- o determine the relationship between the number of sheets of paper and its thickness on how they change together.

Prior Knowledge

- Experiment on number of sheets of papers and its thickness

Preparation

- Table for task 2

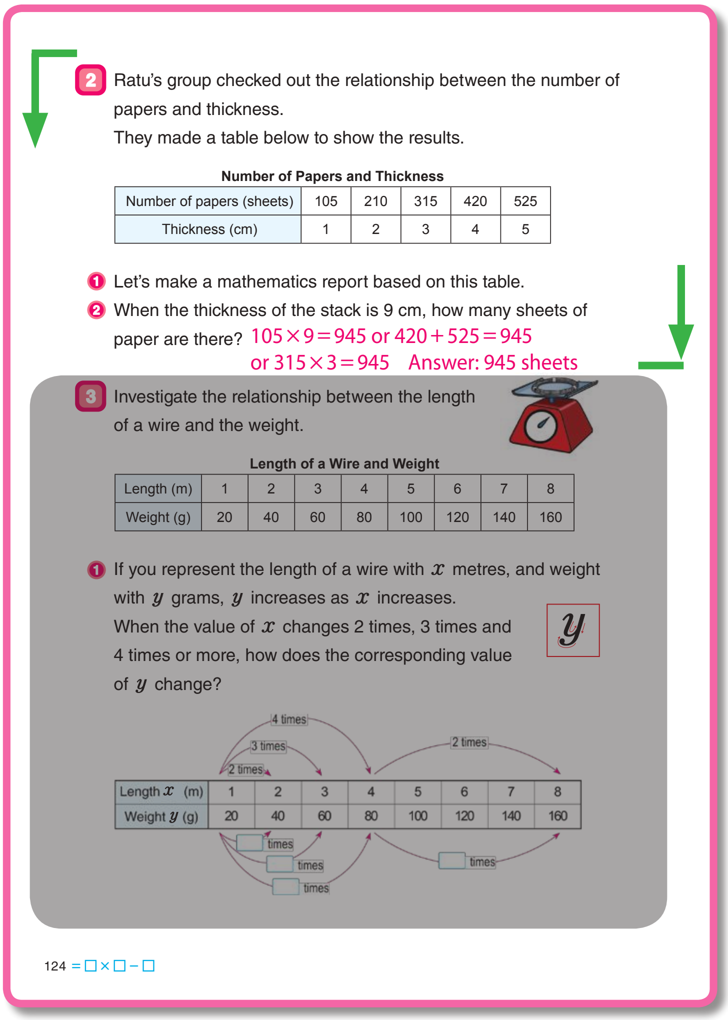
Assessment

- Explain the relationship of paper and its thickness. F S
- Develop the meaning of proportion using the number of papers and its thickness. S

Teacher's Notes

It is easier to find the rule between two quantities by making a table that shows the set of two numbers of objects that change in a related manner.
Have the students to use the term "therefore" when they explain the reason from the result.
It is easy to find the relationship between two quantities by arranging two quantities which change together on a table.

- How does the amount of one change when the other amount increases?
- Are there any rules in the way of change?



2 Ratu's group checked out the relationship between the number of papers and thickness.
They made a table below to show the results.

Number of Papers and Thickness

Number of papers (sheets)	105	210	315	420	525
Thickness (cm)	1	2	3	4	5

① Let's make a mathematics report based on this table.

② When the thickness of the stack is 9 cm, how many sheets of paper are there? $105 \times 9 = 945$ or $420 + 525 = 945$ or $315 \times 3 = 945$ Answer: 945 sheets

3 Investigate the relationship between the length of a wire and the weight.

Length of a Wire and Weight

Length (m)	1	2	3	4	5	6	7	8
Weight (g)	20	40	60	80	100	120	140	160

① If you represent the length of a wire with x metres, and weight with y grams, y increases as x increases.
When the value of x changes 2 times, 3 times and 4 times or more, how does the corresponding value of y change?

Length x (m)	1	2	3	4	5	6	7	8
Weight y (g)	20	40	60	80	100	120	140	160

124 = ☐ × ☐ − ☐

Lesson Flow

1 Review the previous lesson.

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

2 Make a mathematics report based on Ratu's group's table.

T/S ② Read and understand the given situation.

T Ask students to work in groups to think about how the thickness of paper changes when the number of sheets of paper increases.

S ① Write their report as in the previous lesson stating the theme, materials, how, prediction, result and observation.

T As one quantity increases, how does the other quantity change?

S The thickness of the paper increases with the number of sheets of papers.

T What kind of relationship is found in the way the two quantities change?

S As the sheets of paper are increased by 2 times, the thickness also increases by 2 times.

3 Relationship between the number of papers and thickness.

T ② Allow students to work individually.
When the thickness of paper is 9 cm, how many sheets of paper are there?

S When the thickness is 1cm, there are 105 sheets of paper. So when it is 9 cm, the number of sheets of paper becomes 9 times more.
Therefore, 105 × 9 = 945 (sheets).

S Add the number of sheets of paper when the thickness is 4 cm and 5 cm.
420 + 525 = 945 (sheets).

S When the thickness is 3 cm, there are 315 sheets of paper.
So when it is 9 cm, the number of sheets of paper becomes three times more 315 × 3 = 945 (sheets).

4 Compare and share their ideas in their groups.

S Therefore, the relationship between the thickness and the numbers of sheets of paper are in proportion.

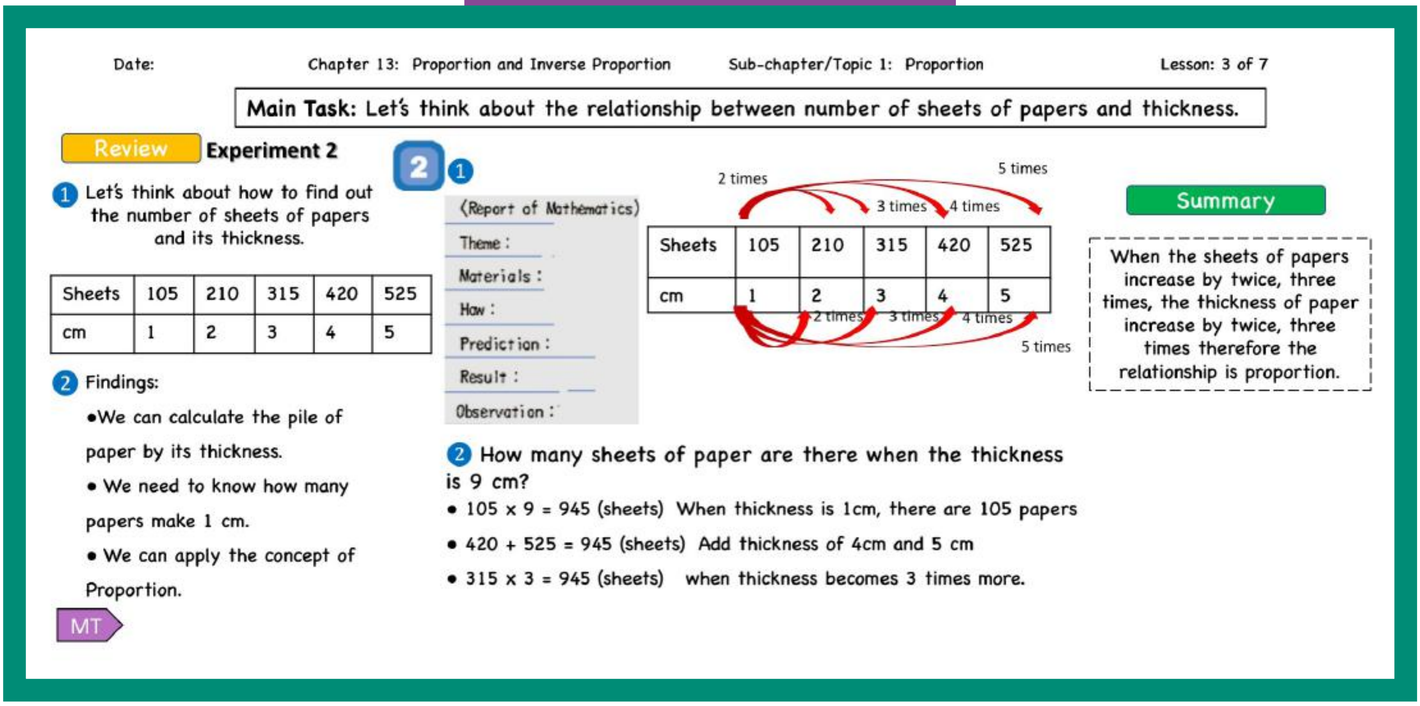
5 Summary

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 13: Proportion and Inverse Proportion Sub-chapter/Topic 1: Proportion Lesson: 3 of 7

Main Task: Let's think about the relationship between number of sheets of papers and thickness.

Review **Experiment 2**

① Let's think about how to find out the number of sheets of papers and its thickness.

Sheets	105	210	315	420	525
cm	1	2	3	4	5

② Findings:

- We can calculate the pile of paper by its thickness.
- We need to know how many papers make 1 cm.
- We can apply the concept of Proportion.

MT

2 ①

(Report of Mathematics)
Theme :
Materials :
How :
Prediction :
Result :
Observation :

Sheets	105	210	315	420	525
cm	1	2	3	4	5

Summary

When the sheets of papers increase by twice, three times, the thickness of paper increase by twice, three times therefore the relationship is proportion.

② How many sheets of paper are there when the thickness is 9 cm?

- 105 x 9 = 945 (sheets) When thickness is 1cm, there are 105 papers
- 420 + 525 = 945 (sheets) Add thickness of 4cm and 5 cm
- 315 x 3 = 945 (sheets) when thickness becomes 3 times more.

Unit
13

Unit: Proportion and Inverse Proportion

Sub-unit: 1. Proportion

Lesson 4 of 7

Textbook Page :
124 and 125
Actual Lesson 096

Lesson Objectives

- To determine how lengths and weight of wire change.
- To put together the meaning of proportion.

Prior Knowledge

- Proportional relationships

Preparation

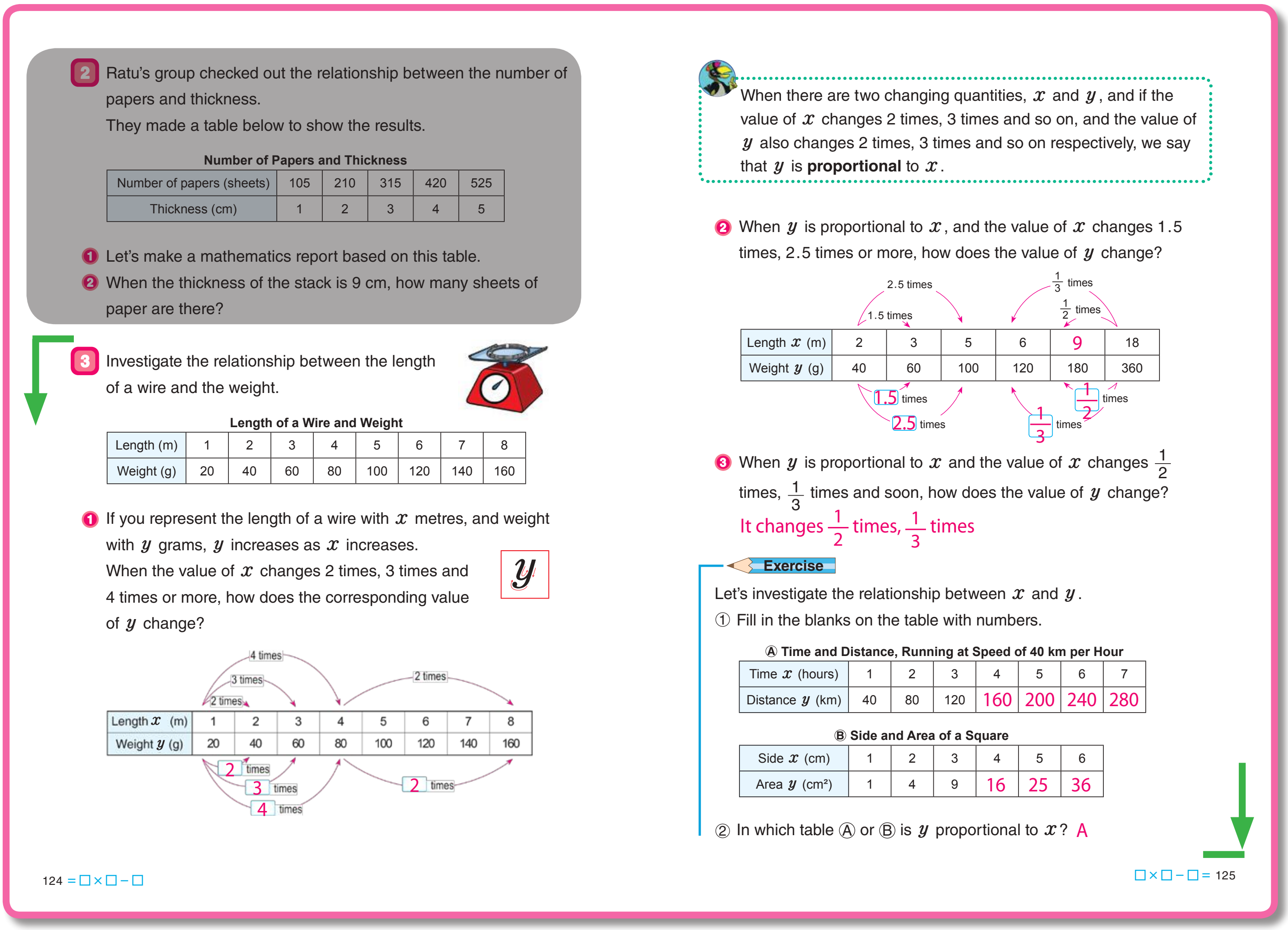
- Task tables on the chart

Assessment

- Explain the relationships of lengths and weight of wire. F
- Explain the 2 changing quantities in a proportional relationship. S
- Complete the exercises correctly. S

Teacher's Notes

Making meaning of x and y variable in the relationship of Proportion.
In general any two quantities (x and y) when one (x) changes 2 times, 3 times, 4 times….. and the other (y) changes in the same manner then we say they are in proportion.
In the same way, when (x) changes $\frac{1}{2}$ times and $\frac{1}{3}$ times, (y) also changes $\frac{1}{2}$ times and $\frac{1}{3}$ times.



2 Ratu's group checked out the relationship between the number of papers and thickness.
They made a table below to show the results.

Number of Papers and Thickness

Number of papers (sheets)	105	210	315	420	525
Thickness (cm)	1	2	3	4	5

① Let's make a mathematics report based on this table.
② When the thickness of the stack is 9 cm, how many sheets of paper are there?

3 Investigate the relationship between the length of a wire and the weight.

Length of a Wire and Weight

Length (m)	1	2	3	4	5	6	7	8
Weight (g)	20	40	60	80	100	120	140	160

① If you represent the length of a wire with x metres, and weight with y grams, y increases as x increases.
When the value of x changes 2 times, 3 times and 4 times or more, how does the corresponding value of y change?

y

4 times
3 times
2 times
2 times

Length x (m)	1	2	3	4	5	6	7	8
Weight y (g)	20	40	60	80	100	120	140	160

2 times
3 times
4 times
2 times

124 = □×□−□

When there are two changing quantities, x and y, and if the value of x changes 2 times, 3 times and so on, and the value of y also changes 2 times, 3 times and so on respectively, we say that y is **proportional** to x.

② When y is proportional to x, and the value of x changes 1.5 times, 2.5 times or more, how does the value of y change?

2.5 times
1.5 times
$\frac{1}{3}$ times
$\frac{1}{2}$ times

Length x (m)	2	3	5	6	9	18
Weight y (g)	40	60	100	120	180	360

1.5 times
2.5 times
$\frac{1}{2}$ times
$\frac{1}{3}$ times

③ When y is proportional to x and the value of x changes $\frac{1}{2}$ times, $\frac{1}{3}$ times and soon, how does the value of y change?
It changes $\frac{1}{2}$ times, $\frac{1}{3}$ times

Exercise

Let's investigate the relationship between x and y.
① Fill in the blanks on the table with numbers.

Ⓐ Time and Distance, Running at Speed of 40 km per Hour

Time x (hours)	1	2	3	4	5	6	7
Distance y (km)	40	80	120	160	200	240	280

Ⓑ Side and Area of a Square

Side x (cm)	1	2	3	4	5	6
Area y (cm²)	1	4	9	16	25	36

② In which table Ⓐ or Ⓑ is y proportional to x? A

□×□−□= 125

Lesson Flow

1 Review the previous lesson.

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

2 ③ Investigate the relationship of length and weight based on the table.

T ① Ask students to write in their exercise book what they find out from the table.

S Expected Responses.

- When length increases 2 times, 3 times, the weight also increased by 2 times, 3 times.
- When length increases by 1 m, the weight increase by 20g.
- Weight Length = 20 (the answer is constant)
- Weight is 20 times as much as length.

3 Important point

T/S Explain the important point in the box .

4 ② Determine if the relationship of proportion exists.

T When y is proportional to x and the value of x changes 1.5 times, 2.5 times and so on, how does the value of y change?

S Fill in the blank squares (□) in the table.

S When the value of x changes 1.5 times and 2.5 times, y also changes 1.5 times and 2.5 times. Therefore, y is proportional to x.

5 ① Determine if the relationship of proportion exists.

T When y is proportional t x and the value of x changes $\frac{1}{2}$ times, $\frac{1}{3}$ times and so on, how does the value of y change?

S Fill in the blank squares (□) in the table.

S When the value of x changes $\frac{1}{2}$ times and $\frac{1}{3}$ times, y also changes $\frac{1}{2}$ times and $\frac{1}{3}$ times. Therefore, y is proportional to x.

6 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

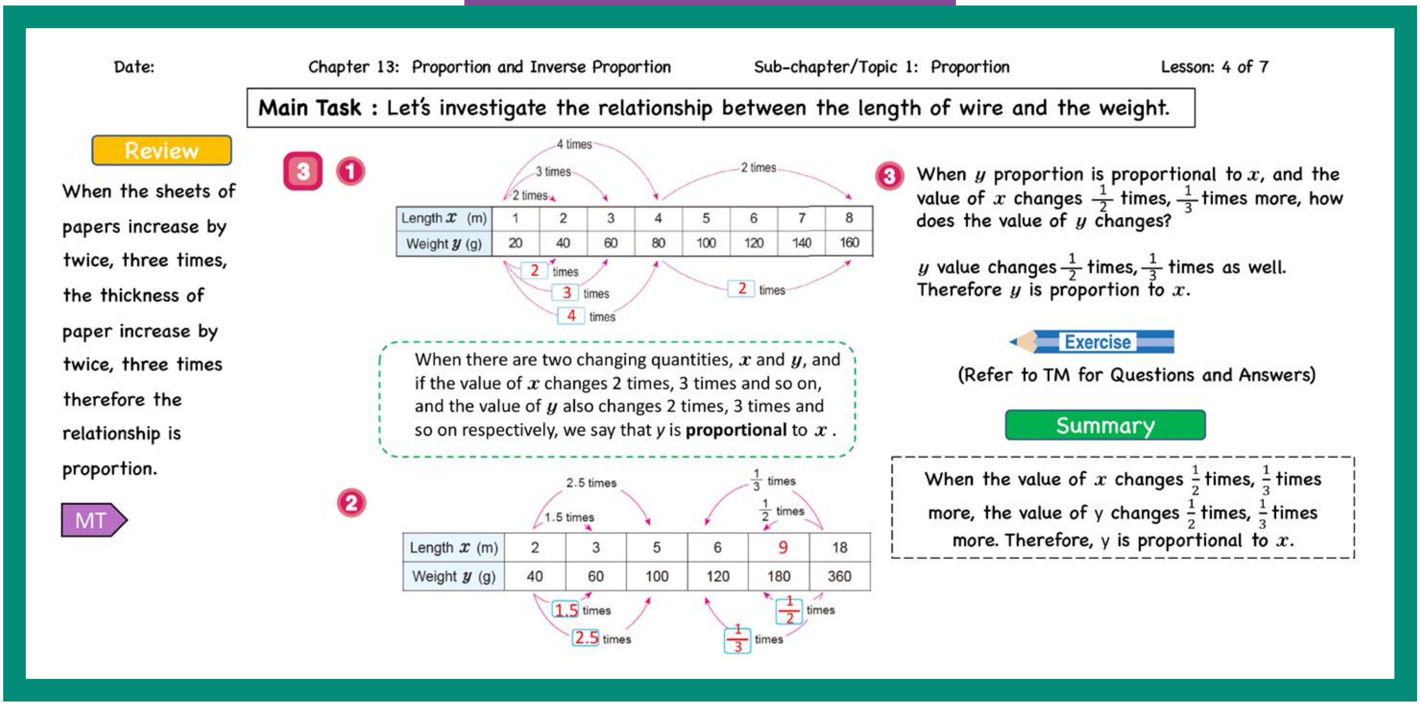
7 Summary

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



Date: Chapter 13: Proportion and Inverse Proportion Sub-chapter/Topic 1: Proportion Lesson: 4 of 7

Main Task : Let's investigate the relationship between the length of wire and the weight.

Review

When the sheets of papers increase by twice, three times, the thickness of paper increase by twice, three times therefore the relationship is proportion.

MT

③ ①

Length x (m)	1	2	3	4	5	6	7	8
Weight y (g)	20	40	60	80	100	120	140	160

When there are two changing quantities, x and y, and if the value of x changes 2 times, 3 times and so on, and the value of y also changes 2 times, 3 times and so on respectively, we say that y is **proportional** to x .

②

Length x (m)	2	3	5	6	9	18
Weight y (g)	40	60	100	120	180	360

③ When y proportion is proportional to x, and the value of x changes $\frac{1}{2}$ times, $\frac{1}{3}$ times more, how does the value of y changes?

y value changes $\frac{1}{2}$ times, $\frac{1}{3}$ times as well. Therefore y is proportion to x.

Exercise

(Refer to TM for Questions and Answers)

Summary

When the value of x changes $\frac{1}{2}$ times, $\frac{1}{3}$ times more, the value of y changes $\frac{1}{2}$ times, $\frac{1}{3}$ times more. Therefore, y is proportional to x.

Unit
13

Unit: Proportion and Inverse Proportion
Sub-unit: 1. Proportion
Lesson 5 of 7

Textbook Page :
126 and 127
Actual Lesson 097

Lesson Objectives

- To investigate the rules of proportion with the relationship of volume and depths of water.
- To explain the relationship of proportion in the form of an equation.

Assessment

- Explain the rules of proportion with the relationship of volume and depths of water. F
- Identify that the relationship of proportion can be described in an equation. S

Prior Knowledge

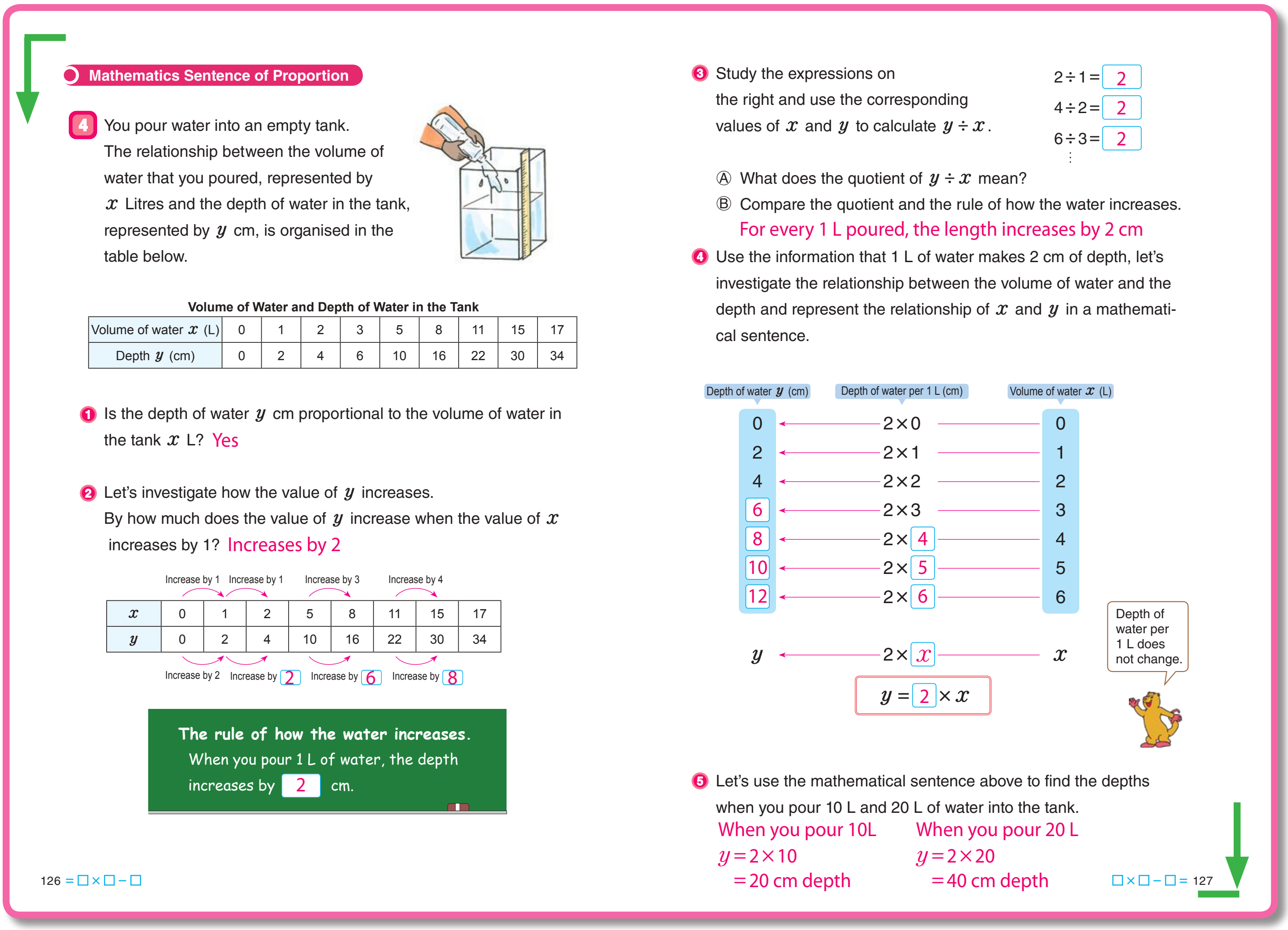
- Meaning of Proportion

Preparation

- Tables, container, water

Teacher's Notes

The formula $y = a \times x$, represents the proportional relationship, it describes the size of y (changing ratio) when × increases by 1. In addition to that it shows y value when $x = 1$.
Remember that when y or $x = 0$ there are no quantities such as an empty container, etc.



Mathematics Sentence of Proportion

4 You pour water into an empty tank. The relationship between the volume of water that you poured, represented by x Litres and the depth of water in the tank, represented by y cm, is organised in the table below.

Volume of Water and Depth of Water in the Tank

Volume of water x (L)	0	1	2	3	5	8	11	15	17
Depth y (cm)	0	2	4	6	10	16	22	30	34

① Is the depth of water y cm proportional to the volume of water in the tank x L? Yes

② Let's investigate how the value of y increases.
By how much does the value of y increase when the value of x increases by 1? Increases by 2

Increase by 1　Increase by 1　Increase by 3　Increase by 4

x	0	1	2	5	8	11	15	17
y	0	2	4	10	16	22	30	34

Increase by 2　Increase by $\boxed{2}$　Increase by $\boxed{6}$　Increase by $\boxed{8}$

The rule of how the water increases.
When you pour 1 L of water, the depth increases by $\boxed{2}$ cm.

126 = □ × □ − □

③ Study the expressions on the right and use the corresponding values of x and y to calculate $y \div x$.

$2 \div 1 = \boxed{2}$
$4 \div 2 = \boxed{2}$
$6 \div 3 = \boxed{2}$
⋮

Ⓐ What does the quotient of $y \div x$ mean?
Ⓑ Compare the quotient and the rule of how the water increases.
For every 1 L poured, the length increases by 2 cm

④ Use the information that 1 L of water makes 2 cm of depth, let's investigate the relationship between the volume of water and the depth and represent the relationship of x and y in a mathematical sentence.

Depth of water y (cm)	Depth of water per 1 L (cm)	Volume of water x (L)
0	2×0	0
2	2×1	1
4	2×2	2
$\boxed{6}$	2×3	3
$\boxed{8}$	$2 \times \boxed{4}$	4
$\boxed{10}$	$2 \times \boxed{5}$	5
$\boxed{12}$	$2 \times \boxed{6}$	6
y	$2 \times \boxed{x}$	x

$y = \boxed{2} \times x$

Depth of water per 1 L does not change.

⑤ Let's use the mathematical sentence above to find the depths when you pour 10 L and 20 L of water into the tank.

When you pour 10L
$y = 2 \times 10$
$= 20$ cm depth

When you pour 20 L
$y = 2 \times 20$
$= 40$ cm depth

□ × □ − □ = 127

Lesson Flow

1 Review the previous lesson.

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

2 Examine if y cm is in a relationship of proportion with x L.

T/S ④ Read and understand the given situation.

T ① Is the depth of water y cm proportional to the volume of water in the container x L?

S When the value of x increases, the value of y also increases.
Therefore, x and y are proportional.

3 Investigate how the value of y increases when x increases by 1.

T ② By how much does the value of y increase when the value of x increases by 1?

S Fill in the blank squares □ and explain that when x increases by 1, y increases by 2.

T Confirm the rule that when x increases by 1, y increases by 2 (the depth increases by 2 cm when the volume increases by 1 L)

4 To think about the meaning of y divided by x.

T Help the students to study and understand the vertical relationship of × and y in the table ②.

T ③ Ask the students to study the expressions and use the corresponding values to calculate $y \div x$.

S Find the answers to the expressions y divided by x as 2.

T What does the quotient of $y \div x$ mean?

S The quotient is the same (2) and does not change.

TN The answer of y divided by x and the consistent number of increasing water by 2 cm in the table are the same.

5 Express the relationship of x and y in a mathematical sentence.

T ④ Ask the students to study the given information and explain how to complete the activity.

TN Assist the students to understand that they can get depth of water as 2 × (volume of water) and lead them to find the mathematical sentence of $y = 2 \times x$.

S Fill in the boxes to complete the mathematical sentences.

T Confirm the mathematical sentence $y = \square \times x$.

6 Determine depths of water when 10 L and 20 L of water are added.

S ⑤ Use the mathematical sentence to do activity

T Assist students to realise that by using $y = 2 \times x$, they can find 10 L and 20 L.
When $x = 10$, $y = 2 \times 10$ thus $y = 20$ and when $x = 20$, $y = 2 \times 20$ and so $y = 40$

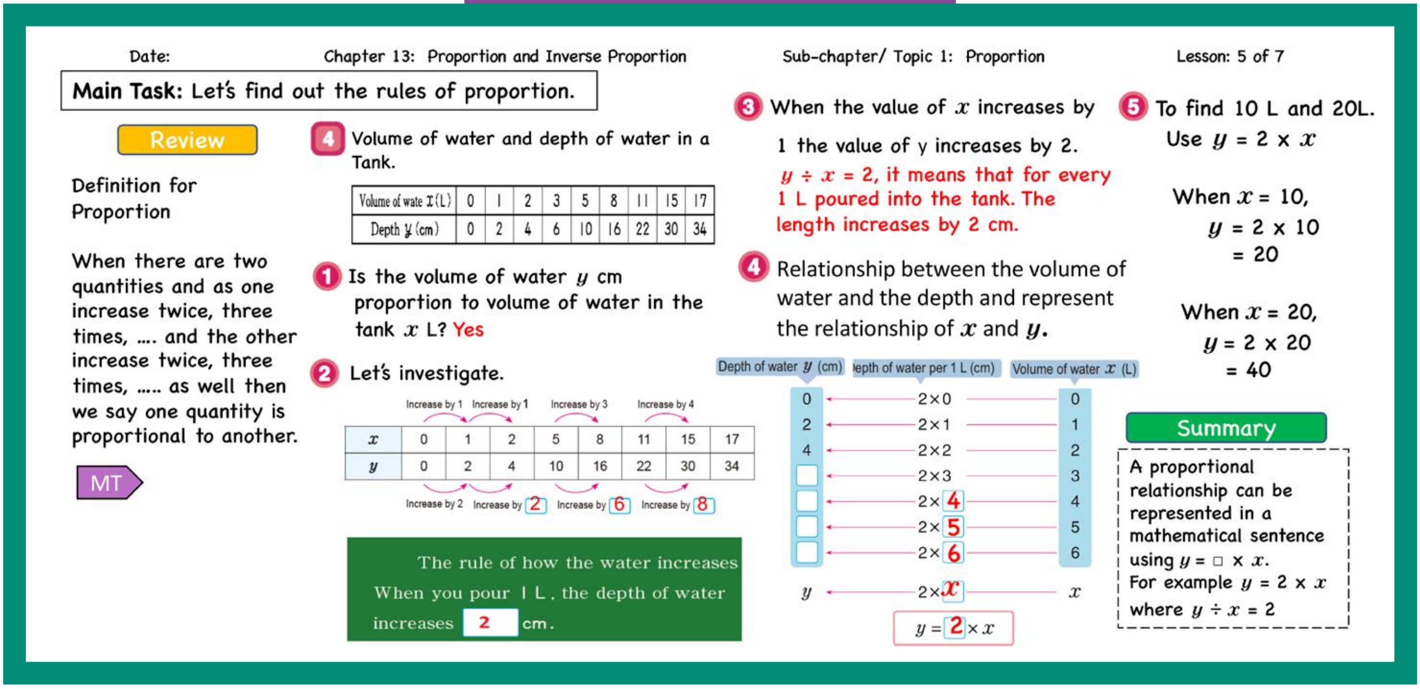
7 Summary

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 13: Proportion and Inverse Proportion

Sub-chapter/ Topic 1: Proportion

Lesson: 5 of 7

Main Task: Let's find out the rules of proportion.

Review

Definition for Proportion

When there are two quantities and as one increase twice, three times, …. and the other increase twice, three times, ….. as well then we say one quantity is proportional to another.

MT

④ Volume of water and depth of water in a Tank.

Volume of wate x (L)	0	1	2	3	5	8	11	15	17
Depth y (cm)	0	2	4	6	10	16	22	30	34

① Is the volume of water y cm proportion to volume of water in the tank x L? Yes

② Let's investigate.

Increase by 1 / Increase by 1 / Increase by 3 / Increase by 4

x	0	1	2	5	8	11	15	17
y	0	2	4	10	16	22	30	34

Increase by 2 / Increase by 2 / Increase by 6 / Increase by 8

The rule of how the water increases
When you pour 1 L, the depth of water increases 2 cm.

③ When the value of x increases by 1 the value of y increases by 2.
$y \div x = 2$, it means that for every 1 L poured into the tank. The length increases by 2 cm.

④ Relationship between the volume of water and the depth and represent the relationship of x and y.

Depth of water y (cm)	Depth of water per 1 L (cm)	Volume of water x (L)
0	2×0	0
2	2×1	1
4	2×2	2
□	2×3	3
□	2×4	4
□	2×5	5
□	2×6	6
y	2×x	x

$y = 2 \times x$

⑤ To find 10 L and 20L.
Use $y = 2 \times x$

When $x = 10$,
$y = 2 \times 10$
$= 20$

When $x = 20$,
$y = 2 \times 20$
$= 40$

Summary

A proportional relationship can be represented in a mathematical sentence using $y = \square \times x$.
For example $y = 2 \times x$ where $y \div x = 2$

Unit 13

Unit: Proportion and Inverse Proportion

Sub-unit: 1. Proportion

Lesson 6 of 7

Textbook Page : 128
Actual Lesson 098

Lesson Objective

- To understand the meaning of the formula of proportional relationship.

Prior Knowledge

- Relationship and Meaning of Proportion
- Representing proportion in a mathematical sentence

Preparation

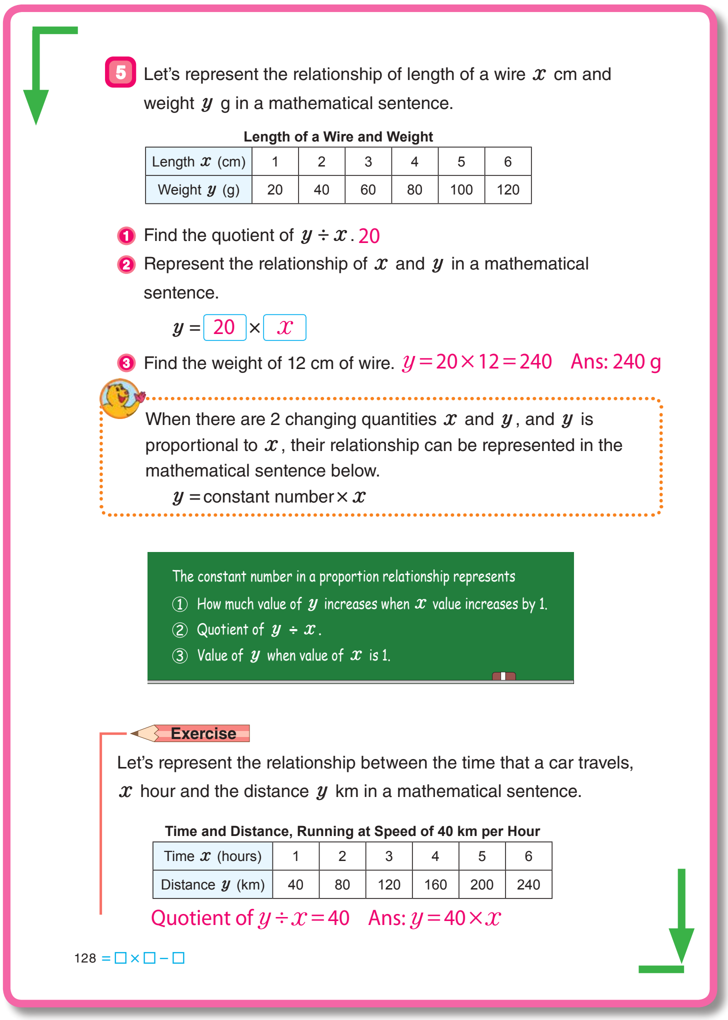
- Table in task 5

Assessment

- Explain the meaning of the formula of proportional relationship. F
- Solve the exercises correctly. S

Teacher's Notes

Review the formula $y = a \times x$, where a is the constant and x and y are the changing quantities.



5 Let's represent the relationship of length of a wire x cm and weight y g in a mathematical sentence.

Length of a Wire and Weight

Length x (cm)	1	2	3	4	5	6
Weight y (g)	20	40	60	80	100	120

① Find the quotient of $y \div x$. 20

② Represent the relationship of x and y in a mathematical sentence.

$y = \boxed{20} \times \boxed{x}$

③ Find the weight of 12 cm of wire. $y = 20 \times 12 = 240$ Ans: 240 g

When there are 2 changing quantities x and y, and y is proportional to x, their relationship can be represented in the mathematical sentence below.

y = constant number × x

The constant number in a proportion relationship represents
① How much value of y increases when x value increases by 1.
② Quotient of $y \div x$.
③ Value of y when value of x is 1.

Exercise

Let's represent the relationship between the time that a car travels, x hour and the distance y km in a mathematical sentence.

Time and Distance, Running at Speed of 40 km per Hour

Time x (hours)	1	2	3	4	5	6
Distance y (km)	40	80	120	160	200	240

Quotient of $y \div x = 40$ Ans: $y = 40 \times x$

128 = □ × □ − □

Lesson Flow

1 Review the previous lesson.

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

2 Represent the relationship of length of a wire x cm and weigth y g.

T/S 5 Read and understand the given situation.

TN Assist students to understand that the weight of wire y grams has a proportional relationship with length x cm.

T Ask the sudents to find the quotient of $y \div x$

S ① Study the table and find the quotient 20.

3 ② Represent the relationship of x and y in a mathematical sentence.

T "What does the quotient represent?"

S The quotient is 20 and does not change.

TN Allow student to explain individually what activity ③ indicates. Guide the students to understand that $y = 20 \times x$.

S From the answer found in activity ①, students can apply 20 × length in order to find out the weight of length.

S ③ Use the formula to find the weight of 12 m of wire.

4 Important Point

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

5 Understand proportional relationship as $y = \text{Constant} \times x$.

T Have students to realise that when they find out the constant, they can complete the equation of proportion.

T/S Discuss with the class on the three points in the green board.

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

Date: Chapter 13: Proportion and Inverse Proportion Sub-chapter/Topic 1: Proportion Lesson: 6 of 7

Main Task: Let's show the relationship of proportion into an algebraic equation.

Review

What does the quotient of $y \div x$ mean in relation to volume and depth of water? The relationship of volume and depth of water is represented by x and y; as the volume of water increases by 1 the depth of water increases by 2 cm when we divide.

$y = 2 \times x$

MT

5

Length of a Wire and Weight

Length x (m)	1	2	3	4	5	6
Weight y (g)	20	40	60	80	100	120

① Find the quotient of $y \div x$?

When $y \div x$ the answer is 20. $y = 20 \times x$

② Represent the relationship of x and y in a mathematical sentence. $y = 20 \times x$

③ Find the weight of 12m of wire. $y = 20 \times x$

$y = 20 \times 12$

Answer: 240g

Important Point

Exercise

(Refer to TM for Questions and Answers)

Summary

The constant number in a proportion relationship represents;

1. How much value of y increases when x value increases by 1.
2. Quotient of $y \div x$.
3. Value of y when value of x is 1.

Unit
13

Unit: Proportion and Inverse Proportion

Sub-unit: 1. Proportion

Lesson 7 of 7

Textbook Page : 129
Actual Lesson 099

Lesson Objective

- To examine the relationship of length of one side of a regular polygon and its perimeter and to represent it in the formula.

Prior Knowledge

- Meaning of the formula of proportional relationship.

Preparation

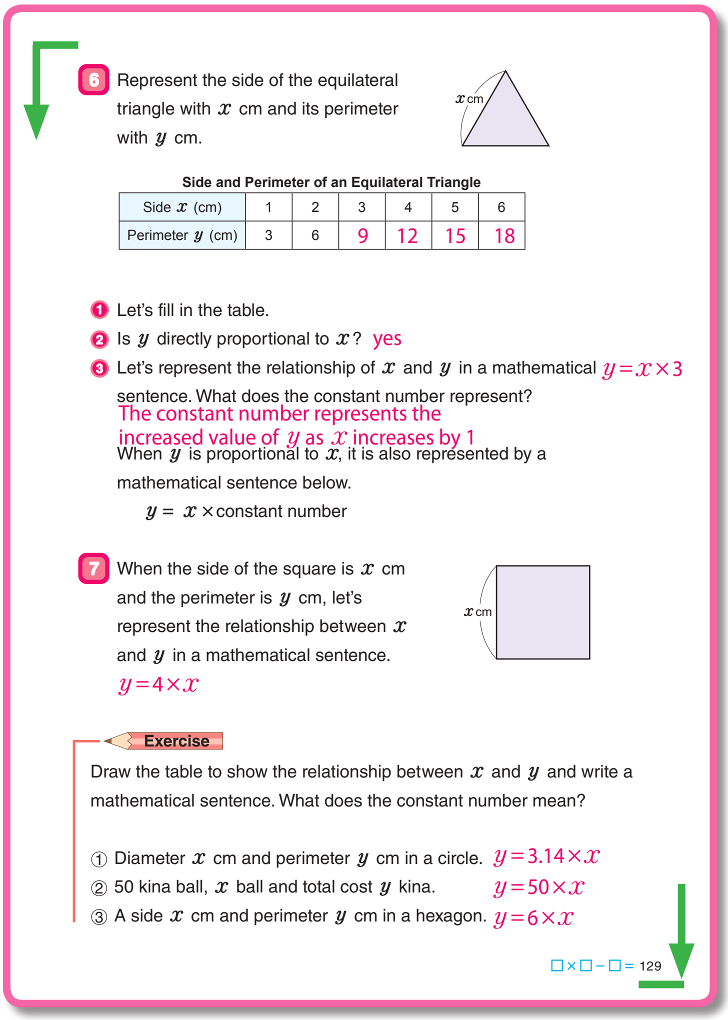
- Table for Task 6

Assessment

- Apply the formula of proportional relationship to side length and perimeter of regular shapes. F S
- Solve the exercises correctly. S

Teacher's Notes

Review the formula $y = a \times \boxed{5}$, where a is the constant and x and y are the changing quantities.
The idea of proportion can be applied to Side and Perimeter of any regular polygon.



6 Represent the side of the equilateral triangle with x cm and its perimeter with y cm.

Side and Perimeter of an Equilateral Triangle

Side x (cm)	1	2	3	4	5	6
Perimeter y (cm)	3	6	9	12	15	18

① Let's fill in the table.

② Is y directly proportional to x? yes

③ Let's represent the relationship of x and y in a mathematical sentence. What does the constant number represent? $y = x \times 3$

The constant number represents the increased value of y as x increases by 1

When y is proportional to x, it is also represented by a mathematical sentence below.

$y = x \times$ constant number

7 When the side of the square is x cm and the perimeter is y cm, let's represent the relationship between x and y in a mathematical sentence.

$y = 4 \times x$

Exercise

Draw the table to show the relationship between x and y and write a mathematical sentence. What does the constant number mean?

① Diameter x cm and perimeter y cm in a circle. $y = 3.14 \times x$
② 50 kina ball, x ball and total cost y kina. $y = 50 \times x$
③ A side x cm and perimeter y cm in a hexagon. $y = 6 \times x$

Lesson Flow

1 Review the previous lesson.

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

2 ⑥ Investigate the proportional relationship in an equilateral triangle.

T/S Read and understand the given situation.
T Ask students to complete activity ① and ② individually.
S ① Study and fill in the table.
T ② Is y directly proportional to x?
S Yes. When the side length increases by 1 the perimeter increases by 3.

3 ③ Represent the relationship of x and y in a mathematical sentence and determine what the constant is.

T What does the constant number represent?
S The constant number represents the quotient of the increasing value of $y \div x$, which is 3.
TN Perimeter = one side of length × 3.
Assist students to apply the actual number in place of the constant number and generalise the relationship.
$y = x \times 3$.

4 Understand the equation of a proportional relationship.

T Assist students to understand that when y is proportional to x, it can be represented as $y = x \times$ constant number.

5 Investigate the proportional relationship in a square.

T/S ⑦ Read and understand the given situation.
T When the side of a square is x cm and perimeter is y cm, represent their relationship in a mathematical sentence.
S $y = 4 \times x$ is similar to the relationship of an equilateral triangle.

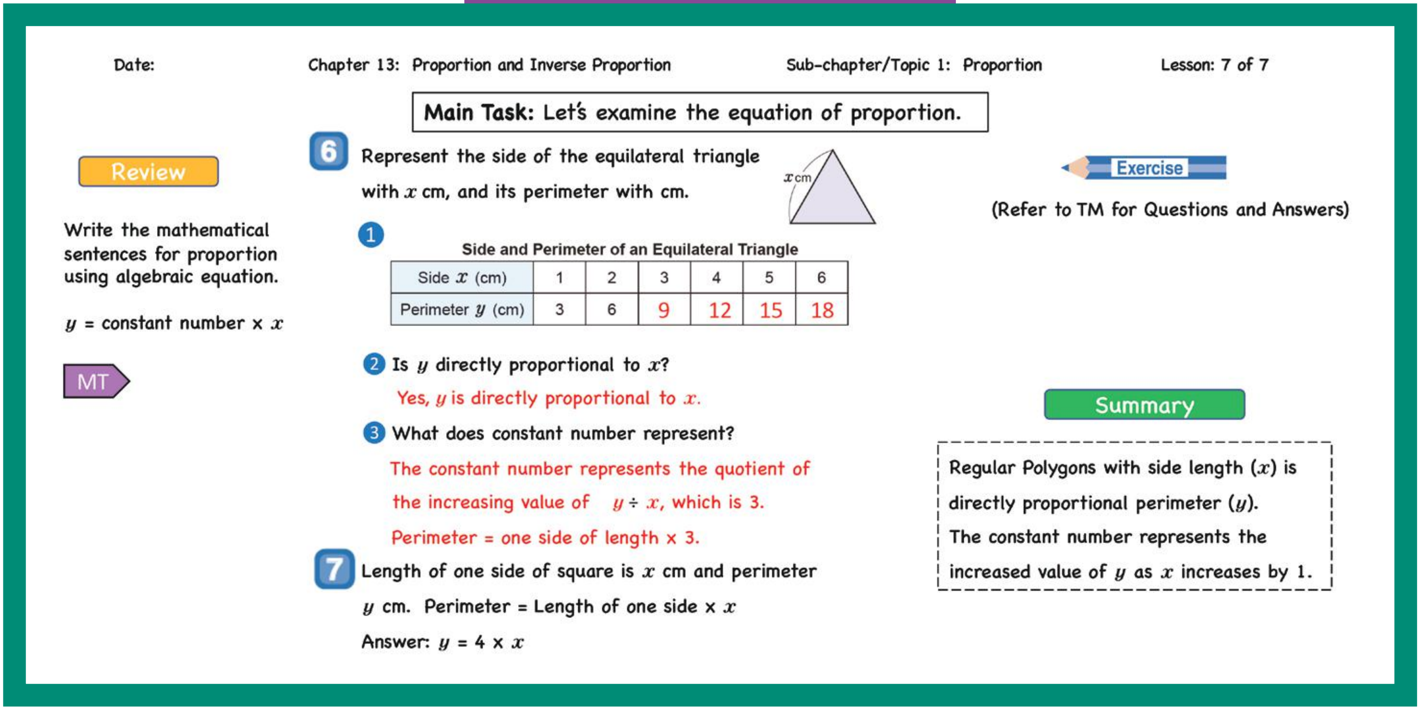
6 Complete the Exercise.

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



Date: Chapter 13: Proportion and Inverse Proportion Sub-chapter/Topic 1: Proportion Lesson: 7 of 7

Main Task: Let's examine the equation of proportion.

Review

Write the mathematical sentences for proportion using algebraic equation.

y = constant number x x

MT

6 Represent the side of the equilateral triangle with x cm, and its perimeter with cm.

① Side and Perimeter of an Equilateral Triangle

Side x (cm)	1	2	3	4	5	6
Perimeter y (cm)	3	6	9	12	15	18

② Is y directly proportional to x?
Yes, y is directly proportional to x.

③ What does constant number represent?
The constant number represents the quotient of the increasing value of $y \div x$, which is 3.
Perimeter = one side of length x 3.

7 Length of one side of square is x cm and perimeter y cm. Perimeter = Length of one side x x
Answer: y = 4 x x

Exercise
(Refer to TM for Questions and Answers)

Summary

Regular Polygons with side length (x) is directly proportional perimeter (y). The constant number represents the increased value of y as x increases by 1.

Unit
13

Unit: Proportion and Inverse Proportion

Sub-unit: 2. Graphs of Proportion

Lesson 1 of 2

Textbook Page :
130 and 131
Actual Lesson 100

Sub-unit Objectives

- To be able to draw the graph of proportion and understand its characteristics.
- To be able to analyse the relationship of numbers of objectives from the graph

Lesson Objective

- To understand that when the relationship of two quantities in proportion is shown on the graph, the line which goes through the crossing point of vertical and horizontal axis (origin) is constant.

Prior Knowledge

- Meaning and Equation of Proportion

Preparation

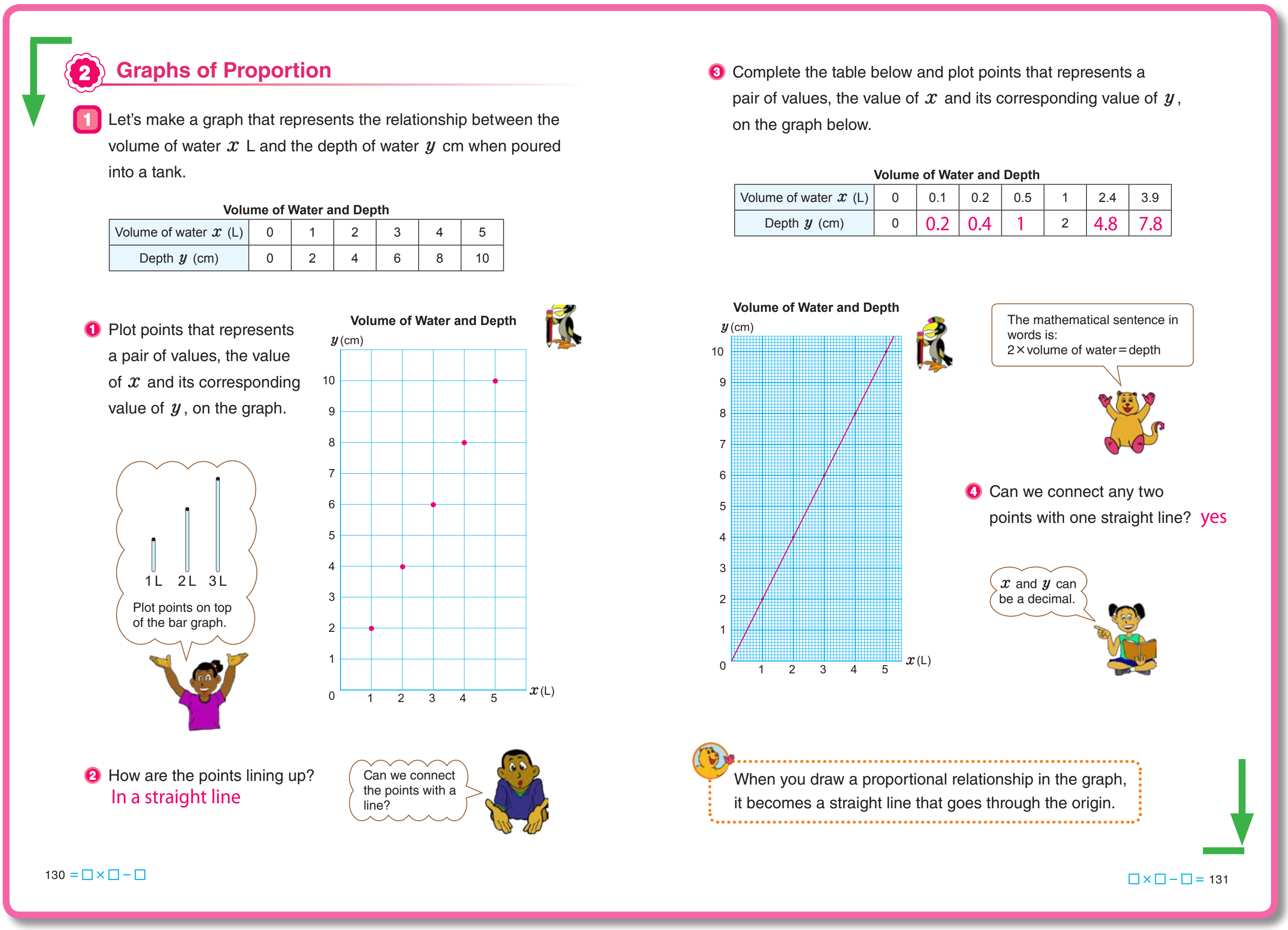
- Table of Volume of water and depth

Assessment

- Plot the points on the graph from a table. F S
- Draw a proportional relationship on a graph. F S

Teacher's Notes

Students experienced drawing bar and line graphs with a pair of numbers from the table. They may have difficulty formulating an equation from the table and may not see that they only need to connect the origin to the dot. Do not let the students do the equation and then graph but show them a table that has several corresponding values and based on the table, they can make a graph. Students should identify the different intervals of the scales when they draw their graph.



② Graphs of Proportion

1 Let's make a graph that represents the relationship between the volume of water x L and the depth of water y cm when poured into a tank.

Volume of Water and Depth

Volume of water x (L)	0	1	2	3	4	5
Depth y (cm)	0	2	4	6	8	10

① Plot points that represents a pair of values, the value of x and its corresponding value of y, on the graph.

Volume of Water and Depth
y (cm)
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
x (L)
1 L 2 L 3 L
Plot points on top of the bar graph.

② How are the points lining up?
In a straight line

③ Complete the table below and plot points that represents a pair of values, the value of x and its corresponding value of y, on the graph below.

Volume of Water and Depth

Volume of water x (L)	0	0.1	0.2	0.5	1	2.4	3.9
Depth y (cm)	0	0.2	0.4	1	2	4.8	7.8

Volume of Water and Depth
y (cm)
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
x (L)
The mathematical sentence in words is:
2 × volume of water = depth

④ Can we connect any two points with one straight line? yes

When you draw a proportional relationship in the graph, it becomes a straight line that goes through the origin.

130 = □ × □ − □

□ × □ − □ = 131

Lesson Flow

1 Review the previous lesson.

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

2 Plot points using x and y values from the table.

T/S 1 Read and understand the given situation.

T Allow students to complete activity ① and ②.

S Plot points on the graph and describe how the points are lined up.

T ③ Ask students to see the relationship of x and y in the equation $y = 2 \times x$.

S Based on the equation $y = 2 \times x$ students find the corresponding value of y when the value of x is 0.1, 0.2, 0.5, 2.4, 3.9 and so on, and write down on the table.

3 Connect points to represent a proportional relationship.

T ④ Guide students to understand that the dot placed according to table in activity ③ are also in straight line.

S Plot dots according to the table and connect all points with a straight line.

S Extend the line from 0 because when the volume of water is 0 L, the depths of water is 0 cm.

T When the line does not form a straight line, ask students to check their dots again.

4 Describe the relationship of proportion in a graph.

S There are two characteristics of this graph that describes the relationship of proportion.

- It is a straight line.
- It goes through 0.

T When two numbers of objects are not related in the manner mentioned above, we cannot say these two numbers are proportional.

5 Important Point

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

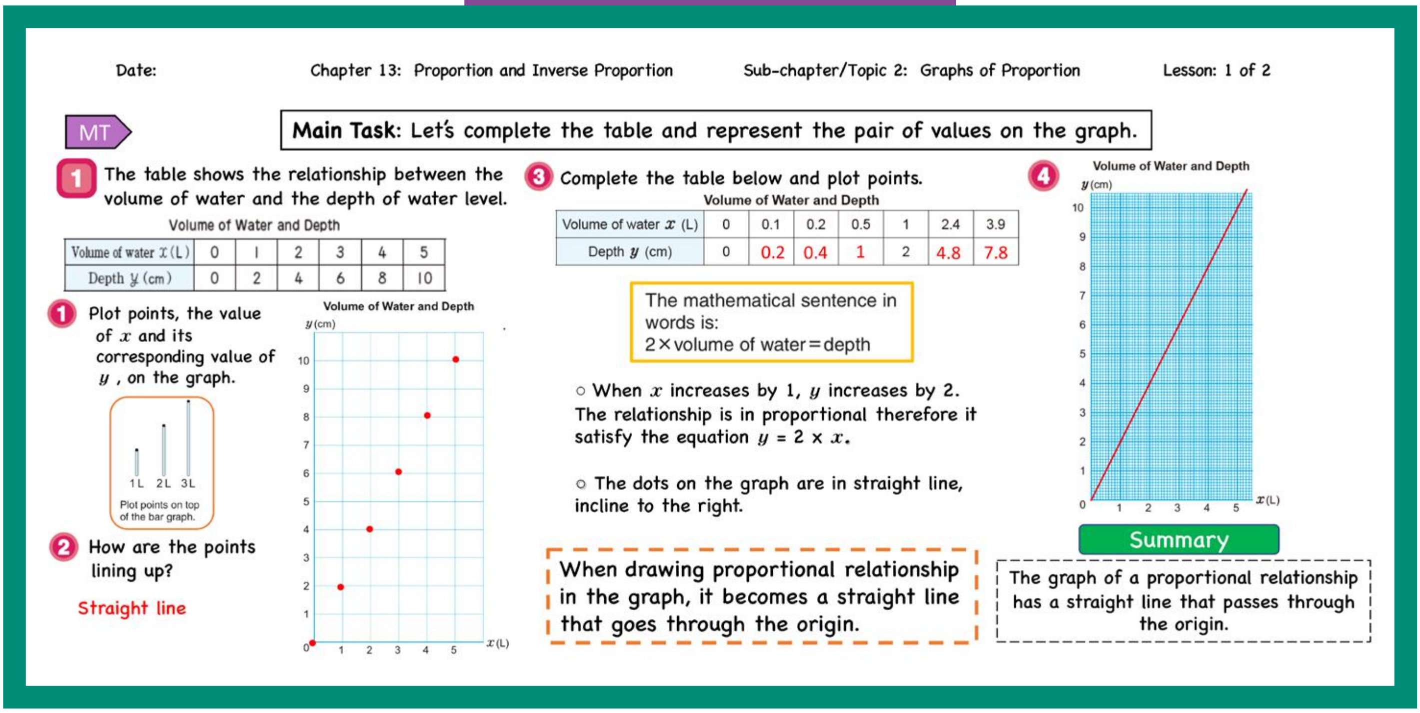
6 Summary

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


MT
y (cm)
x (L)
1 L
2 L
3 L
0
1
2
3
4
5
6
7
8
9
10

Date: Chapter 13: Proportion and Inverse Proportion Sub-chapter/Topic 2: Graphs of Proportion Lesson: 1 of 2

Main Task: Let's complete the table and represent the pair of values on the graph.

1 The table shows the relationship between the volume of water and the depth of water level.

Volume of Water and Depth

Volume of water x (L)	0	1	2	3	4	5
Depth y (cm)	0	2	4	6	8	10

① Plot points, the value of x and its corresponding value of y, on the graph.

Plot points on top of the bar graph.

Volume of Water and Depth

② How are the points lining up?

Straight line

③ Complete the table below and plot points.

Volume of Water and Depth

Volume of water x (L)	0	0.1	0.2	0.5	1	2.4	3.9
Depth y (cm)	0	0.2	0.4	1	2	4.8	7.8

The mathematical sentence in words is:
2 × volume of water = depth

○ When x increases by 1, y increases by 2. The relationship is in proportional therefore it satisfy the equation $y = 2 \times x$.

○ The dots on the graph are in straight line, incline to the right.

When drawing proportional relationship in the graph, it becomes a straight line that goes through the origin.

④ Volume of Water and Depth

Summary

The graph of a proportional relationship has a straight line that passes through the origin.

Unit 13

Unit: Proportion and Inverse Proportion

Sub-unit: 2. Graphs of Proportion

Lesson 2 of 2

Textbook Page : 132
Actual Lesson 101

Lesson Objective

- To read and understand the relationship two quantities from graphs.

Prior Knowledge

- Meaning and Equation of Proportion

Preparation

- Enlarged graph

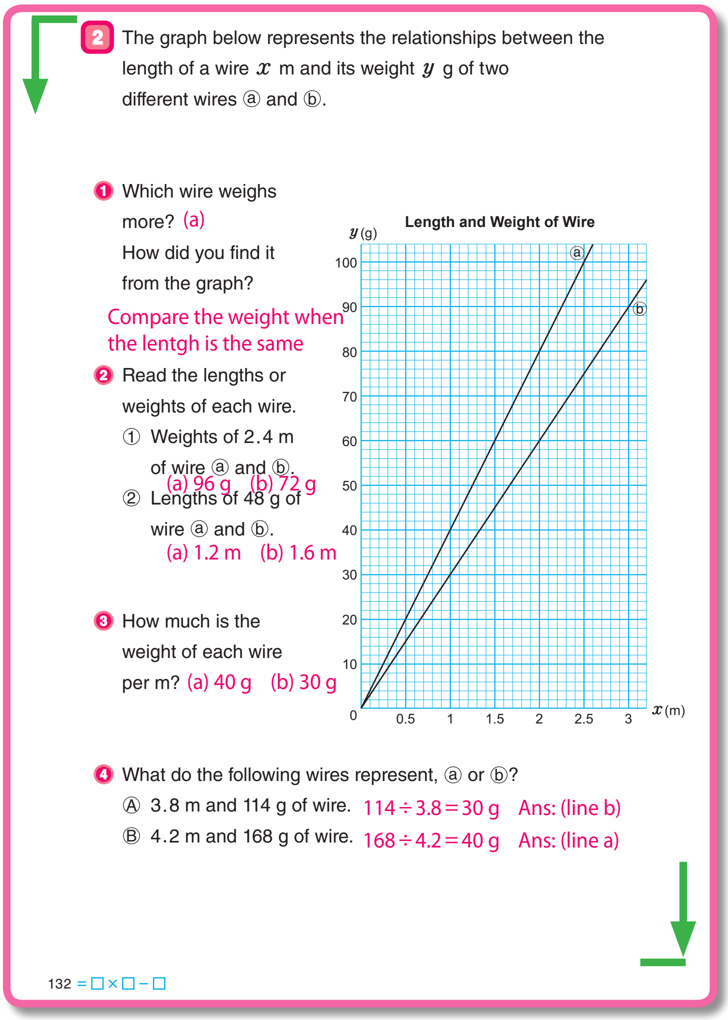
Assessment

- Read and understand the relationship of two quantities on a graph. **F** **S**

Teacher's Notes

Reading of graph is an important skill for students to master.
They may have their own way of reading the graph; the important point is they should read horizontally then vertically or vice versa forming a right angle.
(Observe the reading line on the board)

Students are accustomed to representing the relationship between two quantities in a table by drawing bar graph and line graph.
However, it is difficult for many students to express a mathematical sentence of x and y on a graph.
They have to just determine the origin and another point and connect them with a line, but they feel very difficult.
Therefore, it is important to guide step by step, not directly drawing a graph from a math sentence but first presenting in a table and drawing the graph.



2 The graph below represents the relationships between the length of a wire x m and its weight y g of two different wires ⓐ and ⓑ.

❶ Which wire weighs more? (a)
How did you find it from the graph?
Compare the weight when the lentgh is the same

❷ Read the lengths or weights of each wire.
① Weights of 2.4 m of wire ⓐ and ⓑ.
(a) 96 g (b) 72 g
② Lengths of 48 g of wire ⓐ and ⓑ.
(a) 1.2 m (b) 1.6 m

❸ How much is the weight of each wire per m? (a) 40 g (b) 30 g

❹ What do the following wires represent, ⓐ or ⓑ?
Ⓐ 3.8 m and 114 g of wire. $114 \div 3.8 = 30$ g Ans: (line b)
Ⓑ 4.2 m and 168 g of wire. $168 \div 4.2 = 40$ g Ans: (line a)

132 = □×□−□

Lesson Flow

1 Review the previous lesson.

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

2 2 Investigate which wire is heavier from the graph.

T/S Read and understand the given situation.

T ❶ How can you compare the weights of wire?

S Compare using the same quantity by measuring the weight of the same length.

S Read from the graph to get the weights of the same length.

TN In the graph that indicates two proportions, students understand that one above from the other is heavier.

T Allow students to work individually, then ask them to share their ideas with their friends.

T Guide students to realise that both wire ⓐ and ⓑ are in a relationship of proportion by looking at the graphs.

S ❷ Read and understand the weight and length of wire from the graph. Share ideas in small groups.

TN Refer to Teachers' Notes.

S ❸ Find the weight of each wire individually.

S Use prior knowledge of per unit to find the weight of each wire per metre on the graph.

3 Determine the weights of length that are not shown in the graph.

S ❹ Based on activity ❸, students make algebraic equations for ⓐ and ⓑ.

ⓐ $y = 40 \times x$.

ⓑ $y = 30 \times x$.

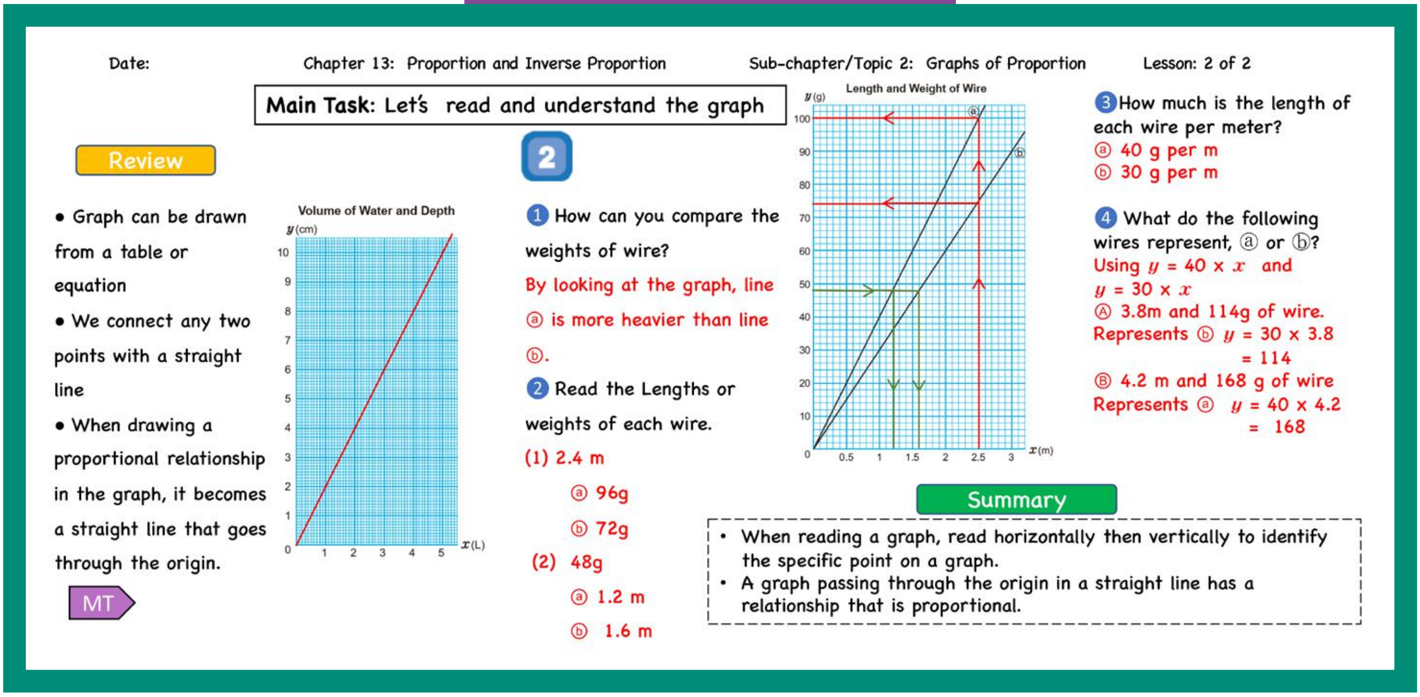
4 Summary

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 13: Proportion and Inverse Proportion Sub-chapter/Topic 2: Graphs of Proportion Lesson: 2 of 2

Main Task: Let's read and understand the graph

Review

- Graph can be drawn from a table or equation
- We connect any two points with a straight line
- When drawing a proportional relationship in the graph, it becomes a straight line that goes through the origin.

Volume of Water and Depth
y (cm)
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
x (L)

MT

2

❶ How can you compare the weights of wire?

By looking at the graph, line ⓐ is more heavier than line ⓑ.

❷ Read the Lengths or weights of each wire.

(1) 2.4 m

ⓐ 96g

ⓑ 72g

(2) 48g

ⓐ 1.2 m

ⓑ 1.6 m

❸ How much is the length of each wire per meter?

ⓐ 40 g per m

ⓑ 30 g per m

❹ What do the following wires represent, ⓐ or ⓑ?

Using $y = 40 \times x$ and $y = 30 \times x$

Ⓐ 3.8m and 114g of wire.

Represents ⓑ $y = 30 \times 3.8$

$= 114$

Ⓑ 4.2 m and 168 g of wire

Represents ⓐ $y = 40 \times 4.2$

$= 168$

Summary

- When reading a graph, read horizontally then vertically to identify the specific point on a graph.
- A graph passing through the origin in a straight line has a relationship that is proportional.

Unit
13

Unit: Proportion and Inverse Proportion
Sub-unit: 3. Using the Properties of Proportion
Lesson 1 of 3

Textbook Page :
033
Actual Lesson 102

Sub-unit Objectives

- To state that some phenomena can be solved efficiently by using the relationships of proportion.
- To solve problems by using equations and graphs of proportion.

Lesson Objective

- To apply the properties of proportion to solve problems.

Prior Knowledge

- Meaning and Equation of Proportion
- Graphs of Proportion

Preparation

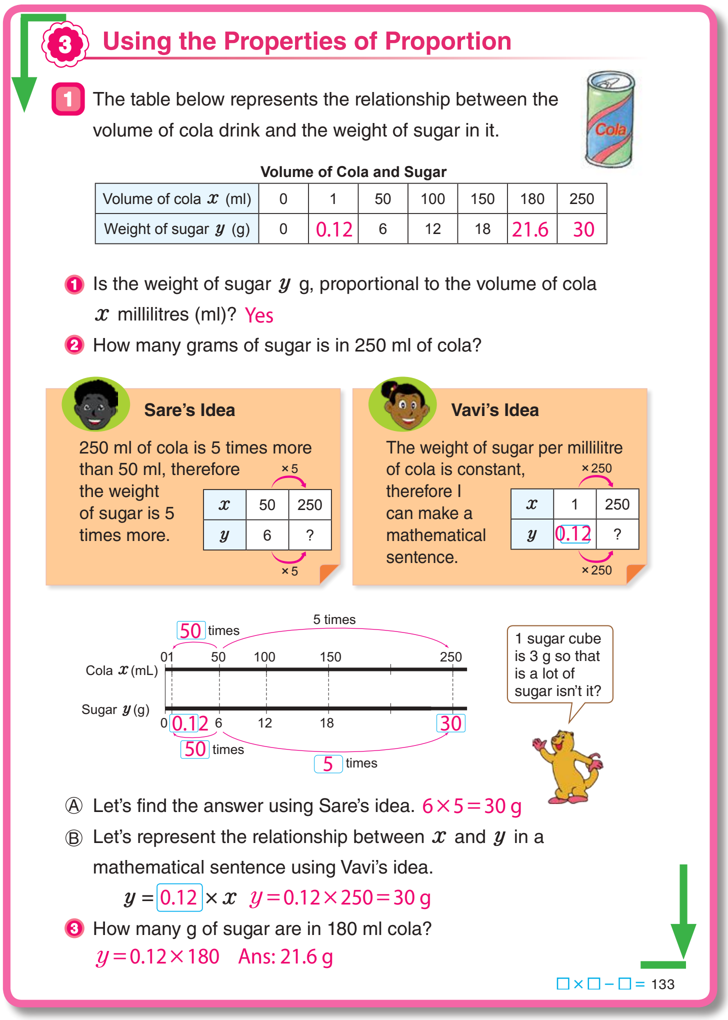
- Table and band graph

Assessment

- Find missing amount in the table by thinking about the relationship between two amounts. F
- Solve the problems by using a table and equations. S

Teacher's Notes

When $x \div y$, the answer is always constant in the equation of proportion, therefore we can apply the relationship to work out the increase in any two quantities that change together at the same rate.



③ Using the Properties of Proportion

1 The table below represents the relationship between the volume of cola drink and the weight of sugar in it.

Volume of Cola and Sugar

Volume of cola x (ml)	0	1	50	100	150	180	250
Weight of sugar y (g)	0	0.12	6	12	18	21.6	30

① Is the weight of sugar y g, proportional to the volume of cola x millilitres (ml)? Yes

② How many grams of sugar is in 250 ml of cola?

Sare's Idea

250 ml of cola is 5 times more than 50 ml, therefore the weight of sugar is 5 times more.

x	50	250
y	6	?

Vavi's Idea

The weight of sugar per millilitre of cola is constant, therefore I can make a mathematical sentence.

x	1	250
y	0.12	?

1 sugar cube is 3 g so that is a lot of sugar isn't it?

Ⓐ Let's find the answer using Sare's idea. $6 \times 5 = 30$ g

Ⓑ Let's represent the relationship between x and y in a mathematical sentence using Vavi's idea.

$y = \boxed{0.12} \times x$ $y = 0.12 \times 250 = 30$ g

③ How many g of sugar are in 180 ml cola?

$y = 0.12 \times 180$ Ans: 21.6 g

□×□−□= 133

Lesson Flow

1 Review previous lesson.

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

2 ① Investigate the relationship of sugar with the amount of cola.

T/S Read and understand the given situation.

T ① Is the weight of sugar y g, proportional to the volume of cola x mL?

S When 50 mL cola becomes 100 mL which is twice as much, 6 g sugar becomes twice as much 12 g, when coke is 150 mL, three times, and sugar becomes 18 g, which is 3 times as before. Therefore, it can be said that the amount of sugar has a relationship of proportion with the amount of cola.

T Use students' ideas to confirm important concepts. In addition, let students see that $y \div x$ has a quotient of 0.12.

3 Find out how many grams of sugar are contained in 250 mL.

T ② How many grams of sugar are in 250 mL of cola?

T/S Discuss the thinking processes of Sare and Vavi.

T Allow students to complete the band diagram.

S Ⓐ Try to solve the problem with Sare's way of thinking.

S Ⓑ Try to solve the problem with Vavi's way of thinking using $y = 0.12 \times x$.

T Use students' ideas to confirm important concepts.
Confirm students answer as 30 g.

4 Using the equation $y = 0.12 \times x$, find the amount of sugar in 180 mL of cola.

T Use students' ideas to confirm important concepts.
③ How many grams of sugar are in 180 mL cola?

S Apply $x = 180$ into the equation $y = 0.12 \times x$ to find the amount of sugar.

T/S Some students may think $12 \times 1.8 = 21.6$ (g).
If so, have a class discussion for them to understand
180 mL is 1.8 times as much as 100 mL.

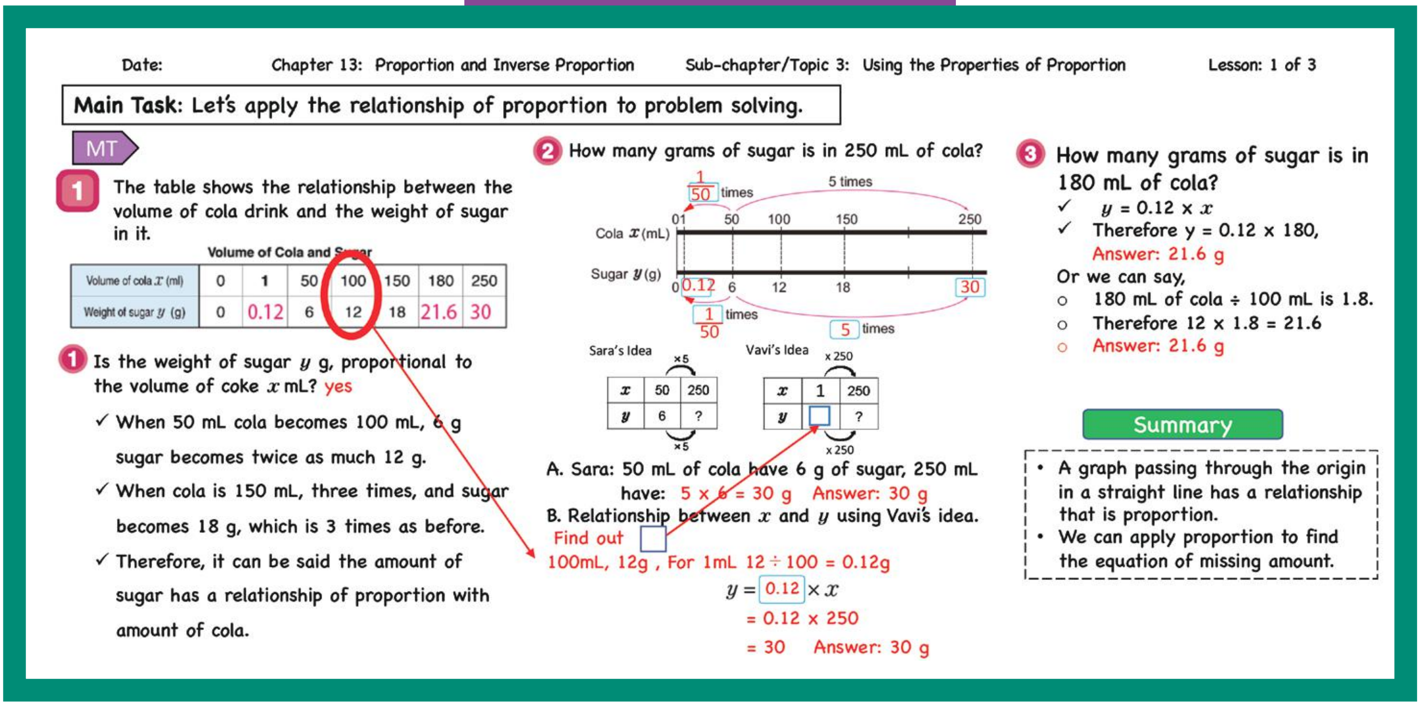
5 Summary

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 13: Proportion and Inverse Proportion Sub-chapter/Topic 3: Using the Properties of Proportion Lesson: 1 of 3

Main Task: Let's apply the relationship of proportion to problem solving.

MT

1 The table shows the relationship between the volume of cola drink and the weight of sugar in it.

Volume of Cola and Sugar

Volume of cola x (ml)	0	1	50	100	150	180	250
Weight of sugar y (g)	0	0.12	6	12	18	21.6	30

① Is the weight of sugar y g, proportional to the volume of coke x mL? yes

✓ When 50 mL cola becomes 100 mL, 6 g sugar becomes twice as much 12 g.

✓ When cola is 150 mL, three times, and sugar becomes 18 g, which is 3 times as before.

✓ Therefore, it can be said the amount of sugar has a relationship of proportion with amount of cola.

② How many grams of sugar is in 250 mL of cola?

Sara's Idea

x	50	250
y	6	?

×5

Vavi's Idea

x	1	250
y	$\square$	?

x 250

A. Sara: 50 mL of cola have 6 g of sugar, 250 mL have: 5 x 6 = 30 g Answer: 30 g

B. Relationship between x and y using Vavi's idea.
Find out $\square$
100mL, 12g , For 1mL 12 ÷ 100 = 0.12g

$$y = \boxed{0.12} \times x$$
$$= 0.12 \times 250$$
$$= 30$$ Answer: 30 g

③ How many grams of sugar is in 180 mL of cola?

✓ $y = 0.12 \times x$

✓ Therefore $y = 0.12 \times 180$,
Answer: 21.6 g

Or we can say,

○ 180 mL of cola ÷ 100 mL is 1.8.

○ Therefore $12 \times 1.8 = 21.6$

○ Answer: 21.6 g

Summary

- A graph passing through the origin in a straight line has a relationship that is proportion.
- We can apply proportion to find the equation of missing amount.

Unit 13

Unit: Proportion and Inverse Proportion
Sub-unit: 3. Using Properties of Proportion
Lesson 2 of 3

Textbook Page : 134
Actual Lesson 103

Lesson Objective

- To solve the problem using the graph.

Prior Knowledge

- Meaning and Equation of Proportion
- Graph of proportion

Preparation

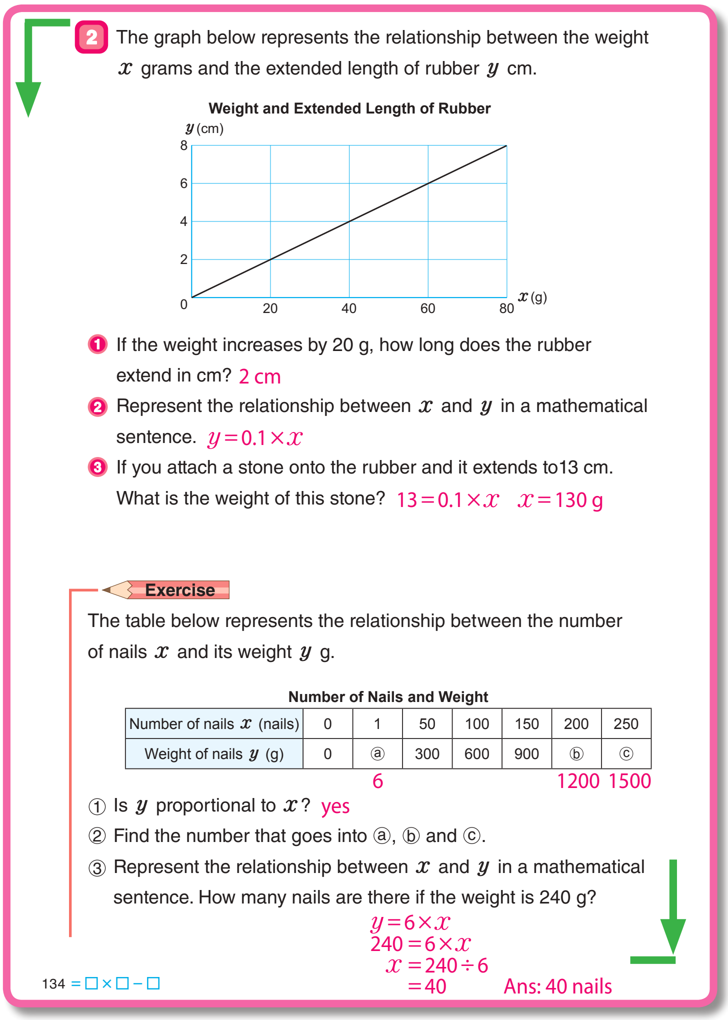
- Graph for Task 2

Assessment

- Apply the relationship of the graph to solve problem. F
- Solve the exercises correctly. S

Teacher's Notes

The graph of Proportion increases at a constant rate so we say that y is proportional to x.
When x increases by 2 times, 3 times…, y increases by 2 times, 3 times as well.



2 The graph below represents the relationship between the weight x grams and the extended length of rubber y cm.

Weight and Extended Length of Rubber

① If the weight increases by 20 g, how long does the rubber extend in cm? 2 cm

② Represent the relationship between x and y in a mathematical sentence. $y = 0.1 \times x$

③ If you attach a stone onto the rubber and it extends to13 cm. What is the weight of this stone? $13 = 0.1 \times x$ $x = 130$ g

Exercise

The table below represents the relationship between the number of nails x and its weight y g.

Number of Nails and Weight

Number of nails x (nails)	0	1	50	100	150	200	250
Weight of nails y (g)	0	ⓐ	300	600	900	ⓑ	ⓒ

6　1200　1500

① Is y proportional to x? yes

② Find the number that goes into ⓐ, ⓑ and ⓒ.

③ Represent the relationship between x and y in a mathematical sentence. How many nails are there if the weight is 240 g?

$y = 6 \times x$
$240 = 6 \times x$
$x = 240 \div 6$
$= 40$　Ans: 40 nails

134 $= \square \times \square - \square$

Lesson Flow

1 Review the previous lesson.

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

2 Understand the characteristics of graphs.

T/S ② Read and understand the given situation.

T What does the graph represent?

TN Lead the students to understand that the graph indicates the relationship of the weight of weights and the length of stretched rubber.

S Realise that the graph is proportional, thus it forms a straight line that goes through the origin.

3 To find the length of stretched rubber.

T ① When weight increases by 20 g, how many cm does the rubber stretch?

S Read and understand the length of rubber stretched when weight of weights is 20 g.

S The length of rubber will increase 2 cm, when the weight increases by 20 g.

T ② Let's write an equation which represents the relationship of x and y.

TN Assist students to determine the relationship of the two quantities based on the graph of proportion.

S Indicate the relationship of x and y into an equation; $y = 0.1 \times x$

T ③ If a stone is attached to the rubber, it stretched 13 cm. How many grams is the weight of stone?

S Solve the problem by using the relationship of proportion $y = 0.1 \times x$.

$x = 13 \div 0.1$, therefore the weight of stone is 130 g.

4 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

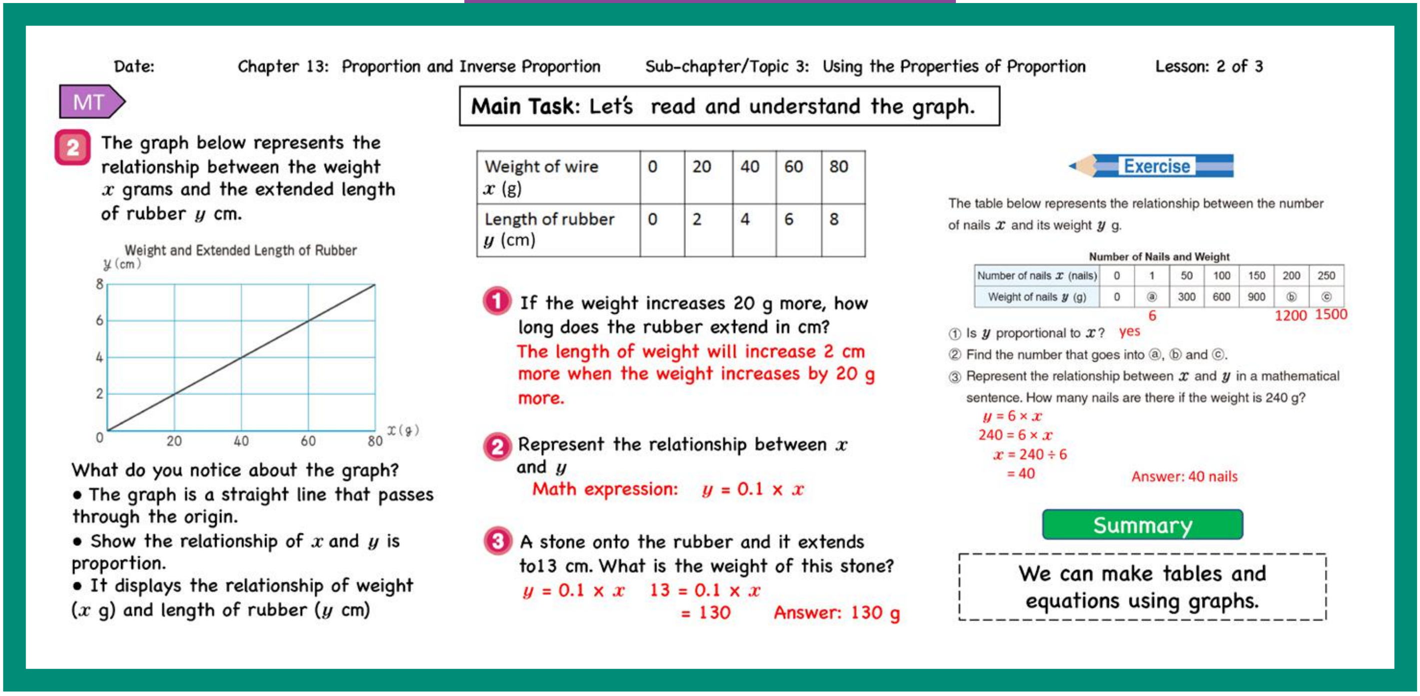
5 Summary

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: Chapter 13: Proportion and Inverse Proportion Sub-chapter/Topic 3: Using the Properties of Proportion Lesson: 2 of 3

MT

Main Task: Let's read and understand the graph.

② The graph below represents the relationship between the weight x grams and the extended length of rubber y cm.

Weight and Extended Length of Rubber

y (cm)
8
6
4
2
0
20
40
60
80
x (g)

What do you notice about the graph?

- The graph is a straight line that passes through the origin.
- Show the relationship of x and y is proportion.
- It displays the relationship of weight (x g) and length of rubber (y cm)

Weight of wire x (g)	0	20	40	60	80
Length of rubber y (cm)	0	2	4	6	8

① If the weight increases 20 g more, how long does the rubber extend in cm?
The length of weight will increase 2 cm more when the weight increases by 20 g more.

② Represent the relationship between x and y
Math expression: $y = 0.1 \times x$

③ A stone onto the rubber and it extends to13 cm. What is the weight of this stone?
$y = 0.1 \times x$ $13 = 0.1 \times x$
$= 130$ Answer: 130 g

Exercise

The table below represents the relationship between the number of nails x and its weight y g.

Number of Nails and Weight

Number of nails x (nails)	0	1	50	100	150	200	250
Weight of nails y (g)	0	ⓐ 6	300	600	900	ⓑ 1200	ⓒ 1500

① Is y proportional to x? yes

② Find the number that goes into ⓐ, ⓑ and ⓒ.

③ Represent the relationship between x and y in a mathematical sentence. How many nails are there if the weight is 240 g?

$y = 6 \times x$
$240 = 6 \times x$
$x = 240 \div 6$
$= 40$

Answer: 40 nails

Summary

We can make tables and equations using graphs.

Unit
13

Unit: Proportion and Inverse Proportion
Sub-unit: 3. Using Properties of Proportion
Lesson 3 of 3

Textbook Page :
135 and 136
Actual Lesson 104

Lesson Objective

- To understand that it is useful to apply the properties of proportion in order to predict a phenomenon.

Assessment

- Apply the properties of proportion to predict the phenomenon. F S
- Solve the exercises correctly. S

Prior Knowledge

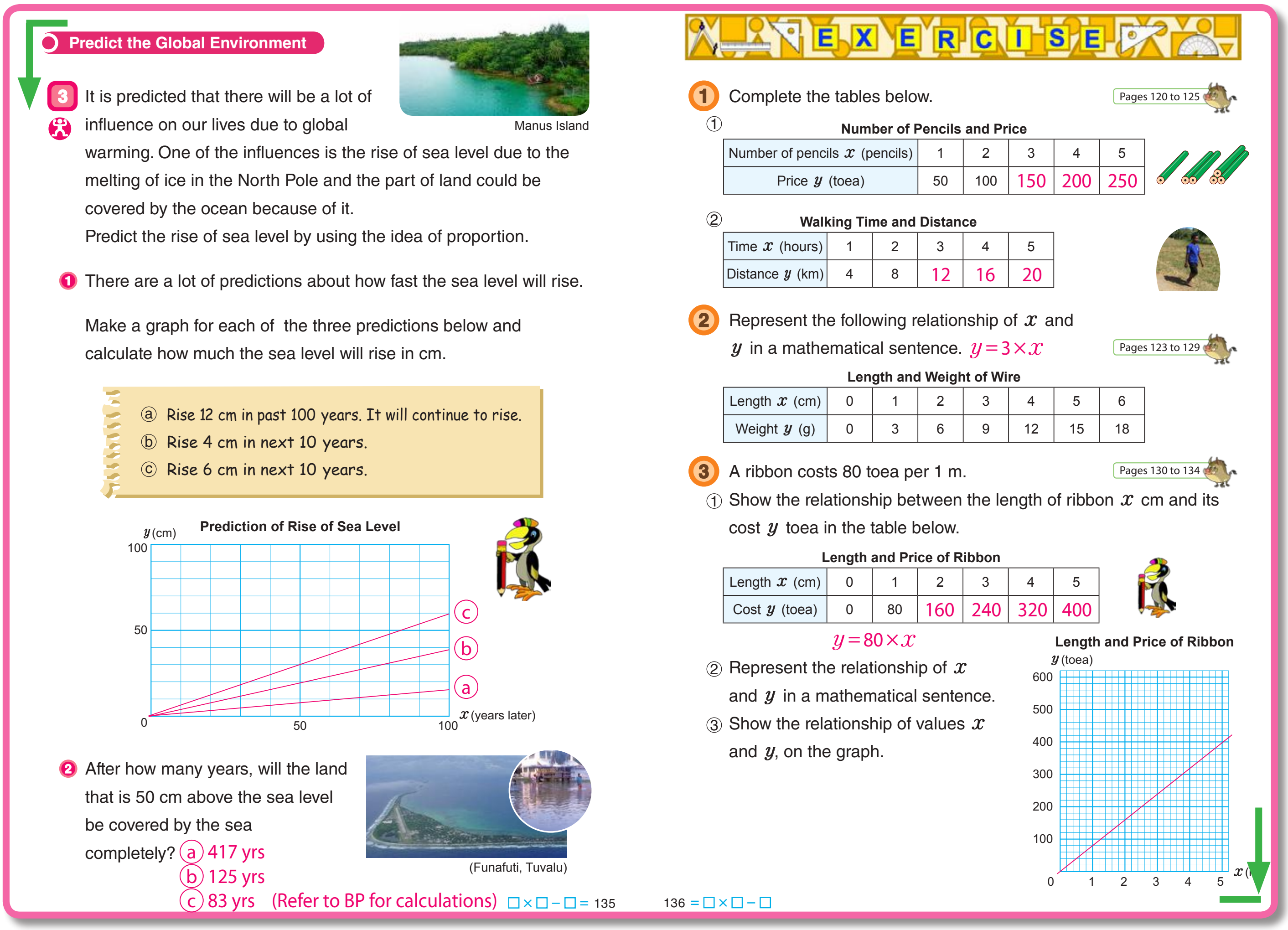
- Graphs of Proportion

Preparation

- Article on global warming
- Prepare graph on the board

Teacher's Notes

Proportion can be applied in any situation as long as the students can understand the properties of proportion that is as one quantity x increases by 2 times, 3 times… the other quantity y changes the same



Predict the Global Environment

3 It is predicted that there will be a lot of influence on our lives due to global warming. One of the influences is the rise of sea level due to the melting of ice in the North Pole and the part of land could be covered by the ocean because of it.
Predict the rise of sea level by using the idea of proportion.

1 There are a lot of predictions about how fast the sea level will rise.

Make a graph for each of the three predictions below and calculate how much the sea level will rise in cm.

ⓐ Rise 12 cm in past 100 years. It will continue to rise.
ⓑ Rise 4 cm in next 10 years.
ⓒ Rise 6 cm in next 10 years.

2 After how many years, will the land that is 50 cm above the sea level be covered by the sea completely? ⓐ 417 yrs
ⓑ 125 yrs
ⓒ 83 yrs (Refer to BP for calculations)

EXERCISE

1 Complete the tables below. Pages 120 to 125

① **Number of Pencils and Price**

Number of pencils x (pencils)	1	2	3	4	5
Price y (toea)	50	100	150	200	250

② **Walking Time and Distance**

Time x (hours)	1	2	3	4	5
Distance y (km)	4	8	12	16	20

2 Represent the following relationship of x and y in a mathematical sentence. $y = 3 \times x$ Pages 123 to 129

Length and Weight of Wire

Length x (cm)	0	1	2	3	4	5	6
Weight y (g)	0	3	6	9	12	15	18

3 A ribbon costs 80 toea per 1 m. Pages 130 to 134

① Show the relationship between the length of ribbon x cm and its cost y toea in the table below.

Length and Price of Ribbon

Length x (cm)	0	1	2	3	4	5
Cost y (toea)	0	80	160	240	320	400

$y = 80 \times x$

② Represent the relationship of x and y in a mathematical sentence.

③ Show the relationship of values x and y, on the graph.

Lesson Flow

1 Review the previous lesson.

2 ③ Read about global warming and understand the fact.

T Read or show to students the prepared applicable documents.
Assist them to understand the effect of global warming.

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

3 ❶ Draw three graphs based on Ⓐ - Ⓒ.

T Guide students to think that in Ⓑ it is 40 cm in 100 years, Ⓒ 60 cm in 100 years.

S In pairs they share ideas and draw a straight line going through 0 to Ⓐ for 12 cm, Ⓑ for 40 cm and Ⓒ for 60 cm for 100 years later.

T Check work and ask students to share ideas in small groups.

T Have 3 students to draw their graph for Ⓐ - Ⓒ on the board.

4 Complete Exercise ① to ③.

TN ① Complete the table in ① and ②.
② Present relationship of x and y in a mathematics sentence.
③ Show the relationship between the lenght of ribbon and cost.

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

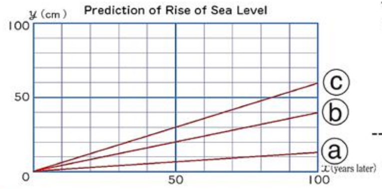
Date: Chapter 13: Proportion and Inverse Proportion Sub-chapter/Topic 3: Using the Properties of Proportion Lesson: 3 of 3

MT

Main Task: Let's Predict the Global Environment

③ Predict the Global Environment

ⓐ Rise 12 cm in past 100 years. It will continue to rise.
ⓑ Rise 4 cm in next 10 years.
ⓒ Rise 6 cm in next 10 years.



❶ How much sea level will rise?
ⓐ Past 100 years 12 cm
ⓑ 100 years later 40 cm
ⓒ 100 years later 60 cm

❷ After how many years will the land that is 50 cm above the sea level be covered by sea completely?

ⓐ

Number of years x (years)	100	?
Rise of sea level y (cm)	12	50

$\times \frac{50}{12}$

Calculation using table

① $50 \div 12 = \frac{25}{6}$
$100 \times \frac{25}{6} = 416.6...$
Answer: 417 years later

Calculation with x and y

② $12 \div 100 = 0.12$
$y = 0.12 \times x$
$50 \div 0.12 = 4166...$

ⓑ

Number of years x (years)	10	?
Rise of sea level y (cm)	4	50

$\times \frac{50}{4}$

① $50 \div 4 = \frac{25}{2}$
$10 \times \frac{25}{2} = 125$
Answer: 125 years later

② $4 \div 10 = 0.4$
$y = 0.4 \times x$
$50 \div 0.4 = 125$

ⓒ

Number of years x (years)	10	?
Rise of sea level y (cm)	6	50

$\times \frac{50}{6}$

① $50 \div 6 = \frac{25}{3}$
$10 \times \frac{25}{3} = 83.3...$
Answer: 83 years later

② $6 \div 10 = 0.6$
$y = 0.6 \times x$
$50 \div 0.6 = 83.\ 3..$

Summary

Proportion is useful in predicting results.

Unit 13

Unit: Proportion and Inverse Proportion

Sub-unit: 4. Inverse Proportion

Lesson 1 of 3

Textbook Page : 137 and 138
Actual Lesson 105

Sub-unit Objectives

- To understand the meaning of inverse proportion
- To investigate two quantities of inverse proportion and understand the characteristics of it.

Lesson Objectives

- To understand the meaning of inverse proportion.
- To investigate the relationship of two quantities where one increases and the other decreases.

Prior Knowledge

- Previous sub unit on direct proportion.

Preparation

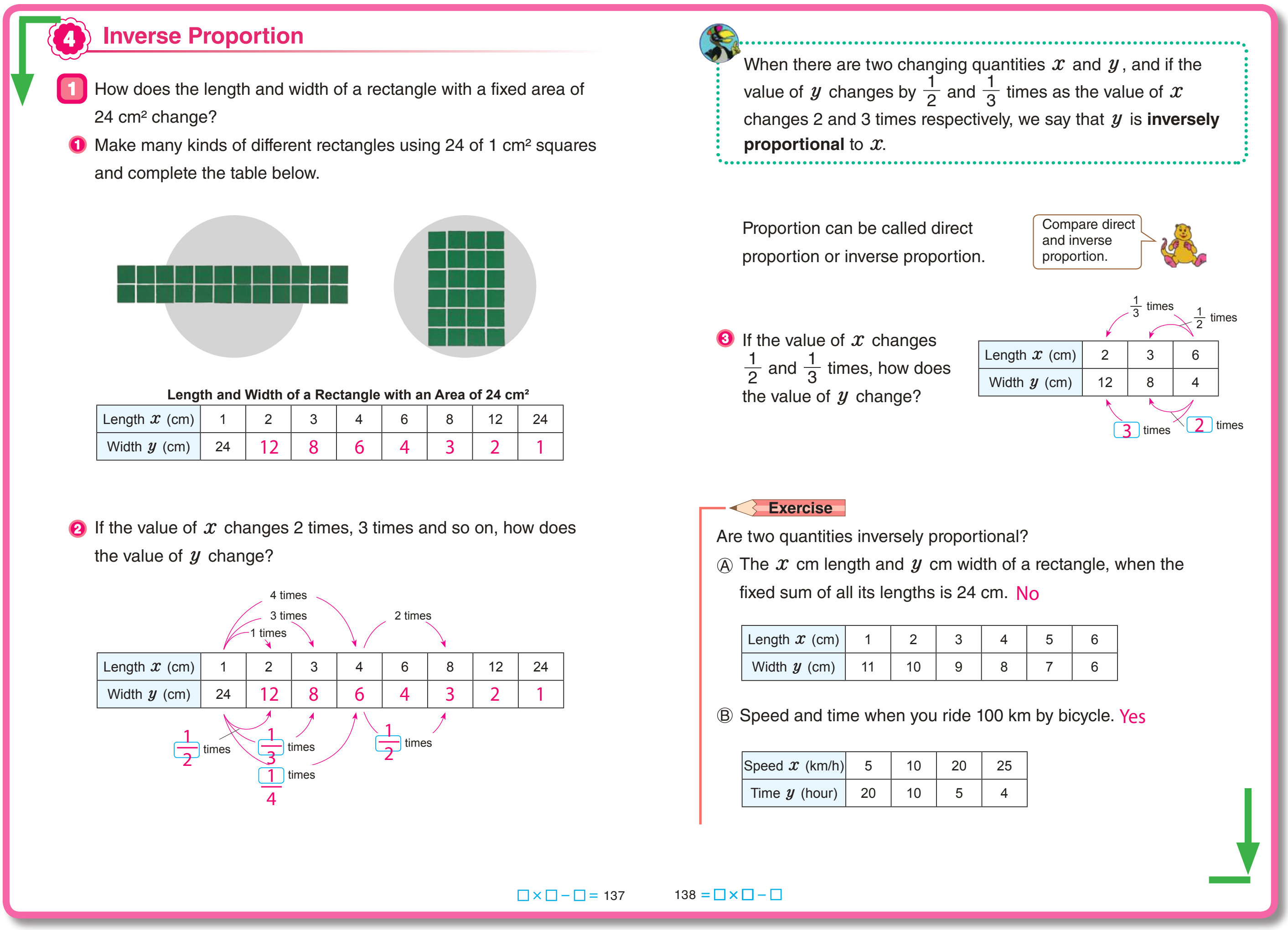
- 24 pieces of 1 cm² squares for each group
- 3 charts of the 3 tables

Assessment

- Think about the relationship of two quantities. **F**
- Explain the relationship where one quantity increases causes the other to decrease. **S**

Teacher's Notes

Let the students identify the difference as they go through the activities.
Do not define the term for them before the task.



④ Inverse Proportion

1 How does the length and width of a rectangle with a fixed area of 24 cm² change?

① Make many kinds of different rectangles using 24 of 1 cm² squares and complete the table below.

Length and Width of a Rectangle with an Area of 24 cm²

Length x (cm)	1	2	3	4	6	8	12	24
Width y (cm)	24	12	8	6	4	3	2	1

② If the value of x changes 2 times, 3 times and so on, how does the value of y change?

Length x (cm)	1	2	3	4	6	8	12	24
Width y (cm)	24	12	8	6	4	3	2	1

When there are two changing quantities x and y, and if the value of y changes by $\frac{1}{2}$ and $\frac{1}{3}$ times as the value of x changes 2 and 3 times respectively, we say that y is **inversely proportional** to x.

Proportion can be called direct proportion or inverse proportion.

③ If the value of x changes $\frac{1}{2}$ and $\frac{1}{3}$ times, how does the value of y change?

Length x (cm)	2	3	6
Width y (cm)	12	8	4

Exercise

Are two quantities inversely proportional?

Ⓐ The x cm length and y cm width of a rectangle, when the fixed sum of all its lengths is 24 cm. No

Length x (cm)	1	2	3	4	5	6
Width y (cm)	11	10	9	8	7	6

Ⓑ Speed and time when you ride 100 km by bicycle. Yes

Speed x (km/h)	5	10	20	25
Time y (hour)	20	10	5	4

□×□−□= 137 138 =□×□−□

Lesson Flow

1 Review the previous lesson.

2 ① The relationship between the length and width of a rectangle.

T/S Read and understand the given situation.

T Assist students to identify that the two quantities are the length and width of the rectangle.

S ① Make many kinds of different rectangles using 24 of 1 cm² squares and complete the table.

T Assist students in constructing different kinds of rectangles.

S Display their completed tables to the class as part of correction.

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

3 Understanding how the quantity of length affects the length of a rectangle.

T ② If the value of x changes 2 times, 3 times, how does the value of y change?

S Fill in the ☐ in the table to see the relationship.

S Notice that when x is multiplied by 2, y is multiplied by $\frac{1}{2}$, x multiplied 3, y is multiplied by $\frac{1}{3}$ and so on.

4 Important Point

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

5 Using the definition of inverse proportion to explain the table.

T ③ If the value of x changes $\frac{1}{2}$ and $\frac{1}{3}$ times, how does the value of y change?

S Identify that when x decreases by $\frac{1}{2}$, y increases by 2 and when x decreases by $\frac{1}{3}$, y increases by 3.

6 Complete Exercise.

S Solve the exercises.

T Confirm students' answers.

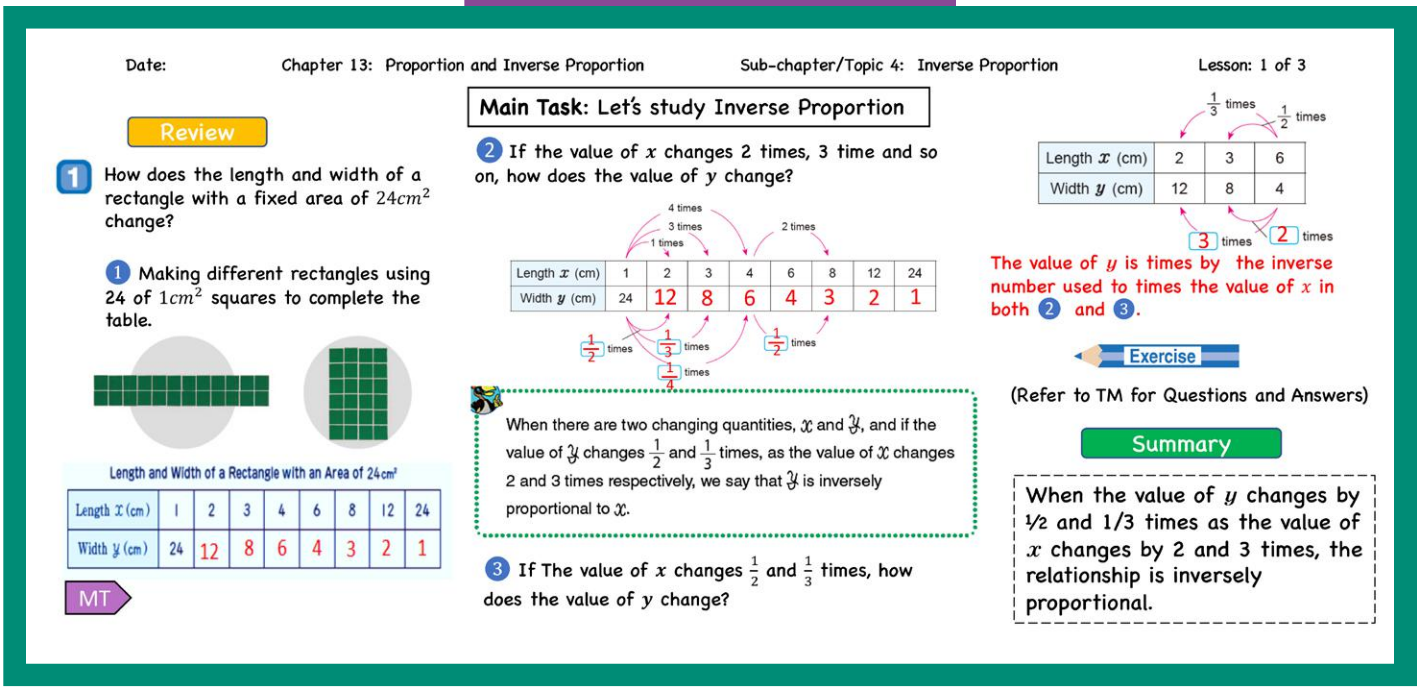
7 Summary

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



Date: Chapter 13: Proportion and Inverse Proportion Sub-chapter/Topic 4: Inverse Proportion Lesson: 1 of 3

Review

1 How does the length and width of a rectangle with a fixed area of $24cm^2$ change?

① Making different rectangles using 24 of $1cm^2$ squares to complete the table.

Length and Width of a Rectangle with an Area of 24cm²

Length x (cm)	1	2	3	4	6	8	12	24
Width y (cm)	24	12	8	6	4	3	2	1

MT

Main Task: Let's study Inverse Proportion

② If the value of x changes 2 times, 3 time and so on, how does the value of y change?

Length x (cm)	1	2	3	4	6	8	12	24
Width y (cm)	24	12	8	6	4	3	2	1

When there are two changing quantities, x and y, and if the value of y changes $\frac{1}{2}$ and $\frac{1}{3}$ times, as the value of x changes 2 and 3 times respectively, we say that y is inversely proportional to x.

③ If The value of x changes $\frac{1}{2}$ and $\frac{1}{3}$ times, how does the value of y change?

Length x (cm)	2	3	6
Width y (cm)	12	8	4

The value of y is times by the inverse number used to times the value of x in both ② and ③.

Exercise

(Refer to TM for Questions and Answers)

Summary

When the value of y changes by ½ and 1/3 times as the value of x changes by 2 and 3 times, the relationship is inversely proportional.

Unit 13

Unit: Proportion and Inverse Proportion

Sub-unit: 4. Inverse Proportion

Lesson 2 of 3

Textbook Page : 139
Actual Lesson 106

Lesson Objective

- To understand the meaning of mathematical sentences which shows inverse proportion.

Prior Knowledge

- Meaning of Inverse Proportion

Preparation

- Table showing length and width of a rectangle
- Chart of mathematical sentence of length and width

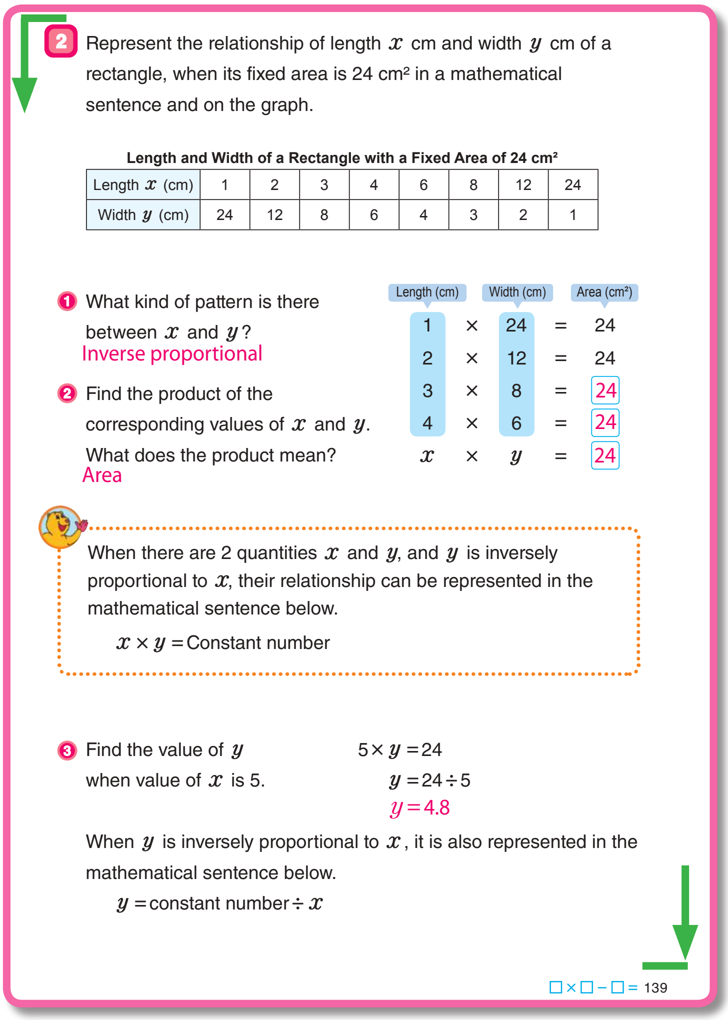
Assessment

- Identify the meaning of the mathematical sentence which shows inverse proportion. F
- Represent the relationship of inverse proportion as a mathematical sentence. S

Teacher's Notes

To identify the relationship of two changing quantities as one increases, the other decreases and when $x \times y$ the product is the same or is constant.

If two amounts are proportional, one amount increases as the other amount increases. On the other hand, the inverse proportion means that when one amount increases, the other decreases.
When one amount becomes x times, the other amount becomes $\frac{1}{x}$ times.
It is important to let students think through comparing proportion and inverse proportion.



2 Represent the relationship of length x cm and width y cm of a rectangle, when its fixed area is 24 cm² in a mathematical sentence and on the graph.

Length and Width of a Rectangle with a Fixed Area of 24 cm²

Length x (cm)	1	2	3	4	6	8	12	24
Width y (cm)	24	12	8	6	4	3	2	1

① What kind of pattern is there between x and y?
Inverse proportional

② Find the product of the corresponding values of x and y.
What does the product mean?
Area

Length (cm)		Width (cm)		Area (cm²)
1	×	24	=	24
2	×	12	=	24
3	×	8	=	24
4	×	6	=	24
x	×	y	=	24

When there are 2 quantities x and y, and y is inversely proportional to x, their relationship can be represented in the mathematical sentence below.

$x \times y =$ Constant number

③ Find the value of y when value of x is 5.

$5 \times y = 24$
$y = 24 \div 5$
$y = 4.8$

When y is inversely proportional to x, it is also represented in the mathematical sentence below.

$y =$ constant number $\div x$

□×□−□= 139

Lesson Flow

1 Review the previous lesson.

2 ② Representing length as x cm and width as y cm.

T/S Read and understand the given situation.

T/S Discuss the representation of length and width as x and y in the table.

T ① What kind of pattern is there between x and y?

S Study the table and report that when x increases, y decreases.

T Check and confirm students' findings.

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

3 The meaning of the product of x and y.

T ② Find the product of the corresponding values of x and y.
What does the product mean?

S Complete the mathematical sentence by filing in the ☐ on the chart and realize that x and y are inversely proportional and their product is constant.

TN By filling in the ☐, the students will notice that the product is the same (constant number) which is the area of the rectangle.
i.e. 24 cm².

T Confirm the mathematical sentence; $x \times y = 24$

4 Important Point

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

5 Find the unknown quantity using the definition of inverse proportion.

S ③ Find the value of y when the value of x is 5.

T Confirm students answers using the definition that $5 \times y = 24$ so $y = 24 \div 5 = 4.8$

T/S When y is inversely proportional to x, it is also represented as $y =$ constant number $\times x$.

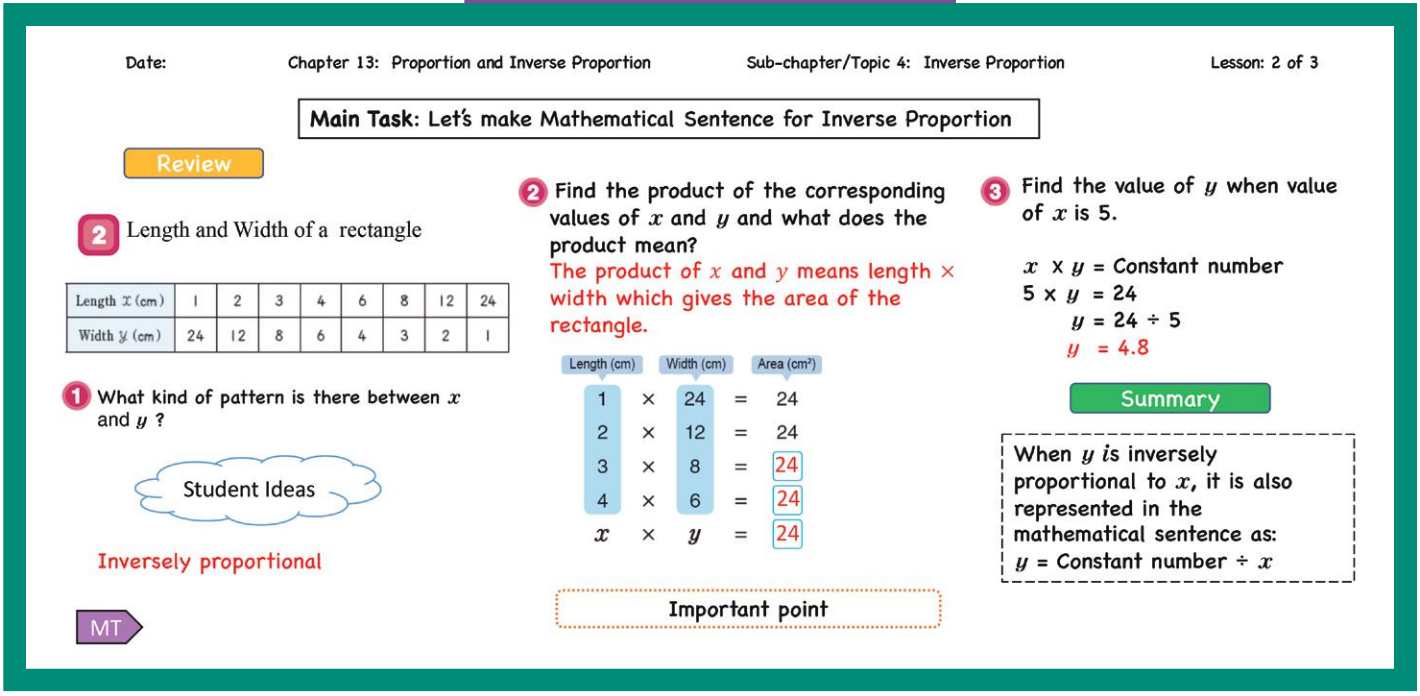
6 Summary

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 13: Proportion and Inverse Proportion Sub-chapter/Topic 4: Inverse Proportion Lesson: 2 of 3

Main Task: Let's make Mathematical Sentence for Inverse Proportion

Review

② Length and Width of a rectangle

Length x (cm)	1	2	3	4	6	8	12	24
Width y (cm)	24	12	8	6	4	3	2	1

① What kind of pattern is there between x and y ?

Student Ideas

Inversely proportional

MT

② Find the product of the corresponding values of x and y and what does the product mean?
The product of x and y means length × width which gives the area of the rectangle.

Length (cm)		Width (cm)		Area (cm²)
1	×	24	=	24
2	×	12	=	24
3	×	8	=	24
4	×	6	=	24
x	×	y	=	24

Important point

③ Find the value of y when value of x is 5.

$x \times y =$ Constant number
$5 \times y = 24$
$y = 24 \div 5$
$y = 4.8$

Summary

When y is inversely proportional to x, it is also represented in the mathematical sentence as:
$y =$ Constant number $\div x$

Unit 13

Unit: Proportion and Inverse Proportion

Sub-unit: 4. Inverse Proportion

Lesson 3 of 3

Textbook Page : 140
Actual Lesson 107

Lesson Objectives

- To deepen the understanding and the meaning of inverse proportion.
- To understand a graph that shows inverse proportion.

Assessment

- Draw a graph that shows inverse proportion. F
- Construct and comprehend graphs of inverse proportion. S

Prior Knowledge

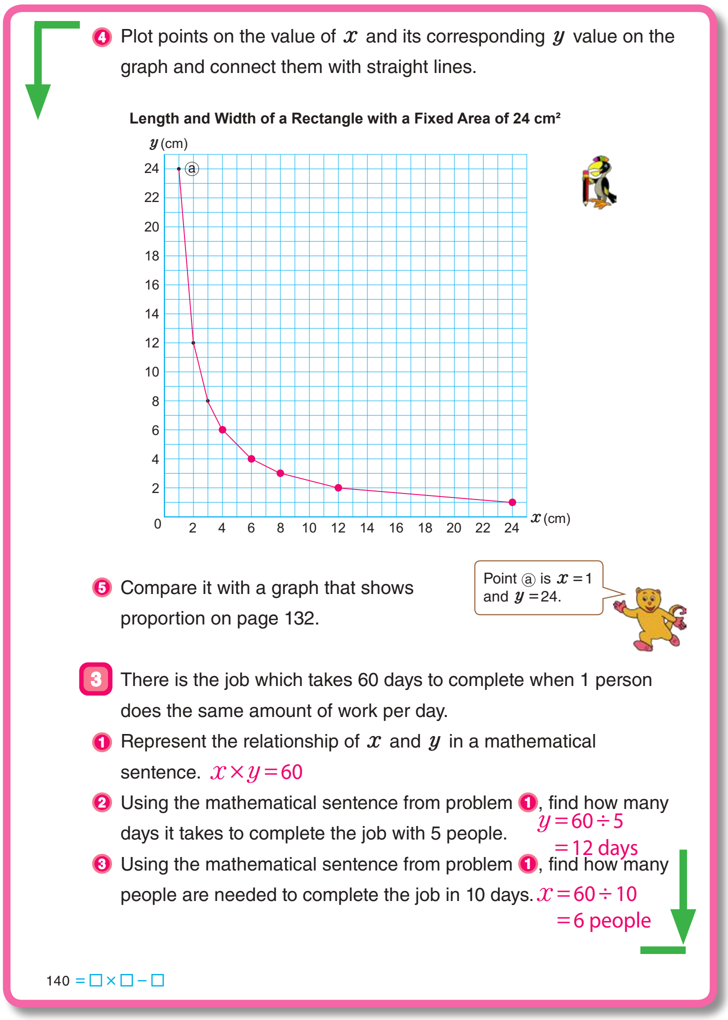
- Meaning of Inverse Proportion
- Line graphs (Grade 4)

Preparation

- Grid papers and if possible enlarged graph paper

Teacher's Notes

To identify the difference between the two graphs, the main difference is their physical appearance.
The graph of Proportion is an increasing straight line where as the graph of the Inverse proportion is a curve.



④ Plot points on the value of x and its corresponding y value on the graph and connect them with straight lines.

Length and Width of a Rectangle with a Fixed Area of 24 cm²

⑤ Compare it with a graph that shows proportion on page 132.

Point ⓐ is $x = 1$ and $y = 24$.

3 There is the job which takes 60 days to complete when 1 person does the same amount of work per day.

① Represent the relationship of x and y in a mathematical sentence. $x \times y = 60$

② Using the mathematical sentence from problem ①, find how many days it takes to complete the job with 5 people. $y = 60 \div 5$
$= 12$ days

③ Using the mathematical sentence from problem ①, find how many people are needed to complete the job in 10 days. $x = 60 \div 10$
$= 6$ people

140 = □×□−□

Lesson Flow

1 Review the previous lesson.

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

2 Draw a graph of inverse proportion.

T Ensure all students have a grid paper each and ask them to do the activity ④.

S Plot the points on the pair of x and its corresponding value of y and connect them with a straight line

TN Students should reflect back to grade 4 on the 5 steps in constructing a line graph to help them draw the graph.

T Confirm students graph with an enlarged graph on the blackboard.

3 Compare graph of inverse proportion and graph of proportion.

T Let the students locate a graph of proportion from the previous sub unit on proportion.

S Locate a graph of proportion.

T ⑤ Ask students to make comparisons and comment on any differences or similarities.

S Compare the graphs and give feedback based on what they discover.

TN Main difference is that a graph of proportion is a straight line and a graph of inverse proportion is a curve or slope.

4 Solve problem involving inverse proportion.

T/S 3 Read and understand the given situation.

T Ask students to complete activity ①, ② and ③.

S ① Represent the relationship of × and y in a mathematical sentence.

Relationship: $x \times y = 60$ or $y = \frac{60}{x}$

S ② Using the mathematical sentence in ①, find how many days it takes to complete the job with 5 people.

$y = 60 \div 5 = 12$ days

S ③ Using the mathematical sentence in ①, find how many people are needed to complete the job in 10 days.

$x = 60 \div 10 = 6$ people

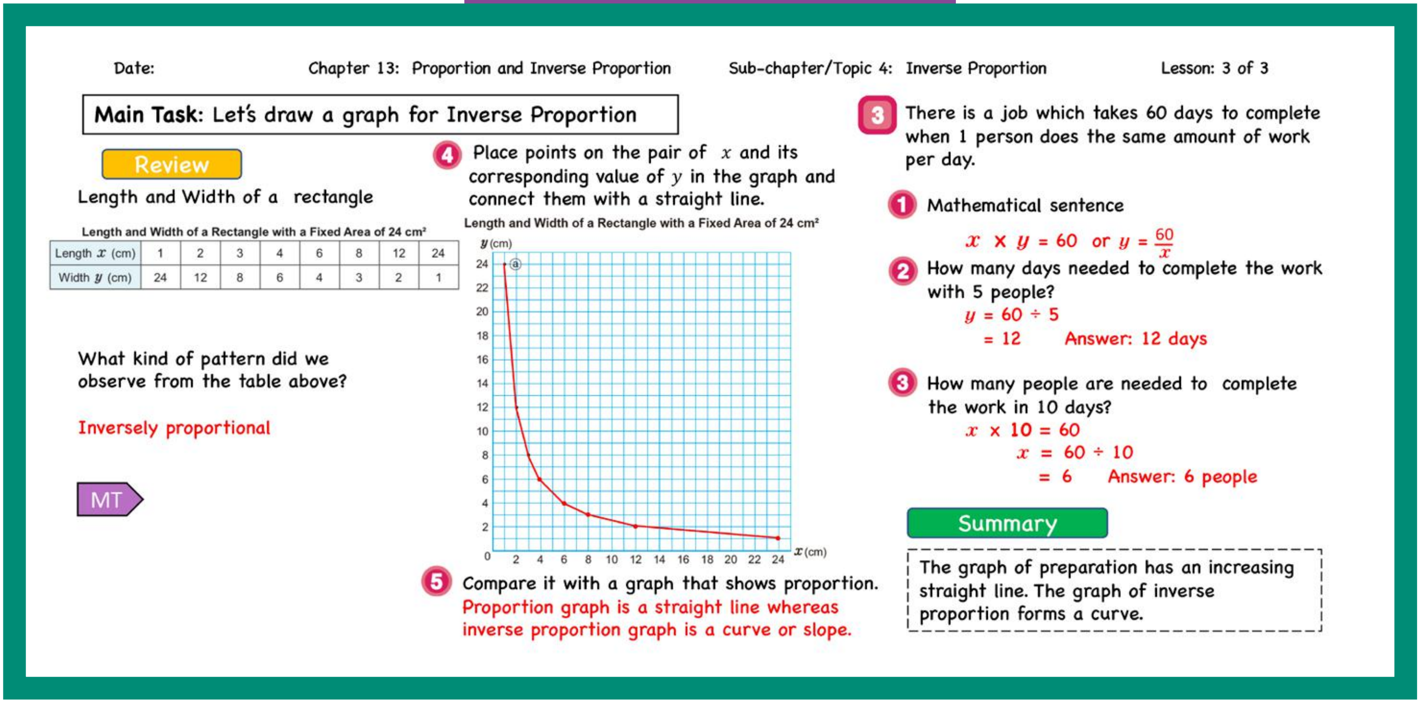
5 Summary

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 13: Proportion and Inverse Proportion Sub-chapter/Topic 4: Inverse Proportion Lesson: 3 of 3

Main Task: Let's draw a graph for Inverse Proportion

Review

Length and Width of a rectangle

Length and Width of a Rectangle with a Fixed Area of 24 cm²

Length x (cm)	1	2	3	4	6	8	12	24
Width y (cm)	24	12	8	6	4	3	2	1

What kind of pattern did we observe from the table above?

Inversely proportional

MT

④ Place points on the pair of x and its corresponding value of y in the graph and connect them with a straight line.

Length and Width of a Rectangle with a Fixed Area of 24 cm²

⑤ Compare it with a graph that shows proportion.

Proportion graph is a straight line whereas inverse proportion graph is a curve or slope.

3 There is a job which takes 60 days to complete when 1 person does the same amount of work per day.

① Mathematical sentence

$x \times y = 60$ or $y = \frac{60}{x}$

② How many days needed to complete the work with 5 people?

$y = 60 \div 5$

$= 12$ Answer: 12 days

③ How many people are needed to complete the work in 10 days?

$x \times 10 = 60$

$x = 60 \div 10$

$= 6$ Answer: 6 people

Summary

The graph of preparation has an increasing straight line. The graph of inverse proportion forms a curve.

Unit 13

Unit: Proportion and Inverse Proportion
Sub-unit: Exercise, Review and Evaluation
Lesson 1 of 2

Textbook Page : 141 and 142
Actual Lesson 108 & 109

Lesson Objective

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

Assessment

- Solve the exercise and review exercises correctly. F S

Prior Knowledge

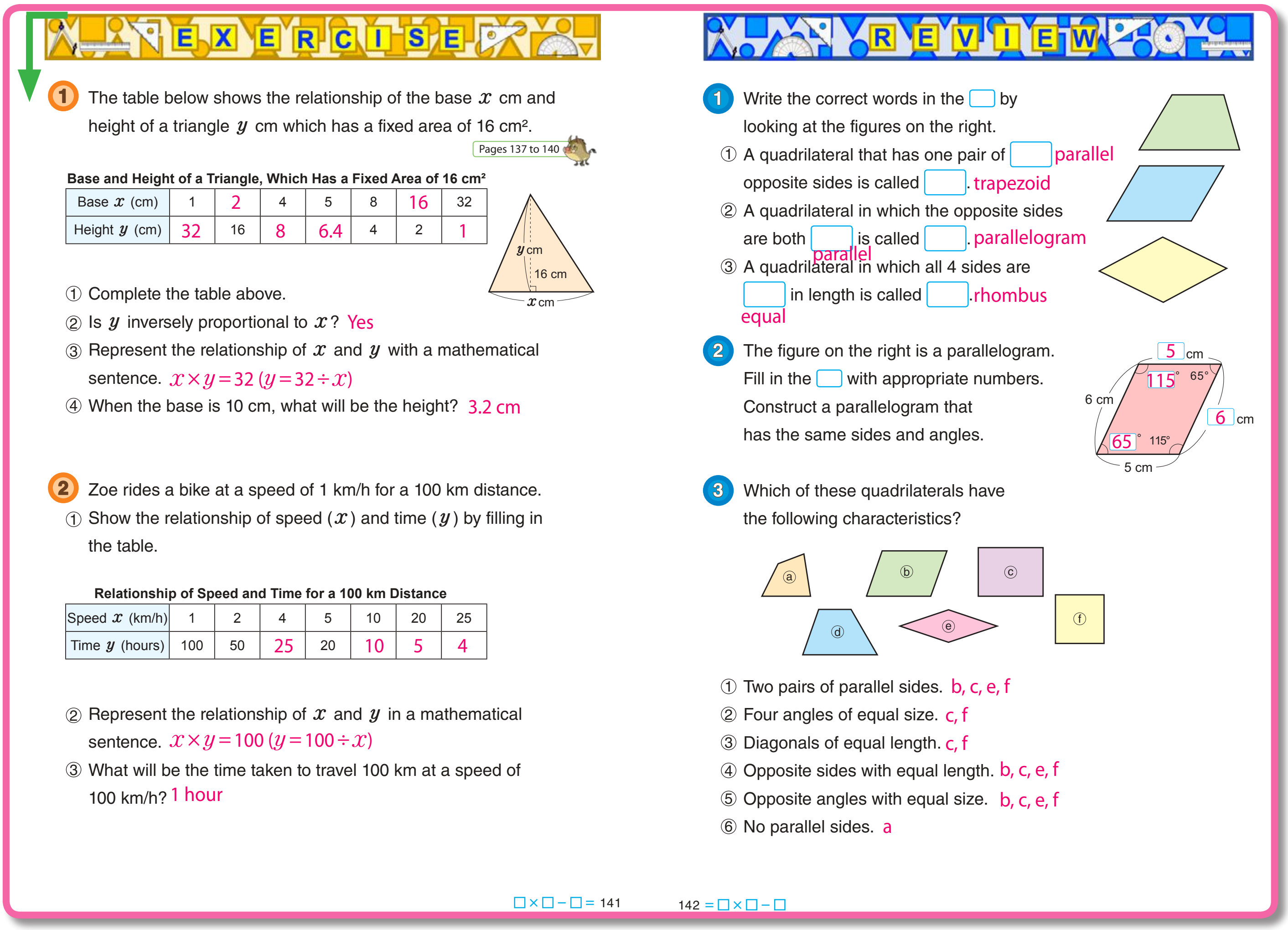
- All the contents learned in this unit of Proportion and Inverse Proportion.

Preparation

- Evaluation Test

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 complete all the exercises and solve the problems in preparation for the evaluation test. Use the attached evaluation test to conduct assessment for your class after finishing all the exercises and review as a seperate lesson.



EXERCISE

① The table below shows the relationship of the base x cm and height of a triangle y cm which has a fixed area of 16 cm².

Pages 137 to 140

Base and Height of a Triangle, Which Has a Fixed Area of 16 cm²

Base x (cm)	1	2	4	5	8	16	32
Height y (cm)	32	16	8	6.4	4	2	1

① Complete the table above.
② Is y inversely proportional to x? Yes
③ Represent the relationship of x and y with a mathematical sentence. $x \times y = 32$ ($y = 32 \div x$)
④ When the base is 10 cm, what will be the height? 3.2 cm

② Zoe rides a bike at a speed of 1 km/h for a 100 km distance.
① Show the relationship of speed (x) and time (y) by filling in the table.

Relationship of Speed and Time for a 100 km Distance

Speed x (km/h)	1	2	4	5	10	20	25
Time y (hours)	100	50	25	20	10	5	4

② Represent the relationship of x and y in a mathematical sentence. $x \times y = 100$ ($y = 100 \div x$)
③ What will be the time taken to travel 100 km at a speed of 100 km/h? 1 hour

REVIEW

① Write the correct words in the ☐ by looking at the figures on the right.
① A quadrilateral that has one pair of ☐ parallel opposite sides is called ☐. trapezoid
② A quadrilateral in which the opposite sides are both ☐ parallel is called ☐. parallelogram
③ A quadrilateral in which all 4 sides are ☐ equal in length is called ☐. rhombus

② The figure on the right is a parallelogram. Fill in the ☐ with appropriate numbers. Construct a parallelogram that has the same sides and angles.

③ Which of these quadrilaterals have the following characteristics?

① Two pairs of parallel sides. b, c, e, f
② Four angles of equal size. c, f
③ Diagonals of equal length. c, f
④ Opposite sides with equal length. b, c, e, f
⑤ Opposite angles with equal size. b, c, e, f
⑥ No parallel sides. a

Lesson Flow

1 Complete Exercise ① and ②.

S ① and ②. Complete table of the relationship of the base and height of the triangle .

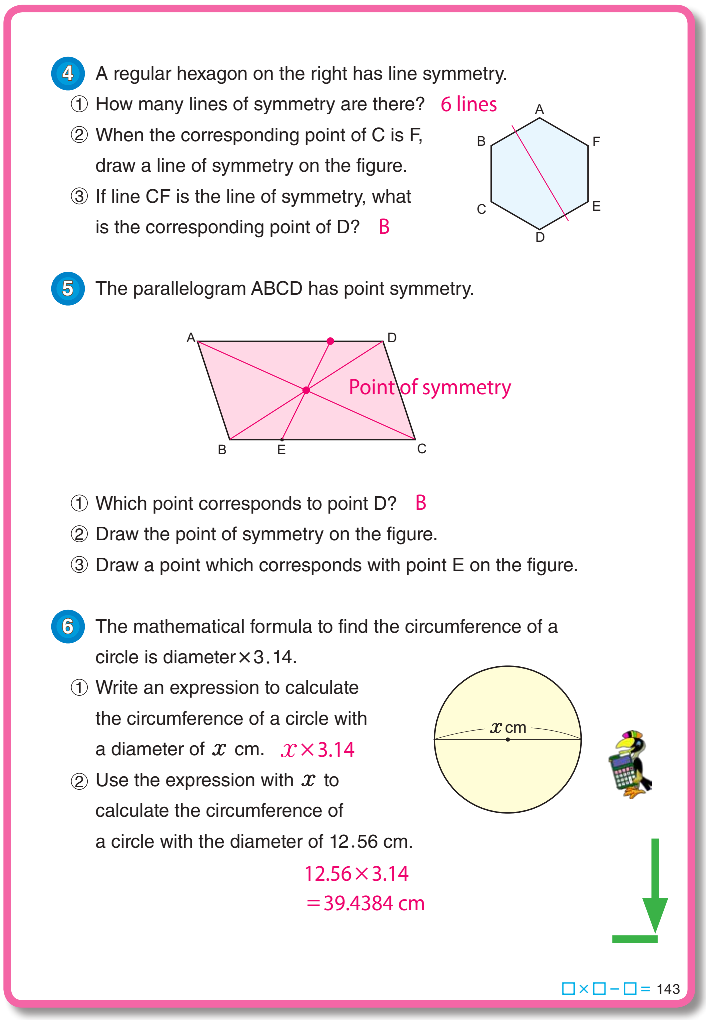
2 Complete Review ❶ to ❻.

S ❶ Read the problem and solve questions ① to ③.
❷ Use the given ratio to find the number of red balls to be drawn.
❸ Study the diagram and solve the problem.
❹ Solve the problem by identifying length and width using a given ratio.
❺ Study the diagram and solve the problem.
❻ Solve the problem by identifying length and width using a given ratio.

3 Complete the Evaluation Test.

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

S Complete the evaluation test.



❹ A regular hexagon on the right has line symmetry.

① How many lines of symmetry are there? 6 lines

② When the corresponding point of C is F, draw a line of symmetry on the figure.

③ If line CF is the line of symmetry, what is the corresponding point of D? B

❺ The parallelogram ABCD has point symmetry.

Point of symmetry

① Which point corresponds to point D? B

② Draw the point of symmetry on the figure.

③ Draw a point which corresponds with point E on the figure.

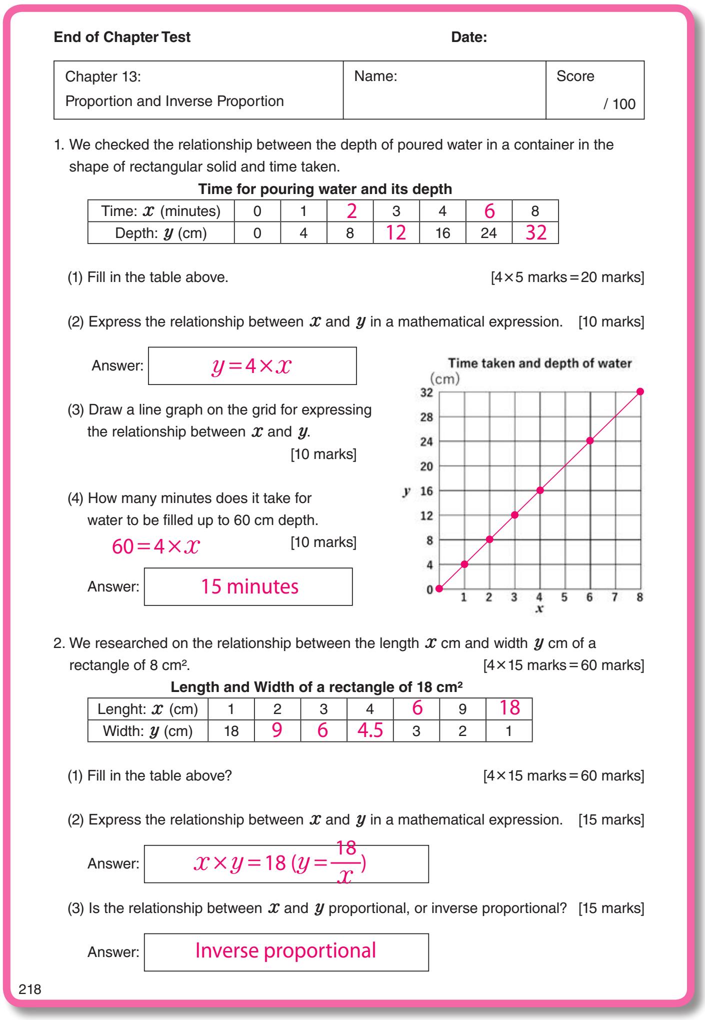
❻ The mathematical formula to find the circumference of a circle is diameter × 3.14.

① Write an expression to calculate the circumference of a circle with a diameter of x cm. $x \times 3.14$

② Use the expression with x to calculate the circumference of a circle with the diameter of 12.56 cm.

12.56×3.14
$= 39.4384$ cm

□×□−□= 143



End of Chapter Test **Date:**

Chapter 13: Proportion and Inverse Proportion	Name:	Score / 100

1. We checked the relationship between the depth of poured water in a container in the shape of rectangular solid and time taken.

Time for pouring water and its depth

Time: x (minutes)	0	1	2	3	4	6	8
Depth: y (cm)	0	4	8	12	16	24	32

(1) Fill in the table above. [4×5 marks = 20 marks]

(2) Express the relationship between x and y in a mathematical expression. [10 marks]

Answer: $y = 4 \times x$

(3) Draw a line graph on the grid for expressing the relationship between x and y. [10 marks]

Time taken and depth of water

(4) How many minutes does it take for water to be filled up to 60 cm depth. [10 marks]

$60 = 4 \times x$

Answer: 15 minutes

2. We researched on the relationship between the length x cm and width y cm of a rectangle of 8 cm². [4×15 marks = 60 marks]

Length and Width of a rectangle of 18 cm²

Lenght: x (cm)	1	2	3	4	6	9	18
Width: y (cm)	18	9	6	4.5	3	2	1

(1) Fill in the table above? [4×15 marks = 60 marks]

(2) Express the relationship between x and y in a mathematical expression. [15 marks]

Answer: $x \times y = 18 \; (y = \frac{18}{x})$

(3) Is the relationship between x and y proportional, or inverse proportional? [15 marks]

Answer: Inverse proportional

218

End of Chapter Test **Date:**

Chapter 13: Proportion and Inverse Proportion	Name:	Score / 100

1. We checked the relationship between the depth of poured water in a container in the shape of rectangular solid and time taken.

Time for pouring water and its depth

Time: x (minutes)	0	1		3	4		8
Depth: y (cm)	0	4	8		16	24	

(1) Fill in the table above. [4×5 marks = 20 marks]

(2) Express the relationship between x and y in a mathematical expression. [10 marks]

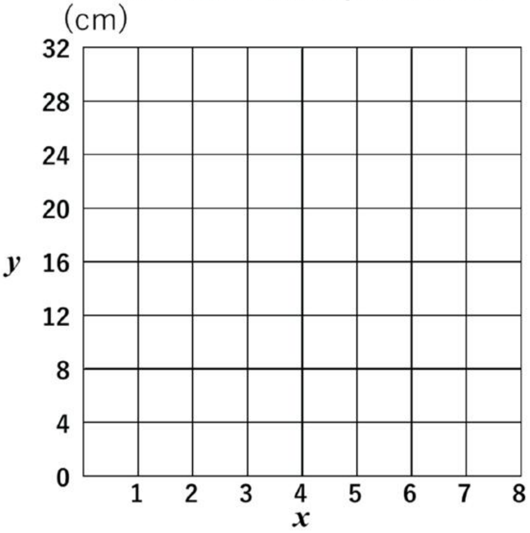
Answer:

(3) Draw a line graph on the grid for expressing the relationship between x and y. [10 marks]

(4) How many minutes does it take for water to be filled up to 60 cm depth. [10 marks]

Answer:

Time taken and depth of water



2. We researched on the relationship between the length x cm and width y cm of a rectangle of 8 cm². [4×15 marks = 60 marks]

Length and Width of a rectangle of 18 cm²

Lenght: x (cm)	1	2	3	4		9	
Width: y (cm)	18				3	2	1

(1) Fill in the table above? [4×15 marks = 60 marks]

(2) Express the relationship between x and y in a mathematical expression. [15 marks]

Answer:

(3) Is the relationship between x and y proportional, or inverse proportional? [15 marks]

Answer:

Chapter 14 How to Explore Data

1. Content Standard

6.4.4. Students will be able to examine data and analyse and represent it statistically and appreciate its usefulness in daily life.

2. Unit Objectives

- To determine the average of data and the distribution of data and represent it statistically.
- To get to know the average of data as the mean.
- To get to know the tables and graphs that represents frequency distribution.

3. Teaching Overview

Students learn how to marshal data in Grade 5. In Grade 6, students will acquire knowledge and skills of expressing and analysing data statistically.

They also acquire the skill of utilizing the interpretation for decision making. Therefore evaluating the tendency of data and discussing on the meaning of the interpretation should be encouraged.

Mean :

Students learn mean as the result of leveling off. In this grade, they learn means for representing the characteristics of data set.

How to Explore Distribution :

How to marshal data follows the following 4 steps; Overviewing the data, Deciding the classes/intervals, Recording frequencies and Drawing a histogram. Students are required to master correct usage of terminologies such as “greater than or equal to”, “less than or equal to” and “less than”.

4. Related Learning Contents

Grade 5

- Meaning of mean and how to seek it.

[2 Amount per Unit Quantity]

- Meaning of ratio
- How to read and draw bar charts and pie charts.

[15 Rates and Graphs]

Grade 6

- Mean as a representative value
- How to express the interval of numbers (greater or equal, less than or equal, less than)
- How to explore distribution how to read and drow distribution tables and histogram
- Estimation of the tendency of the group

[14 How to Explore Data]

Grade 7

- Frequency distribution and histogram
- Relative frequency, the mean value, ranges

Grade 8

- Sample survey

Unit 14

Unit: How to Explore Data

Sub-unit: 1. Mean

Lesson 1 of 2

Textbook Page :
144 and 145
Actual Lesson 110

Sub-unit Objectives

- To understand the meaning of mean using data.
- To understand how to find the mean of data

Lesson Objectives

- To use the mean for comparing real data.
- To interpret data on a table.

Prior Knowledge

- Measurement as an approximate value
- The mean (average) of measured values

Preparation

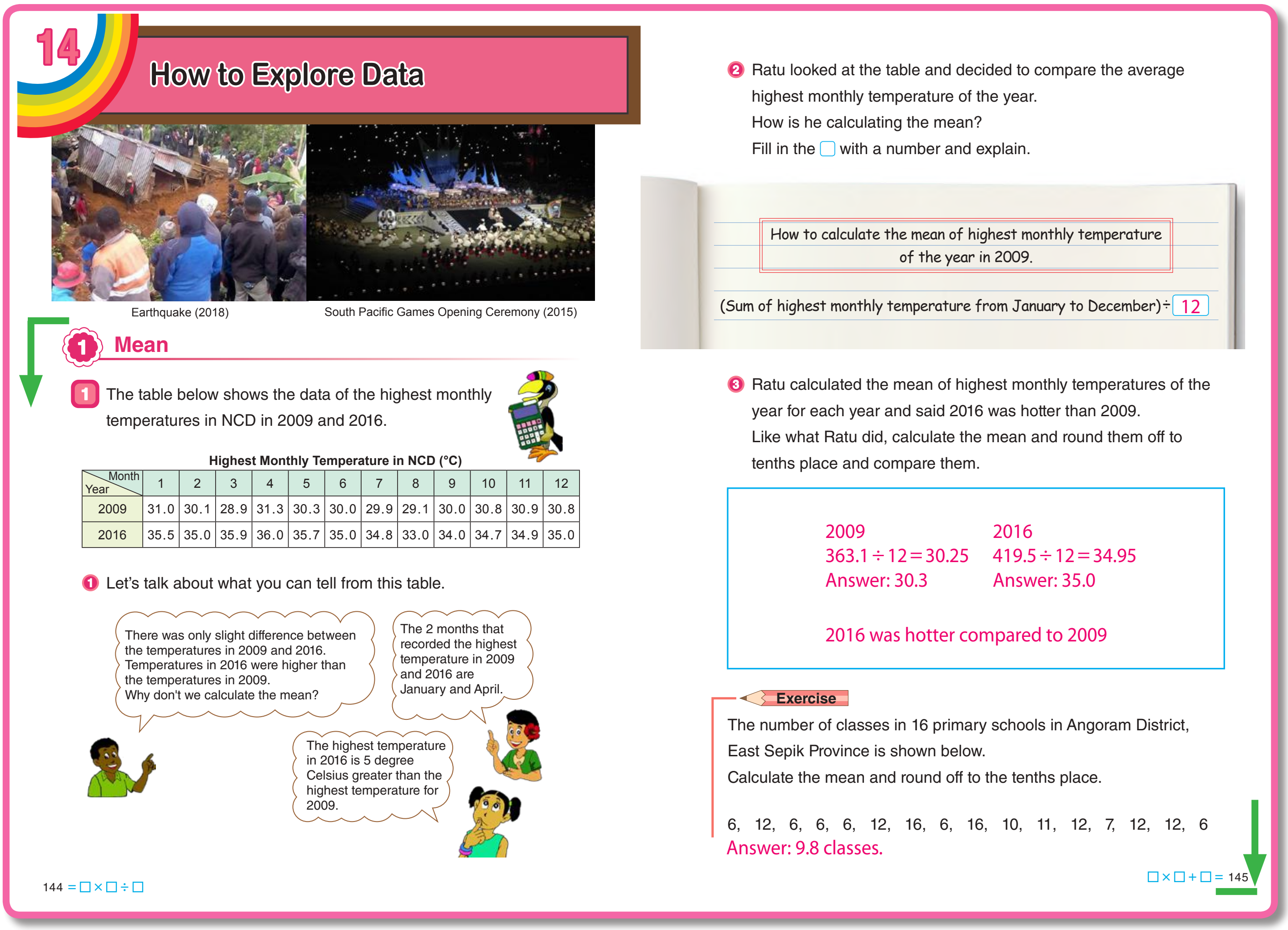
- Table showing local temperature

Assessment

- Explain how mean can be calculated from a data table. **F**
- Compare and analyse data. **F** **S**

Teacher's Notes

Students learned about the mean of measured values in Gr.5.
Based on this, students should be expected to understand mean as a representative value (average) of data to deepen their understanding of mean.



14 How to Explore Data

Earthquake (2018)

South Pacific Games Opening Ceremony (2015)

1 Mean

1 The table below shows the data of the highest monthly temperatures in NCD in 2009 and 2016.

Highest Monthly Temperature in NCD (°C)

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
2009	31.0	30.1	28.9	31.3	30.3	30.0	29.9	29.1	30.0	30.8	30.9	30.8
2016	35.5	35.0	35.9	36.0	35.7	35.0	34.8	33.0	34.0	34.7	34.9	35.0

① Let's talk about what you can tell from this table.

There was only slight difference between the temperatures in 2009 and 2016. Temperatures in 2016 were higher than the temperatures in 2009. Why don't we calculate the mean?

The 2 months that recorded the highest temperature in 2009 and 2016 are January and April.

The highest temperature in 2016 is 5 degree Celsius greater than the highest temperature for 2009.

144 =□×□÷□

② Ratu looked at the table and decided to compare the average highest monthly temperature of the year.
How is he calculating the mean?
Fill in the □ with a number and explain.

How to calculate the mean of highest monthly temperature of the year in 2009.

(Sum of highest monthly temperature from January to December)÷ 12

③ Ratu calculated the mean of highest monthly temperatures of the year for each year and said 2016 was hotter than 2009.
Like what Ratu did, calculate the mean and round them off to tenths place and compare them.

2009	2016
363.1 ÷ 12 = 30.25	419.5 ÷ 12 = 34.95
Answer: 30.3	Answer: 35.0

2016 was hotter compared to 2009

Exercise

The number of classes in 16 primary schools in Angoram District, East Sepik Province is shown below.
Calculate the mean and round off to the tenths place.

6, 12, 6, 6, 6, 12, 16, 6, 16, 10, 11, 12, 7, 12, 12, 6
Answer: 9.8 classes.

□×□+□= 145

Lesson Flow

1 Discuss the data of Average Temperature on the table.

T/S Study the the two pictures and discuss the kind of information or data that can be obtained from these situations.

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

T/S 1 Read and understand the given situation.

T Allow students to study the data table showing the highest monthly temperatures for NCD in 2009 and 2016.

S ① Discuss and interpret the information from the table.

S Identify and explain information by comparing the data of the two years, 2009 and 2016. Example: Temperatures for 2016 are all in the 30's.

2 Explain how to compare data of different years.

T Guide students to compare the temperatures of both years by their average.

S ② Compare the 2 years by finding the average for each year which is;
(Sum of monthly highest temperature from January to December) ÷ 12

S Generalise how mean can be calculated based on prior knowledge.

3 ③ Find the monthly highest temperature average for year 2009 and 2016.

S Use the data from the table to calculate the mean for each year.

S Give a general comparison of the highest average temperature for the 2 years.

T From the calculations of each year's average, students will give a general comparison that 2016 was a hotter year compared to 2009 for NCD.

4 Complete the Exercise.

S Solve the exercises.

T Confirm students' answers.

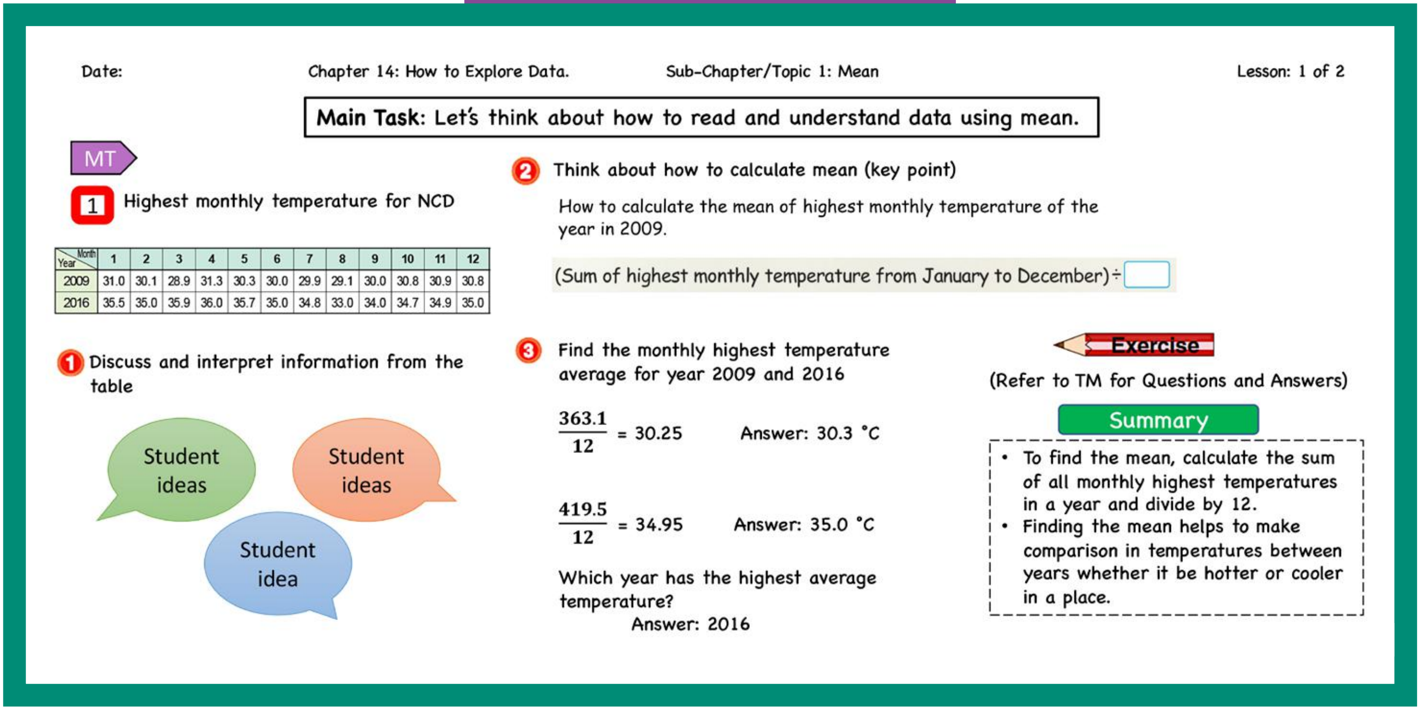
5 Summary

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: Chapter 14: How to Explore Data. Sub-Chapter/Topic 1: Mean Lesson: 1 of 2

Main Task: Let's think about how to read and understand data using mean.

MT

1 Highest monthly temperature for NCD

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
2009	31.0	30.1	28.9	31.3	30.3	30.0	29.9	29.1	30.0	30.8	30.9	30.8
2016	35.5	35.0	35.9	36.0	35.7	35.0	34.8	33.0	34.0	34.7	34.9	35.0

① Discuss and interpret information from the table

Student ideas
Student ideas
Student idea

② Think about how to calculate mean (key point)

How to calculate the mean of highest monthly temperature of the year in 2009.

(Sum of highest monthly temperature from January to December) ÷ ☐

③ Find the monthly highest temperature average for year 2009 and 2016

$\frac{363.1}{12} = 30.25$ Answer: 30.3 °C

$\frac{419.5}{12} = 34.95$ Answer: 35.0 °C

Which year has the highest average temperature?
Answer: 2016

Exercise

(Refer to TM for Questions and Answers)

Summary

- To find the mean, calculate the sum of all monthly highest temperatures in a year and divide by 12.
- Finding the mean helps to make comparison in temperatures between years whether it be hotter or cooler in a place.

Unit
14

Unit: How to Explore Data
Sub-unit: 1. Mean
Lesson 2 of 2

Textbook Page : 146
Actual Lesson 111

Lesson Objective

- To understand how to calculate the average of scores(heights) as the mean.

Prior Knowledge

- The mean (average) of measured values

Preparation

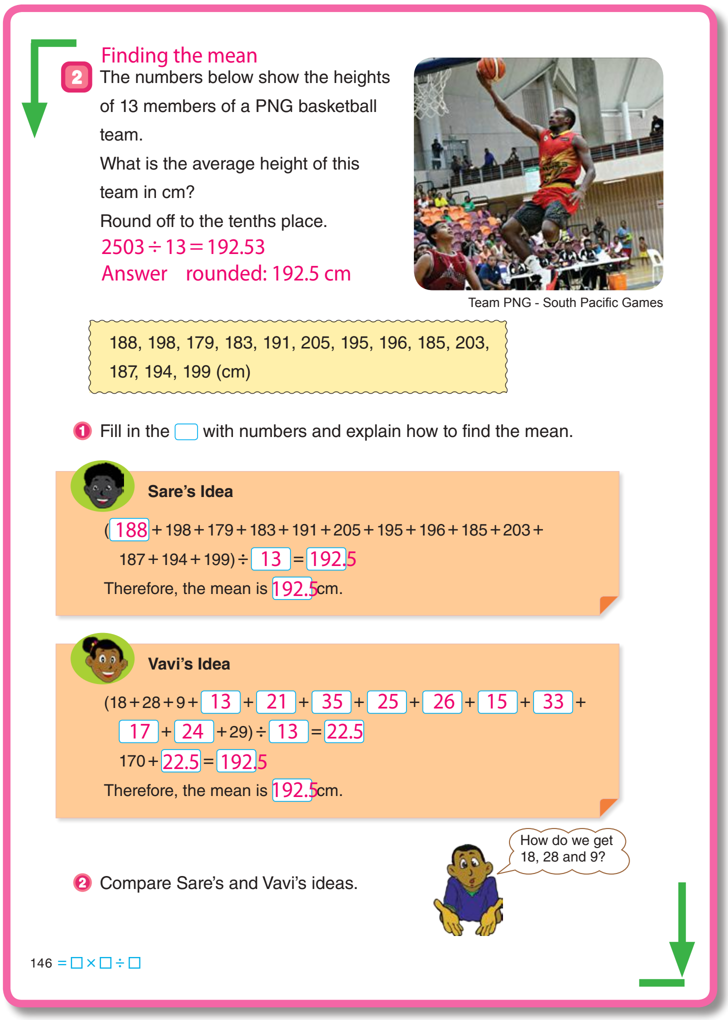
- Data of heights

Assessment

- Calculate mean in different ways to compare and find the easier way. F S

Teacher's Notes

Students may find Vavi's Idea to be interesting. However, guide them to understand that Sare's Calculation is working with two operations and so there are minimum chances of making mistake than Vavi.



Finding the mean

2 The numbers below show the heights of 13 members of a PNG basketball team.
What is the average height of this team in cm?
Round off to the tenths place.
$2503 \div 13 = 192.53$
Answer rounded: 192.5 cm

Team PNG - South Pacific Games

188, 198, 179, 183, 191, 205, 195, 196, 185, 203, 187, 194, 199 (cm)

① Fill in the □ with numbers and explain how to find the mean.

Sare's Idea

$(\boxed{188} + 198 + 179 + 183 + 191 + 205 + 195 + 196 + 185 + 203 +$
$187 + 194 + 199) \div \boxed{13} = \boxed{192.}5$
Therefore, the mean is $\boxed{192.}5$cm.

Vavi's Idea

$(18 + 28 + 9 + \boxed{13} + \boxed{21} + \boxed{35} + \boxed{25} + \boxed{26} + \boxed{15} + \boxed{33} +$
$\boxed{17} + \boxed{24} + 29) \div \boxed{13} = \boxed{22.5}$
$170 + \boxed{22.5} = \boxed{192.}5$
Therefore, the mean is $\boxed{192.}5$cm.

How do we get 18, 28 and 9?

② Compare Sare's and Vavi's ideas.

146 = □ × □ ÷ □

Lesson Flow

1 Review the previous lesson.

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

2 ② Find the average height of basketball players in a team.

T/S Read and understand the given situation.

S Round off the heights to the nearest tenths place

S Calculate the average height.

3 ① Think about and explain how to get the average height.

S Fill in the spaces for the 2 ideas to calculate the mean.

T
- Sare's Idea Adding all the heights and dividing the total heights by the number of players.
- Vavi's Idea Based on 170 cm (least common height of all players) and the difference of individual heights to 170 cm.

Total of (heights-170) ÷ 13 = Average difference

170 + Average difference = Mean Height

4 ② Compare and discuss the 2 ideas

T Let students compare the 2 ideas from activity ① to determine which is easier.

S Compare and conclude that Sare's idea is much easier considering the less calculations involved.

S Demonstrate how the 2 ideas are used to get the mean for the height of the players in the team.

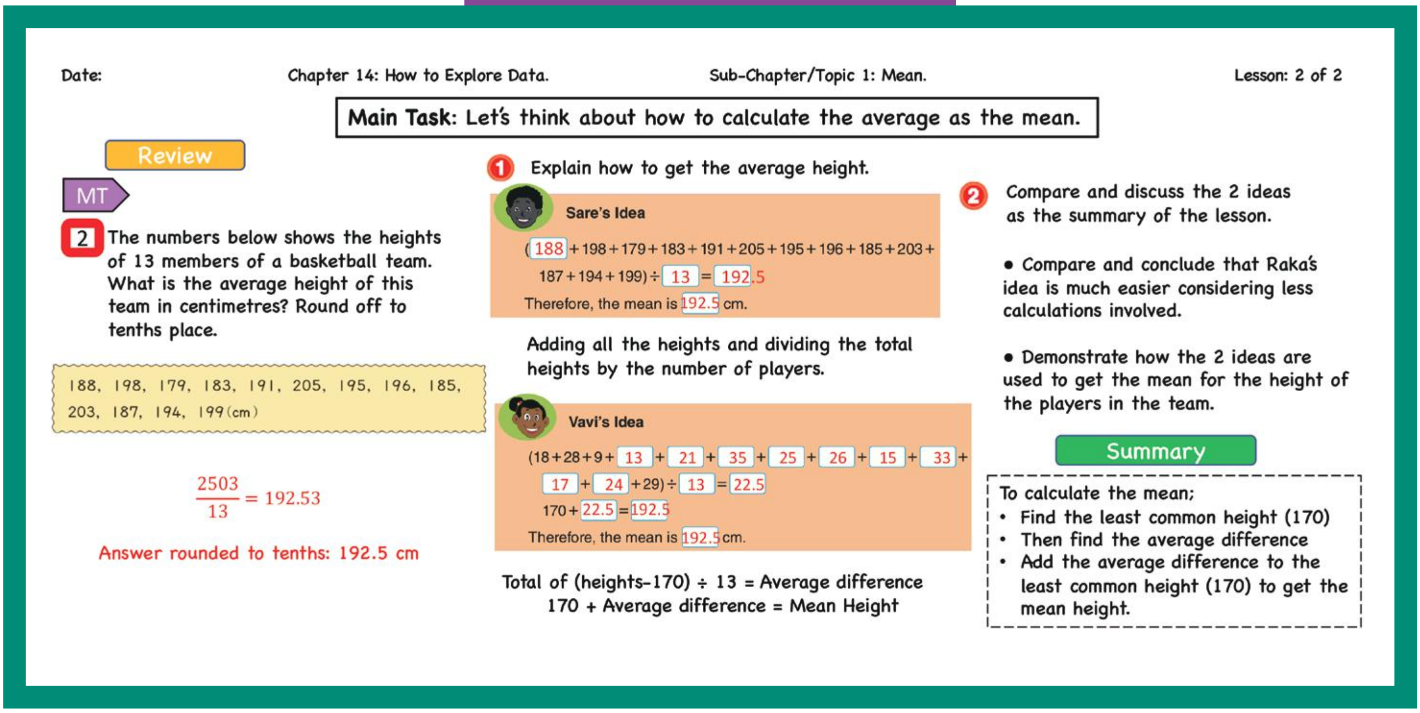
5 Summary

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 14: How to Explore Data. Sub-Chapter/Topic 1: Mean. Lesson: 2 of 2

Main Task: Let's think about how to calculate the average as the mean.

Review

MT

2 The numbers below shows the heights of 13 members of a basketball team. What is the average height of this team in centimetres? Round off to tenths place.

188, 198, 179, 183, 191, 205, 195, 196, 185, 203, 187, 194, 199 (cm)

$$\frac{2503}{13} = 192.53$$

Answer rounded to tenths: 192.5 cm

① Explain how to get the average height.

Sare's Idea

$(\boxed{188}+198+179+183+191+205+195+196+185+203+187+194+199) \div \boxed{13} = \boxed{192}.5$

Therefore, the mean is $\boxed{192.5}$ cm.

Adding all the heights and dividing the total heights by the number of players.

Vavi's Idea

$(18+28+9+\boxed{13}+\boxed{21}+\boxed{35}+\boxed{25}+\boxed{26}+\boxed{15}+\boxed{33}+\boxed{17}+\boxed{24}+29) \div \boxed{13} = \boxed{22.5}$

$170+\boxed{22.5}=\boxed{192.5}$

Therefore, the mean is $\boxed{192.5}$ cm.

Total of (heights-170) ÷ 13 = Average difference

170 + Average difference = Mean Height

② Compare and discuss the 2 ideas as the summary of the lesson.

- Compare and conclude that Raka's idea is much easier considering less calculations involved.
- Demonstrate how the 2 ideas are used to get the mean for the height of the players in the team.

Summary

To calculate the mean;
- Find the least common height (170)
- Then find the average difference
- Add the average difference to the least common height (170) to get the mean height.

Unit 14

Unit: How to Explore Data

Sub-unit: 2. How to Explore Distribution

Lesson 1 of 4

Textbook Page : 147 to 149
Actual Lesson 112

Sub-unit Objectives

- To organise data and analyse the distribution on a frequency distribution table or graph.
- To understand the meaning and how to draw a histogram.
- To understand how to read a histogram and analyse the information.

Lesson Objectives

- To think about how to analyse the distribution of 2 sets of data.
- To organise data on a number line to easily understand distribution.

Prior Knowledge

- Collecting, sorting and organising data
- Representing data using pie and bar graphs

Preparation

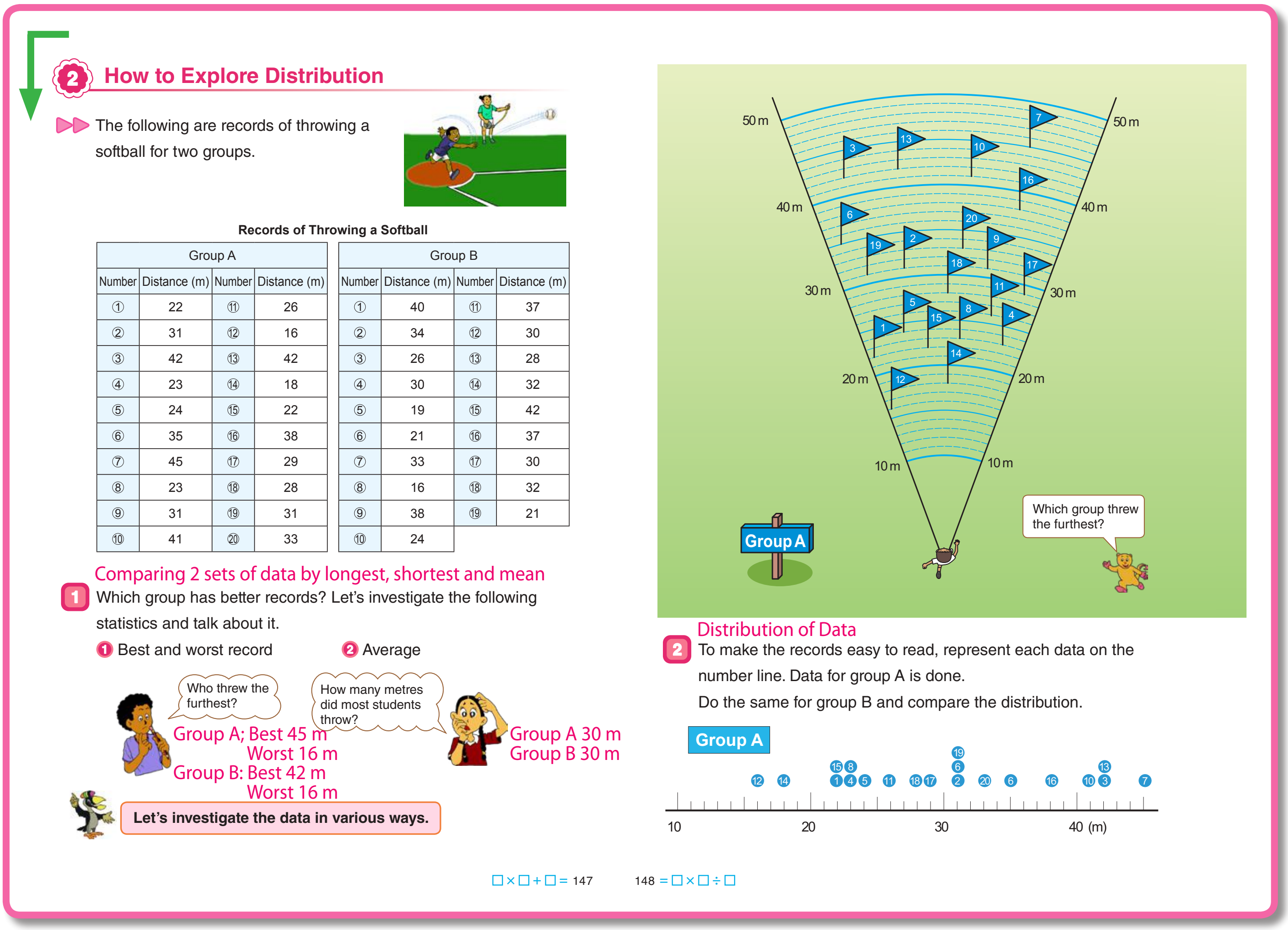
- Number lines for group A & B

Assessment

- Analyse the distribution of two sets of data. **F**
- Organise data on a number line. **S**

Teacher's Notes

Data collection and arrangement is important in order to read the distribution and know the best and worst or average without calculation. Data distribution on number line is one way of making accurate reading.



② How to Explore Distribution

▶▶ The following are records of throwing a softball for two groups.

Records of Throwing a Softball

Group A				Group B			
Number	Distance (m)	Number	Distance (m)	Number	Distance (m)	Number	Distance (m)
①	22	⑪	26	①	40	⑪	37
②	31	⑫	16	②	34	⑫	30
③	42	⑬	42	③	26	⑬	28
④	23	⑭	18	④	30	⑭	32
⑤	24	⑮	22	⑤	19	⑮	42
⑥	35	⑯	38	⑥	21	⑯	37
⑦	45	⑰	29	⑦	33	⑰	30
⑧	23	⑱	28	⑧	16	⑱	32
⑨	31	⑲	31	⑨	38	⑲	21
⑩	41	⑳	33	⑩	24		

Comparing 2 sets of data by longest, shortest and mean

1 Which group has better records? Let's investigate the following statistics and talk about it.

① Best and worst record ② Average

Group A; Best 45 m
Worst 16 m
Group B: Best 42 m
Worst 16 m

Group A 30 m
Group B 30 m

Let's investigate the data in various ways.

Distribution of Data

2 To make the records easy to read, represent each data on the number line. Data for group A is done.

Do the same for group B and compare the distribution.

□×□+□= 147 148 =□×□÷□

Lesson Flow

1 Review the previous lesson.

2 Investigate and discuss the table of records.

T/S ▶▶ Read and understand the given information.

S Study the information on the table showing the distance of a softball been thrown.

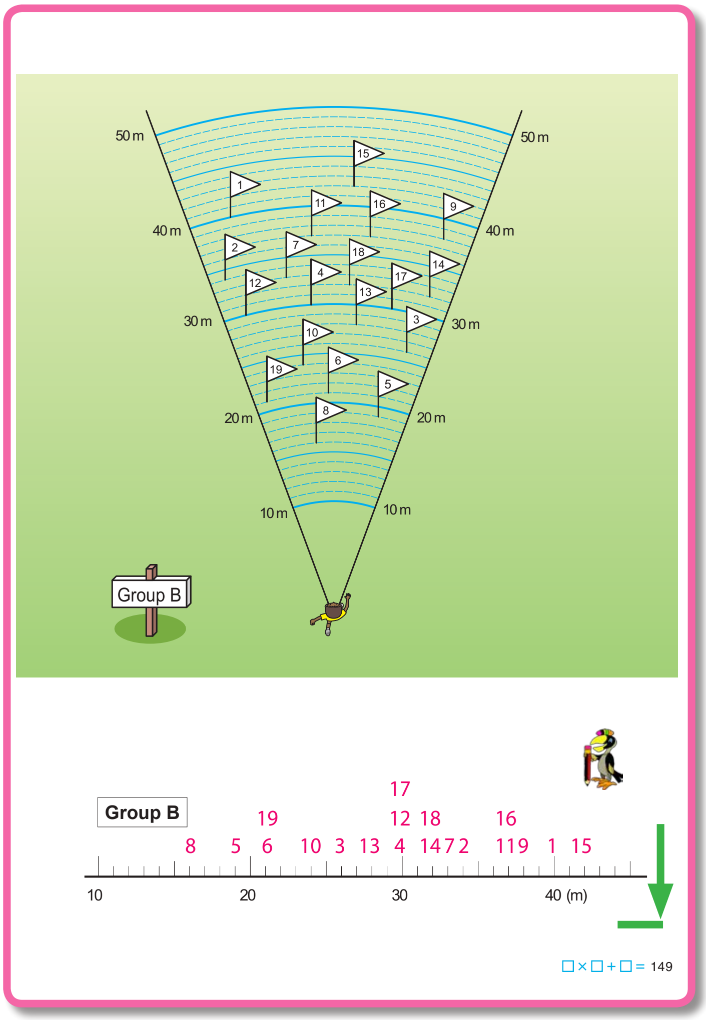
T/S 1 Read and understand the given situation.

T Ask the students to identify the best and worst records and the average.

S ① Identify the best and worst records from the 2 groups.
Group A: Best: 45 m Worst: 16 m
Group B: Best: 42 m Worst: 16 m

S ② Investigate the average distance thrown by each group based on the results.
Group A: 30 metres
Group B: 30 metres

T Give an opportunity to the students to explain how they determine their average without doing any calculations.



3 Represent data on number lines.

T/S 2 Read and understand the given situation.

T Let students represent the data for Group B in the diagram onto a number line.

TN Allow students to observe how the data for Group A was represented on the number line and do the same for Group B.

S Plot the data for group B on the number line to display the distribution

S Identify the best and worst record and also the average from the distribution.

4 Compare and discuss the 2 sets of data

T How can we identify the best record?

S By identifying the last record.

T How can we identify the worst record?

S By identifying the first record.

T How can we identify the mean record?

S By identifying the position where most of the records are clustered.

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 101 sample Blackboard Plan
is on page 231..

Unit
14

Unit: How to Explore Data
Sub-unit: How to Explore Distribution
Lesson 2 of 4

Textbook Page :
150 and 151
Actual Lesson 113

Lesson Objectives

- To understand how to make and read the distribution on a frequency table.
- To understand the meaning of Greater than or Equal to and Less than.

Assessment

- Organise data on frequency tables. F S
- Compare 2 sets of data from frequency tables. F S

Prior Knowledge

- Collecting, sorting and organising data
  - Representing data using pie and bar graphs
  - Representing distribution on a number line

Teacher's Notes

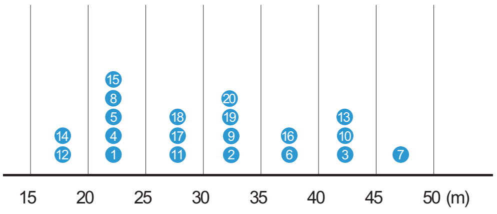
Explain to student the terms Greater or Equal and less than before students fill in the frequency table.

Preparation

- Frequency tables

Organising data on a frequency distribution table

3 To organise the distribution in more detail, they separated the data by intervals of 5 m and made a table.



① Organise the distribution above in the table.

Record of Throwing a Softball (Group A)

Distance (m)	Number of students
Greater or Equal Less Than 15 ~ 20	2
20 ~ 25	5
25 ~ 30	3
30 ~ 35	4
35 ~ 40	2
40 ~ 45	3
45 ~ 50	1

This table includes the shortest to longest records. They divided the recorded distance by 5 m into 7 classes to find out how many students belong to each class.

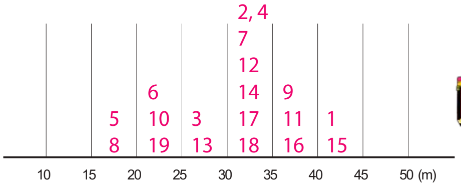
② How many students belong to the recorded distance that is greater or equal to 25 m and less than 30 m? 3 students

③ In which class greater or equal to and less than do 4 students belong to? Greater than or equal to 30 m and less than 35 m

Comparing Data

4 Explore the data for group B and compare it with group A.

① Separate the records by intervals of 5 m and complete the table.



② Record the distribution above in the table.

Record of Throwing a Softball (Group B)

Distance (m)	Number of students
Greater or Equal Less Than 15 ~ 20	2
20 ~ 25	3
25 ~ 30	2
30 ~ 35	7
35 ~ 40	3
40 ~ 45	2
45 ~ 50	0

③ Compare the records of group A and B.

Ⓐ Which group has more records that are greater or equal to 40 m? Group A

Ⓑ Which group has more records that are less than 25 m? Same

Ⓒ Which group has more records that are greater or equal to 25 m and less than 35 m? Group B

Lesson Flow

1 Review the previous lesson.

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

2 3 Organise the distribution of data in detail.

T/S Read and understand the given situation.

T Assist students to re-organise the data for Group A in more detail on a number line.

S Separate the data by intervals of 5 m and place the records in each category or class.

S ① Organise and record the data from the number line into a frequency table.

TN The table should be prepared in advance to be utilised on the board. Spend a few minutes to explain how the table has been organised.

T What does 15 - 20 mean?

S Records that are Greater than or Equal to15 and Less Than 20

3 Read the information and answer questions based on the frequency table.

T Give time to students to read the information on the table and answer questions ② and ③.

S ② Answer: 3 Children

S ③ Answer: Greater than or Equal to 30 m and Less than 35 m.

4 4 Re-organise the data for Group B and compare with Group A.

T/S Read and understand the given situation.

T Get the students to re-organise the data for Group B in more detail on a number line and frequency table.

S ① Separate the records by intervals of 5 m and place the records in each category.

S ② Explore the distribution by organizing the records from the number line into a frequency table.

T ③ Get the students to compare the records of Group A and Group B to answer these questions.

S Ⓐ Answer: Group A

S Ⓑ Answer: Same

S Ⓒ Answer: Group B

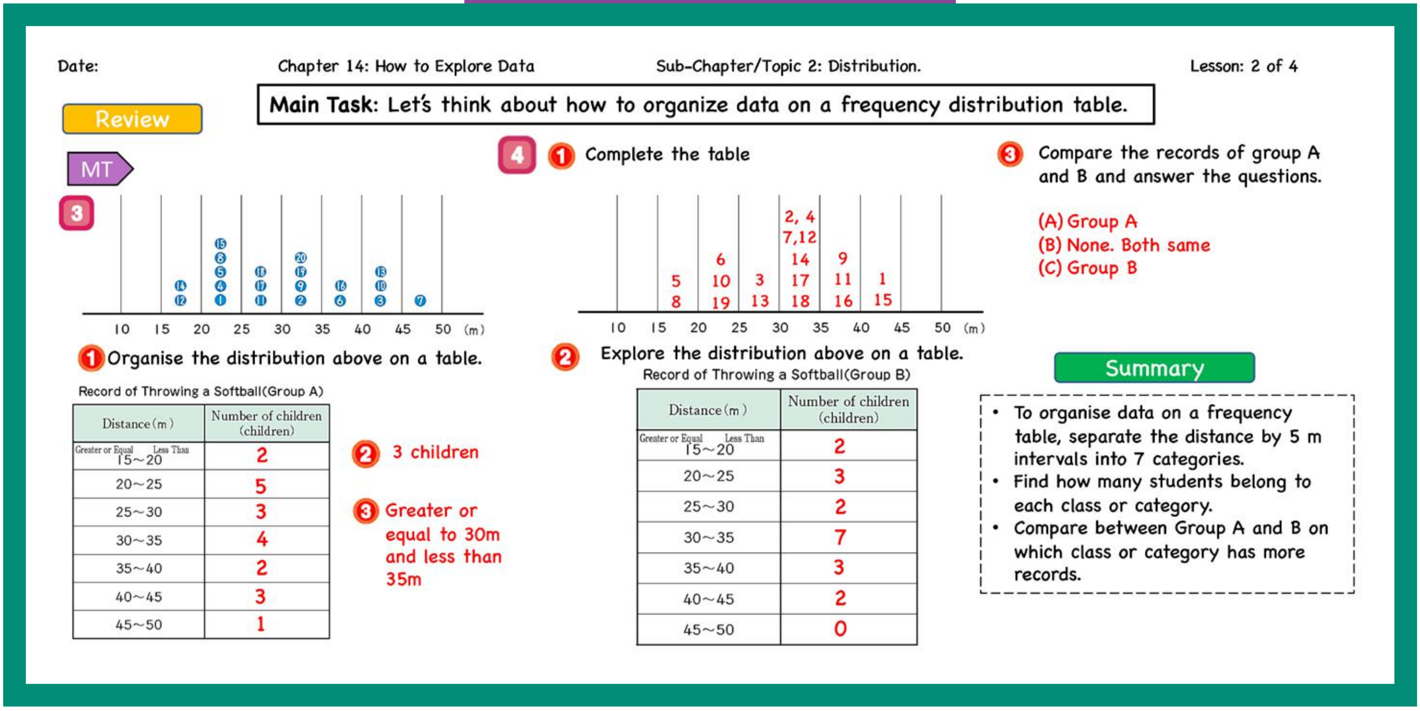
5 Summary

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 14: How to Explore Data

Sub-Chapter/Topic 2: Distribution.

Lesson: 2 of 4

Main Task: Let's think about how to organize data on a frequency distribution table.

Review

MT

3

⑭ ⑫
⑮ ⑧ ⑤ ④ ①
⑱ ⑰ ⑪
⑳ ⑲ ⑨ ②
⑯ ⑥
⑬ ⑩ ③
⑦
10 15 20 25 30 35 40 45 50 (m)

① Organise the distribution above on a table.

Record of Throwing a Softball(Group A)

Distance (m)	Number of children (children)
Greater or Equal Less Than 15～20	2
20～25	5
25～30	3
30～35	4
35～40	2
40～45	3
45～50	1

② 3 children

③ Greater or equal to 30m and less than 35m

4 ① Complete the table

② Explore the distribution above on a table.

Record of Throwing a Softball(Group B)

Distance (m)	Number of children (children)
Greater or Equal Less Than 15～20	2
20～25	3
25～30	2
30～35	7
35～40	3
40～45	2
45～50	0

③ Compare the records of group A and B and answer the questions.

(A) Group A
(B) None. Both same
(C) Group B

Summary

- To organise data on a frequency table, separate the distance by 5 m intervals into 7 categories.
- Find how many students belong to each class or category.
- Compare between Group A and B on which class or category has more records.

Unit
14

Unit: How to Explore Data
Sub-unit: How to Explore Distribution
Lesson 3 of 4

Textbook Page : 152 and 153
Actual Lesson 114

Lesson Objectives

- To understand the meaning of histogram.
- To understand how to make and read a histogram.

Prior Knowledge

- Collecting, sorting and organising data
- Representing data using pie and bar graphs
- Representing distribution on a number line

Preparation

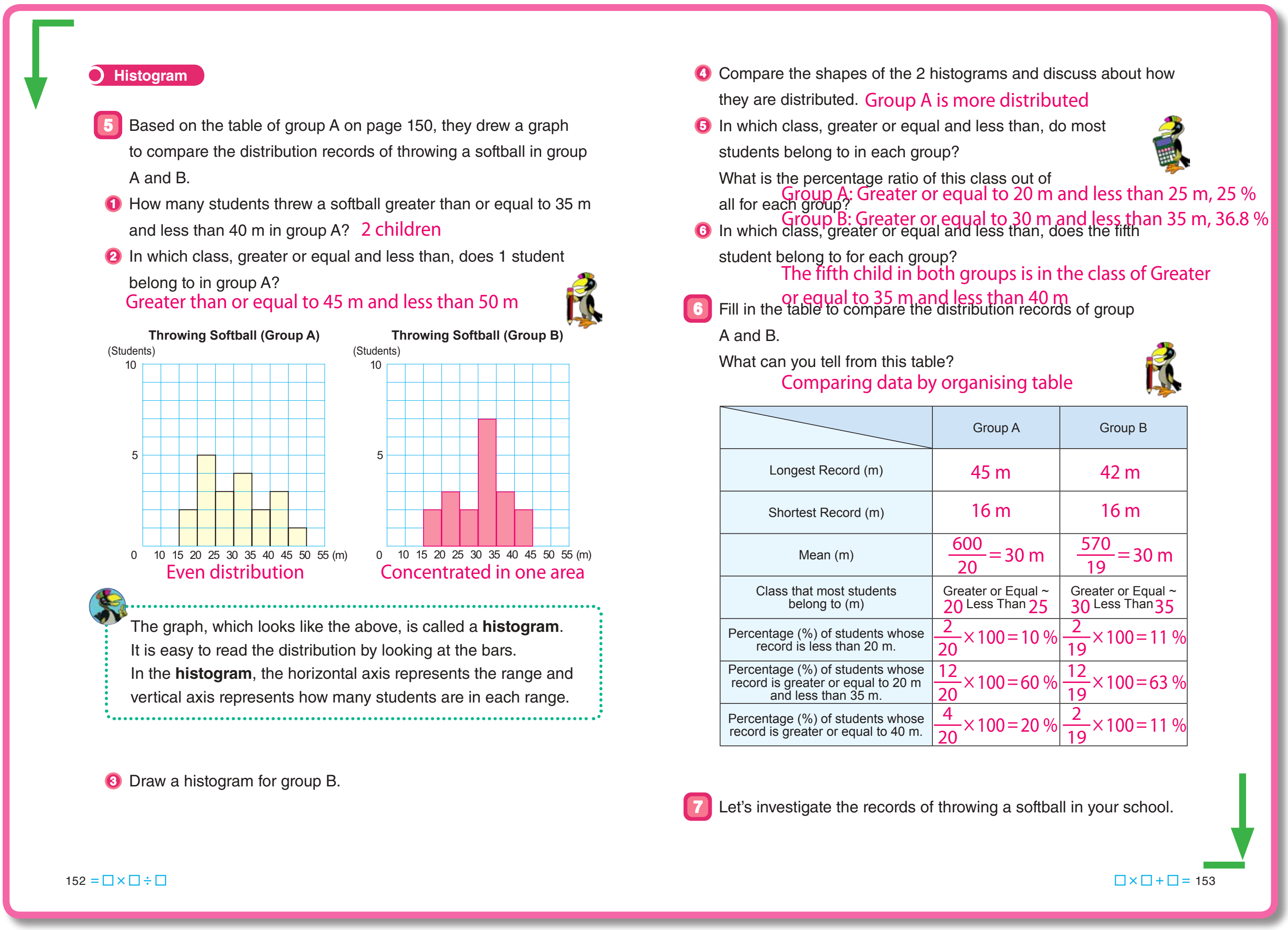
- Square grid paper, table for Task 6.

Assessment

- Organise data on histograms. F
- Compare 2 sets of data from histograms and tables. F S

Teacher's Notes

Differentiate the Histogram from Bar graph. Bar graph represents a single data and Histogram represents range of data.


Throwing Softball (Group A)
(Students)
10
5
0
10 15 20 25 30 35 40 45 50 55 (m)
Throwing Softball (Group B)
(Students)
10
5
0
10 15 20 25 30 35 40 45 50 55 (m)

Histogram

5 Based on the table of group A on page 150, they drew a graph to compare the distribution records of throwing a softball in group A and B.

① How many students threw a softball greater than or equal to 35 m and less than 40 m in group A? 2 children

② In which class, greater or equal and less than, does 1 student belong to in group A?
Greater than or equal to 45 m and less than 50 m

Even distribution

Concentrated in one area

The graph, which looks like the above, is called a **histogram**.
It is easy to read the distribution by looking at the bars.
In the **histogram**, the horizontal axis represents the range and vertical axis represents how many students are in each range.

③ Draw a histogram for group B.

④ Compare the shapes of the 2 histograms and discuss about how they are distributed. Group A is more distributed

⑤ In which class, greater or equal and less than, do most students belong to in each group?
What is the percentage ratio of this class out of all for each group?
Group A: Greater or equal to 20 m and less than 25 m, 25 %
Group B: Greater or equal to 30 m and less than 35 m, 36.8 %

⑥ In which class, greater or equal and less than, does the fifth student belong to for each group?
The fifth child in both groups is in the class of Greater or equal to 35 m and less than 40 m

6 Fill in the table to compare the distribution records of group A and B.
What can you tell from this table?
Comparing data by organising table

	Group A	Group B
Longest Record (m)	45 m	42 m
Shortest Record (m)	16 m	16 m
Mean (m)	$\frac{600}{20}=30$ m	$\frac{570}{19}=30$ m
Class that most students belong to (m)	Greater or Equal ~ 20 Less Than 25	Greater or Equal ~ 30 Less Than 35
Percentage (%) of students whose record is less than 20 m.	$\frac{2}{20}\times100=10$ %	$\frac{2}{19}\times100=11$ %
Percentage (%) of students whose record is greater or equal to 20 m and less than 35 m.	$\frac{12}{20}\times100=60$ %	$\frac{12}{19}\times100=63$ %
Percentage (%) of students whose record is greater or equal to 40 m.	$\frac{4}{20}\times100=20$ %	$\frac{2}{19}\times100=11$ %

7 Let's investigate the records of throwing a softball in your school.

152 =□×□÷□

□×□+□= 153

Lesson Flow

1 Review the previous lesson.

2 ⑤ Interpret the information on the histogram of Group A records.

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

T Allow students to study the histogram for Group A and answer ① and ①.

S ① Answer: 2 Children

S ② Answer: Greater than or Equal to 45 and Less than 50

3 Understand the meaning of Histogram.

T Lead the students to realise that the vertical axis represents the number of children while the horizontal axis represents the range of records.

T “What information can be seen on the horizontal axis?”

S Range of records in metres.

T “What information can be seen on the vertical axis?”

S Number of children.

4 Important Point

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

5 Draw a histogram for Group B.

T Get the students to draw a histogram for Group B using the distribution table from the previous lesson.

S ③ Draw histograms for Group B using Group A histogram as an example.

S ④ Compare and discuss the distribution of both histograms.
Group A: Even Distribution (Spread).
Group B: Concentrated on one area (Clustered).

S ⑤ Answer: Group A: Greater than or Equal to 20 and Less than 25
Percentage ratio: $\frac{5}{20} \times 100 = 25\ \%$
Group B: Greater than or Equal to 30 and Less than 35.
Percentage ratio: $\frac{7}{19} \times 100 = 37\ \%$

S ⑥ Answer: Group A: Greater than or Equal to 20 and Less than 25 Group B: Greater than or Equal to 15 and Less than 20.

6 ⑥ Compare Data on the table.

T Let students fill in the given table and compare the distribution records.

S Complete filling in the table of results and give a summary of what they have found from the results.

T Allow students to present their findings from the table of results.

7 ⑦ Investigate records in your own school.

T/S Do your own investigation at your school on softball throwing records.

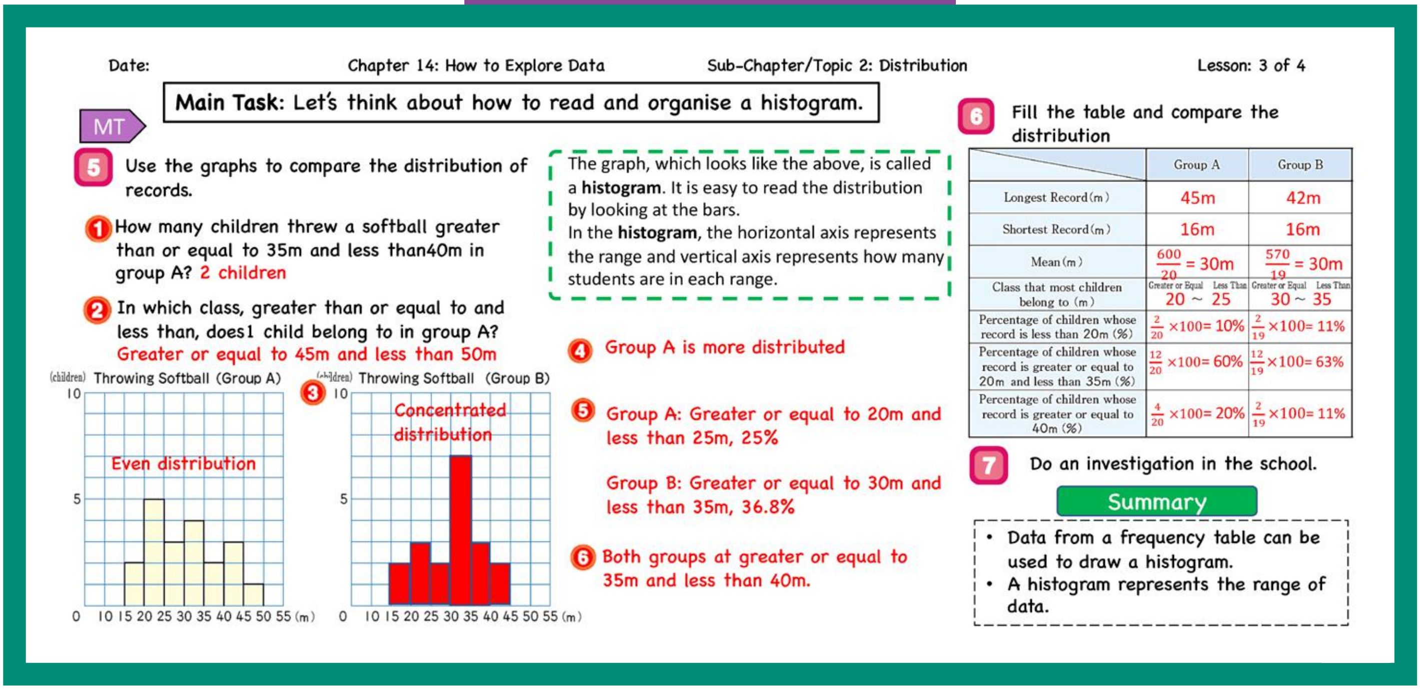
8 Summary

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



Date: Chapter 14: How to Explore Data Sub-Chapter/Topic 2: Distribution Lesson: 3 of 4

MT **Main Task:** Let’s think about how to read and organise a histogram.

⑤ Use the graphs to compare the distribution of records.

① How many children threw a softball greater than or equal to 35m and less than40m in group A? 2 children

② In which class, greater than or equal to and less than, does1 child belong to in group A? Greater or equal to 45m and less than 50m

(children) Throwing Softball (Group A)
Even distribution
③ (children) Throwing Softball (Group B)
Concentrated distribution
10
5
0
10 15 20 25 30 35 40 45 50 55 (m)

The graph, which looks like the above, is called a **histogram**. It is easy to read the distribution by looking at the bars.
In the **histogram**, the horizontal axis represents the range and vertical axis represents how many students are in each range.

④ Group A is more distributed

⑤ Group A: Greater or equal to 20m and less than 25m, 25%

Group B: Greater or equal to 30m and less than 35m, 36.8%

⑥ Both groups at greater or equal to 35m and less than 40m.

⑥ Fill the table and compare the distribution

	Group A	Group B
Longest Record (m)	45m	42m
Shortest Record (m)	16m	16m
Mean (m)	$\frac{600}{20} = 30$m	$\frac{570}{19} = 30$m
Class that most children belong to (m)	Greater or Equal Less Than 20 ~ 25	Greater or Equal Less Than 30 ~ 35
Percentage of children whose record is less than 20m (%)	$\frac{2}{20} \times 100 = 10\%$	$\frac{2}{19} \times 100 = 11\%$
Percentage of children whose record is greater or equal to 20m and less than 35m (%)	$\frac{12}{20} \times 100 = 60\%$	$\frac{12}{19} \times 100 = 63\%$
Percentage of children whose record is greater or equal to 40m (%)	$\frac{4}{20} \times 100 = 20\%$	$\frac{2}{19} \times 100 = 11\%$

⑦ Do an investigation in the school.

Summary

- Data from a frequency table can be used to draw a histogram.
- A histogram represents the range of data.

Unit
14

Unit: How to Explore Data
Sub-unit: How to Explore Distribution
Lesson 4 of 4

Textbook Page : 154
Actual Lesson 115

Lesson Objectives

- To organise data on a frequency table and histogram.
- To read the characteristics of data on a frequency table and histogram.

Assessment

- Organise data on histograms. F
- Compare 2 sets of data from histograms and tables. F S

Prior Knowledge

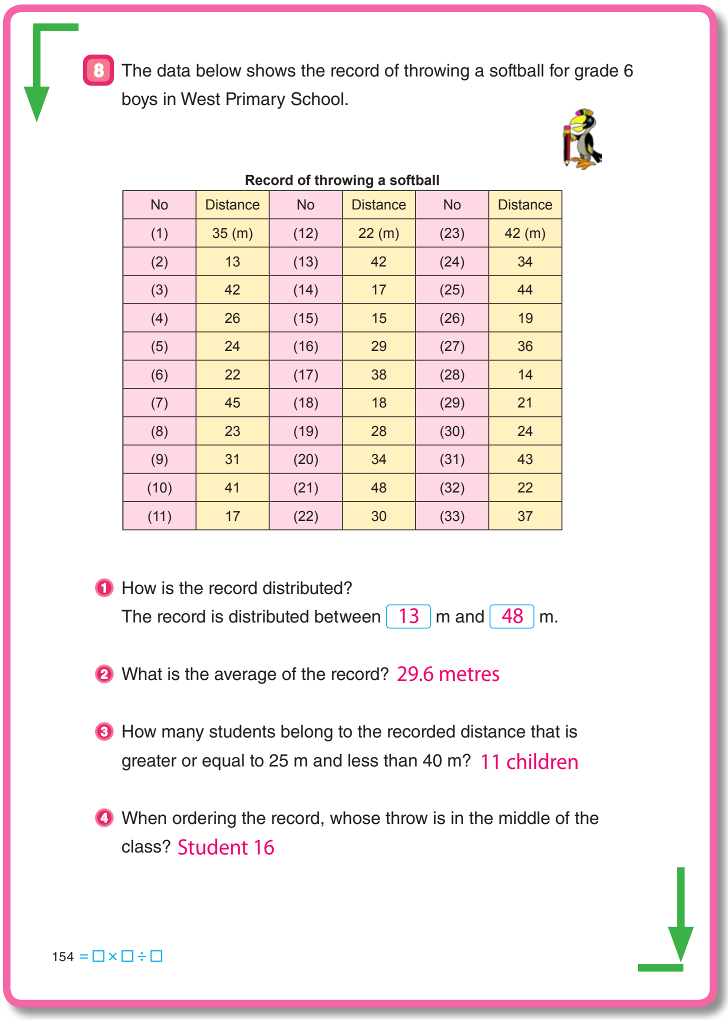
- Collecting, sorting and organising data
- Representing data using graphs
- Representing distribution on a histogram

Preparation

- Table for Task 8

Teacher's Notes

Task 8 is a consolidating Task.
Let the students apply their prior knowledge and skills to draw histogram before answering activity
① to ④.
- Interpret raw data from the table.
- Distribute data on a number line
- Then do a frequency distribution table displaying classes or categories (finding the intervals)
- Draw a Histogram



8 The data below shows the record of throwing a softball for grade 6 boys in West Primary School.

Record of throwing a softball

No	Distance	No	Distance	No	Distance
(1)	35 (m)	(12)	22 (m)	(23)	42 (m)
(2)	13	(13)	42	(24)	34
(3)	42	(14)	17	(25)	44
(4)	26	(15)	15	(26)	19
(5)	24	(16)	29	(27)	36
(6)	22	(17)	38	(28)	14
(7)	45	(18)	18	(29)	21
(8)	23	(19)	28	(30)	24
(9)	31	(20)	34	(31)	43
(10)	41	(21)	48	(32)	22
(11)	17	(22)	30	(33)	37

① How is the record distributed?
The record is distributed between 13 m and 48 m.

② What is the average of the record? 29.6 metres

③ How many students belong to the recorded distance that is greater or equal to 25 m and less than 40 m? 11 children

④ When ordering the record, whose throw is in the middle of the class? Student 16

Lesson Flow

1 Review the previous lesson.

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

2 ⑧ Investigate and discuss the data from the table of records.

T ① Allow students to study the data from the table and answer activity.
"How are the records distributed?"

TN Remind students to do a frequency table and draw a histogram as they answer the activities. (refer to Teachers Note)

S Use the information on the table to fill in the boxes.
Answer: Between 13 m and 48 m.

T ② What is the average for the records?

S Calculate the average record to get the answer 29.7 metres.

S ③ Identify the number of children that have a recorded distance of greater or equal to 25 and less than 40 metres. Answer: 11 children.

T Let students find the record that is in the middle of the class.

S ④ Identify the record that is in the middle of the class.
Answer: 29 is the middle number. Therefore, student 16 throw is in the middle of the class.

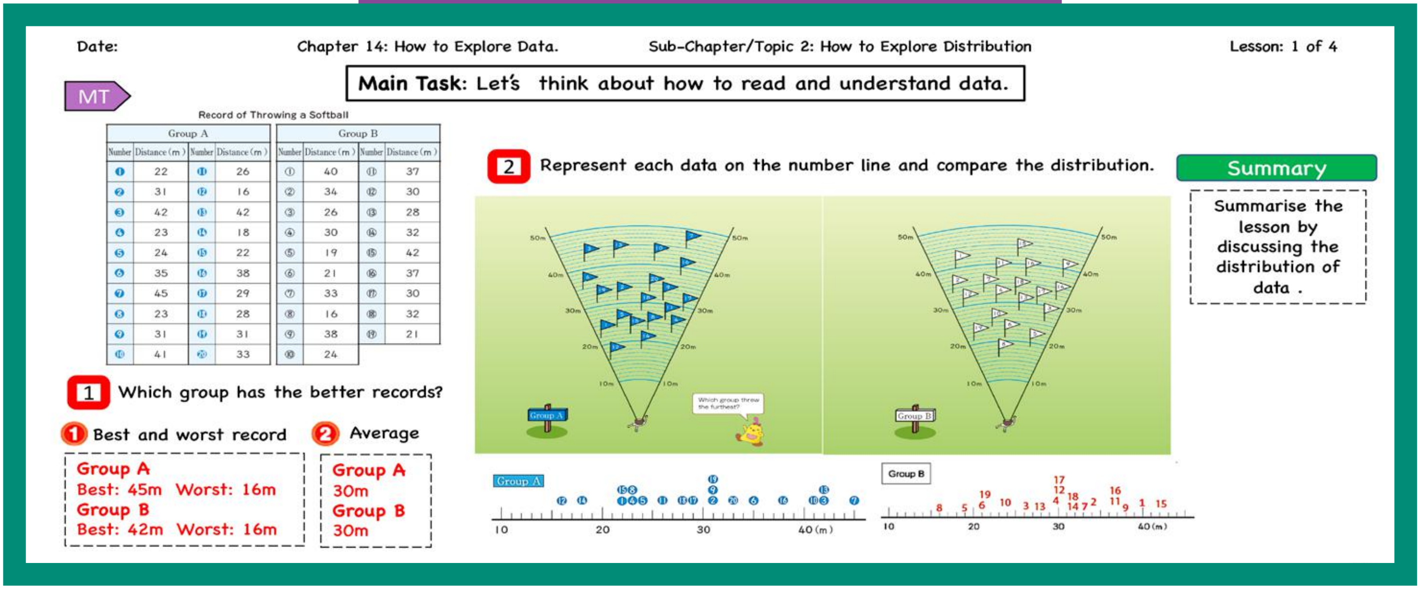
3 Summary

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 (Lesson 101)



Date: Chapter 14: How to Explore Data. Sub-Chapter/Topic 2: How to Explore Distribution Lesson: 1 of 4

Main Task: Let's think about how to read and understand data.

MT

Record of Throwing a Softball

Group A				Group B			
Number	Distance (m)	Number	Distance (m)	Number	Distance (m)	Number	Distance (m)
❶	22	⓫	26	①	40	⑪	37
❷	31	⓬	16	②	34	⑫	30
❸	42	⓭	42	③	26	⑬	28
❹	23	⓮	18	④	30	⑭	32
❺	24	⓯	22	⑤	19	⑮	42
❻	35	⓰	38	⑥	21	⑯	37
❼	45	⓱	29	⑦	33	⑰	30
❽	23	⓲	28	⑧	16	⑱	32
❾	31	⓳	31	⑨	38	⑲	21
❿	41	⓴	33	⑩	24		

1 Which group has the better records?

① Best and worst record

Group A
Best: 45m Worst: 16m
Group B
Best: 42m Worst: 16m

② Average

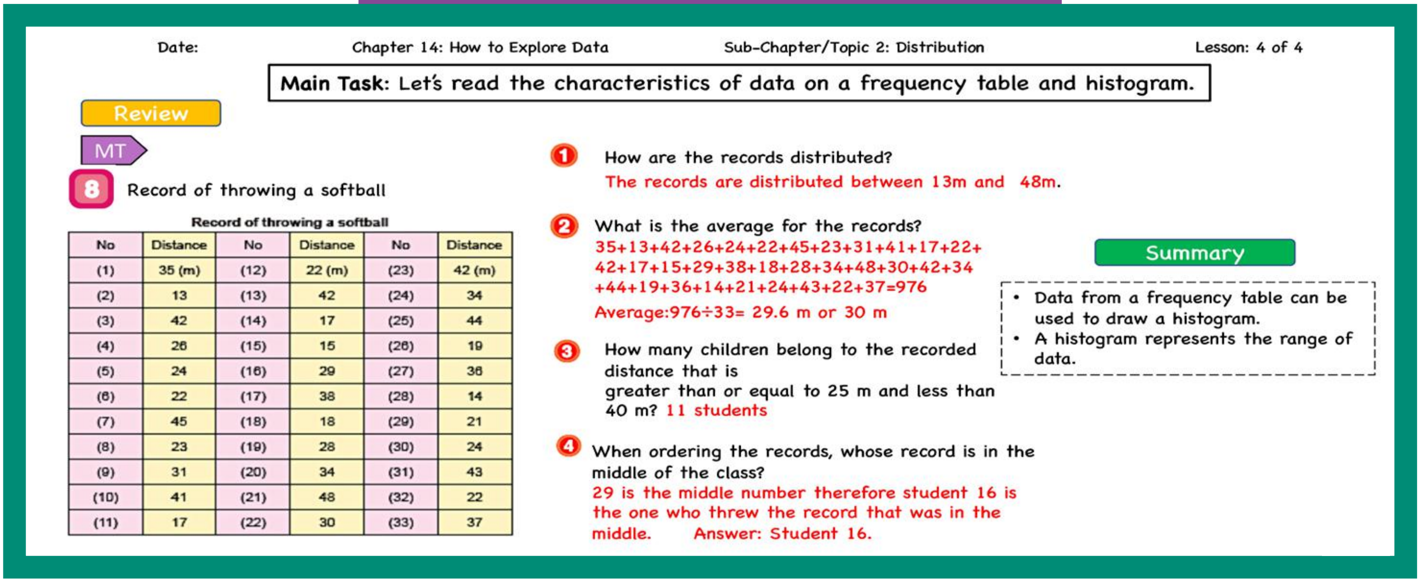
Group A
30m
Group B
30m

2 Represent each data on the number line and compare the distribution.

Summary

Summarise the lesson by discussing the distribution of data .

Sample Blackboard Plan (Lesson 104)



Date: Chapter 14: How to Explore Data Sub-Chapter/Topic 2: Distribution Lesson: 4 of 4

Main Task: Let's read the characteristics of data on a frequency table and histogram.

Review

MT

⑧ Record of throwing a softball

Record of throwing a softball

No	Distance	No	Distance	No	Distance
(1)	35 (m)	(12)	22 (m)	(23)	42 (m)
(2)	13	(13)	42	(24)	34
(3)	42	(14)	17	(25)	44
(4)	26	(15)	15	(26)	19
(5)	24	(16)	29	(27)	36
(6)	22	(17)	38	(28)	14
(7)	45	(18)	18	(29)	21
(8)	23	(19)	28	(30)	24
(9)	31	(20)	34	(31)	43
(10)	41	(21)	48	(32)	22
(11)	17	(22)	30	(33)	37

① How are the records distributed?
The records are distributed between 13m and 48m.

② What is the average for the records?
35+13+42+26+24+22+45+23+31+41+17+22+42+17+15+29+38+18+28+34+48+30+42+34+44+19+36+14+21+24+43+22+37=976
Average:976÷33= 29.6 m or 30 m

③ How many children belong to the recorded distance that is greater than or equal to 25 m and less than 40 m? 11 students

④ When ordering the records, whose record is in the middle of the class?
29 is the middle number therefore student 16 is the one who threw the record that was in the middle. Answer: Student 16.

Summary

- Data from a frequency table can be used to draw a histogram.
- A histogram represents the range of data.

Unit 14

Unit: How to Explore Data

Sub-unit: Problems, Review and Evaluation

Lesson 1 and 2 of 2

Textbook Page : 155 to 157
Actual Lesson 116 & 117

Lesson Objective

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

Prior Knowledge

- All the contents learned in this unit of How to Explore Data.

Preparation

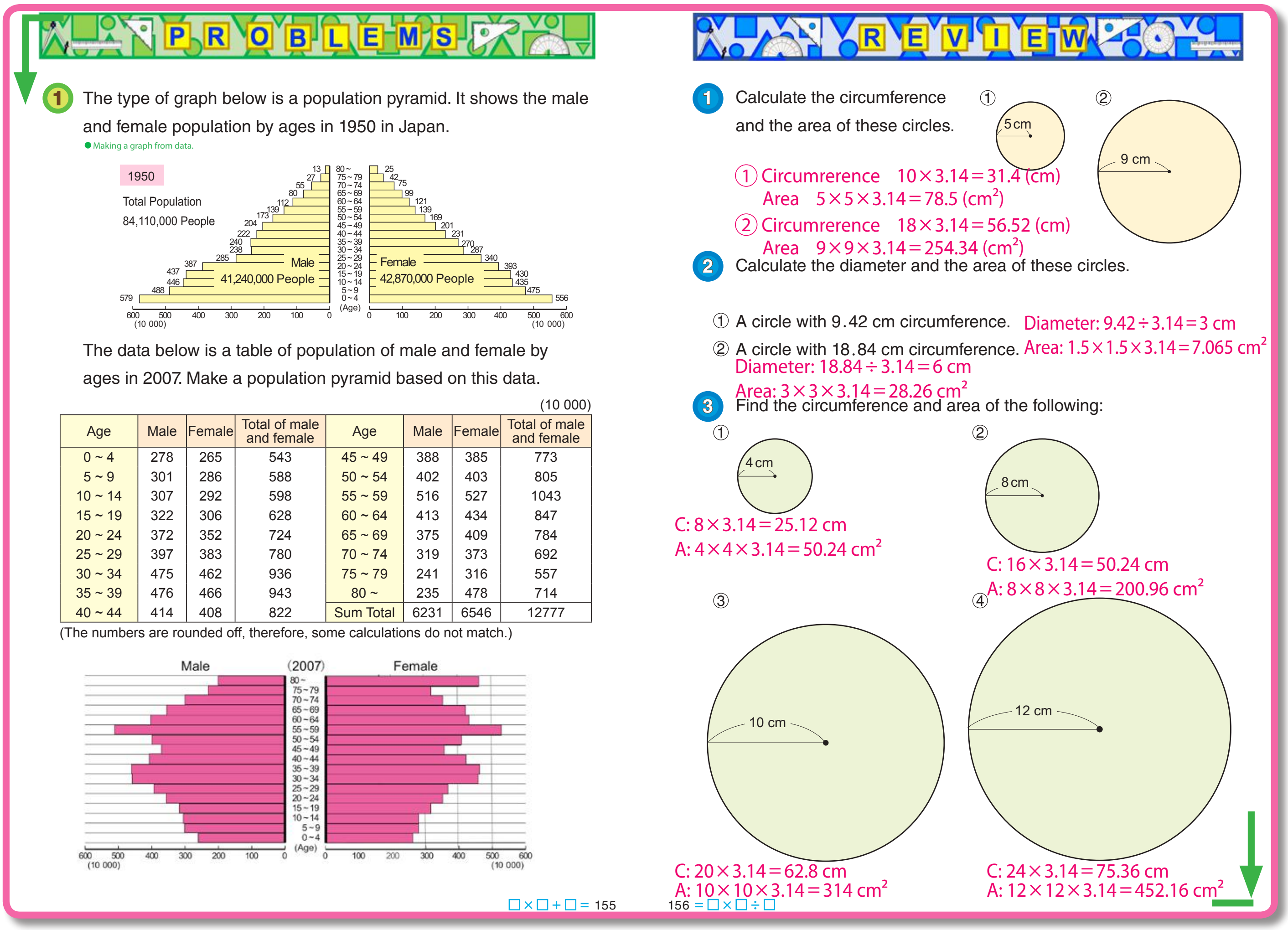
- Evaluation Test

Assessment

- Solve the problems and review exercises correctly.
  F 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 Review Exercises and solve the Problems in preparation for the evaluation test.
Use the attached evaluation test to conduct assessment for your class after finishing all the problems and review as a seperate lesson.



PROBLEMS

① The type of graph below is a population pyramid. It shows the male and female population by ages in 1950 in Japan.

● Making a graph from data.

The data below is a table of population of male and female by ages in 2007. Make a population pyramid based on this data.

(10 000)

Age	Male	Female	Total of male and female	Age	Male	Female	Total of male and female
0 ~ 4	278	265	543	45 ~ 49	388	385	773
5 ~ 9	301	286	588	50 ~ 54	402	403	805
10 ~ 14	307	292	598	55 ~ 59	516	527	1043
15 ~ 19	322	306	628	60 ~ 64	413	434	847
20 ~ 24	372	352	724	65 ~ 69	375	409	784
25 ~ 29	397	383	780	70 ~ 74	319	373	692
30 ~ 34	475	462	936	75 ~ 79	241	316	557
35 ~ 39	476	466	943	80 ~	235	478	714
40 ~ 44	414	408	822	Sum Total	6231	6546	12777

(The numbers are rounded off, therefore, some calculations do not match.)

□×□+□= 155

REVIEW

1 Calculate the circumference and the area of these circles. ① ②

① Circumrerence 10×3.14=31.4 (cm)
Area 5×5×3.14=78.5 (cm²)
② Circumrerence 18×3.14=56.52 (cm)
Area 9×9×3.14=254.34 (cm²)

2 Calculate the diameter and the area of these circles.

① A circle with 9.42 cm circumference. Diameter: 9.42÷3.14=3 cm
Area: 1.5×1.5×3.14=7.065 cm²
② A circle with 18.84 cm circumference. Diameter: 18.84÷3.14=6 cm
Area: 3×3×3.14=28.26 cm²

3 Find the circumference and area of the following:

①
C: 8×3.14=25.12 cm
A: 4×4×3.14=50.24 cm²

②
C: 16×3.14=50.24 cm
A: 8×8×3.14=200.96 cm²

③
C: 20×3.14=62.8 cm
A: 10×10×3.14=314 cm²

④
C: 24×3.14=75.36 cm
A: 12×12×3.14=452.16 cm²

156 =□×□÷□

Lesson Flow

1 Solve Problem ①.

S ① Draw a population pyramid using the data of population in the table.

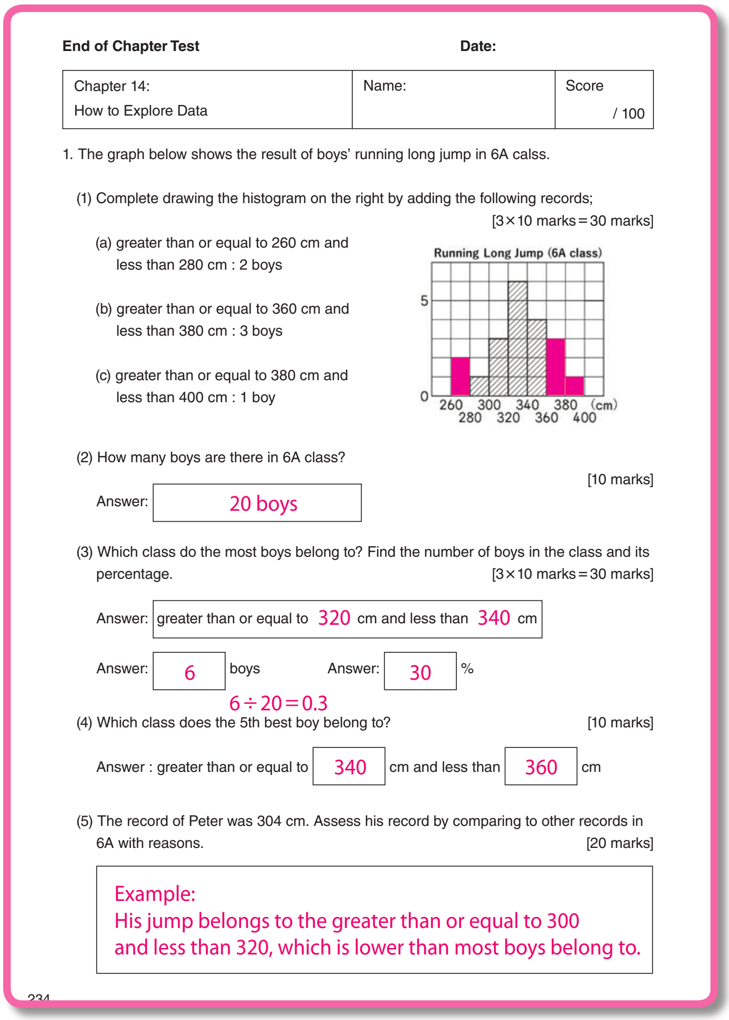
2 Solve the Review from ① to ③.

S ① Calculate to find the area and circumference.
② Calculate to find the area and diameter.
③ Calculate to find the area and circumference..

3 Complete the Evaluation Test.

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

S Complete the evaluation test.



End of Chapter Test **Date:**

Chapter 14: How to Explore Data	Name:	Score / 100

1. The graph below shows the result of boys' running long jump in 6A calss.

(1) Complete drawing the histogram on the right by adding the following records; [3×10 marks = 30 marks]

(a) greater than or equal to 260 cm and less than 280 cm : 2 boys

(b) greater than or equal to 360 cm and less than 380 cm : 3 boys

(c) greater than or equal to 380 cm and less than 400 cm : 1 boy

(2) How many boys are there in 6A class? [10 marks]

Answer: 20 boys

(3) Which class do the most boys belong to? Find the number of boys in the class and its percentage. [3×10 marks = 30 marks]

Answer: greater than or equal to 320 cm and less than 340 cm

Answer: 6 boys Answer: 30 %

6 ÷ 20 = 0.3

(4) Which class does the 5th best boy belong to? [10 marks]

Answer : greater than or equal to 340 cm and less than 360 cm

(5) The record of Peter was 304 cm. Assess his record by comparing to other records in 6A with reasons. [20 marks]

Example:
His jump belongs to the greater than or equal to 300 and less than 320, which is lower than most boys belong to.

234

End of Chapter Test **Date:**

Chapter 14: How to Explore Data	Name:	Score / 100

1. The graph below shows the result of boys' running long jump in 6A class.

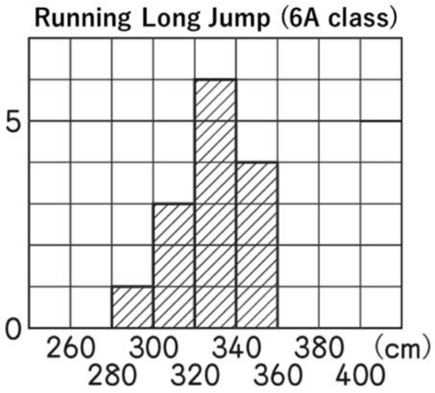
(1) Complete drawing the histogram on the right by adding the following records;

[3×10 marks = 30 marks]

(a) greater than or equal to 260 cm and less than 280 cm : 2 boys

(b) greater than or equal to 360 cm and less than 380 cm : 3 boys

(c) greater than or equal to 380 cm and less than 400 cm : 1 boy



(2) How many boys are there in 6A class?

[10 marks]

Answer:

(3) Which class do the most boys belong to? Find the number of boys in the class and its percentage.

[3×10 marks = 30 marks]

Answer: greater than or equal to cm and less than cm

Answer: boys Answer: %

(4) Which class does the 5th best boy belong to?

[10 marks]

Answer : greater than or equal to cm and less than cm

(5) The record of Peter was 304 cm. Assess his record by comparing to other records in 6A with reasons.

[20 marks]

Chapter 15 Quantity and Unit

1. Content Standard

6. 2. 3. Students will be able to explain the metric unit system and measure various quantities of measurements using it and appreciate its usefulness in real life.

2. Unit Objective

- To understand quantity and the units of the metric system.

3. Teaching Overview

In this unit, students synthesise the units learned and the relationships among them. It will make students appreciate the system and understand how to convert to another unit.

How to Represent Quantities:

Students learn that there are several quantities. There are 2 types of quantities; discrete quantities such as oranges or persons and continuous quantities.
They also should notice that we differentiate to use unit according to objects.

Units of Length: km, m, cm & mm:

Length is the base of metric system. Students should not miss it with conversions.

Units of Area: m^2, ha, a, m^2, cm :

Area is defined by a square. If a side of a square is made 10 times an original side, the area becomes $10 \times 10 = 100$ times.

Units of Volume: m^3, cm^3, kL, dL & mL :

Volume is a 3 - dimensional quantity. Therefore, if an edge of a cube gets 10 times an original edge, the volume becomes $10 \times 10 \times 10 = 1000$ times.

Units of Weight: t, kg, g & mg :

They should understand the relationship between volume of water and its weight.

Metric System:

Teachers should motivate students' interest in the historical origin of metric system. In this topic, students should be given lots of exercise of conversions.

4. Related Learning Contents

Grade 2

- Units of length (m, cm, mm)
- Units of amount (L, dL , mL)

↓

Grade 3

- Units of length (km)
- Units of weight (g, kg, t)

↓

Grade 4

- Units of area (cm^2 , m^2, km^2, a, ha)

→

Grade 5

- Units of volume (cm^2,m^3)
- Relationship of units of volume

1L = 1000 cm
= 1000 ml
1 m^3 = 1000000 cm^3
= 1000000 ml
= 1000 L

→

Grade 6

- Kinds of quantities, meaning of measurements and units
- Units of area
- Units of volumes (kL)
- Units of weight (mg)
- How the units of length, area, volume and weight works
- Interrelationship of units
- Relationship of between the amount of water and the units of volume
- Relationship of the units of the metric systems

Unit 15

Unit: Quantity and Unit

Sub-unit: How to Represent Quantity

Lesson 1 of 1

Textbook Page : 157 and 158
Actual Lesson 118

Sub-unit Objective

- To distinguish the meaning and characteristics of quantity.

Lesson Objectives

- To understand that there are two types of quantities (discrete quantities and continuous quantities) and find various quantities in their daily life.
- To summarise the units of quantities.

Prior Knowledge

- Unit of quantities in terms of distance, weight, time and amount

Preparation

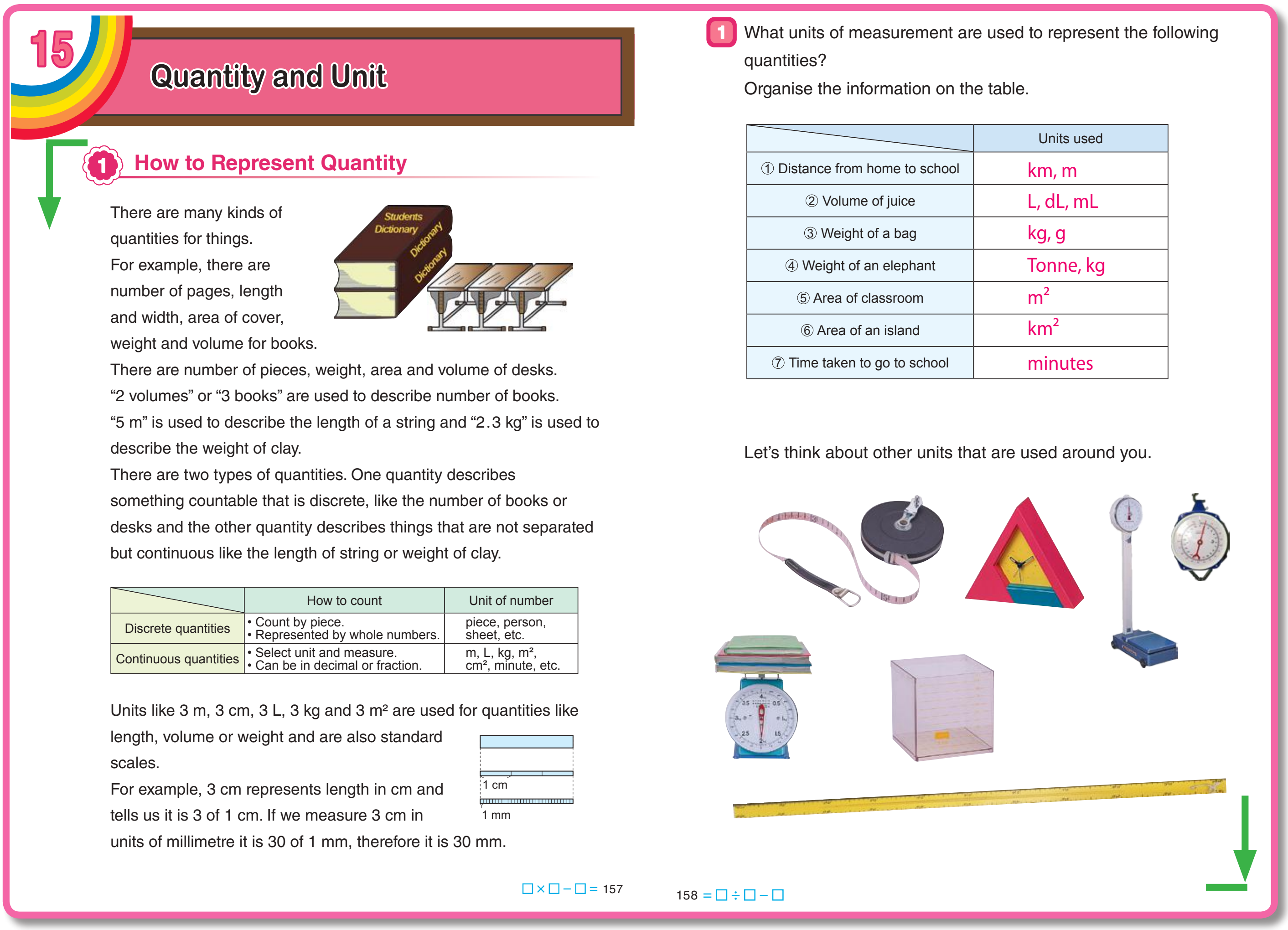
- Table of Quantity and Unit

Assessment

- Explain the difference between discrete quantities and continuous quantities. F
- Find various quantities in our daily life. F
- Summarise the units of quantities. S

Teacher's Notes

Quantity is the expression of value that is comparable.
For example, length, width, bulk, weight, thickness, speed and time.
Discrete quantities are those such as pencils and people while Continuous quantities are those such as weight and time.



15 Quantity and Unit

1 How to Represent Quantity

There are many kinds of quantities for things. For example, there are number of pages, length and width, area of cover, weight and volume for books.
There are number of pieces, weight, area and volume of desks.
"2 volumes" or "3 books" are used to describe number of books.
"5 m" is used to describe the length of a string and "2.3 kg" is used to describe the weight of clay.
There are two types of quantities. One quantity describes something countable that is discrete, like the number of books or desks and the other quantity describes things that are not separated but continuous like the length of string or weight of clay.

	How to count	Unit of number
Discrete quantities	• Count by piece. • Represented by whole numbers.	piece, person, sheet, etc.
Continuous quantities	• Select unit and measure. • Can be in decimal or fraction.	m, L, kg, m^2, cm^2, minute, etc.

Units like 3 m, 3 cm, 3 L, 3 kg and 3 m^2 are used for quantities like length, volume or weight and are also standard scales.
For example, 3 cm represents length in cm and tells us it is 3 of 1 cm. If we measure 3 cm in units of millimetre it is 30 of 1 mm, therefore it is 30 mm.

1 What units of measurement are used to represent the following quantities?
Organise the information on the table.

	Units used
① Distance from home to school	km, m
② Volume of juice	L, dL, mL
③ Weight of a bag	kg, g
④ Weight of an elephant	Tonne, kg
⑤ Area of classroom	m^2
⑥ Area of an island	km^2
⑦ Time taken to go to school	minutes

Let's think about other units that are used around you.

Lesson Flow

1 Discuss what kind of quantities you find in your daily life.

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

T/S Read and understand the information on How to Represent Quantity.

T What kind of quantities can you find around you?

S Pencil, water, distance etc.

T Ask students to list down different types of quantities on the blackboard.

S List down as many types of quantities as they can on the blackboard.

T Assist the students to catergorise them into 2 groups and categorise discrete quantities and continuous quantities.

T/S Discuss the information in the textbook and confirm their listings according to the two types of quantities.

S Summarise discrete quantity and continuous quantity.

2 1 Think about the appropriate unit to show various quantities.

T Allow students to think about the appropriate units for each given quantity to fill in the table.

S Complete filling in the table and discuss the reasons why they chose those units.

T Ask students to think about other quantities and their units in their daily life.

S Identify and describe other quantities that are in the textbook.

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 15: Quantity and Unit Sub-Chapter/Topic 1: How to Represent Quantity Lesson: 1 of 1

Main Task: Let's think about different types of quantities.

MT

1.Think about and discuss the different types of quantities in the surroundings and list them down.

Examples: pencil, water, distance, weight, etc.

2.Categorize the different quantities into 2 groups.

There are 2 types of quantities. One quantity describes something countable that is discrete, like number of books or desks, and the other quantity describes somethings that are not separated but continuous like the length of string or weight of clay.

	How to count	Unit of number
Discrete quantities	• Count by piece. • Represented by whole numbers.	piece, person, sheet, etc.
Continuous quantities	• Select unit and measure. • Can be in decimal or fraction.	m, L, kg, m^2, cm^2, minute, etc.

1 What kind of units are used to represent the following quantities?

	Units used
① Distance from home to school	km, m
② Volume of juice	L, dL, mL
③ Weight of a bag	kg, g
④ Weight of an elephant	Tonne
⑤ Area of classroom	m^2
⑥ Area of an island	km^2
⑦ Time taken to go to school	minutes

Let's think about other units that are used around you.

Summary

- Discrete quantities are countable quantities.
- Continuous quantities are measurable quantities.

Unit 15

Unit: Quantity and Unit
Sub-unit: Units of Length: km, m, cm, mm
Lesson 1of 1

Textbook Page : 159
Actual Lesson 119

Sub-unit Objective

- To comprehend the meaning and characteristic of length.

Lesson Objectives

- To summarise the units of length.
- To represent quantities using units of length.

Prior Knowledge

- Unit of distance(mm, cm, m and km)

Preparation

- Relationship of units

Assessment

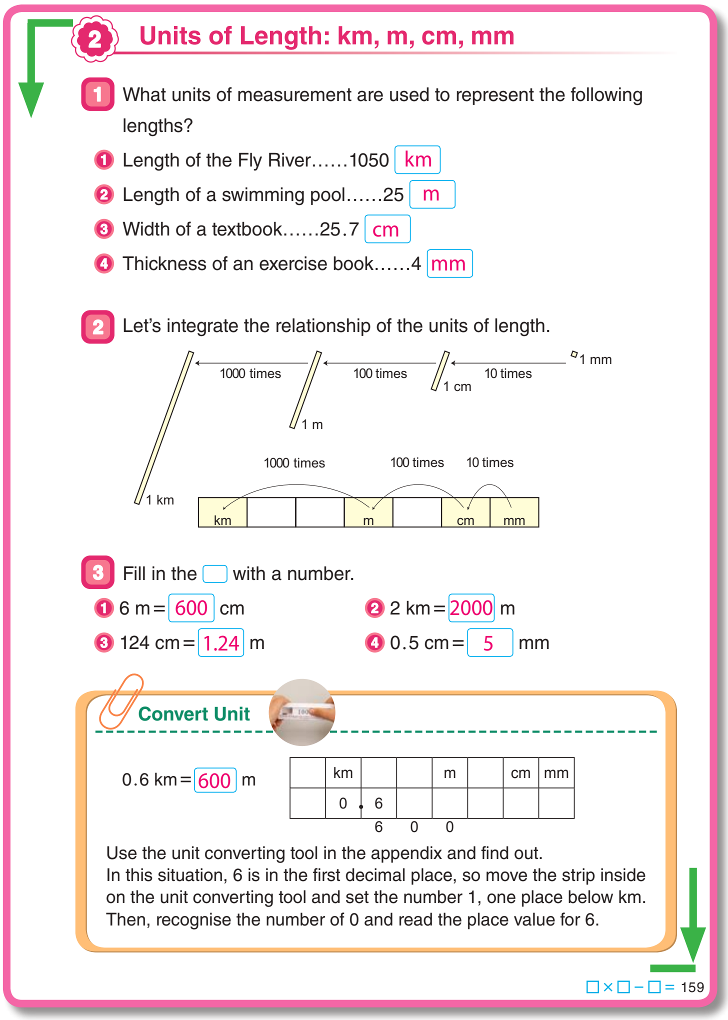
- Use the appropriate units of length considering the distance. F
- Represent the relationship among units. F
- Summarise the relationship of units of length. S

Teacher's Notes

A Unit table can be used to express the conversion of units. Guide students to understand the table since the table will appear through the lessons.

one				km
0.	6			km
	6	0	0	m
Thousand	Hundred	Ten	one	m

For the conversion of 0.6 km simply keep 6 and add zeros till they meet m.



2 Units of Length: km, m, cm, mm

1 What units of measurement are used to represent the following lengths?

① Length of the Fly River……1050 km
② Length of a swimming pool……25 m
③ Width of a textbook……25.7 cm
④ Thickness of an exercise book……4 mm

2 Let's integrate the relationship of the units of length.

3 Fill in the ☐ with a number.

① 6 m = 600 cm
② 2 km = 2000 m
③ 124 cm = 1.24 m
④ 0.5 cm = 5 mm

Convert Unit

0.6 km = 600 m

	km			m		cm	mm
	0.	6					
		6	0	0			

Use the unit converting tool in the appendix and find out.
In this situation, 6 is in the first decimal place, so move the strip inside on the unit converting tool and set the number 1, one place below km.
Then, recognise the number of 0 and read the place value for 6.

☐×☐−☐= 159

Lesson Flow

1 Review the previous lesson.

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

2 Choose the appropriate units of length.

T Introduce the task 1.

S Choose appropriate units to fill in the boxes.

3 2 Think about the relationship among units of length.

T How many times of 1 mm is 1 cm ?

S 10 times.

T What about 1cm and 1 m?

S 100 times.

T How about 1 m and 1 km?

S 1000 times.

TN Explain the relationship of the units of length using the diagrams in the textbook for better understanding.

4 3 Solve the activities.

T Help those students who cannot convert unit correctly to use the unit conversion table.

TN ①

	km			m		cm	mm
				6			
				6	0	0	

②

	km			m		cm	mm
	2						
	2	0	0	0			

③

	km			m		cm	mm
				1	2	4	
				1.	2	4	

④

	km			m		cm	mm
						0	5
						0.	5

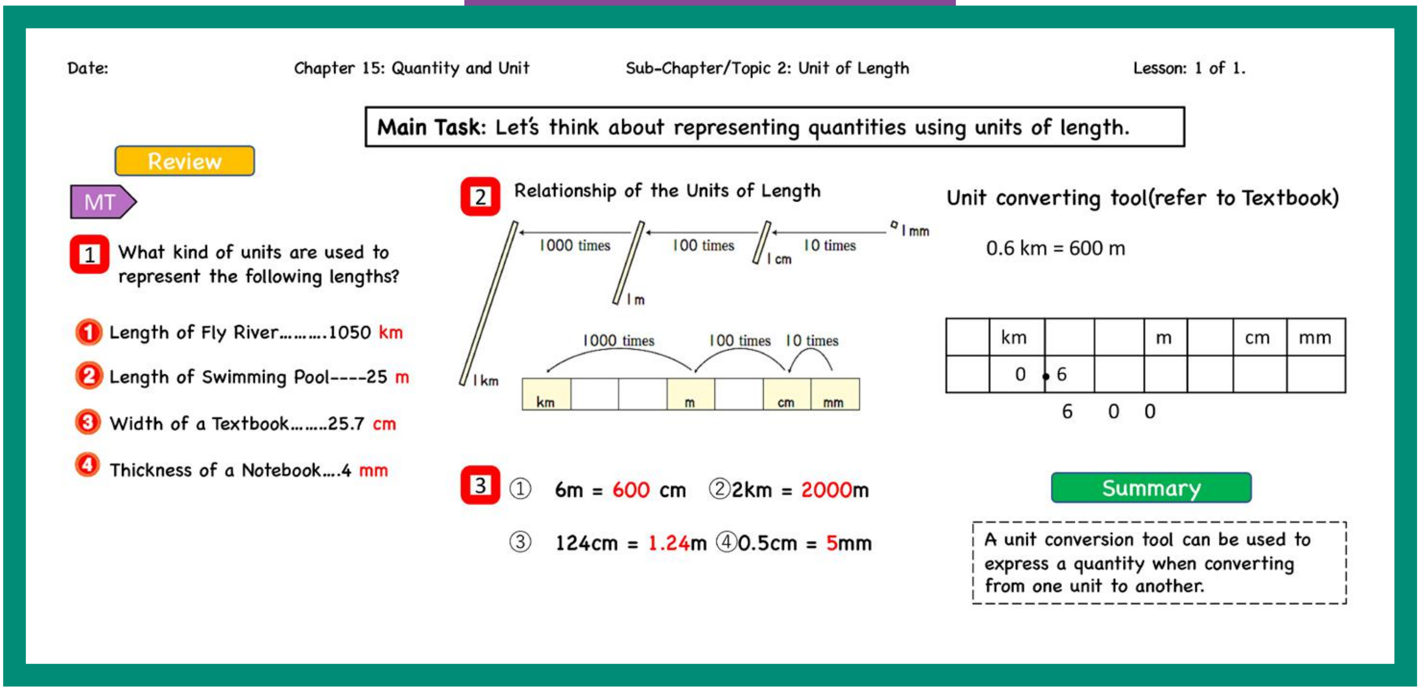
5 Summary

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 15: Quantity and Unit Sub-Chapter/Topic 2: Unit of Length Lesson: 1 of 1.

Main Task: Let's think about representing quantities using units of length.

Review

MT

1 What kind of units are used to represent the following lengths?

① Length of Fly River.........1050 km

② Length of Swimming Pool----25 m

③ Width of a Textbook.......25.7 cm

④ Thickness of a Notebook....4 mm

2 Relationship of the Units of Length

3 ① 6m = 600 cm ②2km = 2000m

③ 124cm = 1.24m ④0.5cm = 5mm

Unit converting tool(refer to Textbook)

0.6 km = 600 m

	km			m		cm	mm
	0	• 6					
		6	0	0			

Summary

A unit conversion tool can be used to express a quantity when converting from one unit to another.

Unit 15

Unit: Quantity and Unit
Sub-unit: Units of Area: km², ha, a, m², cm²
Lesson 1of 1

Textbook Page : 160
Actual Lesson 120

Sub-unit Objective

- To understand the relationship between unit of area and unit of length.

Lesson Objective

- To summarise the units of area

Prior Knowledge

- Unit of area (km², ha, a, m² and cm²)

Preparation

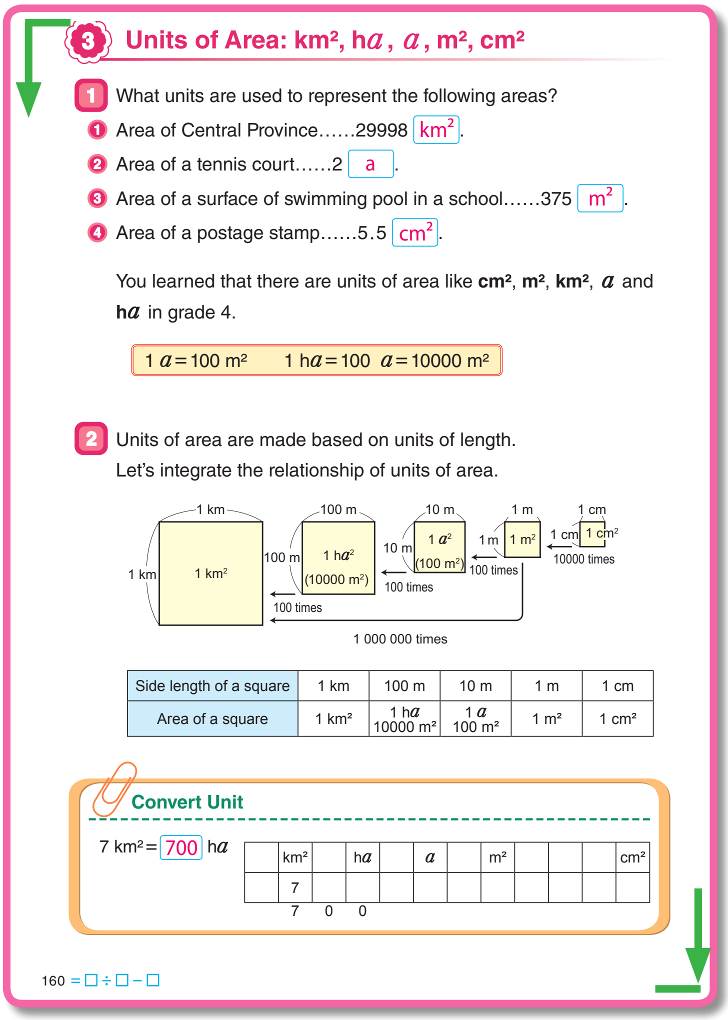
- Table of Units and relationship of units

Assessment

- Use the appropriate units of area considering the distance. **F**
- Represent the relationship between units of area and units of length. **F**
- Summarise the relationship of the units of area. **S**

Teacher's Notes

Compare length with area, as length increases by 10 times, the area increases by 100 times.



③ Units of Area: km², ha, a, m², cm²

1 What units are used to represent the following areas?

① Area of Central Province……29998 km².
② Area of a tennis court……2 a.
③ Area of a surface of swimming pool in a school……375 m².
④ Area of a postage stamp……5.5 cm².

You learned that there are units of area like **cm²**, **m²**, **km²**, a and **ha** in grade 4.

1 a = 100 m²   1 ha = 100 a = 10000 m²

2 Units of area are made based on units of length.
Let's integrate the relationship of units of area.

Side length of a square	1 km	100 m	10 m	1 m	1 cm
Area of a square	1 km²	1 ha 10000 m²	1 a 100 m²	1 m²	1 cm²

Convert Unit

7 km² = 700 ha

	km²		ha		a		m²				cm²
	7										
	7	0	0								

160 = □ ÷ □ − □

Lesson Flow

1 Review the previous lesson.

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

2 ① Choose the appropriate unit of area.

T/S Review what they learned about in Area and choose the appropriate unit for the given areas.
S Choose the appropriate unit of area to fill in the boxes.

3 ② Identify the relationship between units of area and length.

T How many times is the length of 10 m compared to 1 m?
S 10 times.
T How many times is the area of 10 m^2 compared to 1 m^2 ?
S 100 times.
T What about between 10 m^2 and 100 m^2?
S 100 times.
T Explain the relationship of the units of length of sides and area using the diagrams in the textbook for better understanding.
When the length of the sides of square become 10 times, the area of the square becomes 100 times.
TN 1 $cm^2 \times 10{,}000 = 1$ m^2, 1 $m^2 \times 1{,}000{,}000 = 1$ km^2

4 Applying the unit conversion tool.

T Ask students to convert 7 km^2 using the conversion tool.
S Convert 7 km^2 to 700 ha.

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 15: Quantity and Unit Sub-Chapter/Topic 3: Unit of Area Lesson: 1 of 1.

Main Task: Let's think about summarising the units of Area.

Review

MT

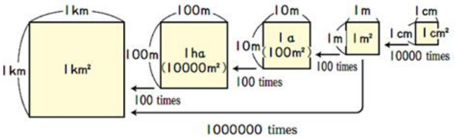
1 What kind of units are used to represent the following areas?

① Area of Central province…29998 km^2
② Area of tennis court…………2 a
③ Area of surface of swimming pool in school……375 m^2
④ Area of postage stamp…… 5.5 cm^2

You learned that there are units of area like **cm^2,m^2,km^2,a** and **ha** in grade 4.

1a = 100 m^2 1ha = 100 a = 10000 m^2

2 Relationship of the Units of Area
Relationship of the Units of Area



Side length of a square	1 km	100 m	10 m	1 m	1 cm
Area of a square	1 km^2	1 ha 10000 m^2	1 a 100 m^2	1 m^2	1 cm^2

Convert Unit

7 km^2 = 700 ha

	km^2		ha		a		m^2				cm^2
	7										
	7	0	0								

Summary

Summarise the lesson based on what the students have learnt and elaborate on important points of
1 a = 100 m^2
1 ha = 100 a = 10000 m^2

Unit
15

Unit: Quantity and Unit
Sub-unit: Unit of Volume: m³, cm³, kL, dL, mL
Lesson 1 of 1

Textbook Page : 161
Actual Lesson 121

Sub-unit Objectives

- To understand that there are two types of unit in volume, a unit based on length and a unit based on L.
- To summarise the unit of volume.

Lesson Objectives

- To understand that there are two types of units in volume, a unit based on length and a unit based on L.
- To summarise the unit of volume.

Prior Knowledge

- Unit of volume (m³, cm³, L, mL and dL)

Preparation

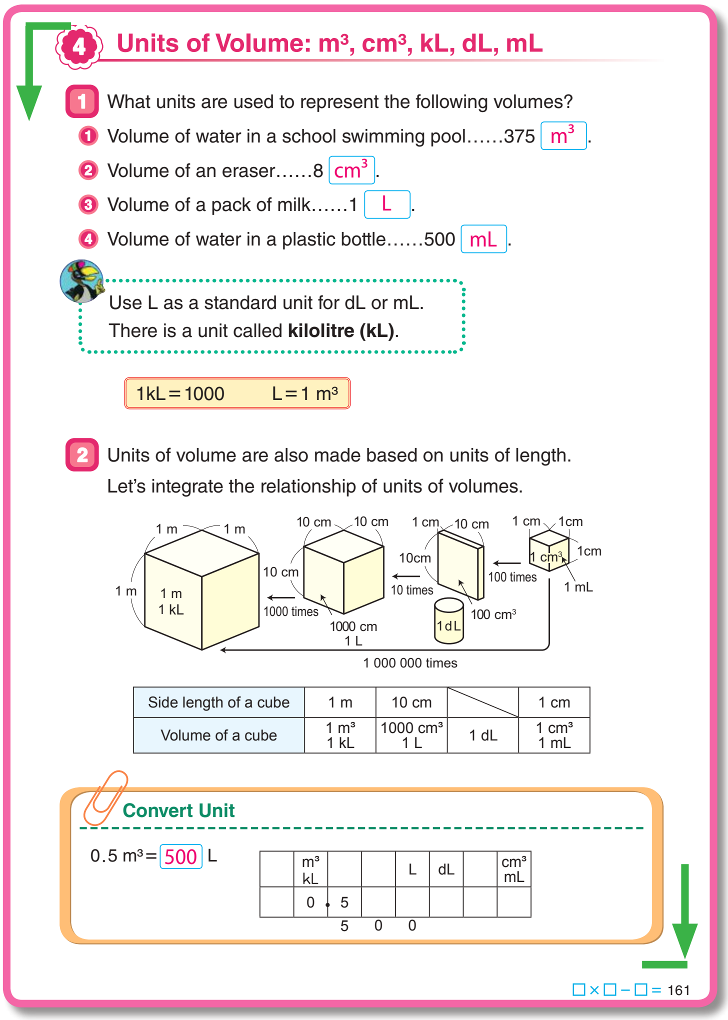
- Unit conversion table and relationship of units.

Assessment

- Use the appropriate units of volume considering the size of various materials. **F**
- Represent the relationship among units. **F**
- Summarise the relationship of the units of volume. **S**

Teacher's Notes

Compare length by volume, as length increases by 10 times the volume increases by 1000 times.



④ Units of Volume: m³, cm³, kL, dL, mL

1 What units are used to represent the following volumes?

① Volume of water in a school swimming pool……375 m³.
② Volume of an eraser……8 cm³.
③ Volume of a pack of milk……1 L.
④ Volume of water in a plastic bottle……500 mL.

Use L as a standard unit for dL or mL.
There is a unit called **kilolitre (kL)**.

1kL = 1000 L = 1 m³

2 Units of volume are also made based on units of length.
Let's integrate the relationship of units of volumes.

Side length of a cube	1 m	10 cm		1 cm
Volume of a cube	1 m³ 1 kL	1000 cm³ 1 L	1 dL	1 cm³ 1 mL

Convert Unit

0.5 m³ = 500 L

	m³ kL			L	dL		cm³ mL
	0	. 5					
		5	0	0			

Lesson Flow

1 Review the previous lesson.

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

2 ① Choose appropriate unit of volume.

T/S Review what they learned about in Volume and choose the appropriate unit for the given volumes.

S Choose the appropriate unit of length, width and height to fill in the boxes.

3 Important Point

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

4 ② Understand the relationship among units

T How many time is the volume which sides of cube increases 10 cm from 1 cm.

S 1000 times.

T Explain the relationship of length of sides and volume using the diagrams in the textbook for better understanding.
When the sides of cube increase 10 times, the volume becomes 1000 times.

TN Emphasise on the relationship of the units of volume is important.

5 Convert the Units of Volume.

T Help those students who cannot convert units correctly to use the unit conversion table.

S $0.5 m^3 = 500$ L

	m^3 kL			L		dL		cm^3 mL
	0.	5						
		5	0	0				

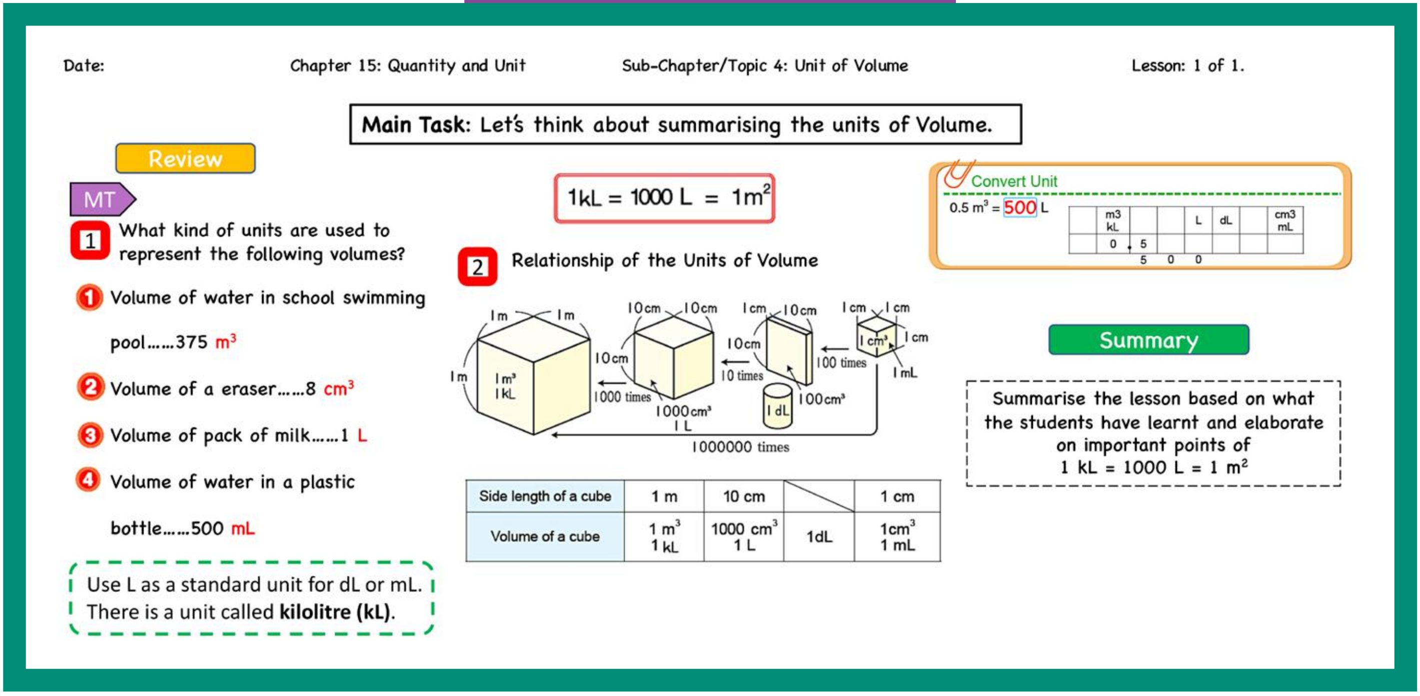
6 Summary

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 15: Quantity and Unit Sub-Chapter/Topic 4: Unit of Volume Lesson: 1 of 1.

Main Task: Let's think about summarising the units of Volume.

Review

MT

1 What kind of units are used to represent the following volumes?

① Volume of water in school swimming pool……375 m^3

② Volume of a eraser……8 cm^3

③ Volume of pack of milk……1 L

④ Volume of water in a plastic bottle……500 mL

Use L as a standard unit for dL or mL.
There is a unit called **kilolitre (kL)**.

1kL = 1000 L = $1m^2$

2 Relationship of the Units of Volume

Side length of a cube	1 m	10 cm		1 cm
Volume of a cube	1 m^3 1 kL	1000 cm^3 1 L	1dL	1cm^3 1 mL

Convert Unit

$0.5 m^3 = 500$ L

	m3 kL			L	dL		cm3 mL
	0 .	5					
		5	0	0			

Summary

Summarise the lesson based on what the students have learnt and elaborate on important points of
1 kL = 1000 L = 1 m^2

Unit
15

Unit: Quantity and Unit
Sub-unit: Unit of Weight: t, kg, g, mg
Lesson 1of 1

Textbook Page : 162
Actual Lesson 122

Sub-unit Objectives

- To recognise the unit milligram (mg).
- To understand the relationship between volume of water and weight.

Lesson Objectives

- To recognise the unit milligram (mg).
- To understand the relationship between volume of water and weight.
- To summarise the unit of weight.

Prior Knowledge

- Unit of weight (t , kg and g)

Preparation

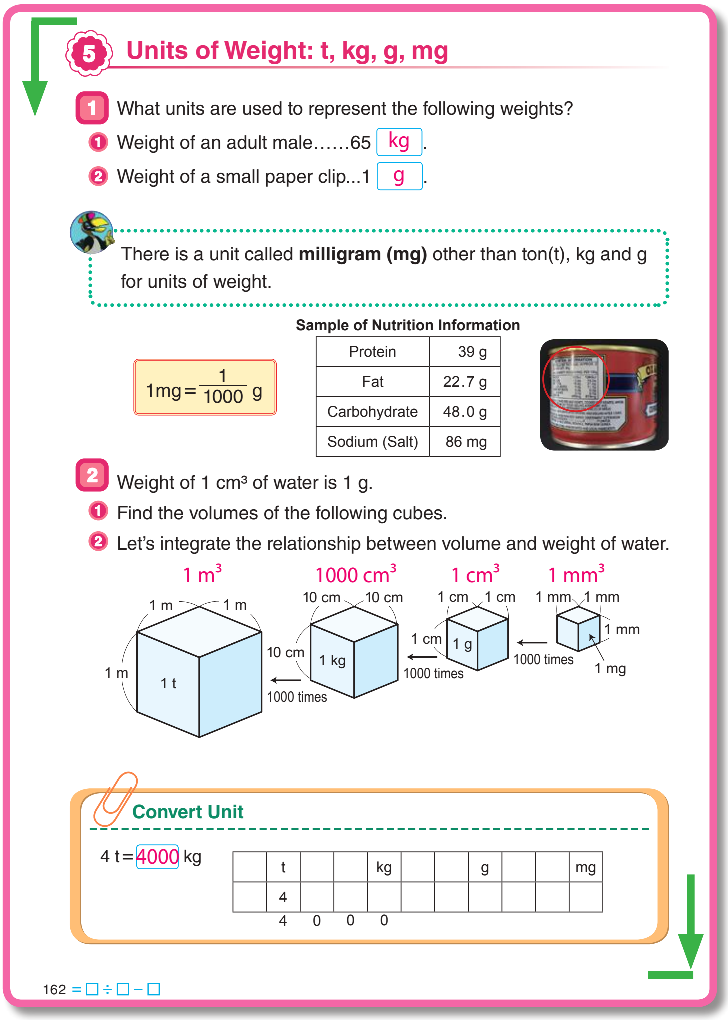
- Unit conversion table and relationship of units

Assessment

- Use the appropriate units of weight considering the characteristic of the materials. F
- Represent the relationship between volume of water and weight. F
- Summarise the relationship of the units of weight. S

Teacher's Notes

As unit of length increases so does the unit of weight.



5 Units of Weight: t, kg, g, mg

1 What units are used to represent the following weights?

① Weight of an adult male……65 kg.

② Weight of a small paper clip...1 g.

There is a unit called **milligram (mg)** other than ton(t), kg and g for units of weight.

$$1\text{mg} = \frac{1}{1000}\text{ g}$$

Sample of Nutrition Information

Protein	39 g
Fat	22.7 g
Carbohydrate	48.0 g
Sodium (Salt)	86 mg

2 Weight of 1 cm^3 of water is 1 g.

① Find the volumes of the following cubes.

② Let's integrate the relationship between volume and weight of water.

Convert Unit

4 t=4000 kg

	t			kg			g			mg
	4									
	4	0	0	0						

Lesson Flow

1 Review the previous lesson.

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

2 1 Choose appropriate unit of weight.

T/S Review what they learned about in Weight and choose the appropriate unit for the given weights.

S ① - ② Choose the appropriate unit of volume and weight to fill in the boxes.

3 Important Point

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

4 The unit of mg.

S Express 1 mg $= \frac{1}{1000}$ g where mg is introduced in the composition of ingredients in food.

5 2 Relationship between volume of water and weight.

S ① Find the volume of each cube.

T Explain the relationship between volume of water and weight using the diagrams in the textbook for better understanding.

S 1 mg of water is equal to 1 mm^3

S 1 g of water is equal to 1 cm^3,

S 1 kg of water is equal to 1000 cm^3

S 1t of water is equal to 1 m^3

T/S ② Discuss the relationship between volume and weight of water.

6 Change the unit of weight.

T Help those students who cannot convert unit correctly to use the unit table.

S 4 t = 4000 kg

	t			kg			g		mg
	4			6					
	4	0	0	0					

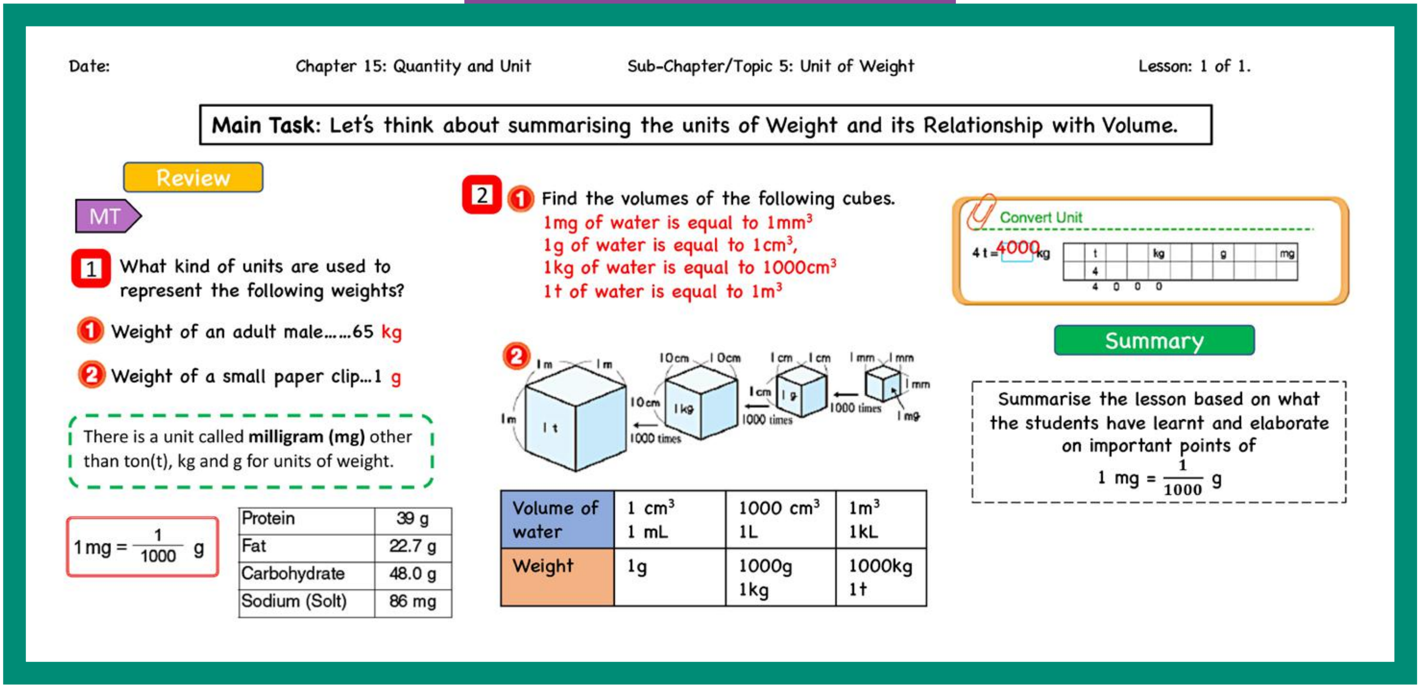
7 Summary

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 15: Quantity and Unit Sub-Chapter/Topic 5: Unit of Weight Lesson: 1 of 1.

Main Task: Let's think about summarising the units of Weight and its Relationship with Volume.

Review

MT

1 What kind of units are used to represent the following weights?

① Weight of an adult male……65 kg

② Weight of a small paper clip…1 g

There is a unit called **milligram (mg)** other than ton(t), kg and g for units of weight.

1 mg $= \frac{1}{1000}$ g

Protein	39 g
Fat	22.7 g
Carbohydrate	48.0 g
Sodium (Solt)	86 mg

2 ① Find the volumes of the following cubes.

1mg of water is equal to 1mm^3
1g of water is equal to 1cm^3,
1kg of water is equal to 1000cm^3
1t of water is equal to 1m^3

②

Volume of water	1 cm^3 1 mL	1000 cm^3 1L	1m^3 1kL
Weight	1g	1000g 1kg	1000kg 1t

Convert Unit

4 t = 4000 kg

	t			kg			g		mg
	4								
	4	0	0	0					

Summary

Summarise the lesson based on what the students have learnt and elaborate on important points of
1 mg $= \frac{1}{1000}$ g

Unit 15

Unit: Quantity and Unit
Sub-unit: Metric system
Lesson 1 and 2 of 2

Textbook Page : 163
Actual Lesson 123 & 124

Sub-unit Objective

- To summarise the structure of the metric system.

Lesson Objective

- To understand the structure of the metric system.

Prior Knowledge

- Units of metric system

Preparation

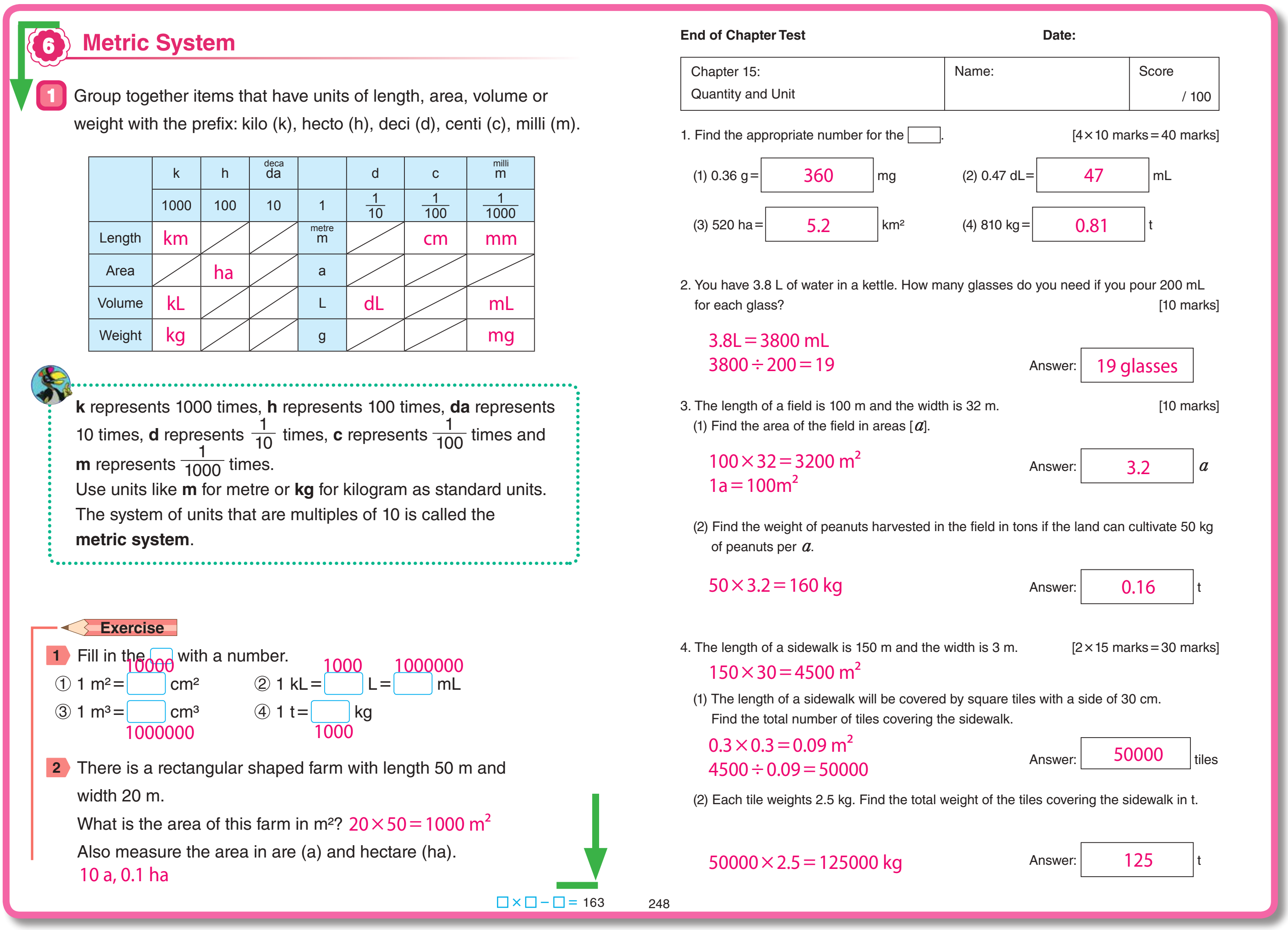
- Conversion table

Assessment

- Express the relationship amongst units in the metric system. F
- Explain the Metric system. S
- Complete the exercises correctly. S

Teacher's Notes

Metric system is based on 10. As the base increases or decreases by 10 the unit also changes.



6 Metric System

1 Group together items that have units of length, area, volume or weight with the prefix: kilo (k), hecto (h), deci (d), centi (c), milli (m).

	k	h	deca da		d	c	milli m
	1000	100	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
Length	km			metre m		cm	mm
Area		ha		a			
Volume	kL			L	dL		mL
Weight	kg			g			mg

k represents 1000 times, **h** represents 100 times, **da** represents 10 times, **d** represents $\frac{1}{10}$ times, **c** represents $\frac{1}{100}$ times and **m** represents $\frac{1}{1000}$ times.
Use units like **m** for metre or **kg** for kilogram as standard units.
The system of units that are multiples of 10 is called the **metric system**.

Exercise

1 Fill in the ☐ with a number.

① 1 m² = 10000 cm²
② 1 kL = 1000 L = 1000000 mL
③ 1 m³ = 1000000 cm³
④ 1 t = 1000 kg

2 There is a rectangular shaped farm with length 50 m and width 20 m.
What is the area of this farm in m²? $20 \times 50 = 1000\ m^2$
Also measure the area in are (a) and hectare (ha).
10 a, 0.1 ha

☐ × ☐ − ☐ = 163

End of Chapter Test **Date:**

Chapter 15: Quantity and Unit	Name:	Score / 100

1. Find the appropriate number for the ☐. [4×10 marks = 40 marks]

(1) 0.36 g = 360 mg
(2) 0.47 dL = 47 mL
(3) 520 ha = 5.2 km²
(4) 810 kg = 0.81 t

2. You have 3.8 L of water in a kettle. How many glasses do you need if you pour 200 mL for each glass? [10 marks]

$3.8L = 3800\ mL$
$3800 \div 200 = 19$
Answer: 19 glasses

3. The length of a field is 100 m and the width is 32 m. [10 marks]
(1) Find the area of the field in areas [a].

$100 \times 32 = 3200\ m^2$
$1a = 100m^2$
Answer: 3.2 a

(2) Find the weight of peanuts harvested in the field in tons if the land can cultivate 50 kg of peanuts per a.

$50 \times 3.2 = 160\ kg$
Answer: 0.16 t

4. The length of a sidewalk is 150 m and the width is 3 m. [2×15 marks = 30 marks]

$150 \times 30 = 4500\ m^2$

(1) The length of a sidewalk will be covered by square tiles with a side of 30 cm. Find the total number of tiles covering the sidewalk.

$0.3 \times 0.3 = 0.09\ m^2$
$4500 \div 0.09 = 50000$
Answer: 50000 tiles

(2) Each tile weights 2.5 kg. Find the total weight of the tiles covering the sidewalk in t.

$50000 \times 2.5 = 125000\ kg$
Answer: 125 t

248

Lesson Flow

1 Review the previous lesson.

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

2 ① Fill in the blanks and think about the relationship.

T Allow students to study the table.

S Think about the relationship amongst units and fill in the blanks.

T How is the relationship among units?

S The units change according to 10, 100 and1000 times based on 1 (m, a, L and g).

S The units also change according to $\frac{1}{10}$, $\frac{1}{100}$ and $\frac{1}{1000}$ based on 1 (m, a, L and g).

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 important concepts of this lesson.

6 Complete the Evaluation Test.

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

Sample Blackboard Plan

Date: Chapter 15: Quantity and Unit Sub-Chapter/Topic 6: Metric System Lesson: 1 of 1.

Main Task: Let's think about and understand the Metric System

Review

MT

① Group together items that have units of length, area, volume, or weight, with the prefix k (kilo), h (hecto), d (deci), c (centi), m (mili).

k represents 1000 times, **h** represents 100 times, **da** represents 10 times, **d** represents $\frac{1}{10}$ times, **c** represents $\frac{1}{100}$ times and **m** represents $\frac{1}{1000}$ times.
Use units like **m** for metre or **kg** for kilogram as standard units. The system of units that are multiples of 10 is called the **metric system**.

	k	h	deca da		d	c	milli m
	1000	100	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
Length	km	╱	╱	metre m	╱	cm	mm
Area	╱	ha	╱	a	╱	╱	╱
Volume	kL	╱	╱	L	dL	╱	mL
Weight	kg	╱	╱	g	╱	╱	mg

Exercise

(Refer to TM for Questions and Answers)

Summary

Summarise the lesson based on what the students have learnt and elaborate on important points in the box ⬚

End of Chapter Test **Date:**

Chapter 15: Quantity and Unit	Name:	Score / 100

1. Find the appropriate number for the $\boxed{\quad}$. [4×10 marks = 40 marks]

(1) 0.36 g = $\boxed{\qquad\qquad}$ mg

(2) 0.47 dL = $\boxed{\qquad\qquad}$ mL

(3) 520 ha = $\boxed{\qquad\qquad}$ km^2

(4) 810 kg = $\boxed{\qquad\qquad}$ t

2. You have 3.8 L of water in a kettle. How many glasses do you need if you pour 200 mL for each glass? [10 marks]

Answer: $\boxed{\qquad\qquad}$

3. The length of a field is 100 m and the width is 32 m. [10 marks]

(1) Find the area of the field in areas [a].

Answer: $\boxed{\qquad\qquad}$ a

(2) Find the weight of peanuts harvested in the field in tons if the land can cultivate 50 kg of peanuts per a.

Answer: $\boxed{\qquad\qquad}$ t

4. The length of a sidewalk is 150 m and the width is 3 m. [2×15 marks = 30 marks]

(1) The length of a sidewalk will be covered by square tiles with a side of 30 cm. Find the total number of tiles covering the sidewalk.

Answer: $\boxed{\qquad\qquad}$ tiles

(2) Each tile weights 2.5 kg. Find the total weight of the tiles covering the sidewalk in t.

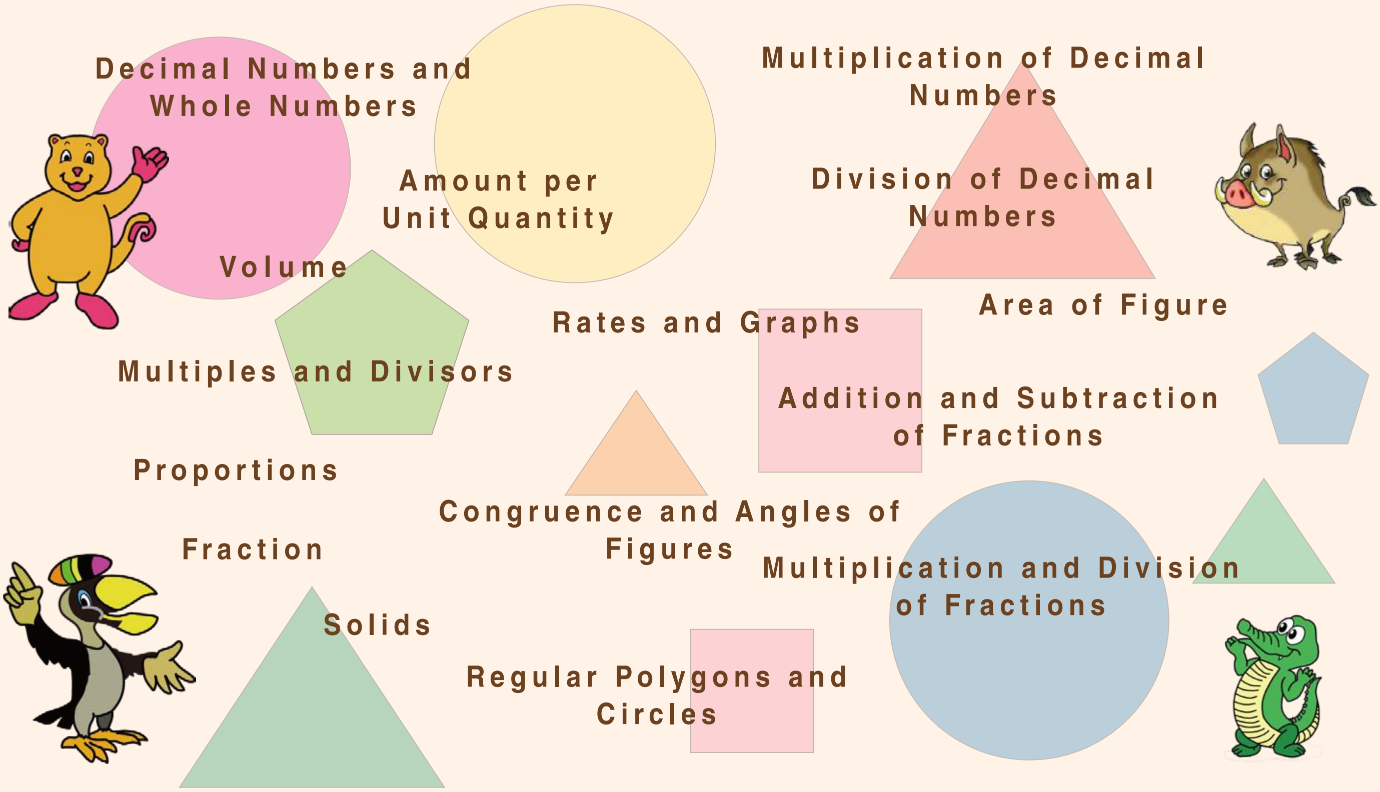
Answer: $\boxed{\qquad\qquad}$ t

Chapter 16 Summary of Grade 3 to 6

This chapter is a summary of all the contents from Grade 3 to 6.

It is important for the students to acquire a procedural fluency in mathematics. That is not just understanding facts or procedures but using various procedures depending on the situation.

Various problems learned in Grade 3 to 6 are included in this chapter, so please give sufficient time to students to solve all the problems.



Decimal Numbers and Whole Numbers

Multiplication of Decimal Numbers

Amount per Unit Quantity

Division of Decimal Numbers

Volume

Rates and Graphs

Area of Figure

Multiples and Divisors

Addition and Subtraction of Fractions

Proportions

Congruence and Angles of Figures

Fraction

Multiplication and Division of Fractions

Solids

Regular Polygons and Circles

Unit
16

Unit: Summary of Grade 3 to 6 Mathematics
Topic 1: Number and Calculation
Lesson 1 of 4

Textbook Page :
166 and 167
Actual Lesson 125

Unit Objective

- To review and confirm what students learned in Grade 6.

Lesson Objective

- To review and confirm about Number and Calculation in Grade 6.

Prior Knowledge

- Number and calculation (Grade 3 - 6)

Preparation

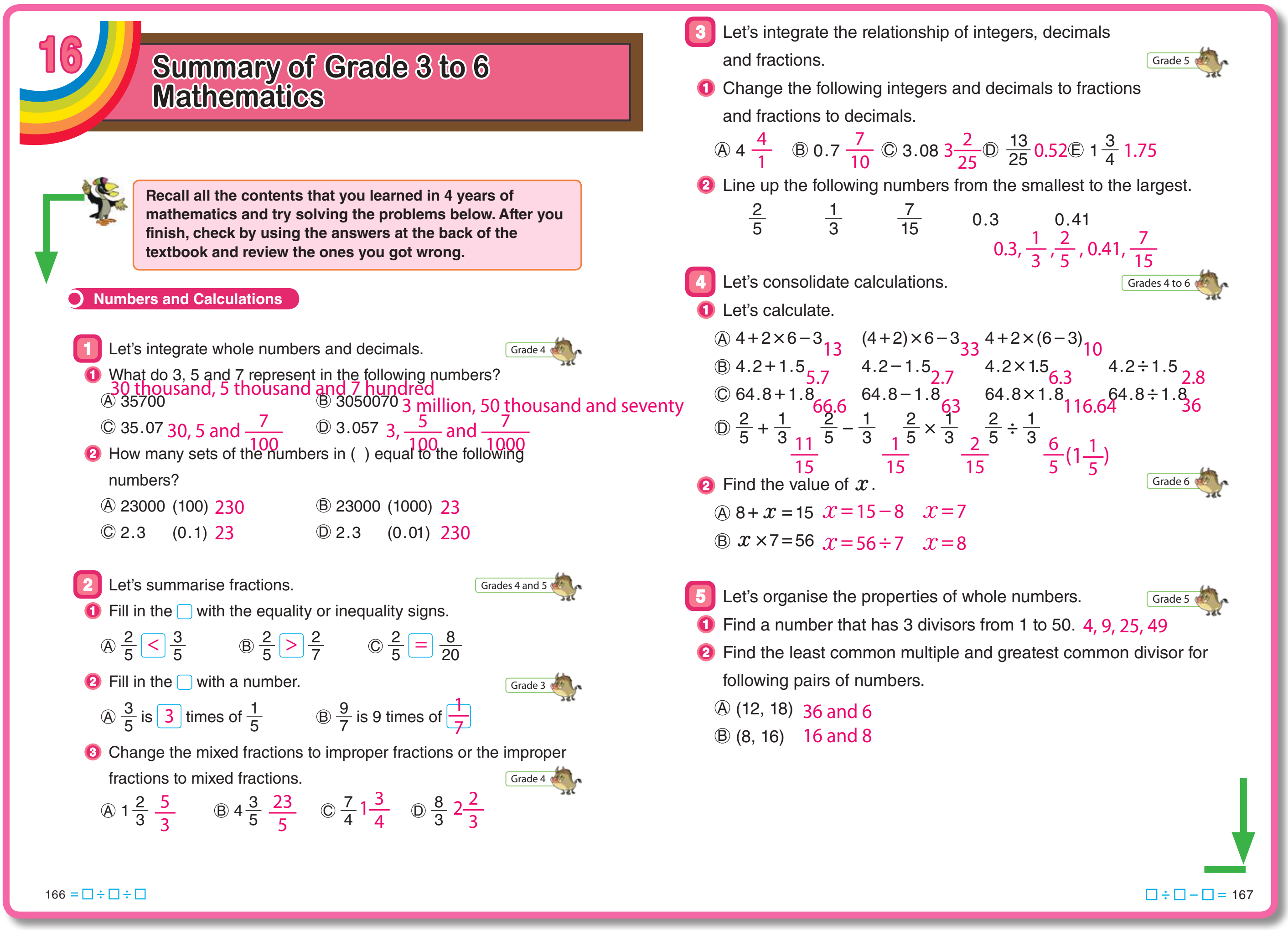
- Revision of Prior Content

Assessment

- Solve the problems remembering what they learned from Grade 3 to 6. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

This is a summary lesson of contents learned from Grade 3 to 6.
You are encouraged to be familiar with the contents of this Unit in order to prepare lead up questions that may help students to recall previously learnt contents.



16

Summary of Grade 3 to 6 Mathematics

Recall all the contents that you learned in 4 years of mathematics and try solving the problems below. After you finish, check by using the answers at the back of the textbook and review the ones you got wrong.

Numbers and Calculations

1 Let's integrate whole numbers and decimals. Grade 4

① What do 3, 5 and 7 represent in the following numbers?

Ⓐ 35700 30 thousand, 5 thousand and 7 hundred
Ⓑ 3050070 3 million, 50 thousand and seventy
Ⓒ 35.07 30, 5 and $\frac{7}{100}$
Ⓓ 3.057 3, $\frac{5}{100}$ and $\frac{7}{1000}$

② How many sets of the numbers in ( ) equal to the following numbers?

Ⓐ 23000 (100) 230
Ⓑ 23000 (1000) 23
Ⓒ 2.3 (0.1) 23
Ⓓ 2.3 (0.01) 230

2 Let's summarise fractions. Grades 4 and 5

① Fill in the □ with the equality or inequality signs.

Ⓐ $\frac{2}{5} \boxed{<} \frac{3}{5}$ Ⓑ $\frac{2}{5} \boxed{>} \frac{2}{7}$ Ⓒ $\frac{2}{5} \boxed{=} \frac{8}{20}$

② Fill in the □ with a number. Grade 3

Ⓐ $\frac{3}{5}$ is $\boxed{3}$ times of $\frac{1}{5}$
Ⓑ $\frac{9}{7}$ is 9 times of $\boxed{\frac{1}{7}}$

③ Change the mixed fractions to improper fractions or the improper fractions to mixed fractions. Grade 4

Ⓐ $1\frac{2}{3}$ $\frac{5}{3}$ Ⓑ $4\frac{3}{5}$ $\frac{23}{5}$ Ⓒ $\frac{7}{4}$ $1\frac{3}{4}$ Ⓓ $\frac{8}{3}$ $2\frac{2}{3}$

3 Let's integrate the relationship of integers, decimals and fractions. Grade 5

① Change the following integers and decimals to fractions and fractions to decimals.

Ⓐ 4 $\frac{4}{1}$ Ⓑ 0.7 $\frac{7}{10}$ Ⓒ 3.08 $3\frac{2}{25}$ Ⓓ $\frac{13}{25}$ 0.52 Ⓔ $1\frac{3}{4}$ 1.75

② Line up the following numbers from the smallest to the largest.

$\frac{2}{5}$ $\frac{1}{3}$ $\frac{7}{15}$ 0.3 0.41

0.3, $\frac{1}{3}$, $\frac{2}{5}$, 0.41, $\frac{7}{15}$

4 Let's consolidate calculations. Grades 4 to 6

① Let's calculate.

Ⓐ $4+2\times6-3$ 13 $(4+2)\times6-3$ 33 $4+2\times(6-3)$ 10
Ⓑ $4.2+1.5$ 5.7 $4.2-1.5$ 2.7 4.2×1.5 6.3 $4.2\div1.5$ 2.8
Ⓒ $64.8+1.8$ 66.6 $64.8-1.8$ 63 64.8×1.8 116.64 $64.8\div1.8$ 36
Ⓓ $\frac{2}{5}+\frac{1}{3}$ $\frac{11}{15}$ $\frac{2}{5}-\frac{1}{3}$ $\frac{1}{15}$ $\frac{2}{5}\times\frac{1}{3}$ $\frac{2}{15}$ $\frac{2}{5}\div\frac{1}{3}$ $\frac{6}{5}(1\frac{1}{5})$

② Find the value of x. Grade 6

Ⓐ $8+x=15$ $x=15-8$ $x=7$
Ⓑ $x\times7=56$ $x=56\div7$ $x=8$

5 Let's organise the properties of whole numbers. Grade 5

① Find a number that has 3 divisors from 1 to 50. 4, 9, 25, 49

② Find the least common multiple and greatest common divisor for following pairs of numbers.

Ⓐ (12, 18) 36 and 6
Ⓑ (8, 16) 16 and 8

Lesson Flow

1 ① Express the value of whole numbers, decimal numbers and fractions.

T Introduce the summary unit.

S ①Solve by writing the values of 3, 5 and 7 in the given numbers.

S ② Identify sets of numbers in given whole numbers and decimal numbers.

2 ② Summarise the value of Fractions.

T Which fraction is larger? $\frac{1}{10}$ or $\frac{1}{2}$?

S $\frac{1}{2}$

TN Confirm the answer and get them to continue with the activities.

S ① Compare fractions and identify which is larger and which is smaller.

S ② Calculate the number of times a fraction is.

T Revise changing mixed fractions to improper fractions and vice versa.

S ③ Complete the activity.

3 ③ Review the relationship of Integers, Decimals and Fractions.

T Intergers and decimals can be expressed as fractions and fractions can be also be expressed as decimals.Does the value change?

S The value remains the same.

S Solve activities ① to ②.

4 ④ Calculate Whole Numbers, Decimal Numbers and Fractions.

S ① Calculate the operations correctly.

S ② Calculate to find the value of x.

5 ⑤ Review the properties of Whole Numbers.

TN Get the students to give examples of common divisors and common multiples.

S Solve activities ① to ② by identifying divisors, common multiples and common divisors.

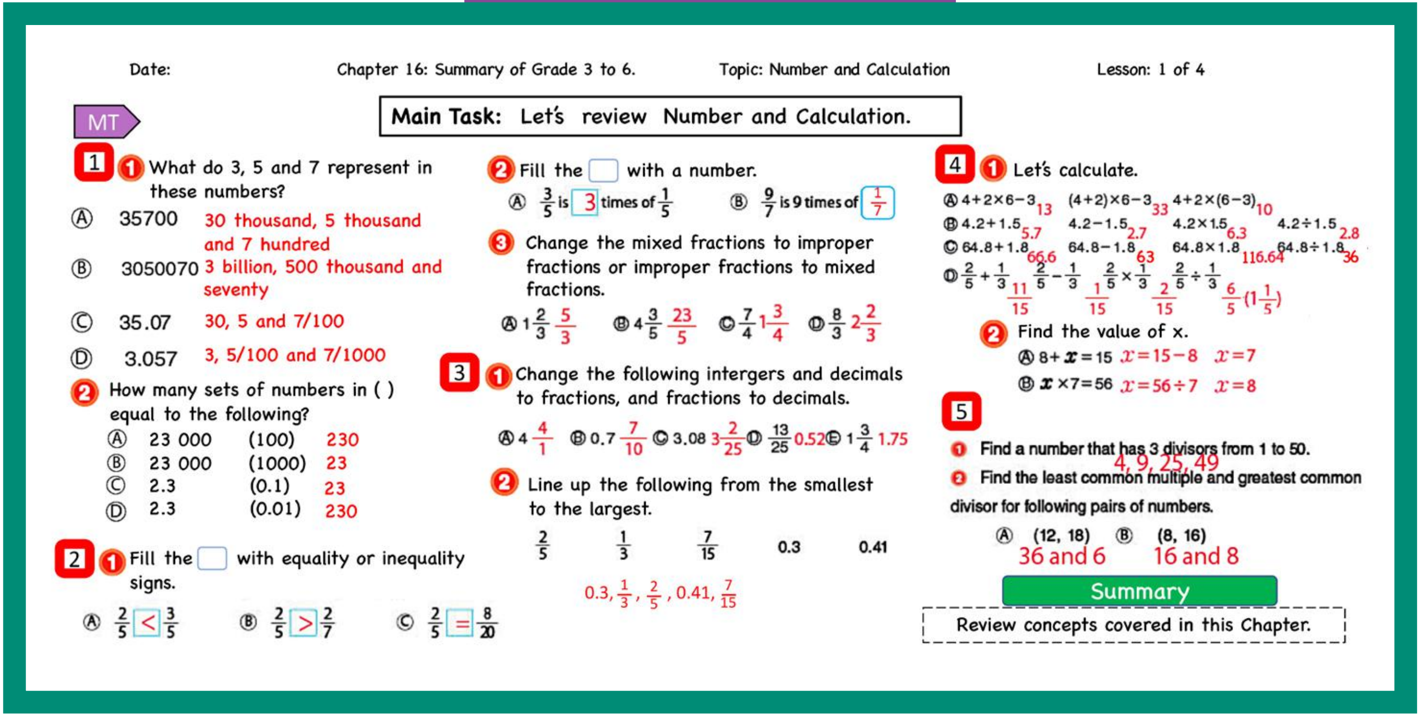
6 Summary

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 16: Summary of Grade 3 to 6. Topic: Number and Calculation Lesson: 1 of 4

MT

Main Task: Let's review Number and Calculation.

1 ① What do 3, 5 and 7 represent in these numbers?

Ⓐ 35700 30 thousand, 5 thousand and 7 hundred
Ⓑ 3050070 3 billion, 500 thousand and seventy
Ⓒ 35.07 30, 5 and 7/100
Ⓓ 3.057 3, 5/100 and 7/1000

② How many sets of numbers in ( ) equal to the following?

Ⓐ 23 000 (100) 230
Ⓑ 23 000 (1000) 23
Ⓒ 2.3 (0.1) 23
Ⓓ 2.3 (0.01) 230

2 ① Fill the ☐ with equality or inequality signs.

Ⓐ $\frac{2}{5} \boxed{<} \frac{3}{5}$ Ⓑ $\frac{2}{5} \boxed{>} \frac{2}{7}$ Ⓒ $\frac{2}{5} \boxed{=} \frac{8}{20}$

② Fill the ☐ with a number.

Ⓐ $\frac{3}{5}$ is $\boxed{3}$ times of $\frac{1}{5}$ Ⓑ $\frac{9}{7}$ is 9 times of $\boxed{\frac{1}{7}}$

③ Change the mixed fractions to improper fractions or improper fractions to mixed fractions.

Ⓐ $1\frac{2}{3}$ $\frac{5}{3}$ Ⓑ $4\frac{3}{5}$ $\frac{23}{5}$ Ⓒ $\frac{7}{4}$ $1\frac{3}{4}$ Ⓓ $\frac{8}{3}$ $2\frac{2}{3}$

3 ① Change the following intergers and decimals to fractions, and fractions to decimals.

Ⓐ 4 $\frac{4}{1}$ Ⓑ 0.7 $\frac{7}{10}$ Ⓒ 3.08 $3\frac{2}{25}$ Ⓓ $\frac{13}{25}$ 0.52 Ⓔ $1\frac{3}{4}$ 1.75

② Line up the following from the smallest to the largest.

$\frac{2}{5}$ $\frac{1}{3}$ $\frac{7}{15}$ 0.3 0.41

0.3, $\frac{1}{3}$, $\frac{2}{5}$, 0.41, $\frac{7}{15}$

4 ① Let's calculate.

Ⓐ $4+2\times6-3$ 13 $(4+2)\times6-3$ 33 $4+2\times(6-3)$ 10
Ⓑ $4.2+1.5$ 5.7 $4.2-1.5$ 2.7 4.2×1.5 6.3 $4.2\div1.5$ 2.8
Ⓒ $64.8+1.8$ 66.6 $64.8-1.8$ 63 64.8×1.8 116.64 $64.8\div1.8$ 36
Ⓓ $\frac{2}{5}+\frac{1}{3}$ $\frac{11}{15}$ $\frac{2}{5}-\frac{1}{3}$ $\frac{1}{15}$ $\frac{2}{5}\times\frac{1}{3}$ $\frac{2}{15}$ $\frac{2}{5}\div\frac{1}{3}$ $\frac{6}{5}$ $(1\frac{1}{5})$

② Find the value of x.

Ⓐ $8+x=15$ $x=15-8$ $x=7$
Ⓑ $x\times7=56$ $x=56\div7$ $x=8$

5

① Find a number that has 3 divisors from 1 to 50.

4, 9, 25, 49

② Find the least common multiple and greatest common divisor for following pairs of numbers.

Ⓐ (12, 18) Ⓑ (8, 16)
36 and 6 16 and 8

Summary

Review concepts covered in this Chapter.

Unit
16

Unit: Summary of Grade 3 to 6 Mathematics
Topic 2: Quantity and Measurement
Lesson 2 of 4

Textbook Page :
168 and 169
Actual Lesson 126

Unit Objective

- To review and confirm what students learned in Grade 6

Lesson Objective

- To review and confirm about Quantity and Measurement in Grade 6.

Prior Knowledge

- Quantity and Measurement (Grade 3 - 6)

Preparation

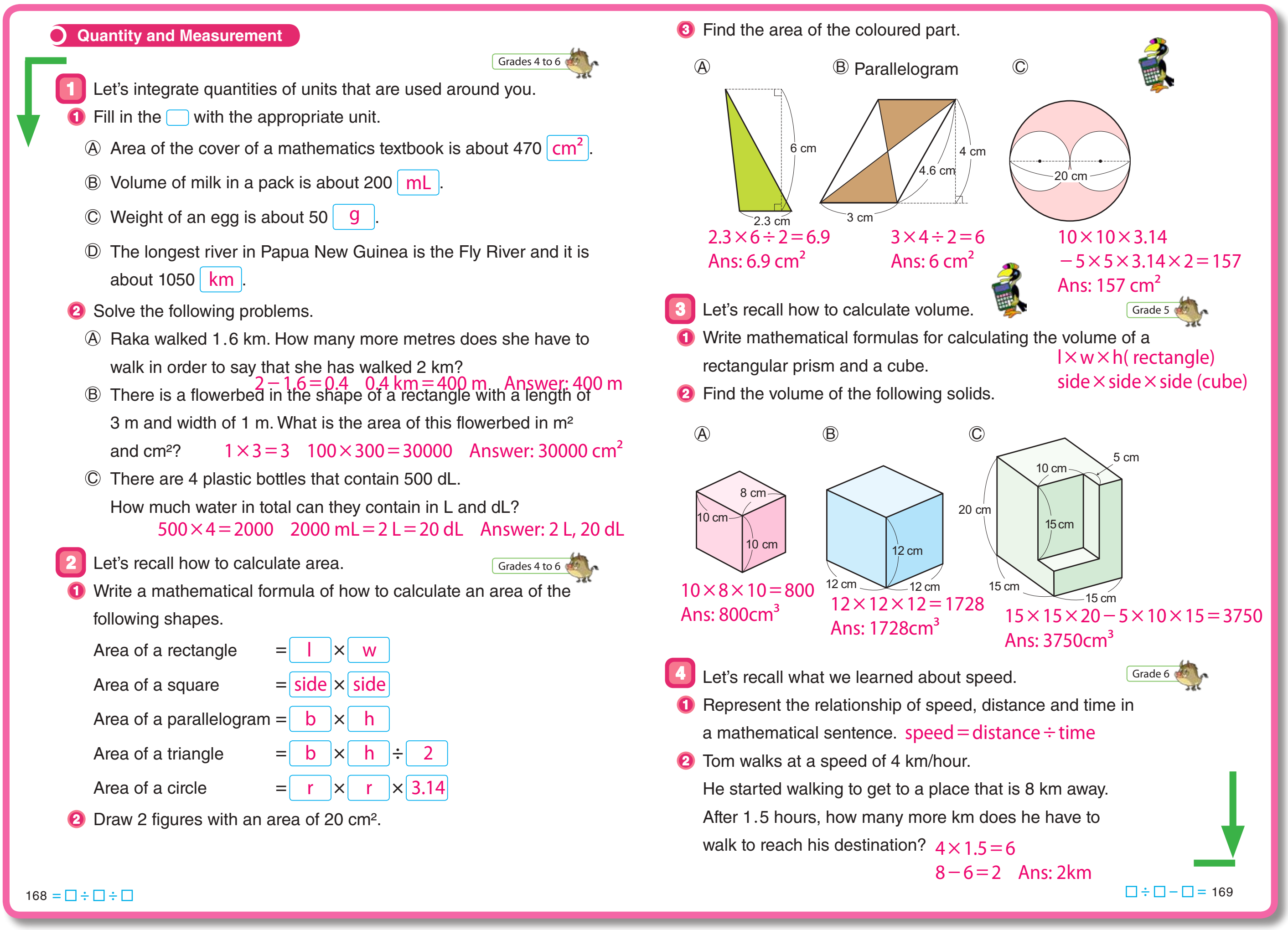
- Revision of Prior Content

Assessment

- Solve the problems remembering what they learned from Grade 3 to 6. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

This is a summary lesson of contents learned from Grade 3 to 6.
You are encouraged to be familiar with the contents of this Unit in order to prepare lead up questions that may help students to recall previously learnt contents.



Quantity and Measurement

1 Let's integrate quantities of units that are used around you.

① Fill in the ☐ with the appropriate unit.

Ⓐ Area of the cover of a mathematics textbook is about 470 $\boxed{cm^2}$.

Ⓑ Volume of milk in a pack is about 200 $\boxed{mL}$.

Ⓒ Weight of an egg is about 50 $\boxed{g}$.

Ⓓ The longest river in Papua New Guinea is the Fly River and it is about 1050 $\boxed{km}$.

② Solve the following problems.

Ⓐ Raka walked 1.6 km. How many more metres does she have to walk in order to say that she has walked 2 km?
$2-1.6=0.4$　$0.4\text{ km}=400\text{ m}$　Answer: 400 m

Ⓑ There is a flowerbed in the shape of a rectangle with a length of 3 m and width of 1 m. What is the area of this flowerbed in m² and cm²?　$1\times3=3$　$100\times300=30000$　Answer: 30000 cm²

Ⓒ There are 4 plastic bottles that contain 500 dL.
How much water in total can they contain in L and dL?
$500\times4=2000$　$2000\text{ mL}=2\text{ L}=20\text{ dL}$　Answer: 2 L, 20 dL

2 Let's recall how to calculate area.

① Write a mathematical formula of how to calculate an area of the following shapes.

Area of a rectangle $=\boxed{l}\times\boxed{w}$
Area of a square $=\boxed{side}\times\boxed{side}$
Area of a parallelogram $=\boxed{b}\times\boxed{h}$
Area of a triangle $=\boxed{b}\times\boxed{h}\div\boxed{2}$
Area of a circle $=\boxed{r}\times\boxed{r}\times\boxed{3.14}$

② Draw 2 figures with an area of 20 cm².

③ Find the area of the coloured part.

Ⓐ $2.3\times6\div2=6.9$
Ans: 6.9 cm²

Ⓑ $3\times4\div2=6$
Ans: 6 cm²

Ⓒ $10\times10\times3.14$
$-5\times5\times3.14\times2=157$
Ans: 157 cm²

3 Let's recall how to calculate volume.

① Write mathematical formulas for calculating the volume of a rectangular prism and a cube.
$l\times w\times h$(rectangle)
$side\times side\times side$ (cube)

② Find the volume of the following solids.

Ⓐ $10\times8\times10=800$
Ans: 800cm³

Ⓑ $12\times12\times12=1728$
Ans: 1728cm³

Ⓒ $15\times15\times20-5\times10\times15=3750$
Ans: 3750cm³

4 Let's recall what we learned about speed.

① Represent the relationship of speed, distance and time in a mathematical sentence. speed = distance ÷ time

② Tom walks at a speed of 4 km/hour.
He started walking to get to a place that is 8 km away.
After 1.5 hours, how many more km does he have to walk to reach his destination? $4\times1.5=6$
$8-6=2$　Ans: 2km

168 ＝☐÷☐÷☐

☐÷☐－☐＝ 169

Lesson Flow

1 Review the previous lesson.

2 ① Review quantities and relationships of Units of Meassurement.

T Introduce the summary unit.

T What are the 2 types of quantities?

S Discrete quantities and continuous quantities.

S ① Identify the appropriate units used to measure quantities.

S ② Solve the problems using the correct units.

3 ② Review calculating the Area of various figures.

S ① Recall and write the formula for calculating area of various figures.

T How can we draw figures with an area of 20 cm²?

S By using formula to determine the lengths of sides, base and heights of the shapes.

S ② Draw 2 different figures with an area of 20 cm².

S ③ Use appropriate formula to calculate the area of shaded parts of figures.

4 ③ Review calculating the Volume of various solids.

TN Ensure that students remember that when calculating the volume of solids/prisms, they should consider calculating the **base area × height**.

S ① Recall and write the formula for calculating the volume of a cube and rectangular prism.

S ② Calculate the volume of the different solids.

5 ④ Review the relationshop of Speed, Distance and Time.

S ① Represent the relationship of speed as **speed = distance ÷ time.**

S ② Read the problem and calculate to solve.

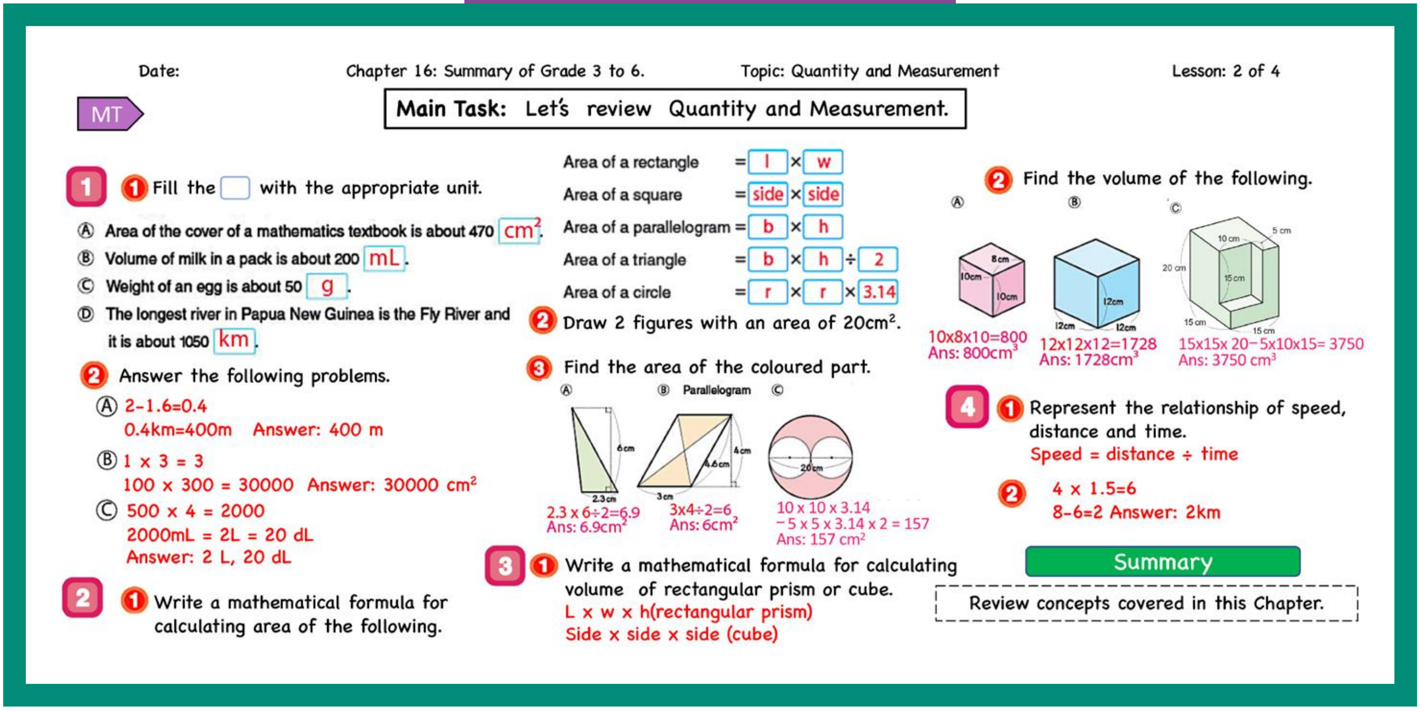
6 Summary

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



Date: Chapter 16: Summary of Grade 3 to 6. Topic: Quantity and Measurement Lesson: 2 of 4

MT

Main Task: Let's review Quantity and Measurement.

1 ① Fill the ☐ with the appropriate unit.

Ⓐ Area of the cover of a mathematics textbook is about 470 cm².
Ⓑ Volume of milk in a pack is about 200 mL.
Ⓒ Weight of an egg is about 50 g.
Ⓓ The longest river in Papua New Guinea is the Fly River and it is about 1050 km.

② Answer the following problems.

Ⓐ 2-1.6=0.4
0.4km=400m Answer: 400 m
Ⓑ 1 x 3 = 3
100 x 300 = 30000 Answer: 30000 cm²
Ⓒ 500 x 4 = 2000
2000mL = 2L = 20 dL
Answer: 2 L, 20 dL

2 ① Write a mathematical formula for calculating area of the following.

Area of a rectangle = l × w
Area of a square = side × side
Area of a parallelogram = b × h
Area of a triangle = b × h ÷ 2
Area of a circle = r × r × 3.14

② Draw 2 figures with an area of 20cm².

③ Find the area of the coloured part.

Ⓐ Ⓑ Parallelogram Ⓒ

2.3 x 6÷2=6.9
Ans: 6.9cm²

3x4÷2=6
Ans: 6cm²

10 x 10 x 3.14
−5 x 5 x 3.14 x 2 = 157
Ans: 157 cm²

3 ① Write a mathematical formula for calculating volume of rectangular prism or cube.
L x w x h(rectangular prism)
Side x side x side (cube)

② Find the volume of the following.

Ⓐ Ⓑ Ⓒ

10x8x10=800
Ans: 800cm³

12x12x12=1728
Ans: 1728cm³

15x15x 20−5x10x15= 3750
Ans: 3750 cm³

4 ① Represent the relationship of speed, distance and time.
Speed = distance ÷ time

② 4 x 1.5=6
8-6=2 Answer: 2km

Summary

Review concepts covered in this Chapter.

Unit
16

Unit: Summary of Grade 3 to 6 Mathematics

Topic 3: Shapes and Figures

Lesson 3 of 4

Textbook Page : 170 and 171
Actual Lesson 127

Unit Objective

- To review and confirm what students learned in Grade 6.

Lesson Objective

- To review and confirm about Figures in Grade 6.

Prior Knowledge

- Figures (Grade 3 - 6)

Preparation

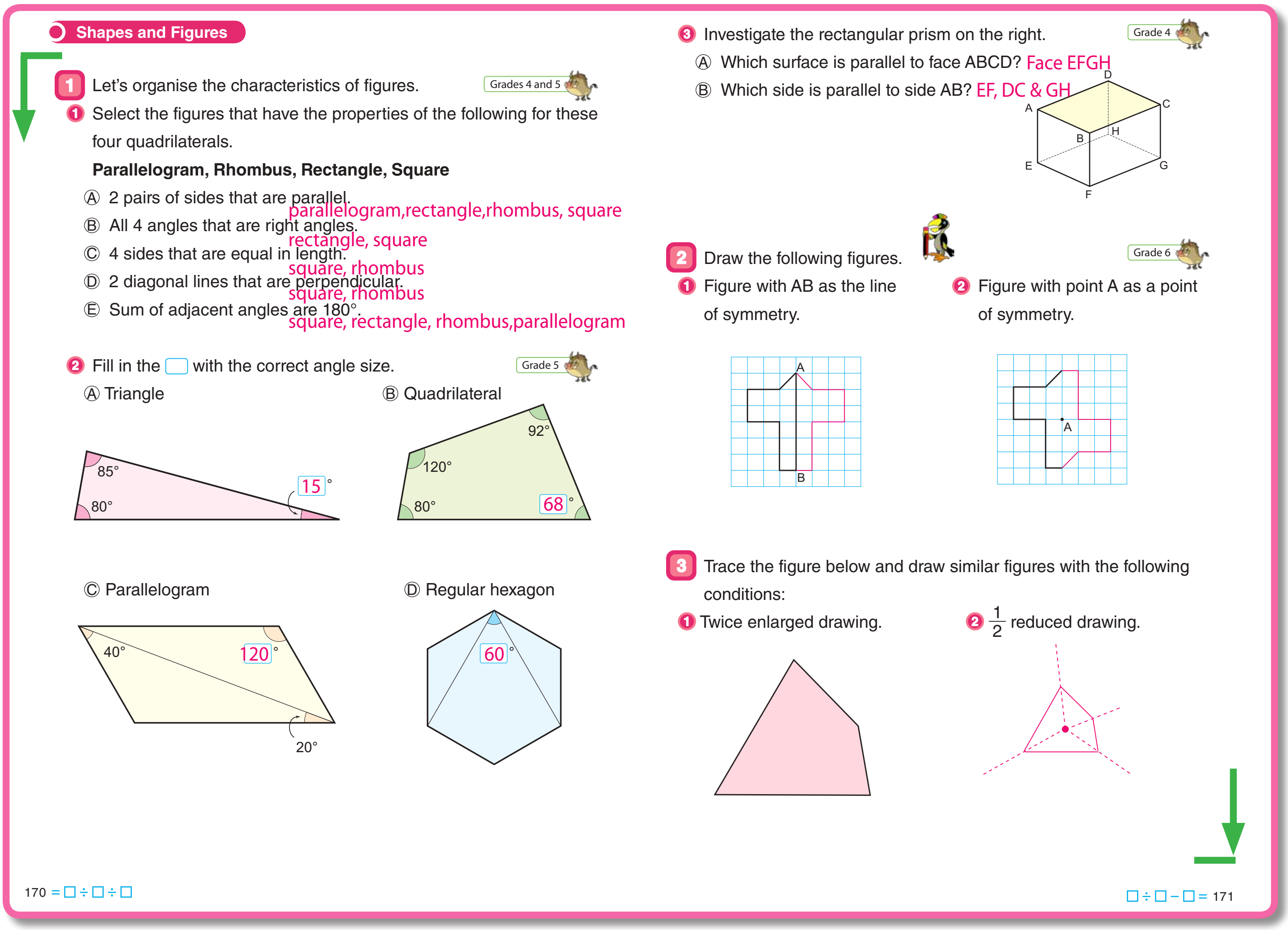
- Revision of Prior Content

Assessment

- Solve the problems remembering what they learned from Grade 3 to 6. F
- Solve the exercise correctly. S

Teacher's Notes

This is a summary lesson of contents learned from Grade 3 to 6.
You are encouraged to be familiar with the contents of this Unit in order to prepare lead up questions that may help students to recall previously learnt contents.



Shapes and Figures

1 Let's organise the characteristics of figures. Grades 4 and 5

① Select the figures that have the properties of the following for these four quadrilaterals.

Parallelogram, Rhombus, Rectangle, Square

Ⓐ 2 pairs of sides that are parallel. parallelogram,rectangle,rhombus, square
Ⓑ All 4 angles that are right angles. rectangle, square
Ⓒ 4 sides that are equal in length. square, rhombus
Ⓓ 2 diagonal lines that are perpendicular. square, rhombus
Ⓔ Sum of adjacent angles are 180°. square, rectangle, rhombus,parallelogram

② Fill in the ☐ with the correct angle size. Grade 5

Ⓐ Triangle
Ⓑ Quadrilateral
Ⓒ Parallelogram
Ⓓ Regular hexagon

③ Investigate the rectangular prism on the right. Grade 4

Ⓐ Which surface is parallel to face ABCD? Face EFGH
Ⓑ Which side is parallel to side AB? EF, DC & GH

2 Draw the following figures. Grade 6

① Figure with AB as the line of symmetry.

② Figure with point A as a point of symmetry.

3 Trace the figure below and draw similar figures with the following conditions:

① Twice enlarged drawing.

② $\frac{1}{2}$ reduced drawing.

170 = ☐ ÷ ☐ ÷ ☐

☐ ÷ ☐ − ☐ = 171

Lesson Flow

1 Review the previous lesson.

2 ① Review the properties of Figures.

T Introduce the summary unit.

T What are some properties of an equilateral triangle.

S All sides equal, all angles equal and angle sum = 1800

S ① Identify figures using the given properties.

S ② Use the properties of each figure to identify the unknown angles.

S ③ Investigate the properties of the rectangular prism.

3 ② Review the properties of Point and Line Symmetry.

TN Students should be able to define or describe point and line symmetry in their own words.

S ① Recall and draw the figure with line symmetry.

S ② Recall and draw the figure with point symmetry.

4 ③ Review the properties of Reduced and enlarged drawings.

S ① Recall and draw a twice enlarged figure of the one given.

S ② Recall and draw a $\frac{1}{2}$ reduced figure of the one given.

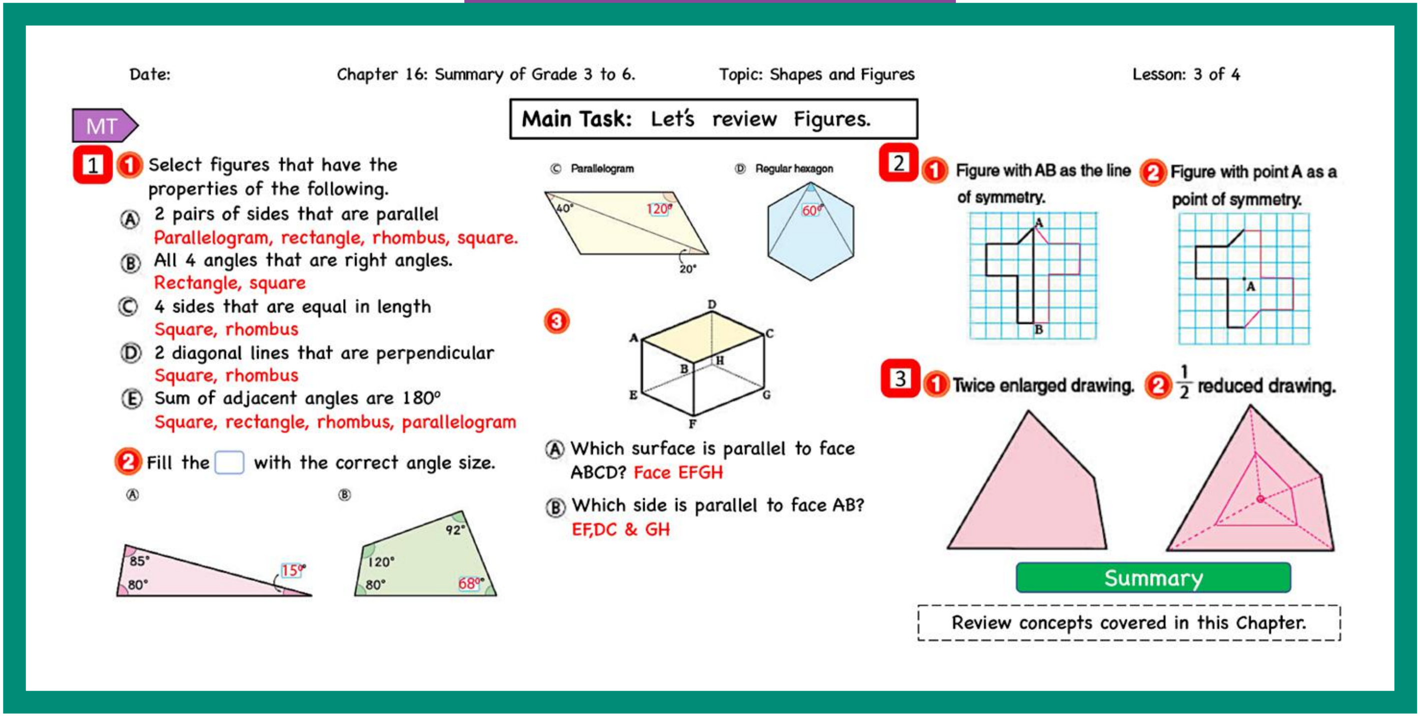
5 Summary

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 16: Summary of Grade 3 to 6. Topic: Shapes and Figures Lesson: 3 of 4

MT

Main Task: Let's review Figures.

1 ① Select figures that have the properties of the following.

Ⓐ 2 pairs of sides that are parallel
Parallelogram, rectangle, rhombus, square.

Ⓑ All 4 angles that are right angles.
Rectangle, square

Ⓒ 4 sides that are equal in length
Square, rhombus

Ⓓ 2 diagonal lines that are perpendicular
Square, rhombus

Ⓔ Sum of adjacent angles are 180°
Square, rectangle, rhombus, parallelogram

② Fill the ☐ with the correct angle size.

③

Ⓐ Which surface is parallel to face ABCD? Face EFGH

Ⓑ Which side is parallel to face AB? EF,DC & GH

2 ① Figure with AB as the line of symmetry. ② Figure with point A as a point of symmetry.

3 ① Twice enlarged drawing. ② $\frac{1}{2}$ reduced drawing.

Summary

Review concepts covered in this Chapter.

Unit 16

Unit: Summary of Grade 3 to 6 Mathematics

Topic 4: Data & Relations

Lesson 4 of 4

Textbook Page : 172 and 173
Actual Lesson 128

Unit Objective

- To review and confirm what students learned in Grade 6.

Lesson Objective

- To review and confirm about Relationship of Numerical Quantities in Grade 6.

Prior Knowledge

- Relationship of Numerical Quantities (Grade 3 - 6)

Preparation

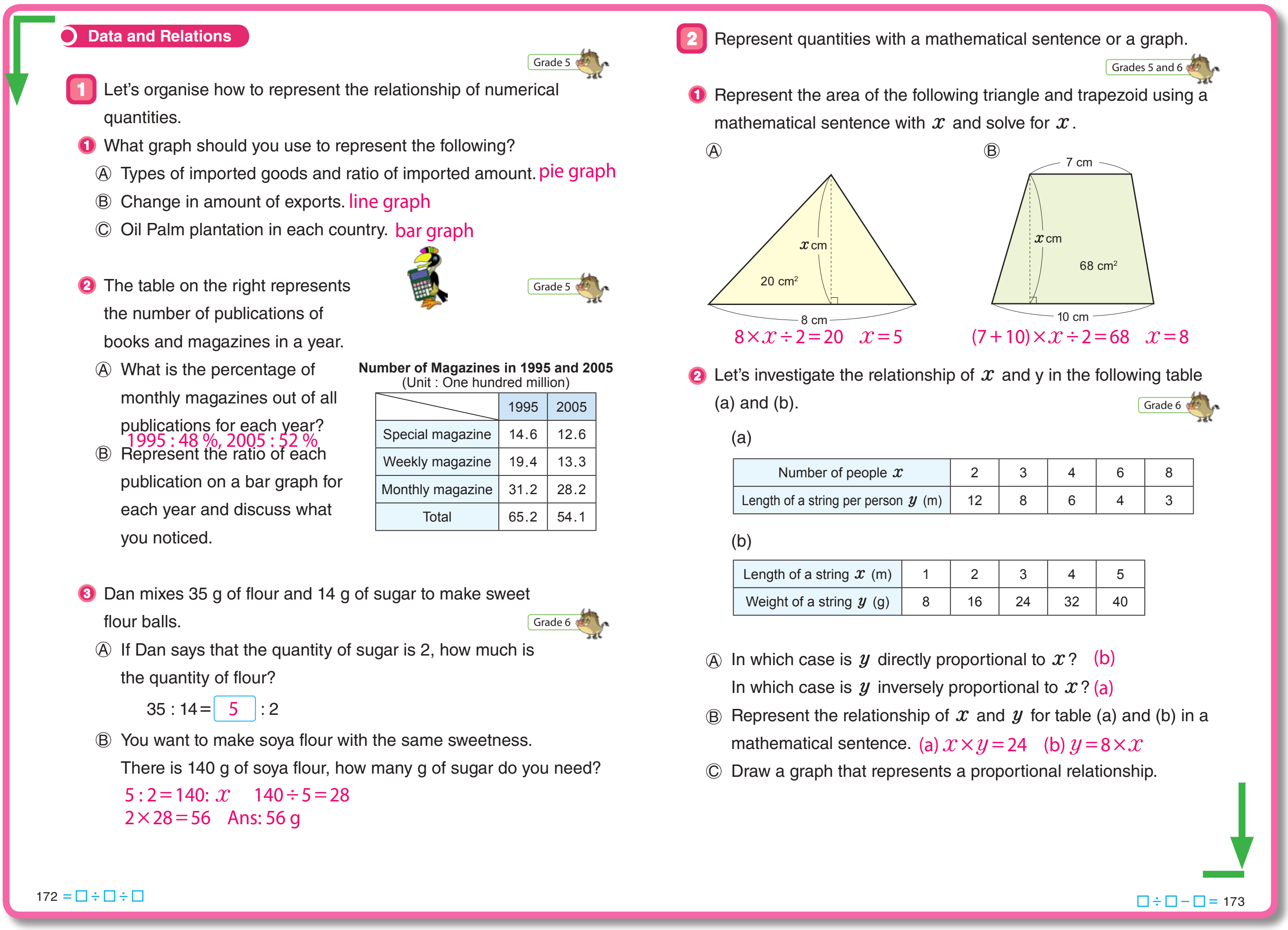
- Revision of Prior Content

Assessment

- Solve the problems remembering what they learned from Grade 3 to 6. **F**
- Solve the exercise correctly. **S**

Teacher's Notes

This is a summary lesson of contents learnt from Grade 3 to 6.
You are encouraged to be familiar with the contents of this Unit in order to prepare lead up questions that may help students to recall previously learnt contents.



Data and Relations

Grade 5

1 Let's organise how to represent the relationship of numerical quantities.

① What graph should you use to represent the following?

Ⓐ Types of imported goods and ratio of imported amount. pie graph

Ⓑ Change in amount of exports. line graph

Ⓒ Oil Palm plantation in each country. bar graph

Grade 5

② The table on the right represents the number of publications of books and magazines in a year.

Ⓐ What is the percentage of monthly magazines out of all publications for each year?

1995 : 48 %, 2005 : 52 %

Ⓑ Represent the ratio of each publication on a bar graph for each year and discuss what you noticed.

Number of Magazines in 1995 and 2005
(Unit : One hundred million)

	1995	2005
Special magazine	14.6	12.6
Weekly magazine	19.4	13.3
Monthly magazine	31.2	28.2
Total	65.2	54.1

③ Dan mixes 35 g of flour and 14 g of sugar to make sweet flour balls.

Grade 6

Ⓐ If Dan says that the quantity of sugar is 2, how much is the quantity of flour?

$35 : 14 = \boxed{5} : 2$

Ⓑ You want to make soya flour with the same sweetness.
There is 140 g of soya flour, how many g of sugar do you need?

$5 : 2 = 140 : x \quad 140 \div 5 = 28$
$2 \times 28 = 56$ Ans: 56 g

2 Represent quantities with a mathematical sentence or a graph.

Grades 5 and 6

① Represent the area of the following triangle and trapezoid using a mathematical sentence with x and solve for x.

Ⓐ $8 \times x \div 2 = 20 \quad x = 5$

Ⓑ $(7 + 10) \times x \div 2 = 68 \quad x = 8$

② Let's investigate the relationship of x and y in the following table (a) and (b).

Grade 6

(a)

Number of people x	2	3	4	6	8
Length of a string per person y (m)	12	8	6	4	3

(b)

Length of a string x (m)	1	2	3	4	5
Weight of a string y (g)	8	16	24	32	40

Ⓐ In which case is y directly proportional to x? (b)
In which case is y inversely proportional to x? (a)

Ⓑ Represent the relationship of x and y for table (a) and (b) in a mathematical sentence. (a) $x \times y = 24$ (b) $y = 8 \times x$

Ⓒ Draw a graph that represents a proportional relationship.

172 $= \square \div \square \div \square$

$\square \div \square - \square =$ 173

Lesson Flow

1 Review the previous lesson.

2 ① Review the relationship of Numerical Quantities.

T Introduce the summary unit.

T What are some ways of organising data?

S Representing them using tally and numerical tables, frequency tables and graphs.

S ① Identify the appropriate graphs that can be used to represent different kinds of data.

S ② Answer questions using information on the table.

S ③ Solve the problem using the relationship of the given ratio.

3 ② Review representing quantities using Mathematical Sentences and graphs.

S ① Represent the area of the figures in a mathematical sentence using x and solve to find the value of x.

S ② Investigate the proportional relationship of x and y in the tables and draw a graph of proportion.

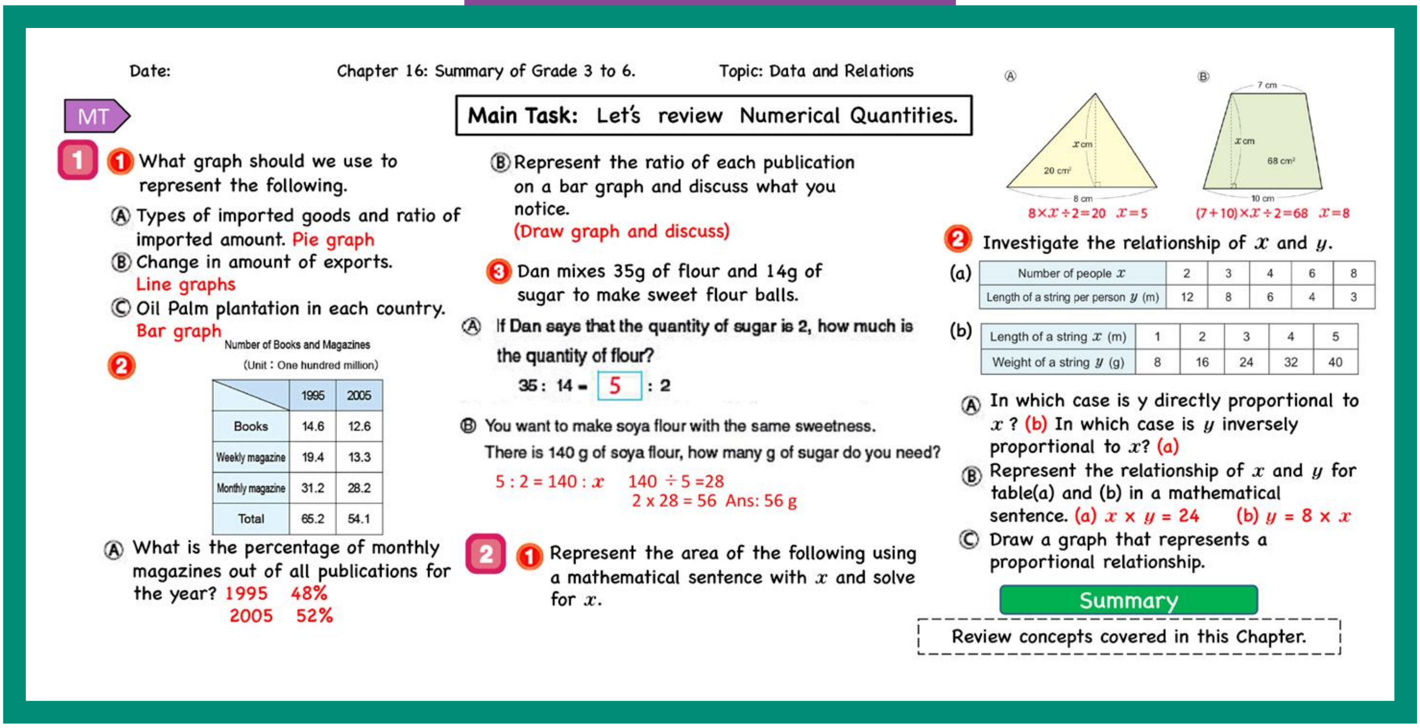
4 Summary

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 16: Summary of Grade 3 to 6. Topic: Data and Relations

MT

Main Task: Let's review Numerical Quantities.

1 ① What graph should we use to represent the following.

Ⓐ Types of imported goods and ratio of imported amount. Pie graph

Ⓑ Change in amount of exports. Line graphs

Ⓒ Oil Palm plantation in each country. Bar graph

②

Number of Books and Magazines

(Unit : One hundred million)

	1995	2005
Books	14.6	12.6
Weekly magazine	19.4	13.3
Monthly magazine	31.2	28.2
Total	65.2	54.1

Ⓐ What is the percentage of monthly magazines out of all publications for the year? 1995 48%
2005 52%

Ⓑ Represent the ratio of each publication on a bar graph and discuss what you notice.
(Draw graph and discuss)

③ Dan mixes 35g of flour and 14g of sugar to make sweet flour balls.

Ⓐ If Dan says that the quantity of sugar is 2, how much is the quantity of flour?

$35 : 14 = \boxed{5} : 2$

Ⓑ You want to make soya flour with the same sweetness.
There is 140 g of soya flour, how many g of sugar do you need?

$5 : 2 = 140 : x$ $140 \div 5 = 28$
$2 \times 28 = 56$ Ans: 56 g

2 ① Represent the area of the following using a mathematical sentence with x and solve for x.

Ⓐ $8 \times x \div 2 = 20$ $x = 5$

Ⓑ $(7 + 10) \times x \div 2 = 68$ $x = 8$

② Investigate the relationship of x and y.

(a)

Number of people x	2	3	4	6	8
Length of a string per person y (m)	12	8	6	4	3

(b)

Length of a string x (m)	1	2	3	4	5
Weight of a string y (g)	8	16	24	32	40

Ⓐ In which case is y directly proportional to x ? (b) In which case is y inversely proportional to x? (a)

Ⓑ Represent the relationship of x and y for table(a) and (b) in a mathematical sentence. (a) $x \times y = 24$ (b) $y = 8 \times x$

Ⓒ Draw a graph that represents a proportional relationship.

Summary

Review concepts covered in this Chapter.

Unit
16

Unit: Summary of Grade 3 to 6 Mathematics

Supplementary Topic: Mathematics Adventure

Textbook Page :
174 to178
Actual Lesson 129

Introduction to Supplementary Topic

Sub-Unit: Mathematics Adventure is a supplementary topic for students to explore mathemaics skills and ideas through stories. Students will travel some places in the world with Prof. Steven and our friends to find beautiful shapes and patterns, endangered animal species, interesting objects and buildings and many more.

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

- To find symmetry shapes around us.
- To investigate symmetry shapes using mirrors.
- To think about maths sentences when the number of squares and figures is x.
- To calculate estimation of areas in place values in 10 000.
- To think about combinations of colouring maps using 4 colours.

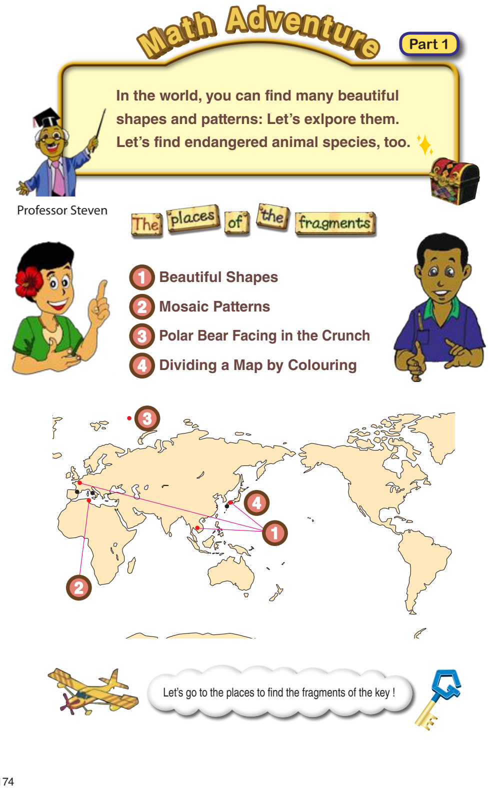
Topic Objectives 2

- To calculate the length of a real spiral bridge.
- To investigate the net of complicated shapes and sketch .
- To investigate the volume of complicated shapes.
- To learn about Roman numbers.
- To learn subtraction of ancient Roman numbers.
- To learn about mathematics and information.
- To learn the system of Morse code.
- To think about the timing of Morse code.

Preparation

- Copy of Japanese map, copy of pieces of puzzle

Matehmatics Adventure has two parts. Part 1 consists of Topic 1 to 4 and Part 2 with Topics 5 to 8. In the adventure, students will visit places like Japan, Tunisia, Europe and the Arctic ocean as indicated in the 2 maps. In each Topic they will apply mathematical skills in real life situations in these interesting places as part of their adventure. (See maps below)



Math Adventure Part 1

In the world, you can find many beautiful shapes and patterns: Let's exlpore them. Let's find endangered animal species, too.

Professor Steven

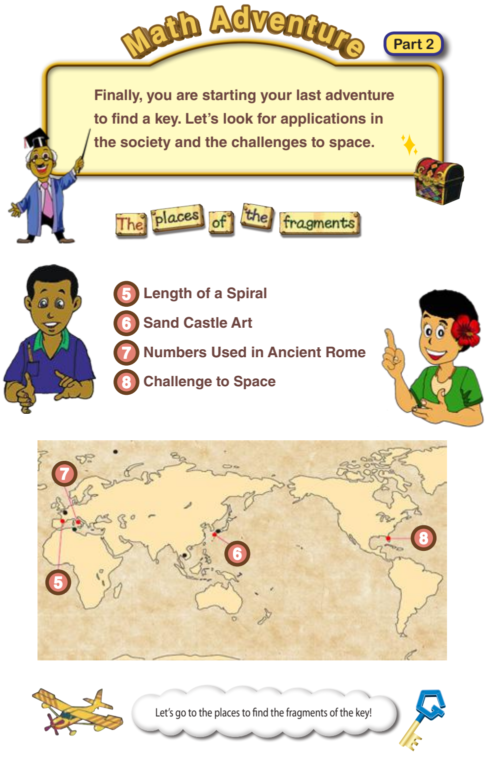
The places of the fragments

① Beautiful Shapes
② Mosaic Patterns
③ Polar Bear Facing in the Crunch
④ Dividing a Map by Colouring

Let's go to the places to find the fragments of the key !

174

At the end of every topic, there are pieces of a puzzle which can 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 pieced together to reveal the key.



Math Adventure Part 2

Finally, you are starting your last adventure to find a key. Let's look for applications in the society and the challenges to space.

The places of the fragments

⑤ Length of a Spiral
⑥ Sand Castle Art
⑦ Numbers Used in Ancient Rome
⑧ Challenge to Space

Let's go to the places to find the fragments of the key!

184

1 Beautiful Shapes

World Heritage Sites include a number of ancient buildings. Most of them have beautiful symmetric structures.
The Palace of Versailles in Paris, Itsukushima Shrine in Japan, Angkor Wat Ruins in Cambodia are some of the examples. Let's find other examples.

The Palace of Versailles

Itsukushima Shrine

Angkor Wat

There are a number of symmetric structures in our surroundings.

The Tokyo Tower and the National Parliament are also symmetric in structure.

The shape of a car is also symmetric from the front view.

A Symmetry-structure is beautiful and stable.

While we are walking in town, we can see buildings with beautiful glasses and the reflection in the glasses is symmetric to the real objects.

Yes, I also saw a picture of Mt. Fuji, which is symmetric Mt. Fuji reflected on the lake, is known as upside-down Fuji.

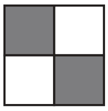
In Nagasaki, there is a bridge called Spectacle Bridge because the Bridge looks like spectacles when its reflected on the surface of the river.

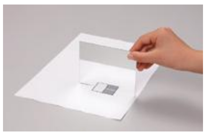
Reflection of Fuji

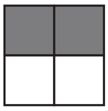
Spectacle Bridge

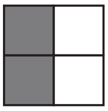
We can see these reflections only when the waters in the lakes and rivers are clear.

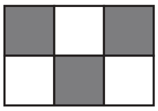
Here, let's identify symmetric shapes which can be created by reflection in a mirror.
Let's explore the position of the mirror where we can create the images of the same shapes for (1) to (4).

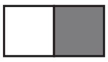




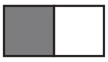
(1)


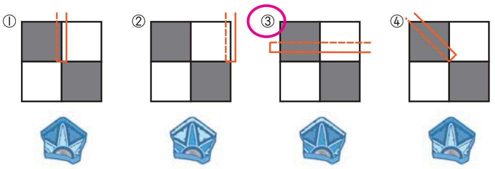
(2)


(3)


(4)


Where should we place the mirror to create the view on the right?
The side represented by - - - is the front side of the mirror.



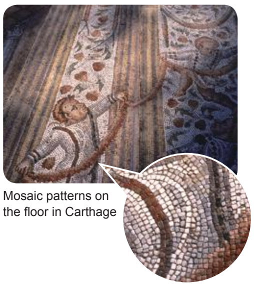


- Let's trace and cut out the fragments on page 198 and paste on the last page.

Let's go to the next place to find the fragments of the key!

2 Mosaic Patterns

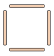
There was a country named Carthage which prospered about 2600 years ago in the Mediterranean Sea.
Beautiful mosaic patterns still remain on the floors and walls there even after the country was conquered by the Roman Empire.

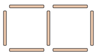

Mosaic patterns on the floor in Carthage

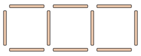
There are a number of small square tiles.

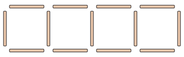
Various paintings were carefully developed by the tiles. How many tiles are necessary for developing them?

If we represent these square tiles by the same size sticks, how many sticks do we need?

If 1 square,  4 sticks.

If 2 squares,  7 sticks.

If 3 squares,  10 sticks.

If 4 squares,  ?

If we increase the number of squares, how many sticks do we need?
How about if the number of square is four?

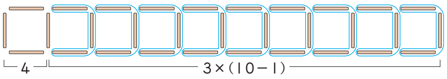
13 sticks.

Have you counted by each?

No, the number of sticks was increasing by 3, so I calculated by adding 3 to the last answer which is 10+3.

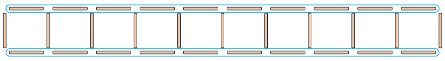
Now, how many sticks do we need for 10 squares?

We started with 4 sticks for 1 square and the number of sticks increased by 3 if the number of squares increased by 1, so we can get an answer by $4+3\times9$. "9" means 9 squares except for the first square. So, we can write $4+3\times(10-1)$, too.

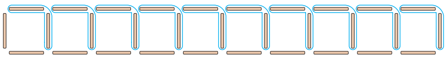


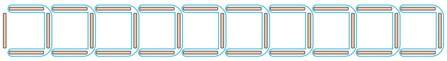
I see. If doing so, we can get the number of sticks by the number of squares at once.If we use symbols, we can represent the number of squares by x and the expression for the number of needed sticks is $4\times3\times(x-1)$.

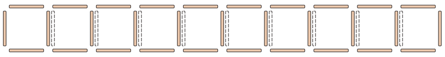
If the number of squares is represented by (x, we can represent the number of needed sticks by $x\times2+(x+1)$, too. We can get it if we use the following figure.

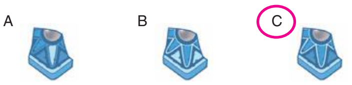


A friend developed the expression $x\times4-(x-1)$. How did he think about it?
In the following, which figure explains his thinking?

A


B


C




- Let's trace and cut out the fragments on page 198 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 3 to 6 Mathematics
Supplementary Topic: Mathematics Adventure

Textbook Page : 168 to 169
Actual Lesson 130 & 131

3 Polar Bear Facing the Crunch

Polar Bears are animals which live in the coast of the Arctic circle.
The average height of the bear is 2.4 m and its weight is about 750 kg.
But, the number has been gradually decreasing and the government of the United States declared them as endangered species in May, 2008. During the announcement they said, "in the Arctic Ocean, the sea ice which is necessary for polar bears moving and catching food has been decreasing in the past decades because of the impact of Global warming.
If the situation is not changed, they face the danger of extinction in about 45 years."

I have seen a polar bear trying to eat a seal.
I have seen a baby polar bear on TV and they were so pretty.

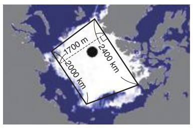
Polar bear (Insert: Its family)

That's right. The main food for polar bears is seals. So, they search places to catch their food, moving on the sea ice.
But the sea ice has been decreasing too.
Furthermore, polar bears do not hibernate and so eat food to save fat during the winter and survive by burning its fat during the summer.
But, the summers are getting longer and longer every year.

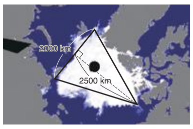
Global warming of the earth has various impacts on the lives of different species.

These are pictures of the sea ice in the Arctic Ocean which were taken from the top view of the North Pole by an artificial satellite.
These pictures were shot in September when there is less amount of the sea ice than any other month.

14/9/2006



23/9/2008



Based on these pictures, the shape of the ice in the picture on the left is a trapezoid and a triangle in the picture on the right.
From these figures, let's find the areas of the ice every year in rounded numbers to the ten thousands place. The earth is a sphere.
The actual area of the ice is bigger than what we can see.

The area of the sea ice in September, 2006

$(2000 + 2400) \times 1700 \div 2$
$= 3740000\ \text{km}^2$

The area of the sea ice in September, 2008

$2000 \times 2500 \div 2$
$= 2500000\ \text{km}^2$

$3740000 - 2500000 = 1240000$ (Difference)
$1240000 \div 3740000 = 0.331$ (Fraction as decimal)

By how many percents did the area of the sea ice in September, 2008 decreased since September, 2006? $124 \div 374 = 0.331 \times 100 = 33\ \%$ (Percentage)

A. about 20 %

B. about 24 %

[✓ C. about 33 %]

D. about 40 %

- Let's trace and cut out the fragments on page 198 and paste it on the last page.

Let's go to the next place to find the fragments of the key!

4 Dividing a Map by Colouring

What are you doing?

We are recording the World Heritage Sites and Japanese towns that are frequently visited by tourists on the blank map.

If we divide the provinces by colours, it will be easy to see.

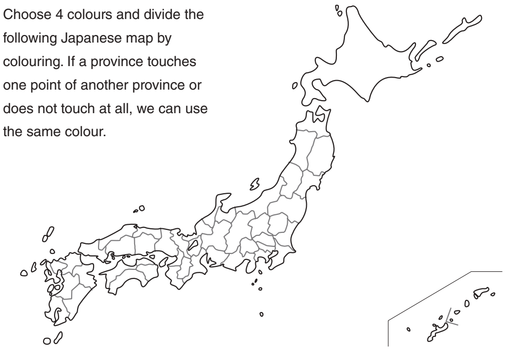
How many coloured pencils do you think is necessary so as not to make adjoined provinces coloured the same?

I am thinking, about 10 colours.

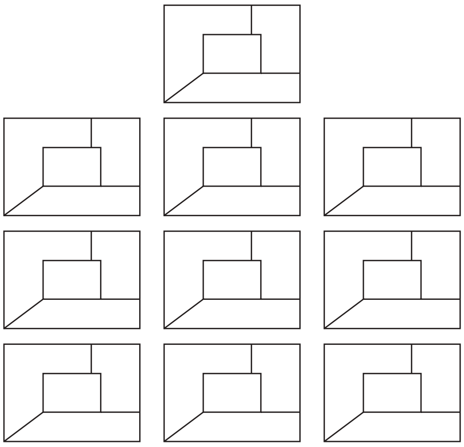
In fact, we can make adjoined provinces on any map painted by different colours if we have 4 colours.

Really?

Choose 4 colours and divide the following Japanese map by colouring. If a province touches one point of another province or does not touch at all, we can use the same colour.



Have you finished? I will give you a problem. If you colour the following figures with the same 4 colours, how many patterns can be made?
Let's try and find out.



If the number of figures on this page is not enough, draw them in your exericse book. How many patterns can you draw?
Compare it with your friends' colouring. $4 \times 3 \times 2 \times 1 = 24$

(1) 6 patterns

(2) 10 patterns

(3) 16 patterns

[✓ (4) 24 patterns]

- Let's trace and cut out the fragments on page 198 and paste it on the last page and make the key complete.

5 Length of a Spiral

There is a bridge in Spain that is quite interesting. It is called the Vizcaya Bridge and was declared a World Heritage Site in 2006.

Vizcaya Bridge

The bridge hangs gondolas.

Why would they need to make a bridge for gondolas?

The height of this bridge is 50 m. There are a lot of vessels below this bridge and they are used for the industries around this district. Therefore it is necessary to make the bridge girder high.
Another reason is that there are already many buildings built by the river and there is not enough space to build a road up to this height.

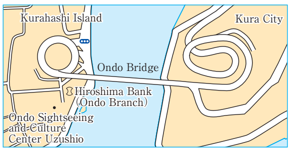
I see.

There is a similar bridge like this in Japan.

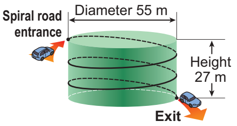
Where is it?

It is the Ondo Bridge in Hiroshima. It connects Kura City on the mainland to Kurahashi Island. This bridge is also built in a place where there are a lot of ships, so people call this place “Ginza in Ondo.” Therefore it is necessary to make the bridge girder high. On the Mainland side, it is elevated but on the Kurahashi Island side it is as low as the sea level. There is not enough land to make a long road on the Kurahashi Island side. Consequently, people built a spiral shaped road, so they can go right underneath the bridge.

Ondo Bridge



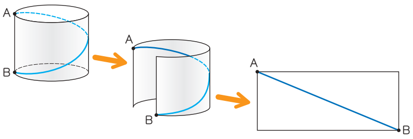
When you draw a spiral road using a cylinder, it will look like the picture on the right. The diameter of the bottom face is 55 m and the height is 27 m.



People go around the cylinder 2 and a half times.

The question is how long is the length of this spiral road.

We can find it using an extended elevation.
For example, a spiral from point A, which is on the top of the top face, to point B, placed directly below point A, is a diagonal line of the rectangle on an extended elevation.



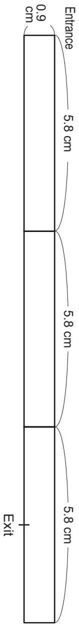
But it is 2 and a half rounds for this problem.

$14.5 \times 3000 = 43500$

$43500\ \text{cm} = 435\ \text{m}$

We can line up 3 side faces.

It will look like the picture on the right if you draw it in $\frac{1}{3000}$ reduced drawing.



How long in metres is the length of the spiral road at Ondo Bridge?

(1) About 300 m

(2) About 335 m

(3) About 400 m

[✓ (4) About 435 m]

- Let’s trace and cut out a key fragment on page 199 and paste on the last page.

Let’s go to the next place to find the fragments of the key!

6 Sand Castle Art

One of the three major sand hills in Japan, is Fukiage Beach in Minami-Satsuma City, Kagoshima Prefecture.
There is an event called Sand Festival every year and people make famous buildings or persons around the world including Japan using sand. In 2008, they built the Westminster Cathedral in England, the Palace of Versailles and the Notre Dame de Paris in France.

How is the Notre Dame de Paris built?

①

②

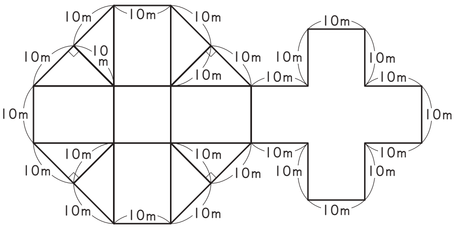
③

④

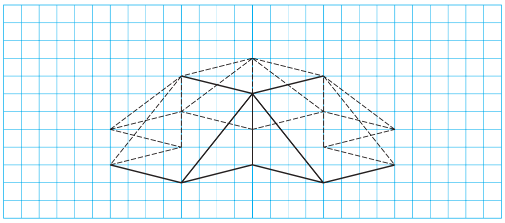
⑤

They harden the sand first and then it is dug out.

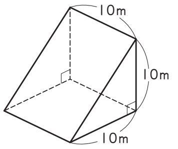
That’s right. They first build a rough approximation on a board, put sand in it and harden it. Then, they remove the board one by one and build it high.
Now, it is time for a question. If you make a base, which looks like the shape of the built structure in this picture, how much is the volume in m³?



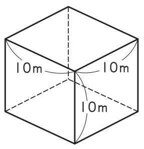
First, complete the blueprint below. Leave the part where you cannot see with a dotted line and connect the line of the part where you can see.
Build the figure on the previous page into a structure.



This shape is made with 4 parts of triangular prisms and 1 cube, which are shown below.



$10 \times 10 \div 2 \times 10 = 500$



$10 \times 10 \times 10 = 1000$

Calculate the volume of this solid and tell your friend how you calculated.

Total Volume $2000 + 1000 = 3000\ \text{m}^3$

(1) 2500 m³

[✓ (2) 3000 m³]

(3) 3500 m³

(4) 4000 m³

- Let’s trace and cut out a key fragment on page 199 and paste on the last page.

Let’s go to the next place to find the fragments of the key!

7 Numbers Used in Ancient Rome

Out of the many world heritage sites with high historical value, Lyon and Rome in Italy are the places where many heritage of the Roman Emperor are found.

Historic District in Rome

Historic District in Lyon

Do you know how numbers are represented in ancient Rome?

I don't know. How are they represented?

The 2 pictures below show numbers used in ancient Rome, called Roman numerals. These numbers are still used today.

What are these numbers used for?

Milestone in ancient Rome

Clock

Have you ever seen symbols like I, II, III, IV, V, VI, VII, VIII, IX, X, XI and XII on a watch dial? These symbols represent; 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12.
Another example is shown at the end of a movie.
Example: Copyrights MCMLXXXVIII
Do you understand what they represent?

First VIII seems like it represents 8, when you look at the clock face. Probably X represents 10. But I don't really understand the rule.

I understand. Roman numerals correspond to numbers like below.

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

They write a bigger number from the left and the sum of all digits is the number that this Roman numeral represents.

However, the left symbol is smaller for IV.

When a smaller number is written on the left side of a bigger number, you subtract the number written before from the number written after.
For example, in IV you subtract 1 from 5, which represents 4.
You can also write it like IIII.

Then, for CM you subtract 100 from 1000, which means 900.

I got it. When you think it as M CM LXXX VIII, it means
1000 + 900 + 80 + 8 = 1988.

The way of representing numbers adopts an idea of positional notation.
Here is an exercise. Calculate the mathematical sentence written in Roman numerals below and also write the answer in Roman Numerals.

MCMLXXXVII + MCMXCIX
1000 + 900 + 80 + 7 + 1000 + 900 + 90 + 9 = 3986

(1) M M D C C C L X X VII
(2) M M M D C C C L X X X VII
[✓ (3)] M M M C M L X X X VI
3986
(4) M M C M L X X X VII

• Let's trace and cut out a key fragment on page 199 and paste on the last page.

Let's go to the next place to find the fragments of the key!

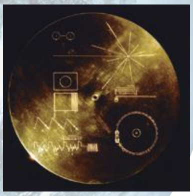
8 Challenge to Space

The view of the earth from space

Let's look back on this adventure. We started our journey from where we are to an exciting adventure that brought us all around the world.

Mathematics has power to answer gloomy questions. We learned about the earth and now I want to know about space.

When you look out into space, there might be several planets where intelligent life forms live like on the earth.
The Voyager space probe, launched in 1977 from America, carried a record to show the existence of life forms and cultures on the earth. It has 115 photos and the "Sounds of Earth", that includes the sounds of waves, winds, thunders and noises of birds and animals. In addition, it even contains world music and 55 languages. It included performances of the Japanese bamboo flute for world music and the Japanese language.


Record in Voyager

It was a message for other celestial life forms, to let them know about the nature and civilization of the earth. It will be wonderful if somebody out there finds them.

There is an interesting sound in one message. It is called the Morse code, which is represented with dots and dashes.
Morse invented the electrical telegraph system in the 19th century.
It is not used much today, but it is useful under noisy situations because it is represented with 2 simple sounds.

Morse Code

A	•–	G	––•	M	––	S	•••	W	•––
B	–•••	H	••••	N	–•	T	–	X	–••–
C	–•–•	I	••	O	–––	U	••–	Y	–•––
D	–••	J	•–––	P	•––•	V	•••–	Y	––••
E	•	K	–•–	Q	––•–				
F	••–•	L	•–••	R	•–•				

Rules for the Morse Code

(1) A dash is equal to 3 dots.
(2) The space between parts of the same letter is equal to one dot.
(3) The space between two letters is equal to three dots.
(4) The space between two words is equal to seven dots.

When you send a word below using Morse code, how long is the length of the Morse code? Count it with the number of dots.

––	–•	–	••••	•••
M	A	T	H	S

U is "••–". There will be a dot between "•" and "•" and "•" and "–".
A dash equals to 3 dots, so it will be 7 dots.
The space between two letters is equal to 3 dots. Therefore, the number of dots will be like below.

M A T H S
7 3 5 3 3 3 7 3 5

The word that was included to the records of the Voyager space probe using Morse code is,

"ad astra per aspera"

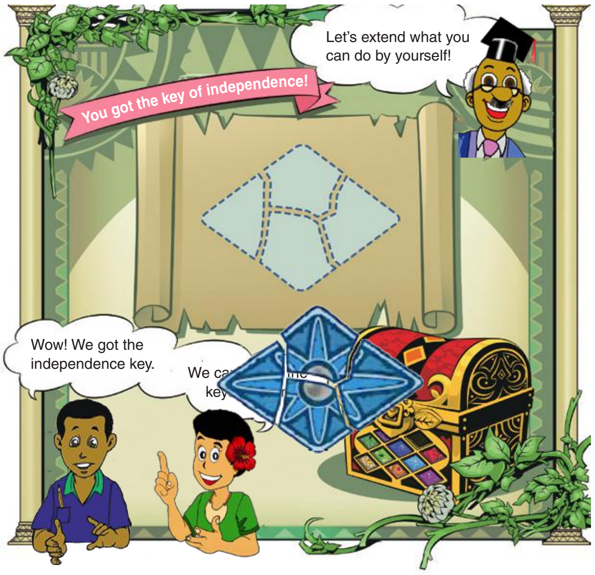
which means "Through hardships to the stars" in Latin. When you write this word with Morse code, it will look like below.
If you state 1 dot is $\frac{1}{3}$ second, how long is the length of the word in seconds?
Read the rules and find out.

•–	–••	•–	•••	–	•–•	•–	•––•	•	•–•
a	d	a	s	t	r	a	p	e	r

•–	•••	•––•	•	•–•	•–
a	s	p	e	r	a

(1) 36 seconds (2) 39 seconds (3) 46 seconds [✓ (4)] 49 seconds

• Let's trace and cut out a key fragment on page 199, paste on the last page and complete the key.


Let's extend what you can do by yourself!
You got the key of independence!
Wow! We got the independence key.

Parliament House of Papua New Guinea

The current Parliament building was officially opened by His Royal Highness, Prince Charles, on 8th August 1984. We can find many symmetrical design in this significant building. There are 4 parts of the building, each part of the building represents the 4 region's symbols. Entrance style of a Maprik Haus Tambaran (house of spirits from East Sepik Province) is a representation of Momase region. Circular cafeteria as Highlands design principles and a mosaic features unmistakably PNG motifs. Can you notice any symmetrical figures from the inserted pictures of the Parliament House?

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At the end of the Adventure Part 1, there will be 4 blue pieces of the puzzle that should be collected after answering the given questions correctly. Each puzzle piece when combined together will reveal the key of Independence. Having these keys means that the students can utilise the necessary knowledge and skills learned to move onto Adventure Part 2.

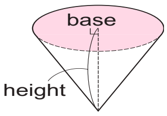
Examples of symmetry;

- The image of the parliament house and its refelection are symmetric.
- The front view of the parliament house shows that half of one side of the building and its steps is symmetrical to the other half.
- The carving of the bird of paradise is symmetrical when a line of symmetry is drawn down the centre.
- The two sides of the doors and its designs are symmetrical as well.

Congratulations! You got a wonderful treasure called the future.
You found a key of hope!
We got a key of hope. We have all the keys now.

Mining pots in Papua New Guinea

Since 1970, the mining industry has dominated PNG's economy. Mineral exports are gold, copper, silver, nickel and cobalt. PNG mines are spread across the country, the largest of which include: Ok Tedi Copper and Gold Mine, Porgera Gold Mine, Lihir Gold Mine, Hidden Valley Gold Mine, Simberi Gold Mine, Tolukuma Gold Mine and Ramu Nickel Mine. The Porgera Gold Mine is a large gold and silver mining operation in Enga province, Papua New Guinea. The open pit mine moves about 160 000 tonnes of rock material.



The mining pit is a like cylinder shape as shown in the picture. The blast left a crater of 400 metres wide and 150 metres deep. Estimate the volume of the rock and soil that were removed using the method of calculation learned in this grade.

193

At the end of the Adventure Part 2, there will be 4 yellow pieces of the puzzle that should be collected after answering the given questions correctly.

Each puzzle piece when combined together will reveal the key of Hope and marks the successfull completion of this grade. Having these keys means that the students can utilise the necessary knowledge and skills learned to advance on to the next grade level and apply these skills to solve problems in their daily lives.

Amount of soil removed

$$\begin{aligned}\text{Volume of cone} &= \frac{1}{3}\times \text{base}\times \text{height}\\ &= \frac{1}{3}\times (200\times 200\times 3.14)\times 150\\ &= \frac{1}{3}\times 125600\times 150\\ &= \frac{1}{3}\times 18\,840\,000\\ &= 6\,280\,000 \quad \text{Answer: } 6\,280\,000\ \text{m}^3\end{aligned}$$

Let’s have fun 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. There are three (3) games, materials and answers introduced from page 265 to 279. 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 and the third game is Sudoku as a mathematics puzzle.

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:

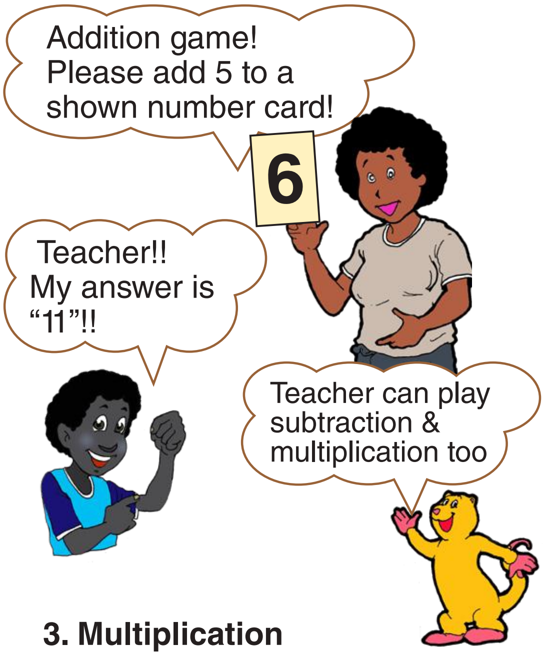
Teacher: “Please subtract the number shown on the card from 15”.

Teacher: Show a number card (8).

Students: “7”

Teacher: Show a number card (6).

Students: “9”


Addition game!
Please add 5 to a shown number card!
6
Teacher!! My answer is “11”!!
Teacher can play subtraction & multiplication too

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 cards sample, 0 - 9

0	1
2	3

4

5

6

7

8	**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.

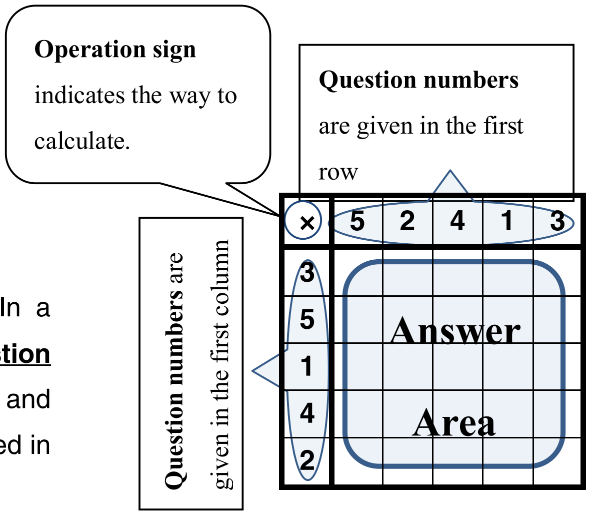
Objectives of Square Calculation

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.


Operation sign indicates the way to calculate.
Question numbers are given in the first row
Question numbers are given in the first column
×
5
2
4
1
3
3
5
1
4
2
Answer Area

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;

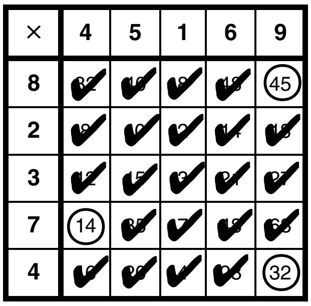
1. mark their friend's answers by putting ✓ on a correct answer or ○ on a wrong answer and a blank square.
2. write their score on the activity sheet.

(C) During recording

Teacher should;

1. collect their activity sheets.
2. record children's score into recording sheet at least once a week.

Time 0:47 Score 22/25

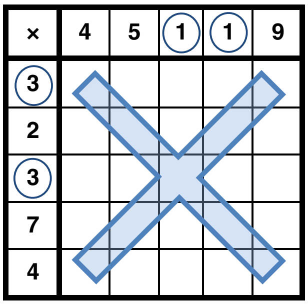


×	4	5	1	6	9
8	✓	✓	✓	✓	45
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
7	14	✓	✓	✓	✓
4	✓	✓	✓	✓	32

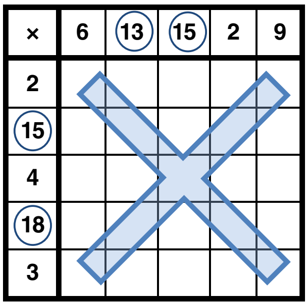
Example of correction

Note: **Bad examples** when the teacher writes question numbers on the blackboard

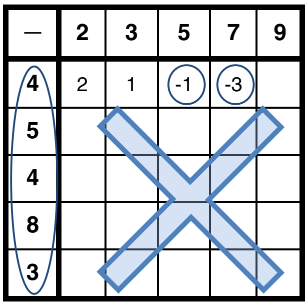
Don't use same numbers in the first column or row.



Don't Use numbers over 10 in the first column or row in addition or multiplication.

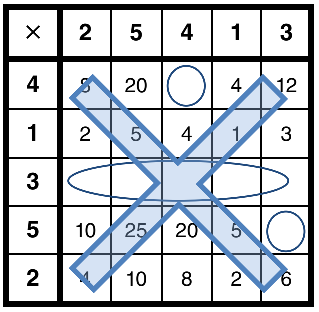


Don't Use numbers from 1 to 10 in the first column in Subtraction.



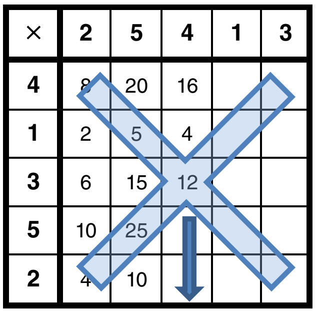
Note: **Bad examples** when students write answers on their activity sheets.

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**.

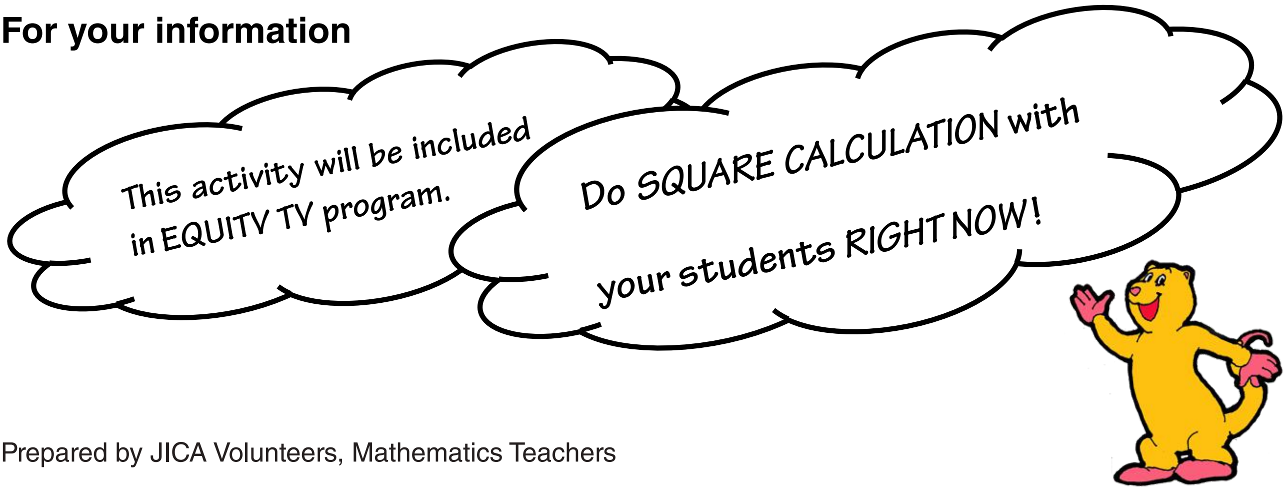
Sample teaching plan for Grade 3

	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


This activity will be included in EQUITV TV program.
Do SQUARE CALCULATION with your students RIGHT NOW!

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: ______________
Class: ______ Date: ______/______
Time: _____:______ Score: ______/

Name: ______________
Class: ______ Date: ______/______
Time: _____:______ Score: ______/

Name: ______________
Class: ______ Date: ______/______
Time: _____:______ Score: ______/

Name: ______________
Class: ______ Date: ______/______
Time: _____:______ Score: ______/

Name: ______________
Class: ______ Date: ______/______
Time: _____:______ Score: ______/

Name: ______________
Class: ______ Date: ______/______
Time: _____:______ Score: ______/

SQUARE CALCULATION SHEETS（Answer area: 7×7）

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

Name:
Class: Date: /
Time: : Score: /

SQUARE CALCULATION SHEETS（Answer area: 10×10）

Name: ____________________ Class:_____

Date:____/_____ Time: ____:______ Score: _____/1

Name: ____________________ Class:_____

Date:____/_____ Time: ____:______ Score: _____/1

Name: ____________________ Class:_____

Date:____/_____ Time: ____:______ Score: _____/1

Name: ____________________ Class:_____

Date:____/_____ Time: ____:______ Score: _____/1

Name: ____________________ Class:_____

Date:____/_____ Time: ____:______ Score: _____/1

Name: ____________________ Class:_____

Date:____/_____ Time: ____:______ Score: _____/1

SQUARE CALCULTATION SCORE SHEET

Year		Term	
Class		Teacher	

SIZE	
Operation sign	
TIME LIMIT	

				Week __		Week __		Week __		Week __		Week __	
No.	First Name	Last Name	Gender	Score	Time	Score	Time	Score	Time	Score	Time	Score	Time
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													

Math game 3

Let’s play SUDOKU!

What is Sudoku

Sudoku is a mathematics puzzled game much like a crossword puzzle designed for a single player. Each little square or cells are partly filled or left incomplete to be filled in which contains a single solution. The objective is to fill a 9 x 9 grid so that each column, each row and each of the nine 3 x 3 region use numbers from 1 to 9.

5				1				4
2	7	4				6		
	8		9		4			
8	1		4	6		3		2
		2		3		1		
7		6		9	1		5	8
			5		3		1	
		5				9	2	7
1				2				3

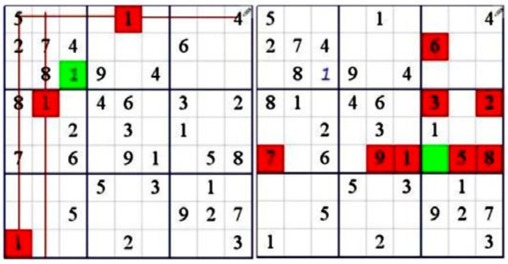
How to Play Sudoku

Step 1: Scanning

The easier way to find missing numbers is scanning.

1) Cross-hatching: Scan to find a specific number given in a region, eg; Shaded green

2) Counting: In counting you simply count all the different numbers that is in a row, column and region that connects to one cell. If there is just one number missing then that is what should be in the cell.

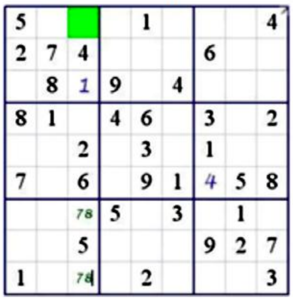

Step 1: Scanning

5				1				4
2	7	4				6		
	8	1	9		4			
8	1		4	6		3		2
		2		3		1		
7		6		9	1		5	8
			5		3		1	
		5				9	2	7
1				2				3

5				1				4
2	7	4				6		
	8	1	9		4			
8	1		4	6		3		2
		2		3		1		
7		6		9	1	🟩	5	8
			5		3		1	
		5				9	2	7
1				2				3

Step 2: The Analysis

This method is the matched pair method. It applies when a pair of numbers are the only possible answer to two cells. After scanning you will notice possibilities of the position of two numbers to place in two cells. In this example notice 7 and 8, they can be placed at the bottom regions.


Step 2: Analysis

5		🟩		1				4
2	7	4				6		
	8	1	9		4			
8	1		4	6		3		2
		2		3		1		
7		6		9	1	4	5	8
		78	5		3		1	
		5				9	2	7
1		78		2				3

Step 3: Analysis (Certainty from uncertainty)

To derive certainty from uncertainty, like step 2 but this time consider the possibility of number that appear at one place at one time and place in the number. For instance, 7 can be placed in the middle right region.

Step 4: Complete the cells

Complete the cells and remember not to repeat the same number in a column, row or region.

Let’s play Sudoku!!

Source: Sudoku, Solving It for Beginners and the Experienced, https://www.instructables.com

Let’s try these Sudoku, Challenge for Early Beginners

No.1

1	7	4			8	6		5
6	3					2		
	8		1	9		7	3	
			8					
5				1		8		
	6	3			9	1	4	
		1	3	8				9
		8				4	2	
				5			1	

No.2

6		3	5					7
			7				9	8
7								
		1				8	2	
2	4				1	7		
8	5			2				6
			6		5		3	
1	8		4		2	5		
5					9			

No.3

			1	9				
4	9		7					1
8	1	3					9	
6	2	7	4	8				
9			2			8		
				6				5
				2	3			
3	5	1		4			2	6
	8		9			5		

No.4

4				8		1	6	7
			6		3		8	2
	2	8				9	5	3
1						8	7	
								1
	7			2	4	5	3	
		5	3	6	1		4	
3						6		8
	9		2		8		1	

No.5

1		4	8					5
3								9
	8					6		
4		6	7	9		8	5	
5	2		4	6	8			
7	9	8	5		3			
		1	9	4	5	2		8
	7			8			4	
			3		1			

No.6

		2			4			
	4		6			7	8	9
	9		8			1		4
2	5		4				3	8
			2	9	1	4	7	
			3					
1	8			2				3
9		3						
		7	1					

Answers for Challenge for Early Beginners

No.1

1	7	4	2	3	8	6	9	5
6	3	9	7	4	5	2	8	1
2	8	5	1	9	6	7	3	4
4	1	7	8	2	3	9	5	6
5	9	2	6	1	4	8	7	3
8	6	3	5	7	9	1	4	2
7	4	1	3	8	2	5	6	9
3	5	8	9	6	1	4	2	7
9	2	6	4	5	7	3	1	8

No.2

6	1	3	5	9	8	2	4	7
4	2	5	7	1	6	3	9	8
7	9	8	2	4	3	1	6	5
3	6	1	9	5	7	8	2	4
2	4	9	8	6	1	7	5	3
8	5	7	3	2	4	9	1	6
9	7	2	6	8	5	4	3	1
1	8	6	4	3	2	5	7	9
5	3	4	1	7	9	6	8	2

No.3

5	7	6	1	9	2	4	8	3
4	9	2	7	3	8	6	5	1
8	1	3	6	5	4	7	9	2
6	2	7	4	8	5	3	1	9
9	3	5	2	7	1	8	6	4
1	4	8	3	6	9	2	7	5
7	6	9	5	2	3	1	4	8
3	5	1	8	4	7	9	2	6
2	8	4	9	1	6	5	3	7

No.4

4	5	3	9	8	2	1	6	7
9	1	7	6	5	3	4	8	2
6	2	8	4	1	7	9	5	3
1	6	2	5	3	9	8	7	4
5	3	4	8	7	6	2	9	1
8	7	9	1	2	4	5	3	6
2	8	5	3	6	1	7	4	9
3	4	1	7	9	5	6	2	8
7	9	6	2	4	8	3	1	5

No.5

1	6	4	8	3	9	7	2	5
3	5	7	6	2	4	1	8	9
2	8	9	1	5	7	6	3	4
4	1	6	7	9	2	8	5	3
5	2	3	4	6	8	9	1	7
7	9	8	5	1	3	4	6	2
6	3	1	9	4	5	2	7	8
9	7	5	2	8	6	3	4	1
8	4	2	3	7	1	5	9	6

No.6

8	1	2	9	7	4	3	5	6
3	4	5	6	1	2	7	8	9
7	9	6	8	5	3	1	2	4
2	5	1	4	6	7	9	3	8
6	3	8	2	9	1	4	7	5
4	7	9	3	8	5	2	6	1
1	8	4	7	2	6	5	9	3
9	2	3	5	4	8	6	1	7
5	6	7	1	3	9	8	4	2

Let’s try these Sudoku, Challenge for Beginners

No.1

			2			1		
1	4	5		9				
	6		8					5
			4					
4		1	6		2			
		2	1	8			3	9
	2					6		7
					8		5	
			5				2	3

No.2

		4	8	3				
				4	6	8		
	8	3				9		
		5			8			3
	1	7	5					8
	2	8		1		5	9	4
		9			3			1
	5							
8		6	2			4		

No.3

		5		8		7		
				2		4		
4	1			9	7	3		5
				3	8	5	6	
6								
				6			7	2
	6					2		4
2	4				1		8	

No.4

1				9				
				7			3	
			2		6	1	4	
3	8							
2			9	5	3		1	
							5	
6	1			2				8
			6					5
9				8		6		

No.5

1				9				
				7			3	
			2		6	1	4	
3	8							
2			9	5	3		1	
							5	
6	1			2				8
			6					5
9				8		6		

No.6

	1		2		5		6	
	6	7		9				
2		9	4					
						9		
				1				5
	5				6	2	1	
1		4	5					
	9							
6	3						7	1

Answer for Challenge for Beginners

No.1

8	3	9	2	7	5	1	4	6
1	4	5	3	9	6	7	8	2
2	6	7	8	1	4	3	9	5
7	8	3	4	5	9	2	6	1
4	9	1	6	3	2	5	7	8
6	5	2	1	8	7	4	3	9
5	2	8	9	4	3	6	1	7
3	1	6	7	2	8	9	5	4
9	7	4	5	6	1	8	2	3

No.2

9	6	4	8	3	5	1	2	7
1	7	2	9	4	6	8	3	5
5	8	3	1	7	2	9	4	6
4	9	5	6	2	8	7	1	3
3	1	7	5	9	4	2	6	8
6	2	8	3	1	7	5	9	4
2	4	9	7	8	3	6	5	1
7	5	1	4	6	9	3	8	2
8	3	6	2	5	1	4	7	9

No.3

3	2	5	1	8	4	7	9	6
7	9	6	3	2	5	4	1	8
4	1	8	6	9	7	3	2	5
1	7	2	4	3	8	5	6	9
6	5	9	7	1	2	8	4	3
8	3	4	5	6	9	1	7	2
9	6	1	8	7	3	2	5	4
2	4	3	9	5	1	6	8	7
5	8	7	2	4	6	9	3	1

No.4

1	3	2	4	9	5	7	8	6
4	6	9	1	7	8	5	3	2
5	7	8	2	3	6	1	4	9
3	8	5	7	1	2	9	6	4
2	4	6	9	5	3	8	1	7
7	9	1	8	6	4	2	5	3
6	1	3	5	2	9	4	7	8
8	2	7	6	4	1	3	9	5
9	5	4	3	8	7	6	2	1

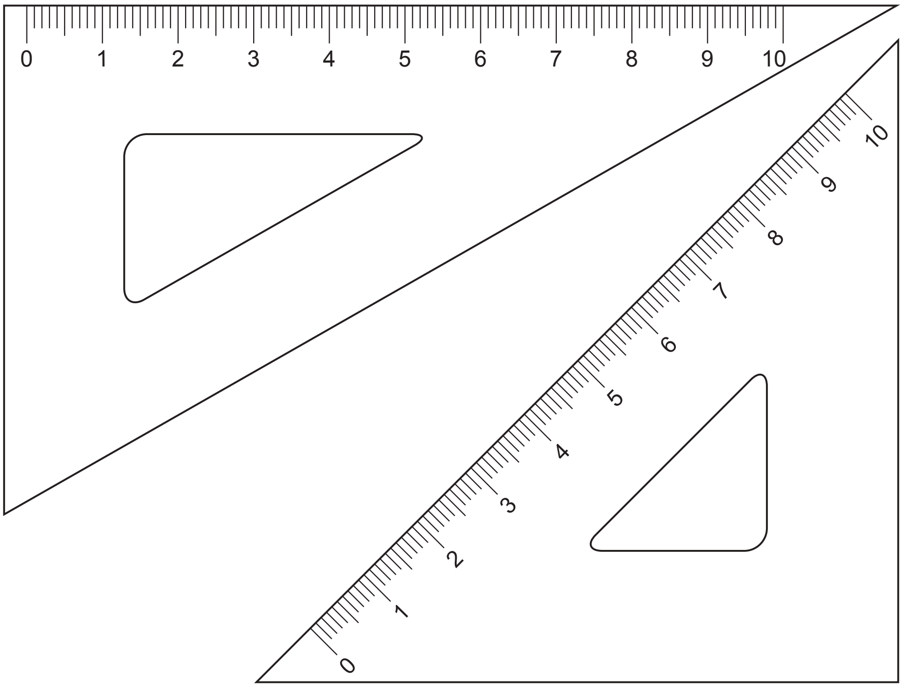
No.5

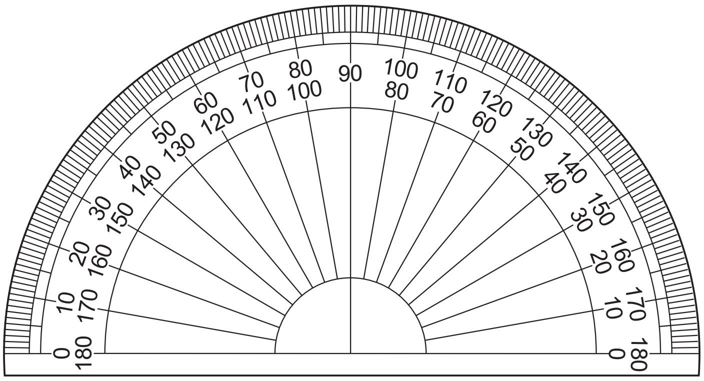
7	1	4	8	3	9	6	5	2
6	2	9	1	5	4	7	3	8
5	8	3	2	6	7	1	4	9
4	3	1	9	7	2	5	8	6
8	6	7	4	1	5	2	9	3
2	9	5	6	8	3	4	1	7
3	5	2	7	9	1	8	6	4
1	4	6	3	2	8	9	7	5
9	7	8	5	4	6	3	2	1

No.6

4	1	3	2	8	5	7	6	9
5	6	7	1	9	3	4	2	8
2	8	9	4	6	7	1	5	3
3	4	1	7	5	2	9	8	6
7	2	6	8	1	9	3	4	5
9	5	8	3	4	6	2	1	7
1	7	4	5	3	8	6	9	2
8	9	2	6	7	1	5	3	4
6	3	5	9	2	4	8	7	1

Triangle rulers and protractor





5mm^2 grid

1cm^2 grid

1cm^2 grid

1cm^2 dotted grid

1cm^2 dotted grid

Structure of learning contents in Mathematics from Elementary Prep to Grade 8

Number and Operation

Elementary Prep – Elementary 2	Grade 3 – Grade 4	Grade 5 – Grade 6	Grade 7 – Grade 8
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	**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 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 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)
Elementary 1 • Natural numbers up to 1000 • Simple fractions • Additions and subtractions of 2-digit numbers • Additions and subtractions of simple 3-digit numbers	**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 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 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
Elementary 2 • Natural numbers up to 10000 • Meaning of multiplication • Multiplication table • Multiplication of simple 2-digit numbers			

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	Grade 3 – Grade 4	Grade 5 – Grade 6	Grade 7 – Grade 8
Elementary Prep • Observing and composing the shapes of planer figures and solid figures	**Grade 3** • Isosceles triangle, equilateral triangles • Angle	**Grade 5** • Polygons and regular polygons (irregular polygons) • Congruence of triangles and quadrilaterals • Circular constant • Prism, cylinders, sketches, nets	**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
Elementary 1 • Triangles, quadrilaterals, rectangles, squares, right triangles • Shape of a box	**Grade 4** • Perpendicular and parallel • Parallelogram, rhombus, trapezium • Cube, cuboid	**Grade 6** • Line symmetry, point symmetry • Enlarged and reduced figures	**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
Elementary 2 • Circle, sphere			

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 6 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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