Chapter 9 Addition and Subtraction of Fractions

1. Content Standard

5.1.1 Apply the process of addition and subtraction to add and subtract the fractions with different denominators.

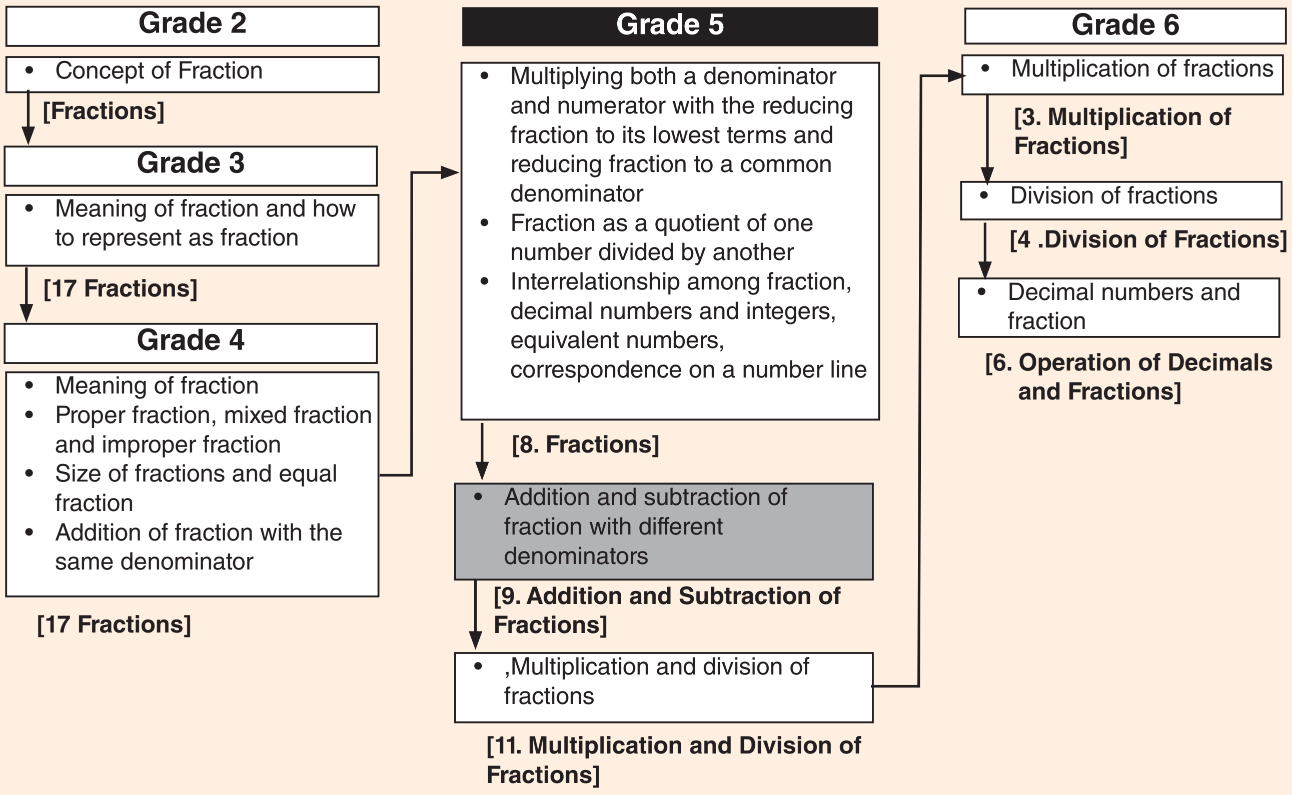
2. Unit Objectives

- To expand students understanding on fractions.
- To think about how to calculate addition and subtraction of fractions with different denominators.
- To master the calculation of fractions with different denominators.

3. Teaching Overview

Students learn addition and subtraction of fractions with different denominators. They will see that addition and subtraction of fractions with different denominators can also be taught based on the common unit fraction. Even though they are given improper or mixed fractions in the calculation, they can think as how many unit fractions should be added or subtracted.
It might look complicated for the students, but they know how to solve it based on their experiences. Finally, they will find out that it is easy to add or subtract several types of fractions by making the denominators common.

4. Related Learning Contents



Grade 2

- Concept of Fraction

[Fractions]

Grade 3

- Meaning of fraction and how to represent as fraction

[17 Fractions]

Grade 4

- Meaning of fraction
- Proper fraction, mixed fraction and improper fraction
- Size of fractions and equal fraction
- Addition of fraction with the same denominator

[17 Fractions]

Grade 5

- Multiplying both a denominator and numerator with the reducing fraction to its lowest terms and reducing fraction to a common denominator
- Fraction as a quotient of one number divided by another
- Interrelationship among fraction, decimal numbers and integers, equivalent numbers, correspondence on a number line

[8. Fractions]

- Addition and subtraction of fraction with different denominators

[9. Addition and Subtraction of Fractions]

- ,Multiplication and division of fractions

[11. Multiplication and Division of Fractions]

Grade 6

- Multiplication of fractions

[3. Multiplication of Fractions]

- Division of fractions

[4 .Division of Fractions]

- Decimal numbers and fraction

[6. Operation of Decimals and Fractions]

Unit
9

Unit: Addition and Subtraction of Fractions

Sub-unit 1: Addition of Fractions

Lesson 1 of 2

Textbook Page :
122 to 124
Actual Lesson 082

Sub-unit Objective

- To understand the meaning of addition of fractions and how to calculate fractions with different denominators.

Lesson Objectives

- To confirm how to calculate addition of fractions with the same denominator.
- To think about how to calculate addition of fractions with different denominator.

Prior Knowledge

- Addition and subtraction of fractions with the same denominators

Preparation

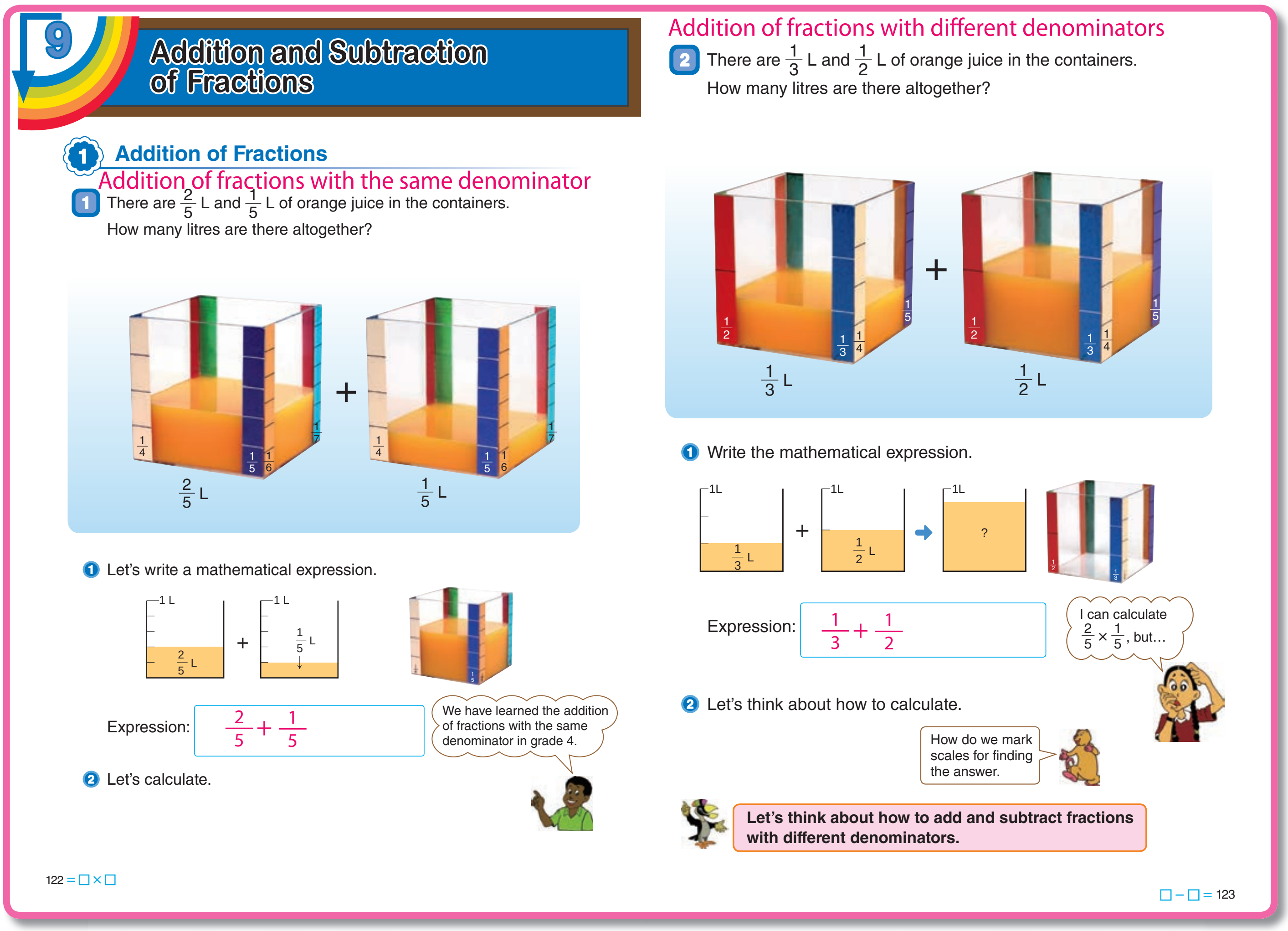
- Diagram for tasks 1 and 2
- Papers to fold and divide the parts

Assessment

- Identify method(s) of representing fractions with different denominators to same denominators. **F**
- Simplify fraction to its simplest form. **F**
- Calculate the addition of fractions with the same and different denominators. **S**

Teacher's Notes

- We can add fractions with different denominators by making the denominators the same.
- When reducing fractions to simplest form, we divide both the numerator and the denominator by the same number.



9

Addition and Subtraction of Fractions

1 Addition of Fractions

Addition of fractions with the same denominator

1 There are $\frac{2}{5}$ L and $\frac{1}{5}$ L of orange juice in the containers.
How many litres are there altogether?

① Let's write a mathematical expression.

Expression: $\frac{2}{5}+\frac{1}{5}$

We have learned the addition of fractions with the same denominator in grade 4.

② Let's calculate.

122 = □ × □

Addition of fractions with different denominators

2 There are $\frac{1}{3}$ L and $\frac{1}{2}$ L of orange juice in the containers.
How many litres are there altogether?

① Write the mathematical expression.

Expression: $\frac{1}{3}+\frac{1}{2}$

I can calculate $\frac{2}{5}\times\frac{1}{5}$, but…

② Let's think about how to calculate.

How do we mark scales for finding the answer.

Let's think about how to add and subtract fractions with different denominators.

□ − □ = 123

Lesson Flow

1 Addition of fractions with same denominators

T/S 1 Read and understand the situation and make meaning of $\frac{2}{5}$ and $\frac{1}{5}$ using the pictures.

S ① Write a mathematical expression. ($\frac{2}{5}+\frac{1}{5}$)

S ② Calculate the problem using prior knowledge.

T Confirm students' answers on the board.

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

2 Addition of fractions with different denominators

T/S 2 Read and understand the situation and make meaning of $\frac{1}{3}$ and $\frac{1}{2}$ using the pictures.

S ① Write a mathematical expression. ($\frac{1}{3}+\frac{1}{2}$)

T ② Let's think about how to calculate.

S Think of ways on how to calculate $\frac{1}{3}+\frac{1}{2}$ and share ideas with friends.

3 ③ How to add fractions with different denominators

T Let's explain how to calculate $\frac{1}{3}+\frac{1}{2}$.

S It's difficult to calculate since the denominators are not the same.

TN Use the speech bubbles to confirm that it's difficult to calculate.

T Show and explain how to get a same denominator for $\frac{1}{3}$ and $\frac{1}{2}$ using papers.

T/S Two papers divided into three parts and two parts respectively can be further divided into six equal parts, making a same denominator of 6.

S Change the representation of the fractions $\frac{1}{3}$ and $\frac{1}{2}$ to same denominator as $\frac{2}{6}$ and $\frac{3}{6}$ respectively and solve the problem.

4 Important Point

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

5 Simplifying fractions to their simplest form.

T 3 Let's think about how to calculate $\frac{3}{10}+\frac{1}{6}$ and simplify it by filling in the box ☐.

S Identify that the answer $\frac{14}{30}$ can be simplified by dividing two on the numerator and denominator to simplify it to $\frac{7}{15}$ as the final answer.

6 Important Point

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

7 Complete the Exercise

S Solve the selected exercises.

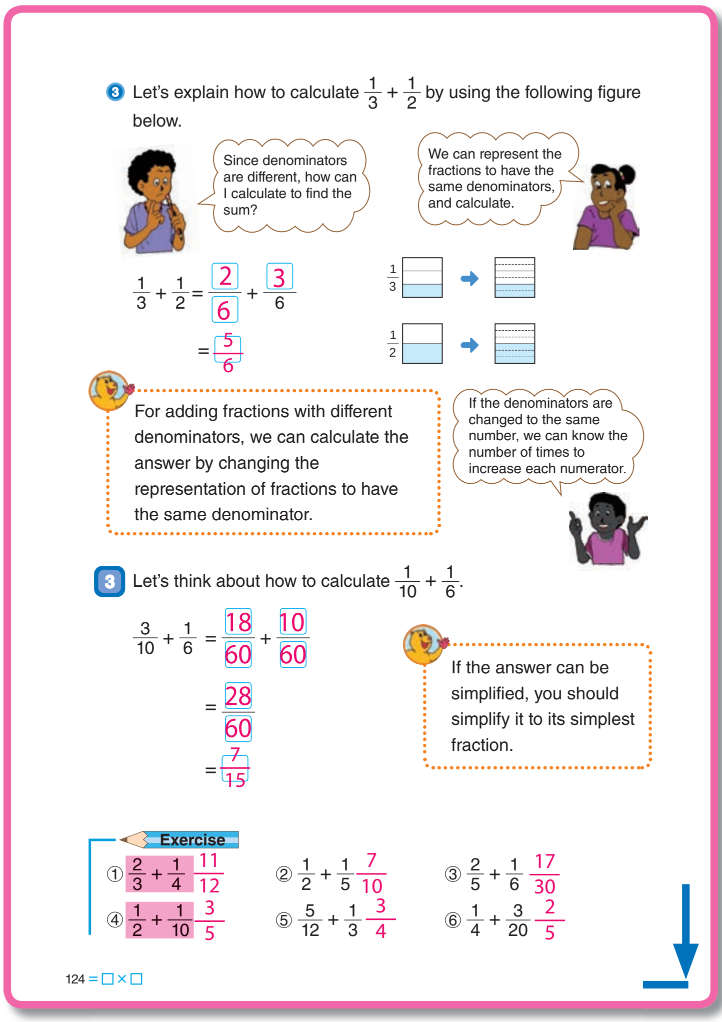
T Confirm students' answers.

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.



③ Let's explain how to calculate $\frac{1}{3}+\frac{1}{2}$ by using the following figure below.

$$\frac{1}{3}+\frac{1}{2}=\frac{\boxed{2}}{\boxed{6}}+\frac{\boxed{3}}{6}$$
$$=\frac{\boxed{5}}{\boxed{6}}$$

For adding fractions with different denominators, we can calculate the answer by changing the representation of fractions to have the same denominator.

3 Let's think about how to calculate $\frac{1}{10}+\frac{1}{6}$.

$$\frac{3}{10}+\frac{1}{6}=\frac{\boxed{18}}{\boxed{60}}+\frac{\boxed{10}}{\boxed{60}}$$
$$=\frac{\boxed{28}}{\boxed{60}}$$
$$=\frac{\boxed{7}}{\boxed{15}}$$

If the answer can be simplified, you should simplify it to its simplest fraction.

Exercise

① $\frac{2}{3}+\frac{1}{4}$ $\frac{11}{12}$　② $\frac{1}{2}+\frac{1}{5}$ $\frac{7}{10}$　③ $\frac{2}{5}+\frac{1}{6}$ $\frac{17}{30}$

④ $\frac{1}{2}+\frac{1}{10}$ $\frac{3}{5}$　⑤ $\frac{5}{12}+\frac{1}{3}$ $\frac{3}{4}$　⑥ $\frac{1}{4}+\frac{3}{20}$ $\frac{2}{5}$

124 = ☐ × ☐

Sample Blackboard Plan

Lesson 082 Sample Blackboard Plan is on page 167.

Unit 9

Unit: Addition and Subtraction of Fractions
Sub-unit 1: Addition of Fractions
Lesson 2 of 2

Textbook Page : 125
Actual Lesson 083

Lesson Objectives

- To understand how to calculate addition of proper fractions with different denominators when the answer is a mixed fraction.
- To understand how to calculate addition of mixed fraction with different denominators.

Prior Knowledge

- Addition and subtraction of fractions with the same denominators

Preparation

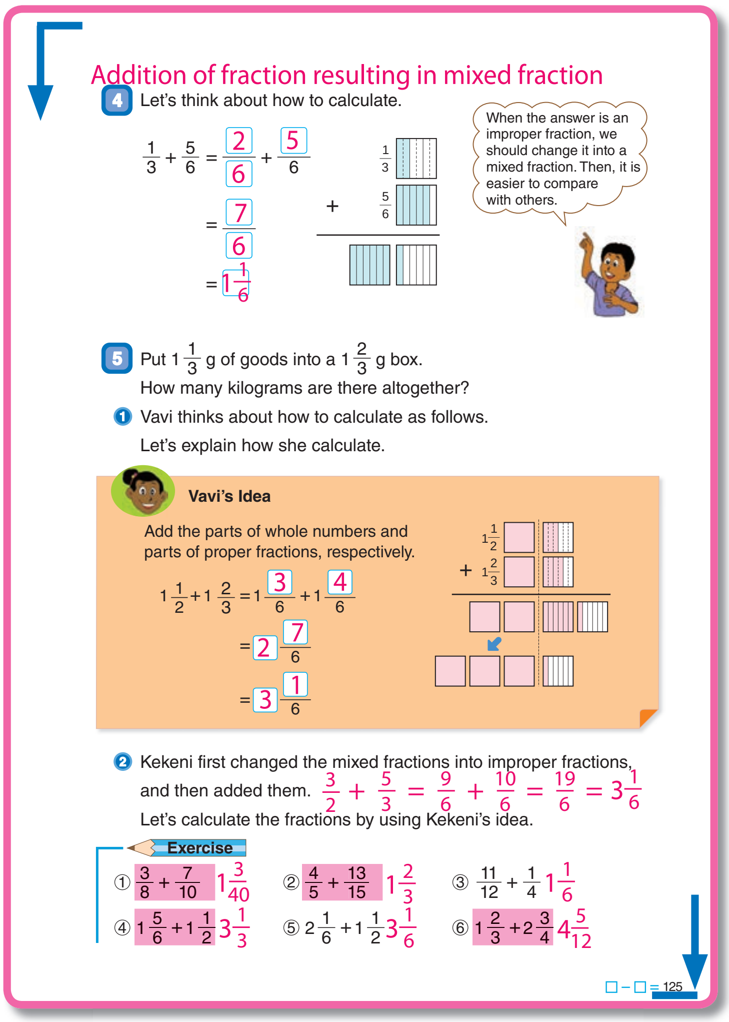
- Chart of diagram for tasks 4 and 5

Assessment

- To demonstrate the understanding of adding proper fractions with different denominators when the answer is a mixed fraction. F S
- Add mixed fractions with different denominators. F
- Solve the exercises correctly. S

Teacher's Notes

- Simplify final answers of fractions to their simplest form where necessary.
- It is important to use the diagram representations to help students visualise the carrying over to make mixed fractions.



Addition of fraction resulting in mixed fraction

4 Let's think about how to calculate.

$\frac{1}{3}+\frac{5}{6}=\frac{\boxed{2}}{\boxed{6}}+\frac{\boxed{5}}{6}$

$=\frac{\boxed{7}}{\boxed{6}}$

$=\boxed{1\frac{1}{6}}$

When the answer is an improper fraction, we should change it into a mixed fraction. Then, it is easier to compare with others.

5 Put $1\frac{1}{3}$ g of goods into a $1\frac{2}{3}$ g box.
How many kilograms are there altogether?

① Vavi thinks about how to calculate as follows.
Let's explain how she calculate.

Vavi's Idea

Add the parts of whole numbers and parts of proper fractions, respectively.

$1\frac{1}{2}+1\frac{2}{3}=1\frac{\boxed{3}}{6}+1\frac{\boxed{4}}{6}$

$=\boxed{2}\frac{\boxed{7}}{6}$

$=\boxed{3}\frac{\boxed{1}}{6}$

② Kekeni first changed the mixed fractions into improper fractions, and then added them. $\frac{3}{2}+\frac{5}{3}=\frac{9}{6}+\frac{10}{6}=\frac{19}{6}=3\frac{1}{6}$
Let's calculate the fractions by using Kekeni's idea.

Exercise

① $\frac{3}{8}+\frac{7}{10}$ $1\frac{3}{40}$
② $\frac{4}{5}+\frac{13}{15}$ $1\frac{2}{3}$
③ $\frac{11}{12}+\frac{1}{4}$ $1\frac{1}{6}$
④ $1\frac{5}{6}+1\frac{1}{2}$ $3\frac{1}{3}$
⑤ $2\frac{1}{6}+1\frac{1}{2}$ $3\frac{1}{6}$
⑥ $1\frac{2}{3}+2\frac{3}{4}$ $4\frac{5}{12}$

□ − □ = 125

Lesson Flow

1 Review the previous lesson.

2 4 Addition of fractions with different denominators when the answer is a mixed fraction.

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

T Let's think about how to calculate $\frac{1}{3}+\frac{5}{6}$?

T Show the diagram representation of $\frac{1}{3}+\frac{5}{6}$ vertically.

S Think about how to add $\frac{1}{3}+\frac{5}{6}$ using the diagram representation and find the answer.

S Present their ideas.

T Use the diagram representation to confirm the calculation vetically as $\frac{1}{3}+\frac{5}{6}=\frac{2}{6}+\frac{5}{6}=\frac{7}{6}$

T Explain the speech bubble. $\frac{7}{6}=1\frac{1}{6}$

3 5 Addition of mixed fractions with different denominators.

T/S Read and understand the situation.

S Write a mathematical expression i.e. $1\frac{1}{2}+1\frac{2}{3}$

Lesson Flow

S ① Think about how to calculate $1\frac{1}{2}+1\frac{2}{3}$ using Vavi's Idea

TN Students should calculate using Vavi's idea as shown with the diagram representation:

1. Add whole numbers first in the mixed fraction.
2. Represent the proper fraction parts to same denominator and add.
3. Change improper fraction to mixed fraction and add whole numbers.

T ② Kekeni first changed mixed fractions to improper fractions and then she added them.

T Using Kekeni's idea, let us calculate $1\frac{1}{2}+1\frac{2}{3}$.

S Calculate using Kekeni's idea as follows:

1. Change mixed fractions to improper fractions.
2. Find the common demonimator and calculate.
3. Write the final answer in mixed fraction.

T Checks and confirms calculation.

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

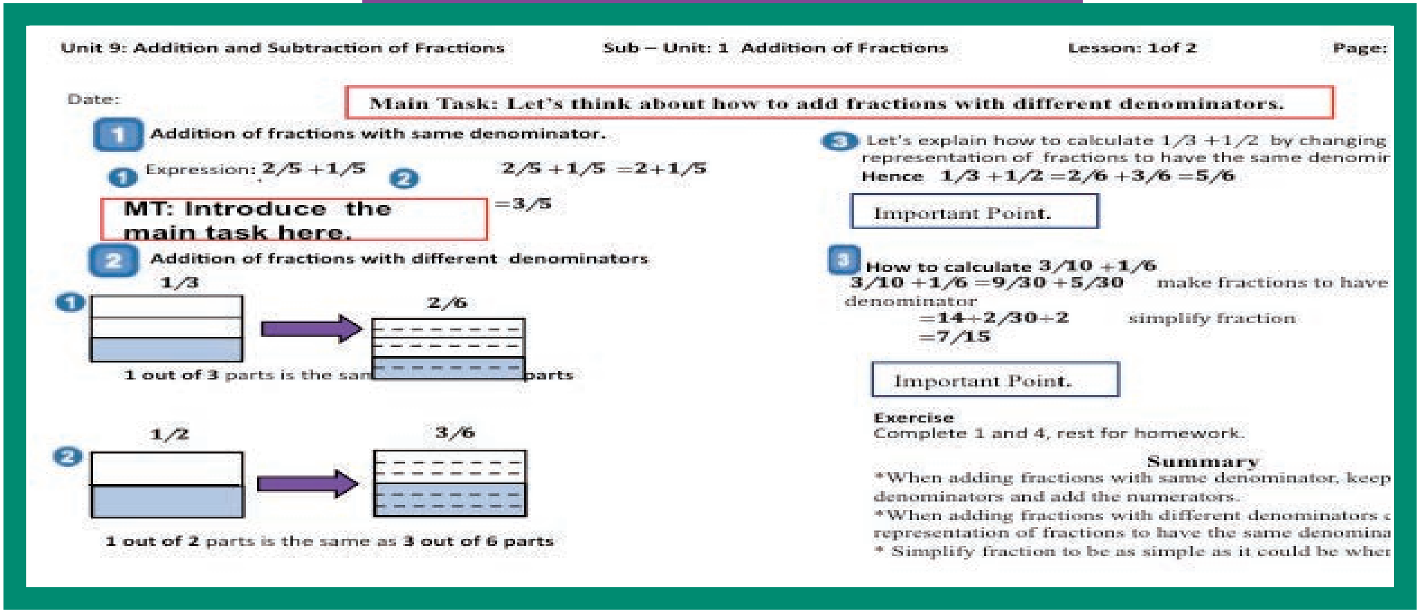
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan (Lesson 82)



Unit 9: Addition and Subtraction of Fractions Sub – Unit: 1 Addition of Fractions Lesson: 1of 2 Page:

Date:

Main Task: Let's think about how to add fractions with different denominators.

1 Addition of fractions with same denominator.

① Expression: 2/5 +1/5 ② 2/5 +1/5 =2+1/5

=3/5

MT: Introduce the main task here.

2 Addition of fractions with different denominators

① 1/3 2/6

1 out of 3 parts is the sam parts

② 1/2 3/6

1 out of 2 parts is the same as 3 out of 6 parts

3 Let's explain how to calculate 1/3 +1/2 by changing representation of fractions to have the same denomir

Hence 1/3 +1/2 =2/6 +3/6 =5/6

Important Point.

3 How to calculate 3/10 +1/6

3/10 +1/6 =9/30 +5/30 make fractions to have denominator

=14÷2/30÷2 simplify fraction

=7/15

Important Point.

Exercise

Complete 1 and 4, rest for homework.

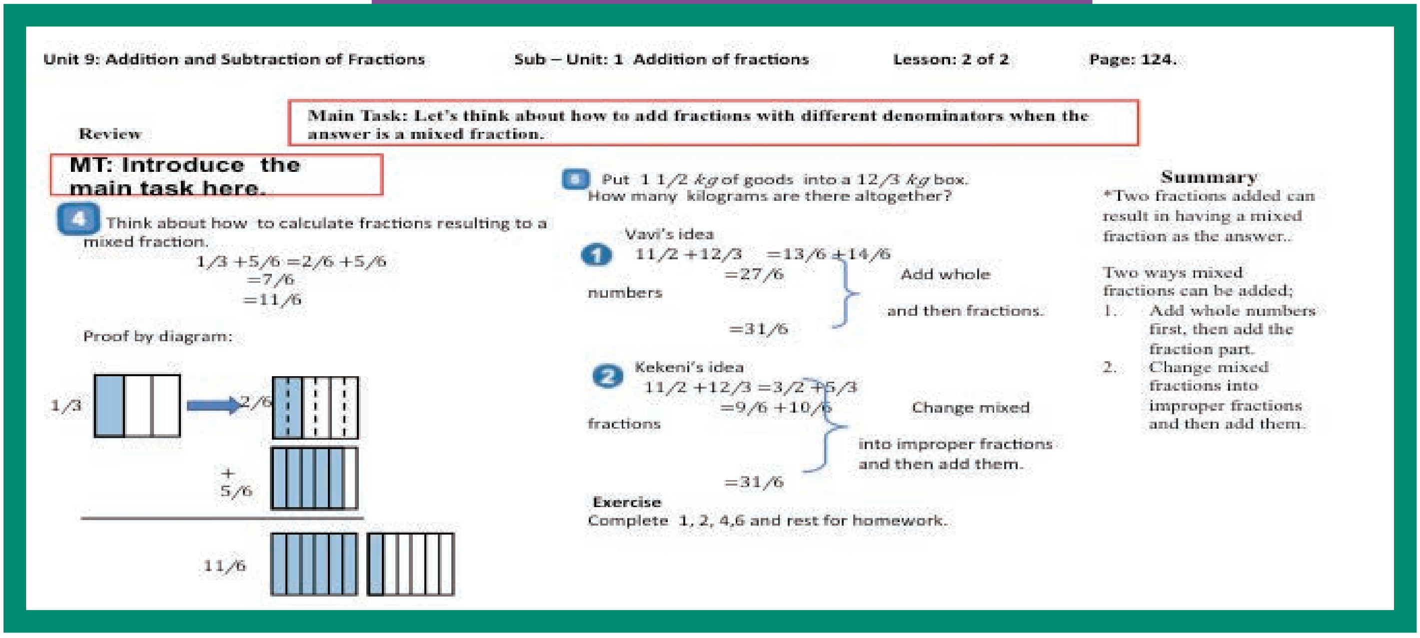
Summary

*When adding fractions with same denominator, keep denominators and add the numerators.

*When adding fractions with different denominators c representation of fractions to have the same denomina

* Simplify fraction to be as simple as it could be wher

Sample Blackboard Plan (Lesson 83)



Unit 9: Addition and Subtraction of Fractions Sub – Unit: 1 Addition of fractions Lesson: 2 of 2 Page: 124.

Review

Main Task: Let's think about how to add fractions with different denominators when the answer is a mixed fraction.

MT: Introduce the main task here.

4 Think about how to calculate fractions resulting to a mixed fraction.

1/3 +5/6 =2/6 +5/6
=7/6
=11/6

Proof by diagram:

1/3 → 2/6
+ 5/6
11/6

5 Put 1 1/2 kg of goods into a 12/3 kg box.
How many kilograms are there altogether?

Vavi's idea

① 11/2 +12/3 =13/6 +14/6
=27/6 Add whole numbers and then fractions.
=31/6

Kekeni's idea

② 11/2 +12/3 =3/2 +5/3
=9/6 +10/6 Change mixed fractions into improper fractions and then add them.
=31/6

Exercise

Complete 1, 2, 4,6 and rest for homework.

Summary

*Two fractions added can result in having a mixed fraction as the answer..

Two ways mixed fractions can be added;

1. Add whole numbers first, then add the fraction part.
2. Change mixed fractions into improper fractions and then add them.

Unit 9

Unit: Addition and Subtraction of Fractions

Sub-unit 2: Subtraction of Fractions

Lesson 1 of 2

Textbook Page : 126 and 127
Actual Lesson 084

Sub-unit Objective

- To understand the meaning and how to calculate subtraction of fractions with different denominators.

Lesson Objectives

- To think about how to calculate subtraction of fractions with different denominators.
- To master the calculation of subtraction of fractions with different denominators.

Prior Knowledge

- Subtraction of fractions with the same denominator

Preparation

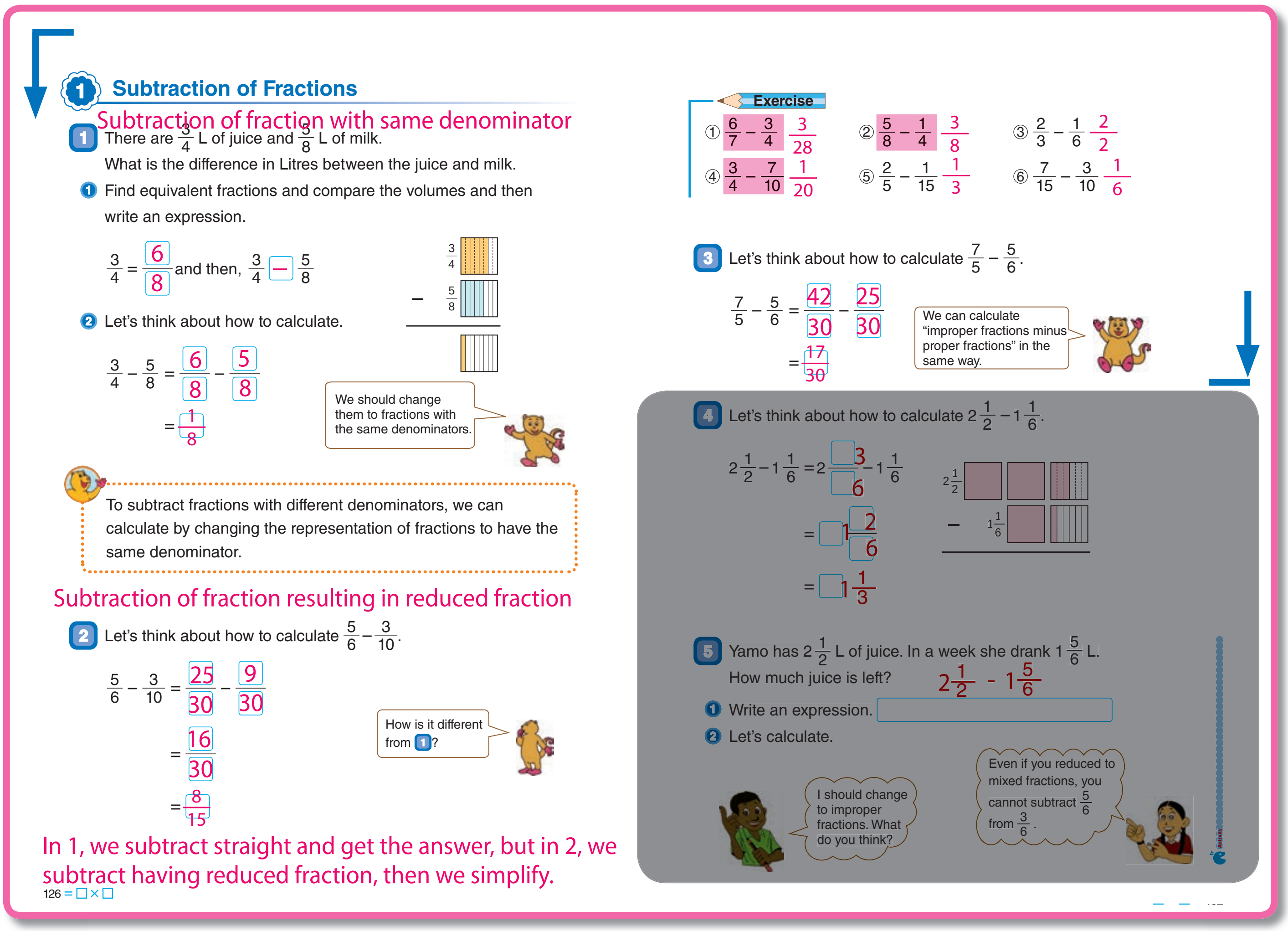
- Bottles of juice or milk (if not available use other forms of liquids)
- Measuring cup

Assessment

- Demonstrate the understanding on how to subtract fractions with different denominators. **F**
- Subtract fractions with different denominators confidently. **S**
- Solve the exercises correctly. **S**

Teacher's Notes

- Reducing of fraction means breaking down of an existing fraction to smaller parts.
- Simplification or simplify means to express a fraction in its simple form. E.g. $\frac{2}{4}=\frac{1}{2}$
- As in addition, we can subtract the numerators for fractions with same denominators.
- For **2**, fill in the box and explain how $\frac{5}{6}$ and $\frac{3}{10}$ are reduced to become $\frac{25}{30}$ and $\frac{9}{30}$ respectively.



① Subtraction of Fractions

Subtraction of fraction with same denominator

1 There are $\frac{3}{4}$ L of juice and $\frac{5}{8}$ L of milk.
What is the difference in Litres between the juice and milk.

① Find equivalent fractions and compare the volumes and then write an expression.

$\frac{3}{4}=\frac{\boxed{6}}{\boxed{8}}$ and then, $\frac{3}{4}\ \boxed{-}\ \frac{5}{8}$

② Let's think about how to calculate.

$\frac{3}{4}-\frac{5}{8}=\frac{\boxed{6}}{\boxed{8}}-\frac{\boxed{5}}{\boxed{8}}$

$=\frac{1}{8}$

We should change them to fractions with the same denominators.

To subtract fractions with different denominators, we can calculate by changing the representation of fractions to have the same denominator.

Subtraction of fraction resulting in reduced fraction

2 Let's think about how to calculate $\frac{5}{6}-\frac{3}{10}$.

$\frac{5}{6}-\frac{3}{10}=\frac{\boxed{25}}{\boxed{30}}-\frac{\boxed{9}}{\boxed{30}}$

$=\frac{\boxed{16}}{\boxed{30}}$

$=\frac{8}{15}$

How is it different from **1**?

In 1, we subtract straight and get the answer, but in 2, we subtract having reduced fraction, then we simplify.

126 = □×□

Exercise

① $\frac{6}{7}-\frac{3}{4}$ $\frac{3}{28}$
② $\frac{5}{8}-\frac{1}{4}$ $\frac{3}{8}$
③ $\frac{2}{3}-\frac{1}{6}$ $\frac{2}{2}$
④ $\frac{3}{4}-\frac{7}{10}$ $\frac{1}{20}$
⑤ $\frac{2}{5}-\frac{1}{15}$ $\frac{1}{3}$
⑥ $\frac{7}{15}-\frac{3}{10}$ $\frac{1}{6}$

3 Let's think about how to calculate $\frac{7}{5}-\frac{5}{6}$.

$\frac{7}{5}-\frac{5}{6}=\frac{\boxed{42}}{\boxed{30}}-\frac{\boxed{25}}{\boxed{30}}$

$=\frac{17}{30}$

We can calculate "improper fractions minus proper fractions" in the same way.

4 Let's think about how to calculate $2\frac{1}{2}-1\frac{1}{6}$.

$2\frac{1}{2}-1\frac{1}{6}=2\frac{\boxed{}3}{\boxed{}6}-1\frac{1}{6}$

$=\boxed{}1\frac{\boxed{}2}{\boxed{}6}$

$=\boxed{}1\frac{1}{3}$

5 Yamo has $2\frac{1}{2}$ L of juice. In a week she drank $1\frac{5}{6}$ L.
How much juice is left? $2\frac{1}{2}$ - $1\frac{5}{6}$

① Write an expression. ☐

② Let's calculate.

I should change to improper fractions. What do you think?

Even if you reduced to mixed fractions, you cannot subtract $\frac{5}{6}$ from $\frac{3}{6}$.

Lesson Flow

1 Review the previous lesson.

2 1 Subtraction of fractions with different denominators.

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

T/S Read and understand the situation.

T ① Find equivalent fractions and compare the volumes and then write an expression.

TN Use the diagram representation to guide the students.

S Fill in the blank squares and explain that 3 of 4 parts is reduced and becomes 6 of 8 parts i.e. $\frac{3}{4}=\frac{6}{8}$. Therefore, the expression is $\frac{3}{4}-\frac{5}{8}$.

T ② Think about how to calculate $\frac{3}{4}-\frac{5}{8}$.

S Refer to Kapul and fill in the box with the new expression as $\frac{3}{4}-\frac{5}{8}=\frac{6}{8}-\frac{5}{8}=\frac{1}{8}$.

T Confirm students' answers.

3 Important Point

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

4 Subtraction of fractions with different denominators resulting in reduced fractions.

T 2 Ask the students to think about how to calculate $\frac{5}{6}-\frac{3}{10}$.

TN Use the same approach as task 1. $\frac{5}{6}-\frac{3}{10}=\frac{25}{30}-\frac{9}{30}=\frac{16}{30}=\frac{8}{15}$. (Refer to TN)

T What is the difference between 1 and 2?

S In 1, the answer is in simple form however in 2 the answer is not in simple form so it is further simplified by dividing the numerator and denominator by a common number 4.

5 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

6 Subtracting proper fraction from improper fraction.

T 3 Ask students to think about how to calculate $\frac{7}{5}-\frac{5}{6}$.

S Fill in the box by using the same approach in 1 and 2. $\frac{7}{5}-\frac{5}{6}=\frac{42}{30}-\frac{25}{30}=\frac{17}{30}$.

TN Improper or proper fractions, we can still subtract by reducing the fractions.

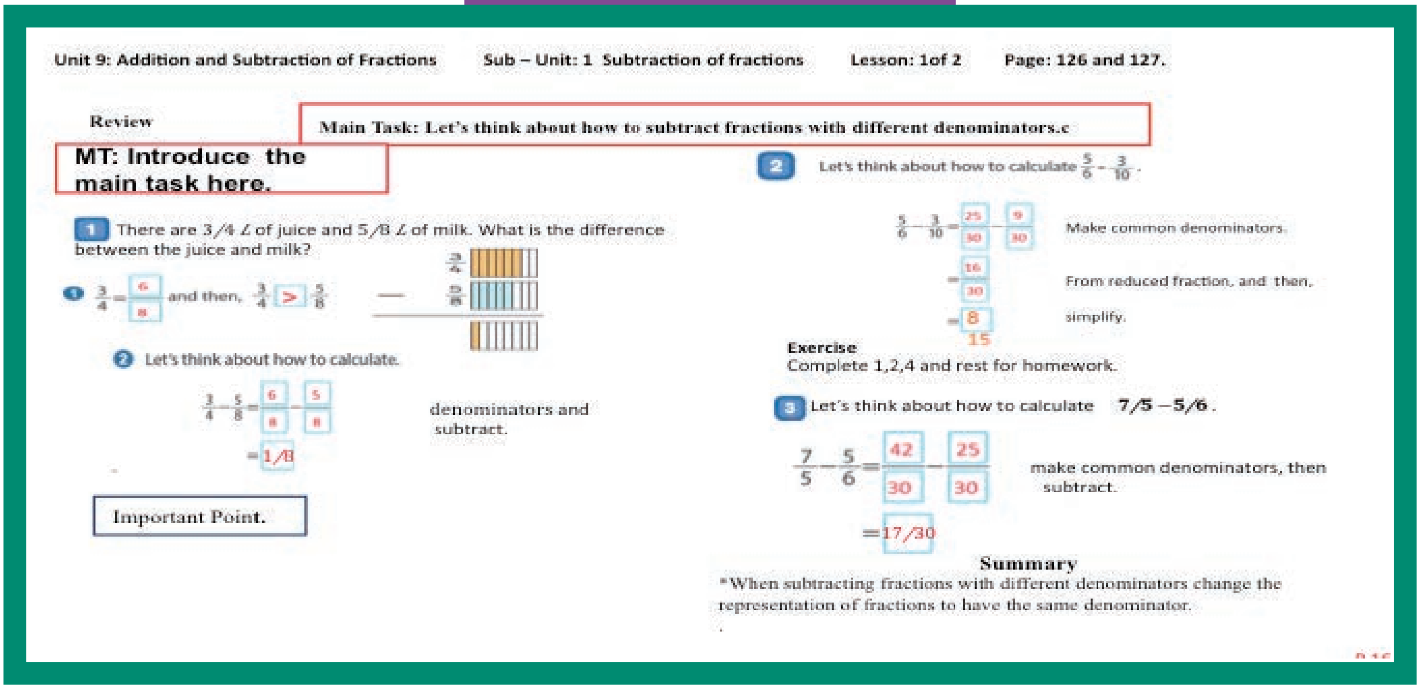
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Unit 9: Addition and Subtraction of Fractions   Sub – Unit: 1 Subtraction of fractions   Lesson: 1of 2   Page: 126 and 127.

Review

MT: Introduce the main task here.

Main Task: Let's think about how to subtract fractions with different denominators.c

1 There are 3/4 ℓ of juice and 5/8 ℓ of milk. What is the difference between the juice and milk?

① $\frac{3}{4}=\boxed{\frac{6}{8}}$ and then, $\frac{3}{4}\boxed{>}\frac{5}{8}$

② Let's think about how to calculate.

$\frac{3}{4}-\frac{5}{8}=\boxed{\frac{6}{8}}-\boxed{\frac{5}{8}}$

$=\boxed{1/8}$

denominators and subtract.

Important Point.

2 Let's think about how to calculate $\frac{5}{6}-\frac{3}{10}$.

$\frac{5}{6}-\frac{3}{10}=\boxed{\frac{25}{30}}-\boxed{\frac{9}{30}}$ Make common denominators.

$=\boxed{\frac{16}{30}}$ From reduced fraction, and then,

$=\boxed{\frac{8}{15}}$ simplify.

Exercise
Complete 1,2,4 and rest for homework.

3 Let's think about how to calculate 7/5 – 5/6.

$\frac{7}{5}-\frac{5}{6}=\boxed{\frac{42}{30}}-\boxed{\frac{25}{30}}$ make common denominators, then subtract.

$=\boxed{17/30}$

Summary
*When subtracting fractions with different denominators change the representation of fractions to have the same denominator.

Unit 9

Unit: Addition and Subtraction of Fractions

Sub-unit 2: Subtraction of Fractions

Lesson 2 of 2

Textbook Page : 127 and 128
Actual Lesson 085

Lesson Objectives

- To think about how to subtract mixed fraction with different denominators.
- Subtract mixed fractions with different denominators.

Prior Knowledge

- Subtraction of fractions with the same denominator

Preparation

- Chart of vertical calculation and diagram representation for 4
- Chart for Mero's and Ambai's ideas in 5

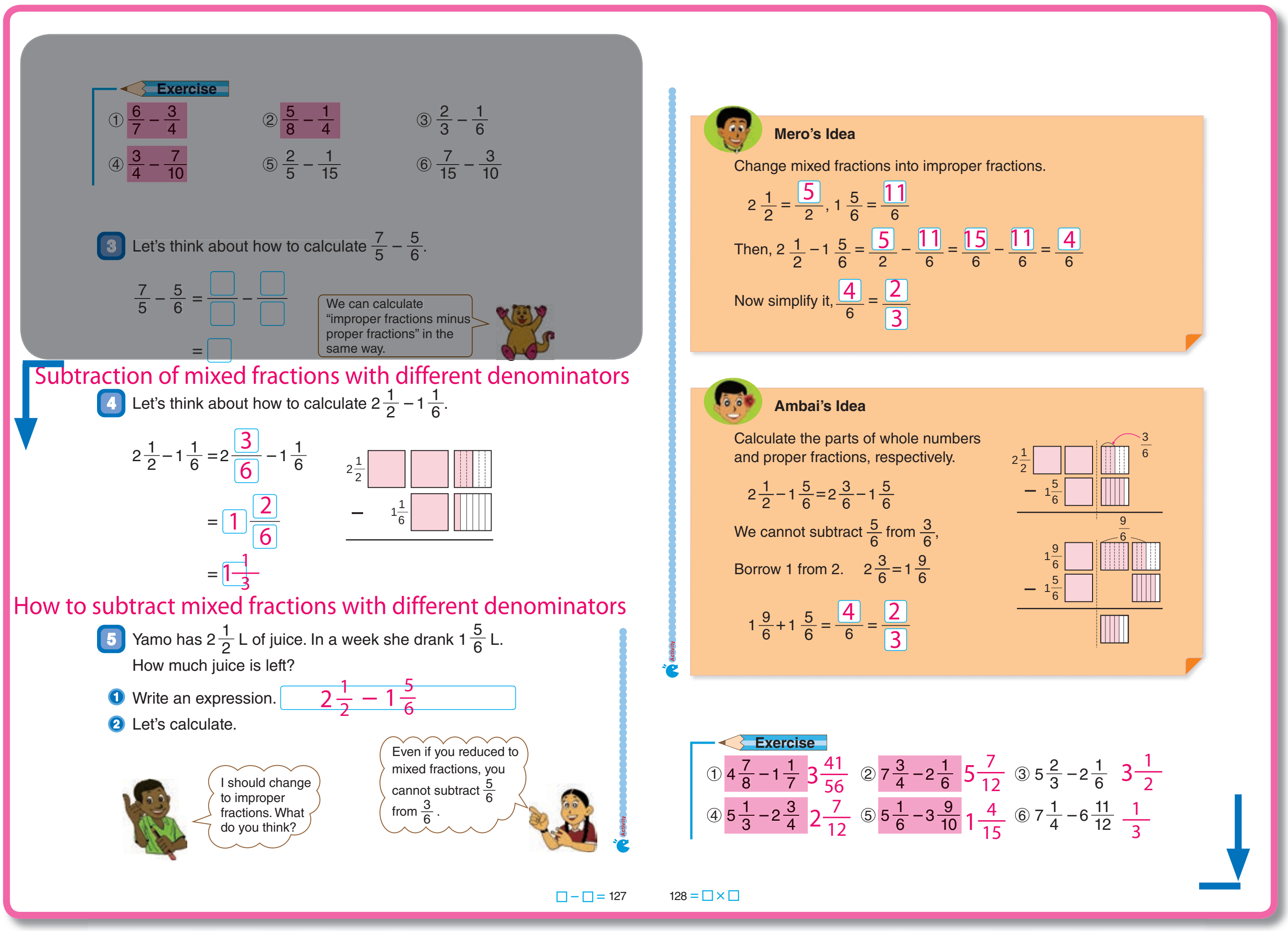
Assessment

- Think about how to subtract mixed fractions with different denominators. F
- Calculate the mixed fractions with different denominators. F
- Solve the exercises correctly. S

Teacher's Notes

Borrowing 1 from 2, $2\frac{3}{6} = 1 + \frac{6}{6} + \frac{3}{6}$

$= 1\frac{9}{6}$



Exercise

① $\frac{6}{7} - \frac{3}{4}$ ② $\frac{5}{8} - \frac{1}{4}$ ③ $\frac{2}{3} - \frac{1}{6}$

④ $\frac{3}{4} - \frac{7}{10}$ ⑤ $\frac{2}{5} - \frac{1}{15}$ ⑥ $\frac{7}{15} - \frac{3}{10}$

3 Let's think about how to calculate $\frac{7}{5} - \frac{5}{6}$.

$\frac{7}{5} - \frac{5}{6} = \frac{\square}{\square} - \frac{\square}{\square}$

$= \square$

We can calculate "improper fractions minus proper fractions" in the same way.

Subtraction of mixed fractions with different denominators

4 Let's think about how to calculate $2\frac{1}{2} - 1\frac{1}{6}$.

$2\frac{1}{2} - 1\frac{1}{6} = 2\frac{3}{6} - 1\frac{1}{6}$

$= 1\frac{2}{6}$

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

How to subtract mixed fractions with different denominators

5 Yamo has $2\frac{1}{2}$ L of juice. In a week she drank $1\frac{5}{6}$ L. How much juice is left?

❶ Write an expression. $2\frac{1}{2} - 1\frac{5}{6}$

❷ Let's calculate.

Mero's Idea

Change mixed fractions into improper fractions.

$2\frac{1}{2} = \frac{5}{2}$, $1\frac{5}{6} = \frac{11}{6}$

Then, $2\frac{1}{2} - 1\frac{5}{6} = \frac{5}{2} - \frac{11}{6} = \frac{15}{6} - \frac{11}{6} = \frac{4}{6}$

Now simplify it, $\frac{4}{6} = \frac{2}{3}$

Ambai's Idea

Calculate the parts of whole numbers and proper fractions, respectively.

$2\frac{1}{2} - 1\frac{5}{6} = 2\frac{3}{6} - 1\frac{5}{6}$

We cannot subtract $\frac{5}{6}$ from $\frac{3}{6}$,

Borrow 1 from 2. $2\frac{3}{6} = 1\frac{9}{6}$

$1\frac{9}{6} + 1\frac{5}{6} = \frac{4}{6} = \frac{2}{3}$

Exercise

① $4\frac{7}{8} - 1\frac{1}{7}$ $3\frac{41}{56}$ ② $7\frac{3}{4} - 2\frac{1}{6}$ $5\frac{7}{12}$ ③ $5\frac{2}{3} - 2\frac{1}{6}$ $3\frac{1}{2}$

④ $5\frac{1}{3} - 2\frac{3}{4}$ $2\frac{7}{12}$ ⑤ $5\frac{1}{6} - 3\frac{9}{10}$ $1\frac{4}{15}$ ⑥ $7\frac{1}{4} - 6\frac{11}{12}$ $\frac{1}{3}$

□ − □ = 127

128 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Subtraction of mixed fractions with different denominators.

T 4 Allow the students to think about how to calculate $2\frac{1}{2}-1\frac{1}{6}$.

S Use the diagram representation and vertical calculation to calculate $2\frac{1}{2}-1\frac{1}{6}$ by filling in the box.

$2\frac{1}{2}-1\frac{1}{6}=2\frac{3}{6}-1\frac{1}{6}=1\frac{2}{6}=1\frac{1}{3}$

T Confirm the calculation by corresponding the diagram representation with the vertical calculation.

T Introduce the Main Task.

(Refer to the BP).

3 5 Methods on how to subtract mixed fractions with different denominators.

S ① Read and understand the situation and write a mathematical expression.

$(2\frac{1}{2}-1\frac{5}{6})$

S ② Think about how to calculate $2\frac{1}{2}-1\frac{5}{6}$ and fill in the boxes in Mero's and Ambai's Ideas.

TN Mero's Idea:

i) Change mixed fractions to improper fractions.

ii) Represent improper fractions with a common denominator.

iii) Subtract using improper fractions.

iv) Simplify fraction.

Ambai's Idea:

i) Represent proper fraction parts with common denominator.

ii) Calculate the parts of whole numbers and proper fractions respectively.

iii) $\frac{5}{6}$ cannot be subtracted from $\frac{3}{6}$ so borrow 1 from 2. Hence $2\frac{3}{6}=1\frac{9}{6}$.

(Refer to TN)

iv) Subtract and simplify fraction.

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

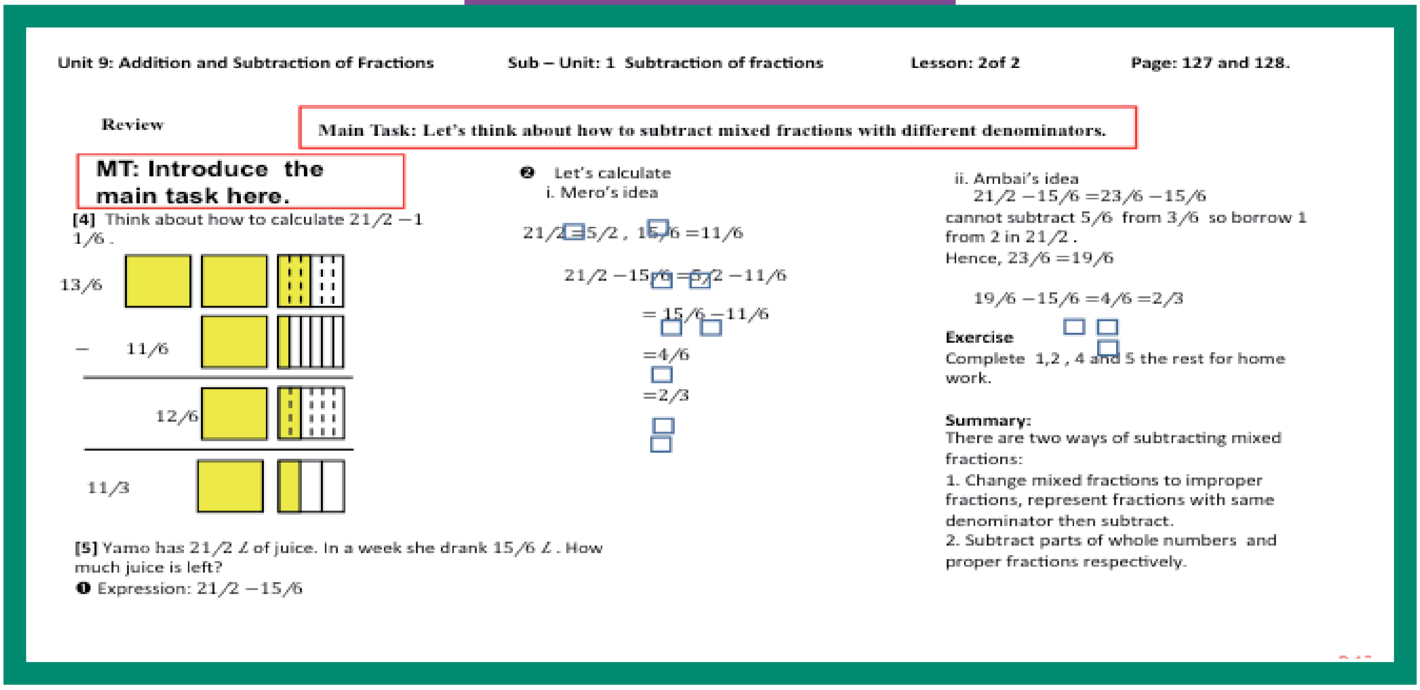
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Unit 9: Addition and Subtraction of Fractions   Sub – Unit: 1 Subtraction of fractions   Lesson: 2of 2   Page: 127 and 128.

Review

Main Task: Let's think about how to subtract mixed fractions with different denominators.

MT: Introduce the main task here.

[4] Think about how to calculate 21/2 −1 1/6 .

[5] Yamo has 21/2 ℒ of juice. In a week she drank 15/6 ℒ . How much juice is left?

❶ Expression: 21/2 −15/6

❷ Let's calculate

i. Mero's idea

21/2 =5/2 , 15/6 =11/6

21/2 −15/6 =5/2 −11/6

= 15/6 −11/6

=4/6

=2/3

ii. Ambai's idea

21/2 −15/6 =23/6 −15/6

cannot subtract 5/6 from 3/6 so borrow 1 from 2 in 21/2 .

Hence, 23/6 =19/6

19/6 −15/6 =4/6 =2/3

Exercise

Complete 1,2 , 4 and 5 the rest for home work.

Summary:

There are two ways of subtracting mixed fractions:

1. Change mixed fractions to improper fractions, represent fractions with same denominator then subtract.
2. Subtract parts of whole numbers and proper fractions respectively.

Unit
9

Unit: Addition and Subtraction of Fractions

Exercise and Evaluation

Lesson 1 of 2

Textbook Page : 129
Actual Lesson 086 and 087

Lesson Objective

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

Prior Knowledge

- All the contents learned in this unit

Preparation

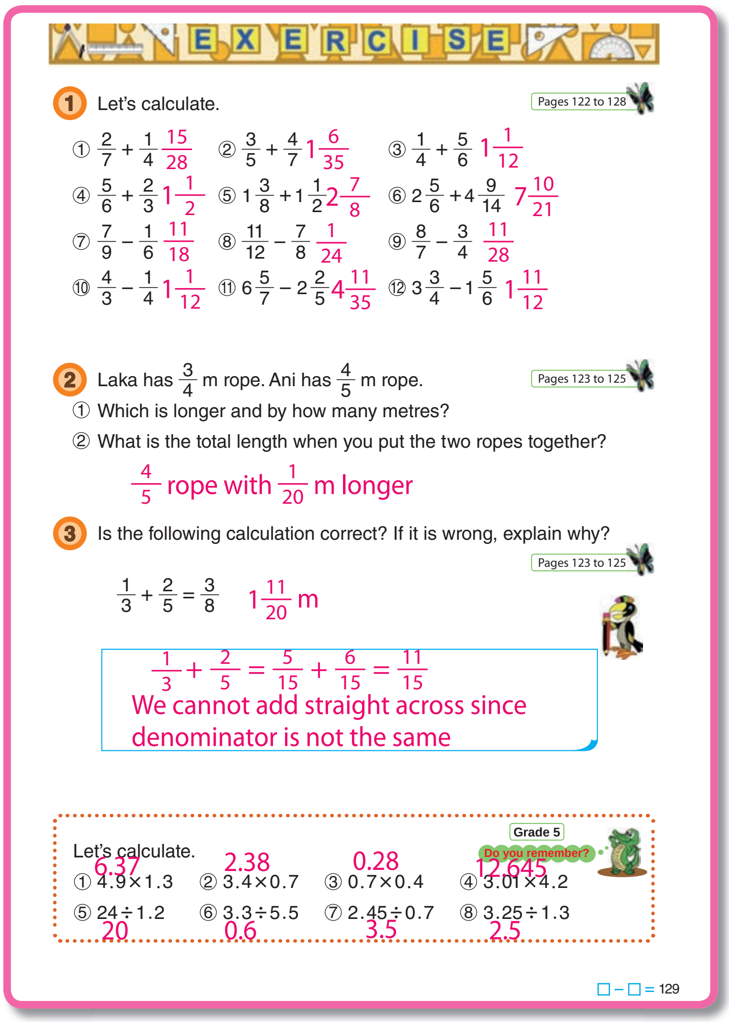
- Evaluation test copy for each student

Assessment

- Complete the Exercise correctly. S

Teacher's Notes

This is the last lesson of Chapter 9. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assesment for your class after completing all the exercises. Use the attached evaluation test to conduct assesment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

① Let's calculate. Pages 122 to 128

① $\frac{2}{7}+\frac{1}{4}$ $\frac{15}{28}$　② $\frac{3}{5}+\frac{4}{7}$ $1\frac{6}{35}$　③ $\frac{1}{4}+\frac{5}{6}$ $1\frac{1}{12}$
④ $\frac{5}{6}+\frac{2}{3}$ $1\frac{1}{2}$　⑤ $1\frac{3}{8}+1\frac{1}{2}$ $2\frac{7}{8}$　⑥ $2\frac{5}{6}+4\frac{9}{14}$ $7\frac{10}{21}$
⑦ $\frac{7}{9}-\frac{1}{6}$ $\frac{11}{18}$　⑧ $\frac{11}{12}-\frac{7}{8}$ $\frac{1}{24}$　⑨ $\frac{8}{7}-\frac{3}{4}$ $\frac{11}{28}$
⑩ $\frac{4}{3}-\frac{1}{4}$ $1\frac{1}{12}$　⑪ $6\frac{5}{7}-2\frac{2}{5}$ $4\frac{11}{35}$　⑫ $3\frac{3}{4}-1\frac{5}{6}$ $1\frac{11}{12}$

② Laka has $\frac{3}{4}$ m rope. Ani has $\frac{4}{5}$ m rope. Pages 123 to 125

① Which is longer and by how many metres?
② What is the total length when you put the two ropes together?

$\frac{4}{5}$ rope with $\frac{1}{20}$ m longer

③ Is the following calculation correct? If it is wrong, explain why? Pages 123 to 125

$\frac{1}{3}+\frac{2}{5}=\frac{3}{8}$　$1\frac{11}{20}$ m

$\frac{1}{3}+\frac{2}{5}=\frac{5}{15}+\frac{6}{15}=\frac{11}{15}$
We cannot add straight across since denominator is not the same

Grade 5
Do you remember?

Let's calculate.
① 4.9×1.3 6.37　② 3.4×0.7 2.38　③ 0.7×0.4 0.28　④ 3.01×4.2 12.645
⑤ 24÷1.2 20　⑥ 3.3÷5.5 0.6　⑦ 2.45÷0.7 3.5　⑧ 3.25÷1.3 2.5

□ − □ = 129

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

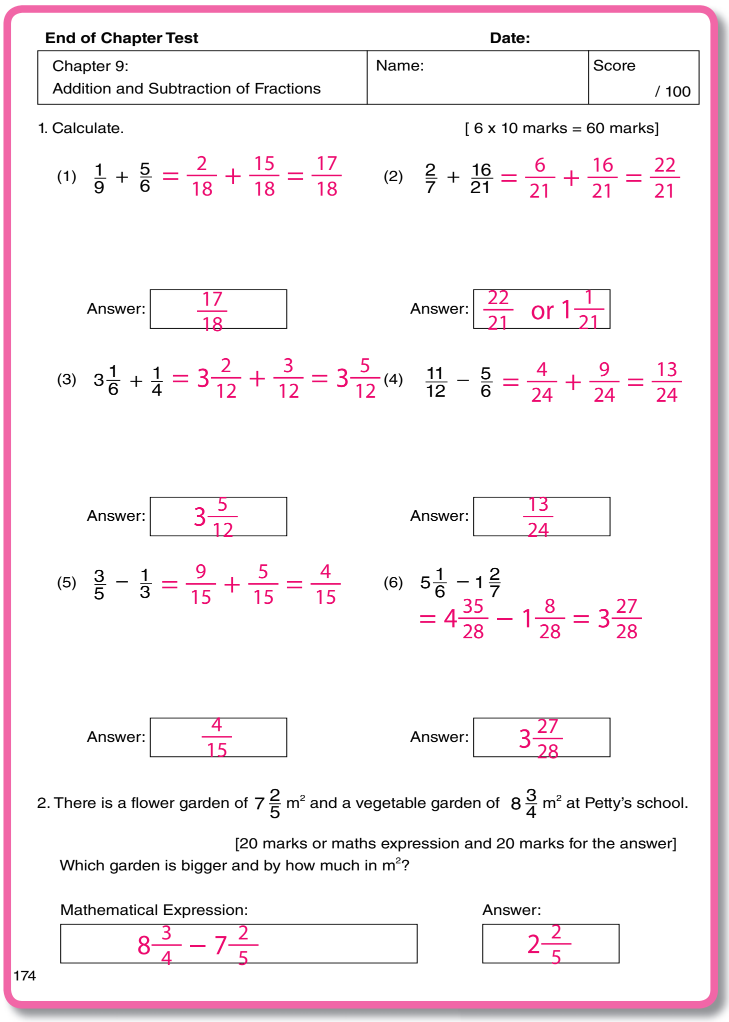
T Confirm students' answers.

TN ① Calculating addition and subtraction of fractions and mixed fractions.
② Word problem involving calculations of fractions.
③ Identifying the correct processes in calculating with fractions.

2 Complete the Evaluation Test

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

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 9: Addition and Subtraction of Fractions	Name:	Score / 100

1. Calculate. [6 x 10 marks = 60 marks]

(1) $\frac{1}{9} + \frac{5}{6} = \frac{2}{18} + \frac{15}{18} = \frac{17}{18}$

Answer: $\frac{17}{18}$

(2) $\frac{2}{7} + \frac{16}{21} = \frac{6}{21} + \frac{16}{21} = \frac{22}{21}$

Answer: $\frac{22}{21}$ or $1\frac{1}{21}$

(3) $3\frac{1}{6} + \frac{1}{4} = 3\frac{2}{12} + \frac{3}{12} = 3\frac{5}{12}$

Answer: $3\frac{5}{12}$

(4) $\frac{11}{12} - \frac{5}{6} = \frac{4}{24} + \frac{9}{24} = \frac{13}{24}$

Answer: $\frac{13}{24}$

(5) $\frac{3}{5} - \frac{1}{3} = \frac{9}{15} + \frac{5}{15} = \frac{4}{15}$

Answer: $\frac{4}{15}$

(6) $5\frac{1}{6} - 1\frac{2}{7}$
$= 4\frac{35}{28} - 1\frac{8}{28} = 3\frac{27}{28}$

Answer: $3\frac{27}{28}$

2. There is a flower garden of $7\frac{2}{5}$ m^2 and a vegetable garden of $8\frac{3}{4}$ m^2 at Petty's school.

[20 marks or maths expression and 20 marks for the answer]

Which garden is bigger and by how much in m^2?

Mathematical Expression: $8\frac{3}{4} - 7\frac{2}{5}$

Answer: $2\frac{2}{5}$

174

End of Chapter Test **Date:**

Chapter 9: Addition and Subtraction of Fractions	Name:	Score / 100

[6×10 marks = 60 marks]

1. Calculate.

(1) $\frac{1}{9}+\frac{5}{6}$

Answer:

(2) $\frac{2}{7}+\frac{16}{21}$

Answer:

(3) $3\frac{1}{6}+\frac{1}{4}$

Answer:

(4) $\frac{11}{12}-\frac{5}{6}$

Answer:

(5) $\frac{3}{5}-\frac{1}{3}$

Answer:

(6) $5\frac{1}{6}-1\frac{2}{7}$

Answer:

2. There is a flower garden of $7\frac{2}{5}$ m² and a vegetable garden of $8\frac{3}{4}$ m² at Petty’s school.
[20 marks or maths expression and 20 marks for the answer]

Which garden is bigger and by how much in m²?

Mathematical Expression:

Answer:

Chapter 10 Area of Figures

1. Content Standard

5.2.1 Develop the formula to calculate areas of parallelogram, triangle, trapezium, rhombus and understand their transformation.

2. Unit Objectives

- To deepen understanding on how to find out the area of various plane figures.
- To think about how to find the area of triangle, parallelogram, rhombus and trapezoid.
- To master calculation for finding the areas of various shapes.

3. Teaching Overview

Students know that area can be known by being familiar with squares of 1cm2. In this unit, students will change their concept of knowing area from paving to utilizing known formula. In other words, students will transform the shape of a figure to another shape by maintaining its area. This utilisation will develop students' ability of mathematical thinking. They should understand the meaning of each formula and be able to explain why the formula is completed by referring to their experiences of transformations.

Area of Parallelograms :

They find the area of parallelogram by transforming the shape of a rectangle to a parallelogram since they already know the area of a rectangle. The misconception of finding the area of a parallelogram as base × another side would be avoided if they experience the transformation of the shape from a rectangle to a parallelogram.

Area of Triangles :

They will know the area of triangles based on the area of a rectangle and a parallelogram. Encourage students to find more ideas of transformations from known shapes. They should discuss more on the meaning of “÷2”.

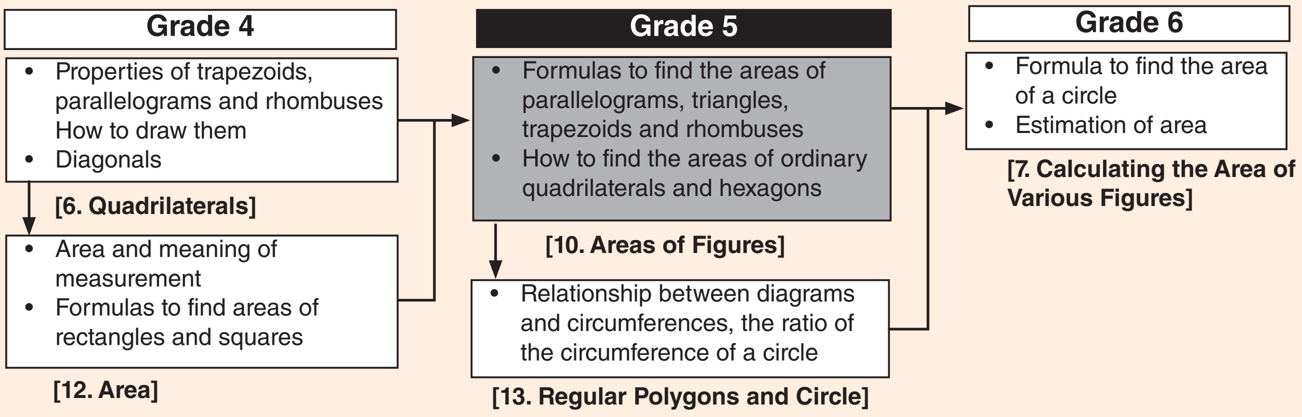
Area of Trapezoids and Rhombuses :

They can utilise the idea of transformation to parallelograms and triangles. They will also be able to find the differences which are the utilisation of diagonals and the existence of upper bottom. Students need to interpret the meaning of formulas. Corresponding each part of shape and formula using the same colours of chalks will help students to understand the meaning.

Thinking about How to Find the Area :

They can separately think about the area of known shapes. The ways of separations will be varied and they should be recognised as long as they are correct.

4. Related Learning Contents



Unit
10

Unit: Area of Figures

Sub-unit 1: Area of Parallelograms

Lesson 1 of 4

Textbook Page : 130 to 132
Actual Lesson 088

Sub-unit Objectives

- To understand the meaning of the formula for finding area of parallelogram.
- To find the area of parallelogram using the formula.

Preparation

- To get the area of parallelogram compared to area of rectangle by applying equivalency transformation and transforming it into a rectangle.

Lesson Objective

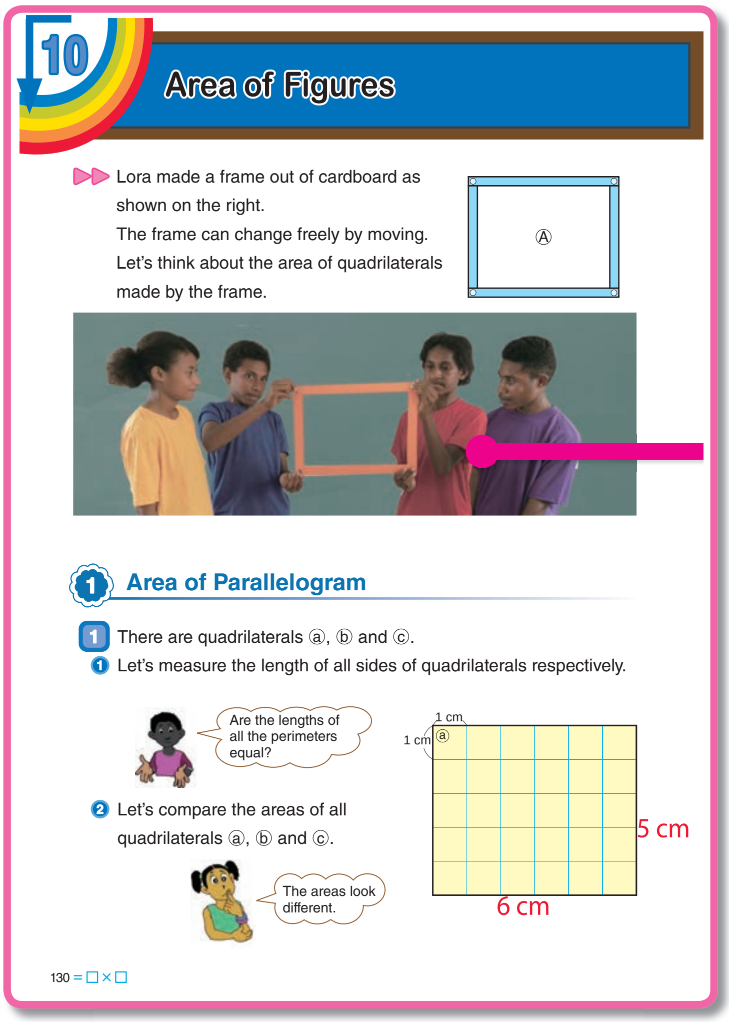
- Quadrilaterals (Grade 4)
- Area of Rectangles and Squares (Grade 4)

Prior Knowledge

- Movable frame using hard paper and paper clips
- Shape ⓐ, ⓑ and ⓒ on grid paper in 1 for each students

Assessment

- Apply the prior knowledge on the area of rectangle to find the area of parallelogram. F
- Understand the relationship between a parallelogram and a rectangle. S



10 Area of Figures

Lora made a frame out of cardboard as shown on the right.
The frame can change freely by moving.
Let's think about the area of quadrilaterals made by the frame.

① Area of Parallelogram

1 There are quadrilaterals ⓐ, ⓑ and ⓒ.

① Let's measure the length of all sides of quadrilaterals respectively.

② Let's compare the areas of all quadrilaterals ⓐ, ⓑ and ⓒ.

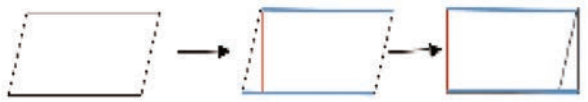
130 = ☐ × ☐

Teacher's Notes

It is important to assist the students to see that the sides of parallelogram can be seen as lower base or upper base, overlap or relate rectangle with parallelogram to indicate which side or part of diagram are applicable like Length and Width.

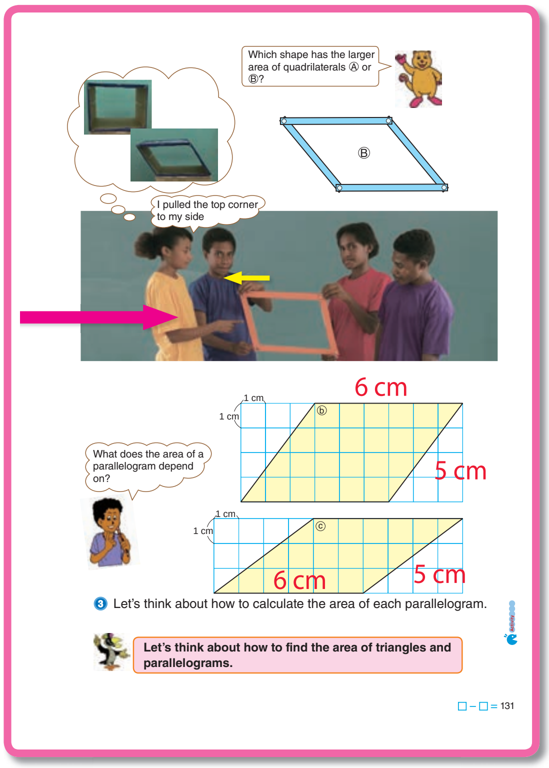
Equivalency Transformation is a transformation of figures without changing their original size or area such as illustrated below:

① Parallelogram ② Cut out a Triangle ③ Paste to make rectangle



① Parallelogram ② Cut out from anywhere ③ Paste to form rectangle

Making the movable frame using strips of hard paper and 4 paper clips



③ Let's think about how to calculate the area of each parallelogram.

Let's think about how to find the area of triangles and parallelograms.

☐ − ☐ = 131

Lesson Flow

1 Transforming rectangles into various Parallelograms.

T Introduce figures using the frame that can move freely.

S Identify different parallelogram that can be formed, apart from the rectangle.

T Put up the shapes ⓐ, ⓑ and ⓒ. "Compare the lengths and area, what can you notice about the three shapes?"

S Observe the shapes ⓐ, ⓑ and ⓒ and discuss with friends about the differences found in the shape in terms of perimeter and area.

2 ① Predict the size of a parallelogram and a rectangle with the same length of perimeter.

T ① "Are the lengths of all sides of the three parallelograms the same?"

S By observing the sides students predict their answer. Notice that it is the same.

T ② "How about comparing the areas of the quadrilaterals?"

S "Find the area of the rectangle by using area formula (Area = L × W)".

S The area formula for rectangle cannot be applied to parallelogram.

3 ③ Think about how to find the area of parallelogram.

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

T Ask students to explain how to get the area of a parallelogram, focusing on one of them.

S Use diagram to show how to get the area by cutting the triangle part and pasting it on the other side of parallelogram to make a rectangle.

T Confirm students' ideas and ask them why they used the idea of cutting.

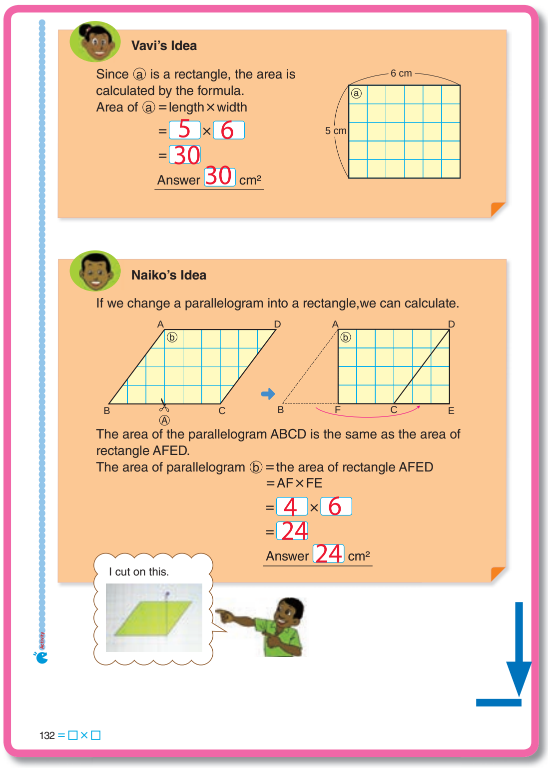
S Possible responses.
- Change the parallelogram to a known shape for easier calculation.
- Transform the parallelogram to a rectangle and use L × W to find the area of parallelogram.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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



Vavi's Idea

Since ⓐ is a rectangle, the area is calculated by the formula.

Area of ⓐ = length × width

$= \boxed{5} \times \boxed{6}$

$= \boxed{30}$

Answer $\boxed{30}$ cm²

Naiko's Idea

If we change a parallelogram into a rectangle,we can calculate.

The area of the parallelogram ABCD is the same as the area of rectangle AFED.

The area of parallelogram ⓑ = the area of rectangle AFED

= AF × FE

$= \boxed{4} \times \boxed{6}$

$= \boxed{24}$

Answer $\boxed{24}$ cm²

132 = □ × □

Sample Blackboard Plan

Lesson 088 Sample Blackboard Plan is on page 179.

Unit
10

Unit: Area of Figures

Sub-unit 1: Area of Parallelograms

Lesson 2 of 4

Textbook Page :
133 and 134
Actual Lesson 089

Lesson Objectives

- To think about the necessary lengths to find out the area of parallelogram.
- To know the terms ’base’ and ’height’ and develop the formula of parallelogram.
- To measure the necessary length and find the area of parallelogram.

Prior Knowledge

- Equivalency transformation
- Previous lesson

Preparation

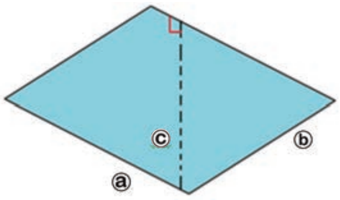
- Parallelogram drawn on the grid lines for ④ and ⑤

Assessment

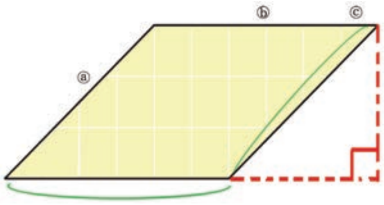
- Identify the required lengths to develop the formula for parallelogram. **F**
- Measure the lengths without using grids and find the area of parallelogram by applying its formula. **S**

Teacher’s Notes

How to find the base and height is very important since students tend to be confused.
Example:
Some students choose ⓐ as base and ⓑ as height when correct answer is when ⓐ is the base then ⓒ is the height. The perpendicular length to the base is the height.

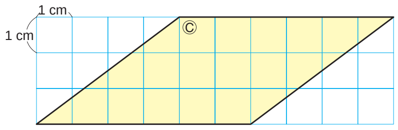


Stress to students that the height should be a perpendicular line to the base.
The correct answer is when ⓐ is the base and ⓒ is the height, so therefore ⓒ is perpendicular to ⓐ.

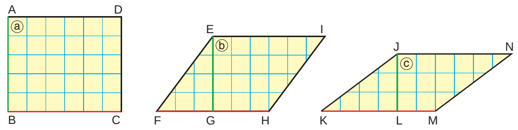


④ Check the lengths of the parallelogram used in ⓒ to find the height and the area.

Length: 6 cm, Width: 3 cm, Area = 6 × 3 = 18 cm^2



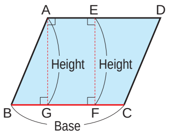
⑤ Which lengths do you use to find the area of quadrilaterals ⓐ, ⓑ and ⓒ?



AB and BC　FH and EG　KM and JL

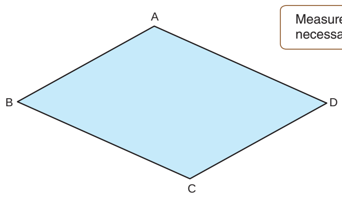
Remember! Perpendicular line intersected at right angle (90°).

Mark one side of a parallelogram the **base**.
Lines AG, EF and other lines, which are perpendicular to base BC, are all the same length.
The length of these line are called **height** against the base BC.



The area of parallelogram = base × height

② Let’s find the area of the parallelogram below.



Measure the necessary lengths.

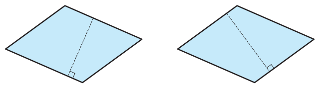
① When side BC is the base, find the area by measuring the height.

Area = 6 × 4 = 24cm^2)

② When side CD is the base, find the area by measuring the height.

Area = 5 × 4.8 = 24cm^2)

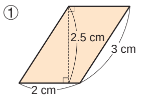
The height depends on the base.



Exercise

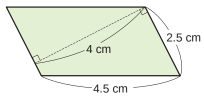
Let’s find the area of the following parallelograms.

①



5 cm^2

②



10 cm^2

Lesson Flow

1 Review the previous lesson.

2 ④ Find the length needed to calculate the area of parallelogram ⓒ.

T Check the lengths of the parallelogram used in ⓒ to find the height and then find the area.
S Work individually to find the lengths which are needed to find the area of parallelogram ⓒ
S Share their answers with others.
T Check and confirm students' answers.
T Introduce the Main Task. (Refer to the BP)

3 ⑤ Construct a formula for the area of parallelogram.

T Using the diagrams ⓐ, ⓑ and ⓒ, ask students to find the lengths needed to calculate the area of parallelogram.
S Discuss and identify the required lengths to find the area.
TN Height (green) and the base (red) are the required lenghts.

4 Important Point

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

5 2 Find the area of parallelogram without using the grid.

T Let's find the area of the parallelogram.
S Measure the required lengths and use the formula to calculate the area of parallelogram.
TN ① When side BC is the base;
Area = 6 × 4 = (24 cm²)
② When side CD is the base, find the area by measuring the height; Area = 5 × 4.8 = 24 (cm²).
T Check and confirm students' answers.

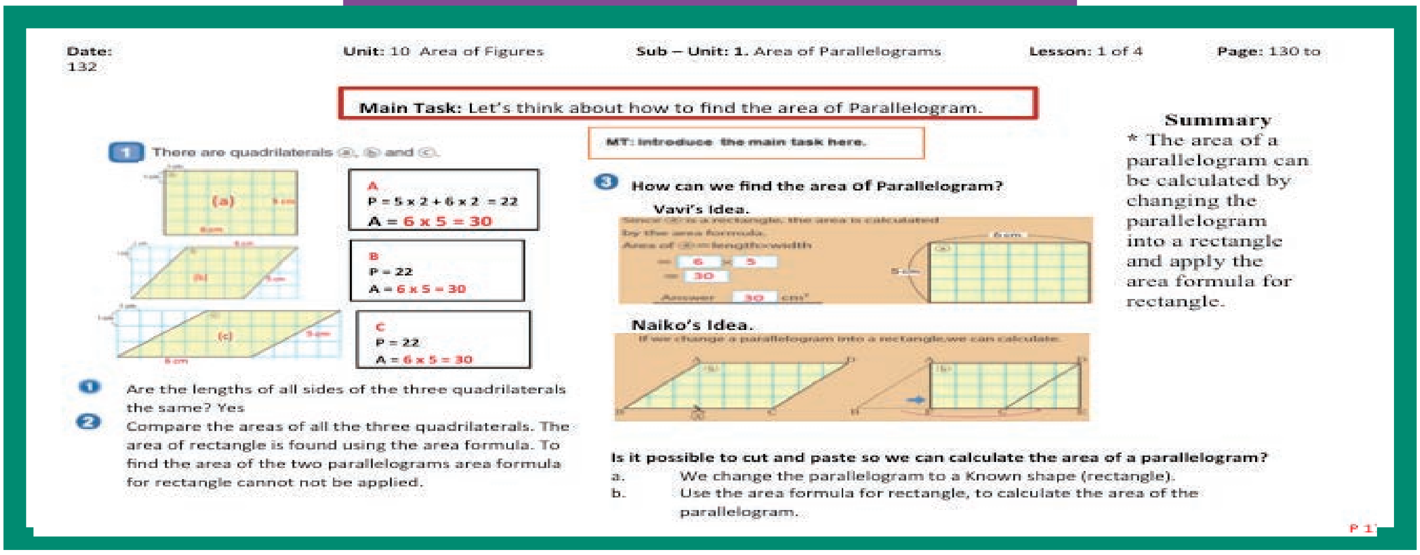
6 Important Point

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

7 Complete the Exercise

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

Sample Black Board Plan (Lesson 88)



Date: 132 **Unit:** 10 Area of Figures **Sub – Unit: 1.** Area of Parallelograms **Lesson:** 1 of 4 **Page:** 130 to

Main Task: Let's think about how to find the area of Parallelogram.

1 There are quadrilaterals ⓐ, ⓑ and ⓒ.

A
P = 5 x 2 + 6 x 2 = 22
A = 6 x 5 = 30

B
P = 22
A = 6 x 5 = 30

C
P = 22
A = 6 x 5 = 30

① Are the lengths of all sides of the three quadrilaterals the same? Yes

② Compare the areas of all the three quadrilaterals. The area of rectangle is found using the area formula. To find the area of the two parallelograms area formula for rectangle cannot not be applied.

MT: introduce the main task here.

③ How can we find the area of Parallelogram?

Vavi's Idea.
Since ⓐ is a rectangle, the area is calculated by the area formula.
Area of ⓐ = length×width
= 6 × 5
= 30
Answer 30 cm²

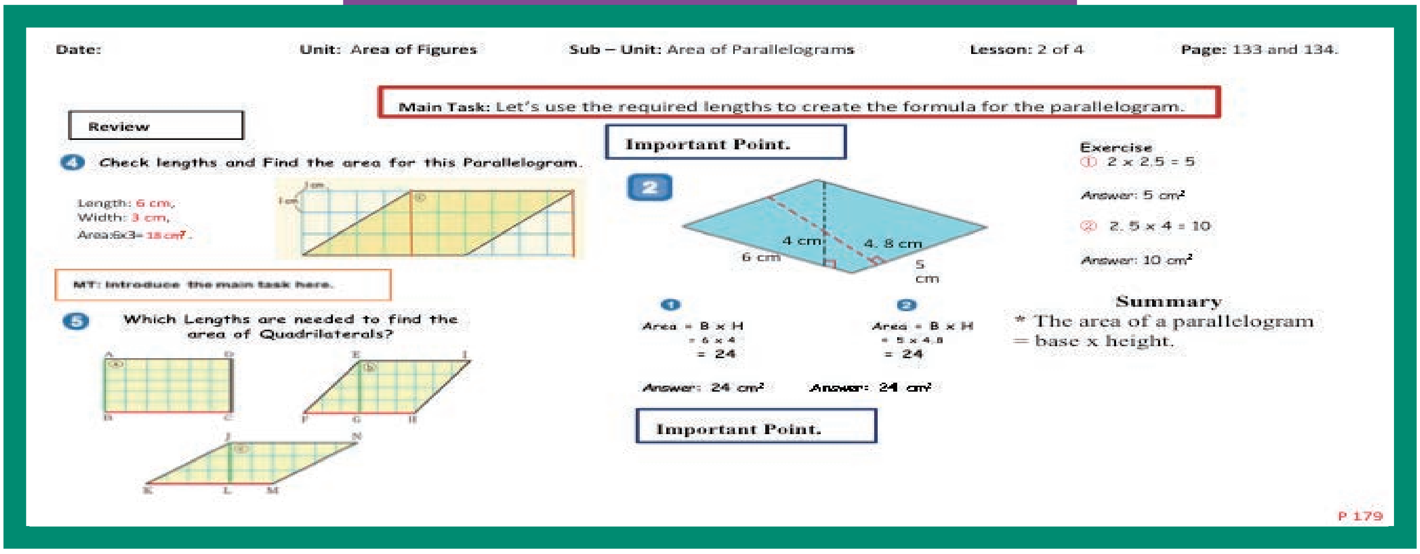
Naiko's Idea.
If we change a parallelogram into a rectangle,we can calculate.

Is it possible to cut and paste so we can calculate the area of a parallelogram?
a. We change the parallelogram to a Known shape (rectangle).
b. Use the area formula for rectangle, to calculate the area of the parallelogram.

Summary
* The area of a parallelogram can be calculated by changing the parallelogram into a rectangle and apply the area formula for rectangle.

P 1

Sample Black Board Plan (Lesson #89)



Date: **Unit:** Area of Figures **Sub – Unit:** Area of Parallelograms **Lesson:** 2 of 4 **Page:** 133 and 134.

Main Task: Let's use the required lengths to create the formula for the parallelogram.

Review

④ Check lengths and Find the area for this Parallelogram.

Length: 6 cm,
Width: 3 cm,
Area:6x3= 18 cm².

MT: introduce the main task here.

⑤ Which Lengths are needed to find the area of Quadrilaterals?

Important Point.

2

①
Area = B x H
= 6 x 4
= 24
Answer: 24 cm²

②
Area = B x H
= 5 x 4.8
= 24
Answer: 24 cm²

Important Point.

Exercise
① 2 x 2.5 = 5
Answer: 5 cm²
② 2. 5 x 4 = 10
Answer: 10 cm²

Summary
* The area of a parallelogram = base x height.

P 179

Unit 10

Unit: Area of Figures

Sub-unit 1: Area of Parallelograms

Lesson 3 of 4

Textbook Page : 135
Actual Lesson 090

Lesson Objectives

- To think about how to find the perpendicular height of a parallelogram.
- Find the area of the parallelogram using the base and the perpendicular height.

Prior Knowledge

- Formula for area of parallelogram

Preparation

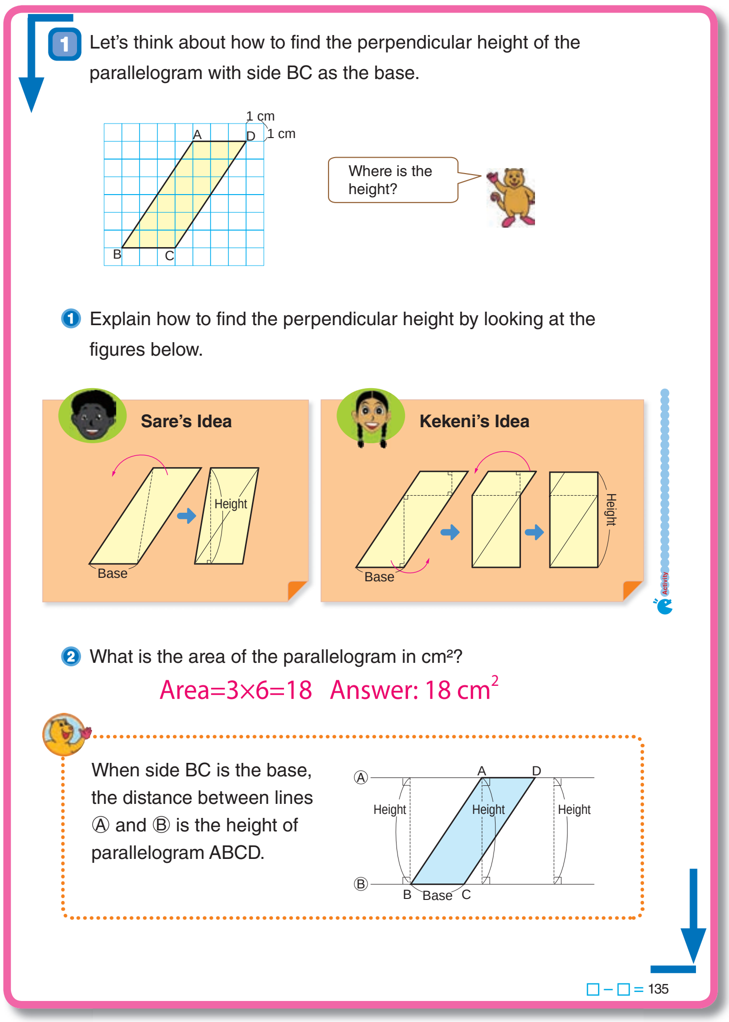
- Grid paper
- Chart showing Sare's and Kekeni's Ideas

Assessment

- Find the perpendicular height of a parallelogram. **F**
- Find the area of a parallelogram using the base and the perpendicular height. **S** **F**

Teacher's Notes

- Use grid papers for easier method in finding the perpendicular height of the parallelogram in **3**.
- The height of the parallelogram can be located anywhere between the top and bottom bases.



1 Let's think about how to find the perpendicular height of the parallelogram with side BC as the base.

① Explain how to find the perpendicular height by looking at the figures below.

Sare's Idea

Kekeni's Idea

② What is the area of the parallelogram in cm²?

Area=3×6=18 Answer: 18 cm^2

When side BC is the base, the distance between lines Ⓐ and Ⓑ is the height of parallelogram ABCD.

□ − □ = 135

Lesson Flow

1 Review the previous lesson.

2 ③ Find the perpendicular height of parallelogram.

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

T Refer to the diagram in the textbook.
“Where is the height?”

S Use grid papers to express idea on how to find the height and share with friends.

3 Find out the height and calculate the area.

TN Let students to compare their ideas with Sare’s and Kekeni’s Ideas.

T ① Ask students to study the ideas of the students in the textbook.

T Explain and display the idea in the textbook on the board.
Find a perpendicular line between upper and lower bases.
Make a parallelogram or rectangle by applying equivalency transformation using Sare’s and Kekeni’s ideas.

S Height is the line connecting the lower base and upper base.

S Height should be perpendicular to the base.

T Confirm students’ ideas to find the height by cutting or folding the parallelogram to known shapes.

T Ask students to complete activity ②.

S ② Area = 3 × 6 = 18
Answer: 18 cm^2

4 Important Point

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

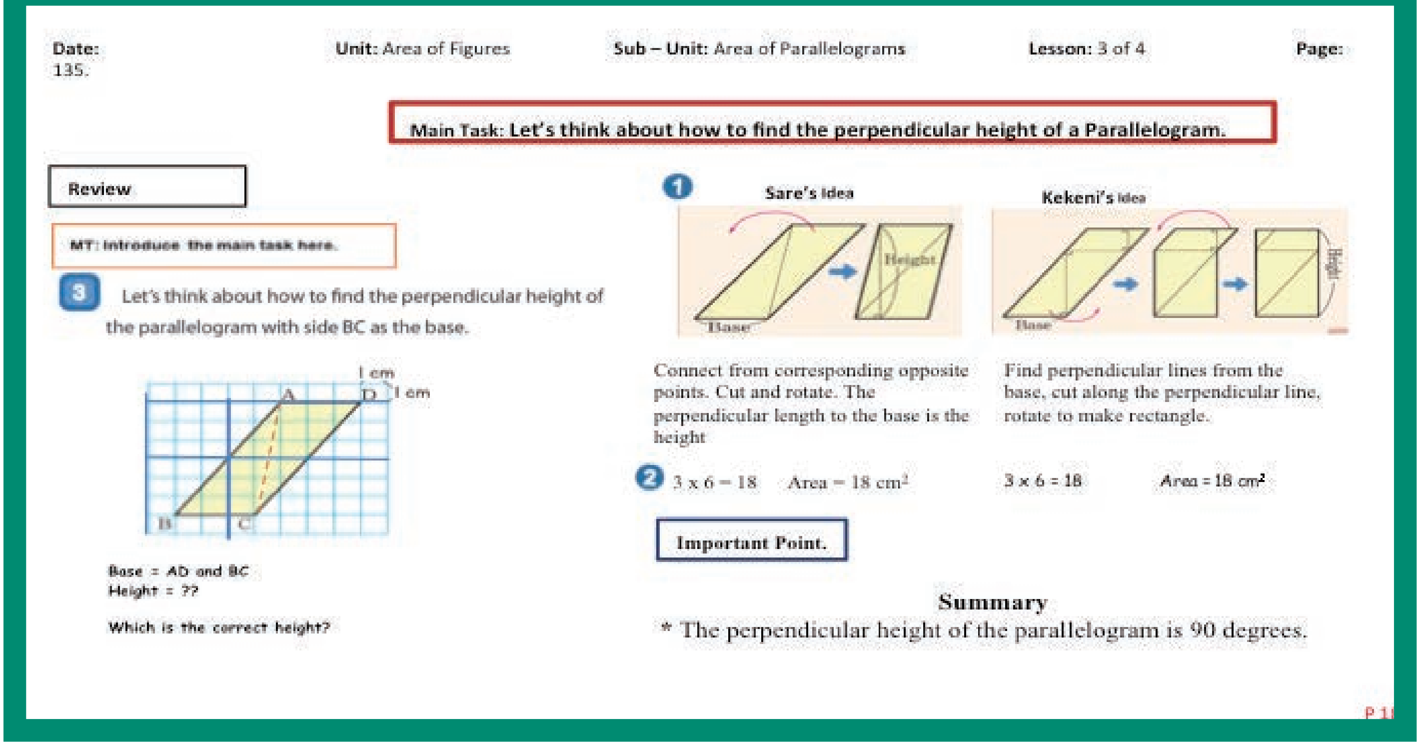
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: 135.
Unit: Area of Figures
Sub – Unit: Area of Parallelograms
Lesson: 3 of 4
Page:

Main Task: Let’s think about how to find the perpendicular height of a Parallelogram.

Review

MT: Introduce the main task here.

③ Let’s think about how to find the perpendicular height of the parallelogram with side BC as the base.

Base = AD and BC
Height = ??

Which is the correct height?

① **Sare’s Idea**

Connect from corresponding opposite points. Cut and rotate. The perpendicular length to the base is the height

Kekeni’s Idea

Find perpendicular lines from the base, cut along the perpendicular line, rotate to make rectangle.

② 3 x 6 = 18 Area = 18 cm^2

3 x 6 = 18 Area = 18 cm^2

Important Point.

Summary
* The perpendicular height of the parallelogram is 90 degrees.

P 1

Unit 10

Unit: Area of Figures

Sub-unit 1: Area of Parallelograms

Lesson 4 of 4

Textbook Page : 136
Actual Lesson 091

Lesson Objectives

- To think about the relationship between area, height and base of parallelogram.
- To find the base from the area and height of the parallelogram.

Prior Knowledge

- How to find the various types of parallelogram using formula

Preparation

- Prepare diagram on grid paper for 4.

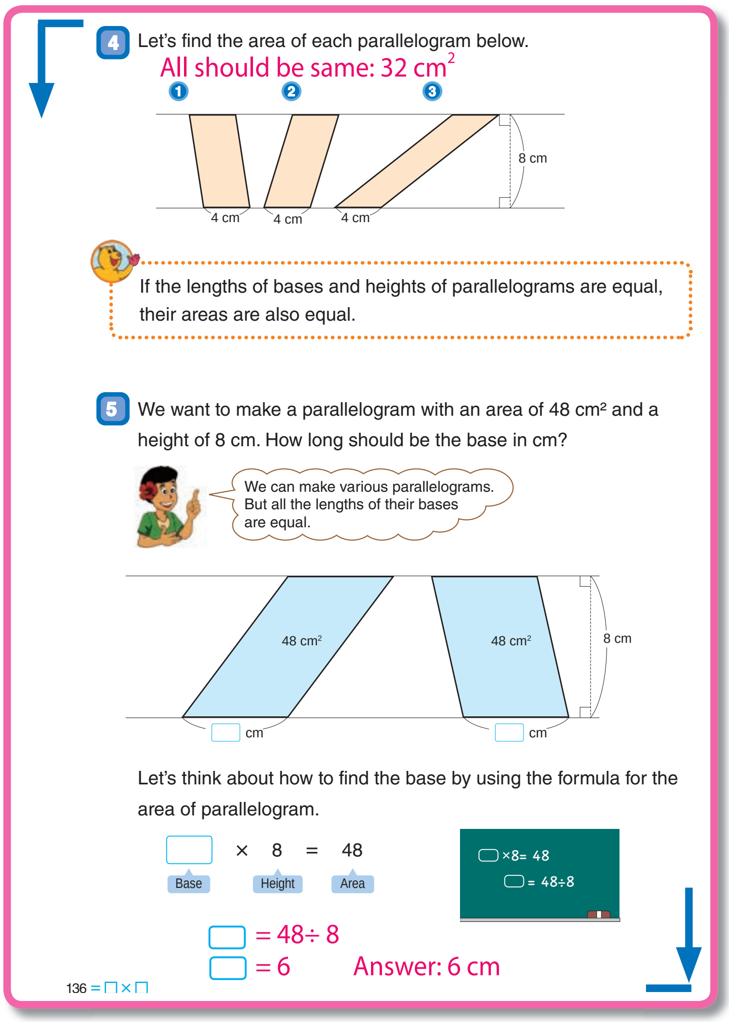
Assessment

- Understand and explain the relationship between area, height and base of parallelogram. F
- Find the base from the area and the height of parallelogram. S

Teacher's Notes

The key points in this lesson is to:

- Confirm whether students can find the area of parallelograms when their bases and heights are the same.
- Correctly apply the area formula to find out the base or the height, based on this understanding.



4 Let's find the area of each parallelogram below.

All should be same: 32 cm^2

If the lengths of bases and heights of parallelograms are equal, their areas are also equal.

5 We want to make a parallelogram with an area of 48 cm² and a height of 8 cm. How long should be the base in cm?

We can make various parallelograms. But all the lengths of their bases are equal.

Let's think about how to find the base by using the formula for the area of parallelogram.

☐ × 8 = 48
Base Height Area

☐ ×8= 48
☐ = 48÷8

☐ = 48÷ 8
☐ = 6 Answer: 6 cm

136 = ☐ × ☐

Lesson Flow

1 4 Predict the size of area whether it is larger or smaller.

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

T Direct the students attention to task 4 on the blackboard and ask them to predict which parallelogram has a larger area and explain the reason why they think so.

TN Possible student responses:

- ① looks similar to ②, because of the base and height are the same.
- ① looks larger than ③, because of the space inside ① looks wider.

S Present ideas on the blackboard.

2 Find the area of the parallelograms.

T Find the area for parallelograms ①, ② and ③.

S Work individually to find the areas of parallelograms.

T Ask students to share their answers in pairs. “What do you notice?”

S Discuss and share their answers in pairs.

3 Important Point

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

4 5 Find the length of base using the area and length of height.

T We want to make a parallelogram with an area of 48 cm² and a height of 8 cm.
How long should be the base in cm?

S Discuss in pairs on how to find the base.

T Ask few students to share their answers to the class using the blackboard.

S Share their answers with the class using the blackboard for explanation.

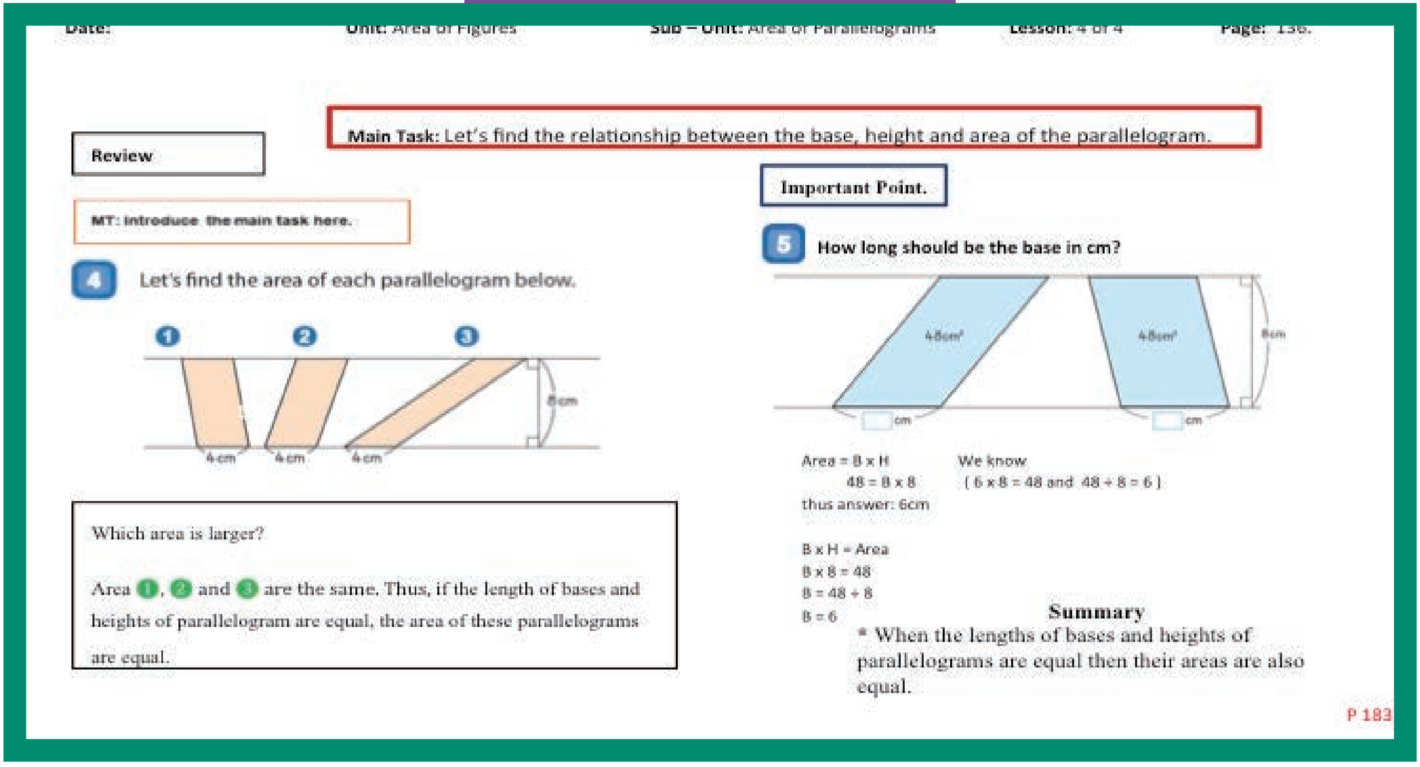
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Unit: Area of Figures Sub – Unit: Area of Parallelograms Lesson: 4 of 4 Page: 136.

Main Task: Let’s find the relationship between the base, height and area of the parallelogram.

Review

MT: introduce the main task here.

4 Let’s find the area of each parallelogram below.

Which area is larger?

Area ①, ② and ③ are the same. Thus, if the length of bases and heights of parallelogram are equal, the area of these parallelograms are equal.

Important Point.

5 **How long should be the base in cm?**

Area = B x H
48 = B x 8
thus answer: 6cm

We know
(6 x 8 = 48 and 48 ÷ 8 = 6)

B x H = Area
B x 8 = 48
B = 48 ÷ 8
B = 6

Summary

* When the lengths of bases and heights of parallelograms are equal then their areas are also equal.

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Unit 10

Unit: Area of Figures
Sub-unit 2: Area of Triangles
Lesson 1 of 4

Textbook Page : 137 to 139
Actual Lesson 092

Sub-unit Objectives

- To understand how to calculate the area of triangle and the meaning of the formula.
- To calculate the area of triangle by applying the area formula for triangle.

Lesson Objectives

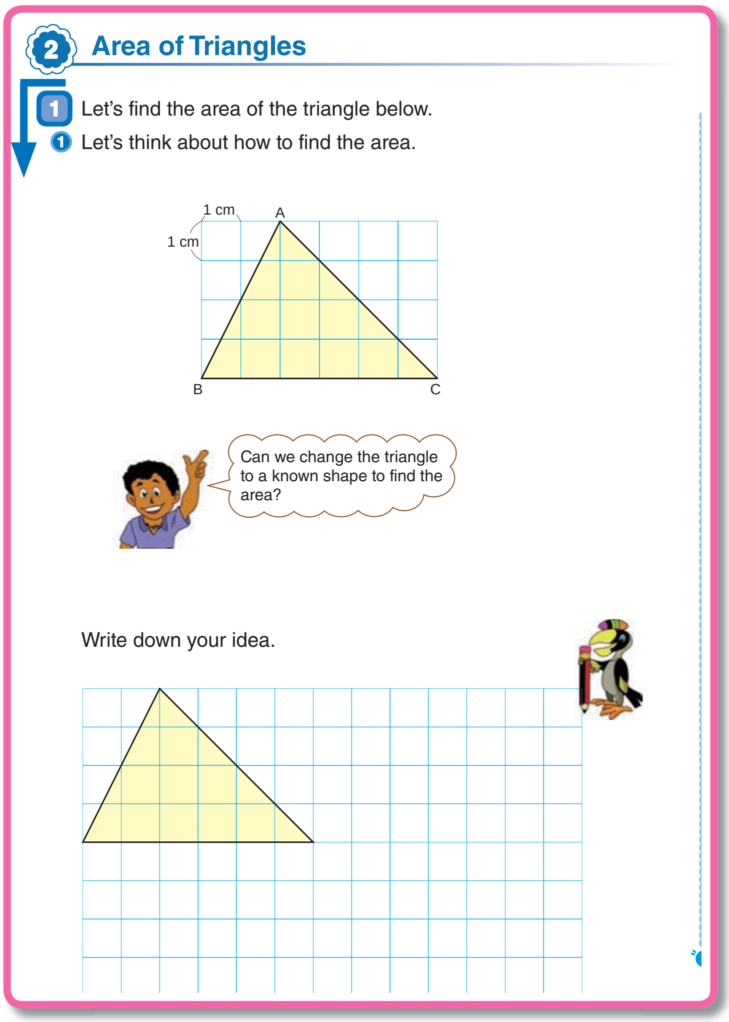
- To think about how to find the area of a triangle by applying the equivalency transformation or multiple transformation.
- To calculate the area of triangle by applying the area formula for triangle.

Prior Knowledge

- Area of Parallelograms
- Finding the area using the formula for the area of different parallelograms and rectangles

Preparation

- Grid papers, Enlarge drawing of a triangle on a chart and different ideas presented on charts



② **Area of Triangles**

1 Let's find the area of the triangle below.

① Let's think about how to find the area.

Write down your idea.

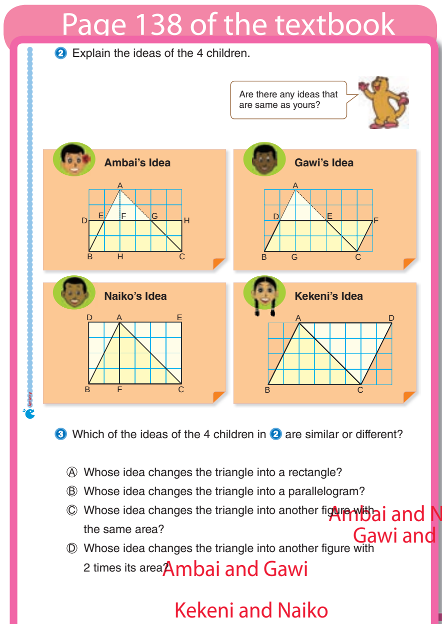
Assessment

- Think about how to find the area of a triangle based on equivalency and multiple transformation. F
- Explain how to find the area of a triangle. S

Teacher's Notes

Multiple Transformation is to combine another same figure to the original figure in which the area formula is known.
Students have already understood Equivalency transformation to find the area of parallelogram. It's important for teachers to let them understand and explain how to apply it for the area of triangle.

Page 138 of the textbook



② Explain the ideas of the 4 children.

③ Which of the ideas of the 4 children in ② are similar or different?

Ⓐ Whose idea changes the triangle into a rectangle?

Ⓑ Whose idea changes the triangle into a parallelogram?

Ⓒ Whose idea changes the triangle into another figure with the same area?

Ambai and Naiko

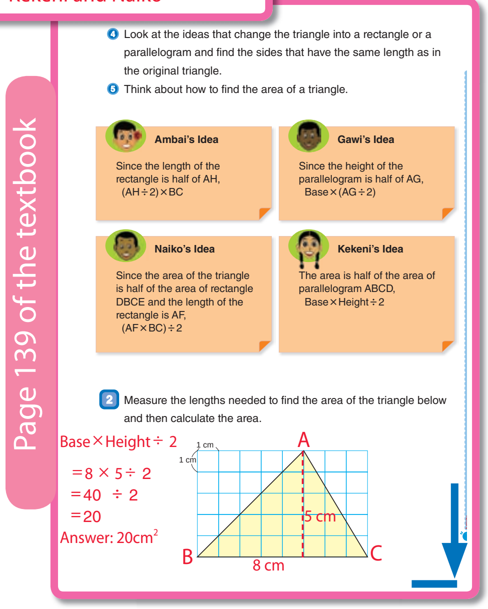
Gawi and Kekeni

Ⓓ Whose idea changes the triangle into another figure with 2 times its area?

Ambai and Gawi

Kekeni and Naiko

Page 139 of the textbook



④ Look at the ideas that change the triangle into a rectangle or a parallelogram and find the sides that have the same length as in the original triangle.

⑤ Think about how to find the area of a triangle.

Ambai's Idea
Since the length of the rectangle is half of AH,
(AH÷2)×BC

Gawi's Idea
Since the height of the parallelogram is half of AG,
Base×(AG÷2)

Naiko's Idea
Since the area of the triangle is half of the area of rectangle DBCE and the length of the rectangle is AF,
(AF×BC)÷2

Kekeni's Idea
The area is half of the area of parallelogram ABCD,
Base×Height÷2

2 Measure the lengths needed to find the area of the triangle below and then calculate the area.

Base×Height÷ 2
=8 × 5÷ 2
=40 ÷ 2
=20
Answer: $20cm^2$

Lesson Flow

1 Review the previous lesson.

2 1 Let's find the area of the triangle.

T ① Let's try to think about how to find the area of a triangle.

S Think about how to find the area of the triangle.

T Can we change the triangle to a known shape?

S Discuss and write down own ideas and share.

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

3 How to find the area of a triangle.

T ② Explain the ideas of 4 students.

1. **Ambai's Idea: Equivalency Transformation**

TN Draw a small rectangle (BCDEFGH) on top of the original triangle. Then, find the length of the rectangle which is going to be half of AH (the line running down from A to H) 2 small right triangles out of rectangle are the same as those inside of the rectangle. Therefore, the area of triangle is the same as that of the rectangle.

2. **Gawi's Idea: Equivalency transformation**

TN A small parallelogram (BCDEFG) is drawn. Use the length of the parallelogram with the height of the parallelogram which is the line in the middle that is half of AG (the height of the triangle). One small triangle out of the parallelogram is equal to the triangle inside of the parallelogram. Then, the area of triangle is the same as that of the parallelogram.

3. **Naiko's Idea: Multiple transformation**- refer to teacher's notes for explanation.

TN A big rectangle is drawn on top of the triangle. The area of the two small right triangles is half of the area of the 2 small rectangle. Since the area of each small triangle is the half of the each small rectangle.

4. **Kekeni's Idea: Multiple transformation**

TN Draw a triangle as the opposite side of the original triangle with the same shape and size so that a big parallelogram is formed. Therefore, the area of the triangle is half of the area of parallelogram ABCD.

T ③ Which of the 4 childrens ideas are similar or different?

S Ⓐ which one changes the triangle into a rectangle? Ambai's and Naiko's ideas.

S Ⓑ which one changes the triangle into a parallelogram? Gawi's and Kekeni's ideas.

S Ⓒ which one changes the triangle into other figure with the same area? Ambai's and Gawi's ideas.

S Ⓓ which one changes the triangle into other figure with the 2 times area? Naiko's and Kekeni's ideas.

T ④ Look at the ideas that change the triangle into a rectangle or a parallelogram, find the sides that have the same lenght as in the original triangle.

S All sides are changed but the base remains the same.

4 ⑤ Think about how to find the area of a triangle.

T Calculate the area based on each students' ideas.

TN Explain the blackboard plan and display the explanations below the diagrams.

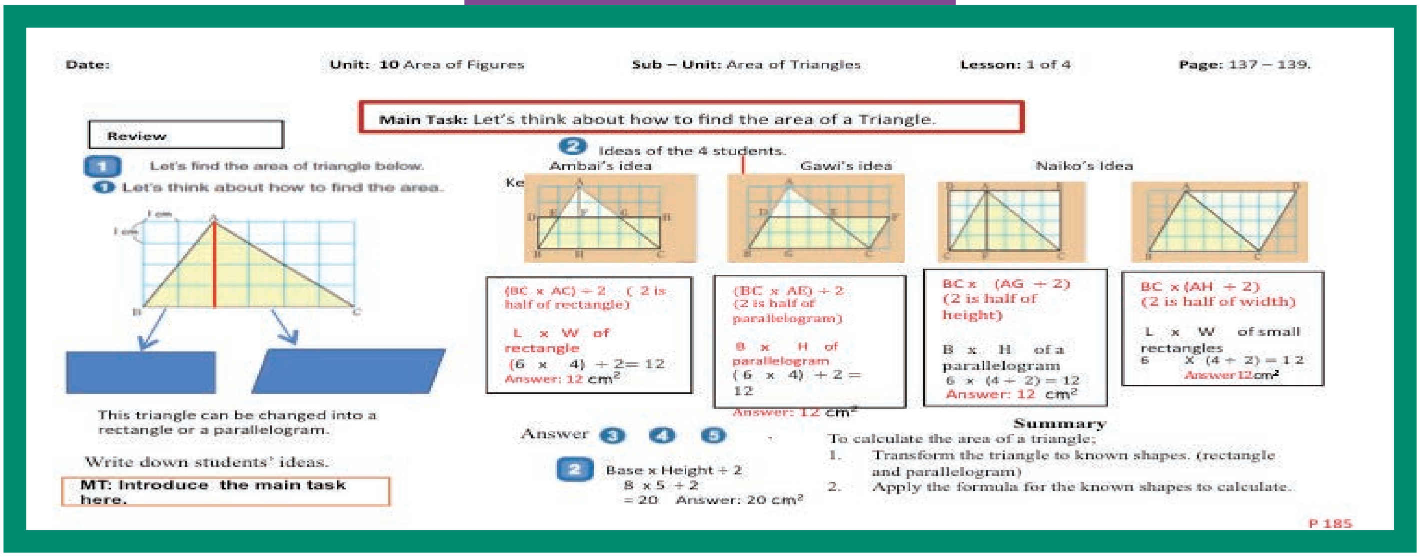
5 2 Find the lengths required to calculate the area.

T Let students find out the lengths required to calculate the area of a triangle.

S Base (8 cm), and height (5 cm) are used to calculate the area of the triangle.

$8 \times 5 \div 2 = 20$ cm²

Sample Blackboard Plan



Date: **Unit:** 10 Area of Figures **Sub – Unit:** Area of Triangles **Lesson:** 1 of 4 **Page:** 137 – 139.

Main Task: Let's think about how to find the area of a Triangle.

Review

1 Let's find the area of triangle below.

① Let's think about how to find the area.

This triangle can be changed into a rectangle or a parallelogram.

Write down students' ideas.

MT: Introduce the main task here.

② Ideas of the 4 students.

Ambai's idea: (BC x AC) ÷ 2 (2 is half of rectangle) L x W of rectangle (6 x 4) ÷ 2= 12 Answer: 12 cm²

Gawi's idea: (BC x AE) ÷ 2 (2 is half of parallelogram) B x H of parallelogram (6 x 4) ÷ 2 = 12 Answer: 12 cm²

Naiko's Idea: BC x (AG ÷ 2) (2 is half of height) B x H of a parallelogram 6 x (4 ÷ 2) = 12 Answer: 12 cm²

Ke: BC x (AH ÷ 2) (2 is half of width) L x W of small rectangles 6 X (4 ÷ 2) = 1 2 Answer 12cm²

Answer ③ ④ ⑤

2 Base x Height ÷ 2
8 x 5 ÷ 2
= 20 Answer: 20 cm²

Summary

To calculate the area of a triangle;

1. Transform the triangle to known shapes. (rectangle and parallelogram)
2. Apply the formula for the known shapes to calculate.

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Unit 10

Unit: Area of Figures

Sub-unit 2: Area of Triangles

Lesson 2 of 4

Textbook Page : 140
Actual Lesson 093

Lesson Objectives

- To understand the relationship between the base of the triangle and the height and make a formula of the triangle.
- To measure the required length of the triangle and find the area.
- To use the area formula for triangle to find the area of a triangle.

Prior Knowledge

- Finding the area of a Triangle

Preparation

- Grid paper, Enlarge drawing of a triangle on a chart for 3

Assessment

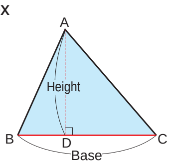
- Identify and understand the relationship between the base and the height of a triangle and derive the formula. F
- Calculate the area of a triangle using the formula. S
- Complete the Exercise correctly. S

Teacher's Notes

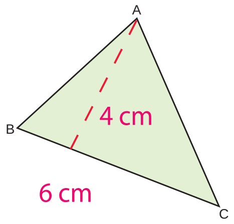
- Ensure the students use rulers to measure the heights of the triangles when each of the three sides are bases.
- The area of the triangle will be the same even though the base and the height are measured from three different lengths.

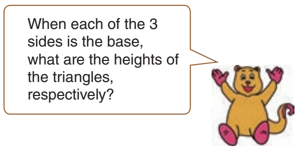
Draw a perpendicular line AD from the vertex A to the opposite side BC of the triangle. Side BC is called the base and line AD is called the **height** of the triangle.

Area of triangle = (base × height) ÷ 2



3 Let's find the area of the triangle below by measuring the necessary lengths.





Area=6×4÷ 2=12

Answer: 12 cm^2

Exercise

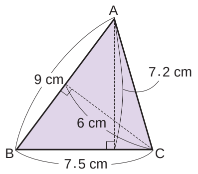
Let's find the area of triangle, as follows:

① when side BC is the base.

② when side AB is the base.

$7.5×7.2÷ 2=27\ cm^2$

$9×6÷ 2=27\ cm^2$



140 = □×□

Lesson Flow

1 Review the previous lesson.

2 Constructing the formular for triangle using the required lengths.

TN Using the ideas from the previous lesson, students will construct the formular for triangles using the required lengths. The required lengths are base, height and then ÷ 2.

T/S Identify the required lengths to construct the formula for triangle through discussion.

3 Important Point

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

4 3 Apply the area formula for triangle.

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

T Let's find the area of the triangle by measuring the required lengths.

S Use the formula for triangle to calculate the area.

1. Base BC: $6 \times 4 \div 2 = 12$
Answer is 12 cm²
2. Base AC: $5.7 \times 4.2 \div 2 = 11.97$
Answer is 11.97 cm²
3. Base AB: $4.5 \times 5.4 \div 2 = 12.15$
Answer is 12.15 cm²

$(12 + 11.97 + 12.15) \div 3 = 12.04$
Area is approximately 12 cm².

TN When the base changes, the height also changes but the area remains the same.

5 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

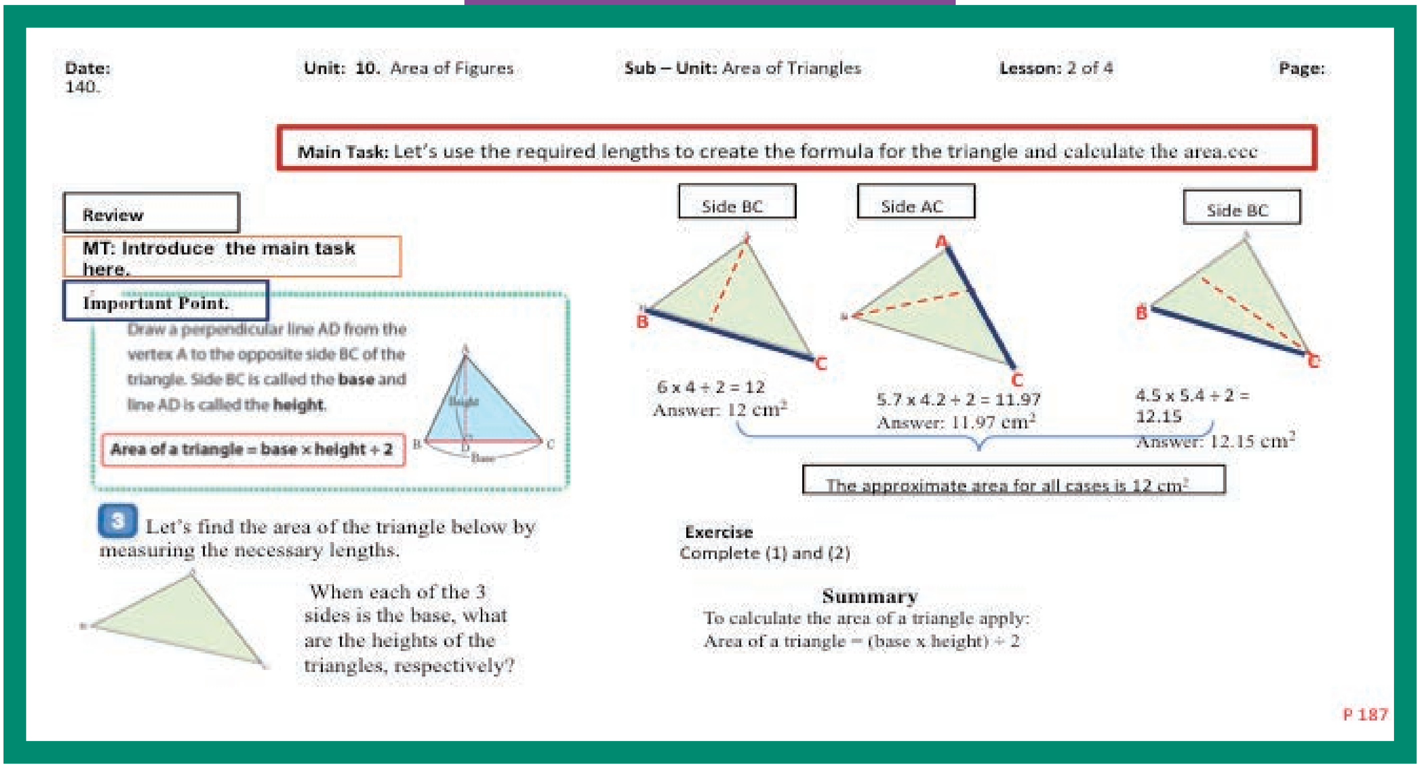
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: 140.
Unit: 10. Area of Figures
Sub – Unit: Area of Triangles
Lesson: 2 of 4
Page:

Main Task: Let's use the required lengths to create the formula for the triangle and calculate the area.ccc

Review

MT: Introduce the main task here.

Important Point.

Draw a perpendicular line AD from the vertex A to the opposite side BC of the triangle. Side BC is called the **base** and line AD is called the **height**.

Area of a triangle = base × height ÷ 2

3 Let's find the area of the triangle below by measuring the necessary lengths.

When each of the 3 sides is the base, what are the heights of the triangles, respectively?

Side BC
6 x 4 ÷ 2 = 12
Answer: 12 cm²

Side AC
5.7 x 4.2 ÷ 2 = 11.97
Answer: 11.97 cm²

Side BC
4.5 x 5.4 ÷ 2 = 12.15
Answer: 12.15 cm²

The approximate area for all cases is 12 cm²

Exercise
Complete (1) and (2)

Summary
To calculate the area of a triangle apply:
Area of a triangle = (base x height) ÷ 2

P 187

Unit
10

Unit: Area of Figures

Sub-unit 2: Area of Triangles

Lesson 3 of 4

Textbook Page : 141
Actual Lesson 094

Lesson Objectives

- To understanding how to find the height outside of a triangle.
- To find the area of triangle whose height is located on the outside of the triangle.

Prior Knowledge

- Using the formula to find the heights of each sides of the triangle

Preparation

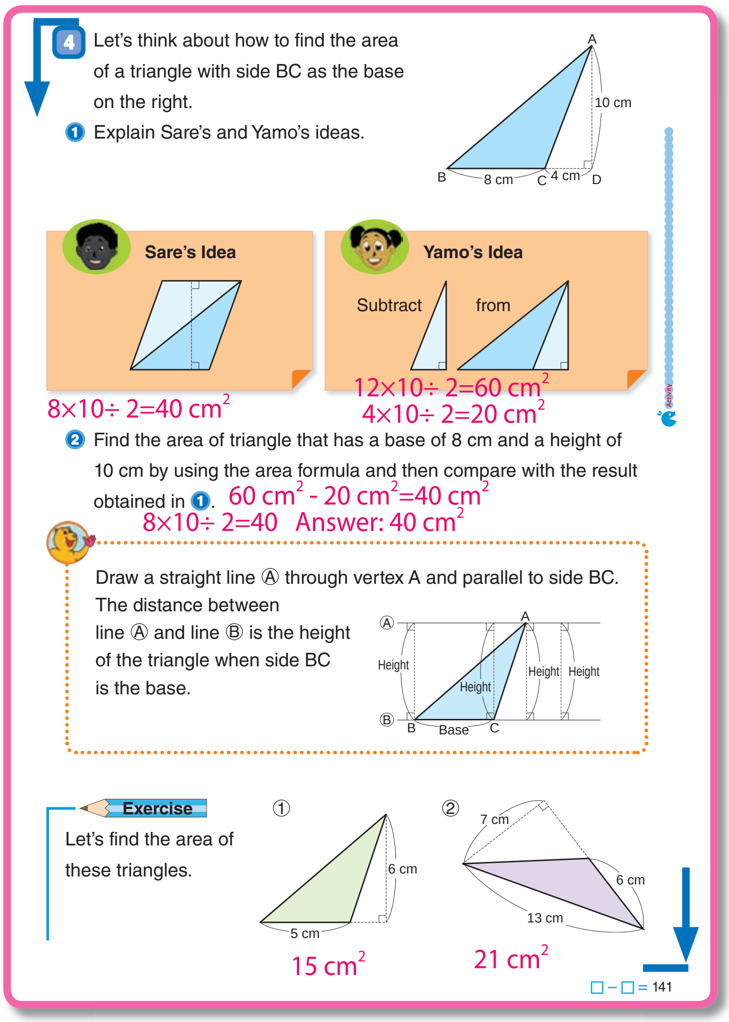
- Charts of 4

Assessment

- Understand and explain the height of the triangle. F
- Calculate the area of a triangle using the outside height. S
- Complete the Exercise correctly. S

Teacher's Notes

The 2 right angle triangles were identified by a perpendicular line, therefore, we used its formula (B×H÷2) to solve the problem. Based on the idea of transformation, the small triangle was subtracted from the bigger triangle to find the area of the triangle.



4 Let's think about how to find the area of a triangle with side BC as the base on the right.

① Explain Sare's and Yamo's ideas.

Sare's Idea

8×10÷ 2=40 cm²

Yamo's Idea

Subtract from

12×10÷ 2=60 cm²
4×10÷ 2=20 cm²

② Find the area of triangle that has a base of 8 cm and a height of 10 cm by using the area formula and then compare with the result obtained in ①. 60 cm² - 20 cm²=40 cm²
8×10÷ 2=40 Answer: 40 cm²

Draw a straight line Ⓐ through vertex A and parallel to side BC. The distance between line Ⓐ and line Ⓑ is the height of the triangle when side BC is the base.

Exercise

Let's find the area of these triangles.

① 15 cm²

② 21 cm²

□－□＝141

Lesson Flow

1 Review the previous lesson.

2 Think about how to find the area of a triangle.

T/S ④ Read and understand the situation.

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

T ① Explain Sare's and Yamo's ideas to confirm the height as 10 cm.

TN • **Sare's Idea**

I drew a parallelogram and used a ruler to confirm the height of the triangle inside the parallelogram and calculated its area.

• **Yamo's Idea**

1. Adding a smaller triangle to the original triangle to form a right triangle
2. Use a ruler to find the height outside the original triangle and calculate the area of the right triangle.
3. Subtract the area of the smaller triangle from the area of the right triangle.

TN The height remains the same whether drawn inside or outside of the triangle.

3 ② Using the formula to find the area of a triangle.

T Find the area of triangle that has a base of 8 cm and a height of 10 cm.

S Calculate the area of the triangle using the formula, Area = B × H ÷ 2.

S Compare the answers obtained in ①.

4 Important Point

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

5 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

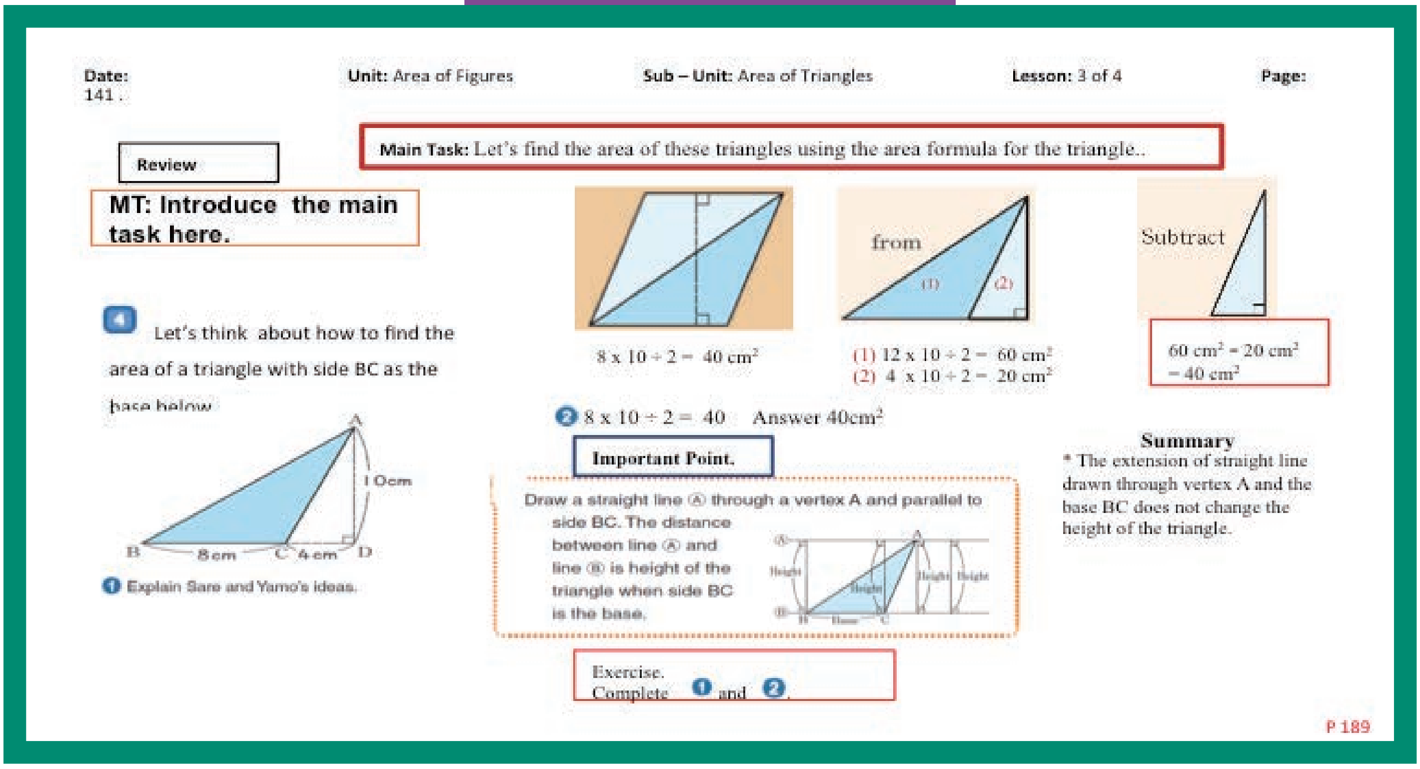
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: 141 .

Unit: Area of Figures

Sub – Unit: Area of Triangles

Lesson: 3 of 4

Page:

Review

MT: Introduce the main task here.

Main Task: Let's find the area of these triangles using the area formula for the triangle..

④ Let's think about how to find the area of a triangle with side BC as the base below

① Explain Sare and Yamo's ideas.

$8 \times 10 \div 2 = 40$ cm^2

from

(1) $12 \times 10 \div 2 = 60$ cm^2
(2) $4 \times 10 \div 2 = 20$ cm^2

Subtract

60 cm^2 $- 20$ cm^2
$= 40$ cm^2

② $8 \times 10 \div 2 = 40$ Answer 40cm^2

Important Point.

Draw a straight line Ⓐ through a vertex A and parallel to side BC. The distance between line Ⓐ and line Ⓑ is height of the triangle when side BC is the base.

Summary
* The extension of straight line drawn through vertex A and the base BC does not change the height of the triangle.

Exercise.
Complete ① and ②.

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Unit 10

Unit: Area of Figures

Sub-unit 2: Area of Triangles

Lesson 4 of 4

Textbook Page : 142
Actual Lesson 095

Lesson Objectives

- To think about the area of triangles with the same base and height.
- To find the height of triangle from its area and base.

Prior Knowledge

- Area of triangle
- Finding the area of triangle with the given base and the height

Preparation

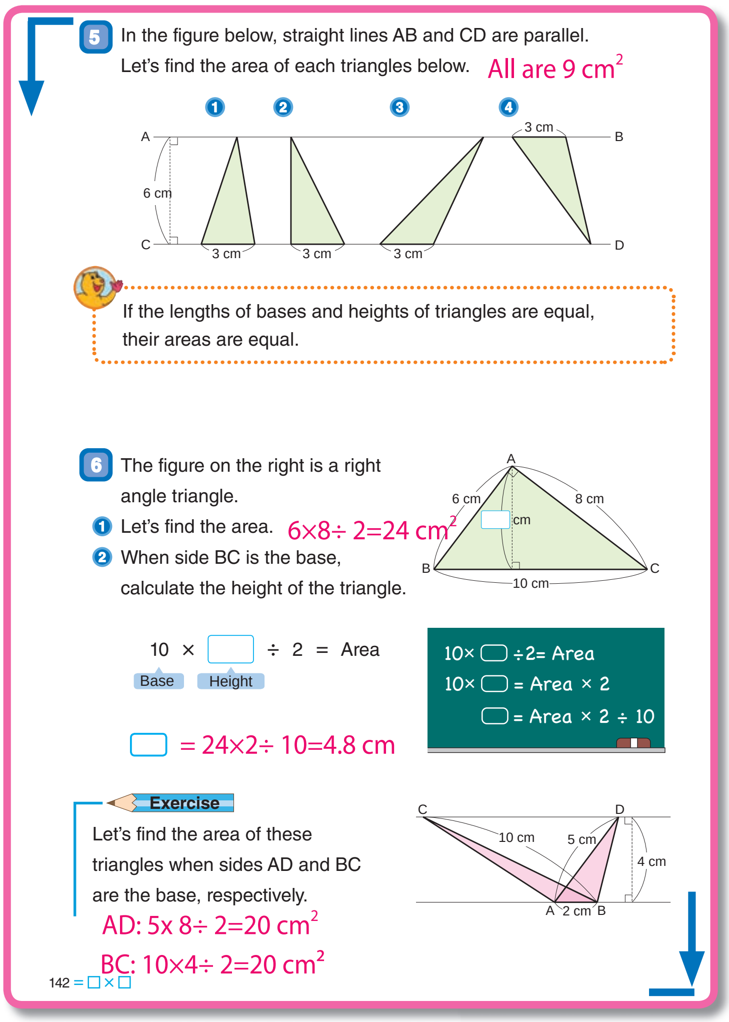
- Grid paper, enlarged drawing of a triangle on a chart

Assessment

- Understand the relationships between area, height and base of the triangle. **F**
- Calculate the height of a triangle with the given base and the area. **S** **F**
- Complete the Exercise correctly. **S**

Teacher's Notes

Students have a habit of understand that if there are different triangles their areas are also different even though their base and height are the same.
Another confusion is that they cannot find out which side or length is base or height, if the triangle shape is rotated.
Teachers need to guide students repeatedly and thoroughly about what is height or base, even though we rotate the triangle or change its shape (example done in **5**).



5 In the figure below, straight lines AB and CD are parallel.
Let's find the area of each triangles below. All are 9 cm^2

If the lengths of bases and heights of triangles are equal, their areas are equal.

6 The figure on the right is a right angle triangle.

① Let's find the area. $6\times8\div 2=24\text{ cm}^2$

② When side BC is the base, calculate the height of the triangle.

$10 \times \boxed{} \div 2 = \text{Area}$

Base Height

$10\times \boxed{} \div 2 = \text{Area}$
$10\times \boxed{} = \text{Area} \times 2$
$\boxed{} = \text{Area} \times 2 \div 10$

$\boxed{} = 24\times2\div 10=4.8\text{ cm}$

Exercise

Let's find the area of these triangles when sides AD and BC are the base, respectively.

AD: $5\text{x } 8\div 2=20\text{ cm}^2$

BC: $10\times4\div 2=20\text{ cm}^2$

142 = □×□

Lesson Flow

1 Review the previous lesson.

2 5 Find the area of triangles with the same base and height.

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

T Let's find the area of each triangle below.

S Discuss in groups and share their ideas with friends.

TN Calculate ① to ④.
All give the same answer as $3 \times 6 \div 2 = 9$
Answer is 9 cm².

S The areas are the same, because the height is 6 cm and the base is 3 cm for all triangles from ① to ④.

3 Important Point

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

4 6 Find the height of a triangle by using the base and the area.

T ① Let's find the area in cm².

S Using the formula of a triangle.
The base AB is 6 cm and the height AC is 8 cm.
The area is $6 \times 8 \div 2 = 24$
Answer is 24 cm²

T ② When side BC is the base, calculate the height of the triangle.

S Use the area formula of triangle to find the height of the triangle when the base is BC.

TN 1. We know the area is 24 cm and the base is BC, which is 10 cm.
2. We know the formula is $B \times H =$ area, we can substitute the area and the base,
which is $10 \times \square \div 2 = 24$. $24 \times 2 \div 10 = 4.8$
Answer: 4.8 cm

T What do you understand through this task?

S "If we know the base and the area of a triangle, we can find its height.

5 Complete the Exercise

S Solve the exercise.

T Confirm students' answers.

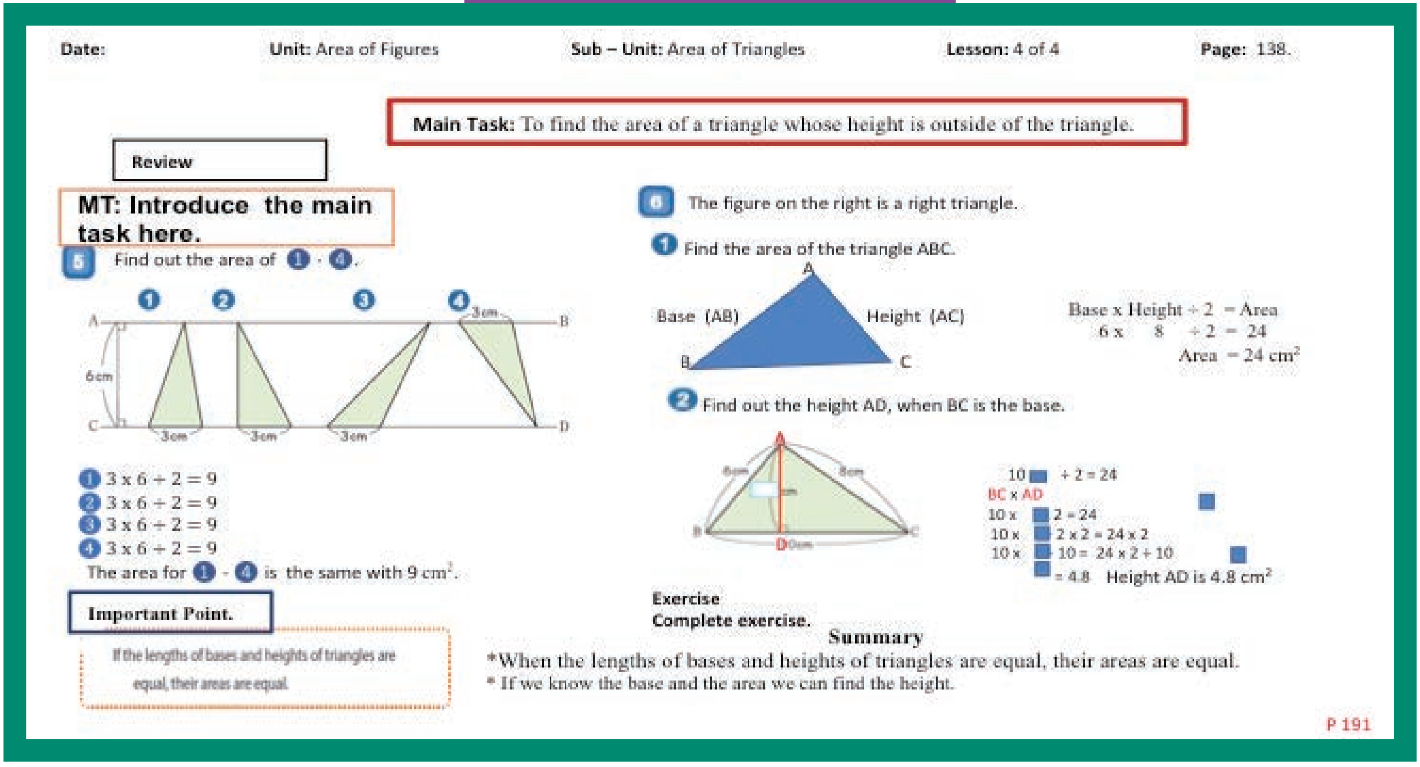
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Area of Figures **Sub – Unit:** Area of Triangles **Lesson:** 4 of 4 **Page:** 138.

Main Task: To find the area of a triangle whose height is outside of the triangle.

Review

MT: Introduce the main task here.

5 Find out the area of ① - ④.

① $3 \times 6 \div 2 = 9$
② $3 \times 6 \div 2 = 9$
③ $3 \times 6 \div 2 = 9$
④ $3 \times 6 \div 2 = 9$
The area for ① - ④ is the same with 9 cm².

Important Point.

If the lengths of bases and heights of triangles are equal, their areas are equal.

6 The figure on the right is a right triangle.

① Find the area of the triangle ABC.

Base x Height ÷ 2 = Area
6 x 8 ÷ 2 = 24
Area = 24 cm²

② Find out the height AD, when BC is the base.

10 ■ ÷ 2 = 24
BC x AD
10 x ■ ÷ 2 = 24
10 x ■ ÷ 2 x 2 = 24 x 2
10 x ■ ÷ 10 = 24 x 2 ÷ 10
■ = 4.8 Height AD is 4.8 cm²

Exercise
Complete exercise.

Summary
*When the lengths of bases and heights of triangles are equal, their areas are equal.
* If we know the base and the area we can find the height.

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Unit 10

Unit: Area of Figures

Sub-unit 3: Area of Trapezoids

Lesson 1 of 1

Textbook Page : 143 and 144
Actual Lesson 096

Sub-unit Objectives

- To understand the meaning of the area formula for trapezoid.
- To calculate the area of trapezoid using its formula.

Lesson Objectives

- Identify that to calculate the area of trapezoid, three lengths are used. (Upper base, lower base and height).
- To develop a formula to find the area of trapezoid.

Prior Knowledge

- Area of parallelogram and triangle

Preparation

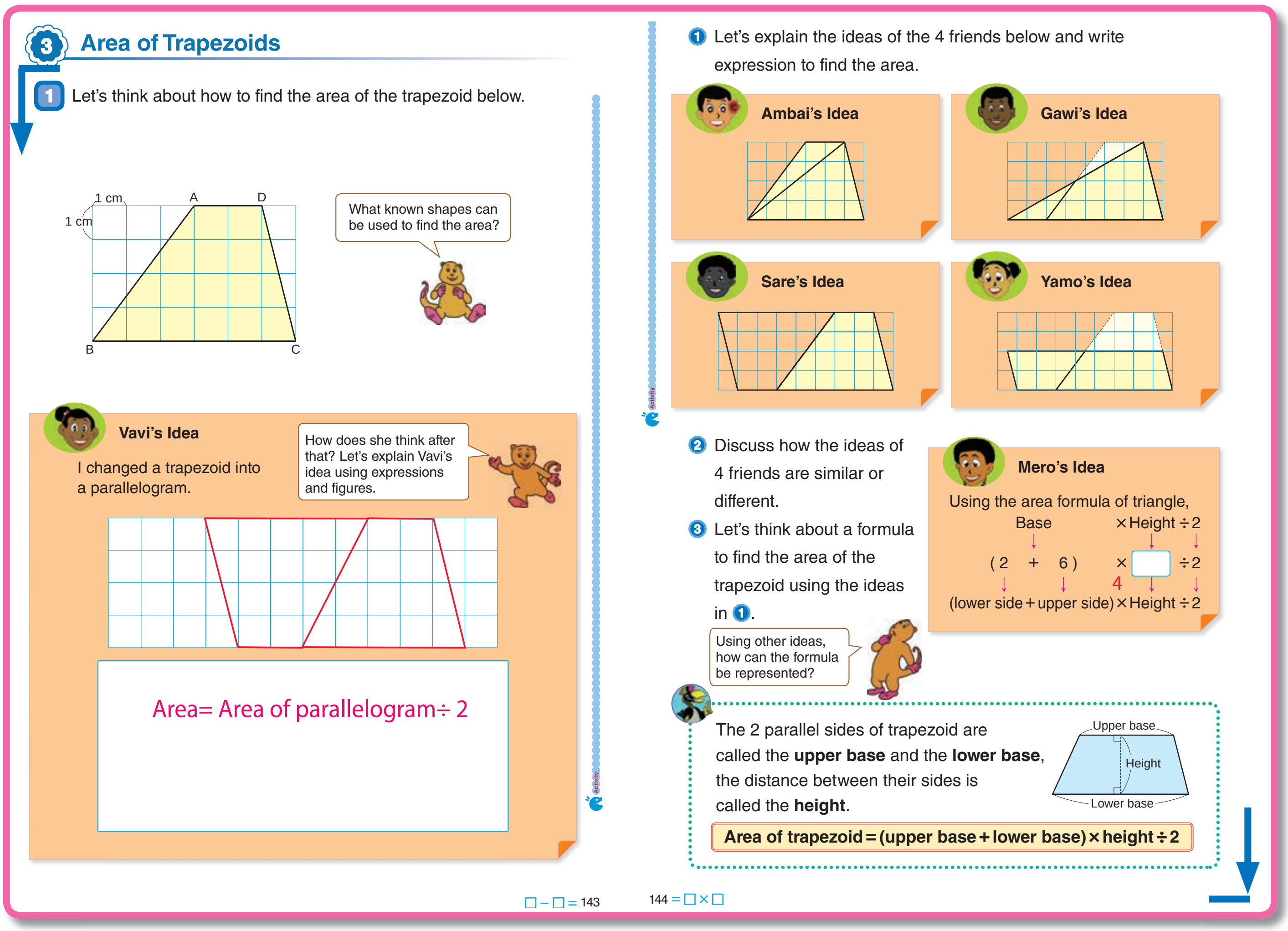
- Grid papers and scissors
- Chart of the important point

Assessment

- Identify that three lengths (Upper base, lower base and height) are used to calculate the area of trapezoid. F
- Derive the area formula for trapezoid. F
- Apply the area formula for trapezoid. S

Teacher's Notes

The importance of this lesson is to understand how we can apply the area of parallelogram and triangle and locate the 3 lengths of sides as upper base, lower base and height are used to calculate the area of trapezoid.
It is necessary to highlight these three lengths during the lesson; e.g. marking them with colours or underlines.



3 Area of Trapezoids

1 Let's think about how to find the area of the trapezoid below.

What known shapes can be used to find the area?

Vavi's Idea

I changed a trapezoid into a parallelogram.

How does she think after that? Let's explain Vavi's idea using expressions and figures.

Area= Area of parallelogram÷ 2

□－□＝143

1 Let's explain the ideas of the 4 friends below and write expression to find the area.

Ambai's Idea

Gawi's Idea

Sare's Idea

Yamo's Idea

2 Discuss how the ideas of 4 friends are similar or different.

3 Let's think about a formula to find the area of the trapezoid using the ideas in 1.

Using other ideas, how can the formula be represented?

Mero's Idea

Using the area formula of triangle,

Base ×Height ÷2

(2 + 6) × □ ÷2

4

(lower side＋upper side)×Height÷2

The 2 parallel sides of trapezoid are called the **upper base** and the **lower base**, the distance between their sides is called the **height**.

Area of trapezoid＝(upper base＋lower base)×height÷2

144＝□×□

Lesson Flow

1 Review the previous lesson.

2 1 Think about how to find the area of a trapezoid.

T Which known shapes can a trapezoid be transformed into to find its area?

S Observe the trapezoid and transform it to known shapes.

T Complete Vavi's idea using expressions and figures.

S Present their transformation.

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

3 ① Let's explain the ideas of 4 students and write expressions to find the area.

T ① Refer to board plan for the explanation of the 4 students' ideas.

S Write mathematical expressions for each ideas.

S ② Compare the ideas and discuss how the 4 ideas of the students are different or similar.

TN 1. Ambai and Gawi used the formula for triangle to find the area of trapeziod.
2. Sare and Yamo used the formula for parallelogram to find the area of trapezoid.

4 ③ Form the area formula for trapezoid.

T Let students understand that when Gawi used the formula for triangle, the base is: lower side (2) + upper side (6) that totals up to only one base (8) then multiplied by the height (4) ÷ 2.

T Ask students to confirm whether the others ideas are similar with Gawi's idea or formula.

S Check and conclude that they are all the same and this is the area formula for trapezoid.

5 Important Point

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

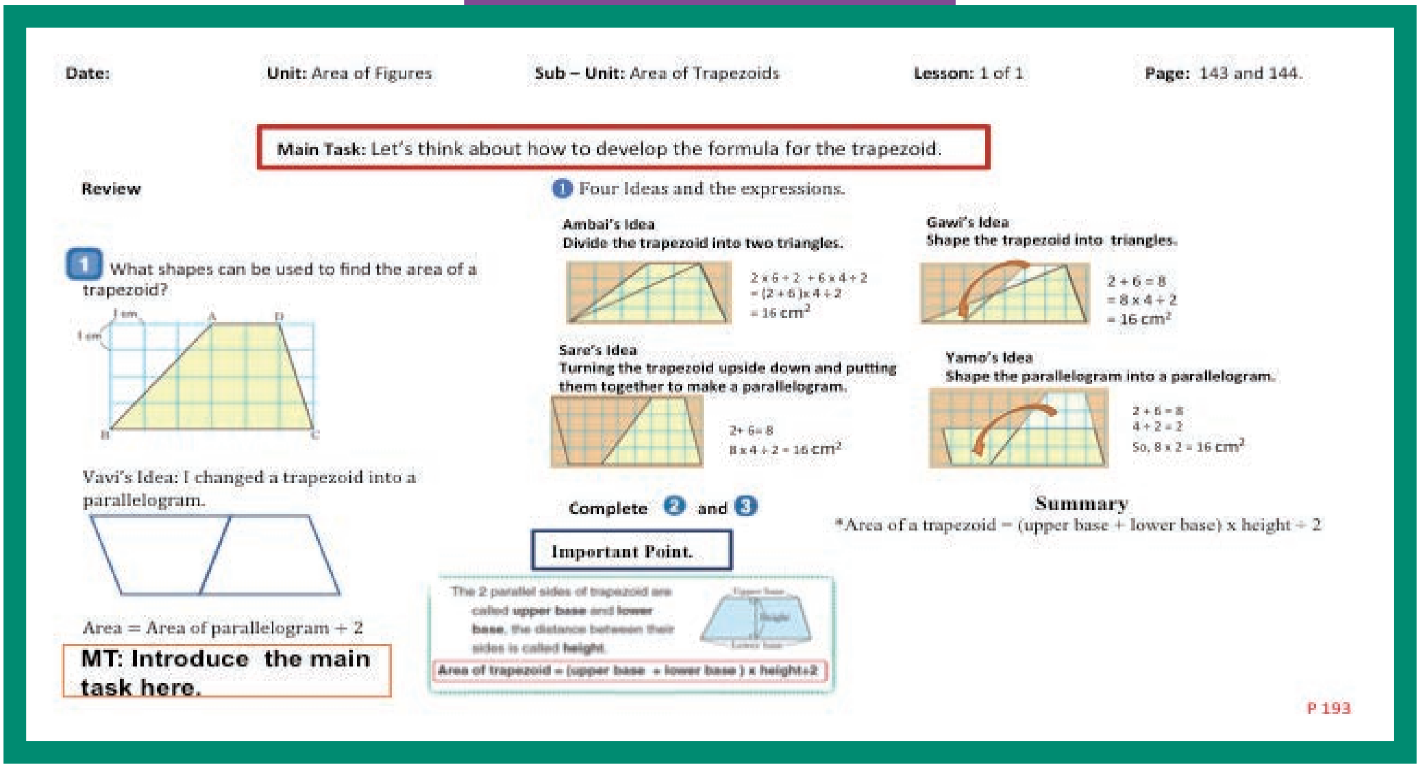
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Area of Figures **Sub – Unit:** Area of Trapezoids **Lesson:** 1 of 1 **Page:** 143 and 144.

Main Task: Let's think about how to develop the formula for the trapezoid.

Review

1 What shapes can be used to find the area of a trapezoid?

Vavi's Idea: I changed a trapezoid into a parallelogram.

Area = Area of parallelogram ÷ 2

MT: Introduce the main task here.

① Four Ideas and the expressions.

Ambai's Idea
Divide the trapezoid into two triangles.

2 x 6 ÷ 2 + 6 x 4 ÷ 2
= (2 + 6) x 4 ÷ 2
= 16 cm²

Gawi's Idea
Shape the trapezoid into triangles.

2 + 6 = 8
= 8 x 4 ÷ 2
= 16 cm²

Sare's Idea
Turning the trapezoid upside down and putting them together to make a parallelogram.

2+ 6= 8
8 x 4 ÷ 2 = 16 cm²

Yamo's Idea
Shape the parallelogram into a parallelogram.

2 + 6 = 8
4 ÷ 2 = 2
So, 8 x 2 = 16 cm²

Complete ② and ③

Important Point.

The 2 parallel sides of trapezoid are called **upper base** and **lower base**, the distance between their sides is called **height**.

Area of trapezoid = (upper base + lower base) x height÷2

Summary

*Area of a trapezoid = (upper base + lower base) x height ÷ 2

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Unit
10

Unit: Area of Figures

Sub-unit 4: Area of Rhombuses

Lesson 1 of 1

Textbook Page : 145
Actual Lesson 097

Sub-unit Objectives

- To understand the meaning of the formula for area of rhombus.
- To find the area of rhombus by applying the formula.

Lesson Objectives

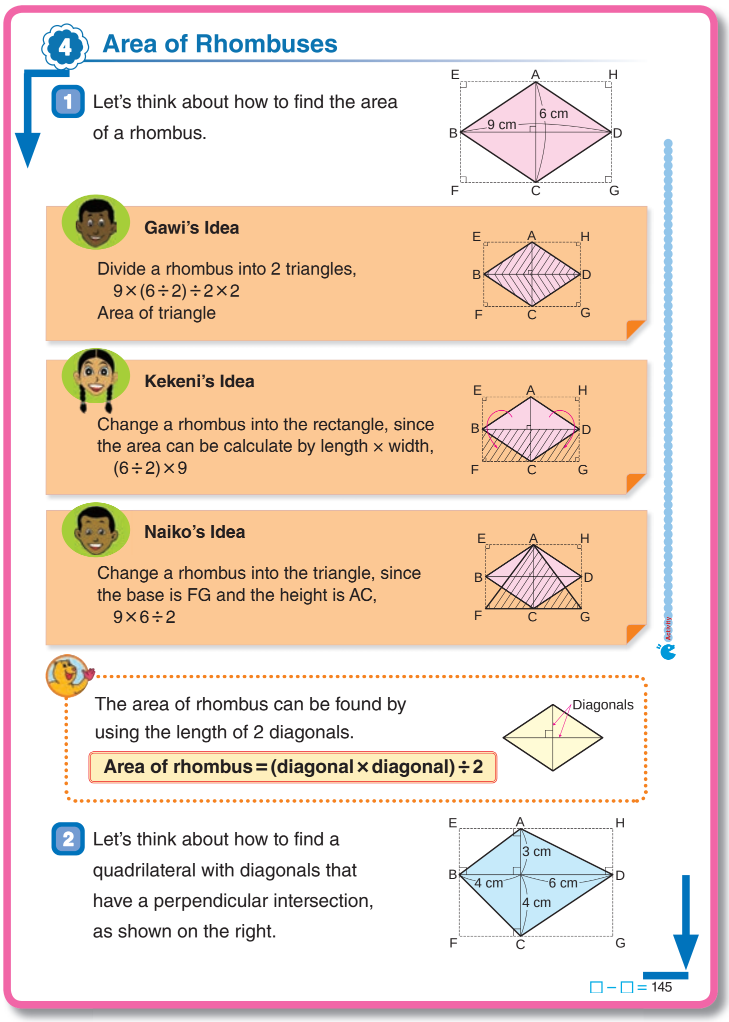
- To identify that if we find the length of diagonals we can calculate the area of rhombus.
- To develop a formula to find the area of rhombus.

Prior Knowledge

- The area of triangle and its formula
- The area of rectangle and its formula

Preparation

- Enlarged drawing of 1 and 2, rulers for students



4 Area of Rhombuses

1 Let's think about how to find the area of a rhombus.

Gawi's Idea

Divide a rhombus into 2 triangles,
9×(6÷2)÷2×2
Area of triangle

Kekeni's Idea

Change a rhombus into the rectangle, since the area can be calculate by length × width,
(6÷2)×9

Naiko's Idea

Change a rhombus into the triangle, since the base is FG and the height is AC,
9×6÷2

The area of rhombus can be found by using the length of 2 diagonals.

Area of rhombus = (diagonal × diagonal) ÷ 2

2 Let's think about how to find a quadrilateral with diagonals that have a perpendicular intersection, as shown on the right.

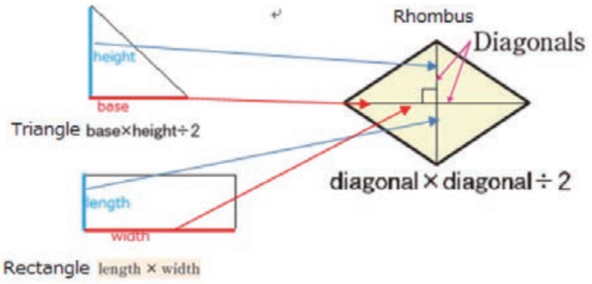
□ − □ = 145

Assessment

- Think about how to develop a formula to find the area of rhombus. F
- Apply the formula of rhombus for the quadrilateral with diagonals crossing perpendicularly. S

Teacher's Notes

In Rectangle, the blue line is the length and the red line is the width.
The length and the width of the rectangle are multiplied together to find the area.
In Triangle, the red line is the base and the blue line is the height.
The base and the height of the triangle are multiplied than divided by 2 to get its area.
From rectangle and triangle to rhombus the red and blue lines are diagonals.
The lengths of the two diagonals are multiplied then divided by 2 because the area is double.
This becomes the formula for Rhombus:
Area = Diagonal × Diagonal ÷ 2



Lesson Flow

1 Review the previous lesson.

2 ① Think about the way of finding out the area of rhombus.

T Review the formula and the area of triangle and the rectangle and let students to observe the rhombus and think about how to find its area.

S Review and observe the rhombus and think about how to find the area of a rhombus applying the ideas of rectangle and triangle.

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

3 Find the area of rhombus.

S Think of own ways on how to find the area of rhombus and present their ideas

T Let students read and discuss in groups the three ideas and ask them to explain.

S Analyse in groups the ideas and identify how these ideas are used to find the area of a rhombus.

T Confim the students ideas with Gawi's, Kekeni's and Naiko's ideas.

4 Construct the area formula for rhombus.

T Ask the students to compare the three ideas and find out common features.

S Common features are:
(1) all the ideas calculate 9×6÷2
(2) AC and BD are the diagonals.
(3) Multiplying diagonals and ÷2

S Develop the formula for rhombus from summary of students' ideas.

5 Important Point

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

6 ② Find the area of the quadrilateral with diagonals that have perpendicular intersection.

S Use the formula for rhombus and calculate the quadrilateral with diagonals that have perpendicular intersection.

T Check and confirm the answer with the students.

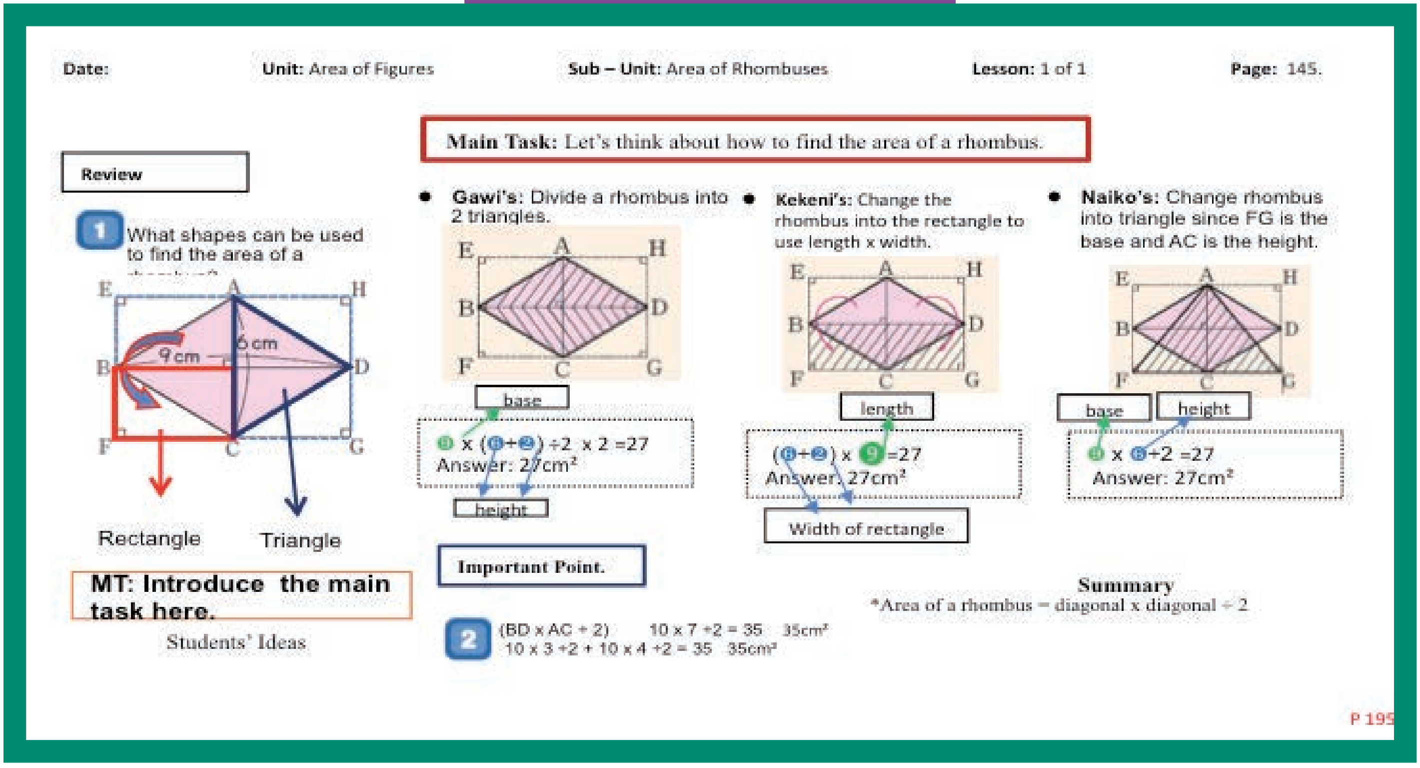
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Area of Figures **Sub – Unit:** Area of Rhombuses **Lesson:** 1 of 1 **Page:** 145.

Main Task: Let's think about how to find the area of a rhombus.

Review

① What shapes can be used to find the area of a rhombus?

Rectangle Triangle

MT: Introduce the main task here.

Students' Ideas

- **Gawi's:** Divide a rhombus into 2 triangles.
  [illegible] x ([illegible]+[illegible]) ÷2 x 2 =27
  Answer: 27cm²
- **Kekeni's:** Change the rhombus into the rectangle to use length x width.
  ([illegible]+[illegible]) x 9 =27
  Answer: 27cm²
- **Naiko's:** Change rhombus into triangle since FG is the base and AC is the height.
  [illegible] x [illegible]÷2 =27
  Answer: 27cm²

Important Point.

② (BD x AC ÷ 2) 10 x 7 ÷2 = 35 35cm²
10 x 3 ÷2 + 10 x 4 ÷2 = 35 35cm²

Summary
*Area of a rhombus = diagonal x diagonal ÷ 2

Unit 10

Unit: Area of Figures

Sub-unit 5: Thinking About How to Find the Area

Lesson 1 of 1

Textbook Page : 146
Actual Lesson 098

Sub-unit Objective

- To find the area of various quadrilaterals and pentagons.

Lesson Objectives

- To understand that the area of various quadrilaterals and pentagons can be found by separating them into known shapes.
- To calculate the area of various quadrilateral and pentagon by separating into known shapes and applying the correct formula.

Prior Knowledge

- Formulae for finding the area of triangle, parallelogram, rhombus and trapezoid

Preparation

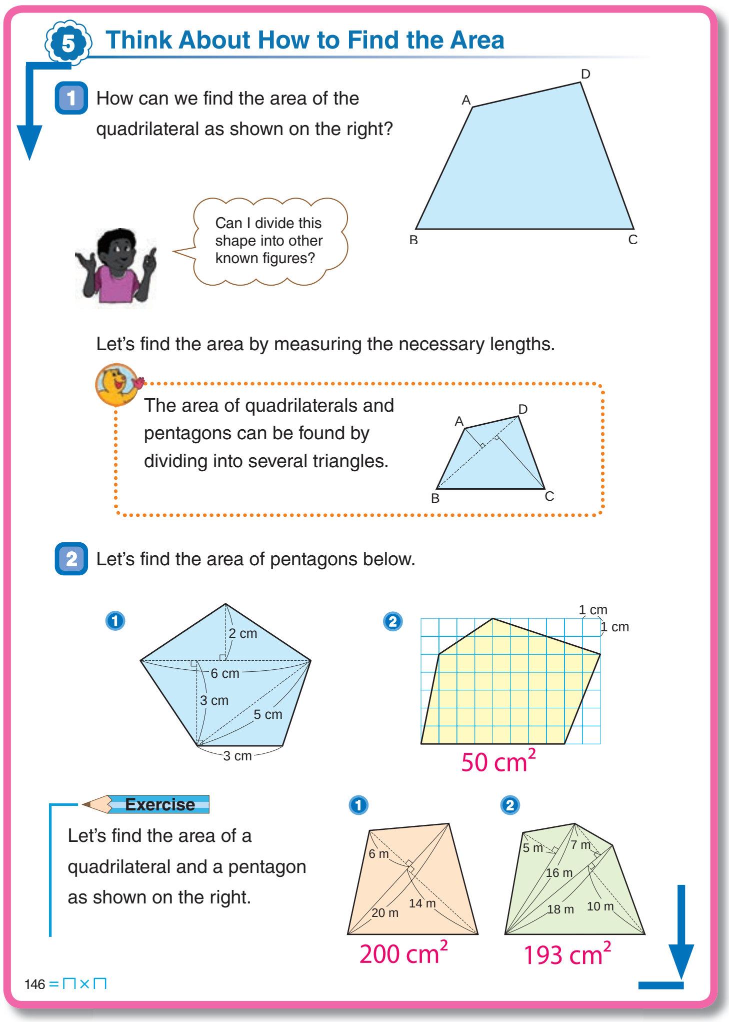
- Enlarged quadrilateral on the large sheet, rulers

Assessment

- Understand and explain how the area of various quadrilaterals and pentagons can be found. F
- Calculate the area of various quadrilaterals and pentagons. S F
- Complete the Exercise correctly. S

Teacher's Notes

In this lesson the area of quadrilateral and pentagon is found by dividing the two shapes into several triangles and applying the triangle formula to calculate.



5 Think About How to Find the Area

1 How can we find the area of the quadrilateral as shown on the right?

Can I divide this shape into other known figures?

Let's find the area by measuring the necessary lengths.

The area of quadrilaterals and pentagons can be found by dividing into several triangles.

2 Let's find the area of pentagons below.

①

②

$50\ cm^2$

Exercise

Let's find the area of a quadrilateral and a pentagon as shown on the right.

①

$200\ cm^2$

②

$193\ cm^2$

146 = ⊓ × ⊓

Lesson Flow

1 Review the previous lesson.

2 ① Think of ways on how to find the area of a quadrilateral.

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

T How can we find the area of a quadrilateral?

S Observe the quadrilateral and think of ways on how to find the area.

TN 1) Divide the quadrilateral into 2 triangles
2) Use the diagonals of the quadrilateral as a base of the 2 triangles.

3 Find the area of quadrilateral by measuring.

T Let the students to measure the required lengths before calculating the area.

S
- Divide the shape into 2 triangles
- Measure the required lengths
- Apply the formula for triangle to calculate the area.

4 Important Point

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

5 ② Find the area of pentagons.

S ① Calculate the area of the pentagon using the measurements given.

S ② Divide the pentagon into known shapes and calculate the area.

T Ask students to present their calculations and confirm.

6 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

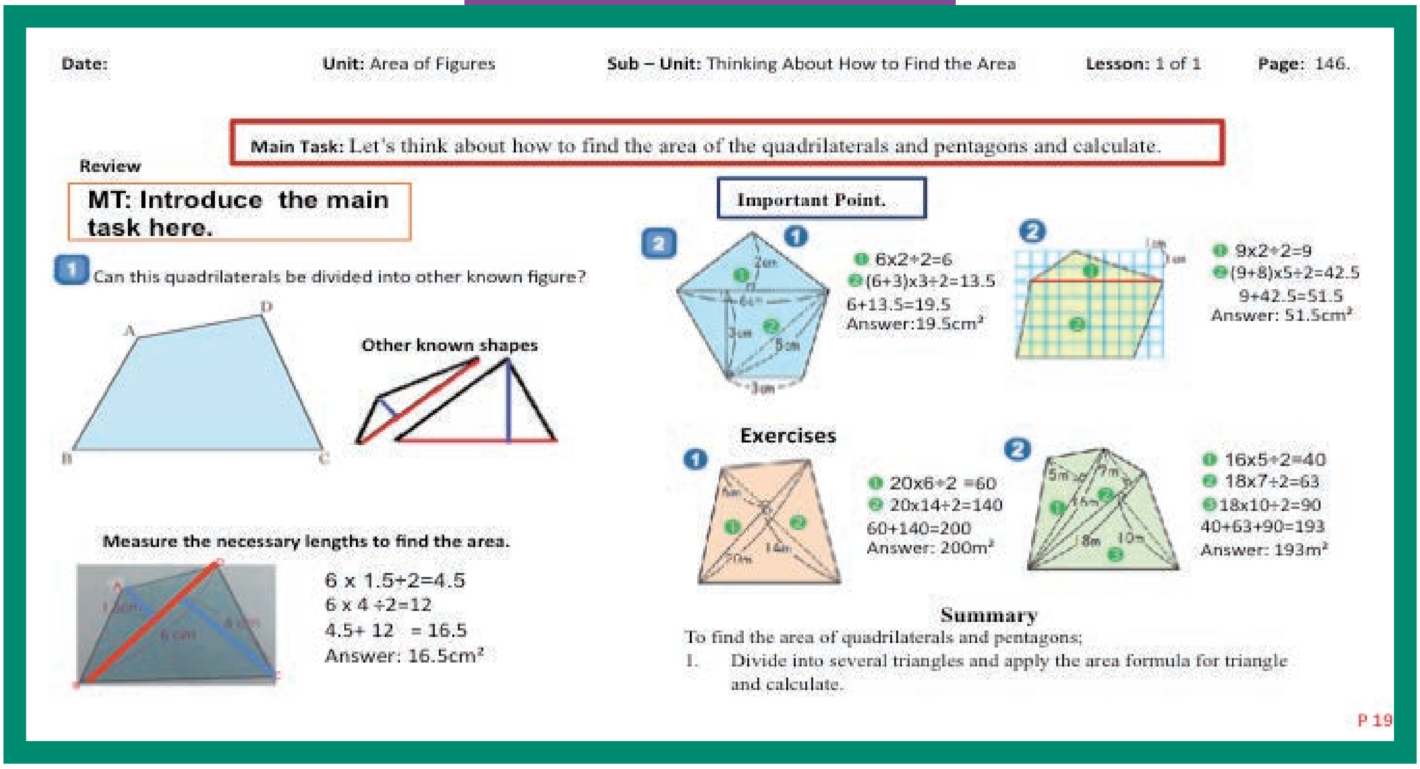
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Area of Figures **Sub – Unit:** Thinking About How to Find the Area **Lesson:** 1 of 1 **Page:** 146.

Main Task: Let's think about how to find the area of the quadrilaterals and pentagons and calculate.

Review

MT: Introduce the main task here.

① Can this quadrilaterals be divided into other known figure?

Other known shapes

Measure the necessary lengths to find the area.

6 x 1.5÷2=4.5
6 x 4 ÷2=12
4.5+ 12 = 16.5
Answer: 16.5cm^2

Important Point.

② ①
① 6x2÷2=6
② (6+3)x3÷2=13.5
6+13.5=19.5
Answer:19.5cm^2

②
① 9x2÷2=9
② (9+8)x5÷2=42.5
9+42.5=51.5
Answer: 51.5cm^2

Exercises

①
① 20x6÷2 =60
② 20x14÷2=140
60+140=200
Answer: 200m^2

②
① 16x5÷2=40
② 18x7÷2=63
③ 18x10÷2=90
40+63+90=193
Answer: 193m^2

Summary

To find the area of quadrilaterals and pentagons;
1. Divide into several triangles and apply the area formula for triangle and calculate.

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Unit
10

Unit: Area of Figures
Exercise, Problems and Evaluation
Lesson 1 and 2 of 2

Textbook Page :
147 and 148
Actual Lesson 99 and 100

Lesson Objective

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

Prior Knowledge

- All the contents learned in this unit

Preparation

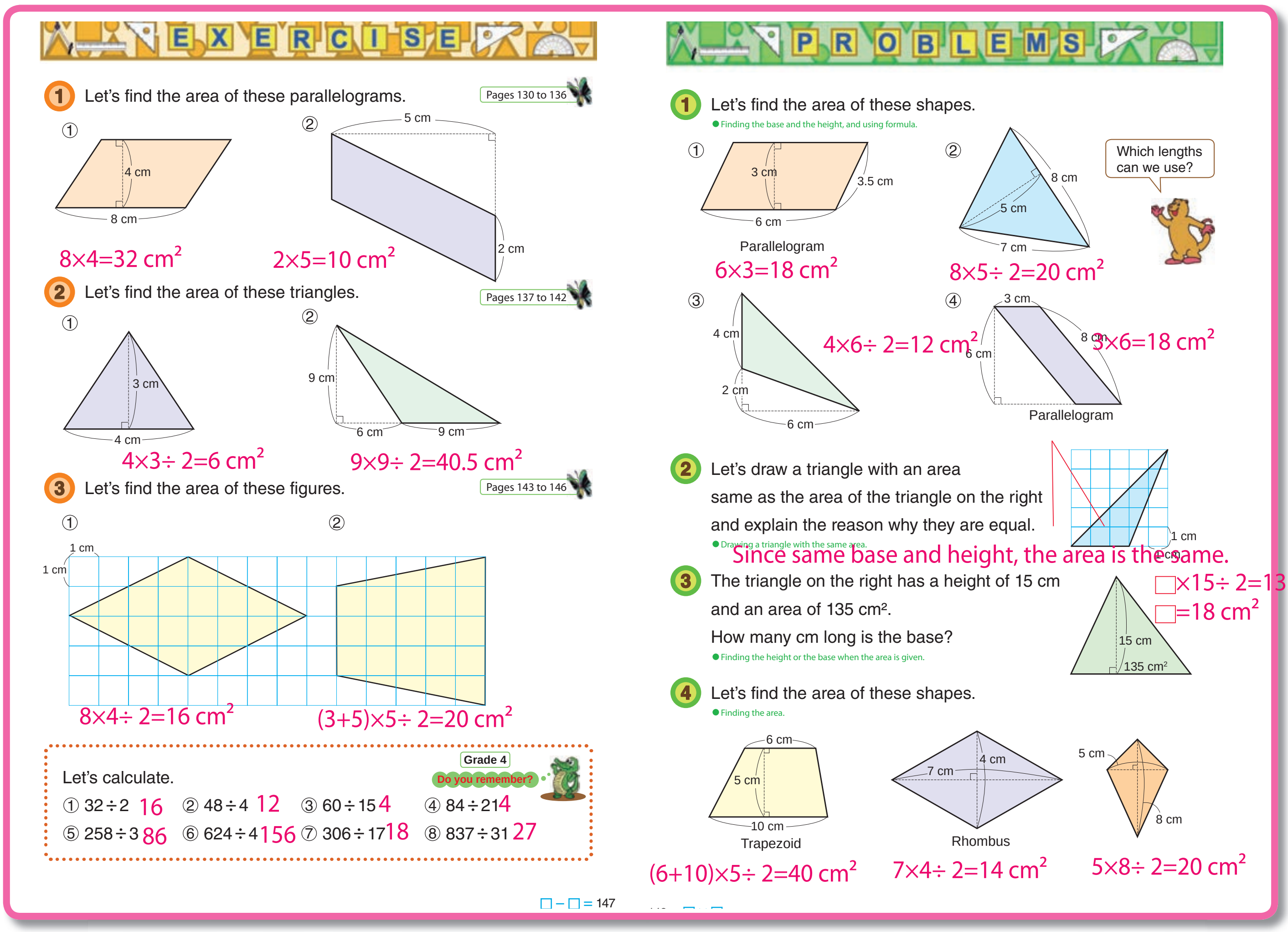
- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 10. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assesment for your class after completing all the exercises. Use the attached evaluation test to conduct assesment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

① Let's find the area of these parallelograms. Pages 130 to 136

① $8\times4=32\ \text{cm}^2$ ② $2\times5=10\ \text{cm}^2$

② Let's find the area of these triangles. Pages 137 to 142

① $4\times3\div 2=6\ \text{cm}^2$ ② $9\times9\div 2=40.5\ \text{cm}^2$

③ Let's find the area of these figures. Pages 143 to 146

① $8\times4\div 2=16\ \text{cm}^2$ ② $(3+5)\times5\div 2=20\ \text{cm}^2$

Let's calculate.

① 32÷2 16 ② 48÷4 12 ③ 60÷15 4 ④ 84÷21 4
⑤ 258÷3 86 ⑥ 624÷4 156 ⑦ 306÷17 18 ⑧ 837÷31 27

□ − □ = 147

PROBLEMS

① Let's find the area of these shapes.
● Finding the base and the height, and using formula.

① Parallelogram $6\times3=18\ \text{cm}^2$
② $8\times5\div 2=20\ \text{cm}^2$
③ $4\times6\div 2=12\ \text{cm}^2$
④ Parallelogram $3\times6=18\ \text{cm}^2$

② Let's draw a triangle with an area same as the area of the triangle on the right and explain the reason why they are equal.
● Drawing a triangle with the same area.

Since same base and height, the area is the same.

③ The triangle on the right has a height of 15 cm and an area of 135 cm². How many cm long is the base?
● Finding the height or the base when the area is given.

$\square\times15\div 2=135\ \text{cm}^2$
$\square=18\ \text{cm}^2$

④ Let's find the area of these shapes.
● Finding the area.

Trapezoid $(6+10)\times5\div 2=40\ \text{cm}^2$
Rhombus $7\times4\div 2=14\ \text{cm}^2$
$5\times8\div 2=20\ \text{cm}^2$

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN ① Finding the area of parallelograms.
② Finding the area of triangles.
③ Finding the area of rhombus and trapezium.

2 Solve the Problems

S Solve all the problems.

T Confirm students' answers.

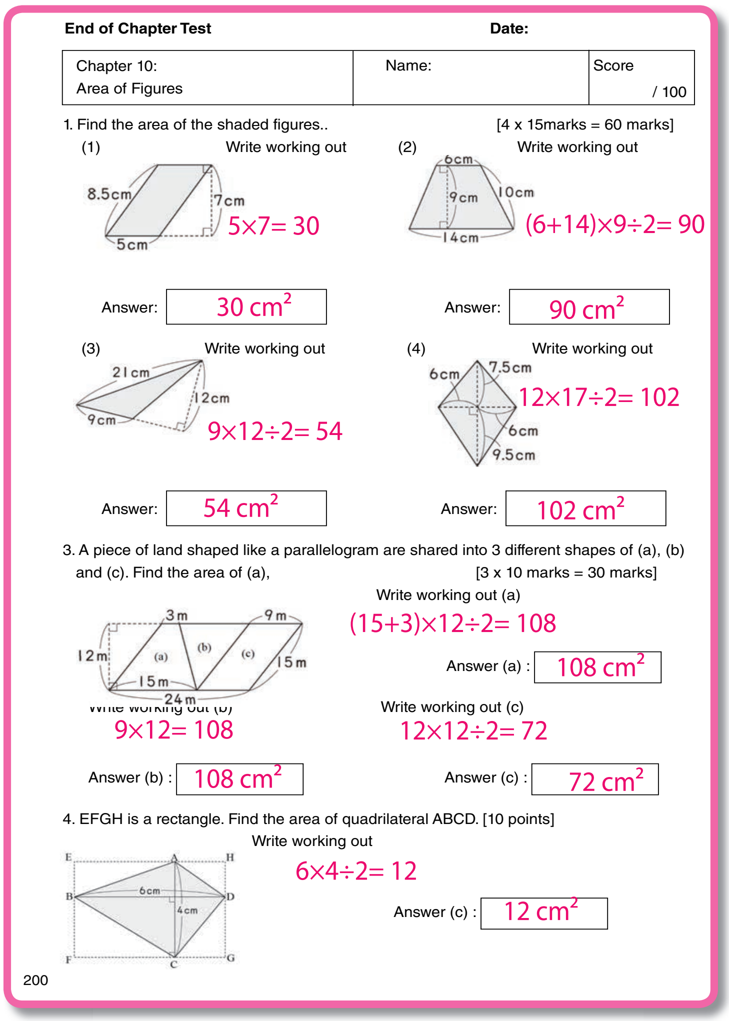
TN All problems to be done for homework.

TN ① Finding the base and the height and using the formula.
② Drawing the triangle with the same area.
③ Finding the height or the base when the area is given.
④ Finding the area.

3 Complete the Evaluation Test

TN Use the attached evaluation test to conduct assesment 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: Area of Figures	Name:	Score / 100

1. Find the area of the shaded figures.. [4 x 15marks = 60 marks]

(1) Write working out

5×7= 30

Answer: 30 cm^2

(2) Write working out

(6+14)×9÷2= 90

Answer: 90 cm^2

(3) Write working out

9×12÷2= 54

Answer: 54 cm^2

(4) Write working out

12×17÷2= 102

Answer: 102 cm^2

3. A piece of land shaped like a parallelogram are shared into 3 different shapes of (a), (b) and (c). Find the area of (a), [3 x 10 marks = 30 marks]

Write working out (a)

(15+3)×12÷2= 108

Answer (a) : 108 cm^2

Write working out (b)

9×12= 108

Answer (b) : 108 cm^2

Write working out (c)

12×12÷2= 72

Answer (c) : 72 cm^2

4. EFGH is a rectangle. Find the area of quadrilateral ABCD. [10 points]

Write working out

6×4÷2= 12

Answer (c) : 12 cm^2

200

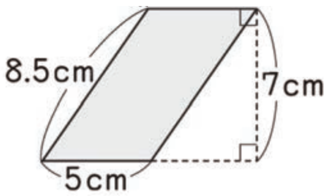
End of Chapter Test **Date:**

Chapter 10: Area of Figures	Name:	Score / 100

1. Find the area of the shaded figures.

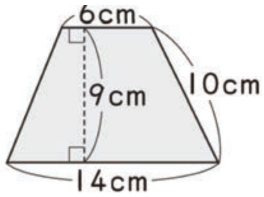
[4×15marks = 60 marks]

(1) Show working out



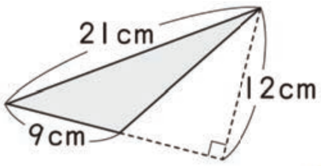
Answer:

(2) Show working out



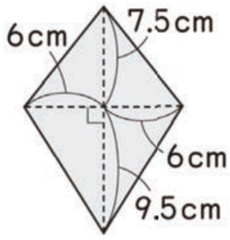
Answer:

(3) Show working out



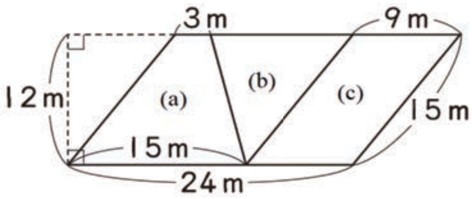
Answer:

(4) Show working out



Answer:

2. A piece of land shaped like a parallelogram is shared into 3 different shapes of (a), (b) and (c). Find the area of (a),



[3×10 marks = 30 marks]

Show working out (a)

Answer (a):

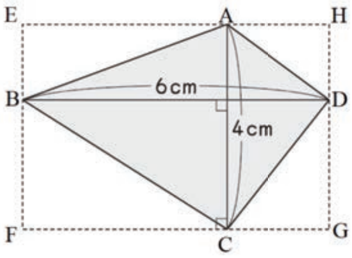
Show working out (b)

Answer (b):

Show working out (c)

Answer (c):

3. EFGH is a rectangle. Find the area of quadrilateral ABCD. [10 points]



Show working out

Answer (c) :

Chapter 11 Multiplication and Division of Fractions

1. Content Standard

5.1.2 Extend learned multiplication and division to multiply and divide fractions by whole numbers.

2. Unit Objectives

- To deepen understanding about fraction.
- To understand the meaning of multiplication and division of fractions by whole numbers and think about how to calculate.
- To master the calculation of fraction multiplied or divided by a whole number.

3. Teaching Overview

This unit is to get prepared for the further leaning of fraction × fraction and fraction ÷ fraction. As they summarise and consolidate operation of fractions × whole numbers and fractions ÷ whole numbers, they will also get used to the use of area diagram and rules of multiplications and divisions. In this unit, students should master operation of fractions × whole numbers and operations of fractions ÷ whole numbers, to enhance further learning of fractions.

4. Related Learning Contents

Grade 4

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

[16. Multiplication and Division of Decimal Numbers]

→

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 Fraction]

→

Grade 6

- How to find the volume of a prism and cylinder.

[3. Multiplication of Fractions]

↓

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

[4. Division of Fractions]

Unit 11

Unit: Multiplication and Division of Fractions

Sub-unit 1: Operation of Fractions × Whole Numbers

Lesson 1 of 3

Textbook Page s: 150 to 152
Actual Lesson 101

Sub-unit Objective

- To understand the meaning and how to calculate fraction multiplied by a whole number.

Lesson Objectives

- To think about how to calculate fraction multiplied by a whole number.
- Calculate fraction multiplied by a whole number.

Prior Knowledge

- Fractions in Grade 4

Preparation

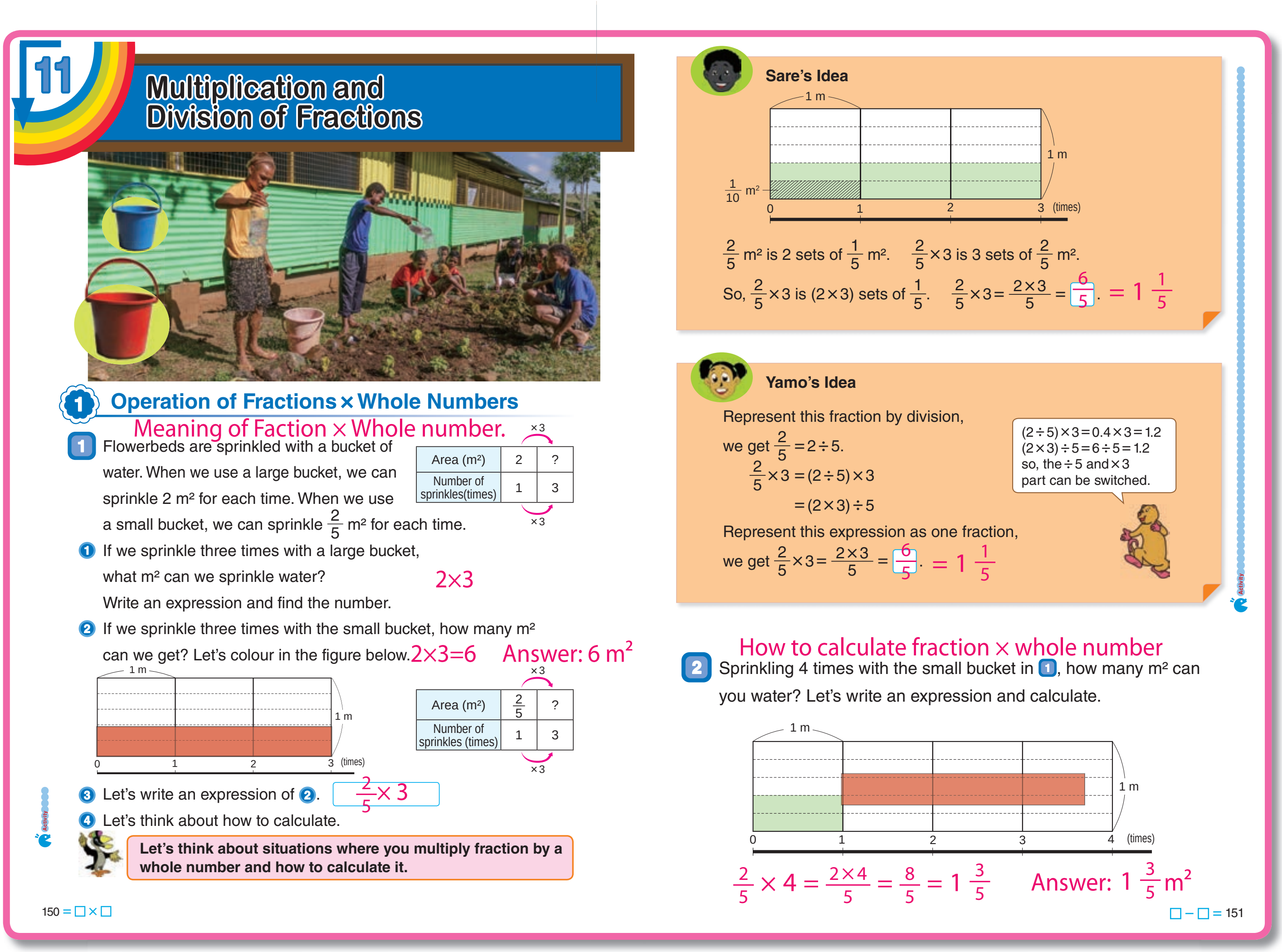
- Chart and table for task 1 and activity 2

Assessment

- Think about how to calculate Fraction × Whole number. **F**
- Understand and explain how to calculate Fraction × Whole number. **S**

Teacher's Note

- Remind students to represent improper fractions to proper fractions as their final answer.
- From Yamo's idea on $2 \div 5 \times 3 = 2 \times 3 \div 5$, it is learned in Gr. 5 unit 1 that:
  i. $(2 \div 5) \times 3 = 0.4 \times 3 = \mathbf{1.2}$ and
  ii. $(2 \times 3) \div 5 = 6 \div 5 = \mathbf{1.2}$



11 Multiplication and Division of Fractions

① Operation of Fractions × Whole Numbers

Meaning of Faction × Whole number.

1 Flowerbeds are sprinkled with a bucket of water. When we use a large bucket, we can sprinkle 2 m² for each time. When we use a small bucket, we can sprinkle $\frac{2}{5}$ m² for each time.

Area (m²)	2	?
Number of sprinkles(times)	1	3

① If we sprinkle three times with a large bucket, what m² can we sprinkle water? Write an expression and find the number. 2×3

② If we sprinkle three times with the small bucket, how many m² can we get? Let's colour in the figure below. $2 \times 3 = 6$ Answer: 6 m²

Area (m²)	$\frac{2}{5}$	?
Number of sprinkles (times)	1	3

③ Let's write an expression of ②. $\boxed{\frac{2}{5} \times 3}$

④ Let's think about how to calculate.

Let's think about situations where you multiply fraction by a whole number and how to calculate it.

Sare's Idea

$\frac{2}{5}$ m² is 2 sets of $\frac{1}{5}$ m². $\frac{2}{5} \times 3$ is 3 sets of $\frac{2}{5}$ m².

So, $\frac{2}{5} \times 3$ is (2×3) sets of $\frac{1}{5}$. $\frac{2}{5} \times 3 = \frac{2 \times 3}{5} = \boxed{\frac{6}{5}}. = 1\frac{1}{5}$

Yamo's Idea

Represent this fraction by division,

we get $\frac{2}{5} = 2 \div 5$.

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

$= (2 \times 3) \div 5$

Represent this expression as one fraction,

we get $\frac{2}{5} \times 3 = \frac{2 \times 3}{5} = \boxed{\frac{6}{5}}. = 1\frac{1}{5}$

$(2 \div 5) \times 3 = 0.4 \times 3 = 1.2$
$(2 \times 3) \div 5 = 6 \div 5 = 1.2$
so, the ÷ 5 and × 3 part can be switched.

How to calculate fraction × whole number

2 Sprinkling 4 times with the small bucket in 1, how many m² can you water? Let's write an expression and calculate.

$\frac{2}{5} \times 4 = \frac{2 \times 4}{5} = \frac{8}{5} = 1\frac{3}{5}$ Answer: $1\frac{3}{5}$ m²

Lesson Flow

1 ① Meaning of Faction × Whole number.

T Introduce the picture of the new unit and have pre-discussion.

T/S Read and understand the situation using the table.

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

T ① If we sprinkle three times with the large bucket, what m² can we get?

S Write a mathematical expression using the table as 2 × 3.

S Solve the problem. i.e.
2 × 3 = 6

T ② If we sprinkle three times with the small bucket, how many m² can we get?

T Explain the diagram and table.

TN Assist students to colour the part for 1 time first, then colour in the part for 3 times.

S ③ Using the table write a mathematical expression as $\frac{2}{5} \times 3$.

S ④ Think about how to calculate and present own ideas.

T Confirm and explain students ideas using Sare's and Yamo's ideas.

2 ② How to calculate fraction × whole number.

T Explain the diagram and table.

TN Assist students to colour the part for 1 time first, then colour in the parts for 4 times.

S Write an expression and calculate using Sare's and Yamo's ideas.

TN $\frac{2}{5} \times 4 = \frac{2 \times 4}{5}$

3 Important Point

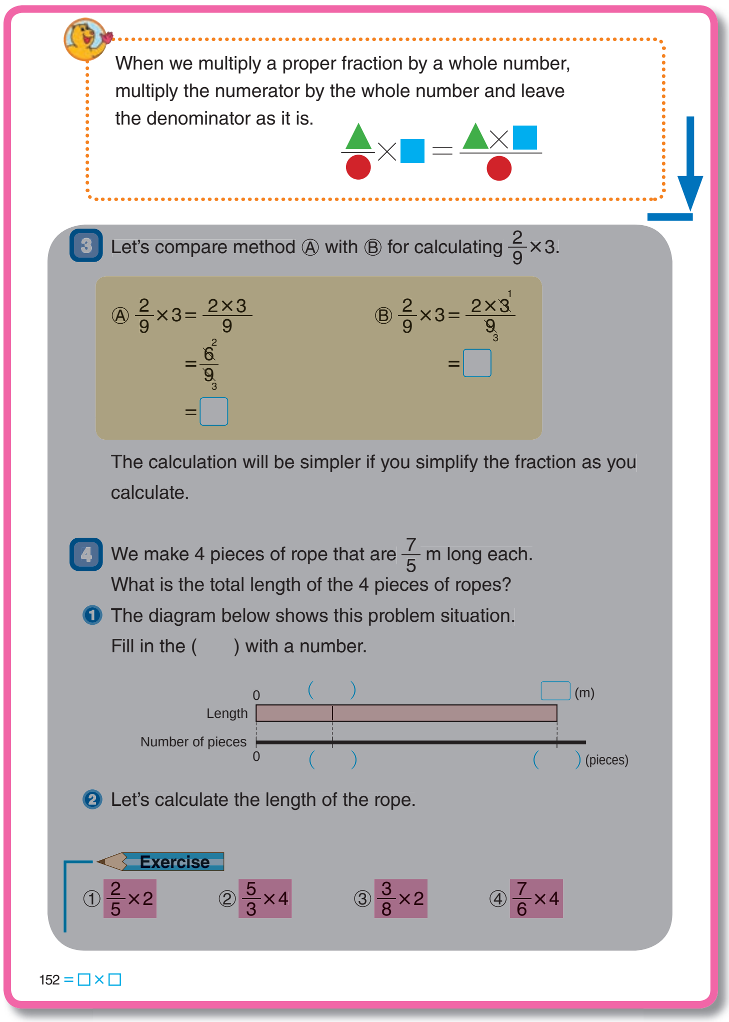
T/S Explain the important point in the box ⬚.

4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

T Use students ideas to confirm important concepts of this lesson.



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

$$\frac{▲}{●} \times ■ = \frac{▲ \times ■}{●}$$

③ Let's compare method Ⓐ with Ⓑ for calculating $\frac{2}{9} \times 3$.

Ⓐ $\frac{2}{9} \times 3 = \frac{2 \times 3}{9}$

$= \frac{\overset{2}{\cancel{6}}}{\underset{3}{\cancel{9}}}$

$= \square$

Ⓑ $\frac{2}{9} \times 3 = \frac{2 \times \overset{1}{\cancel{3}}}{\underset{3}{\cancel{9}}}$

$= \square$

The calculation will be simpler if you simplify the fraction as you calculate.

④ We make 4 pieces of rope that are $\frac{7}{5}$ m long each.
What is the total length of the 4 pieces of ropes?

① The diagram below shows this problem situation.
Fill in the (　　) with a number.

② Let's calculate the length of the rope.

Exercise

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

152 = □ × □

Sample Blackboard Plan

Lesson 101 Sample Blackboard Plan is on page 207.

Unit 11

Unit: Multiplication and Division of Fractions

Sub-unit 1: Operation of Fractions × Whole Numbers

Lesson 2 of 3

Textbook Page : 152
Actual Lesson 102

Lesson Objectives

- To understand how to simplify by cancelling in the middle of calculation of fraction multiplied by a whole number.
- To understand how to calculate improper fraction multiplied by a whole number.

Assessment

- Demonstrate and explain the process of multiplying fraction with a whole number and simplifying in the middle of the calculation. **F**
- Do the exercise correctly. **S**

Prior Knowledge

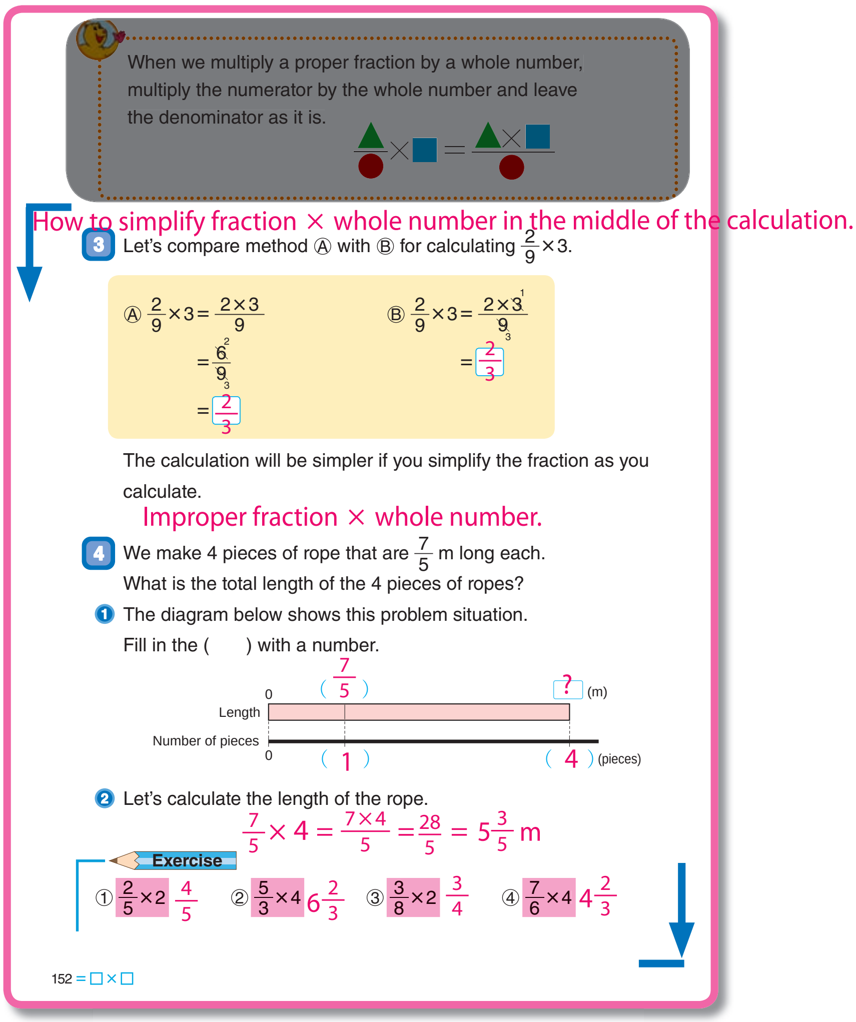
- How to calculate multiplication of fraction

Teacher's Note

The process of expressing improper fractions to proper fractions is outlined in lesson flow **3**.

Preparation

- Tape diagram for task **4**



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

$$\frac{▲}{●}\times■=\frac{▲\times■}{●}$$

How to simplify fraction × whole number in the middle of the calculation.

3 Let's compare method Ⓐ with Ⓑ for calculating $\frac{2}{9}\times3$.

Ⓐ $\frac{2}{9}\times3=\frac{2\times3}{9}$
$=\frac{\overset{2}{\cancel{6}}}{\underset{3}{\cancel{9}}}$
$=\boxed{\frac{2}{3}}$

Ⓑ $\frac{2}{9}\times3=\frac{2\times\overset{1}{\cancel{3}}}{\underset{3}{\cancel{9}}}$
$=\boxed{\frac{2}{3}}$

The calculation will be simpler if you simplify the fraction as you calculate.

Improper fraction × whole number.

4 We make 4 pieces of rope that are $\frac{7}{5}$ m long each.
What is the total length of the 4 pieces of ropes?

① The diagram below shows this problem situation.
Fill in the ( ) with a number.

② Let's calculate the length of the rope.

$$\frac{7}{5}\times4=\frac{7\times4}{5}=\frac{28}{5}=5\frac{3}{5}\text{ m}$$

Exercise

① $\frac{2}{5}\times2$ $\frac{4}{5}$ ② $\frac{5}{3}\times4$ $6\frac{2}{3}$ ③ $\frac{3}{8}\times2$ $\frac{3}{4}$ ④ $\frac{7}{6}\times4$ $4\frac{2}{3}$

152 = □×□

Lesson Flow

1 Review the previous lesson.

T How can we solve $\frac{2}{5}\times 3$?

S $\frac{2}{5}\times 3=\frac{2\times 3}{5}=\frac{6}{5}=1\frac{1}{5}$

T Confirm answers using the definition $\frac{\blacktriangle}{\bullet}\times\blacksquare=\frac{\blacktriangle\times\blacksquare}{\bullet}$.

2 ③ How to simplify fraction × whole number in the middle of the calculation.

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

T Let students compare methods A with B.

TN Give enough time to the students to compare methods A and B.

S Compare Methods A and B.

TN A. Simplify after getting the answer.
B. Simplify by dividing 3 in both the numerator and the denominator in the middle of the calculation.

T What have you noticed about the two calculations?

S The calculation will be simpler if you simplify the fraction as you calculate.

3 ④ Improper fraction × whole number.

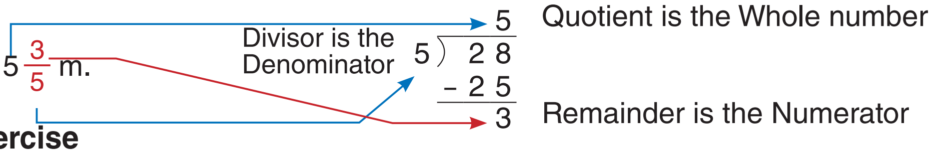
T We make 4 pieces of rope that are $\frac{7}{5}$ m long each. What is the total lenght of the 4 pieces of rope?

S ① Fill in the blank with a number using the tape diagram.

T ② Calculate the length of the rope.

S Calculate.

TN $\frac{7}{5}\times 4=\frac{7\times 4}{5}=\frac{28}{5}=5\frac{3}{5}$ m.



4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

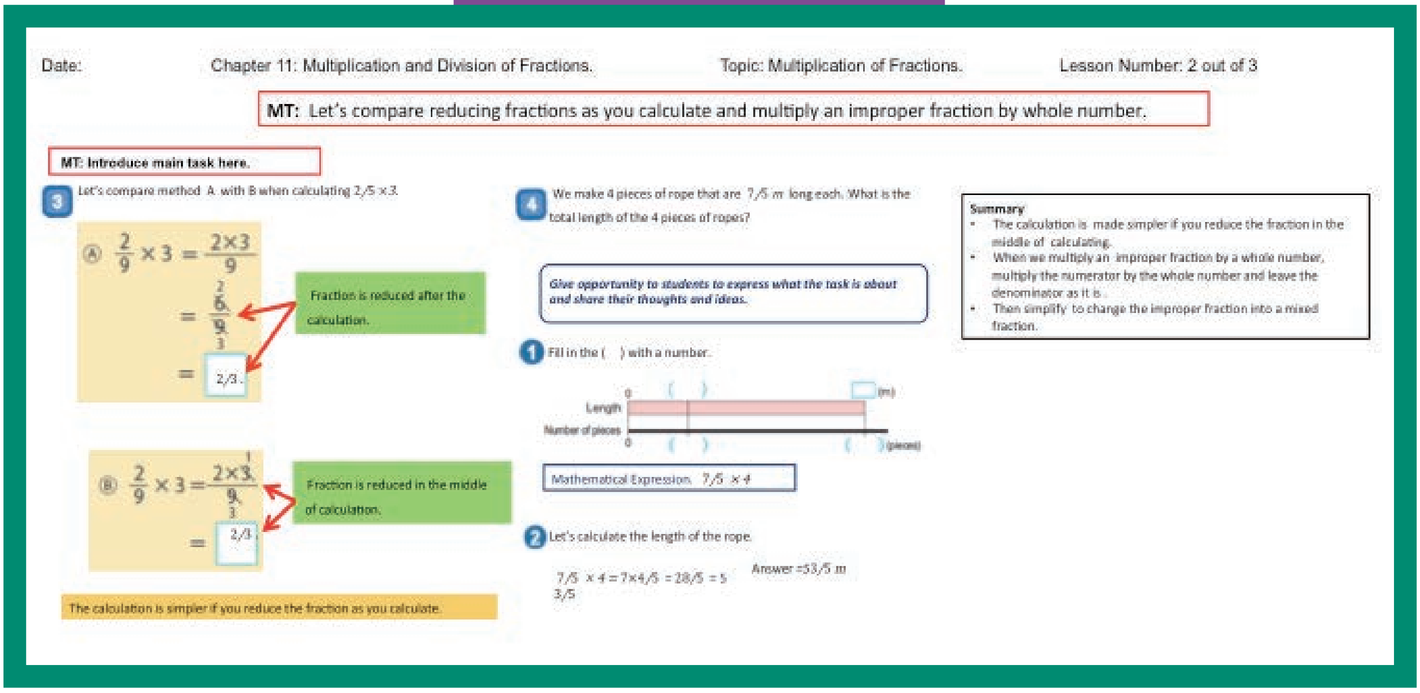
5 Summary

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 11: Multiplication and Division of Fractions. Topic: Multiplication of Fractions. Lesson Number: 2 out of 3

MT: Let's compare reducing fractions as you calculate and multiply an improper fraction by whole number.

MT: Introduce main task here.

③ Let's compare method A with B when calculating 2/5 ×3.

Ⓐ $\frac{2}{9}\times 3=\frac{2\times 3}{9}=\frac{\overset{2}{\cancel{6}}}{\underset{3}{\cancel{9}}}=\boxed{2/3}$

Fraction is reduced after the calculation.

Ⓑ $\frac{2}{9}\times 3=\frac{2\times\overset{1}{\cancel{3}}}{\underset{3}{\cancel{9}}}=\boxed{2/3}$

Fraction is reduced in the middle of calculation.

The calculation is simpler if you reduce the fraction as you calculate.

④ We make 4 pieces of rope that are 7/5 m long each. What is the total length of the 4 pieces of ropes?

Give opportunity to students to express what the task is about and share their thoughts and ideas.

① Fill in the ( ) with a number.

Mathematical Expression. 7/5 × 4

② Let's calculate the length of the rope.

7/5 × 4 = 7×4/5 = 28/5 = 5 3/5

Answer =53/5 m

Summary
- The calculation is made simpler if you reduce the fraction in the middle of calculating.
- When we multiply an improper fraction by a whole number, multiply the numerator by the whole number and leave the denominator as it is .
- Then simplify to change the improper fraction into a mixed fraction.

Unit 11

Unit: Multiplication and Division of Fractions

Sub-unit 1: Operation of Fractions × Whole Numbers

Lesson 3 of 3

Textbook Page : 153
Actual Lesson 103

Lesson Objectives

- To think about how to calculate mixed fraction multiplied by whole number.
- Calculate mixed fraction multiplied by whole number.

Prior Knowledge

- Multiplication of fractions (Unit 8)

Preparation

- Tape diagram for task 5
- Chart for Gawi's and Kekeni's ideas

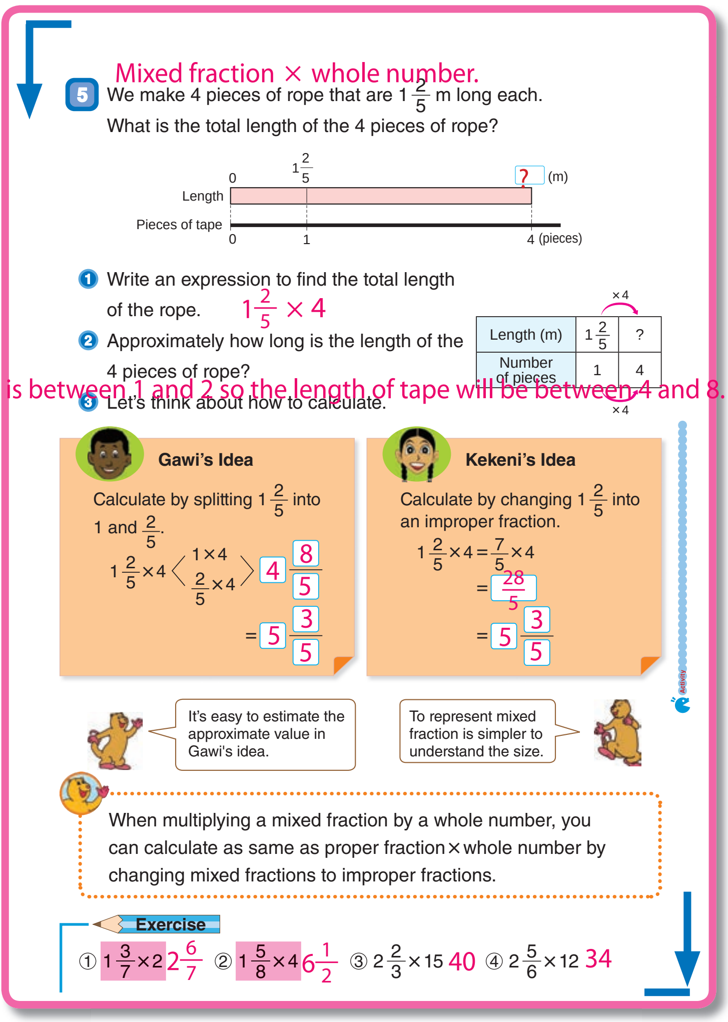
Assessment

- Demonstrate and understand the process of calculating mixed fraction multiplied by a whole number. F
- Complete the Exercise correctly. S

Teacher's Note

Remind students that answers in improper fractions should be changed to mixed fractions.

Complete theExercise
Students should solve exercise questions (1) to (4) leaving answers in their simplest form.



Mixed fraction × whole number.

5 We make 4 pieces of rope that are $1\frac{2}{5}$ m long each.
What is the total length of the 4 pieces of rope?

① Write an expression to find the total length of the rope. $1\frac{2}{5} \times 4$

② Approximately how long is the length of the 4 pieces of rope?

Length (m)	$1\frac{2}{5}$	?
Number of pieces	1	4

$1\frac{2}{5}$ is between 1 and 2 so the length of tape will be between 4 and 8.

③ Let's think about how to calculate.

Gawi's Idea

Calculate by splitting $1\frac{2}{5}$ into 1 and $\frac{2}{5}$.

$1\frac{2}{5}\times4 \left\langle \begin{matrix} 1\times4 \\ \frac{2}{5}\times4 \end{matrix} \right\rangle \boxed{4}\,\frac{\boxed{8}}{\boxed{5}}$

$=\boxed{5}\,\frac{\boxed{3}}{\boxed{5}}$

Kekeni's Idea

Calculate by changing $1\frac{2}{5}$ into an improper fraction.

$1\frac{2}{5}\times4=\frac{7}{5}\times4$

$=\boxed{\frac{28}{5}}$

$=\boxed{5}\,\frac{\boxed{3}}{\boxed{5}}$

It's easy to estimate the approximate value in Gawi's idea.

To represent mixed fraction is simpler to understand the size.

When multiplying a mixed fraction by a whole number, you can calculate as same as proper fraction × whole number by changing mixed fractions to improper fractions.

Exercise

① $1\frac{3}{7}\times2$ $2\frac{6}{7}$ ② $1\frac{5}{8}\times4$ $6\frac{1}{2}$ ③ $2\frac{2}{3}\times15$ 40 ④ $2\frac{5}{6}\times12$ 34

Lesson Flow

1 Review the previous lesson.

2 Mixed fraction × whole number.

T/S 5 Read and understand the given situation.

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

T Explain the situation using the tape diagram to make four pieces of rope that are $1\frac{2}{5}$ m long each.
How long is the rope in metres do we need?

S ① Write an expresison to find the total length of the rope. ($1\frac{2}{5}\times4$)

T ② Approximately how long is the lenght of the 4 pieces of rope?

S $1\frac{2}{5}\times4$ more than 4 metres.

T ③ Let's think about how to calculate.

Lesson Flow

3 How to calculate $1\frac{2}{5}\times4$.

S Present their ideas on how to calculate $1\frac{2}{5}\times4$.

T/S Refer to Gawi's and Kekeni's ideas to confirm their ideas and fill in the box.

TN
- Gawi's idea : Calculate by splitting $1\frac{2}{5}$ into 1 and $\frac{2}{5}$ as 1×4 and $\frac{2}{5}\times4$.
- Kekeni's idea : Calculate by changing $1\frac{2}{5}$ into an improper fraction.

T When multiplying a mixed fraction by a whole number, you can calculate similarly as proper fractions × whole numbers by changing mixed fractions to improper fractions.

4 Important Point

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

5 Complete the Exercise.

S Solve the selected exercises.

T Confirm students' answers.

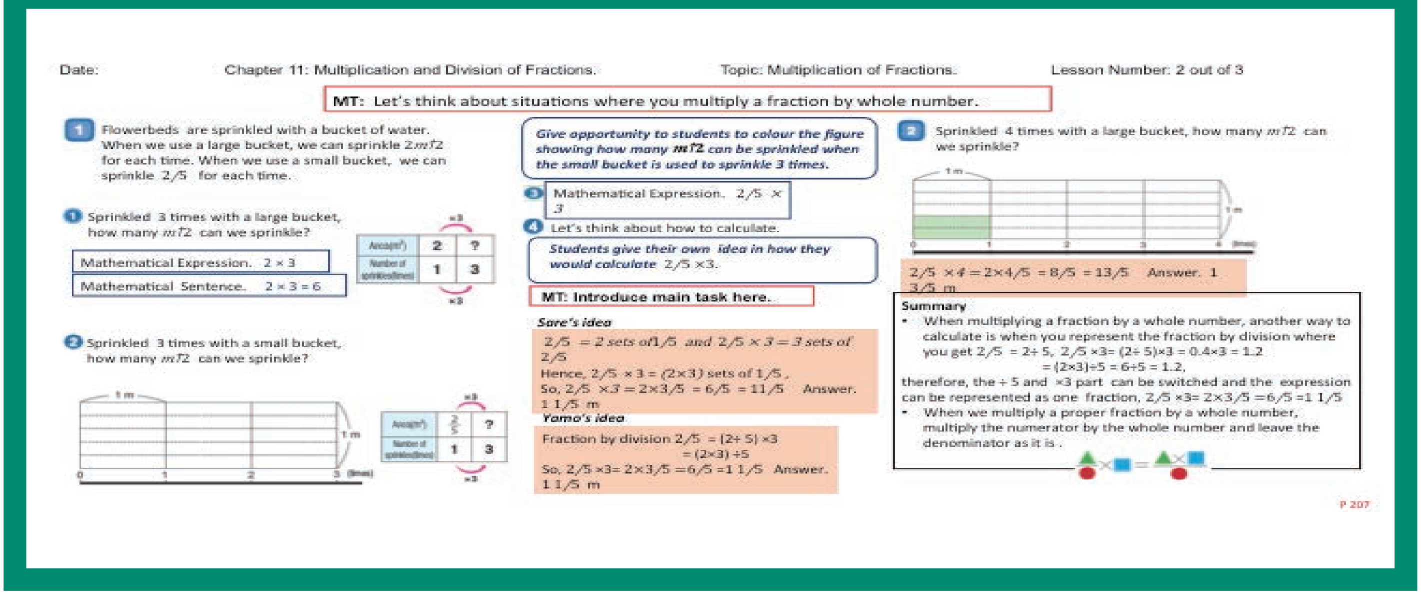
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan (Lesson 101)



Date: Chapter 11: Multiplication and Division of Fractions. Topic: Multiplication of Fractions. Lesson Number: 2 out of 3

MT: Let's think about situations where you multiply a fraction by whole number.

1 Flowerbeds are sprinkled with a bucket of water. When we use a large bucket, we can sprinkle 2m↑2 for each time. When we use a small bucket, we can sprinkle 2/5 for each time.

① Sprinkled 3 times with a large bucket, how many m↑2 can we sprinkle?

Mathematical Expression. 2 × 3

Mathematical Sentence. 2 × 3 = 6

Area(m²)	2	?
Number of sprinkles(times)	1	3

② Sprinkled 3 times with a small bucket, how many m↑2 can we sprinkle?

Area(m²)	$\frac{2}{5}$	?
Number of sprinkles(times)	1	3

Give opportunity to students to colour the figure showing how many m↑2 can be sprinkled when the small bucket is used to sprinkle 3 times.

③ Mathematical Expression. 2/5 × 3

④ Let's think about how to calculate.

Students give their own idea in how they would calculate 2/5 ×3.

MT: Introduce main task here.

Sare's idea

2/5 = 2 sets of1/5 and 2/5 × 3 = 3 sets of 2/5
Hence, 2/5 × 3 = (2×3) sets of 1/5 .
So, 2/5 ×3 = 2×3/5 = 6/5 = 11/5 Answer. 1 1/5 m

Yamo's idea

Fraction by division 2/5 = (2÷ 5) ×3
= (2×3) ÷5
So, 2/5 ×3= 2×3/5 =6/5 =1 1/5 Answer. 1 1/5 m

2 Sprinkled 4 times with a large bucket, how many m↑2 can we sprinkle?

2/5 ×4 = 2×4/5 = 8/5 = 13/5 Answer. 1 3/5 m

Summary
- When multiplying a fraction by a whole number, another way to calculate is when you represent the fraction by division where you get 2/5 = 2÷ 5, 2/5 ×3= (2÷ 5)×3 = 0.4×3 = 1.2
= (2×3)÷5 = 6÷5 = 1.2,

therefore, the ÷ 5 and ×3 part can be switched and the expression can be represented as one fraction, 2/5 ×3= 2×3/5 =6/5 =1 1/5
- When we multiply a proper fraction by a whole number, multiply the numerator by the whole number and leave the denominator as it is .

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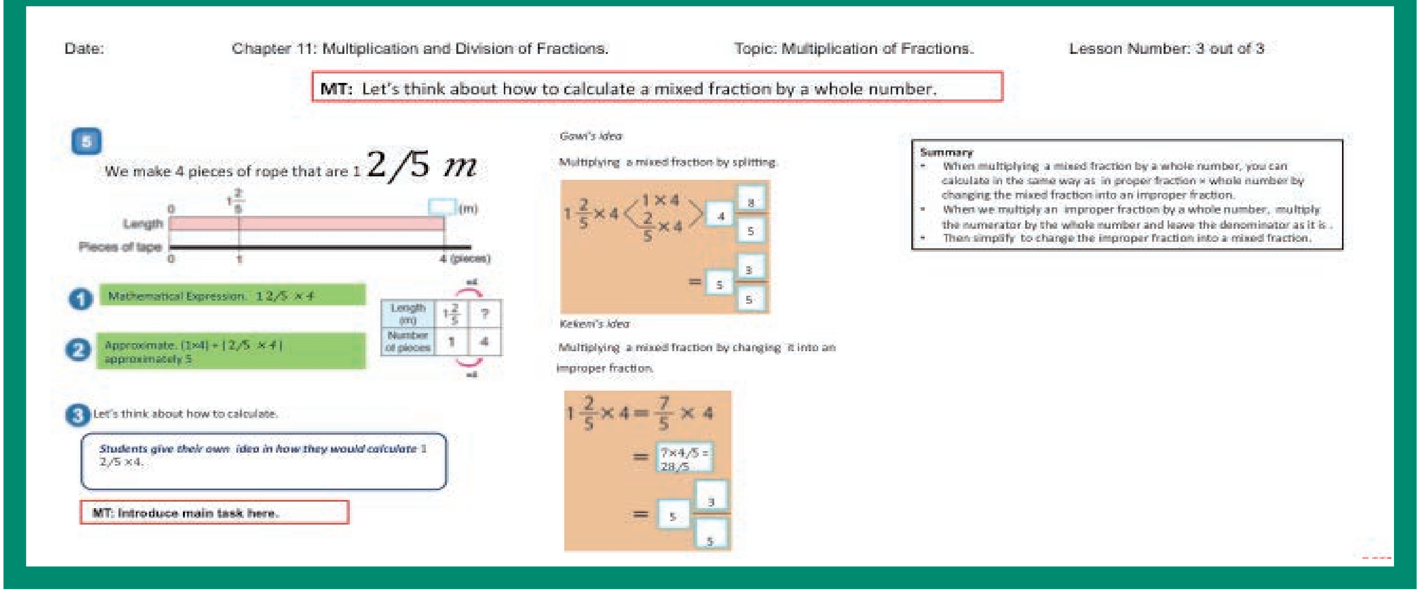
Sample Blackboard Plan (Lesson 103)



Date: Chapter 11: Multiplication and Division of Fractions. Topic: Multiplication of Fractions. Lesson Number: 3 out of 3

MT: Let's think about how to calculate a mixed fraction by a whole number.

5 We make 4 pieces of rope that are 1 2/5 m

① Mathematical Expression. 1 2/5 × 4

② Approximate. (1×4) + (2/5 × 4) approximately 5

Length (m)	$1\frac{2}{5}$	?
Number of pieces	1	4

③ Let's think about how to calculate.

Students give their own idea in how they would calculate 1 2/5 ×4.

MT: Introduce main task here.

Gawi's idea

Multiplying a mixed fraction by splitting.

$$1\frac{2}{5}\times4 \begin{cases} 1\times4 \\ \frac{2}{5}\times4 \end{cases} \boxed{4}\frac{\boxed{8}}{\boxed{5}}$$

$$=\boxed{5}\frac{\boxed{3}}{\boxed{5}}$$

Kekeni's idea

Multiplying a mixed fraction by changing it into an improper fraction.

$$1\frac{2}{5}\times4=\frac{7}{5}\times4$$

$$=\boxed{7\times4/5 = 28/5}$$

$$=\boxed{5}\frac{\boxed{3}}{\boxed{5}}$$

Summary
- When multiplying a mixed fraction by a whole number, you can calculate in the same way as in proper fraction × whole number by changing the mixed fraction into an improper fraction.
- When we multiply an improper fraction by a whole number, multiply the numerator by the whole number and leave the denominator as it is .
- Then simplify to change the improper fraction into a mixed fraction.

Unit 11

Unit: Multiplication and Division of Fractions

Sub-unit 2: Operation of Fractions ÷ Whole Numbers

Lesson 1 of 4

Textbook Page : 154 and 155
Actual Lesson 104

Sub-unit Objective

- To understand how to calculate fraction divided by a whole number.

Lesson Objective

- To think about the meaning and how to calculate fraction divided by a whole number.

Prior Knowledge

- Multiplication of fractions (Unit 8)

Preparation

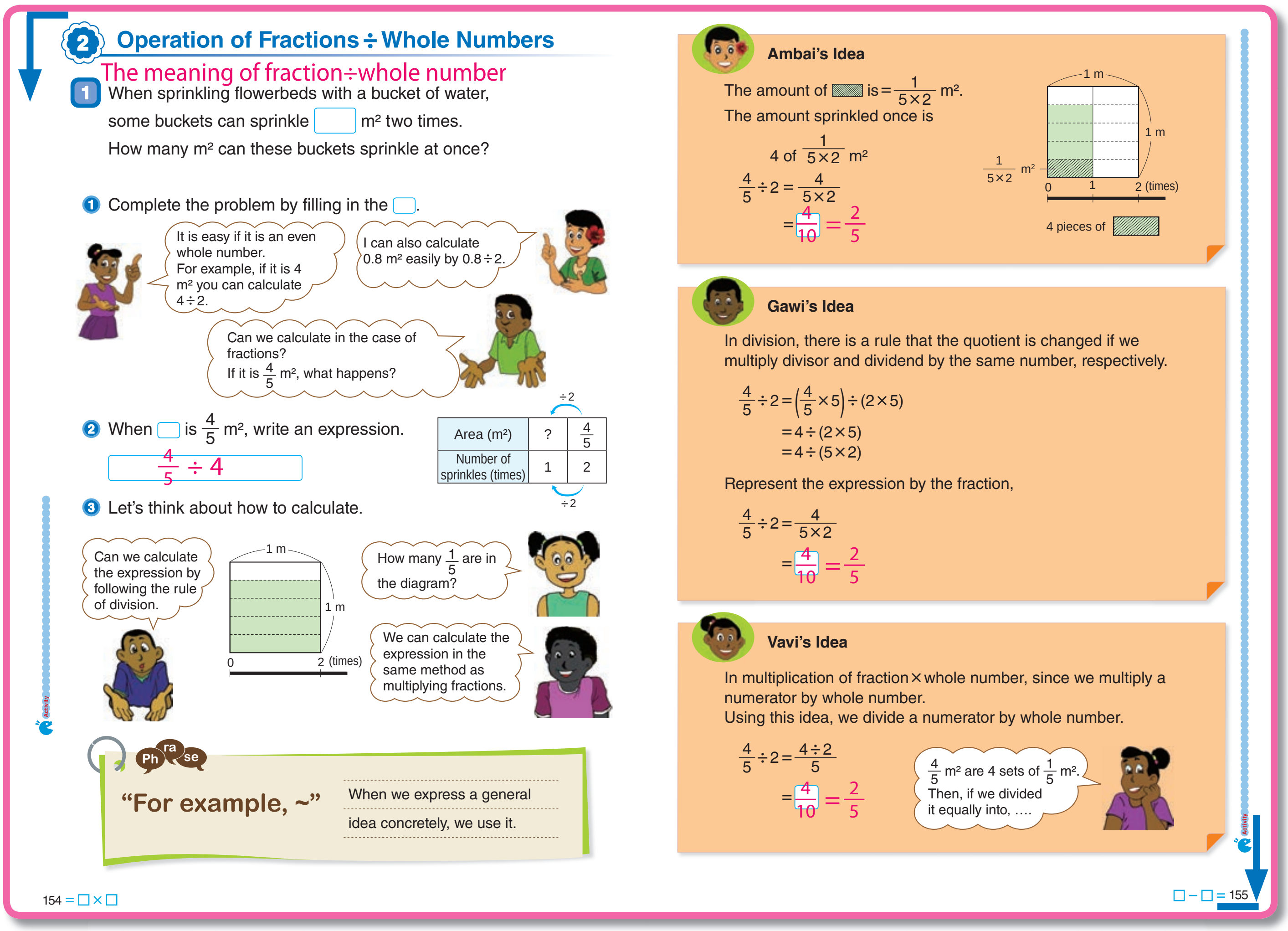
- Chart of the students' ideas

Assessment

- Explain the meaning of fraction ÷ whole number. F
- Think about how to calculate fraction ÷ whole number. S

Teacher's Note

There are three different ways of dividing a fraction by a whole number.
The teacher should inform students to decide which one of the three ideas is easier for them to use.



② Operation of Fractions ÷ Whole Numbers

The meaning of fraction÷whole number

1 When sprinkling flowerbeds with a bucket of water, some buckets can sprinkle ☐ m² two times. How many m² can these buckets sprinkle at once?

① Complete the problem by filling in the ☐.

It is easy if it is an even whole number. For example, if it is 4 m² you can calculate 4 ÷ 2.

I can also calculate 0.8 m² easily by 0.8 ÷ 2.

Can we calculate in the case of fractions? If it is $\frac{4}{5}$ m², what happens?

② When ☐ is $\frac{4}{5}$ m², write an expression.

$\frac{4}{5} \div 4$

Area (m²)	?	$\frac{4}{5}$
Number of sprinkles (times)	1	2

÷2
÷2

③ Let's think about how to calculate.

Can we calculate the expression by following the rule of division.

How many $\frac{1}{5}$ are in the diagram?

We can calculate the expression in the same method as multiplying fractions.

Phrase

"For example, ~"

When we express a general idea concretely, we use it.

Ambai's Idea

The amount of ▨ is $= \frac{1}{5 \times 2}$ m².
The amount sprinkled once is

4 of $\frac{1}{5 \times 2}$ m²

$$\frac{4}{5} \div 2 = \frac{4}{5 \times 2} = \boxed{\frac{4}{10}} = \frac{2}{5}$$

Gawi's Idea

In division, there is a rule that the quotient is changed if we multiply divisor and dividend by the same number, respectively.

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

Represent the expression by the fraction,

$$\frac{4}{5} \div 2 = \frac{4}{5 \times 2} = \boxed{\frac{4}{10}} = \frac{2}{5}$$

Vavi's Idea

In multiplication of fraction × whole number, since we multiply a numerator by whole number.
Using this idea, we divide a numerator by whole number.

$$\frac{4}{5} \div 2 = \frac{4 \div 2}{5} = \boxed{\frac{4}{10}} = \frac{2}{5}$$

$\frac{4}{5}$ m² are 4 sets of $\frac{1}{5}$ m². Then, if we divided it equally into, ….

154 = ☐ × ☐

☐ − ☐ = 155

Lesson Flow

1 ① The meaning of fraction ÷ whole number.

T Introduce the Main Task. (Refer to the Blackboard Plan)
T/S Read and understand the situation.
T How many m^2 can this bucket of water sprinkle at once?
S ① Complete the problem by filling in the box ☐.
TN It's easy if it's an even whole number. E.g. 4 $m^2 \div 2 = 2$ m^2.
S ② When it is $\frac{4}{5}$ m^2, write an expression.
S $\frac{4}{5} \div 2$

2 How to calculate $\frac{4}{5} \div 2$.

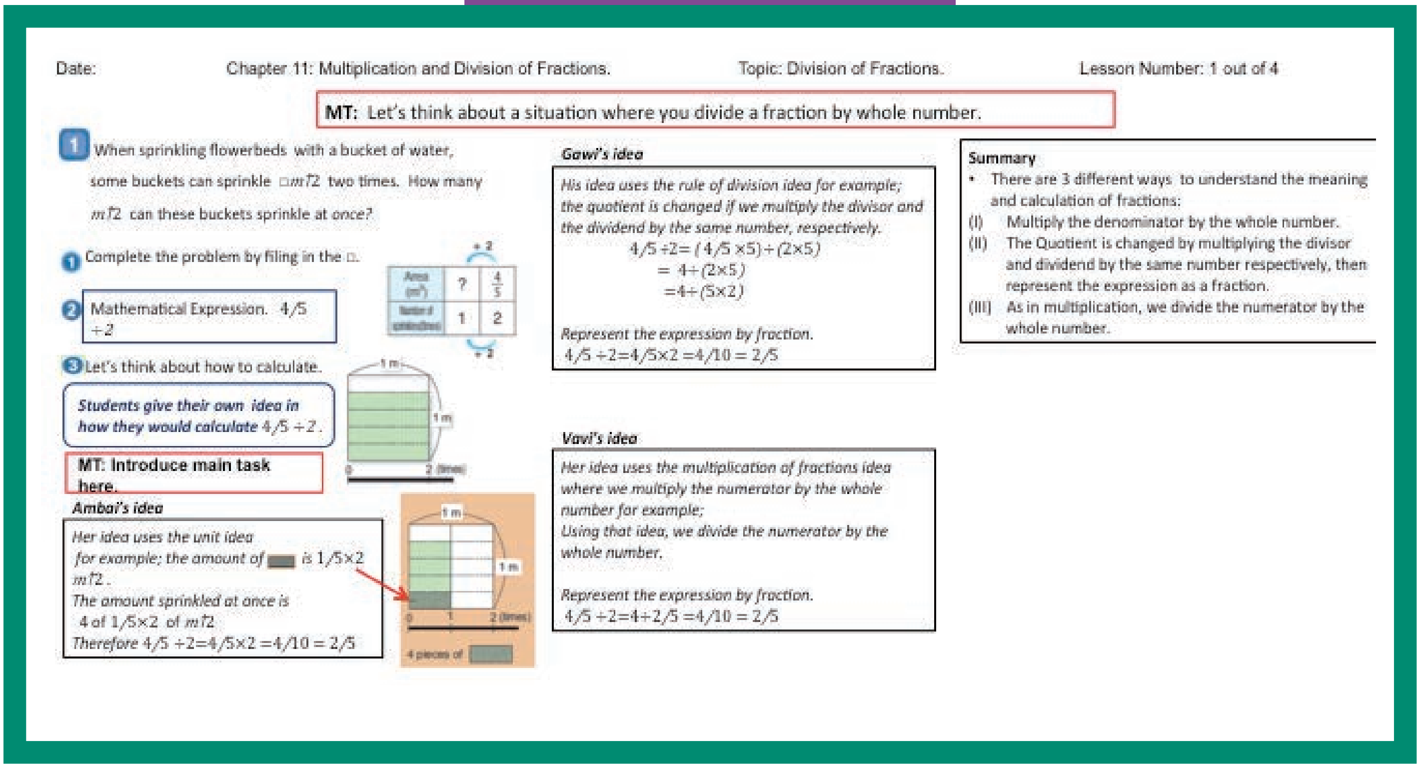
T ③ Let's think about how to calculate $\frac{4}{5} \div 2$.
S Present their ideas on how to calculate $\frac{4}{5} \div 2$.
TN When presenting their ideas concretely, they can use the phrase 'for example'.
T/S Refer to Ambai's, Gawi's and Vavi's ideas to confirm their ideas and fill in the box.
TN Compare the ideas.

Ambai's Idea : Using the unit idea.
Gawi's Idea : Using the rule of division that the quotient is changed if we multiply divisor and dividend with the same number.
Vavi's Idea : Applying the idea of multiplication of fraction, numerator × whole number.
In this case, its division so the numerator is divided by whole number.

3 Summary

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

Sample Blackboard Plan



Date: Chapter 11: Multiplication and Division of Fractions. Topic: Division of Fractions. Lesson Number: 1 out of 4

MT: Let's think about a situation where you divide a fraction by whole number.

① When sprinkling flowerbeds with a bucket of water, some buckets can sprinkle ☐m↑2 two times. How many m↑2 can these buckets sprinkle at once?

① Complete the problem by filing in the ☐.

② Mathematical Expression. 4/5 ÷2

③ Let's think about how to calculate.

Students give their own idea in how they would calculate 4/5 ÷2 .

MT: Introduce main task here.

Ambai's idea

Her idea uses the unit idea
for example; the amount of ▆ *is* 1/5×2 *m↑2 .*
The amount sprinkled at once is
4 of 1/5×2 of m↑2
Therefore 4/5 ÷2=4/5×2 =4/10 = 2/5

Gawi's idea

His idea uses the rule of division idea for example; the quotient is changed if we multiply the divisor and the dividend by the same number, respectively.
4/5 ÷2= (4/5 ×5)÷(2×5)
= 4÷(2×5)
=4÷(5×2)

Represent the expression by fraction.
4/5 ÷2=4/5×2 =4/10 = 2/5

Vavi's idea

Her idea uses the multiplication of fractions idea where we multiply the numerator by the whole number for example;
Using that idea, we divide the numerator by the whole number.

Represent the expression by fraction.
4/5 ÷2=4÷2/5 =4/10 = 2/5

Summary
- There are 3 different ways to understand the meaning and calculation of fractions:

(I) Multiply the denominator by the whole number.
(II) The Quotient is changed by multiplying the divisor and dividend by the same number respectively, then represent the expression as a fraction.
(III) As in multiplication, we divide the numerator by the whole number.

Unit 11

Unit: Multiplication and Division of Fractions

Sub-unit 2: Operation of Fractions ÷ Whole Numbers

Lesson 2 of 4

Textbook Page : 156
Actual Lesson 105

Lesson Objective

- To deepen students' knowledge on how to calculate fraction ÷ whole number.

Prior Knowledge

- Multiplication of fractions (Unit 8)

Preparation

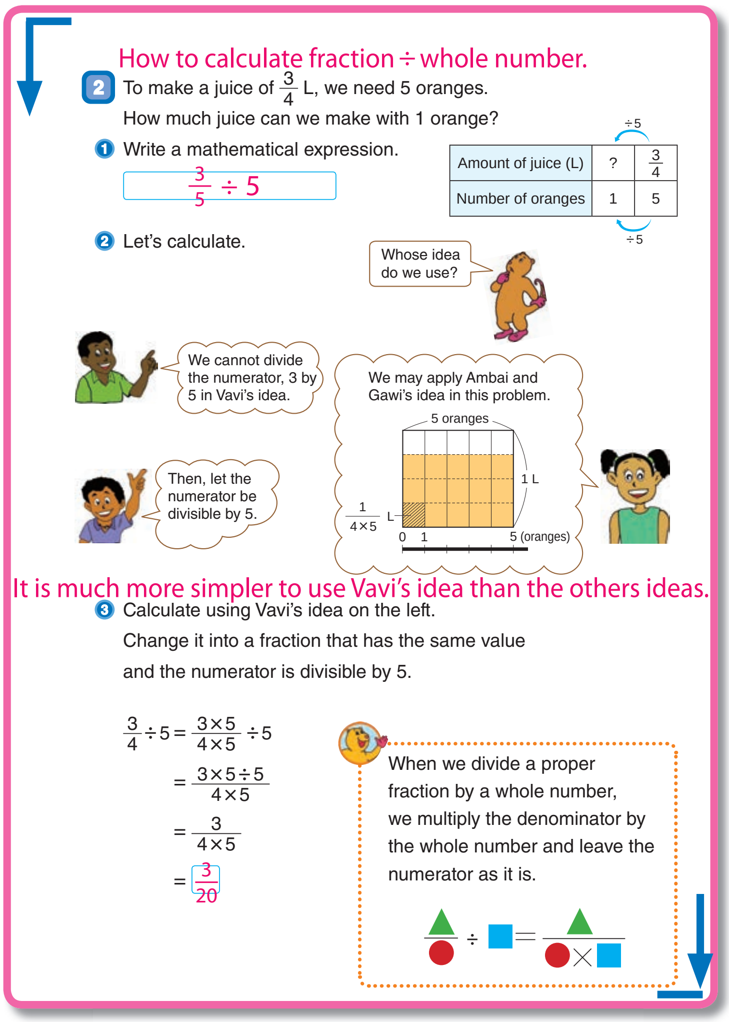
- Table and diagram representation for task 2

Assessment

- Think about how to calculate fraction divided by a whole number. F
- Calculate fraction ÷ whole number. S

Teacher's Note

We can still use the three ideas to solve task 2 however, let students find simpler ways to solve different types of problems given.



How to calculate fraction ÷ whole number.

2 To make a juice of $\frac{3}{4}$ L, we need 5 oranges.
How much juice can we make with 1 orange?

① Write a mathematical expression.

$\frac{3}{5} \div 5$

÷5

Amount of juice (L)	?	$\frac{3}{4}$
Number of oranges	1	5

÷5

② Let's calculate.

Whose idea do we use?

We cannot divide the numerator, 3 by 5 in Vavi's idea.

Then, let the numerator be divisible by 5.

We may apply Ambai and Gawi's idea in this problem.

It is much more simpler to use Vavi's idea than the others ideas.

③ Calculate using Vavi's idea on the left.
Change it into a fraction that has the same value and the numerator is divisible by 5.

$$\frac{3}{4} \div 5 = \frac{3\times5}{4\times5} \div 5 = \frac{3\times5\div5}{4\times5} = \frac{3}{4\times5} = \boxed{\frac{3}{20}}$$

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

$$\frac{▲}{●} \div ■ = \frac{▲}{●\times■}$$

Lesson Flow

1 Review the previous lesson.

2 ② How to calculate fraction ÷ whole number.

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

T/S Read and understand the situation.

S ① Write a mathematical expression using the table. $\boxed{\frac{3}{4}\div 5}$

3 Let's calculate $\frac{3}{4}\div 5$ using the three ideas.

T ② Whose idea can we use to calculate $\frac{3}{4}\div 5$ easily?

TN We cannot divide the numerator, 3 by 5 in Vavi's idea therefore we may apply Gawi's or Ambai's idea to calculate easily.

T Use Ambai's idea from the diagram representation in the speech bubble to explain how to calculate $\frac{3}{4}\div 5$.

S Calculate $\frac{3}{4}\div 5$ using Ambai's idea.

$$\frac{3}{4}\div 5=\frac{3}{4\times 5}=\frac{3}{20}$$

T Use Gawi's idea by multiply divisor and dividend with the same number.

S Calculate $\frac{3}{4}\div 5$ using Gawi's idea.

$$\frac{3}{4}\div 5=3\div(4\times 5)=\frac{3}{20}$$

T ③ Ask students to apply Vavi's idea to calculate $\frac{3}{4}\div 5$.

S Calculate $\frac{3}{4}\div 5$ using Vavi's idea.

TN Change the fraction $\frac{3}{4}$ to an equivalent fraction which the numerator is divisible by 5 and complete the calculation in the textbook.

4 Important Point

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

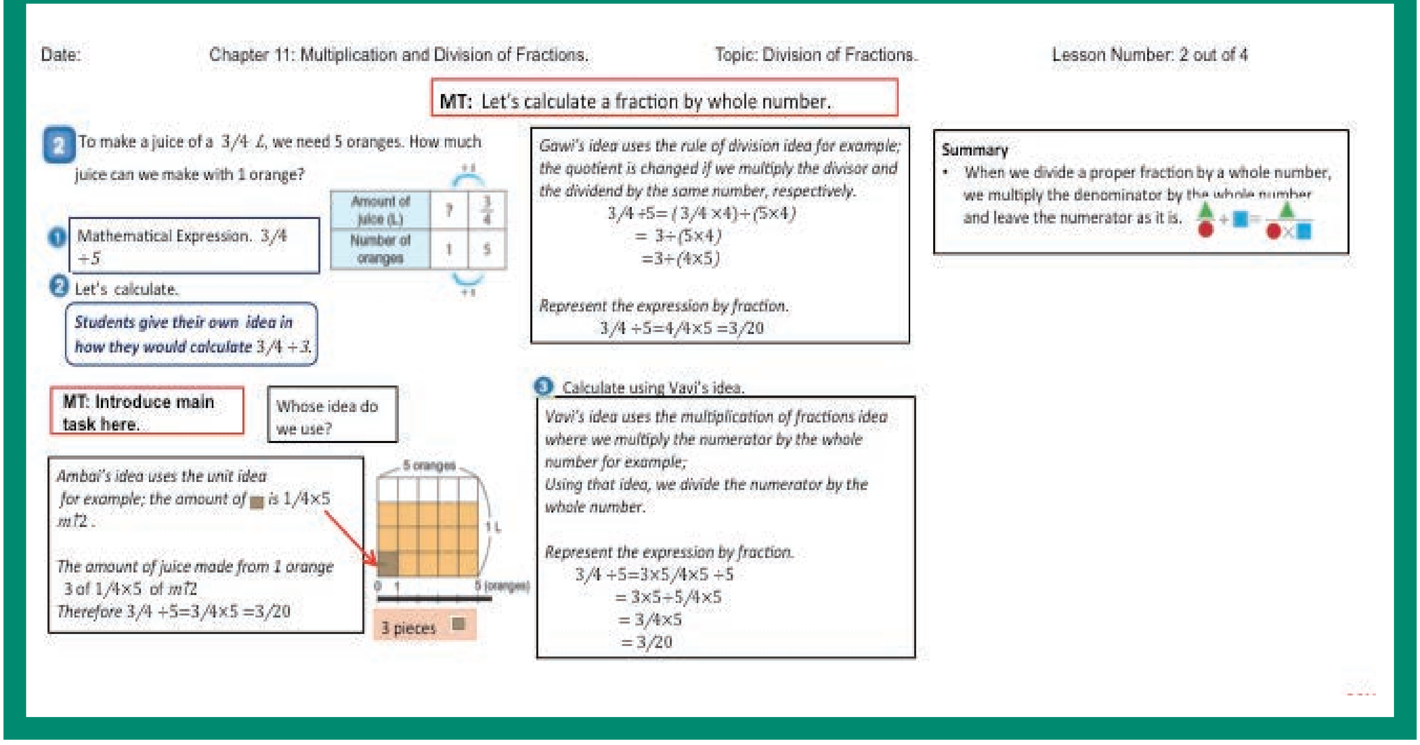
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Multiplication and Division of Fractions. Topic: Division of Fractions. Lesson Number: 2 out of 4

MT: Let's calculate a fraction by whole number.

② To make a juice of a 3/4 L, we need 5 oranges. How much juice can we make with 1 orange?

Amount of juice (L)	?	$\frac{3}{4}$
Number of oranges	1	5

① Mathematical Expression. 3/4 ÷5

② Let's calculate.

Students give their own idea in how they would calculate 3/4 ÷3.

MT: Introduce main task here.

Whose idea do we use?

Ambai's idea uses the unit idea for example; the amount of ■ is 1/4×5 m†2 .

The amount of juice made from 1 orange 3 of 1/4×5 of m†2
Therefore 3/4 ÷5=3/4×5 =3/20

Gawi's idea uses the rule of division idea for example; the quotient is changed if we multiply the divisor and the dividend by the same number, respectively.

3/4 ÷5= (3/4 ×4)÷(5×4)
= 3÷(5×4)
=3÷(4×5)

Represent the expression by fraction.
3/4 ÷5=4/4×5 =3/20

③ Calculate using Vavi's idea.

Vavi's idea uses the multiplication of fractions idea where we multiply the numerator by the whole number for example;
Using that idea, we divide the numerator by the whole number.

Represent the expression by fraction.
3/4 ÷5=3×5/4×5 ÷5
= 3×5÷5/4×5
= 3/4×5
= 3/20

Summary
- When we divide a proper fraction by a whole number, we multiply the denominator by the whole number and leave the numerator as it is. $\frac{\blacktriangle}{\bullet}\div\blacksquare=\frac{\blacktriangle}{\bullet\times\blacksquare}$

Unit 11

Unit: Multiplication and Division of Fractions

Sub-unit 2: Operation of Fractions ÷ Whole Numbers

Lesson 3 of 4

Textbook Page : 157
Actual Lesson 106

Lesson Objectives

- To think about how to calculate improper fractions divided by a whole number.
- Calculate improper fractions divided by a whole number.
- To simplify during the process of calculating a fraction divided by a whole number.

Prior Knowledge

- Division of fraction by whole number (Unit 8)

Preparation

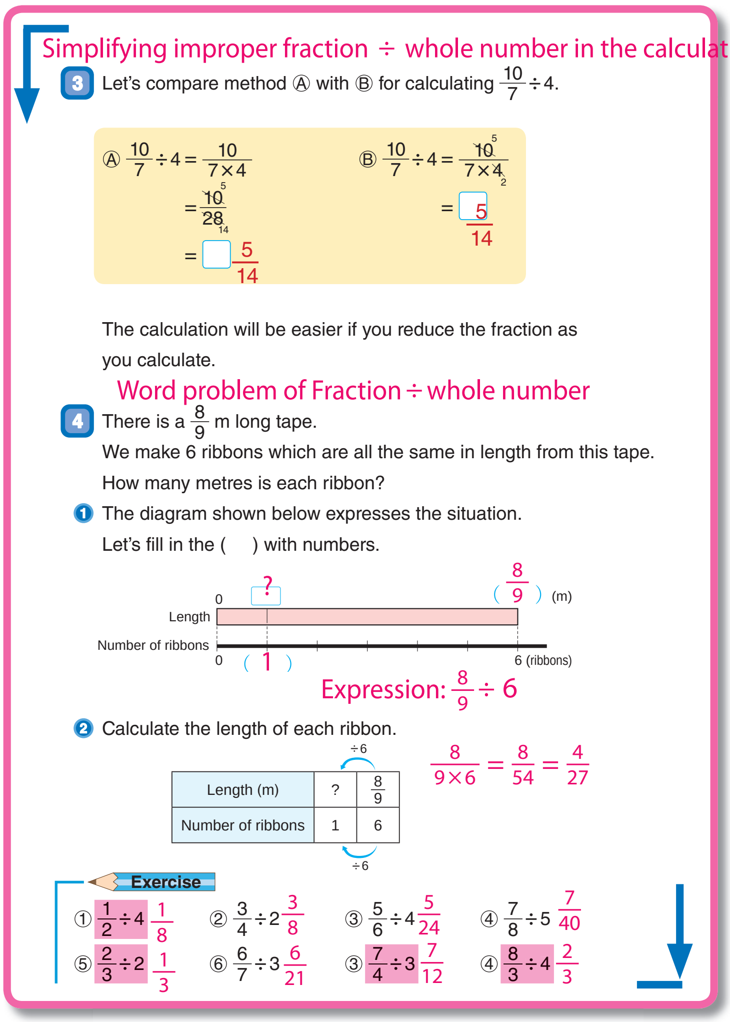
- Chart for task 3
- Tape diagram and table for task 4

Assessment

- Calculate improper fraction ÷ whole number and simplify where necessary. F
- Complete the Exercise correctly. S

Teacher's Note

Emphasise on the two main ways to do cancellation in task 3.



Simplifying improper fraction ÷ whole number in the calculation.

3 Let's compare method Ⓐ with Ⓑ for calculating $\frac{10}{7} \div 4$.

Ⓐ $\frac{10}{7} \div 4 = \frac{10}{7 \times 4}$

$= \frac{\overset{5}{\cancel{10}}}{\underset{14}{\cancel{28}}}$

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

Ⓑ $\frac{10}{7} \div 4 = \frac{\overset{5}{\cancel{10}}}{7 \times \underset{2}{\cancel{4}}}$

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

The calculation will be easier if you reduce the fraction as you calculate.

Word problem of Fraction ÷ whole number

4 There is a $\frac{8}{9}$ m long tape.
We make 6 ribbons which are all the same in length from this tape.
How many metres is each ribbon?

① The diagram shown below expresses the situation.
Let's fill in the (　　) with numbers.

Expression: $\frac{8}{9} \div 6$

② Calculate the length of each ribbon.

÷6

Length (m)	?	$\frac{8}{9}$
Number of ribbons	1	6

÷6

$\frac{8}{9 \times 6} = \frac{8}{54} = \frac{4}{27}$

Exercise

① $\frac{1}{2} \div 4$ $\frac{1}{8}$　② $\frac{3}{4} \div 2$ $\frac{3}{8}$　③ $\frac{5}{6} \div 4$ $\frac{5}{24}$　④ $\frac{7}{8} \div 5$ $\frac{7}{40}$

⑤ $\frac{2}{3} \div 2$ $\frac{1}{3}$　⑥ $\frac{6}{7} \div 3$ $\frac{6}{21}$　③ $\frac{7}{4} \div 3$ $\frac{7}{12}$　④ $\frac{8}{3} \div 4$ $\frac{2}{3}$

Lesson Flow

1 Review the previous lesson.

2 ③ Simplifying improper fraction ÷ whole number in the calculation.

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

T Compare method Ⓐ with Ⓑ for calculating $\frac{10}{7}\div 4$.

S Compare how the cancellation (or simplification) is done in Ⓐ and Ⓑ.

Ⓐ: Simplify after calculation.

Ⓑ: Simplify during calculation.

T What did you notice about methods Ⓐ and Ⓑ?

S The calculation will be easier if you simplify the fraction as you calculate as in Ⓑ.

3 ④ Word problem of Fraction ÷ whole number

T/S Read and understand the situation.

S ① Fill in the ( ) with numbers and write a mathematical expression using the tape diagram and table.

S ② Calculate the length of each rope. $\frac{8}{9}\div 6=\frac{\cancel{8}^{4}}{9\times\cancel{6}^{3}}=\frac{4}{27}$

TN The calculation can be simplified during the process of calculation.

4 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

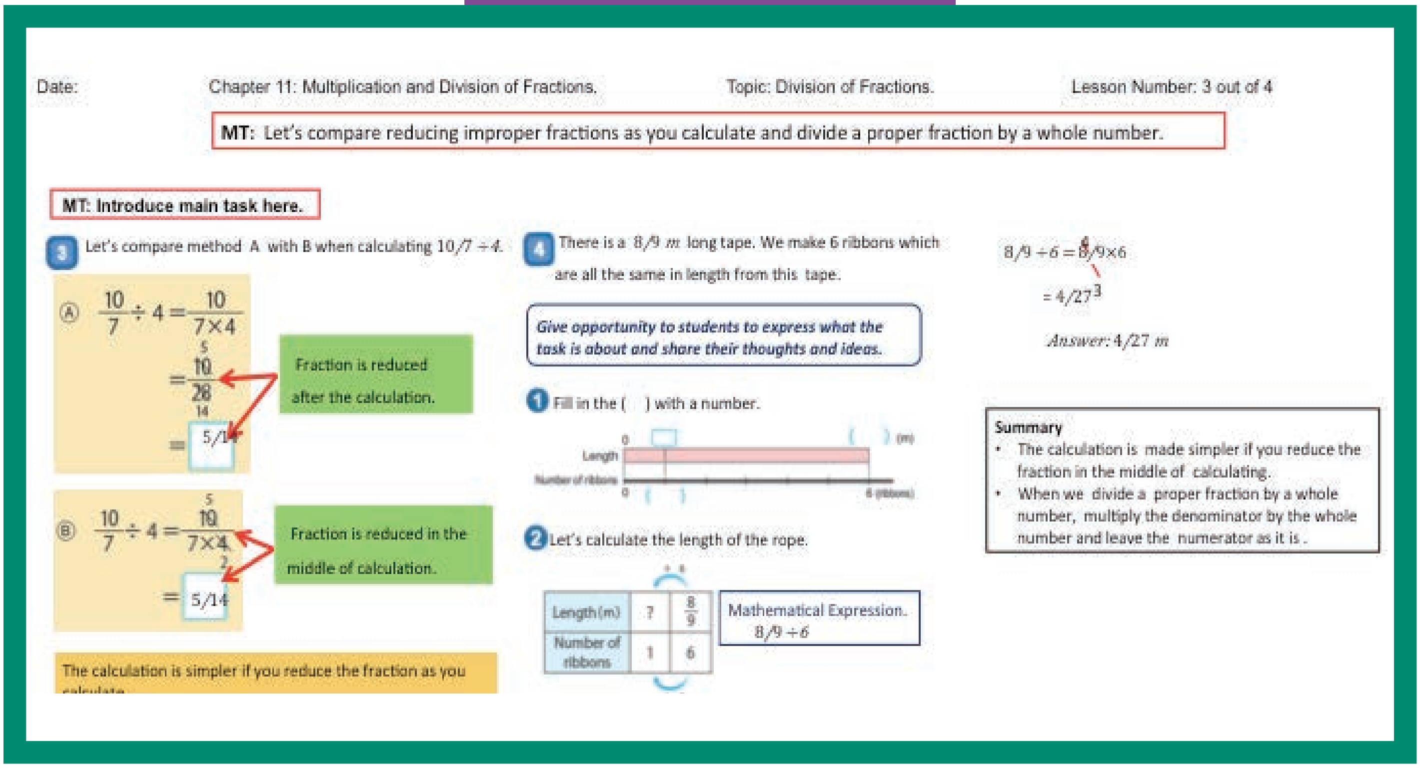
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Multiplication and Division of Fractions. Topic: Division of Fractions. Lesson Number: 3 out of 4

MT: Let's compare reducing improper fractions as you calculate and divide a proper fraction by a whole number.

MT: Introduce main task here.

③ Let's compare method A with B when calculating 10/7 ÷ 4.

Ⓐ $\frac{10}{7}\div 4=\frac{10}{7\times 4}$

$=\frac{\cancel{10}^{5}}{\cancel{28}_{14}}$

$=$ 5/14

Fraction is reduced after the calculation.

Ⓑ $\frac{10}{7}\div 4=\frac{\cancel{10}^{5}}{7\times\cancel{4}_{2}}$

$=$ 5/14

Fraction is reduced in the middle of calculation.

The calculation is simpler if you reduce the fraction as you calculate.

④ There is a 8/9 m long tape. We make 6 ribbons which are all the same in length from this tape.

Give opportunity to students to express what the task is about and share their thoughts and ideas.

① Fill in the ( ) with a number.

② Let's calculate the length of the rope.

Length (m)	?	$\frac{8}{9}$
Number of ribbons	1	6

Mathematical Expression.
8/9 ÷ 6

$8/9\div 6=\cancel{8}^{4}/9\times\cancel{6}$

$=4/27^{3}$

Answer: 4/27 m

Summary

- The calculation is made simpler if you reduce the fraction in the middle of calculating.
- When we divide a proper fraction by a whole number, multiply the denominator by the whole number and leave the numerator as it is .

Unit 11

Unit: Multiplication and Division of Fractions

Sub-unit 2: Operation of Fractions ÷ Whole Numbers

Lesson 4 of 4

Textbook Page :
158
Actual Lesson 107

Lesson Objectives

- To understand how to calculate mixed fraction divided by a whole number.
- Calculate mixed fraction divided by a whole number.

Assessment

- Calculate mixed fraction ÷ whole number using the process of calculation. F
- Complete the Exercise correctly. S

Prior Knowledge

- Division of fractions (Unit 8)

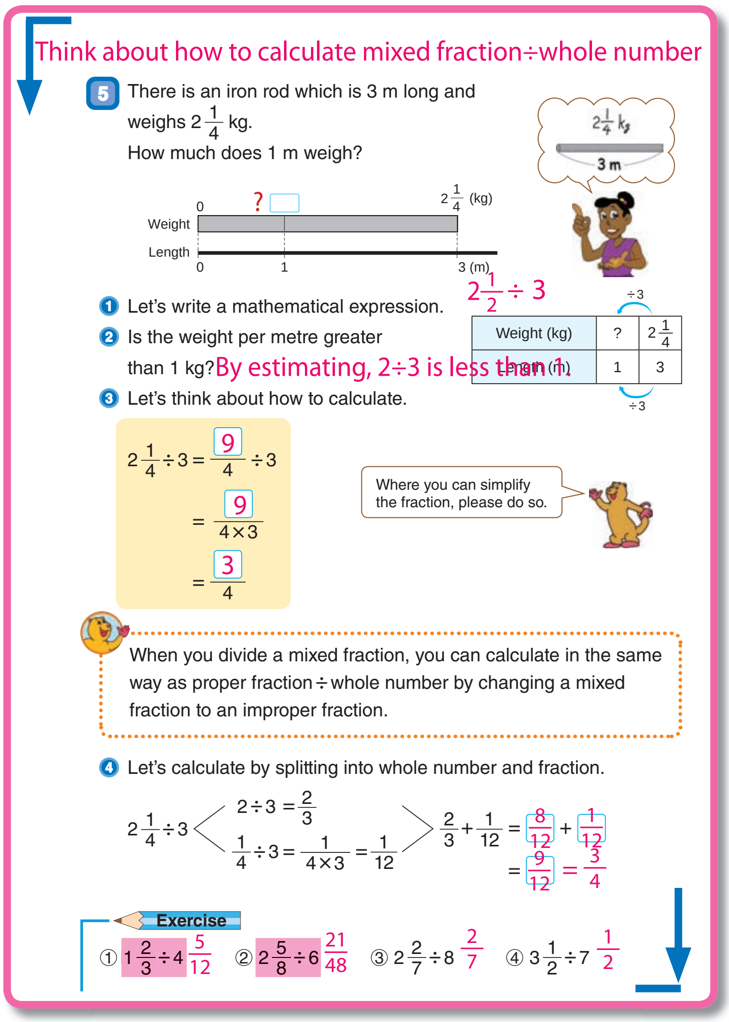
Preparation

- Tape diagram and table for task 5

Teacher's Note

Exercise

Calculate: • questions 1 and 2 using splitting.
questions 3 and 4 by changing mixed fraction to improper fraction.



Think about how to calculate mixed fraction÷whole number

5 There is an iron rod which is 3 m long and weighs $2\frac{1}{4}$ kg.
How much does 1 m weigh?

① Let's write a mathematical expression. $2\frac{1}{2} \div 3$

② Is the weight per metre greater than 1 kg? By estimating, 2÷3 is less than 1.

Weight (kg)	?	$2\frac{1}{4}$
Length (m)	1	3

③ Let's think about how to calculate.

$$2\frac{1}{4} \div 3 = \frac{\boxed{9}}{4} \div 3$$
$$= \frac{\boxed{9}}{4 \times 3}$$
$$= \frac{\boxed{3}}{4}$$

Where you can simplify the fraction, please do so.

When you divide a mixed fraction, you can calculate in the same way as proper fraction ÷ whole number by changing a mixed fraction to an improper fraction.

④ Let's calculate by splitting into whole number and fraction.

$$2\frac{1}{4} \div 3 \left< \begin{matrix} 2 \div 3 = \frac{2}{3} \\ \frac{1}{4} \div 3 = \frac{1}{4 \times 3} = \frac{1}{12} \end{matrix} \right> \frac{2}{3} + \frac{1}{12} = \frac{\boxed{8}}{\boxed{12}} + \frac{\boxed{1}}{\boxed{12}}$$
$$= \frac{\boxed{9}}{\boxed{12}} = \frac{3}{4}$$

Exercise

① $1\frac{2}{3} \div 4$ $\frac{5}{12}$ ② $2\frac{5}{8} \div 6$ $\frac{21}{48}$ ③ $2\frac{2}{7} \div 8$ $\frac{2}{7}$ ④ $3\frac{1}{2} \div 7$ $\frac{1}{2}$

Lesson Flow

1 Review the previous lesson.

2 ⑤ Think about how to calculate mixed fraction ÷ whole number.

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

T/S Read and understand the situation.

T ① Write a mathematical expression using the tape diagram and the table.

S $2\frac{1}{4} \div 3$.

T ② Is the weight per metre greater than 1 kg?

S Estimate using the diagram above. $2\frac{1}{4}$ is less than 3 so the weight per metre is less than 1 kg.

S ③ Think about how to calculate by filling in the box ☐.

TN Remind students to refer to Kapul call out when calculating.

3 Important Point

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

4 Calculating mixed fraction ÷ whole number by splitting.

T ④ Let's calculate $2\frac{1}{4} \div 3$ by splitting $2\frac{1}{4}$ into whole number and fraction.

TN Use prior knowledge of spliting mixed fraction and assist the students to fill in the box ☐.

S Calculate by filling in the box ☐.

5 Complete the Exercise

S Solve the selected exercises.

T Confirm students' answers.

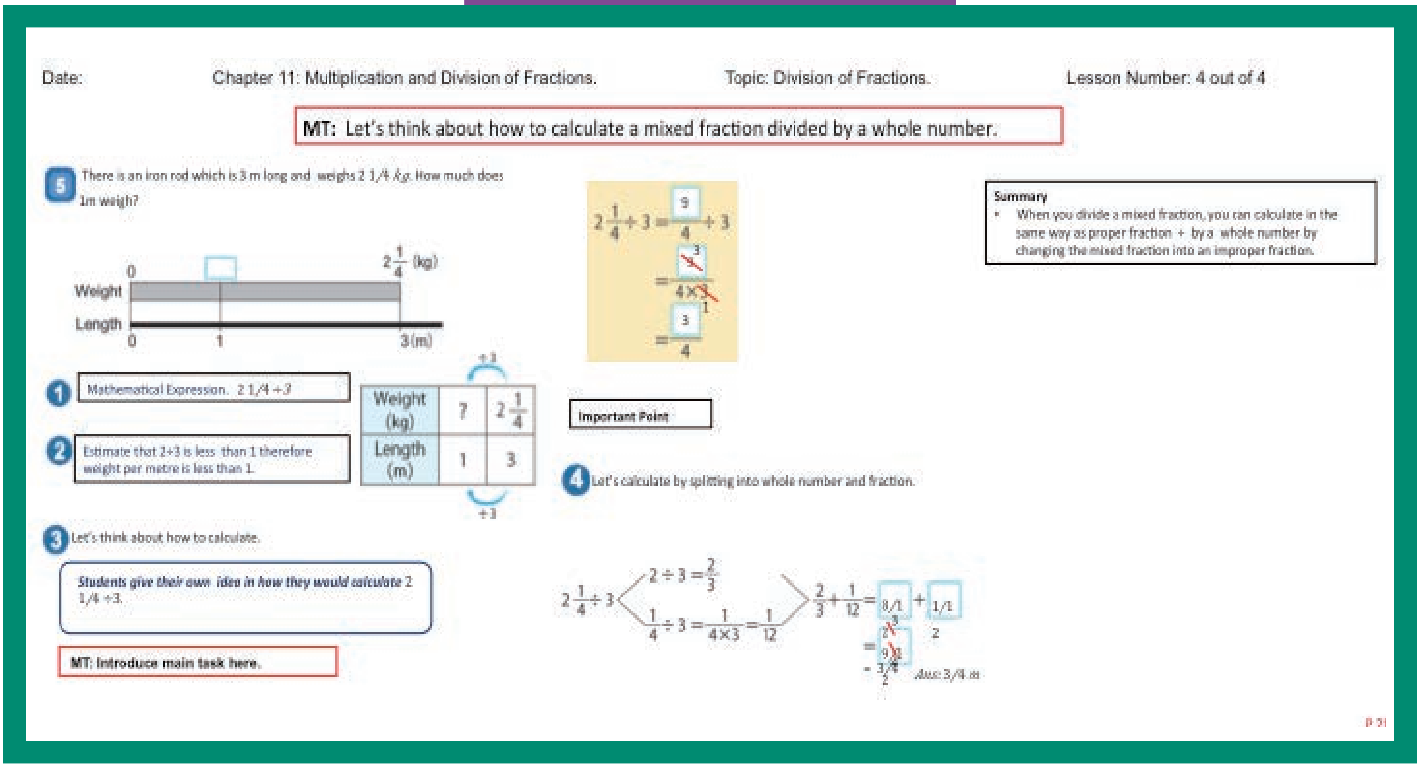
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 11: Multiplication and Division of Fractions. Topic: Division of Fractions. Lesson Number: 4 out of 4

MT: Let's think about how to calculate a mixed fraction divided by a whole number.

⑤ There is an iron rod which is 3 m long and weighs 2 1/4 kg. How much does 1m weigh?

① Mathematical Expression. 2 1/4 ÷3

② Estimate that 2÷3 is less than 1 therefore weight per metre is less than 1.

Weight (kg)	?	$2\frac{1}{4}$
Length (m)	1	3

③ Let's think about how to calculate.

Students give their own idea in how they would calculate 2 1/4 ÷3.

MT: Introduce main task here.

$2\frac{1}{4} \div 3 = \frac{\boxed{9}}{4} \div 3 = \frac{\boxed{\cancel{9}}^{3}}{4 \times \cancel{3}_{1}} = \frac{\boxed{3}}{4}$

Important Point

④ Let's calculate by splitting into whole number and fraction.

$2\frac{1}{4} \div 3$: $2 \div 3 = \frac{2}{3}$, $\frac{1}{4} \div 3 = \frac{1}{4 \times 3} = \frac{1}{12}$

$\frac{2}{3} + \frac{1}{12} = \boxed{8/1} + \boxed{1/1}$

Ans: 3/4 m

Summary
- When you divide a mixed fraction, you can calculate in the same way as proper fraction ÷ by a whole number by changing the mixed fraction into an improper fraction.

Unit
11

Unit: Multiplication and Division of Fractions
Exercise, Problem and Evaluation
Lesson 1 and 2 of 2

Textbook Page : 159 and 160
Actual Lesson 108 and 109

Lesson Objective

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

Prior Knowledge

- All the contents covered in this unit

Preparation

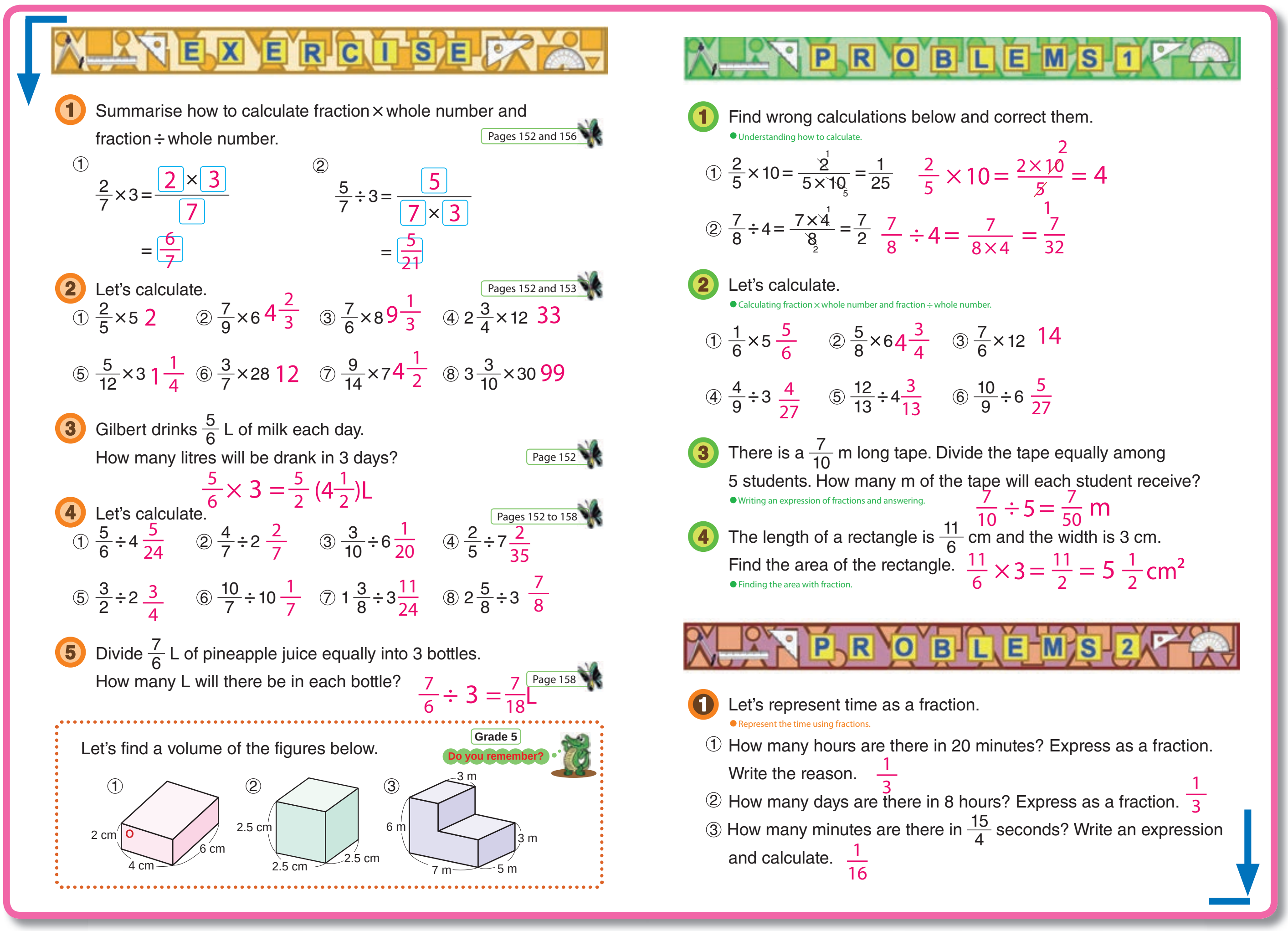
- Evaluation test copy for each student

Assessment

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

Teacher's Note

This is the last lesson of Chapter 11. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assesment for your class after completing all the exercises. Use the attached evaluation test to conduct assesment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

① Summarise how to calculate fraction × whole number and fraction ÷ whole number. Pages 152 and 156

① $\frac{2}{7}\times 3=\frac{\boxed{2}\times\boxed{3}}{\boxed{7}}=\boxed{\frac{6}{7}}$

② $\frac{5}{7}\div 3=\frac{\boxed{5}}{\boxed{7}\times\boxed{3}}=\boxed{\frac{5}{21}}$

② Let's calculate. Pages 152 and 153

① $\frac{2}{5}\times 5$ 2 ② $\frac{7}{9}\times 6$ $4\frac{2}{3}$ ③ $\frac{7}{6}\times 8$ $9\frac{1}{3}$ ④ $2\frac{3}{4}\times 12$ 33

⑤ $\frac{5}{12}\times 3$ $1\frac{1}{4}$ ⑥ $\frac{3}{7}\times 28$ 12 ⑦ $\frac{9}{14}\times 7$ $4\frac{1}{2}$ ⑧ $3\frac{3}{10}\times 30$ 99

③ Gilbert drinks $\frac{5}{6}$ L of milk each day.
How many litres will be drank in 3 days? Page 152

$\frac{5}{6}\times 3=\frac{5}{2}\ (4\frac{1}{2})$L

④ Let's calculate. Pages 152 to 158

① $\frac{5}{6}\div 4$ $\frac{5}{24}$ ② $\frac{4}{7}\div 2$ $\frac{2}{7}$ ③ $\frac{3}{10}\div 6$ $\frac{1}{20}$ ④ $\frac{2}{5}\div 7$ $\frac{2}{35}$

⑤ $\frac{3}{2}\div 2$ $\frac{3}{4}$ ⑥ $\frac{10}{7}\div 10$ $\frac{1}{7}$ ⑦ $1\frac{3}{8}\div 3$ $\frac{11}{24}$ ⑧ $2\frac{5}{8}\div 3$ $\frac{7}{8}$

⑤ Divide $\frac{7}{6}$ L of pineapple juice equally into 3 bottles.
How many L will there be in each bottle? Page 158

$\frac{7}{6}\div 3=\frac{7}{18}$L

Let's find a volume of the figures below.

Grade 5
Do you remember?

PROBLEMS 1

① Find wrong calculations below and correct them.
● Understanding how to calculate.

① $\frac{2}{5}\times 10=\frac{\overset{1}{\cancel{2}}}{5\times\underset{5}{\cancel{10}}}=\frac{1}{25}$ $\frac{2}{5}\times 10=\frac{2\times\overset{2}{\cancel{10}}}{\cancel{5}}=4$

② $\frac{7}{8}\div 4=\frac{7\times\overset{1}{\cancel{4}}}{\underset{2}{\cancel{8}}}=\frac{7}{2}$ $\frac{7}{8}\div 4=\frac{7}{8\times 4}=\frac{7}{32}$

② Let's calculate.
● Calculating fraction × whole number and fraction ÷ whole number.

① $\frac{1}{6}\times 5$ $\frac{5}{6}$ ② $\frac{5}{8}\times 6$ $4\frac{3}{4}$ ③ $\frac{7}{6}\times 12$ 14

④ $\frac{4}{9}\div 3$ $\frac{4}{27}$ ⑤ $\frac{12}{13}\div 4$ $\frac{3}{13}$ ⑥ $\frac{10}{9}\div 6$ $\frac{5}{27}$

③ There is a $\frac{7}{10}$ m long tape. Divide the tape equally among 5 students. How many m of the tape will each student receive?
● Writing an expression of fractions and answering.

$\frac{7}{10}\div 5=\frac{7}{50}$ m

④ The length of a rectangle is $\frac{11}{6}$ cm and the width is 3 cm.
Find the area of the rectangle.
● Finding the area with fraction.

$\frac{11}{6}\times 3=\frac{11}{2}=5\frac{1}{2}\text{cm}^2$

PROBLEMS 2

① Let's represent time as a fraction.
● Represent the time using fractions.

① How many hours are there in 20 minutes? Express as a fraction.
Write the reason. $\frac{1}{3}$

② How many days are there in 8 hours? Express as a fraction. $\frac{1}{3}$

③ How many minutes are there in $\frac{15}{4}$ seconds? Write an expression and calculate. $\frac{1}{16}$

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

3 Solve the Problems 1

S Solve all the problems.

T Confirm students' answers.

TN ① Understanding how to calculate.
② Calculating fraction × whole number and fraction ÷ whole number.
③ Writing an expression of fractions and answering.
④ Finding the area with fractions.

4 Solve the Problems 2

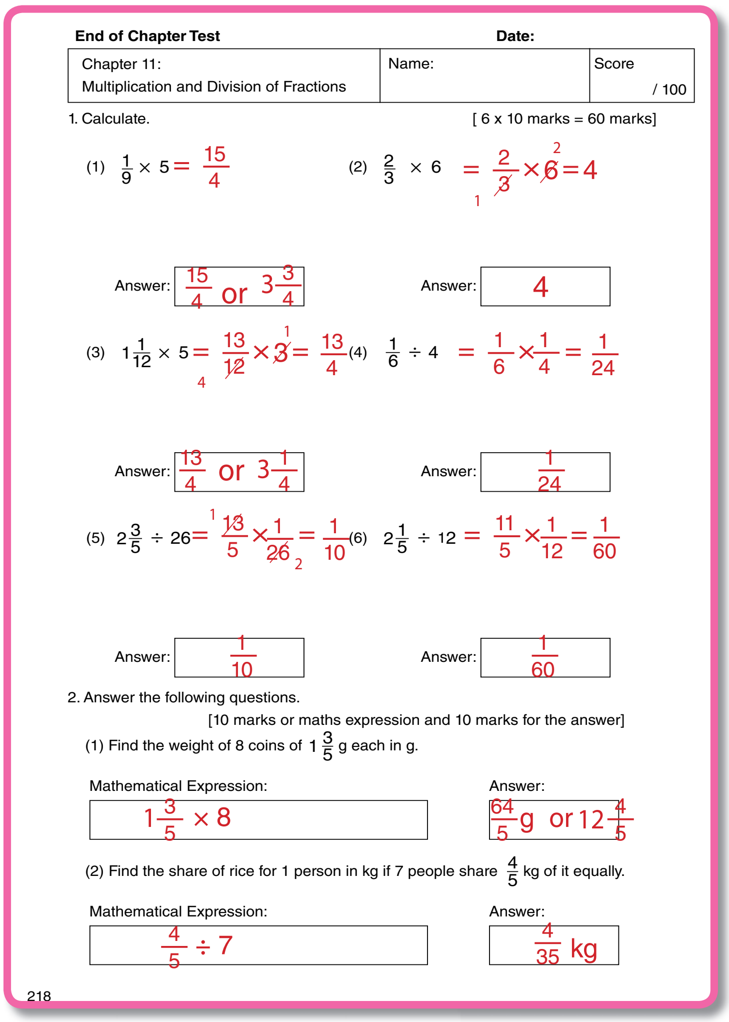
S Solve all the problems.

T Confirm students' answers.

2 Complete the Evaluation Test

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

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 11: Multiplication and Division of Fractions	Name:	Score / 100

1. Calculate. [6 x 10 marks = 60 marks]

(1) $\frac{1}{9} \times 5 = \frac{15}{4}$

Answer: $\frac{15}{4}$ or $3\frac{3}{4}$

(2) $\frac{2}{3} \times 6 = \frac{2}{\underset{1}{\cancel{3}}} \times \overset{2}{\cancel{6}} = 4$

Answer: 4

(3) $1\frac{1}{12} \times 5 = \frac{13}{\underset{4}{\cancel{12}}} \times \overset{1}{\cancel{3}} = \frac{13}{4}$

Answer: $\frac{13}{4}$ or $3\frac{1}{4}$

(4) $\frac{1}{6} \div 4 = \frac{1}{6} \times \frac{1}{4} = \frac{1}{24}$

Answer: $\frac{1}{24}$

(5) $2\frac{3}{5} \div 26 = \frac{\overset{1}{\cancel{13}}}{5} \times \frac{1}{\underset{2}{\cancel{26}}} = \frac{1}{10}$

Answer: $\frac{1}{10}$

(6) $2\frac{1}{5} \div 12 = \frac{11}{5} \times \frac{1}{12} = \frac{1}{60}$

Answer: $\frac{1}{60}$

2. Answer the following questions.

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

(1) Find the weight of 8 coins of $1\frac{3}{5}$ g each in g.

Mathematical Expression: $1\frac{3}{5} \times 8$

Answer: $\frac{64}{5}$g or $12\frac{4}{5}$

(2) Find the share of rice for 1 person in kg if 7 people share $\frac{4}{5}$ kg of it equally.

Mathematical Expression: $\frac{4}{5} \div 7$

Answer: $\frac{4}{35}$ kg

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End of Chapter Test **Date:**

Chapter 11: Multiplication and Division of Fractions	Name:	Score / 100

1. Calculate.

[6 × 10 marks = 60 marks]

(1) $\frac{1}{9} \times 5$

Answer:

(2) $\frac{2}{3} \times 6$

Answer:

(3) $1\frac{1}{12} \times 5$

Answer:

(4) $\frac{1}{6} \div 4$

Answer:

(5) $2\frac{3}{5} \div 26$

Answer:

(6) $2\frac{1}{5} \div 12$

Answer:

2. Answer the following questions.

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

(1) Find the weight of 8 coins weighing $1\frac{3}{5}$ g each in grams.

Mathematical Expression:

Answer:

(2) Find the share of rice for 1 person in kg if 7 people share $\frac{4}{5}$ kg of it equally.

Mathematical Expression:

Answer:

Chapter 12 Proportions

1. Content Standard

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

2. Unit Objectives

- To analyse the two changing quantities by observing the table.
- To understand the proportion of two quantities.
- To deepen the understanding of equations that shows the relation of two quantities.

3. Teaching Overview

This is the first unit for learning proportions.

They already built some foundations in the previous grades such as quantities changing together expressed as line graphs or mathematical sentences using ○ and □. In grade 5, students will deepen their understanding of mathematical sentences using □ and ○, and get familiar with simple proportional relationship.

Further learning will be expected in Grade 6.

Quantities Changing Together:

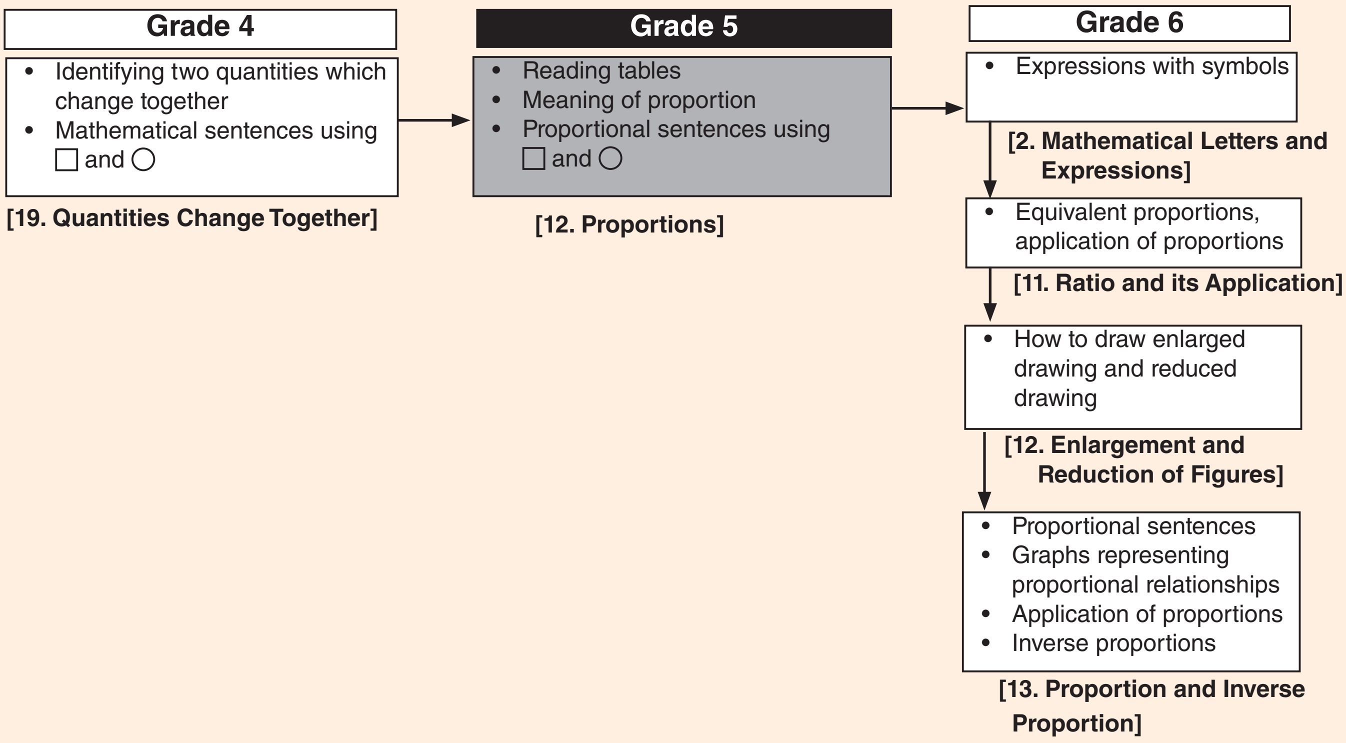
Students put appropriate values in a table based on a situation given and pay attention to changing quantities and constant.

They replace the changing quantities by □ and △. Students are to be given enough opportunities to interpret and use the expressions with ○, □ and △.

Proportions :

Many situations should be thought in this topic to investigate the patterns of changes and relationships of values corresponding.

4. Related Learning Contents



Grade 4

- Identifying two quantities which change together
- Mathematical sentences using □ and ○

[19. Quantities Change Together]

Grade 5

- Reading tables
- Meaning of proportion
- Proportional sentences using □ and ○

[12. Proportions]

Grade 6

- Expressions with symbols

[2. Mathematical Letters and Expressions]

- Equivalent proportions, application of proportions

[11. Ratio and its Application]

- How to draw enlarged drawing and reduced drawing

[12. Enlargement and Reduction of Figures]

- Proportional sentences
- Graphs representing proportional relationships
- Application of proportions
- Inverse proportions

[13. Proportion and Inverse Proportion]

Unit 12

Unit: Proportions
Sub-unit 1: Quantities Changing Together
Lesson 1 of 1

Textbook Page : 162 and 163
Actual Lesson 110

Sub-unit Objectives

- To derive equations of two quantities that change together.
- To understand how the quantities change from observing the table.
- To write equations using the symbols □ and ○.

Lesson Objectives

- To find the quantities that change from the table.
- To write equations of two quantities using □ and ○.

Prior Knowledge

- Quantities that change together (Grade 4)

Preparation

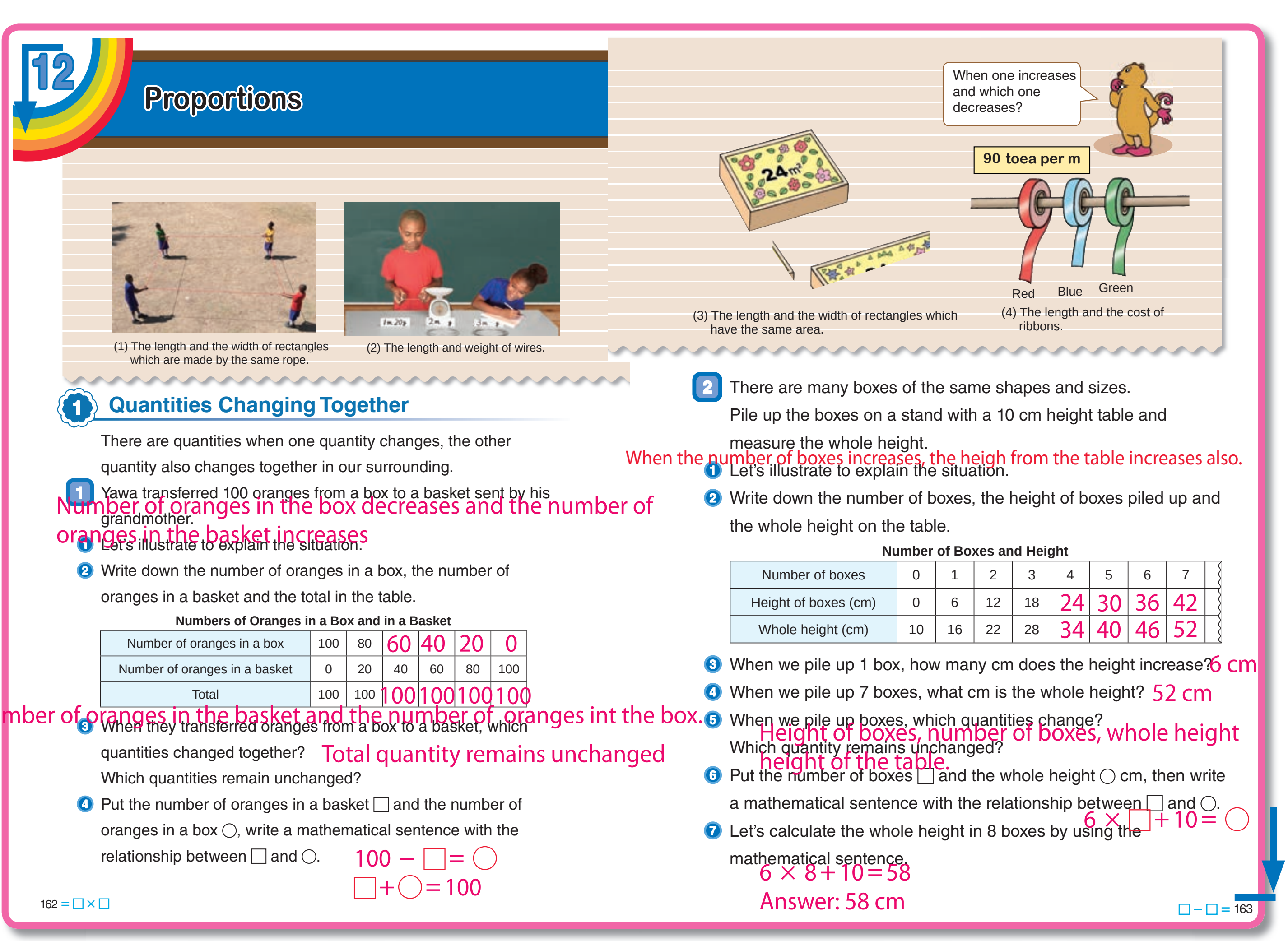
- Table for task 1 and 2

Assessment

- Analyse two quantities by using the table. F
- Express equations of two quantities using □ and ○. S

Teacher's Notes

The students had identified that in their surroundings in their lesson from Grade 4, there are some quantities that change as another quantity changes.
In this unit, the students will use their background knowledge to identify when one quantity changes, the other quantity changes together.
They will enhance their knowledge using the table and the symbols to understand the mathematical relationship between □ and ○.



(1) The length and the width of rectangles which are made by the same rope.

(2) The length and weight of wires.

(3) The length and the width of rectangles which have the same area.

(4) The length and the cost of ribbons.

1 Quantities Changing Together

There are quantities when one quantity changes, the other quantity also changes together in our surrounding.

1 Yawa transferred 100 oranges from a box to a basket sent by his grandmother.

Number of oranges in the box decreases and the number of oranges in the basket increases

① Let's illustrate to explain the situation.

② Write down the number of oranges in a box, the number of oranges in a basket and the total in the table.

Numbers of Oranges in a Box and in a Basket

Number of oranges in a box	100	80	60	40	20	0
Number of oranges in a basket	0	20	40	60	80	100
Total	100	100	100	100	100	100

Number of oranges in the basket and the number of oranges int the box.

③ When they transferred oranges from a box to a basket, which quantities changed together? Total quantity remains unchanged
Which quantities remain unchanged?

④ Put the number of oranges in a basket □ and the number of oranges in a box ○, write a mathematical sentence with the relationship between □ and ○.

100 − □ = ○
□ + ○ = 100

162 = □ × □

2 There are many boxes of the same shapes and sizes.
Pile up the boxes on a stand with a 10 cm height table and measure the whole height.

When the number of boxes increases, the heigh from the table increases also.

① Let's illustrate to explain the situation.

② Write down the number of boxes, the height of boxes piled up and the whole height on the table.

Number of Boxes and Height

Number of boxes	0	1	2	3	4	5	6	7
Height of boxes (cm)	0	6	12	18	24	30	36	42
Whole height (cm)	10	16	22	28	34	40	46	52

③ When we pile up 1 box, how many cm does the height increase? 6 cm

④ When we pile up 7 boxes, what cm is the whole height? 52 cm

⑤ When we pile up boxes, which quantities change?
Height of boxes, number of boxes, whole height
Which quantity remains unchanged?
height of the table.

⑥ Put the number of boxes □ and the whole height ○ cm, then write a mathematical sentence with the relationship between □ and ○.

6 × □ + 10 = ○

⑦ Let's calculate the whole height in 8 boxes by using the mathematical sentence.

6 × 8 + 10 = 58
Answer: 58 cm

□ − □ = 163

Lesson Flow

1 Investigate and understand the meaning of proportion.

T Discuss diagrams (1) to (4) with students and identify how the quantities are changing together.

TN (1) When length increases the width decreases.
(2) Both the length and the weight increase.
(3) When length increases the width decreases.
(4) Both the length and price increases.

2 Relationship between two quantities where one increases and the other decreases.

T/S 1 Read and understand the situation.

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

T ① Ask the students to refer to the table and answer .

S Explain the situation in own words or drawings.

TN The quantity of oranges decreases in the box as the amount of oranges increase in the basket.

S ② Fill in the table.

T ③ Which quantities changes together?

S The quantity of oranges in the box and basket changed together but the total quantity of oranges remains the same.

S ④ Write the mathematical sentence between □ and ○. (□+○=100)

T Check and confirm students'answers.

3 Relationship between two quantities where both increases.

T/S 2 Read and understand the situation.

S ① Explain the situation in own words or drawings.

TN When there are no boxes on the table, the height of the table is 10 cm.

T Ask students to refer to the table and complete activities ② to ④.

S ② Fill in the table.
③ When 1 box is piled, the height increases by 6 cm,
④ When 7 boxes are piled, the whole height is 52 cm.

T ⑤ Which quantities change and which quantity remain unchanged?

S As the number of boxes increases, the height and the whole height increases but the height of the table remains the same.

S ⑥ Write the mathematical sentence with the relationship between □ and ○. (6×□+10=○)

S ⑦ Calculate the whole height in 8 boxes using the mathematical sentence from ⑥.
6×8+10=58 Answer: 58 cm.

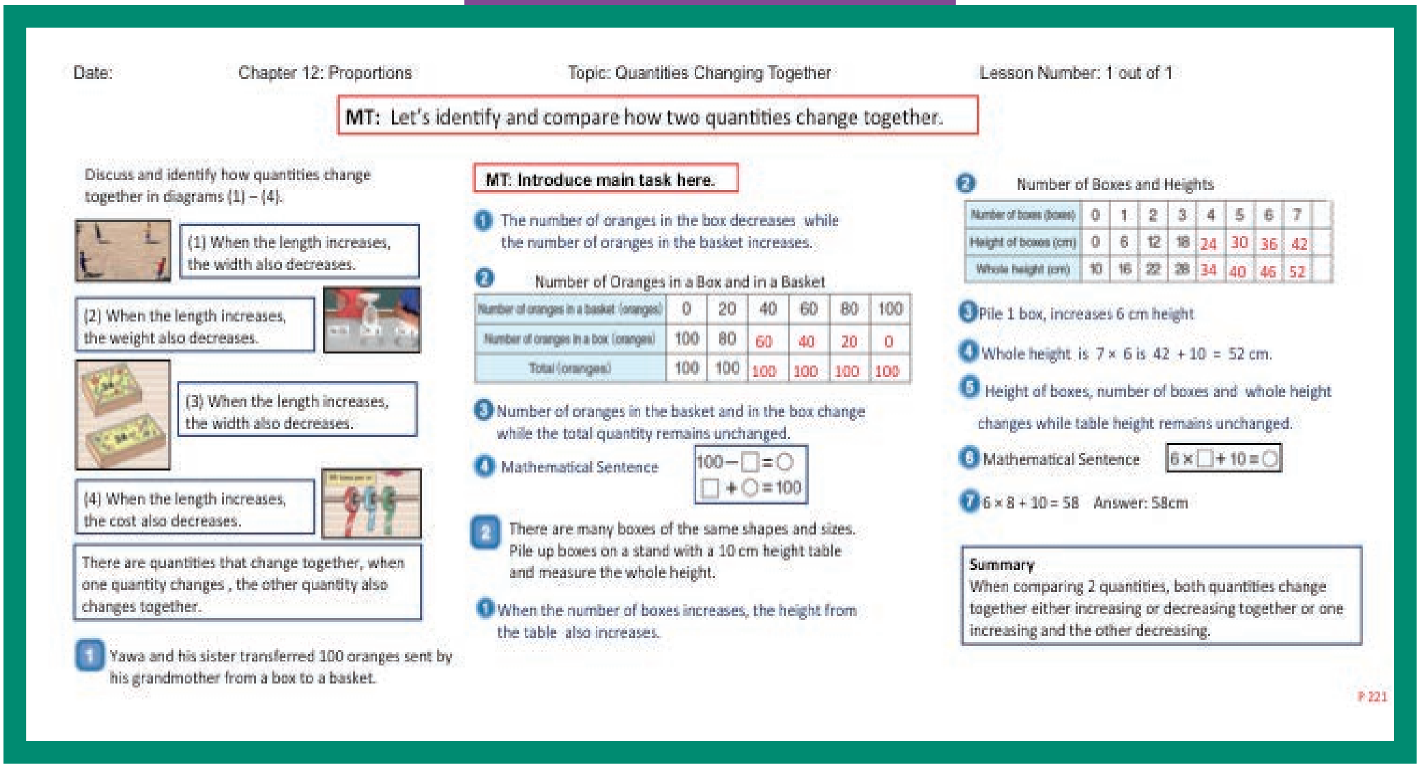
4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter 12: Proportions Topic: Quantities Changing Together Lesson Number: 1 out of 1

MT: Let's identify and compare how two quantities change together.

Discuss and identify how quantities change together in diagrams (1) – (4).

(1) When the length increases, the width also decreases.

(2) When the length increases, the weight also decreases.

(3) When the length increases, the width also decreases.

(4) When the length increases, the cost also decreases.

There are quantities that change together, when one quantity changes , the other quantity also changes together.

1 Yawa and his sister transferred 100 oranges sent by his grandmother from a box to a basket.

MT: Introduce main task here.

① The number of oranges in the box decreases while the number of oranges in the basket increases.

② Number of Oranges in a Box and in a Basket

Number of oranges in a basket (oranges)	0	20	40	60	80	100
Number of oranges in a box (oranges)	100	80	60	40	20	0
Total (oranges)	100	100	100	100	100	100

③ Number of oranges in the basket and in the box change while the total quantity remains unchanged.

④ Mathematical Sentence
100−□=○
□+○=100

2 There are many boxes of the same shapes and sizes. Pile up boxes on a stand with a 10 cm height table and measure the whole height.

① When the number of boxes increases, the height from the table also increases.

② Number of Boxes and Heights

Number of boxes (boxes)	0	1	2	3	4	5	6	7	
Height of boxes (cm)	0	6	12	18	24	30	36	42	
Whole height (cm)	10	16	22	28	34	40	46	52	

③ Pile 1 box, increases 6 cm height

④ Whole height is 7 × 6 is 42 + 10 = 52 cm.

⑤ Height of boxes, number of boxes and whole height changes while table height remains unchanged.

⑥ Mathematical Sentence 6×□+10=○

⑦ 6 × 8 + 10 = 58 Answer: 58cm

Summary
When comparing 2 quantities, both quantities change together either increasing or decreasing together or one increasing and the other decreasing.

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Unit 12

Unit: Proportions

Sub-unit 2: Proportions

Lesson 1 of 4

Textbook Page : 164 and 165
Actual Lesson 111

Sub-unit Objectives

- To understand the meaning of proportion.
- To represent proportion as an equation.

Lesson Objective

- To investigate the relationship between the time and the height.

Prior Knowledge

- Two Changing Quantities

Preparation

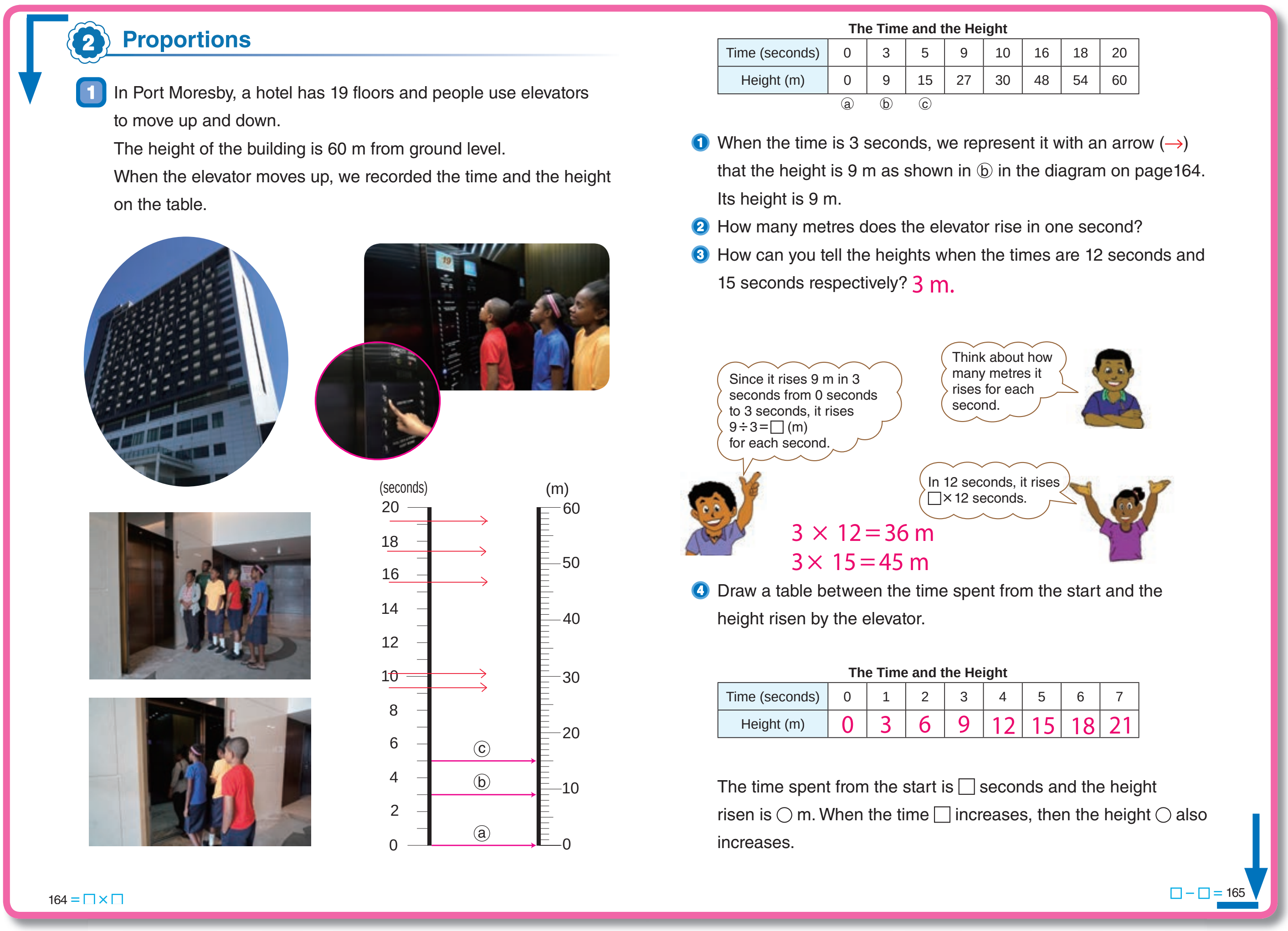
- Diagram (height and time) and table for task 1

Assessment

- Analyse two quantities by using the table. F
- Identify the changes between time and height. S

Teacher's Notes

This lesson focuses on time and height. As height increases the time increases as well. This leads the students to understand direct proportion that is when one changes, another changes.



2 Proportions

1 In Port Moresby, a hotel has 19 floors and people use elevators to move up and down.
The height of the building is 60 m from ground level.
When the elevator moves up, we recorded the time and the height on the table.

The Time and the Height

Time (seconds)	0	3	5	9	10	16	18	20
Height (m)	0	9	15	27	30	48	54	60
	ⓐ	ⓑ	ⓒ					

① When the time is 3 seconds, we represent it with an arrow (→) that the height is 9 m as shown in ⓑ in the diagram on page164. Its height is 9 m.

② How many metres does the elevator rise in one second?

③ How can you tell the heights when the times are 12 seconds and 15 seconds respectively? 3 m.

Since it rises 9 m in 3 seconds from 0 seconds to 3 seconds, it rises 9÷3=□ (m) for each second.

Think about how many metres it rises for each second.

In 12 seconds, it rises □× 12 seconds.

3 × 12 = 36 m
3 × 15 = 45 m

④ Draw a table between the time spent from the start and the height risen by the elevator.

The Time and the Height

Time (seconds)	0	1	2	3	4	5	6	7
Height (m)	0	3	6	9	12	15	18	21

The time spent from the start is □ seconds and the height risen is ○ m. When the time □ increases, then the height ○ also increases.

Lesson Flow

1 Review the previous lesson.

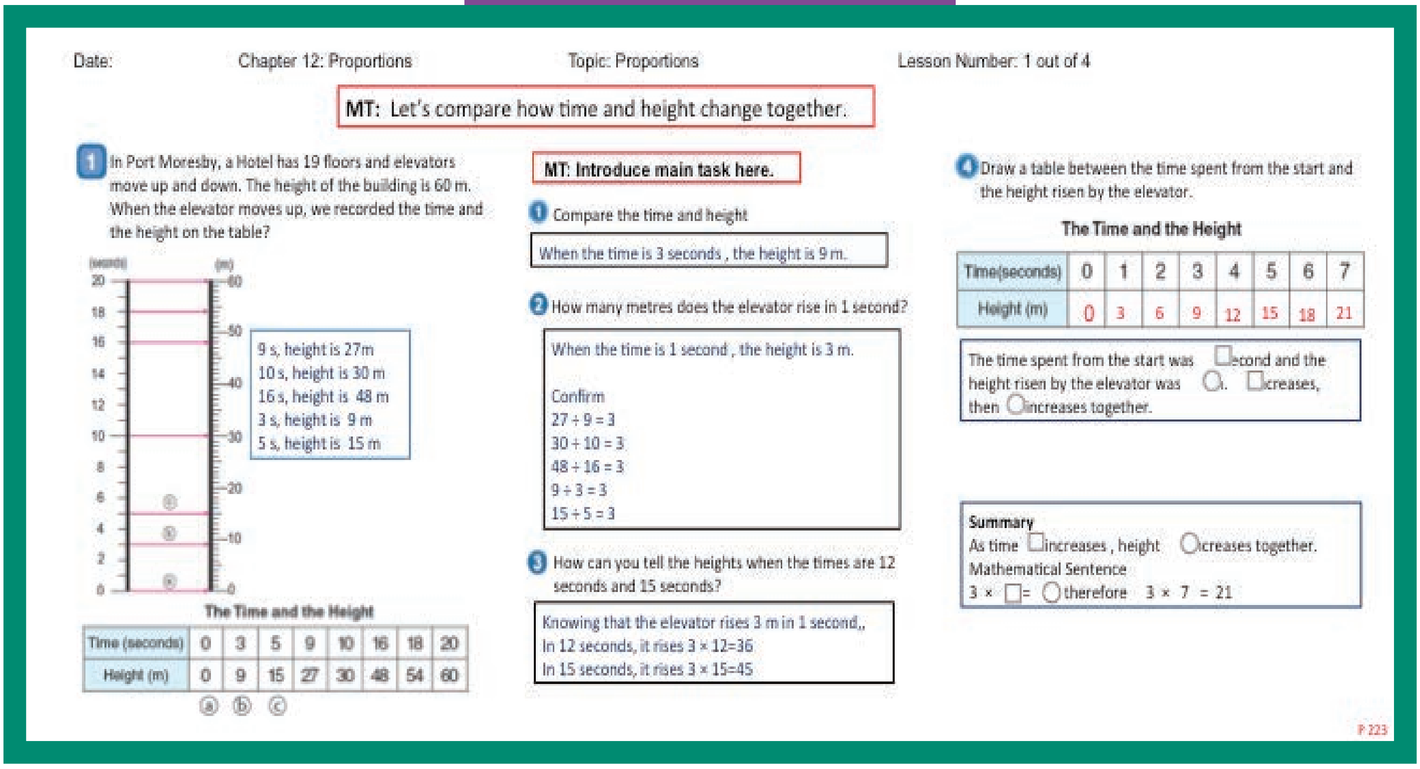
2 Comparing time and height.

T/S ① Read and understand the situation.
T Introduce the Main Task. (Refer to the Blackboard Plan)
T Ask the students to explain the diagram and table.
S Explain the situation in their own words.
T Ask students to answer ① and ②
S ① Draw → to represent other times to confirm the corresponding heights given in the table.
T ② How many metres does the elevator rise in one second?
S In 1 second the elevator rises 3 m in height.
T ③ How can you tell the height when the time is 12 seconds and 15 seconds respectively?
TN Refer to the speech bubbles to find the answer.
S In 12 seconds it rises 36 m (3×12=36) and in 15 seconds it rises 45 m (3×15=45)
T ④ Ask the students to draw and complete the table.
S Draw and complete the table between time spent from start and the height risen by the elevator.
S Write the mathematical sentence between □ and ○.
Mathematica sentence : (3×□=○)
T Check and confirm students answers.

3 Summary

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

Sample Blackboard Plan



Date: Chapter 12: Proportions Topic: Proportions Lesson Number: 1 out of 4

MT: Let's compare how time and height change together.

① In Port Moresby, a Hotel has 19 floors and elevators move up and down. The height of the building is 60 m. When the elevator moves up, we recorded the time and the height on the table?

9 s, height is 27m
10 s, height is 30 m
16 s, height is 48 m
3 s, height is 9 m
5 s, height is 15 m

The Time and the Height

Time (seconds)	0	3	5	9	10	16	18	20
Height (m)	0	9	15	27	30	48	54	60
	ⓐ	ⓑ	ⓒ					

MT: Introduce main task here.

① Compare the time and height

When the time is 3 seconds , the height is 9 m.

② How many metres does the elevator rise in 1 second?

When the time is 1 second , the height is 3 m.

Confirm
27 ÷ 9 = 3
30 ÷ 10 = 3
48 ÷ 16 = 3
9 ÷ 3 = 3
15 ÷ 5 = 3

③ How can you tell the heights when the times are 12 seconds and 15 seconds?

Knowing that the elevator rises 3 m in 1 second,,
In 12 seconds, it rises 3 × 12=36
In 15 seconds, it rises 3 × 15=45

④ Draw a table between the time spent from the start and the height risen by the elevator.

The Time and the Height

Time(seconds)	0	1	2	3	4	5	6	7
Height (m)	0	3	6	9	12	15	18	21

The time spent from the start was □econd and the height risen by the elevator was ○. □creases, then ○increases together.

Summary
As time □increases , height ○creases together.
Mathematical Sentence
3 × □= ○therefore 3 × 7 = 21

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Unit
12

Unit: Proportions

Sub-unit 2: Proportions

Lesson 2 of 4

Textbook Page :
166
Actual Lesson 112

Lesson Objective

- To understand the meaning of proportion.

Prior Knowledge

- Quantities changing together

Preparation

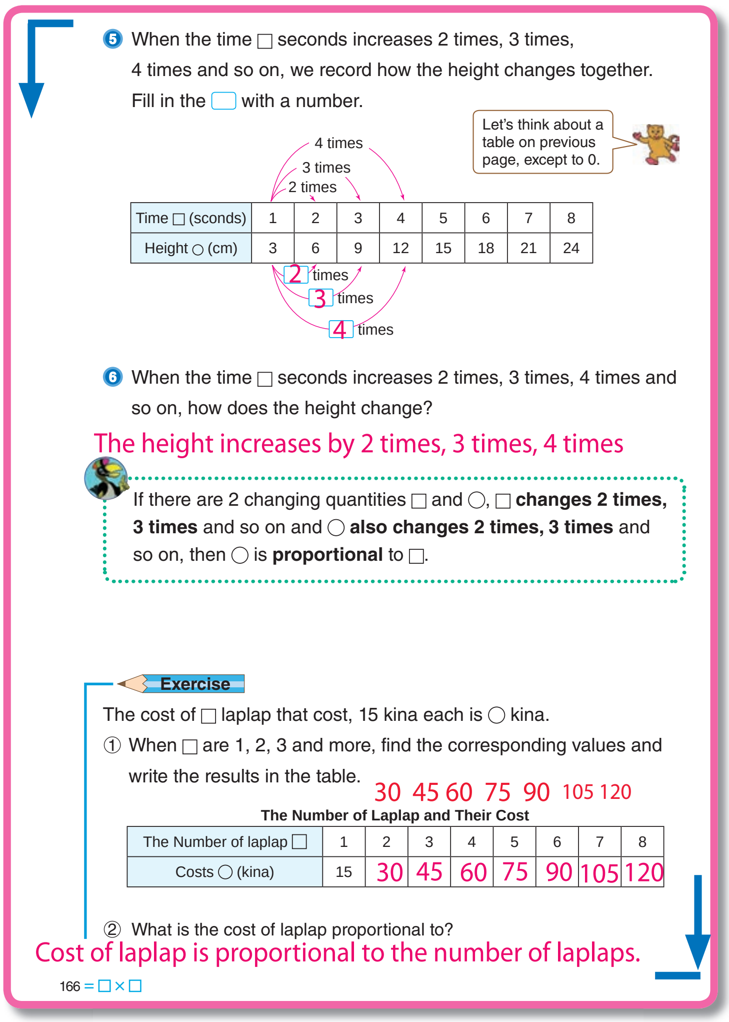
- Table for activity ⑤ and the exercise

Assessment

- Explain the meaning of proportion. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

When the time in seconds increases by 2 times, 3 times and so on, the height increases by 2 times, 3 times and so on.
The time and height are proportional to each other.



⑤ When the time □ seconds increases 2 times, 3 times, 4 times and so on, we record how the height changes together. Fill in the ▭ with a number.

Let's think about a table on previous page, except to 0.

4 times
3 times
2 times

Time □ (sconds)	1	2	3	4	5	6	7	8
Height ○ (cm)	3	6	9	12	15	18	21	24

2 times
3 times
4 times

⑥ When the time □ seconds increases 2 times, 3 times, 4 times and so on, how does the height change?

The height increases by 2 times, 3 times, 4 times

If there are 2 changing quantities □ and ○, □ **changes 2 times, 3 times** and so on and ○ **also changes 2 times, 3 times** and so on, then ○ is **proportional** to □.

Exercise

The cost of □ laplap that cost, 15 kina each is ○ kina.

① When □ are 1, 2, 3 and more, find the corresponding values and write the results in the table.

30 45 60 75 90 105 120

The Number of Laplap and Their Cost

The Number of laplap □	1	2	3	4	5	6	7	8
Costs ○ (kina)	15	30	45	60	75	90	105	120

② What is the cost of laplap proportional to?

Cost of laplap is proportional to the number of laplaps.

166 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Investigate how the height changes when time increase by 2 times, 3 times, 4 times and so on.

T/S Read and understand the situation.
T Introduce the Main Task. (Refer to the Blackboard Plan)
T Ask students to refer to the table and fill in the box.
S ⑤ Fill in the box ☐ with the correct number. (2, 3 and 4)
TN Identify that the increase in height is the same as the time by 2 times, 3times, 4 times and so.
T ⑥ How does the height change when time increase by 2 times, 3 times, 4 times and so on?
S The height ○ cm also increases by 2 times, 3 times, 4 times and so on.
TN The height is proportional to the time.

3 Important Point

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

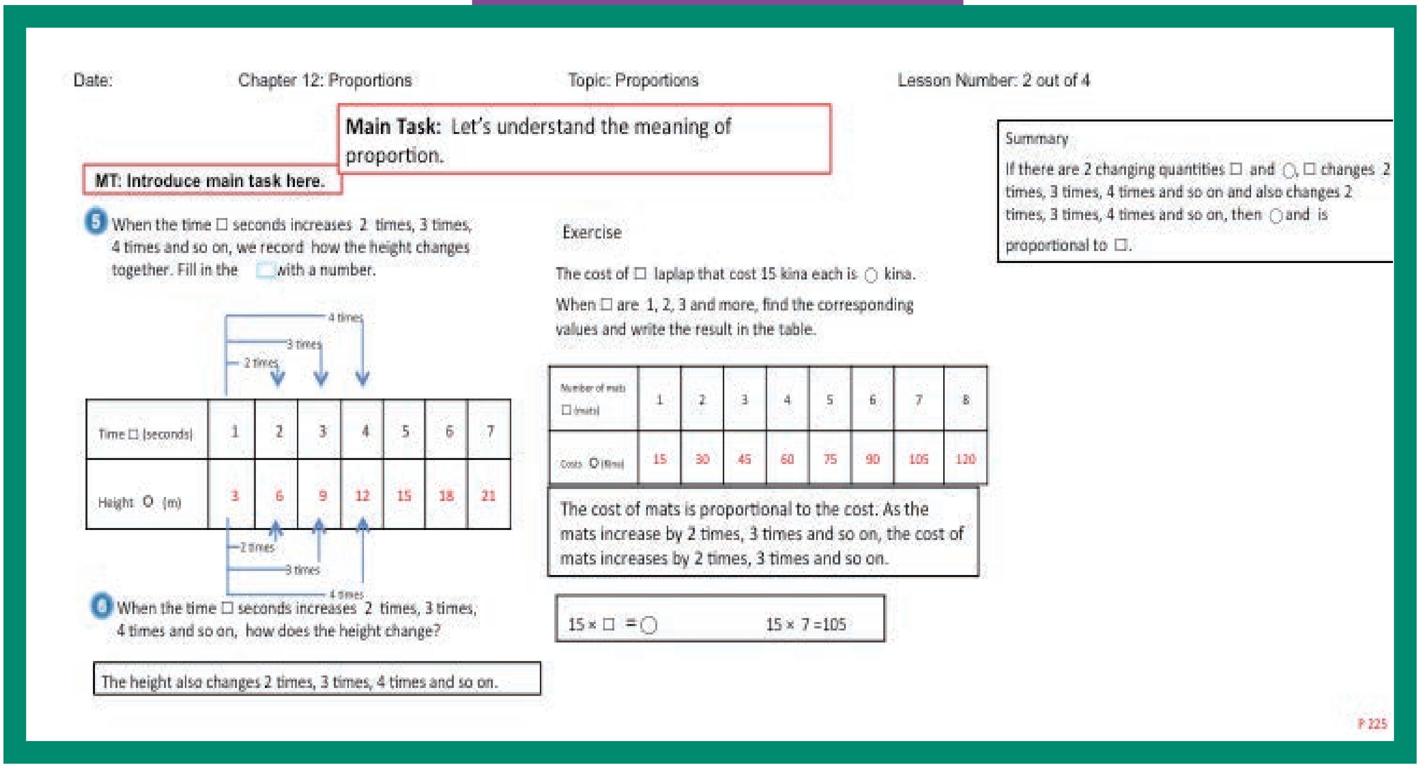
4 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

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: Proportions Topic: Proportions Lesson Number: 2 out of 4

Main Task: Let's understand the meaning of proportion.

MT: Introduce main task here.

⑤ When the time ☐ seconds increases 2 times, 3 times, 4 times and so on, we record how the height changes together. Fill in the ☐ with a number.

Time ☐ (seconds)	1	2	3	4	5	6	7
Height ○ (m)	3	6	9	12	15	18	21

⑥ When the time ☐ seconds increases 2 times, 3 times, 4 times and so on, how does the height change?

The height also changes 2 times, 3 times, 4 times and so on.

Exercise

The cost of ☐ laplap that cost 15 kina each is ○ kina.

When ☐ are 1, 2, 3 and more, find the corresponding values and write the result in the table.

Number of mats ☐ (mats)	1	2	3	4	5	6	7	8
Costs ○ (Kina)	15	30	45	60	75	90	105	120

The cost of mats is proportional to the cost. As the mats increase by 2 times, 3 times and so on, the cost of mats increases by 2 times, 3 times and so on.

15 × ☐ = ○ 15 × 7 = 105

Summary

If there are 2 changing quantities ☐ and ○, ☐ changes 2 times, 3 times, 4 times and so on and also changes 2 times, 3 times, 4 times and so on, then ○ and is proportional to ☐.

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Unit 12

Unit: Proportions
Sub-unit 2: Proportions
Lesson 3 of 4

Textbook Page : 167
Actual Lesson 113

Lesson Objectives

- To understand how the area of parallelogram changes.
- To identify how the area of parallelogram changes.

Prior Knowledge

- Meaning of Proportion

Preparation

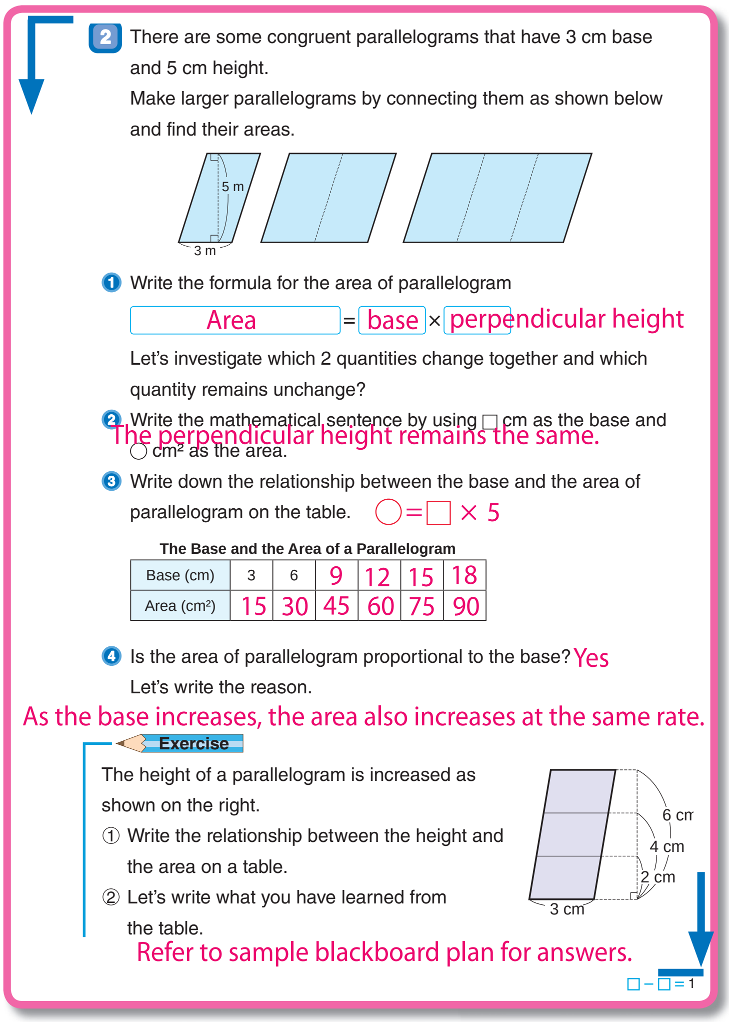
- Diagram for task 2, table for activity 3

Assessment

- Identify how the area of parallelogram changes. F
- Solve the exercises correctly. S

Teacher's Notes

This lesson focuses on Area in relation to base and height of the parallelogram. Remind the students on the term 'congruent'.



2 There are some congruent parallelograms that have 3 cm base and 5 cm height.
Make larger parallelograms by connecting them as shown below and find their areas.

① Write the formula for the area of parallelogram

Area = base × perpendicular height

Let's investigate which 2 quantities change together and which quantity remains unchange?

The perpendicular height remains the same.

② Write the mathematical sentence by using □ cm as the base and ○ cm² as the area.

③ Write down the relationship between the base and the area of parallelogram on the table. ○=□ × 5

The Base and the Area of a Parallelogram

Base (cm)	3	6	9	12	15	18
Area (cm²)	15	30	45	60	75	90

④ Is the area of parallelogram proportional to the base? Yes
Let's write the reason.

As the base increases, the area also increases at the same rate.

Exercise

The height of a parallelogram is increased as shown on the right.

① Write the relationship between the height and the area on a table.

② Let's write what you have learned from the table.

Refer to sample blackboard plan for answers.

□ − □ = 1

Lesson Flow

1 Review the previous lesson.

2 Finding the base and the area of parallelogram

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

T/S 2 Read and understand the situation.

TN Make larger paralellograms by connecting them as shown in 2 and find the area.

S 1)Base 3 cm, area 15 cm^2 2) Base 6 cm, area 30 cm^2 3) Base 9 cm, area 45 cm^2

T ① Write the formula for the area of parallelogram and investigate which two quantities change together and which quantity remains unchanged?

S Area = Base × Perpendcular Height.
Base and area will increase together but the Height of the parallelogram will remain the same.
② The mathematical sentence becomes ○=□×5.

T ③ Write down the relationship between the base and the area of parallelogram on the table.

S Fill in the table and identify that when the base increases by 2 times, 3 times and so on, the area also increase by 2 times, 3 times and so on.

T ④ Is the area of parallelogram proportional to the base? Let's write the reason.

S Yes,the area of parallelogram is proportional to the base because as the base increases by 2 times 3 times, 4 times the area also increases by 2 times 3 times, 4 times.

3 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

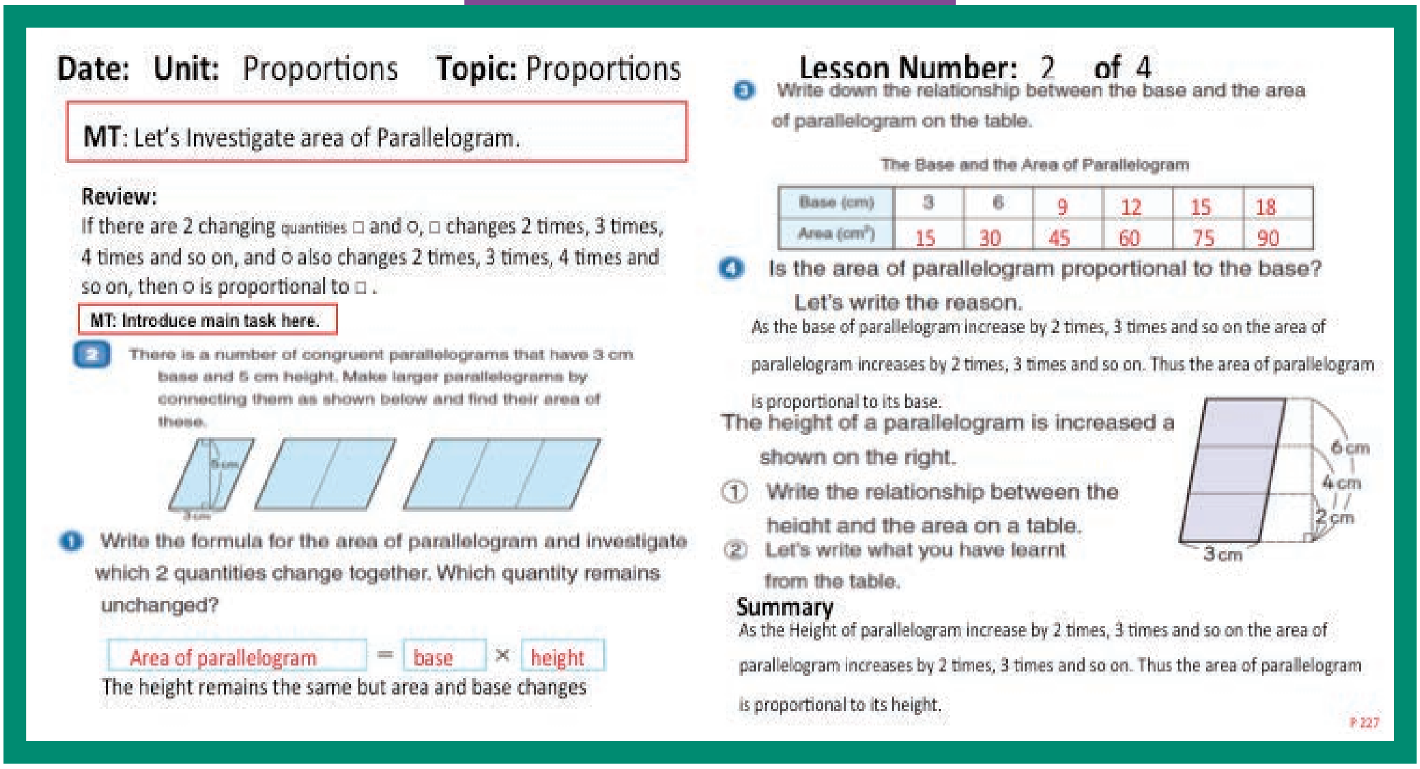
4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Proportions **Topic:** Proportions

Lesson Number: 2 of 4

MT: Let's Investigate area of Parallelogram.

Review:
If there are 2 changing quantities □ and ○, □ changes 2 times, 3 times, 4 times and so on, and ○ also changes 2 times, 3 times, 4 times and so on, then ○ is proportional to □ .

MT: Introduce main task here.

2 There is a number of congruent parallelograms that have 3 cm base and 5 cm height. Make larger parallelograms by connecting them as shown below and find their area of these.

① Write the formula for the area of parallelogram and investigate which 2 quantities change together. Which quantity remains unchanged?

Area of parallelogram = base × height

The height remains the same but area and base changes

③ Write down the relationship between the base and the area of parallelogram on the table.

The Base and the Area of Parallelogram

Base (cm)	3	6	9	12	15	18
Area (cm^2)	15	30	45	60	75	90

④ Is the area of parallelogram proportional to the base?
Let's write the reason.

As the base of parallelogram increase by 2 times, 3 times and so on the area of parallelogram increases by 2 times, 3 times and so on. Thus the area of parallelogram is proportional to its base.

The height of a parallelogram is increased a shown on the right.

① Write the relationship between the height and the area on a table.

② Let's write what you have learnt from the table.

Summary
As the Height of parallelogram increase by 2 times, 3 times and so on the area of parallelogram increases by 2 times, 3 times and so on. Thus the area of parallelogram is proportional to its height.

P 227

Unit
12

Unit: Proportions

Sub-unit 2: Proportions

Lesson 4 of 4

Textbook Page : 168
Actual Lesson 114

Lesson Objectives

- To understand how the area of triangle changes.
- To identify how the area of triangle changes.

Assessment

- Identify and explain how the area of triangle changes. F
- Solve the exercises correctly. S

Prior Knowledge

- Area of Parallelogram

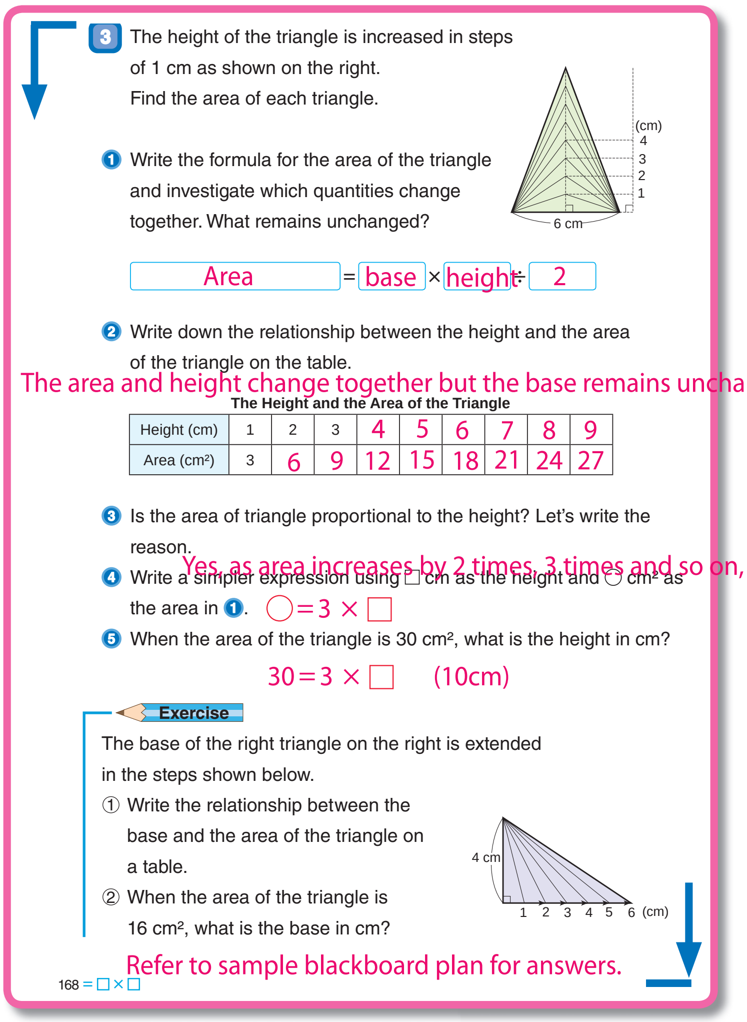
Preparation

- Diagram for task 3, table for activity ②

Teacher's Notes

This lesson focuses on Area in relation to base and height of the triangle.
Remind the students on the term 'congruent'.
In ④, A = base × height ÷ 2.

○ = 6 × □ ÷2
○ = □ × 6 ÷2
○ = □ × 3



3 The height of the triangle is increased in steps of 1 cm as shown on the right.
Find the area of each triangle.

① Write the formula for the area of the triangle and investigate which quantities change together. What remains unchanged?

Area = base × height ÷ 2

② Write down the relationship between the height and the area of the triangle on the table.

The area and height change together but the base remains unchanged.

The Height and the Area of the Triangle

Height (cm)	1	2	3	4	5	6	7	8	9
Area (cm²)	3	6	9	12	15	18	21	24	27

③ Is the area of triangle proportional to the height? Let's write the reason.

Yes, as area increases by 2 times, 3 times and so on, height also increases by 2 times, 3 times and so on.

④ Write a simpler expression using □ cm as the height and ○ cm² as the area in ①. ○ = 3 × □

⑤ When the area of the triangle is 30 cm², what is the height in cm?

30 = 3 × □ (10cm)

Exercise

The base of the right triangle on the right is extended in the steps shown below.

① Write the relationship between the base and the area of the triangle on a table.

② When the area of the triangle is 16 cm², what is the base in cm?

Refer to sample blackboard plan for answers.

168 = □ × □

Lesson Flow

1 Review the previous lesson.

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

2 Finding the height and the area of triangle.

T/S ③ Read and understand the situation.

TN Make larger triangles by increasing the heights as shown in ③ and find the area.

S 1)height 1 cm, area 3 cm^2 (2) height 2 cm, area 6 cm^2 (3) height 3 cm, area 9 cm^2
(4) height 4, area 12cm^2

T ① Write the formula for the area of triangle and investigate which two quantities change together and which quantity remains unchanged?

S Area = (Base × Height) ÷ 2.
○ = 6 × □ ÷ 2
Height and area will increase together but the Base of the triangle will remain the same.

T ② Write down the relationship between the base and the area of triangle on the table.

S Fill in the table and identify that when the height increases by 2 times, 3 times and so on, the area also increase by 2 times, 3 times and so on.

T ③ Is the area of the triangle proportional to the height? Let's write the reason.

S Yes,the area of the triangle is proportional to the height because as the area increases by 2 times 3 times, 4 times the height also increases by 2 times 3 times, 4 times.

T ④ Write a simpler expression using □ as the height and the ○ cm^2 as the area in ①.

S ○ = 6 × □ ÷ 2, ○ = 3 × □

T ⑤ What is the height in cm, when the area of the triangle is 30 cm^2?

S Using ○ = 3 × □ 30 = 3 × □ therefore, □ = 30 ÷ 3 = 10 cm

3 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

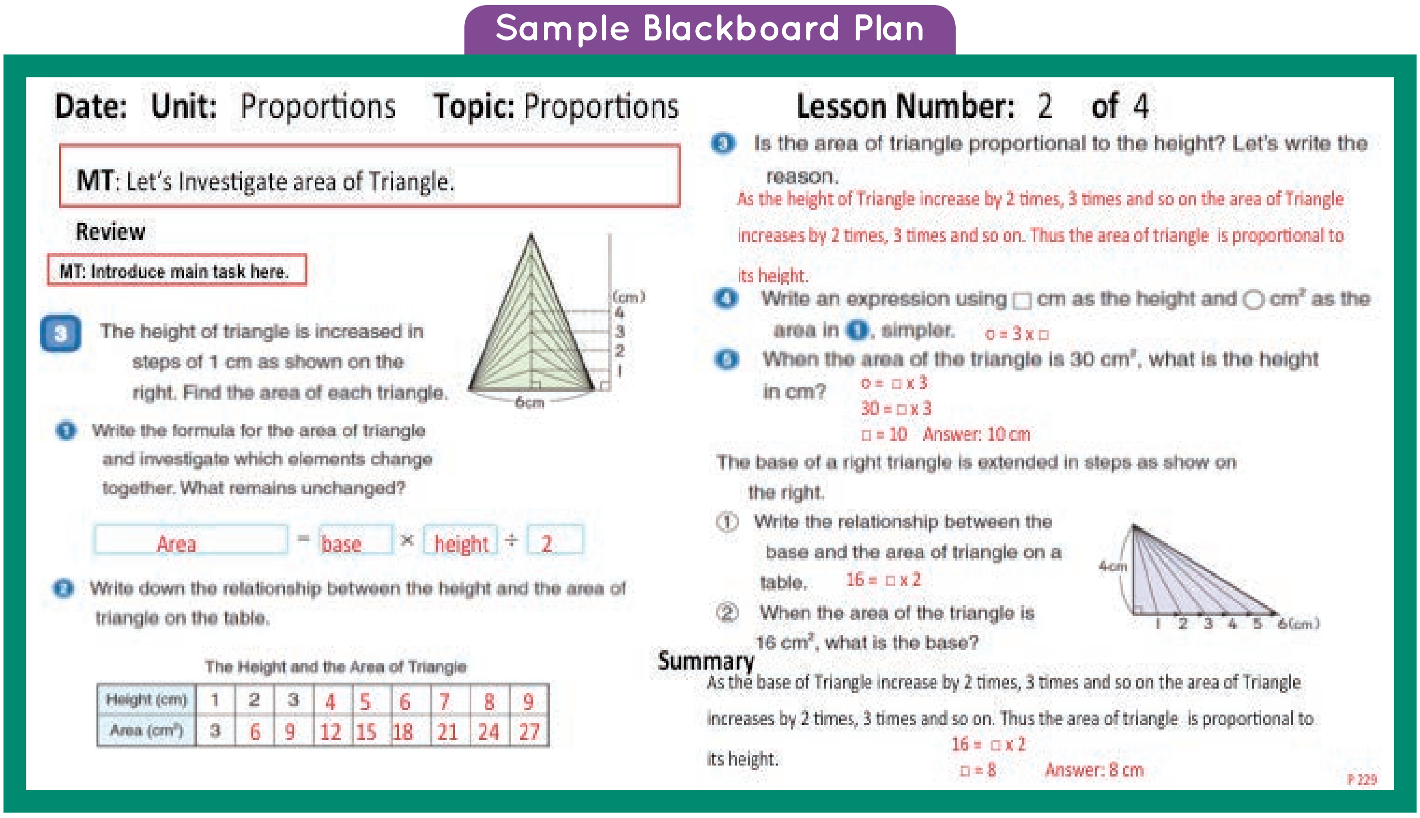
4 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Proportions **Topic:** Proportions **Lesson Number:** 2 of 4

MT: Let's Investigate area of Triangle.

Review

MT: Introduce main task here.

③ The height of triangle is increased in steps of 1 cm as shown on the right. Find the area of each triangle.

① Write the formula for the area of triangle and investigate which elements change together. What remains unchanged?

Area = base × height ÷ 2

② Write down the relationship between the height and the area of triangle on the table.

The Height and the Area of Triangle

Height (cm)	1	2	3	4	5	6	7	8	9
Area (cm^2)	3	6	9	12	15	18	21	24	27

③ Is the area of triangle proportional to the height? Let's write the reason.

As the height of Triangle increase by 2 times, 3 times and so on the area of Triangle increases by 2 times, 3 times and so on. Thus the area of triangle is proportional to its height.

④ Write an expression using □ cm as the height and ○ cm^2 as the area in ①, simpler. ○ = 3 x □

⑤ When the area of the triangle is 30 cm^2, what is the height in cm?

○ = □ x 3
30 = □ x 3
□ = 10 Answer: 10 cm

The base of a right triangle is extended in steps as show on the right.

① Write the relationship between the base and the area of triangle on a table. 16 = □ x 2

② When the area of the triangle is 16 cm^2, what is the base?

Summary

As the base of Triangle increase by 2 times, 3 times and so on the area of Triangle increases by 2 times, 3 times and so on. Thus the area of triangle is proportional to its height.

16 = □ x 2
□ = 8 Answer: 8 cm

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Unit 12

Unit: Proportions

Problems and Evaluation

Lesson 1 and 2 of 2

Textbook Page :
169
Actual Lesson 115 and 116

Lesson Objective

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

Prior Knowledge

- All the contents covered in this unit

Preparation

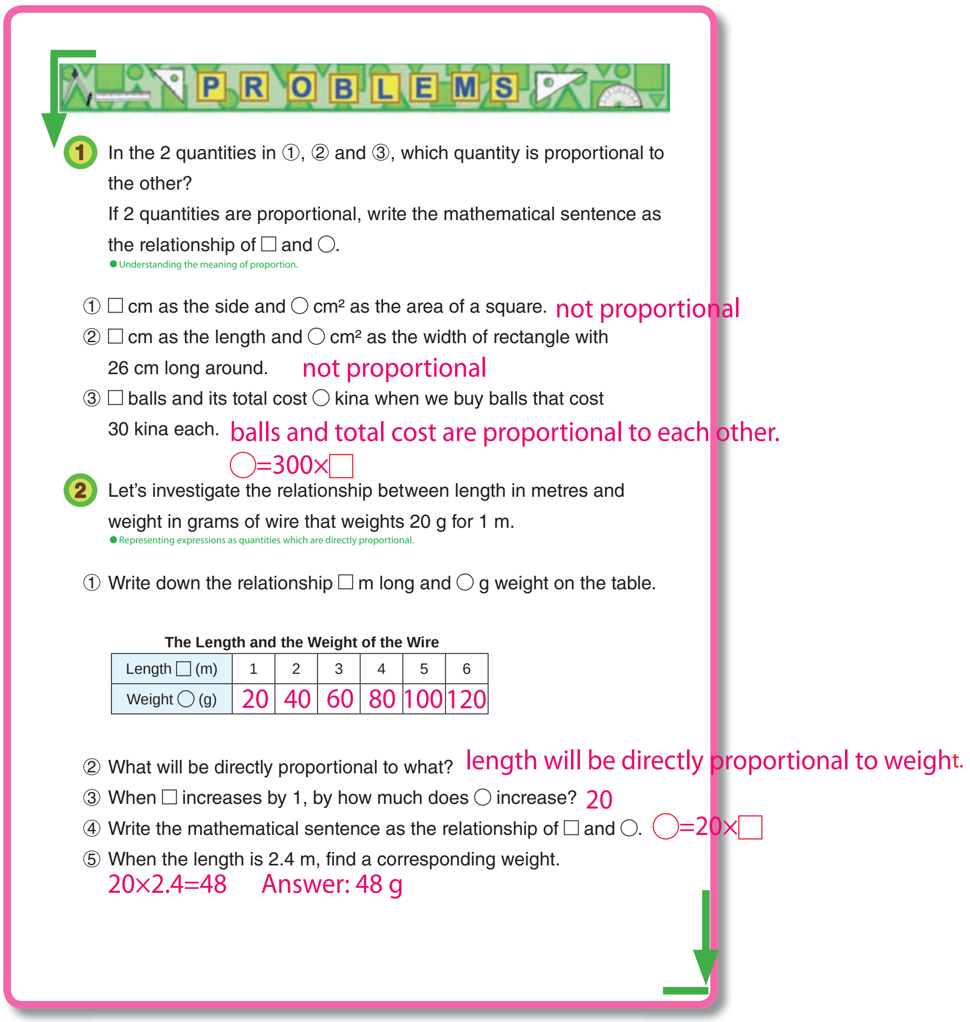
- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 12.
Students should be encouraged to use the necessary skills learned in this unit to solve the Problems in preparation for the evaluation test.
The test can be conducted as assesment for your class after completing all the exercises.
Use the attached evaluation test to conduct assesment for your class after finishing all the problems as a seperate lesson.



PROBLEMS

① In the 2 quantities in ①, ② and ③, which quantity is proportional to the other?
If 2 quantities are proportional, write the mathematical sentence as the relationship of □ and ○.
● Understanding the meaning of proportion.

① □ cm as the side and ○ cm² as the area of a square. not proportional
② □ cm as the length and ○ cm² as the width of rectangle with 26 cm long around. not proportional
③ □ balls and its total cost ○ kina when we buy balls that cost 30 kina each. balls and total cost are proportional to each other.
○=300×□

② Let's investigate the relationship between length in metres and weight in grams of wire that weights 20 g for 1 m.
● Representing expressions as quantities which are directly proportional.

① Write down the relationship □ m long and ○ g weight on the table.

The Length and the Weight of the Wire

Length □ (m)	1	2	3	4	5	6
Weight ○ (g)	20	40	60	80	100	120

② What will be directly proportional to what? length will be directly proportional to weight.
③ When □ increases by 1, by how much does ○ increase? 20
④ Write the mathematical sentence as the relationship of □ and ○. ○=20×□
⑤ When the length is 2.4 m, find a corresponding weight.
20×2.4=48 Answer: 48 g

Lesson Flow

1 Solve the Problems 1

S Solve all the problems.

T Confirm students' answers.

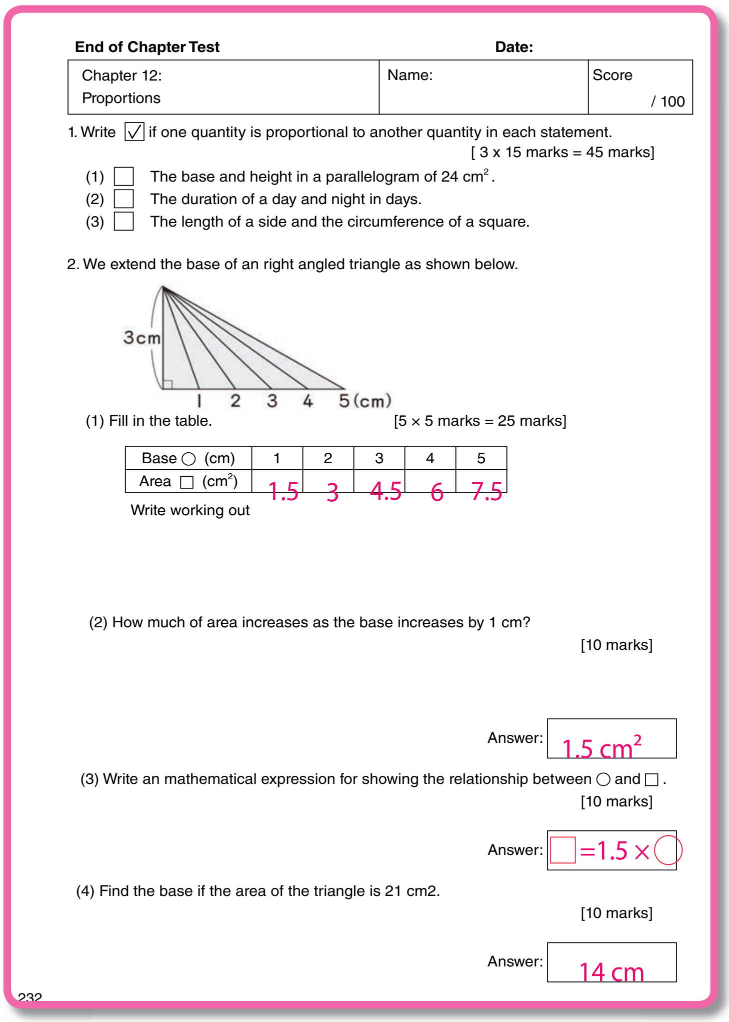
TN ① Understanding the meaning of proportion.

② Representing expressions as quantities which are directly proportional.

2 Complete the Evaluation Test

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

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 12: Proportions	Name:	Score / 100

1. Write ☑ if one quantity is proportional to another quantity in each statement.
[3 x 15 marks = 45 marks]

(1) ☐ The base and height in a parallelogram of 24 cm^2 .
(2) ☐ The duration of a day and night in days.
(3) ☐ The length of a side and the circumference of a square.

2. We extend the base of an right angled triangle as shown below.

(1) Fill in the table. [5 × 5 marks = 25 marks]

Base ○ (cm)	1	2	3	4	5
Area □ (cm^2)	1.5	3	4.5	6	7.5

Write working out

(2) How much of area increases as the base increases by 1 cm?
[10 marks]

Answer: 1.5 cm^2

(3) Write an mathematical expression for showing the relationship between ○ and □ .
[10 marks]

Answer: □ =1.5 × ○

(4) Find the base if the area of the triangle is 21 cm2.
[10 marks]

Answer: 14 cm

232

End of Chapter Test **Date:**

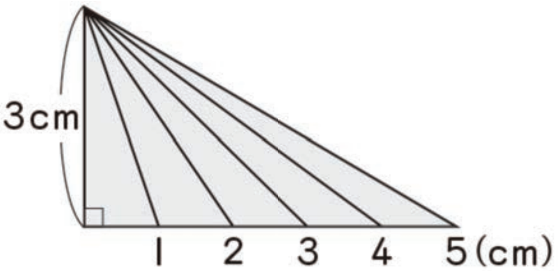
Chapter 12: Proportions	Name:	Score / 100

1. Write ☑ if one quantity is proportional to another quantity in each statement.

[3×15 marks＝45 marks]

(1) ☐ The base and height in a parallelogram of 24 cm^2 .
(2) ☐ The duration of a day and night in days.
(3) ☐ The length of a side and the circumference of a square.

2. We extend the base of a right angled triangle as shown below.



(1) Fill in the table.

[5×5 marks＝25 marks]

Base ○ (cm)	1	2	3	4	5
Area ☐ (cm^2)					

Show working out.

(2) How much of area increases when the base increases by 1 cm?

[10 marks]

Answer: ☐

(3) Write a mathematical expression for showing the relationship between ○ and ☐.

[10 marks]

Answer: ☐

(4) Find the base if the area of the triangle is 21 cm^2.

[10 marks]

Answer: ☐

Chapter 13 Regular Polygons and Circles

1. Content Standard

5.3.2 Investigate and construct regular polygons and identify the properties of angles.

2. Unit Objectives

- To deepen the understanding about plane shapes through observation and activities.
- To know about polygons and regular polygons.
- To understand and use

3. Teaching Overview

In Grade 3, students learn how to draw circles and have the knowledge of centre, diameter and radius. In Grade 5, they learn ratio of circumference to diameter and utilise it to find the circumference.

They also investigate the relationship between a circle and its inscribed regular polygons and compare the circumferences of the circle and the polygon.

Regular Polygons :

Students will capture the features of regular polygons through activities of making them by folding and cutting a paper.

They should know the process of more accurate construction of regular polygons by dividing the centre angle equally.

Diameters and Circumferences :

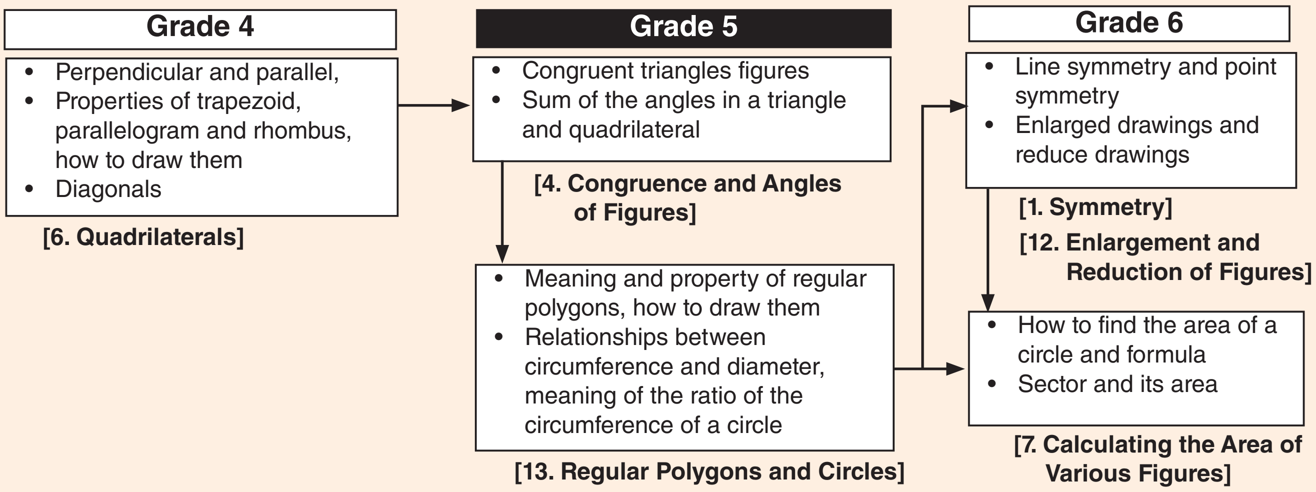
Students should find out by themselves that the circumference of a circle is greater than 3 times the diameter and less than 4 times through activities.

They should get used to finding the circumference from its diameter or radius and vise versa.

Encourage students to be interested in the history of the ratio of circumference to diameter and its infinity.

Note that teachers should not just give the ratio to the students, however, students should discover and calculate by themselves as much as possible.

4. Related Learning Contents



Grade 4

- Perpendicular and parallel,
- Properties of trapezoid, parallelogram and rhombus, how to draw them
- Diagonals

[6. Quadrilaterals]

Grade 5

- Congruent triangles figures
- Sum of the angles in a triangle and quadrilateral

[4. Congruence and Angles of Figures]

- Meaning and property of regular polygons, how to draw them
- Relationships between circumference and diameter, meaning of the ratio of the circumference of a circle

[13. Regular Polygons and Circles]

Grade 6

- Line symmetry and point symmetry
- Enlarged drawings and reduce drawings

[1. Symmetry]

[12. Enlargement and Reduction of Figures]

- How to find the area of a circle and formula
- Sector and its area

[7. Calculating the Area of Various Figures]

Unit 13

Unit: Regular Polygons and Circles

Sub-unit 1: Regular Polygons

Lesson 1 of 3

Textbook Page :
170 to 172
Actual Lesson 117

Sub-unit Objectives

- To understand properties of regular polygons by making their shapes using the square papers.
- To draw regular polygons, applying the properties of circumscribed or inscribed circles.

Lesson Objective

- To understand the definition of regular polygons and summarise their features.

Prior Knowledge

- Names and properties of basic shapes like square, triangle, rectangles, etc...

Preparation

- Square papers (Origami)
- Scissors, rulers, protractor, compass, equilateral triangle for the blackboard

Assessment

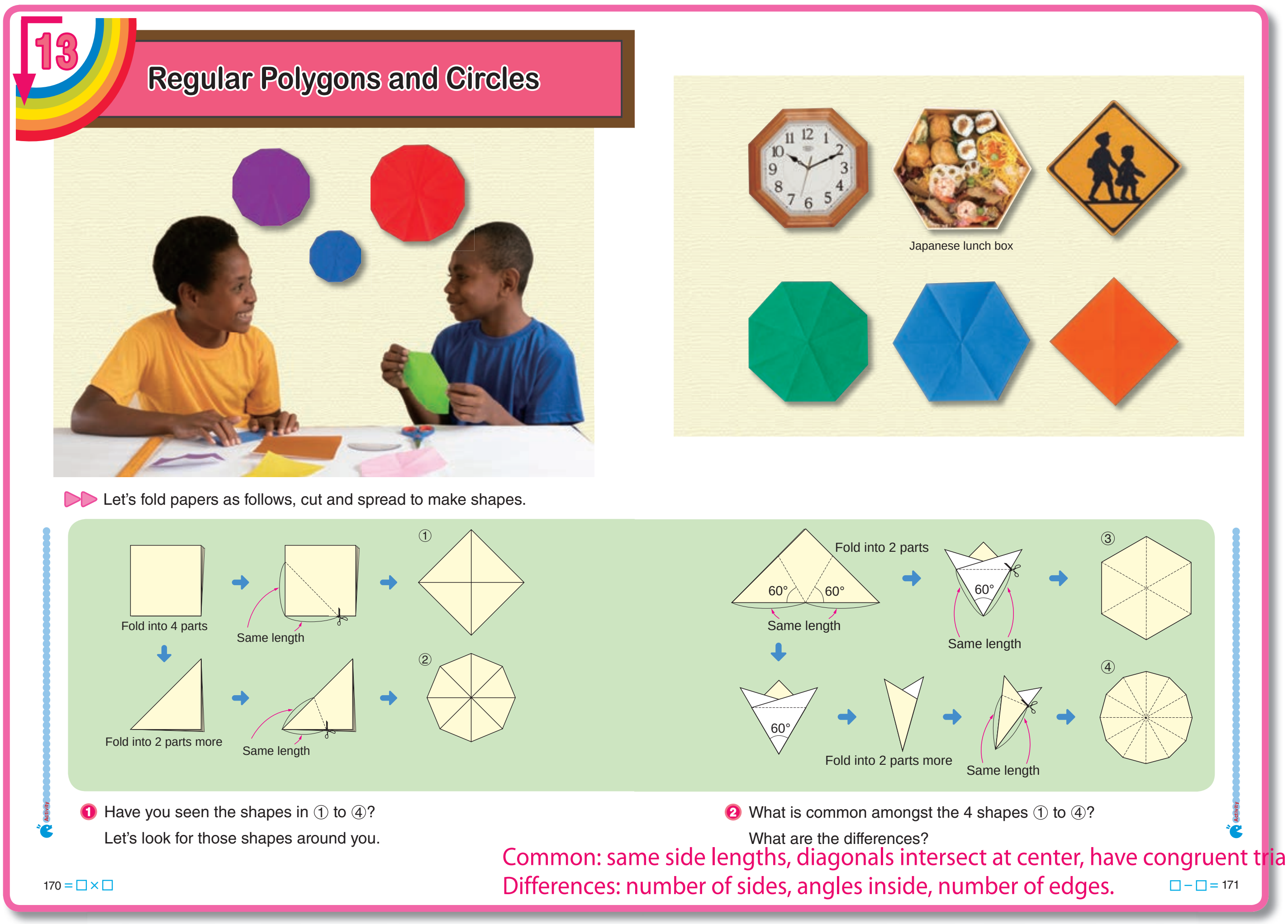
- Fold the square papers correctly and cut out to make regular polygons. **F**
- Understand and identify the features that are common and different in regular polygons. **F**
- Identify the number of sides and size of angles in regular polygons. **S**

Teacher's Notes

It's best for the teacher to try out the foldings and cuttings before the actual lesson. Demonstrate during lesson as students follow through.

To obtain a regular polygon, square papers (coloured papers if available) must be used.

It is important that the students must be well guided to make the polygons using square papers because students can easily make mistake in folding and cutting.



13 Regular Polygons and Circles

▶▶ Let's fold papers as follows, cut and spread to make shapes.

❶ Have you seen the shapes in ① to ④?
Let's look for those shapes around you.

❷ What is common amongst the 4 shapes ① to ④?
What are the differences?

Common: same side lengths, diagonals intersect at center, have congruent triangles
Differences: number of sides, angles inside, number of edges.

170 = ☐ × ☐

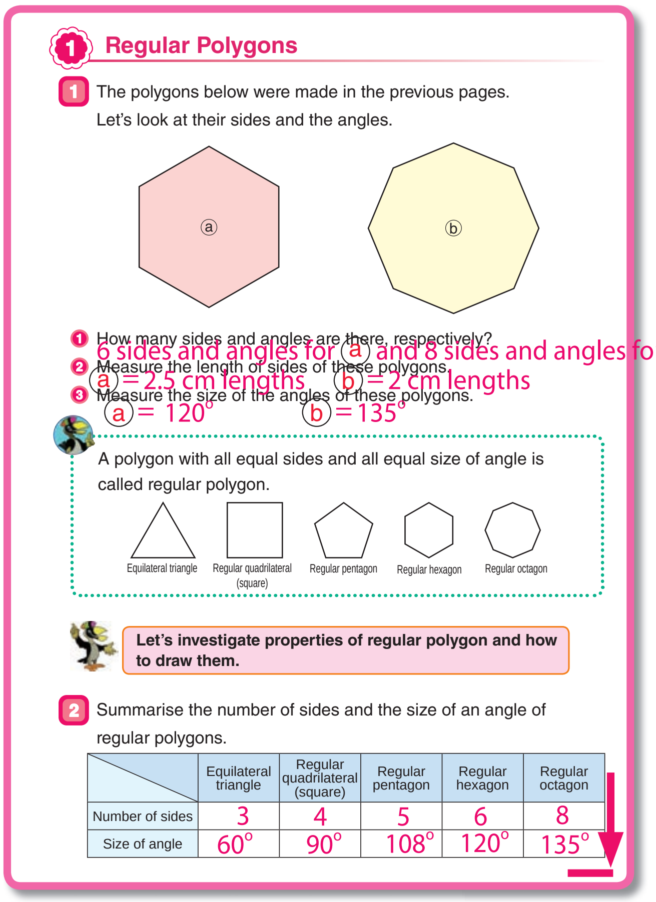
☐ − ☐ = 171

Lesson Flow

1 ▶▶ Discuss the features of shapes and make them.

T/S Discuss the shapes and describe them.

T Provide students with square paper and scissors and ask them to fold and cut according to the instruction in the textbook from ① to ④.



① Regular Polygons

1 The polygons below were made in the previous pages. Let's look at their sides and the angles.

❶ How many sides and angles are there, respectively?

6 sides and angles for ⓐ and 8 sides and angles for ⓑ

❷ Measure the length of sides of these polygons.

ⓐ = 2.5 cm lengths ⓑ = 2 cm lengths

❸ Measure the size of the angles of these polygons.

ⓐ = 120° ⓑ = 135°

A polygon with all equal sides and all equal size of angle is called regular polygon.

Let's investigate properties of regular polygon and how to draw them.

2 Summarise the number of sides and the size of an angle of regular polygons.

	Equilateral triangle	Regular quadrilateral (square)	Regular pentagon	Regular hexagon	Regular octagon
Number of sides	3	4	5	6	8
Size of angle	60°	90°	108°	120°	135°

S Understand and make various polygons using square papers.

T ❶ Ask students if they have seen the shapes ① to ④ around them.

S Identify the shapes around them.

T ❷ Ask students to find the common and different features amongst the four shapes.

S 1) Common features: same side length, diagonals intersect at the centre and have congruent triangles.
2) Different features: number of sides, angles inside and number of edges.

2 **1** Investigate the characteristics of regular hexagon and octagon.

T Ask students to answer activities ❶ to ❸.

S Share their answers.

❶ Number of sides and angles for ⓐ is 6 and ⓑ is 8.

❷ Length of sides ⓐ is 2.5 cm and ⓑ is 2 cm.

❸ Sizes of angles for Ⓐ is 120° and Ⓐ is 135°.

T Confirm students answers

3 Important Point

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

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

4 **2** Investige the properties of regular polygons and how to draw them.

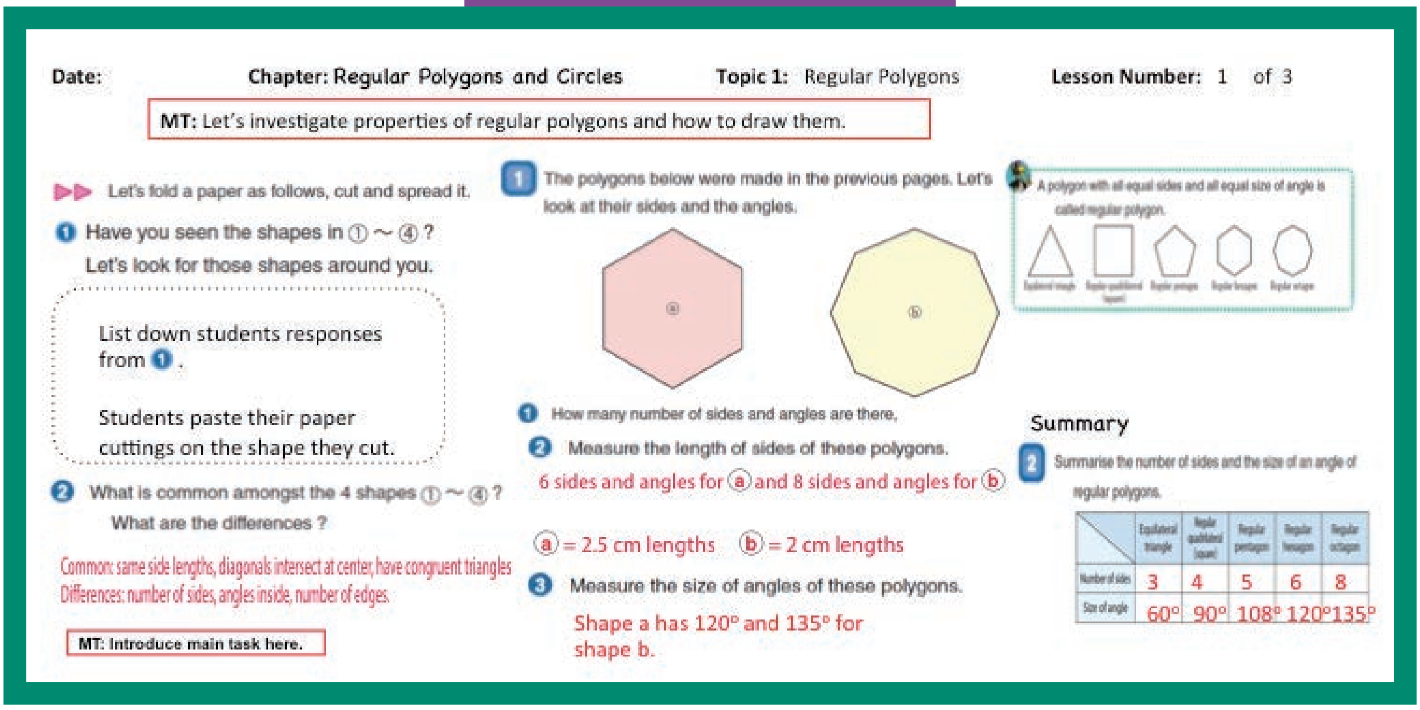
T Ask students to complete the table.

S Copy and complete the summary table.

4 Summary

TN Similar to next summary flow.

Sample Blackboard Plan



Date: **Chapter:** Regular Polygons and Circles **Topic 1:** Regular Polygons **Lesson Number:** 1 of 3

MT: Let's investigate properties of regular polygons and how to draw them.

▶▶ Let's fold a paper as follows, cut and spread it.

❶ Have you seen the shapes in ① ~ ④ ?
Let's look for those shapes around you.

List down students responses from ❶ .

Students paste their paper cuttings on the shape they cut.

❷ What is common amongst the 4 shapes ① ~ ④ ?
What are the differences ?

Common: same side lengths, diagonals intersect at center, have congruent triangles
Differences: number of sides, angles inside, number of edges.

MT: Introduce main task here.

1 The polygons below were made in the previous pages. Let's look at their sides and the angles.

❶ How many number of sides and angles are there,

❷ Measure the length of sides of these polygons.

6 sides and angles for ⓐ and 8 sides and angles for ⓑ

ⓐ = 2.5 cm lengths ⓑ = 2 cm lengths

❸ Measure the size of angles of these polygons.

Shape a has 120° and 135° for shape b.

A polygon with all equal sides and all equal size of angle is called regular polygon.

Summary

2 Summarise the number of sides and the size of an angle of regular polygons.

	Equilateral triangle	Regular quadrilateral (square)	Regular pentagon	Regular hexagon	Regular octagon
Number of sides	3	4	5	6	8
Size of angle	60°	90°	108°	120°	135°

Unit
13

Unit: Regular Polygons and Circles

Sub-unit 1: Regular Polygons

Lesson 2 of 3

Textbook Page :
173
Actual Lesson 118

Lesson Objective

- To investigate properties of regular polygons and how to draw them.

Prior Knowledge

- Meaning and features of regular polygons

Preparation

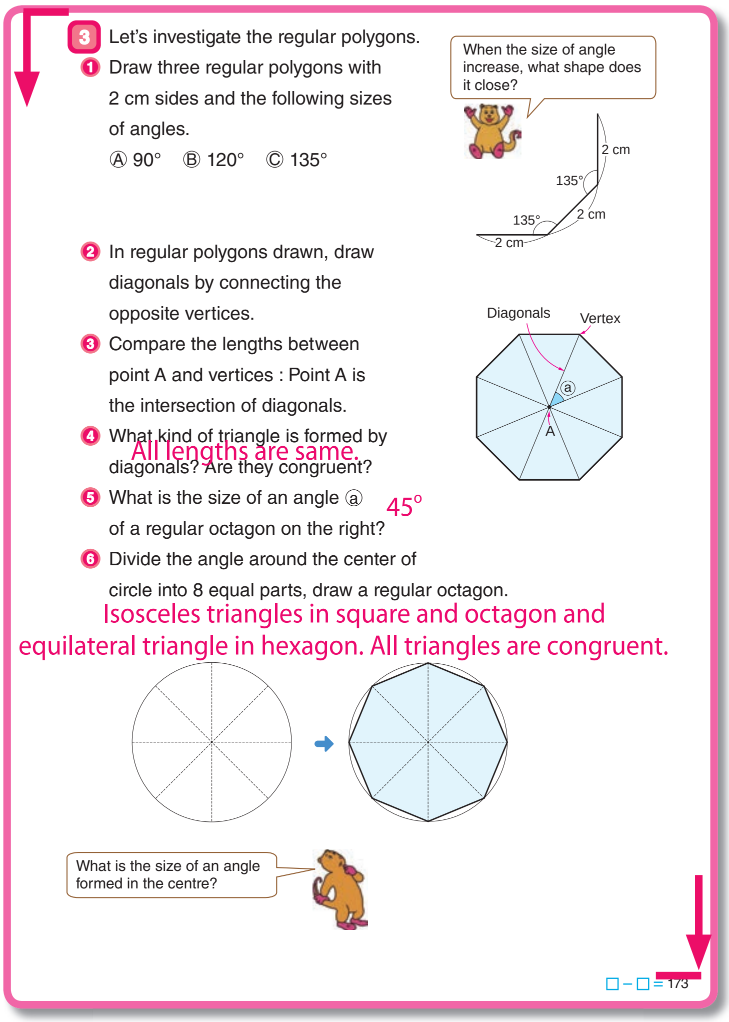
- Regular hexagon and octagon
- Ruler, compass, and protractor

Assessment

- Think about how to draw the regular polygons correctly. **F**
- Discover the features of regular polygons with angles made by diagonals. **F**
- Use math set to draw regular polygons correctly. **S**

Teacher's Notes

Constructing regular polygons accurately is very significant in geometry and is easy to do if children know how to precisely use ruler, compass, and protractors.
A rule of polygons is that the sum of the exterior angles always equals 360 degrees.
Since it is a regular octagon, so each of the interior angles of octagon should be equal.
Distance from the centre of the octagon to the vertex is also the same.



3 Let's investigate the regular polygons.

① Draw three regular polygons with 2 cm sides and the following sizes of angles.

Ⓐ 90° Ⓑ 120° Ⓒ 135°

When the size of angle increase, what shape does it close?

② In regular polygons drawn, draw diagonals by connecting the opposite vertices.

③ Compare the lengths between point A and vertices : Point A is the intersection of diagonals.

④ What kind of triangle is formed by diagonals? Are they congruent?

All lengths are same.

⑤ What is the size of an angle ⓐ of a regular octagon on the right?

45°

⑥ Divide the angle around the center of circle into 8 equal parts, draw a regular octagon.

Isosceles triangles in square and octagon and equilateral triangle in hexagon. All triangles are congruent.

What is the size of an angle formed in the centre?

□ − □ = 173

Lesson Flow

1 Review the previous lesson.

2 3 Let's investigate regular polygons.

T/S Read and understand the given situation.

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

T ① Ask students to draw 3 regular polygons with 2 cm sides and the following sizes of angles of Ⓐ 90°, Ⓑ 120° and Ⓒ 135° using rulers and protractors.

S Draw the 3 regular polygons using the given measurements.

TN The incomplete shape is for Ⓒ.

T What is the name of the regular polygon in Ⓐ, Ⓑ and Ⓒ?

S square, hexagon, octagon.

3 Find out an easier way to draw a regular octagon.

S ② Draw diagonals by connecting pairs of opposite vertices.

T Compare the lengths between point A and vertices: Point A is the intersection of diagonals.

S ③ The length of diagonal from the center point to all the vertices are all the same.

T ④ What kind of triangles are formed by the diagonals? Are they congruent?

S The kind of triangles formed are Isosceles and all are congruent.

S ⑤ Refer to the activity and find that the angles divided equally from the centre is 360÷8=45. Answer 45°.

4 ⑥ Draw a circumscribed regular octagon.

T Ask students to draw a regular octagon, drawing a circle first and then dividing center into 8 equal angles (360°÷8=45°) and connecting lines on vertex points.

S Draw the regular octagon.

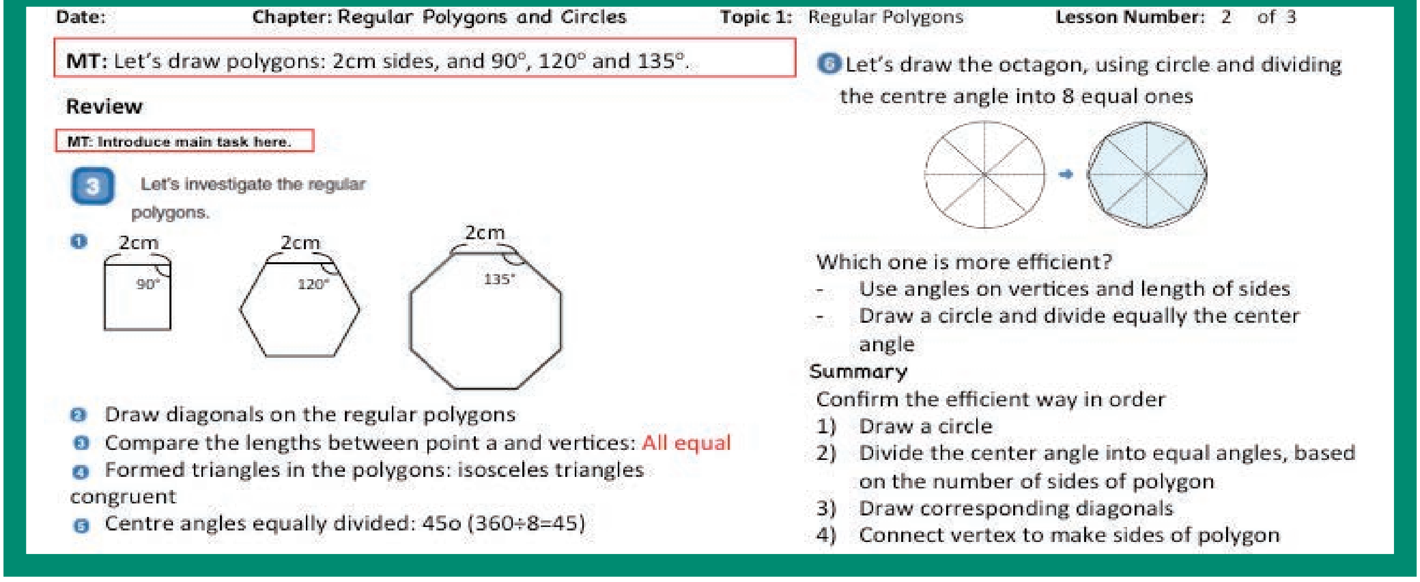
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Chapter:** Regular Polygons and Circles **Topic 1:** Regular Polygons **Lesson Number:** 2 of 3

MT: Let's draw polygons: 2cm sides, and 90°, 120° and 135°.

Review

MT: Introduce main task here.

3 Let's investigate the regular polygons.

①

2cm 90°

2cm 120°

2cm 135°

② Draw diagonals on the regular polygons

③ Compare the lengths between point a and vertices: All equal

④ Formed triangles in the polygons: isosceles triangles congruent

⑤ Centre angles equally divided: 45o (360÷8=45)

⑥ Let's draw the octagon, using circle and dividing the centre angle into 8 equal ones

Which one is more efficient?

- Use angles on vertices and length of sides
- Draw a circle and divide equally the center angle

Summary

Confirm the efficient way in order

1) Draw a circle
2) Divide the center angle into equal angles, based on the number of sides of polygon
3) Draw corresponding diagonals
4) Connect vertex to make sides of polygon

Unit 13

Unit: Regular Polygons and Circles

Sub-unit 1: Regular Polygons

Lesson 3 of 3

Textbook Page : 174
Actual Lesson 119

Lesson Objectives

- Draw regular pentagons and hexagons inscribed in a circle.
- Identify the centre of the polygon and divide angle into equal parts.
- Investigate the properties of pentagon and hexagon.

Prior Knowledge

- Ideas about angles and basic shapes in geometry.
- Understanding of what regular shapes are with regard to their sides and angles property.
- Interior angle sum of quadrilaterals and polygons

Preparation

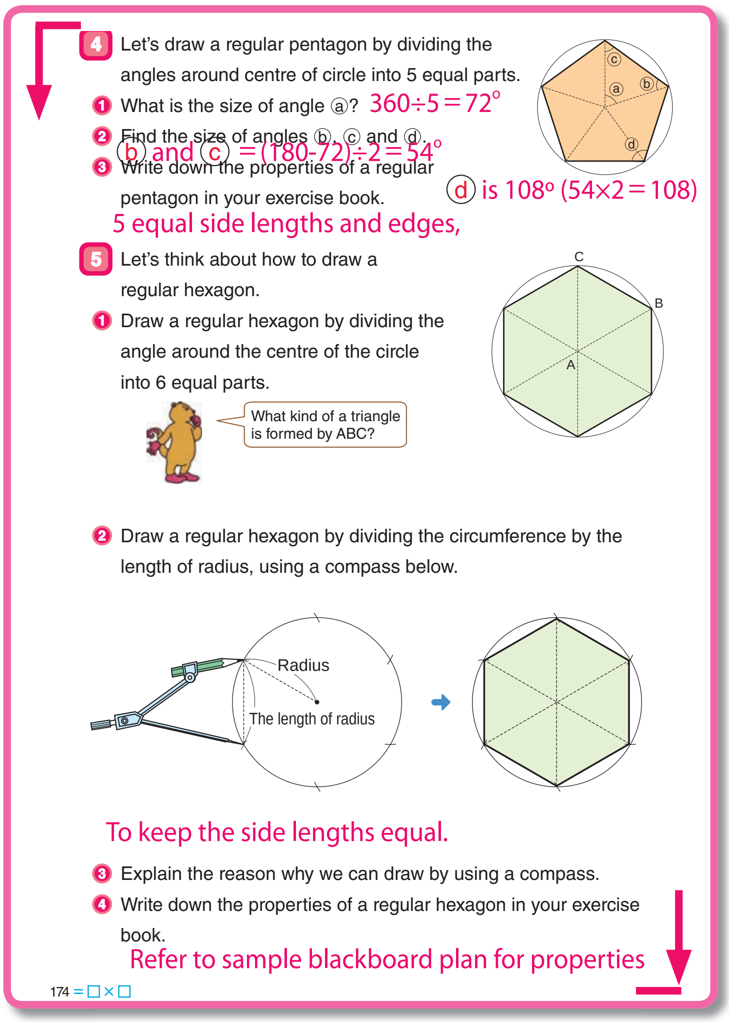
- Protractors, Compass, Rulers

Assessment

- Think about how to draw regular hexagon, using compass. F
- Find the size of centre angles and angle on the vertices. F
- Draw regular pentagon and hexagon correctly. S

Teacher's Notes

The center of the regular polygon is the same as the center of the circle if the polygon is inscribed in the circle.
Thus, the radius of the circle is the same as the distance from the center to the vertex of the polygon.
Dividing the angle around the center of the circle of the regular polygon into equal parts.
For a regular pentagon, there are congruent triangles, and in the case of hexagon, there are 6 congruent equilateral triangles.



4 Let's draw a regular pentagon by dividing the angles around centre of circle into 5 equal parts.

① What is the size of angle ⓐ? 360÷5＝72°

② Find the size of angles ⓑ, ⓒ and ⓓ.

ⓑ and ⓒ ＝(180-72)÷2＝54°

ⓓ is 108° (54×2＝108)

③ Write down the properties of a regular pentagon in your exercise book.

5 equal side lengths and edges,

5 Let's think about how to draw a regular hexagon.

① Draw a regular hexagon by dividing the angle around the centre of the circle into 6 equal parts.

What kind of a triangle is formed by ABC?

② Draw a regular hexagon by dividing the circumference by the length of radius, using a compass below.

To keep the side lengths equal.

③ Explain the reason why we can draw by using a compass.

④ Write down the properties of a regular hexagon in your exercise book.

Refer to sample blackboard plan for properties

174 = □×□

Lesson Flow

1 Review the previous lesson.

2 Let's draw a regular pentagon by dividing the angle around the of circle into 5 equal parts.

T/S 4 Read and understand the given situation.

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

T Ask students to answer activities ①, ② and ③

S ① The angle ⓐ is (360÷5=72).
Answer 72°.

S ② The sizes of angles; ⓑ and ⓒ is 54° (180−72)÷2=54). ⓓ is 108° (54×2=108).

S ③ The properties of regular pentagon are; 5 equal side lengths, edges and 5 isosceles triangles.

3 Let's think about how to draw regular hexagon.

T/S 5 Read and understand the given situation.

S ① Draw a circle using the compass, dividing the center angle into 6 equal parts. Join all the points on the circumference with straight lines to form a regular hexagon.

TN First of all draw a circle, find out the 6 equal angles and draw diagonals and the regular hexagon in the circle, indicating that the triangles made in the hexagon are equilateral triangles (like ABC) and congruent to each other, since all the angles are 60° with equal sides.

4 ② Draw a regular hexagon by dividing the circumference by the lenght of radius, using a compass.

S Draw a circle by using a compass and divide the circle's circumference by the same length of the compass (the same length of its radius). Then, draw a regular hexagon, connecting the points made in the previous activity.

S ③ Think about the reason why regular hexagon is drawn using a compass.

S To keep the side lengths equal by using a compass.

S Write down the properties of regular hexagon.

TN Refer to the board plan for thee properties.

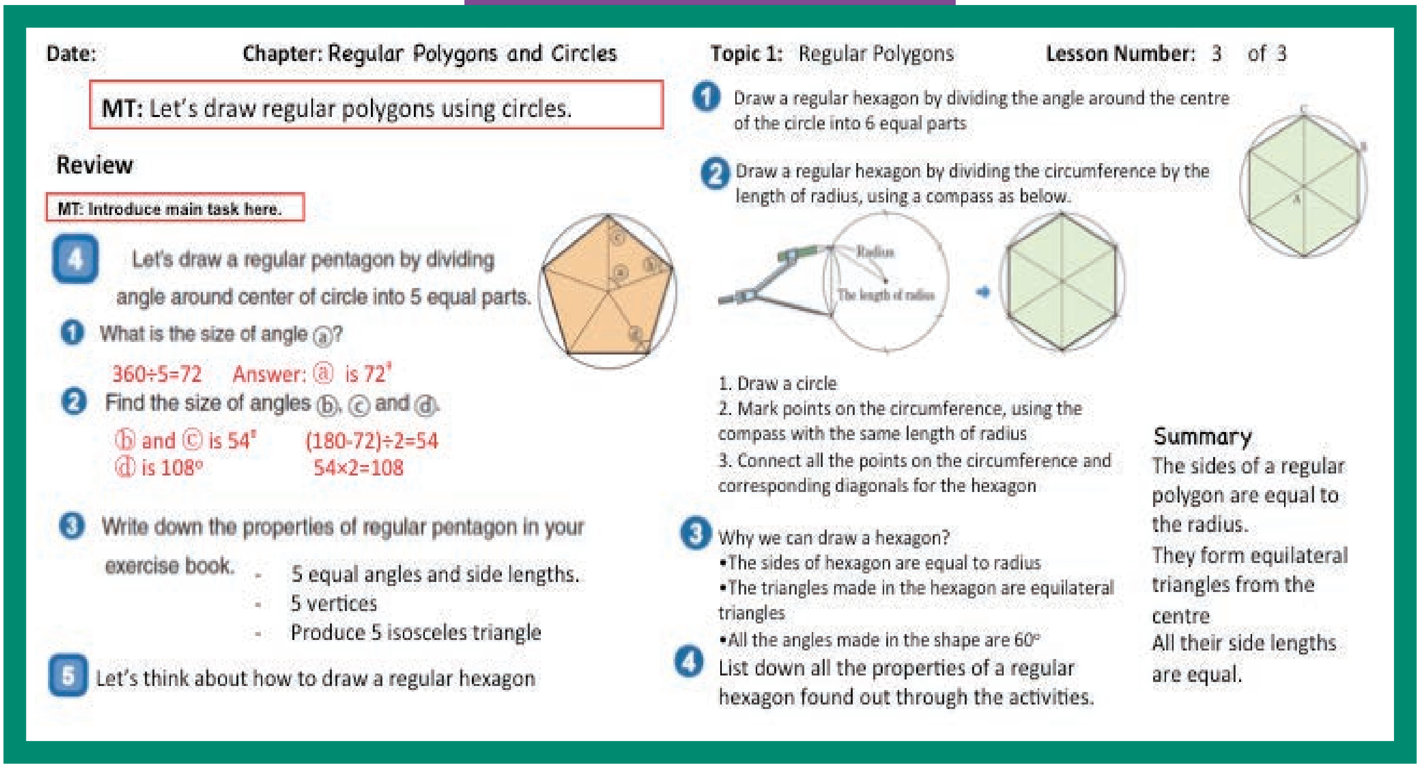
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Chapter:** Regular Polygons and Circles **Topic 1:** Regular Polygons **Lesson Number:** 3 of 3

MT: Let's draw regular polygons using circles.

Review

MT: Introduce main task here.

4 Let's draw a regular pentagon by dividing angle around center of circle into 5 equal parts.

① What is the size of angle ⓐ?

360÷5=72 Answer: ⓐ is 72°

② Find the size of angles ⓑ, ⓒ and ⓓ.

ⓑ and ⓒ is 54° (180-72)÷2=54
ⓓ is 108° 54×2=108

③ Write down the properties of regular pentagon in your exercise book.
- 5 equal angles and side lengths.
- 5 vertices
- Produce 5 isosceles triangle

5 Let's think about how to draw a regular hexagon

① Draw a regular hexagon by dividing the angle around the centre of the circle into 6 equal parts

② Draw a regular hexagon by dividing the circumference by the length of radius, using a compass as below.

1. Draw a circle
2. Mark points on the circumference, using the compass with the same length of radius
3. Connect all the points on the circumference and corresponding diagonals for the hexagon

③ Why we can draw a hexagon?
- The sides of hexagon are equal to radius
- The triangles made in the hexagon are equilateral triangles
- All the angles made in the shape are 60°

④ List down all the properties of a regular hexagon found out through the activities.

Summary
The sides of a regular polygon are equal to the radius.
They form equilateral triangles from the centre
All their side lengths are equal.

Unit 13

Unit: Regular Polygons and Circles

Sub-unit 2: Diameters and Circumferences

Lesson 1 of 4

Textbook Page : 175
Actual Lesson 120

Sub-unit Objectives

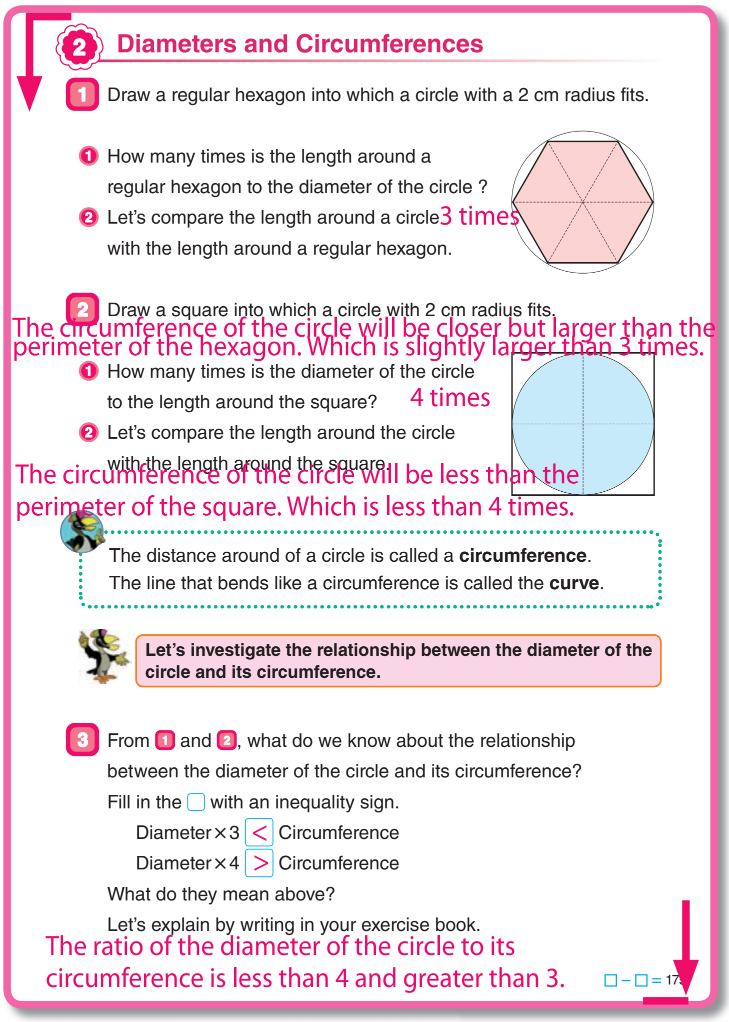
- To understand the meaning of circumference and diameter and how to find them.
- To understand the meaning of the ratio of circumference to its diameter.

Lesson Objectives

- To explore and understand the relationship between the diameter of the circle and its circumference.
- Find the length of circumference.

Prior Knowledge

- How to draw regular pentagon, hexagon, dividing circle center into equal angles
- How to draw circle by compass and divide the circumference



2 Diameters and Circumferences

1 Draw a regular hexagon into which a circle with a 2 cm radius fits.

① How many times is the length around a regular hexagon to the diameter of the circle ?

② Let's compare the length around a circle with the length around a regular hexagon.

3 times

2 Draw a square into which a circle with 2 cm radius fits.

The circumference of the circle will be closer but larger than the perimeter of the hexagon. Which is slightly larger than 3 times.

① How many times is the diameter of the circle to the length around the square?

4 times

② Let's compare the length around the circle with the length around the square.

The circumference of the circle will be less than the perimeter of the square. Which is less than 4 times.

The distance around of a circle is called a **circumference**.
The line that bends like a circumference is called the **curve**.

Let's investigate the relationship between the diameter of the circle and its circumference.

3 From 1 and 2, what do we know about the relationship between the diameter of the circle and its circumference?

Fill in the □ with an inequality sign.

Diameter × 3 < Circumference
Diameter × 4 > Circumference

What do they mean above?

Let's explain by writing in your exercise book.

The ratio of the diameter of the circle to its circumference is less than 4 and greater than 3.

□ − □ = 17

Preparation

- Charts, drawing sheets, compass, rulers, scissors, sticky tape

Assessment

- Understand and explain the relationship between the diameter of the circle and its circumference. F
- Discover that the circumference is longer than 3 times diameter, but shorter than 4 times diameter. S

Teacher's Notes

- How to draw the shape in 1.

1. Measure the length of the compass to get 2 cm.
2. Draw the circle
3. Use the compass to make 6 points around the circumference.
4. Connect the points inside the circle as diagonals.
5. Create a regular hexagon by drawing the sides.

- The length around the regular hexagon is less than the circumference of the circle
- The circumference of the circle is less than the perimeter of the square.

Lesson Summary

- Conduct the summary at the end of the lesson similar to the process in previous lessons.

Lesson Flow

1 Review the previous lesson.

2 1 Draw a regular hexagon into which a circle with a 2 cm radius fits.

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

T Ask students to use their previous knowledge to draw a regular hexagon in which a circle with a 2 cm radius is circumscribed.

S Draw a regular hexagon on which a circle with a 2 cm radius fits.

T ① How many times is the length around a regular hexagon to the diameter of the circle?

S The perimeter of a regular hexagon is 3 times the length of the diameter.

T ② Let's compare the length around the circle with the length around the regular hexagon.

S The perimeter of the circle is longer than the perimeter of the hexagon.

TN Observe one side of the equilateral triangle part and the length of corresponding curve, the curved line is longer than its corresponding straight line.

3 2 Draw a square into which a circle with a 2 cm radius fits.

T ① How many times is the diameter of the circle to the length around the square?

S Find out that the length of the perimeter of square is 4 times the length of diameter.

T ② Let's compare the length around the circle with the length around the square.

S The perimeter of the circle is less than the perimeter of square.

TN The length of 2 sides of square is longer than the corresponding quarter part of the perimeter of circle.

4 Important Point

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

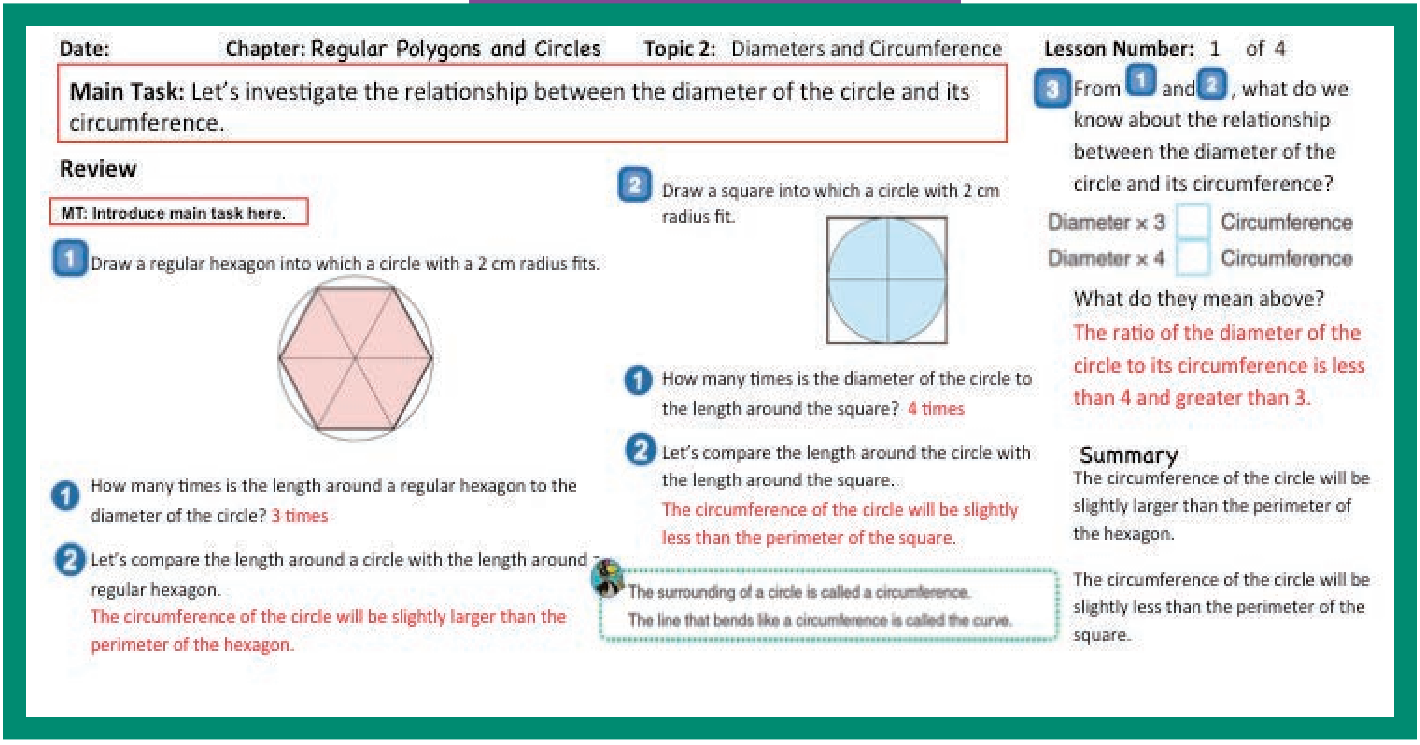
5 3 Investigate the relationship between the circumference and diameter of a circle.

T Ask students to investigate the relationship between the diameter of the circle and its circumference and fill in theb box ☐ with an inequality sign

S In groups or individually discuss the relationship between the diameter of the circle and its circumference, referring to the previous two activities of comparison among the circle, the regular hexagon and square. Conclude that Diameter × 3 < Circumference, and Diameter × 4 > Circumference.

S Conclude that the circumference is longer than 3 times the diameter and shorter than 4 times the diameter.

Sample Blackboard Plan



Date: **Chapter:** Regular Polygons and Circles **Topic 2:** Diameters and Circumference **Lesson Number:** 1 of 4

Main Task: Let's investigate the relationship between the diameter of the circle and its circumference.

Review

MT: Introduce main task here.

1 Draw a regular hexagon into which a circle with a 2 cm radius fits.

① How many times is the length around a regular hexagon to the diameter of the circle? 3 times

② Let's compare the length around a circle with the length around a regular hexagon.
The circumference of the circle will be slightly larger than the perimeter of the hexagon.

2 Draw a square into which a circle with 2 cm radius fit.

① How many times is the diameter of the circle to the length around the square? 4 times

② Let's compare the length around the circle with the length around the square.
The circumference of the circle will be slightly less than the perimeter of the square.

The surrounding of a circle is called a circumference.
The line that bends like a circumference is called the curve.

3 From 1 and 2, what do we know about the relationship between the diameter of the circle and its circumference?

Diameter × 3 ☐ Circumference
Diameter × 4 ☐ Circumference

What do they mean above?
The ratio of the diameter of the circle to its circumference is less than 4 and greater than 3.

Summary
The circumference of the circle will be slightly larger than the perimeter of the hexagon.

The circumference of the circle will be slightly less than the perimeter of the square.

Unit
13

Unit: Regular Polygons and Circles
Sub-unit 2: Diameters and Circumferences
Lesson 2 of 4

Textbook Page : 176
Actual Lesson 121

Lesson Objective

- Investigate the relationship between diameter and circumference.

Prior Knowledge

- Parts of a circle and meaning of circumference, diameter and radius

Preparation

- Hard cardboard (circles with diameter of 10 cm, 20 cm, 30 cm and 40 cm), ropes or tapes (correspond to the length of their circumference), scissors, sticky tapes, A4 papers, rulers, compass

Assessment

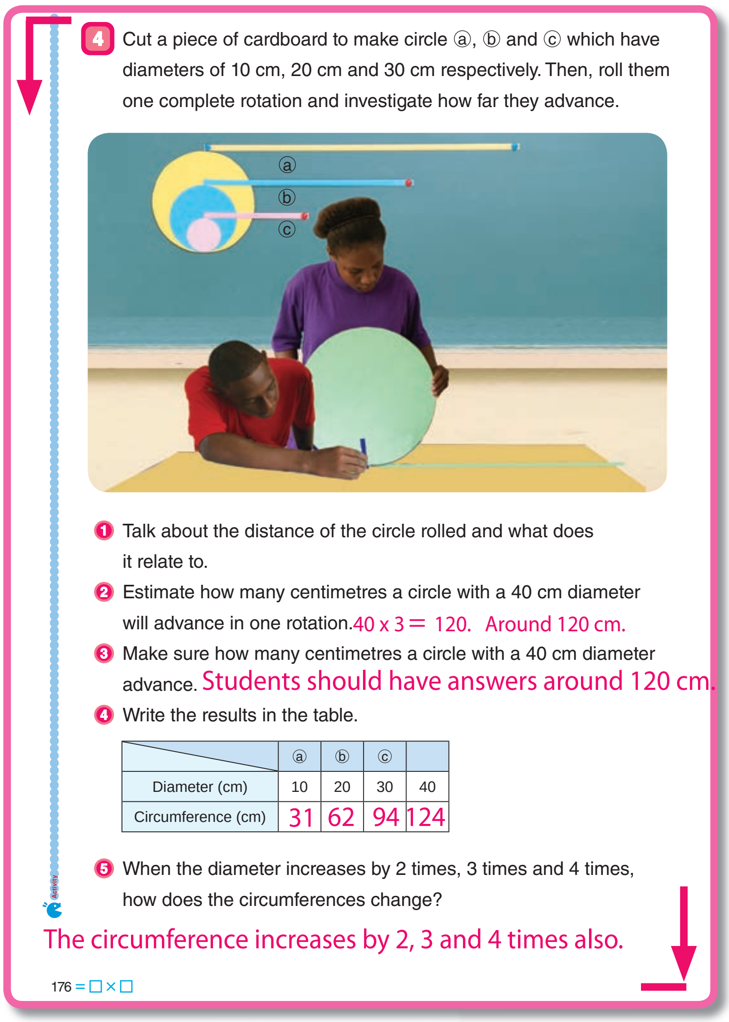
- Think about and explain the relationship between the diameter and circumference through experiment. F
- Explain the relationship between the diameter and circumference. S

Teacher's Notes

The teacher must understand that there is a relationship between the diameter and circumference that they have a common ratio. In order to apply an experiment to confirm this relationship, the teacher need to:

(1) Prepare a table for students to roll the circle 1 time well before lesson.

(2) Mark out the start point for the roll and mark the distance up to 130 cm (1.3 m) before lesson, since if the diameter is 40 cm, the circumference would be between 120 cm and 130 cm.



4 Cut a piece of cardboard to make circle ⓐ, ⓑ and ⓒ which have diameters of 10 cm, 20 cm and 30 cm respectively. Then, roll them one complete rotation and investigate how far they advance.

① Talk about the distance of the circle rolled and what does it relate to.

② Estimate how many centimetres a circle with a 40 cm diameter will advance in one rotation. 40 x 3 = 120. Around 120 cm.

③ Make sure how many centimetres a circle with a 40 cm diameter advance. Students should have answers around 120 cm.

④ Write the results in the table.

	ⓐ	ⓑ	ⓒ	
Diameter (cm)	10	20	30	40
Circumference (cm)	31	62	94	124

⑤ When the diameter increases by 2 times, 3 times and 4 times, how does the circumferences change?

The circumference increases by 2, 3 and 4 times also.

176 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ④ To make three circles with diameter of 10 cm, 20 cm and 30 cm and to survey how many cm the circles route 1 time

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

S In group or pair, draw circles ⓐ, ⓑ, and ⓒ using compass and cut them out according to the diameter length given.

T Using the 3 circles from the students, ask students in group or pair at a time to measure the distance in cm. The circle should be rotated 1 time and record the results in the table using tape or rope to measure it.

S Carefully, rotate the circles 1 time and record results in cm as instructed and record them on a table prepared for the experiment.

3 ① Discuss what kind of thing is related to the distance a circle rotates 1 time.

T Ask each group or pair to share with the whole class their results about the rotation of the 3 circles.

S Express their results

T What happens to the distance when a circle rotates 1 time?

S 1) the distance is equal to circumference of each circle.

2) if the diameter of circle gets longer, the distance also gets longer.

4 ② Predict how many cm a circle with 40 cm diameter rotates 1 time.

T Ask the students to predict the length a circle with 40 cm diameter make if it routes 1 time. Write the prediction beside the table. Then do the experiment and record the results on the table.

S ③ Confirm it by experimenting. After the experiment, they should have an answer around 124 cm.

S ④ Record the results on the table.

5 ⑤ Survey the relationship between length of diameter and circumference.

T Ask students to summarize what they noticed on the table, preciously the relationship between the length of diameter and circumference.

S The circumference will increase 2 times, 3 times or 4 times according to the increase in diameter such as 2 times, 3 times or 4 times.

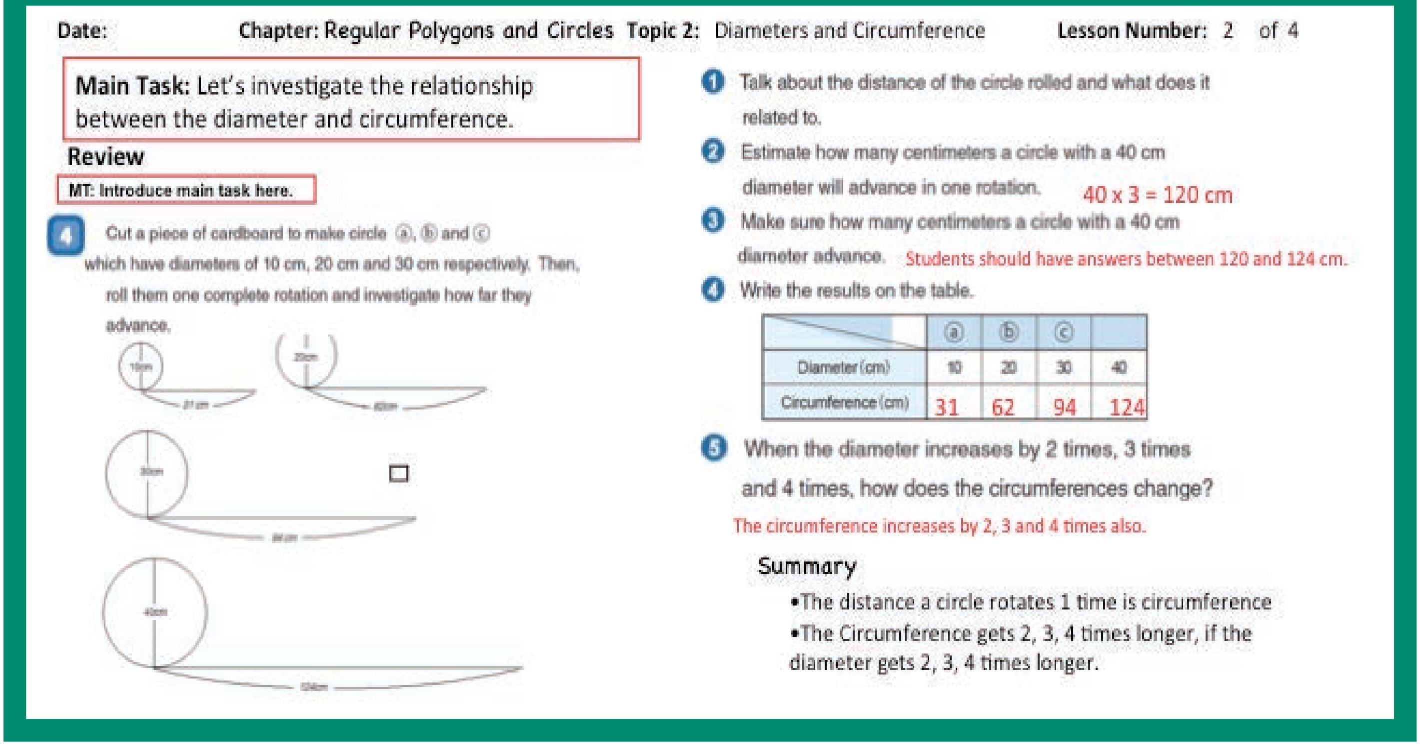
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Chapter:** Regular Polygons and Circles **Topic 2:** Diameters and Circumference **Lesson Number:** 2 of 4

Main Task: Let's investigate the relationship between the diameter and circumference.

Review

MT: Introduce main task here.

④ Cut a piece of cardboard to make circle ⓐ, ⓑ and ⓒ which have diameters of 10 cm, 20 cm and 30 cm respectively. Then, roll them one complete rotation and investigate how far they advance.

① Talk about the distance of the circle rolled and what does it related to.

② Estimate how many centimeters a circle with a 40 cm diameter will advance in one rotation. 40 x 3 = 120 cm

③ Make sure how many centimeters a circle with a 40 cm diameter advance. Students should have answers between 120 and 124 cm.

④ Write the results on the table.

	ⓐ	ⓑ	ⓒ	
Diameter (cm)	10	20	30	40
Circumference (cm)	31	62	94	124

⑤ When the diameter increases by 2 times, 3 times and 4 times, how does the circumferences change?

The circumference increases by 2, 3 and 4 times also.

Summary

- The distance a circle rotates 1 time is circumference
- The Circumference gets 2, 3, 4 times longer, if the diameter gets 2, 3, 4 times longer.

Unit
13

Unit: Regular Polygons and Circles
Sub-unit 2: Diameters and Circumferences
Lesson 3 of 4

Textbook Page :
177 and 178
Actual Lesson 122

Lesson Objectives

- To understand the meaning of the ratio of circumference of a circle to its diameter.
- Derived from the relationship between diameter and circumference.

Prior Knowledge

- How to draw a circle and measure its circumference, and record on a comparative table.
- Understanding the relationship between diameter and circumference

Preparation

- Strips of papers, cylindrical item (can), some kinds of objects whose shape is circle, cardboard cutout circles of various sizes; 10 cm, 20 cm and 30 cm and tapes or ropes

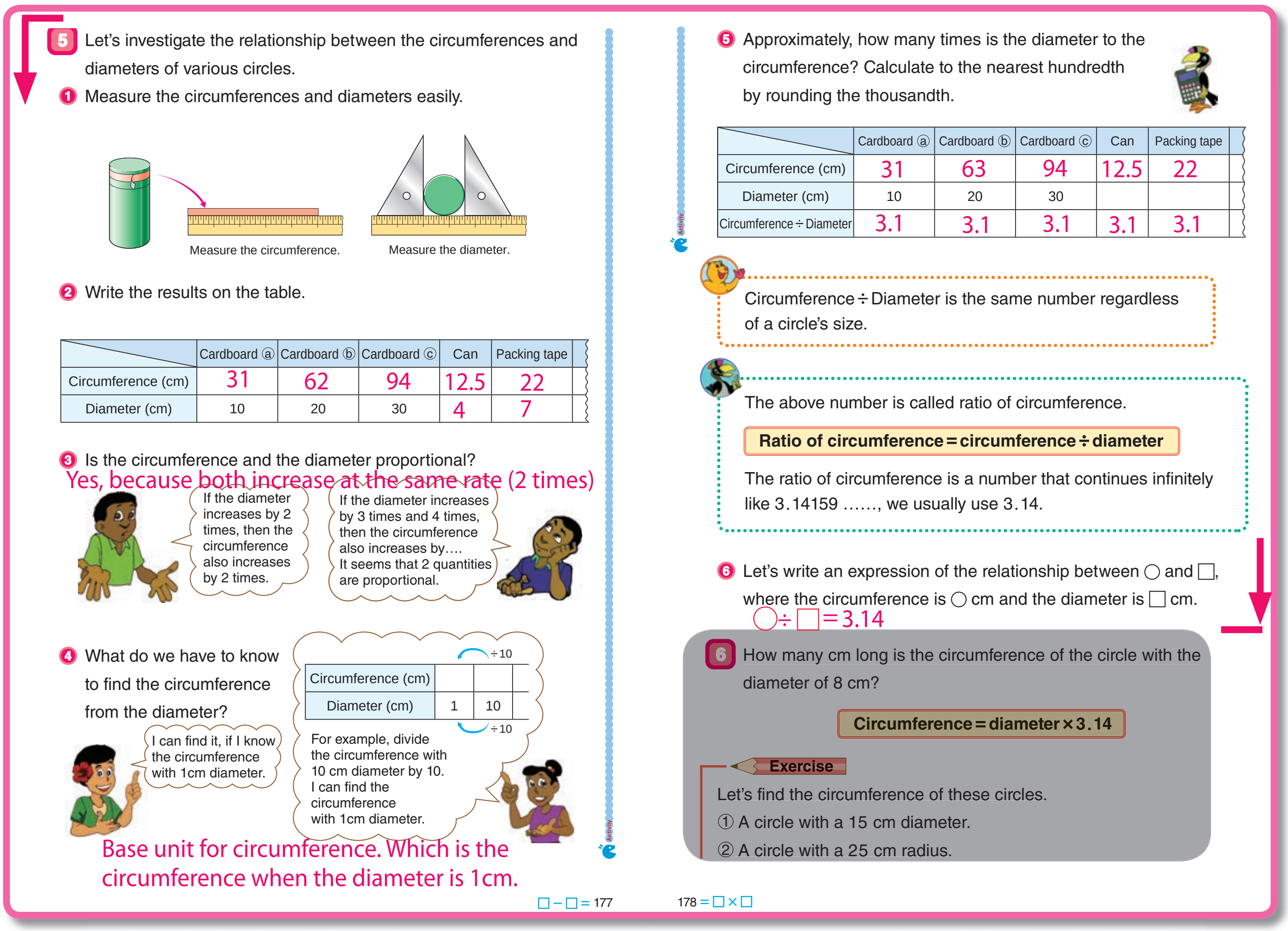
Assessment

- Measure the circumference and diameter using strip of paper and diameter using rulers. **F**
- Find the proportional relationship between diameter of a circle and its circumference. **F** **S**

Teacher's Notes

At this stage the students are just defining the meaning of the word “ Pi”.
However, the teacher should not use this term to students yet but instead say ’the **’ratio of the circumference’.**

Lesson Summary
Conduct the summary at the end of the lesson similar to the process in previous lessons.



5 Let’s investigate the relationship between the circumferences and diameters of various circles.

① Measure the circumferences and diameters easily.

Measure the circumference.

Measure the diameter.

② Write the results on the table.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape	
Circumference (cm)	31	62	94	12.5	22	
Diameter (cm)	10	20	30	4	7	

③ Is the circumference and the diameter proportional?
Yes, because both increase at the same rate (2 times)

④ What do we have to know to find the circumference from the diameter?

Circumference (cm)			
Diameter (cm)	1	10	

÷10
÷10

Base unit for circumference. Which is the circumference when the diameter is 1cm.

□ − □ = 177

⑤ Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding the thousandth.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape	
Circumference (cm)	31	63	94	12.5	22	
Diameter (cm)	10	20	30			
Circumference ÷ Diameter	3.1	3.1	3.1	3.1	3.1	

Circumference ÷ Diameter is the same number regardless of a circle’s size.

The above number is called ratio of circumference.

Ratio of circumference = circumference ÷ diameter

The ratio of circumference is a number that continues infinitely like 3.14159 ……, we usually use 3.14.

⑥ Let’s write an expression of the relationship between ○ and □, where the circumference is ○ cm and the diameter is □ cm.
○ ÷ □ = 3.14

6 How many cm long is the circumference of the circle with the diameter of 8 cm?

Circumference = diameter × 3.14

Exercise

Let’s find the circumference of these circles.
① A circle with a 15 cm diameter.
② A circle with a 25 cm radius.

178 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ⑤ Investigate the relationship between the circumferences and diameters of various circle.

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

T ① How would you measure the circumference and diameter of a cylinder?

S 1) Use a paper strip to wrap it around the cylinder and then measure it with a ruler.
2) Place the cylinder in between the two triangle rulers and take the measurement using a stright ruler.

S ② Measure and record the measurements in the table.

3 ③ Find whether the circumference is proportional to the diameter.

T From the results obtained and recorded in the table, what is your thinking about the circumference and the diameter, are they proportional?

TN Remind the students about the meaning of proportion, if necessary, show another examples.

S Referring to the table and remembering the relationship found in the previous lesson between the diameter and circumference, diameter increases by 2, the circumference increases by 2 also. If the diameter increases by 3 or 4 times, then the circumference increases at the same ratio. The diameter and circumference are proportional.

TN The speech bubbles can help students to identify if two quantities are proportionl.

S ④ Think about the circumference of a circle with 1 cm diameter.

TN The speech bubble can help to identify the unkown quantity.

T ⑤ Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding the thousandth.

S Complete the table.

4 Important Point

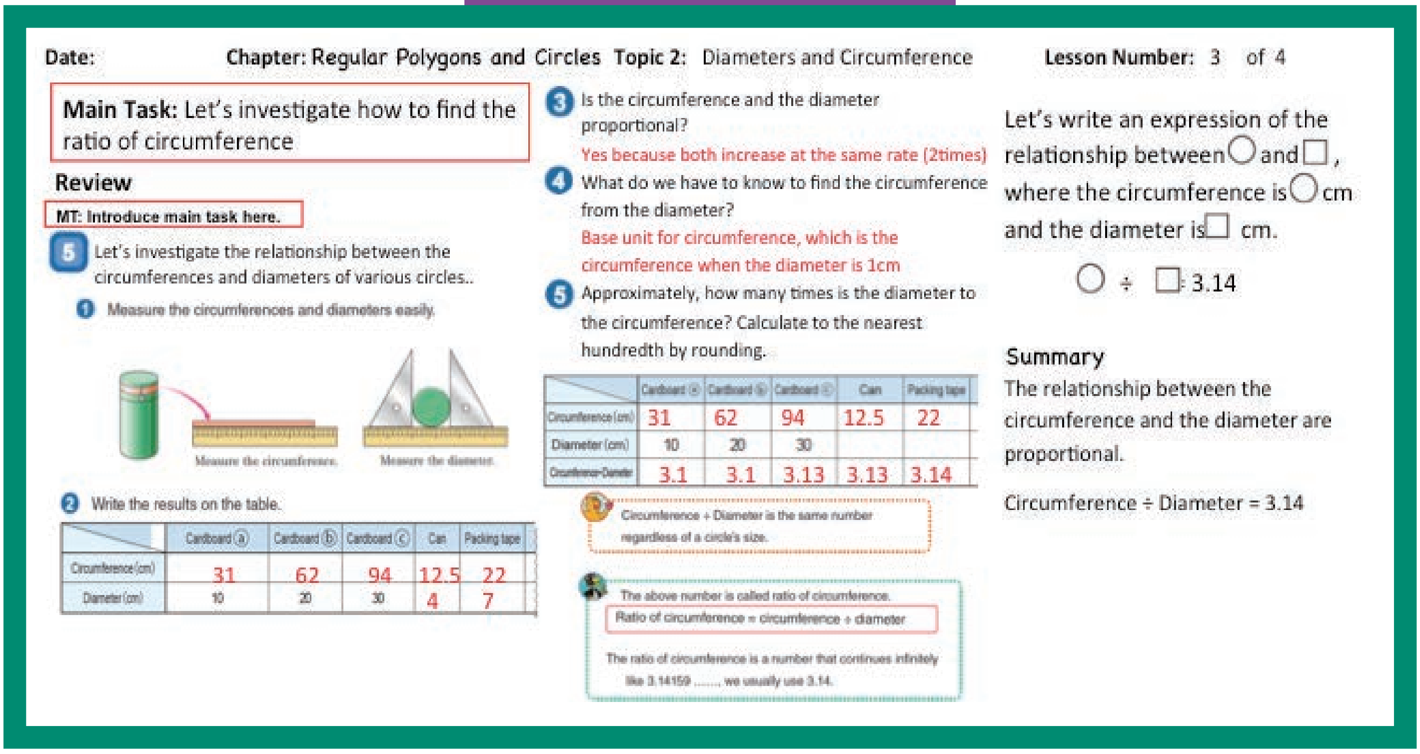
T/S Explain the important point in the boxes ☐ and ☐.

5 ⑥ Relationship between the length of circumference and diameter.

T Ask students to write a mathematical expression of the relationship between the circumference and the diameter.

S When the circumference is □ cm and the diameter is ○ cm. Write down the expression as;
□÷○=3.14

Sample Blackboard Plan



Date: **Chapter:** Regular Polygons and Circles **Topic 2:** Diameters and Circumference **Lesson Number:** 3 of 4

Main Task: Let's investigate how to find the ratio of circumference

Review

MT: Introduce main task here.

⑤ Let's investigate the relationship between the circumferences and diameters of various circles..

① Measure the circumferences and diameters easily.

② Write the results on the table.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)	31	62	94	12.5	22
Diameter (cm)	10	20	30	4	7

③ Is the circumference and the diameter proportional?

Yes because both increase at the same rate (2times)

④ What do we have to know to find the circumference from the diameter?

Base unit for circumference, which is the circumference when the diameter is 1cm

⑤ Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)	31	62	94	12.5	22
Diameter (cm)	10	20	30		
Circumference÷Diameter	3.1	3.1	3.13	3.13	3.14

Circumference ÷ Diameter is the same number regardless of a circle's size.

The above number is called ratio of circumference.

Ratio of circumference = circumference ÷ diameter

The ratio of circumference is a number that continues infinitely like 3.14159 ......, we usually use 3.14.

Let's write an expression of the relationship between ○ and □, where the circumference is ○ cm and the diameter is □ cm.

○ ÷ □: 3.14

Summary

The relationship between the circumference and the diameter are proportional.

Circumference ÷ Diameter = 3.14

Unit 13

Unit: Regular Polygons and Circles

Sub-unit 2: Diameters and Circumferences

Lesson 4 of 4

Textbook Page : 178 and 179
Actual Lesson 123

Lesson Objective

- To apply the ratio of circumference and calculate the length of the circumference when the diameter is known or vice versa.

Prior Knowledge

- Understand the ratio of circumference, which is usually defined as 3.14

Preparation

- An items similar to the one in the textbook

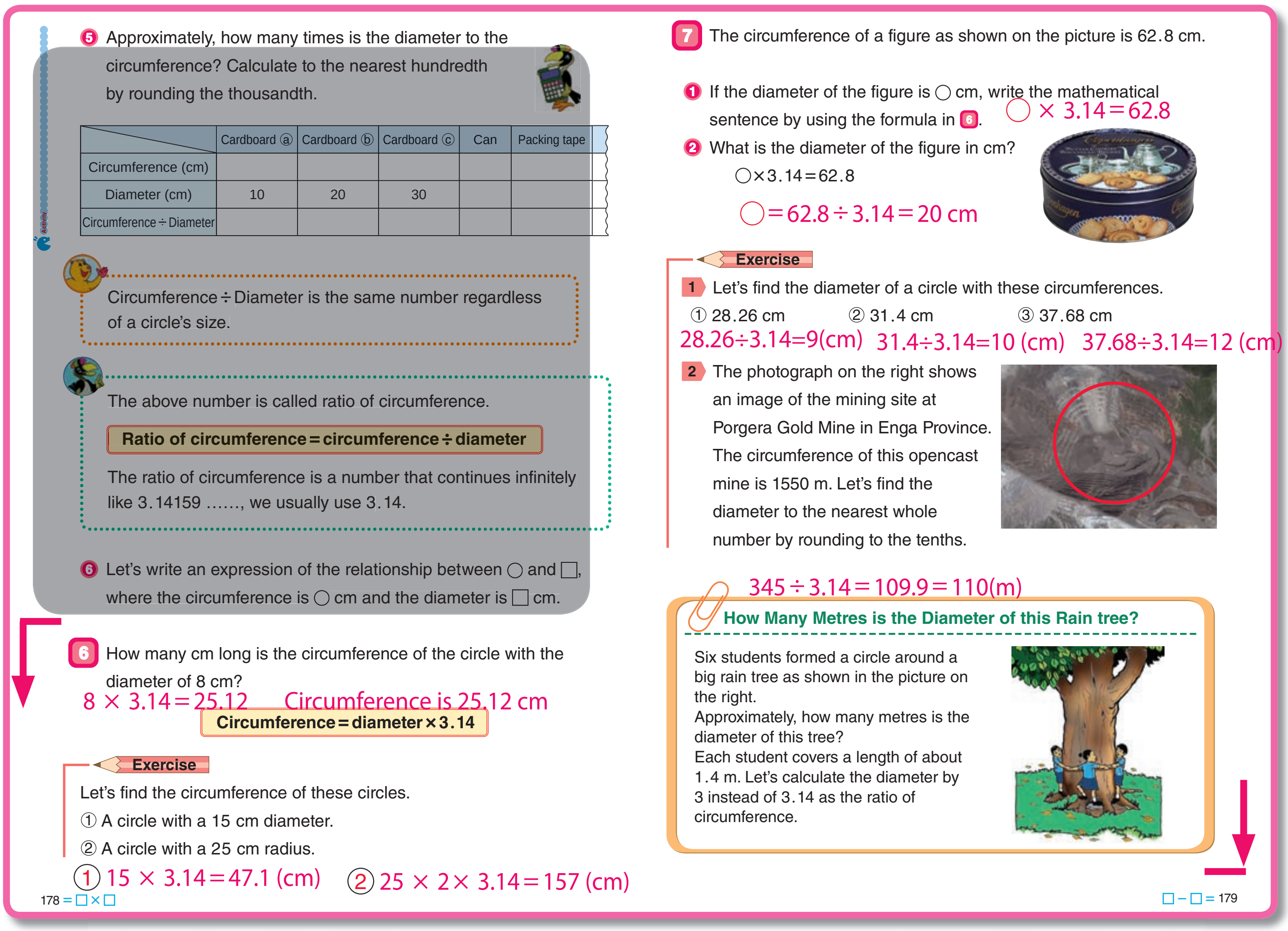
Assessment

- Calculate the length of circumference and diameter. F
- Use the formula to find the circumference or diameter. S
- Solve the exercises correctly. S

Teacher's Notes

The ratio of circumference and rearranging its formula is important to find information about circles.

1) $3.14 = \text{circumference} \div \text{diameter}$
2) $\text{Circumference} = \text{diameter} \times 3.14$
3) $\text{Diameter} = \text{Circumference} \div 3.14$



⑤ Approximately, how many times is the diameter to the circumference? Calculate to the nearest hundredth by rounding the thousandth.

	Cardboard ⓐ	Cardboard ⓑ	Cardboard ⓒ	Can	Packing tape
Circumference (cm)					
Diameter (cm)	10	20	30		
Circumference ÷ Diameter					

Circumference ÷ Diameter is the same number regardless of a circle's size.

The above number is called ratio of circumference.

Ratio of circumference = circumference ÷ diameter

The ratio of circumference is a number that continues infinitely like 3.14159 ……, we usually use 3.14.

⑥ Let's write an expression of the relationship between ○ and □, where the circumference is ○ cm and the diameter is □ cm.

6 How many cm long is the circumference of the circle with the diameter of 8 cm?

$8 \times 3.14 = 25.12$ Circumference is 25.12 cm

Circumference = diameter × 3.14

Exercise

Let's find the circumference of these circles.

① A circle with a 15 cm diameter.

② A circle with a 25 cm radius.

① $15 \times 3.14 = 47.1$ (cm) ② $25 \times 2 \times 3.14 = 157$ (cm)

178 = □×□

7 The circumference of a figure as shown on the picture is 62.8 cm.

❶ If the diameter of the figure is ○ cm, write the mathematical sentence by using the formula in 6.

$\bigcirc \times 3.14 = 62.8$

❷ What is the diameter of the figure in cm?

$\bigcirc \times 3.14 = 62.8$

$\bigcirc = 62.8 \div 3.14 = 20$ cm

Exercise

1 Let's find the diameter of a circle with these circumferences.

① 28.26 cm ② 31.4 cm ③ 37.68 cm

$28.26 \div 3.14 = 9$(cm) $31.4 \div 3.14 = 10$ (cm) $37.68 \div 3.14 = 12$ (cm)

2 The photograph on the right shows an image of the mining site at Porgera Gold Mine in Enga Province. The circumference of this opencast mine is 1550 m. Let's find the diameter to the nearest whole number by rounding to the tenths.

$345 \div 3.14 = 109.9 = 110$(m)

How Many Metres is the Diameter of this Rain tree?

Six students formed a circle around a big rain tree as shown in the picture on the right.
Approximately, how many metres is the diameter of this tree?
Each student covers a length of about 1.4 m. Let's calculate the diameter by 3 instead of 3.14 as the ratio of circumference.

□ − □ = 179

Lesson Flow

1 Review the previous lesson.

2 ⑥ Find the length of circumference for a circle with 8 cm diameter.

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

T How many cm long is the circumference of the circle with 8 cm diameter?

S Circumference ÷ diameter = 3.14, can be changed to: Circumference = diameter × 3.14
Therefore, □=○×3.14, I put 8 cm in the ○ and multiply by 3.14 to get □=25.12 cm.

3 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

4 ⑦ Find the length of diameter for the figure with 62.8 cm of circumference.

S ❶ If circumference is 62.8 cm,
then: ○×3.14=62.8.

S ❷ Therefore, ○=62.8÷3.14=20.
Answer 20 cm.

5 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

6 How many metres is the Diameter of the Rain Tree.

T/S Read and understand the situation and calculate the diameter of the rain tree.

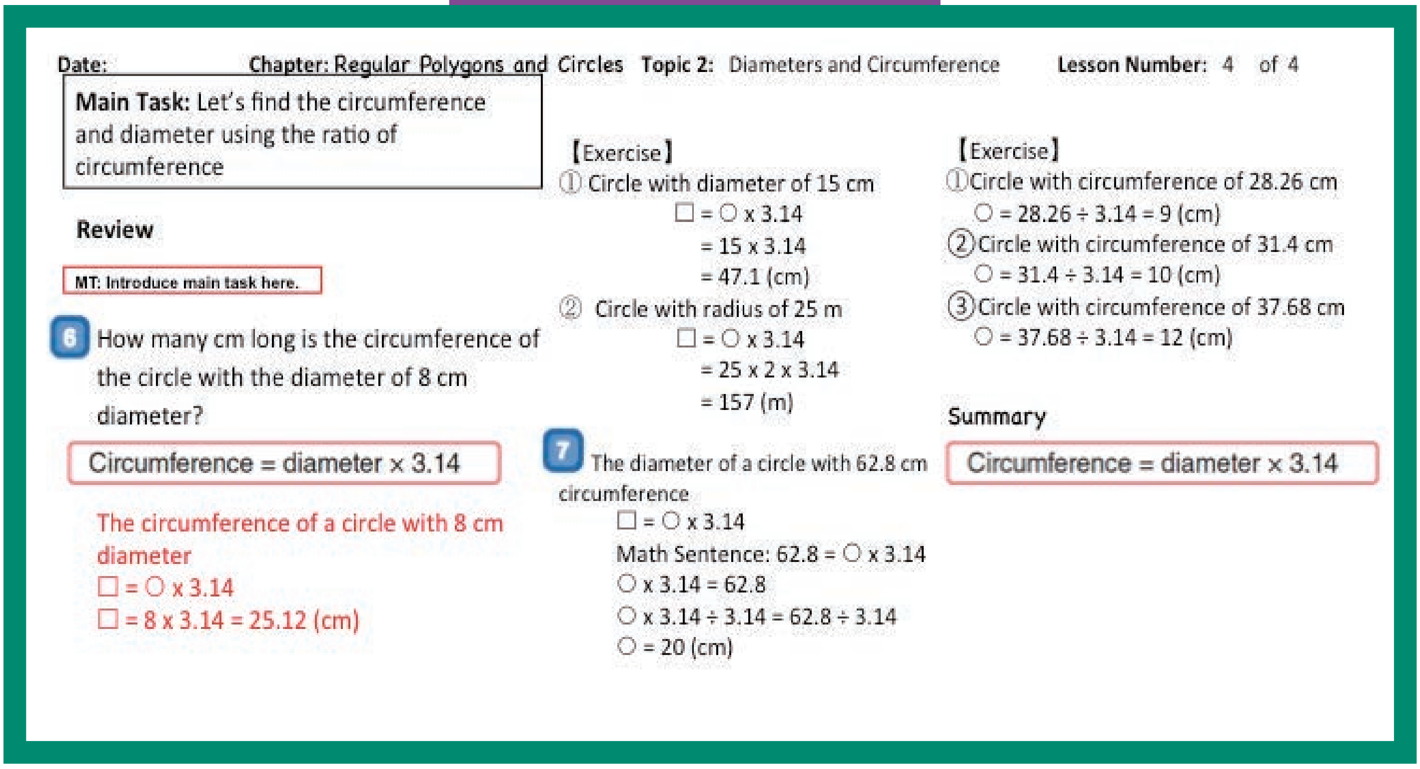
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: Chapter: Regular Polygons and Circles Topic 2: Diameters and Circumference Lesson Number: 4 of 4

Main Task: Let's find the circumference and diameter using the ratio of circumference

Review

MT: Introduce main task here.

⑥ How many cm long is the circumference of the circle with the diameter of 8 cm diameter?

Circumference = diameter × 3.14

The circumference of a circle with 8 cm diameter
□ = ○ x 3.14
□ = 8 x 3.14 = 25.12 (cm)

【Exercise】
① Circle with diameter of 15 cm
□ = ○ x 3.14
= 15 x 3.14
= 47.1 (cm)
② Circle with radius of 25 m
□ = ○ x 3.14
= 25 x 2 x 3.14
= 157 (m)

⑦ The diameter of a circle with 62.8 cm circumference
□ = ○ x 3.14
Math Sentence: 62.8 = ○ x 3.14
○ x 3.14 = 62.8
○ x 3.14 ÷ 3.14 = 62.8 ÷ 3.14
○ = 20 (cm)

【Exercise】
①Circle with circumference of 28.26 cm
○ = 28.26 ÷ 3.14 = 9 (cm)
②Circle with circumference of 31.4 cm
○ = 31.4 ÷ 3.14 = 10 (cm)
③Circle with circumference of 37.68 cm
○ = 37.68 ÷ 3.14 = 12 (cm)

Summary

Circumference = diameter × 3.14

Unit 13

Unit: Regular Polygons and Circles

Exercise and Evaluation

Lesson 1 and 2 of 2

Textbook Page :
181
Actual Lesson 124 and 125

Lesson Objective

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

Prior Knowledge

- All the contents covered in this unit

Preparation

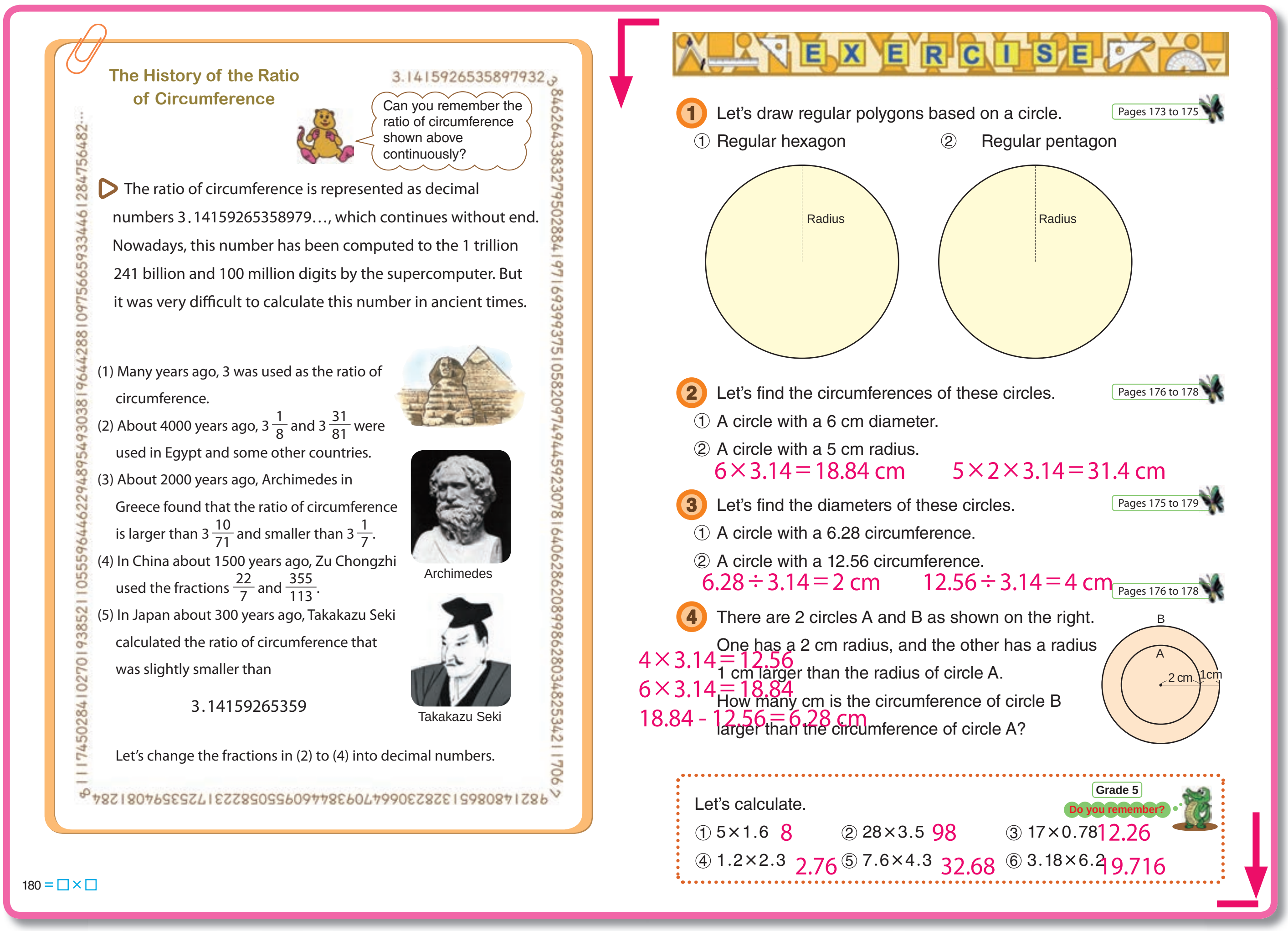
- Evaluation test copy for each student

Assessment

- Complete the Exercise correctly. S

Teacher's Notes

This is the last lesson of Chapter 13. Students should be encouraged to use the necessary skills learned in this unit to solve the in preparation for the evaluation test. The test can be conducted as assesment for your class after completing all the exercises. Use the attached evaluation test to conduct assesment for your class after finishing all the problems as a seperate lesson.



The History of the Ratio of Circumference

3.1415926535897932

Can you remember the ratio of circumference shown above continuously?

▷ The ratio of circumference is represented as decimal numbers 3.14159265358979…, which continues without end. Nowadays, this number has been computed to the 1 trillion 241 billion and 100 million digits by the supercomputer. But it was very difficult to calculate this number in ancient times.

(1) Many years ago, 3 was used as the ratio of circumference.

(2) About 4000 years ago, $3\frac{1}{8}$ and $3\frac{31}{81}$ were used in Egypt and some other countries.

(3) About 2000 years ago, Archimedes in Greece found that the ratio of circumference is larger than $3\frac{10}{71}$ and smaller than $3\frac{1}{7}$.

(4) In China about 1500 years ago, Zu Chongzhi used the fractions $\frac{22}{7}$ and $\frac{355}{113}$.

(5) In Japan about 300 years ago, Takakazu Seki calculated the ratio of circumference that was slightly smaller than

3.14159265359

Archimedes

Takakazu Seki

Let's change the fractions in (2) to (4) into decimal numbers.

180 = □×□

EXERCISE

① Let's draw regular polygons based on a circle. Pages 173 to 175

① Regular hexagon ② Regular pentagon

② Let's find the circumferences of these circles. Pages 176 to 178

① A circle with a 6 cm diameter.

② A circle with a 5 cm radius.

6×3.14＝18.84 cm 5×2×3.14＝31.4 cm

③ Let's find the diameters of these circles. Pages 175 to 179

① A circle with a 6.28 circumference.

② A circle with a 12.56 circumference.

6.28÷3.14＝2 cm 12.56÷3.14＝4 cm

④ There are 2 circles A and B as shown on the right. One has a 2 cm radius, and the other has a radius 1 cm larger than the radius of circle A. How many cm is the circumference of circle B larger than the circumference of circle A? Pages 176 to 178

4×3.14＝12.56
6×3.14＝18.84
18.84 - 12.56＝6.28 cm

Grade 5 Do you remember?

Let's calculate.

① 5×1.6 8 ② 28×3.5 98 ③ 17×0.78 12.26
④ 1.2×2.3 2.76 ⑤ 7.6×4.3 32.68 ⑥ 3.18×6.2 19.716

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

T Confirm students' answers.

TN ① Drawing regular polygons based on a circle.
② Finding the circumference of circles.
③ Finding the diameter of circles.
④ Comparing the circumference of circles by its definition.

2 Complete Do You Remember exercises.

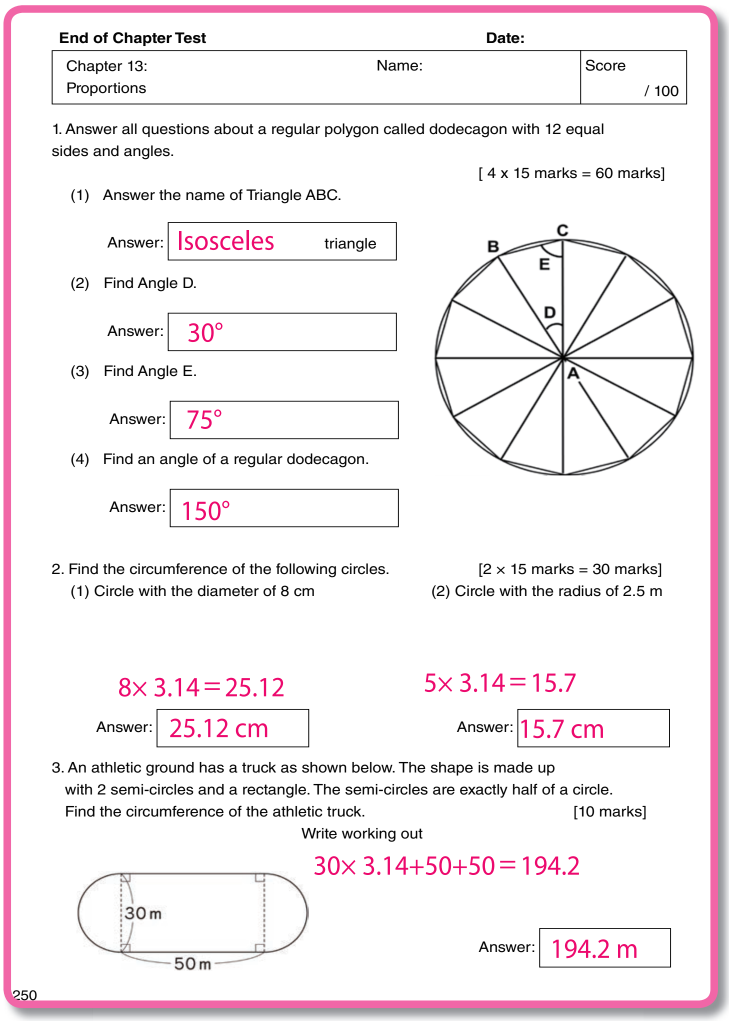
S Solve the exercises.

T Confirm students' answers.

3 Complete the Evaluation Test

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

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 13: Proportions	Name:	Score / 100

1. Answer all questions about a regular polygon called dodecagon with 12 equal sides and angles.

[4 x 15 marks = 60 marks]

(1) Answer the name of Triangle ABC.

Answer: Isosceles triangle

(2) Find Angle D.

Answer: 30°

(3) Find Angle E.

Answer: 75°

(4) Find an angle of a regular dodecagon.

Answer: 150°

2. Find the circumference of the following circles. [2 × 15 marks = 30 marks]

(1) Circle with the diameter of 8 cm

8× 3.14＝25.12

Answer: 25.12 cm

(2) Circle with the radius of 2.5 m

5× 3.14＝15.7

Answer: 15.7 cm

3. An athletic ground has a truck as shown below. The shape is made up with 2 semi-circles and a rectangle. The semi-circles are exactly half of a circle. Find the circumference of the athletic truck. [10 marks]

Write working out

30× 3.14+50+50＝194.2

Answer: 194.2 m

250

End of Chapter Test **Date:**

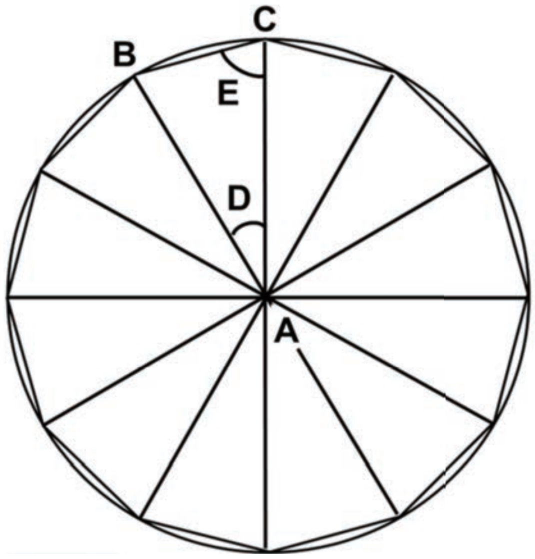
Chapter 13: Proportions	Name:	Score / 100

1. Answer all questions about a regular polygon called dodecagon with 12 equal sides and angles.

[4×15 marks = 60 marks]

(1) Write the name of Triangle ABC.

Answer: triangle



(2) Find Angle D.

Answer:

(3) Find Angle E.

Answer:

(4) Find an angle of a regular dodecagon.

Answer:

2. Find the circumference of the following circles.

[2×15 marks = 30 marks]

(1) Circle with the diameter of 8 cm

(2) Circle with the radius of 2.5 m

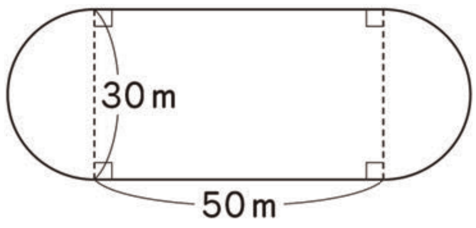
Answer:

Answer:

3. An athletic field has a track as shown below. The shape is made up with 2 semi-circles and a rectangle. The semi-circles are exactly half of a circle. Find the circumference of the athletic track.

[10 marks]

Write working out



Answer:

Chapter 14 Solids

1. Content Standard

5.3.4 Investigate and identify the properties of solids (Prisms and cylinders).

2. Unit Objectives

- To make students understand the solid shapes, through activities such as observation and construction of solid shapes.
- To understand prisms and cylinder.
- To be able to draw sketch (3 dimensions) and nets of solid shapes.

3. Teaching Overview

In this unit, students observe prisms and cylinders, then express these solids as sketches and nets.

Sketches and nets also give other pictures.

Prisms and Cylinders :

Students are to capture the features of prisms and cylinders through verbal expressions and identify those solids from their features.

It will enhance students' 3-dimensional sense of geometry.

Sketches and Nets of Prisms and Cylinders :

It will enhance students' spatial imagination skills by drawing sketches, assembling and disassembling nets. Students are to think which sides meet.

4. Related Learning Contents

Grade 4	Grade 5	Grade 7
• Understanding rectangular prisms and cubes • Perpendicular and parallel faces and edges in rectangular prisms and cubes • Drawing sketches and development net of rectangular prisms and cubes	• Curved surface and solids • Understanding prisms (prisms and cylinders), their sketches and development nets	• Positional relationships of lines and faces in a space • Making three dimensional figures by moving (rotating, etc.) two dimensional figures • Projection of three dimensional figures and development of nets
[18. Rectangular Prisms and Cubes]	**[14. Solids]**	

Unit 14

Unit: Solids

Sub-unit 1: Prisms and Cylinders

Lesson 1 of 3

Textbook Page : 182 and 183
Actual Lesson 126

Sub-unit Objectives

- To understand structural components (face, side, vertex) of solid shapes through a game of finding out shapes.
- To understand definitions, names and structural components with respect to prisms and cylinder.

Lesson Objective

- To be familiar with the structural components, by classifying solid shapes based on shapes of faces or number of vertex.

Prior Knowledge

- Difference between Triangles and Quadrilaterals
- Knowledge of angles and faces of plane shapes
- Difference between Circles and Spheres
- Difference between Cuboids and Cubes

Preparation

- Boxes filled with different types of solids

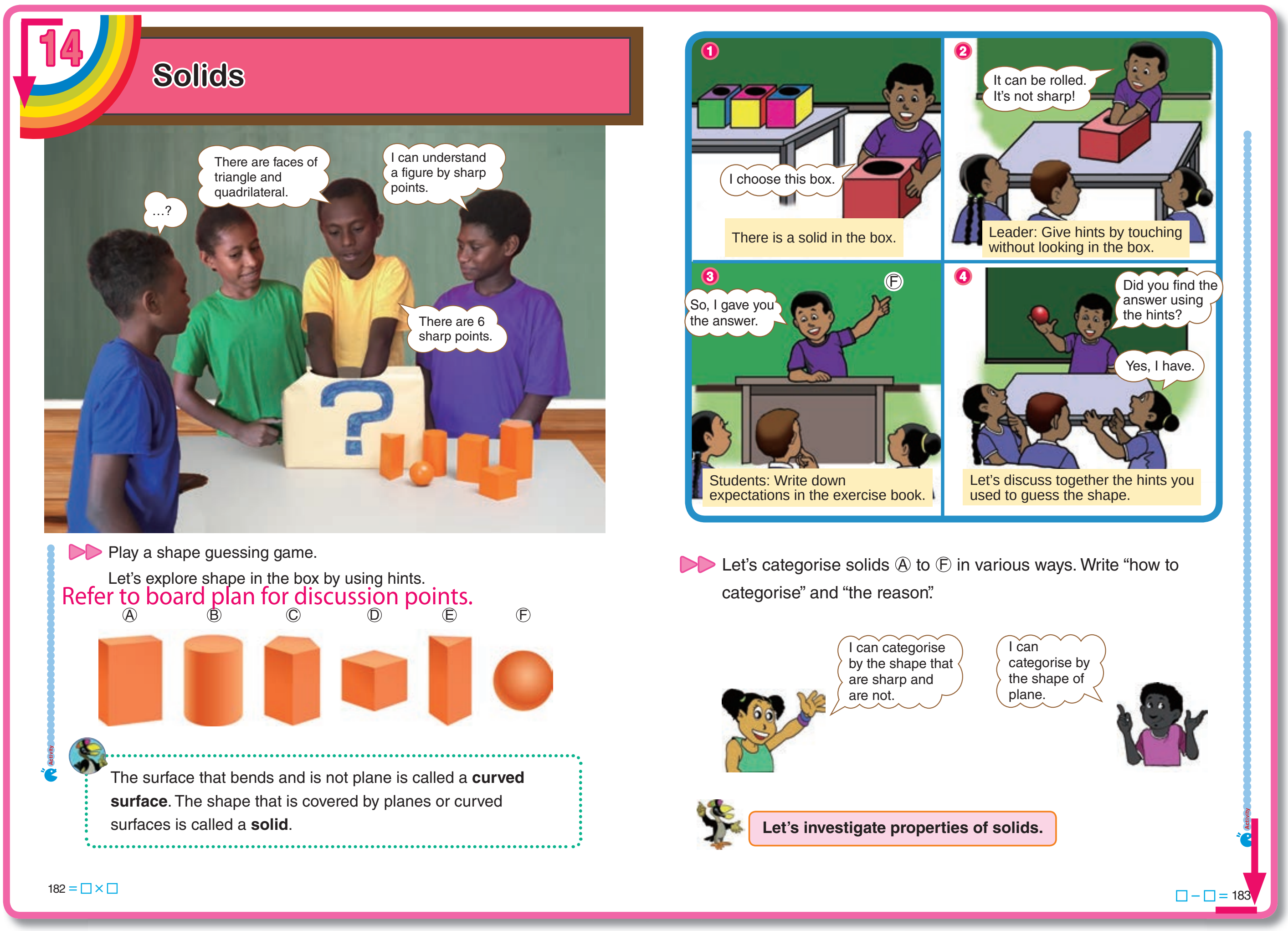
Assessment

faces and sharp points. F

- Use the properties of solids and categorise them in various ways. F
- Understand the meaning of curved surface and solids. S

Teacher's Notes

- On a solid figure, there are three viewpoints:
  - (i) Shape, number and position of the surface
  - (ii) Number and position of sides
  - (iii) Number of vertex
- Among these viewpoints, surface is a new structural concept for students. Shapes or congruency of surface and positions of surface are expected to be found by children themselves.



14 **Solids**

▶▶ Play a shape guessing game.

Let's explore shape in the box by using hints.

Refer to board plan for discussion points.

The surface that bends and is not plane is called a **curved surface**. The shape that is covered by planes or curved surfaces is called a **solid**.

182 = □×□

▶▶ Let's categorise solids Ⓐ to Ⓕ in various ways. Write "how to categorise" and "the reason".

Let's investigate properties of solids.

□−□= 183

Lesson Flow

1 Investigate rules of the game in finding out shapes.

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

T Display the solids and ask students what they know about these solids.

S Use their previous knowledge to tell anything they know about the displayed solids Ⓐ to Ⓕ. Name the plane shapes found in the solid shapes.

T Introduce and explain how to play the game to guess a shape in a box by hints.
Ask a student volunteer to choose a solid in the box without looking in the box and provide hint for other students to guess the solid as per described.

S Guess the name of solid without looking in the box and write down their answers in their exercise books.
They check their expectation after the display.

2 Important Point

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

3 Play the game.

T Group students and ask them to play the game in their small groups.

S In groups students categorise solids in various ways: (i) solids made of only plane surface (ii) solids made of plane and curved surface (iii) solids made of only curved surface

4 Share and summarise the words (terms) the students have used for the game.

T Ask students to share their description words for each shape.

S Share and call out the words (terms) such as ’sharp, not sharp, round, not round, flat, smooth, plane, curved surface” etc..

T Ask the students to think about how to categorise the solids using the definition of planes and curved surface.

5 Categorise the solid shapes.

T Ask students to categorise solids from Ⓐ to Ⓕ in various ways.

S In groups categorise solids in various ways: (i) solids made of only plane surface (ii) solids made of plane and curved surface (iii) solids made of only curved surface.

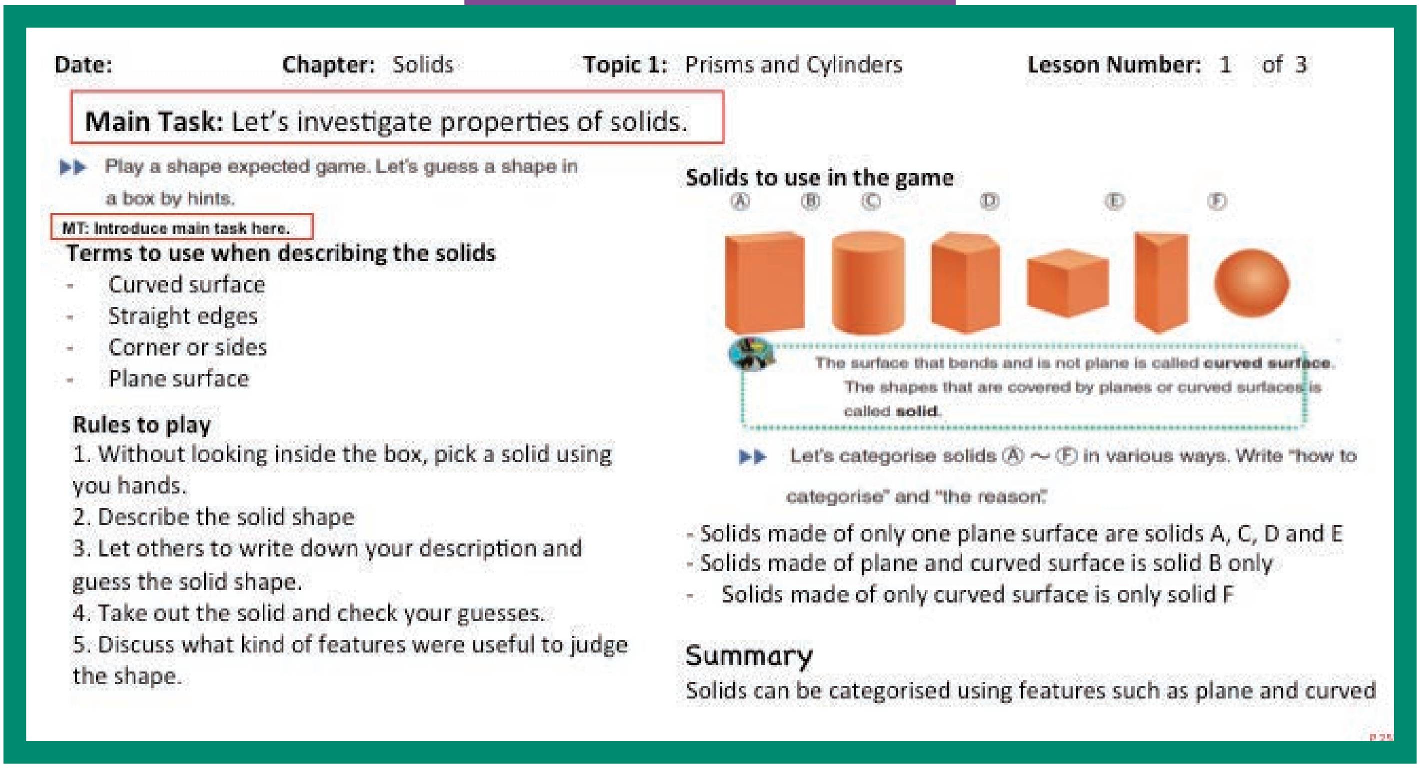
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Chapter:** Solids **Topic 1:** Prisms and Cylinders **Lesson Number:** 1 of 3

Main Task: Let’s investigate properties of solids.

▶▶ Play a shape expected game. Let’s guess a shape in a box by hints.

MT: Introduce main task here.

Terms to use when describing the solids
- Curved surface
- Straight edges
- Corner or sides
- Plane surface

Rules to play
1. Without looking inside the box, pick a solid using you hands.
2. Describe the solid shape
3. Let others to write down your description and guess the solid shape.
4. Take out the solid and check your guesses.
5. Discuss what kind of features were useful to judge the shape.

Solids to use in the game

The surface that bends and is not plane is called **curved surface**. The shapes that are covered by planes or curved surfaces is called **solid**.

▶▶ Let’s categorise solids Ⓐ ∼ Ⓕ in various ways. Write “how to categorise” and “the reason”.

- Solids made of only one plane surface are solids A, C, D and E
- Solids made of plane and curved surface is solid B only
- Solids made of only curved surface is only solid F

Summary

Solids can be categorised using features such as plane and curved

Unit
14

Unit: Solids

Sub-unit 1: Prisms and Cylinders

Lesson 2 of 3

Textbook Page :
184 and 185
Actual Lesson 127

Lesson Objective

- To survey properties of prisms, based on their structural components such as face, side, vertex, base face and side face.

Prior Knowledge

- Classification of solid shapes based on shapes of faces or number of vertex

Preparation

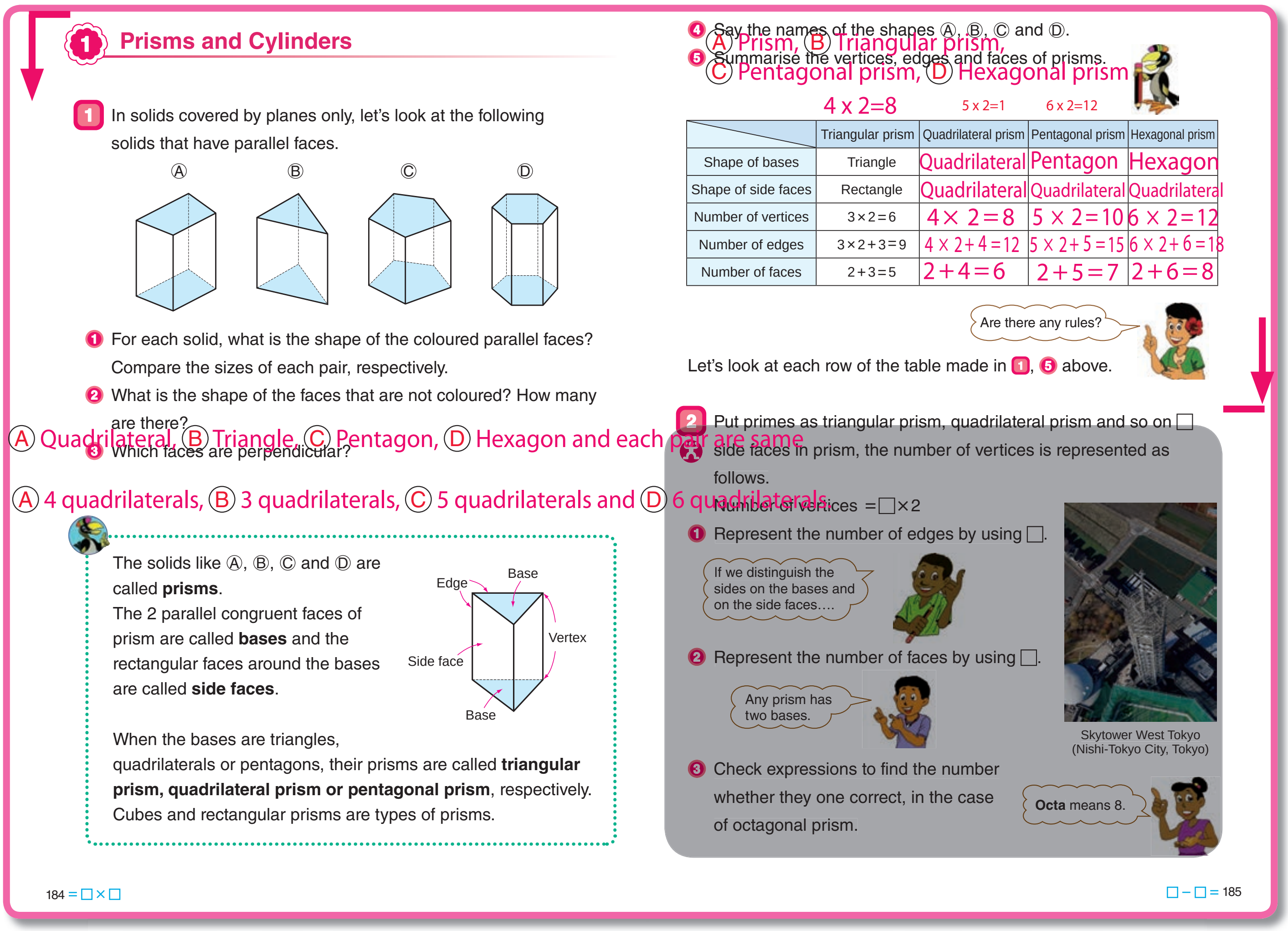
- Charts of solids covered by planes only such as quadrangular, triangular prisms
  coloured chalks, white or blackboard and marker

Assessment

- Compare the sizes of bases and identify the perpendicular faces of solids. F
- Name the prisms Ⓐ to Ⓓ correctly. S
- Find the number of vertex, side and faces of prisms and complete the summary table. S

Teacher's Notes

- The most important thing for this lesson is for the students to understand regularity which exists among the number of faces, vertex and sides and to construct mathematical expressions to calculate them.
- Some plane figures can have squares or rectangles so we use the term quadrilateral to generalise the planes.



① Prisms and Cylinders

1 In solids covered by planes only, let's look at the following solids that have parallel faces.

Ⓐ Ⓑ Ⓒ Ⓓ

① For each solid, what is the shape of the coloured parallel faces? Compare the sizes of each pair, respectively.

② What is the shape of the faces that are not coloured? How many are there?

Ⓐ Quadrilateral, Ⓑ Triangle, Ⓒ Pentagon, Ⓓ Hexagon and each pair are same

③ Which faces are perpendicular?

Ⓐ 4 quadrilaterals, Ⓑ 3 quadrilaterals, Ⓒ 5 quadrilaterals and Ⓓ 6 quadrilaterals.

The solids like Ⓐ, Ⓑ, Ⓒ and Ⓓ are called **prisms**.
The 2 parallel congruent faces of prism are called **bases** and the rectangular faces around the bases are called **side faces**.

When the bases are triangles, quadrilaterals or pentagons, their prisms are called **triangular prism, quadrilateral prism or pentagonal prism**, respectively.
Cubes and rectangular prisms are types of prisms.

184 = □ × □

④ Say the names of the shapes Ⓐ, Ⓑ, Ⓒ and Ⓓ.

Ⓐ Prism, Ⓑ Triangular prism,
Ⓒ Pentagonal prism, Ⓓ Hexagonal prism

⑤ Summarise the vertices, edges and faces of prisms.

4 x 2=8 5 x 2=1 6 x 2=12

	Triangular prism	Quadrilateral prism	Pentagonal prism	Hexagonal prism
Shape of bases	Triangle	Quadrilateral	Pentagon	Hexagon
Shape of side faces	Rectangle	Quadrilateral	Quadrilateral	Quadrilateral
Number of vertices	3×2=6	4× 2=8	5 × 2=10	6 × 2=12
Number of edges	3×2+3=9	4 x 2+4=12	5 x 2+5=15	6 x 2+6=18
Number of faces	2+3=5	2+4=6	2+5=7	2+6=8

Let's look at each row of the table made in 1, ⑤ above.

2 Put primes as triangular prism, quadrilateral prism and so on □ side faces in prism, the number of vertices is represented as follows.

Number of vertices =□×2

① Represent the number of edges by using □.

② Represent the number of faces by using □.

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③ Check expressions to find the number whether they one correct, in the case of octagonal prism.

□ − □ = 185

Lesson Flow

1 Review the previous lesson.

2 ① Investigate and identify solid shapes with planes that have parallel faces.

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

S Look at the solids covered by planes Ⓐ, Ⓑ, Ⓒ and Ⓓ and ask students to answer the following question.

T ① For these solids, what is the shape of the coloured parallel faces?
Compare the sizes of each pair, respectively.

S Observe the solids covered by planes and use their prior knowledge to name the shape of the coloured parallel faces and compare the sizes of each pair respectively.

TN Provide opportunity for students to think and answer the question.

T ② What is the shape of the faces that are not coloured? How many are there?

S Identify that they are quadrilaterals where Ⓐ has 4, Ⓑ has 3, Ⓒ has 5 and Ⓓ has 6 quadrilaterals.

T ③ Which faces are perpendicular?

S Use prior knowledge to identify whic faces are perpendicular.

3 Important Point

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

4 To understand names and structural components of prisms

T ④ Say the names of the shapes Ⓐ, Ⓑ, Ⓐ and Ⓓ.

S Ⓐ is a rectangula prism, Ⓑ is triangular prism, Ⓒ is a pentagonal prism and Ⓓ is a hexagonal prism.

T ⑤ Ask the students to complete the table.

S Work in groups to discuss and complete the table of summary for vertices, edges and faces of prisms.

TN Guide the students to think and complete the summary table.

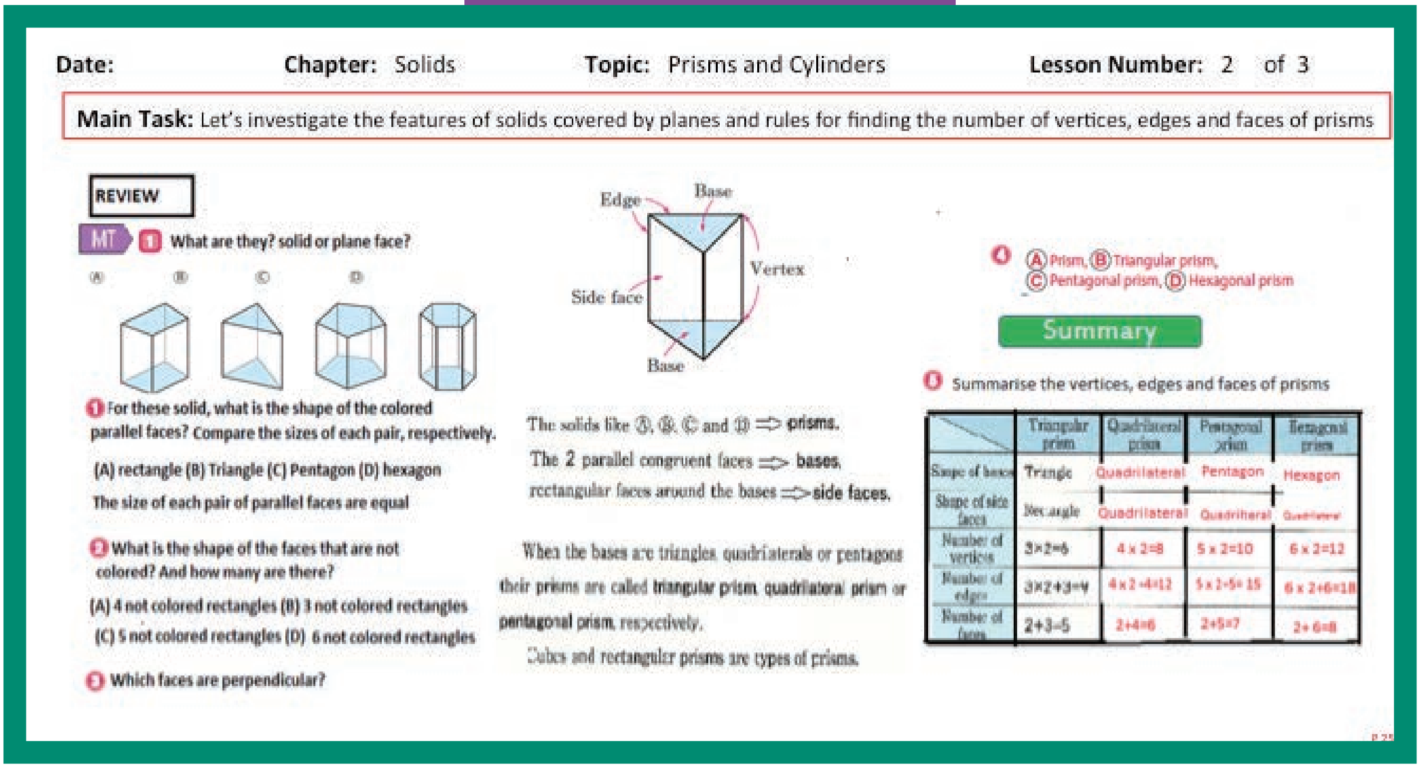
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Chapter:** Solids **Topic:** Prisms and Cylinders **Lesson Number:** 2 of 3

Main Task: Let's investigate the features of solids covered by planes and rules for finding the number of vertices, edges and faces of prisms

REVIEW

MT ① What are they? solid or plane face?

① For these solid, what is the shape of the colored parallel faces? Compare the sizes of each pair, respectively.

(A) rectangle (B) Triangle (C) Pentagon (D) hexagon

The size of each pair of parallel faces are equal

② What is the shape of the faces that are not colored? And how many are there?

(A) 4 not colored rectangles (B) 3 not colored rectangles
(C) 5 not colored rectangles (D) 6 not colored rectangles

③ Which faces are perpendicular?

The solids like Ⓐ, Ⓑ, Ⓒ and Ⓓ ⇒ **prisms.**
The 2 parallel congruent faces ⇒ **bases,**
rectangular faces around the bases ⇒ **side faces.**

When the bases are triangles, quadrilaterals or pentagons their prisms are called **triangular prism, quadrilateral prism** or **pentagonal prism,** respectively.
Cubes and rectangular prisms are types of prisms.

④ Ⓐ Prism, Ⓑ Triangular prism,
Ⓒ Pentagonal prism, Ⓓ Hexagonal prism

Summary

⑤ Summarise the vertices, edges and faces of prisms

	Triangular prism	Quadrilateral prism	Pentagonal prism	Hexagonal prism
Shape of bases	Triangle	Quadrilateral	Pentagon	Hexagon
Shape of side faces	Rectangle	Quadrilateral	Quadriheral	Quadrilateral
Number of vertices	3×2=6	4×2=8	5×2=10	6×2=12
Number of edges	3×2+3=9	4×2+4=12	5×2+5=15	6×2+6=18
Number of faces	2+3=5	2+4=6	2+5=7	2+6=8

Unit 14

Unit: Solids

Sub-unit 1: Prisms and Cylinders

Lesson 3 out of 3

Textbook Page :
185 and 186
Actual Lesson 128

Lesson Objectives

- To investigate the relationship among the number of faces, side and vertex of prisms.
- To understand the definitions, name and structural components of a cylinder.

Prior Knowledge

- Knowledge of the properties of prisms, based on their structural components such as face, side, vertex, base face and side face

Preparation

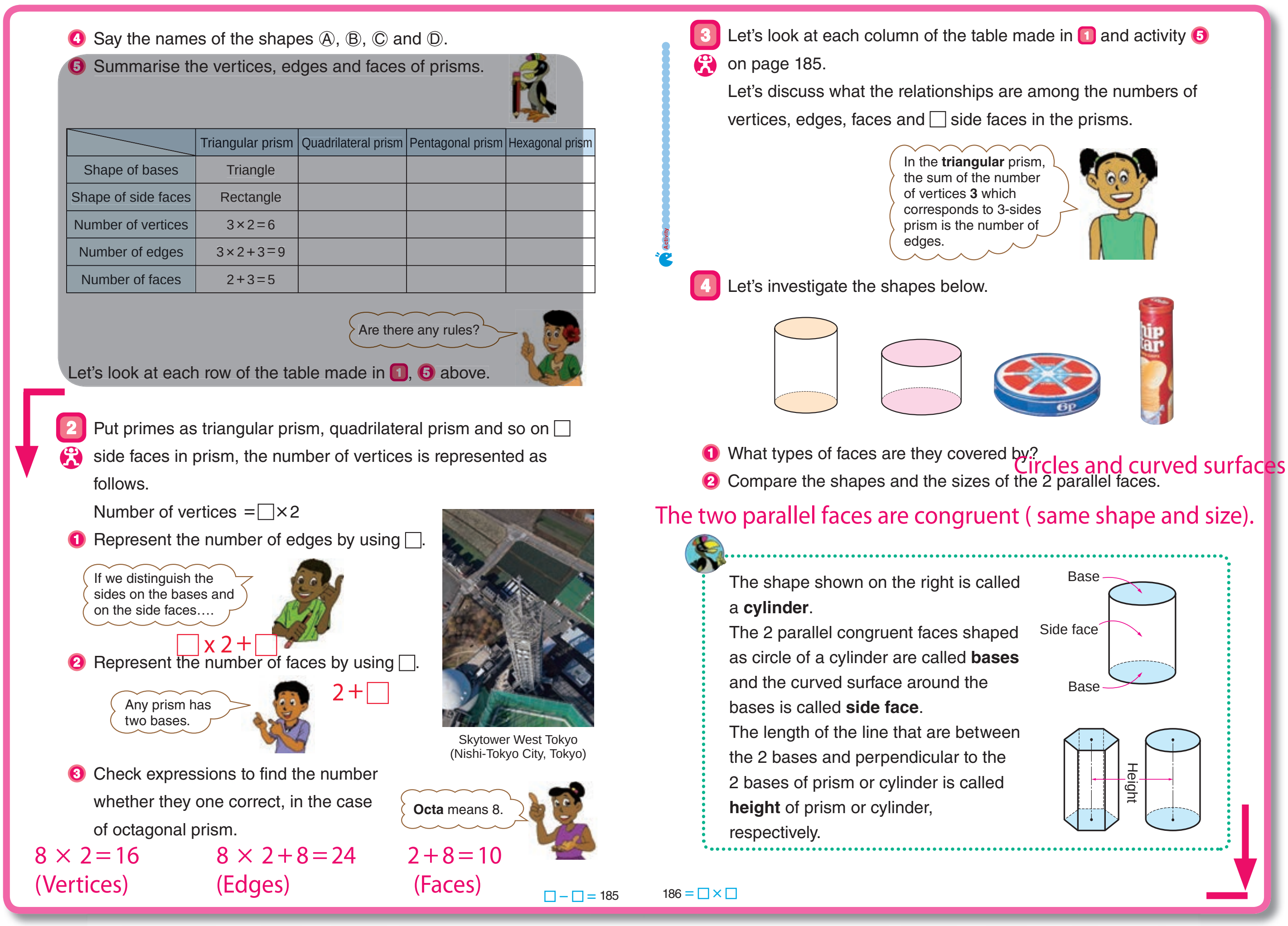
- Boxes filled with different types of Solids

Assessment

- Investigate the properties of solids such as faces and sharp points. F
- Use the properties of solids and categorise them in various ways. F
- Understand the meaning and properties of curved surface and solids. S

Teacher's Notes

This lesson is the same as the previous lesson. However, this lesson is for students to understand the similarity between prisms and cylinder such as height and base faces, and the difference about side faces.



④ Say the names of the shapes Ⓐ, Ⓑ, Ⓒ and Ⓓ.

⑤ Summarise the vertices, edges and faces of prisms.

	Triangular prism	Quadrilateral prism	Pentagonal prism	Hexagonal prism
Shape of bases	Triangle			
Shape of side faces	Rectangle			
Number of vertices	3×2=6			
Number of edges	3×2+3=9			
Number of faces	2+3=5			

Are there any rules?

Let's look at each row of the table made in 1, ⑤ above.

2 Put primes as triangular prism, quadrilateral prism and so on □ side faces in prism, the number of vertices is represented as follows.

Number of vertices =□×2

① Represent the number of edges by using □.

If we distinguish the sides on the bases and on the side faces....

□ x 2 + □

② Represent the number of faces by using □.

Any prism has two bases.

2 + □

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③ Check expressions to find the number whether they one correct, in the case of octagonal prism.

Octa means 8.

8 × 2 = 16
(Vertices)

8 × 2 + 8 = 24
(Edges)

2 + 8 = 10
(Faces)

□ − □ = 185

3 Let's look at each column of the table made in 1 and activity ⑤ on page 185.

Let's discuss what the relationships are among the numbers of vertices, edges, faces and □ side faces in the prisms.

In the **triangular** prism, the sum of the number of vertices **3** which corresponds to 3-sides prism is the number of edges.

4 Let's investigate the shapes below.

① What types of faces are they covered by? Circles and curved surfaces

② Compare the shapes and the sizes of the 2 parallel faces.

The two parallel faces are congruent (same shape and size).

The shape shown on the right is called a **cylinder**.
The 2 parallel congruent faces shaped as circle of a cylinder are called **bases** and the curved surface around the bases is called **side face**.
The length of the line that are between the 2 bases and perpendicular to the 2 bases of prism or cylinder is called **height** of prism or cylinder, respectively.

186 = □ × □

Lesson Flow

1 Review the previous lesson.

2 ② Think about how to finds the number of vertex, side and face.

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

T ① Ask students to study each row of the table made. Use Triangular and Quadrilateral prisms as an example. □ sides prism and confirm that the number of vertices is □×2

S Confirm that the number of vertices is □×2.

T Ask students to represent the number of faces by using the box □.

S Use the summary table and pattern to identify the expression using the box □.
Number of edges = □×2 + □ or (□×3)

TN Students are to consider the number of sides, separating side face and base face

T ② Ask students to write a mathematical expression for the number of faces of prism using the box □.

S Use the summary table and pattern to identify an expression for the number of faces: □+2,

TN Students are to consider that the numbers of faces of the bases are always 2.

T ③ Ask students to use their rules to check for the case of octagonal prism.

S Use their rules to check and confirm the number of vertices, edges and faces of octagonal prism.

3 ③ Discuss what the relationships amongst the number of vertices, edges, faces and sides in prisms.

T Group students and ask them to discuss and think about the relationship amongst the number of vertices, sides and faces on the summary table.

S In groups discuss and think about the relationship Number of vertices = □×2, Number of edges = □×2 + □, Number of faces = □+2

4 ④ Investigate cylinders.

T Display or show different sizes of cylinders and ask student to do the following investigation.

T ① What kinds of faces are they covered by?

S Circles and curved surfaces.

T ② Compare the shape and sizes of the two parallel faces of each cylinder.

S The two paralle faces are congruent (same shape and size).

5 Important Point

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

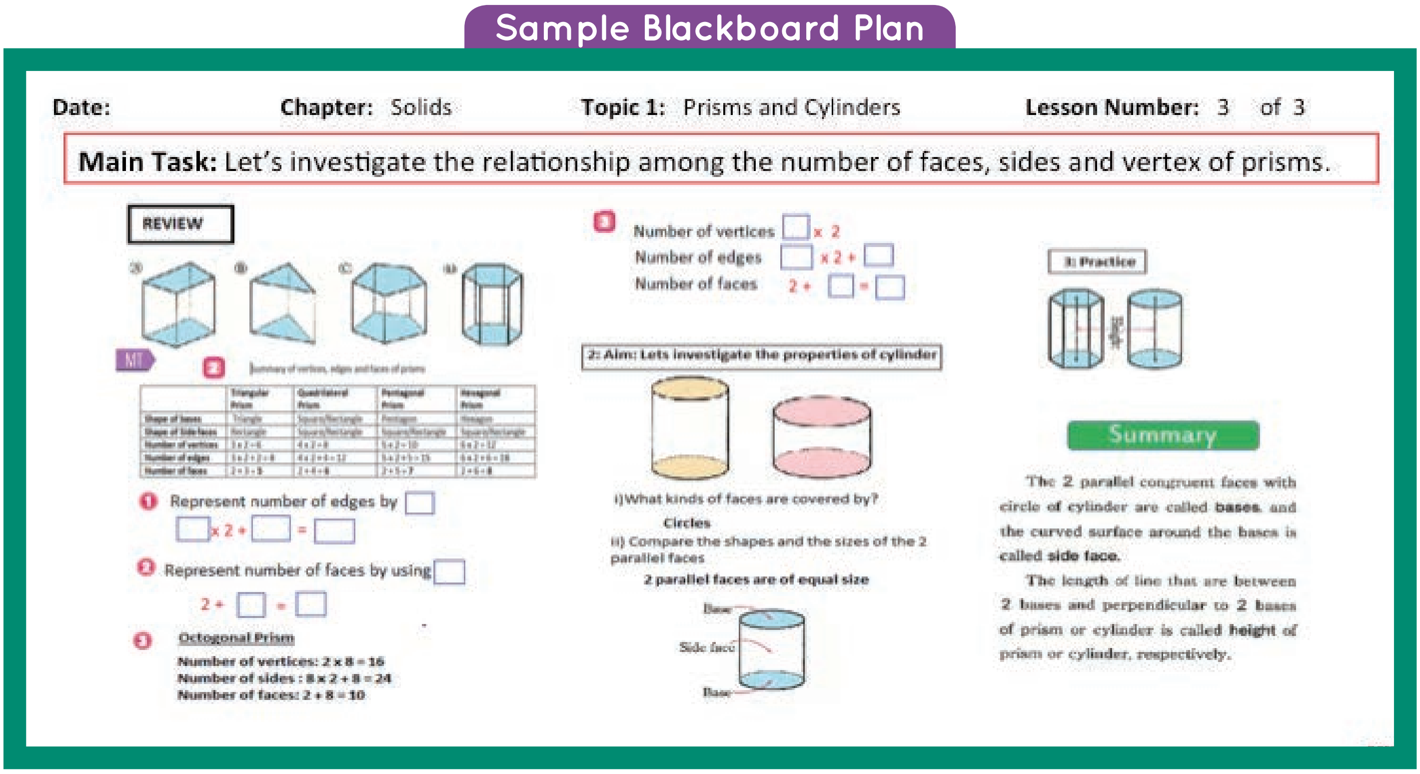
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Chapter:** Solids **Topic 1:** Prisms and Cylinders **Lesson Number:** 3 of 3

Main Task: Let's investigate the relationship among the number of faces, sides and vertex of prisms.

REVIEW

② Summary of vertices, edges and faces of prisms

① Represent number of edges by □
□ x 2 + □ = □

② Represent number of faces by using □
2 + □ = □

③ Octogonal Prism
Number of vertices: 2 x 8 = 16
Number of sides : 8 x 2 + 8 = 24
Number of faces: 2 + 8 = 10

③ Number of vertices □ x 2
Number of edges □ x 2 + □
Number of faces 2 + □ = □

2: Aim: Lets investigate the properties of cylinder

i)What kinds of faces are covered by?
Circles
ii) Compare the shapes and the sizes of the 2 parallel faces
2 parallel faces are of equal size

3: Practice

Summary

The 2 parallel congruent faces with circle of cylinder are called **bases**, and the curved surface around the bases is called **side face.**

The length of line that are between 2 bases and perpendicular to 2 bases of prism or cylinder is called **height** of prism or cylinder, respectively.

Unit 14

Unit: Solids

Sub-unit 2: Sketches and Nets of Prisms and Cylinders

Lesson 1 of 3

Textbook Page : 187
Actual Lesson 129

Sub-unit Objectives

- To sketch and draw the net of triangular prism.
- To sketch and draw the net of cylinder.

Lesson Objective

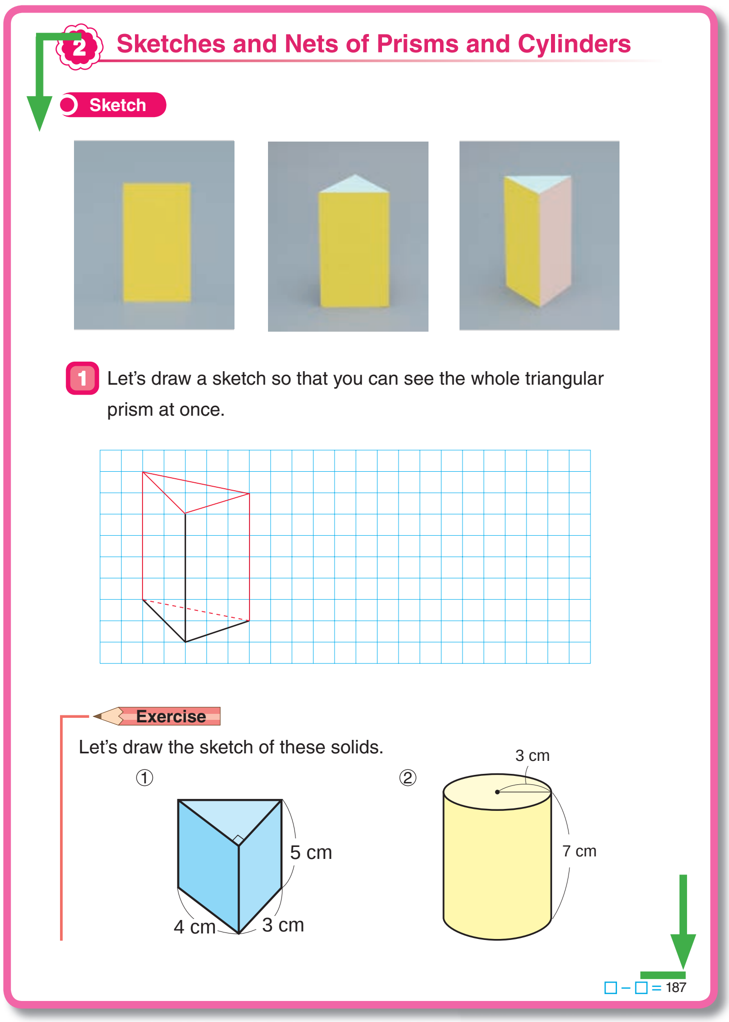
- To think of ways to sketch a rectangular prism based on how to sketch triangular prism.

Prior Knowledge

- Knowledge of the properties of prisms based on their structural components such as face, side, vertex, base face and side face

Preparation

- Cardboard paper, pictures of common triangular prism and cylinder, grid paper



2 Sketches and Nets of Prisms and Cylinders

Sketch

1 Let's draw a sketch so that you can see the whole triangular prism at once.

Exercise

Let's draw the sketch of these solids.

□−□= 187

Assessment

- Draw common solids (triangular prism, cylinder). F
- Think about how to make sketches to see three faces at once. F
- Make sketch of a triangular prism and cylinder on the grid paper. S
- Solve the exercises correctly. S

Teacher's Notes

- It's important to make students notice that when three faces are seen, we understand this is a triangular prism and then we need to be able to sketch it on this position. The three different sides should be drawn first to have a good shape of prism.
- Base of the cylinder can be sketched by free hands. Shape of bases are not congruent to the real sides or shape.
- A concrete example could be eminent for learners who are finding difficulties to sketch such solids.
- Line cannot be seen is drawn as a dotted line.

Lesson Flow

1 Review the previous lesson.

2 1 Sketch a triangular prism to see the three faces at one glance.

T Introduce the Main Task. (Refer to the BP)
T Display the side face view of the triangular prism in three different positions and ask if they can be able to see all the faces at one glance.
S Observe and think about the display of triangular prism in different positions.
T Ask students to identify in which position they can decide if this shape is a triangular prism.
S Understand and explain when the three faces can be seen we can decide this is a triangular prism
T Guide students to draw the triangular prism so that the three faces can be seen (i) to draw it based on the black three sides (ii) draw the side behind the sketch, with dotted line.
S Practice using the grid papers to sketch the solids which should have three faces at one glance.

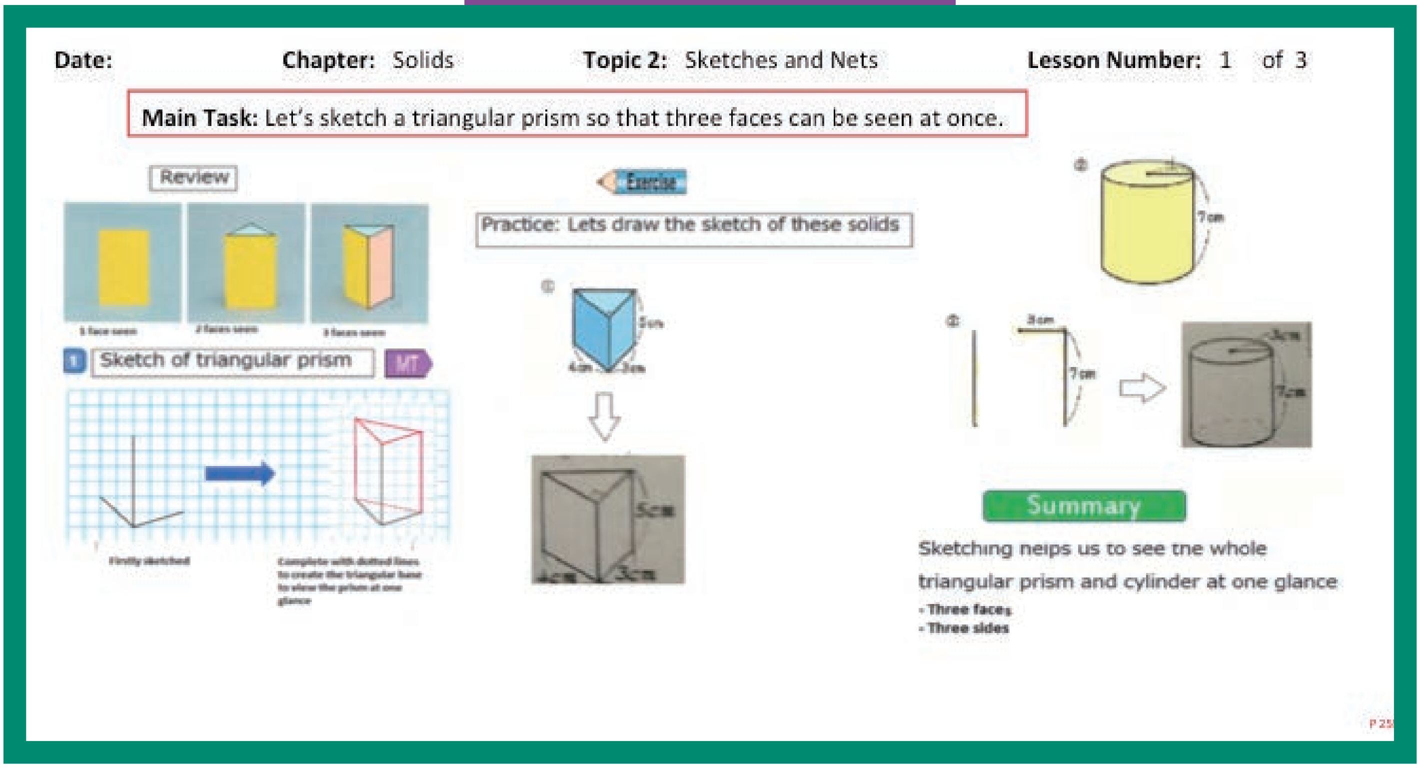
3 Complete the Exercise

S Solve the exercises.
T Confirm students' answers.

4 Summary

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

Sample Blackboard Plan



Date: **Chapter:** Solids **Topic 2:** Sketches and Nets **Lesson Number:** 1 of 3

Main Task: Let's sketch a triangular prism so that three faces can be seen at once.

Review

1 Sketch of triangular prism

Exercise

Practice: Lets draw the sketch of these solids

Summary

Sketching helps us to see the whole triangular prism and cylinder at one glance

- Three faces
- Three sides

Unit 14

Unit: Solids

Sub-unit 2: Sketches and Nets of Prisms and Cylinders

Lesson 2 of 3

Textbook Page : 188
Actual Lesson 130

Lesson Objectives

- To investigate and draw the development (net) of a triangular prism, based on the way of drawing rectangular prism.
- To think of other nets for making a triangular prism and nets for other types of prisms.

Prior Knowledge

- Sketching solids such as rectangular prism

Preparation

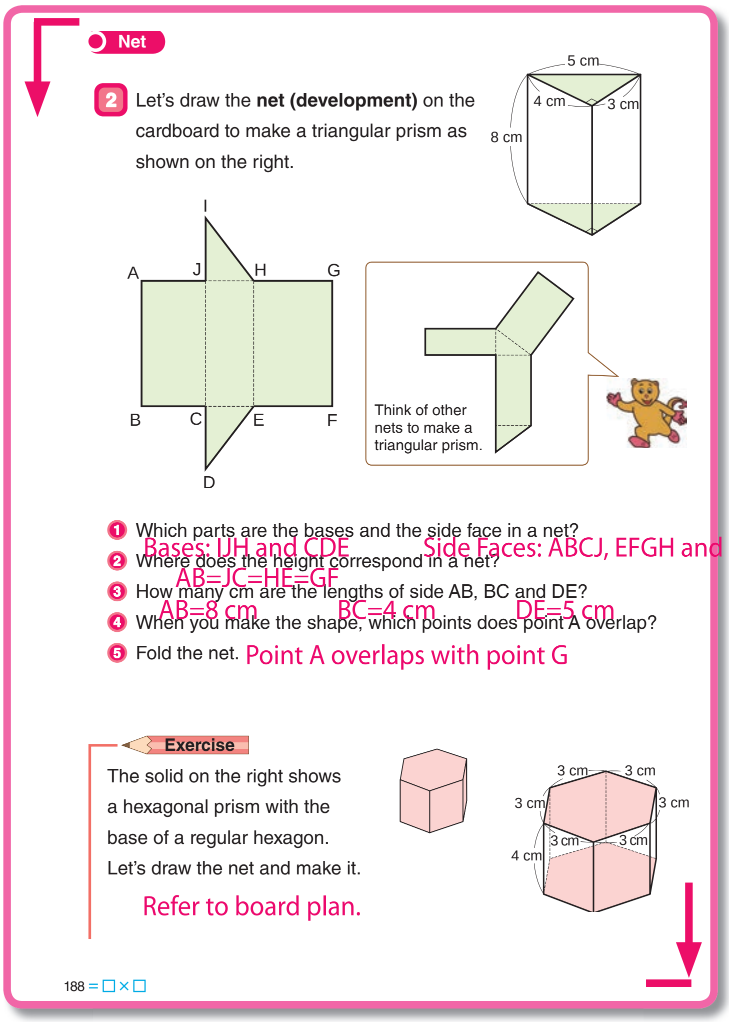
- Cardboard papers, example of solid figures such as rectangular, triangular, hexagonal prisms and nets of corresponding figures

Assessment

- Investigate and confirm the properties of solids such as faces and sharp points. **F**
- Draw triangular and hexagonal prism correclty applying previous knowledge. **S**
- Solve the exercises correctly. **S**

Teacher's Notes

Label all the corners and edges of the rectangular, triangular and hexagonal prism on the cardboard before development of the net (construction of solid shapes).
It is important for all students to participate in developing the net of the triangular and hexagonal prism and check each other's shapes.



Net

② Let's draw the **net (development)** on the cardboard to make a triangular prism as shown on the right.

Think of other nets to make a triangular prism.

① Which parts are the bases and the side face in a net?
Bases: IJH and CDE Side Faces: ABCJ, EFGH and CEHJ

② Where does the height correspond in a net?
AB=JC=HE=GF

③ How many cm are the lengths of side AB, BC and DE?
AB=8 cm BC=4 cm DE=5 cm

④ When you make the shape, which points does point A overlap?

⑤ Fold the net. Point A overlaps with point G

Exercise

The solid on the right shows a hexagonal prism with the base of a regular hexagon.
Let's draw the net and make it.

Refer to board plan.

188 = □×□

Lesson Flow

1 Review the previous lesson.

2 2 Net of a triangular prism.

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

T Display and ask students to answer question ① to ⑤ respectively.

T ① Which parts are the bases and the side face in a net?

S Bases: triangles IJH and CDE, Side faces: rectangles ABCJ, EFGH and CEHJ

T ② Where does the height correspond in a net?

S Height: Lines AB, JC, HE and GF

T ③ How many cm are the length of side AB, BC and DE?

S AB = 8 cm, BC = 4 cm and DE = 5 cm

T ④ When you make the shape, which point does A overlap?

S Points: I and G

S ⑤ Draw on a cardboard the net based on the answers for ① to ④ and construct a triangular prism, using the net.

TN Guide the students to measure and confirm all the lengths correctly to draw the net and confirm which sides and vertices overlap each other and fold the net.

3 To draw other nets for making a triangular prism.

T Ask students to think of other nets for making the same triangular prism.

S Think about other nets to make a triangular prism, confirming whether the all sides and vertices overlap each other correctly.

T Ask some students to put their drawn nets on the blackboard and explain what they considered in drawing nets.

S Explain and share it to the whole class.

4 Complete the Exercise

S Solve the exercise.

T Confirm students' answers.

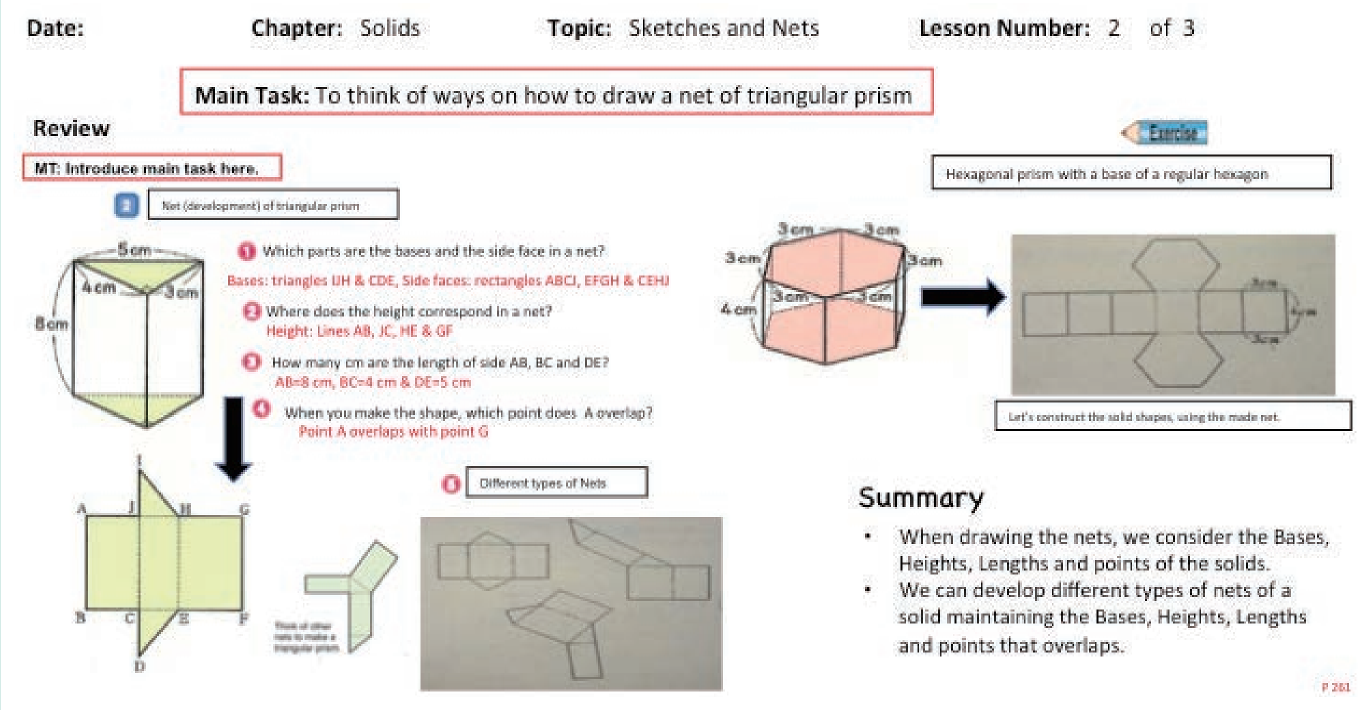
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Chapter:** Solids **Topic:** Sketches and Nets **Lesson Number:** 2 of 3

Main Task: To think of ways on how to draw a net of triangular prism

Review

MT: Introduce main task here.

2 Net (development) of triangular prism

① Which parts are the bases and the side face in a net?
Bases: triangles IJH & CDE, Side faces: rectangles ABCJ, EFGH & CEHJ

② Where does the height correspond in a net?
Height: Lines AB, JC, HE & GF

③ How many cm are the length of side AB, BC and DE?
AB=8 cm, BC=4 cm & DE=5 cm

④ When you make the shape, which point does A overlap?
Point A overlaps with point G

⑤ Different types of Nets

Think of other nets to make a triangular prism.

Exercise

Hexagonal prism with a base of a regular hexagon

Let's construct the solid shapes, using the made net.

Summary

- When drawing the nets, we consider the Bases, Heights, Lengths and points of the solids.
- We can develop different types of nets of a solid maintaining the Bases, Heights, Lengths and points that overlaps.

P 261

Unit
14

Unit: Solids

Sub-unit 2: Sketches and Nets of Prisms and Cylinders

Lesson 3 of 3

Textbook Page :
189
Actual Lesson 131

Lesson Objective

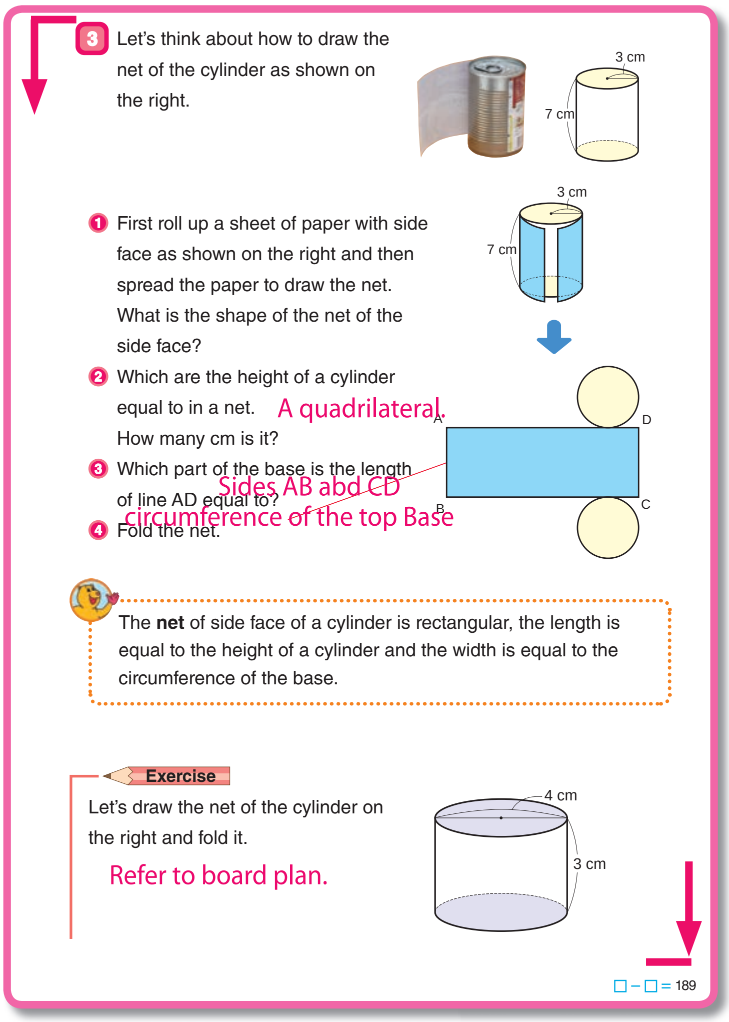
- To investigate and draw the development (net) of a cylinder.

Prior Knowledge

- Identify the faces of a cylinder and sketch it.
- Calculate the circumference.

Preparation

- Different cylinders (e.g. tinned fish, soft drink can), scissors and cardboard papers.



③ Let's think about how to draw the net of the cylinder as shown on the right.

① First roll up a sheet of paper with side face as shown on the right and then spread the paper to draw the net. What is the shape of the net of the side face?

② Which are the height of a cylinder equal to in a net. A quadrilateral.
How many cm is it?

③ Which part of the base is the length of line AD equal to? Sides AB abd CD
circumference of the top Base

④ Fold the net.

The **net** of side face of a cylinder is rectangular, the length is equal to the height of a cylinder and the width is equal to the circumference of the base.

Exercise

Let's draw the net of the cylinder on the right and fold it.

Refer to board plan.

□ − □ = 189

Assessment

- Investigate and confirm the properties of solids. F
- Draw the net of cylinder, applying previous knowledge correctly. S
- Solve the exercises correctly. S

Teacher's Notes

The net of side face of a cylinder is rectangular, the length is equal to the height of the cylinder and the width is equal to the circumference of the base.
In order to draw the net, it's indispensable to calculate the length of circumference of the base circle before drawing the rectangle.
To construct the solid figure of cylinder, it's necessary to keep the rectangle and the 2 base circles tangible.
If any students fail to do it, they can paste the rectangle and the 2 base circles with tape.
To construct it, it's better to form, first of all, a side (curved) faces from the rectangle of net, and then paste the 2 base circles on it.

Lesson Flow

1 Review the previous lesson.

2 ③ To think about the ways of drawing a net of cylinder.

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

T Show the students a cylindrical object and ask them to think about how to draw the net of a cylinder.

TN Teacher can use drawings or concrete cylindrical objects to show students. Teacher can give hints such as:
1) What kind of faces does a cylinder have?
2) Can we fit a paper on and around the cylinder to see the side faces.

S 1) There are 2 circles on the upper and lower bases
2) The side (curved) face can be rolled and copied on a paper, etc.

T ① What is the shape of the net of the side face?

S It's a quadrilateral.

T ② Which are the height of the cylinder equal to in a net?
How many cm is it?

S It's the same length as the rectangle's side face which the widths AB and CD are 7cm long.

T ③ Which part of the base is the length of line AD equal to?

S Line AD is equal to the circumference of the top base.

S ④ Fold the net.

3 Important Point

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

4 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

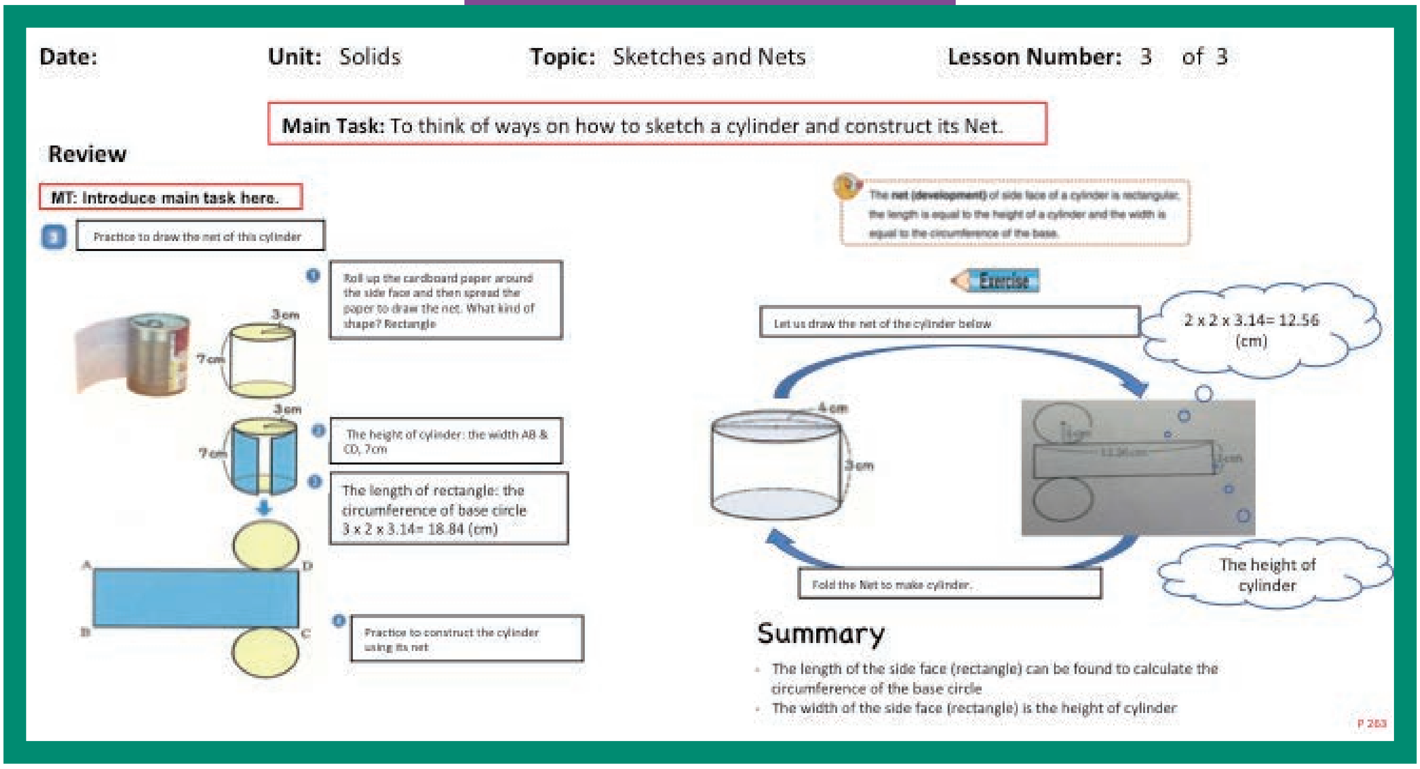
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Solids **Topic:** Sketches and Nets **Lesson Number:** 3 of 3

Main Task: To think of ways on how to sketch a cylinder and construct its Net.

Review

MT: Introduce main task here.

③ Practice to draw the net of this cylinder

① Roll up the cardboard paper around the side face and then spread the paper to draw the net. What kind of shape? Rectangle

② The height of cylinder: the width AB & CD, 7cm

③ The length of rectangle: the circumference of base circle 3 x 2 x 3.14= 18.84 (cm)

④ Practice to construct the cylinder using its net

The **net (development)** of side face of a cylinder is rectangular, the length is equal to the height of a cylinder and the width is equal to the circumference of the base.

Exercise

Let us draw the net of the cylinder below

2 x 2 x 3.14= 12.56 (cm)

Fold the Net to make cylinder.

The height of cylinder

Summary

- The length of the side face (rectangle) can be found to calculate the circumference of the base circle
- The width of the side face (rectangle) is the height of cylinder

Unit 14

Unit: Solids

Exercise, Problems and Evaluation

Lesson 1 and 2 of 2

Textbook Page : 190 and 191
Actual Lesson 132 and 133

Lesson Objective

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

Prior Knowledge

- All the contents covered in this unit

Preparation

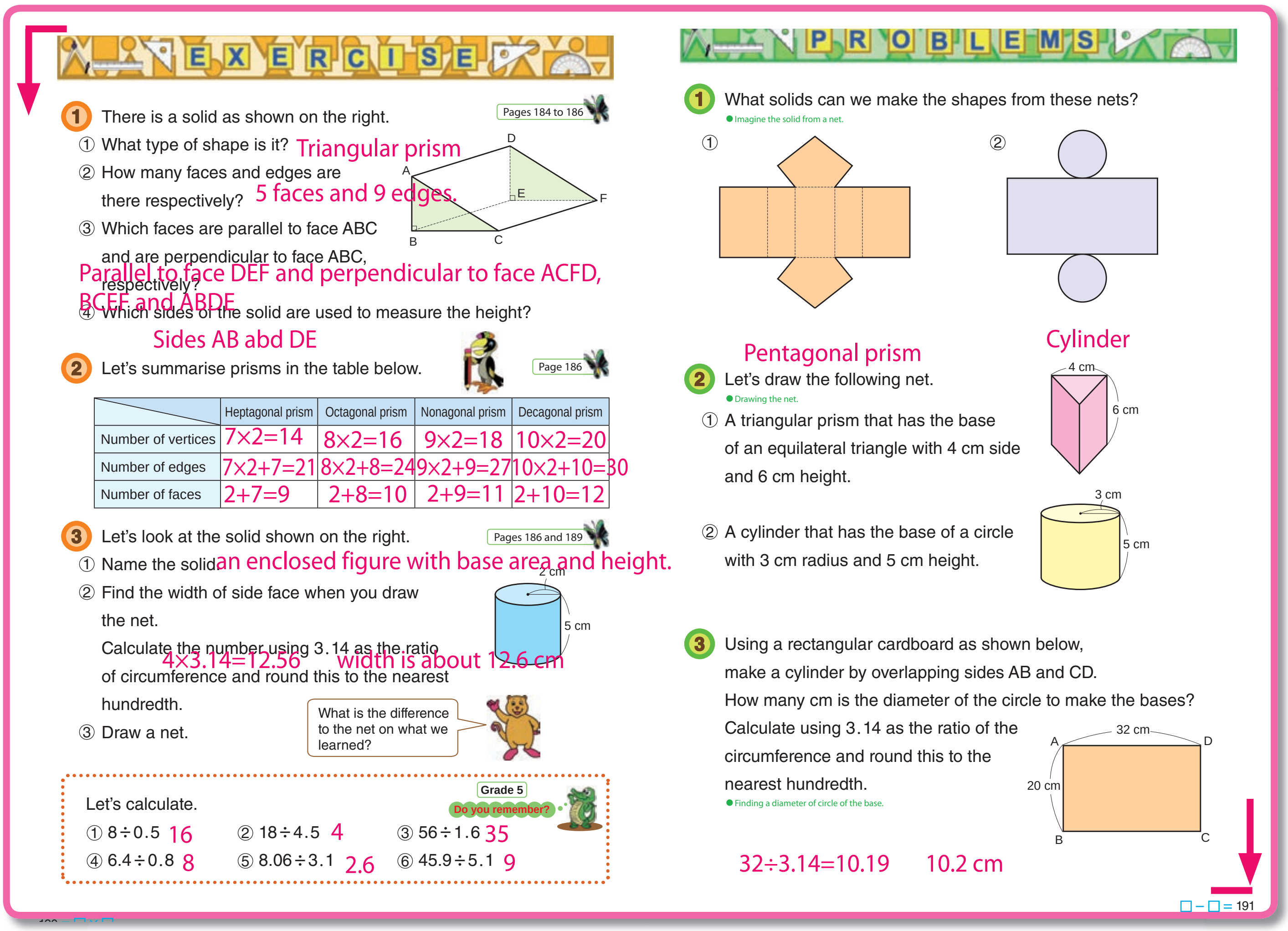
- Evaluation test copy for each student

Assessment

- Complete the Exercise and Problems correctly. S

Teacher's Notes

This is the last lesson of Chapter 14. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises and solve the Problems in preparation for the evaluation test. The test can be conducted as assesment for your class after completing all the exercises. Use the attached evaluation test to conduct assesment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

① There is a solid as shown on the right. Pages 184 to 186

① What type of shape is it? Triangular prism

② How many faces and edges are there respectively? 5 faces and 9 edges.

③ Which faces are parallel to face ABC and are perpendicular to face ABC, respectively?

Parallel to face DEF and perpendicular to face ACFD, BCEF and ABDE

④ Which sides of the solid are used to measure the height?

Sides AB abd DE

② Let's summarise prisms in the table below. Page 186

	Heptagonal prism	Octagonal prism	Nonagonal prism	Decagonal prism
Number of vertices	7×2=14	8×2=16	9×2=18	10×2=20
Number of edges	7×2+7=21	8×2+8=24	9×2+9=27	10×2+10=30
Number of faces	2+7=9	2+8=10	2+9=11	2+10=12

③ Let's look at the solid shown on the right. Pages 186 and 189

① Name the solid. an enclosed figure with base area and height.

② Find the width of side face when you draw the net.
Calculate the number using 3.14 as the ratio of circumference and round this to the nearest hundredth.

4×3.14=12.56 width is about 12.6 cm

③ Draw a net.

What is the difference to the net on what we learned?

Let's calculate. Grade 5 Do you remember?

① 8÷0.5 16 ② 18÷4.5 4 ③ 56÷1.6 35
④ 6.4÷0.8 8 ⑤ 8.06÷3.1 2.6 ⑥ 45.9÷5.1 9

PROBLEMS

① What solids can we make the shapes from these nets?
● Imagine the solid from a net.

① Pentagonal prism

② Cylinder

② Let's draw the following net.
● Drawing the net.

① A triangular prism that has the base of an equilateral triangle with 4 cm side and 6 cm height.

② A cylinder that has the base of a circle with 3 cm radius and 5 cm height.

③ Using a rectangular cardboard as shown below, make a cylinder by overlapping sides AB and CD. How many cm is the diameter of the circle to make the bases? Calculate using 3.14 as the ratio of the circumference and round this to the nearest hundredth.
● Finding a diameter of circle of the base.

32÷3.14=10.19 10.2 cm

□ − □ = 191

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.
T Confirm students’ answers.
TN ① Identifying the type of solid shapes.
② Understanding the prisms.
③ Understanding and identifying the type of shapes that make up a cylinder.

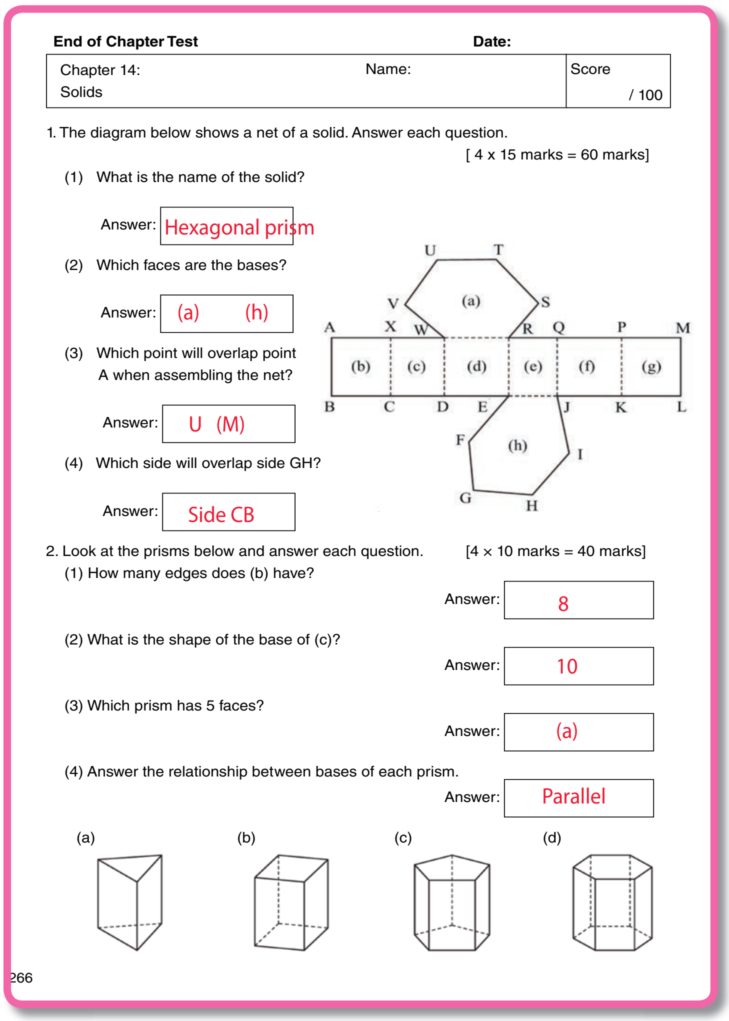
2 Solve the Problems

S Solve all the problems.
T Confirm students’ answers.
TN ① Imagine the solid from a net.
② Constructing the net of the solid shapes given.
③ Finding the diameter of circle base formed from the net.

Complete the Evaluation Test

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

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 14: Solids	Name:	Score / 100

1. The diagram below shows a net of a solid. Answer each question.
[4 x 15 marks = 60 marks]

(1) What is the name of the solid?

Answer: Hexagonal prism

(2) Which faces are the bases?

Answer: (a) (h)

(3) Which point will overlap point A when assembling the net?

Answer: U (M)

(4) Which side will overlap side GH?

Answer: Side CB

2. Look at the prisms below and answer each question. [4 × 10 marks = 40 marks]

(1) How many edges does (b) have?

Answer: 8

(2) What is the shape of the base of (c)?

Answer: 10

(3) Which prism has 5 faces?

Answer: (a)

(4) Answer the relationship between bases of each prism.

Answer: Parallel

266

End of Chapter Test **Date:**

Chapter 14: Solids	Name:	Score / 100

1. The diagram below shows a net of a solid. Answer each question.

[4×15 marks = 60 marks]

(1) What is the name of the solid?

Answer:

(2) Which faces are the bases?

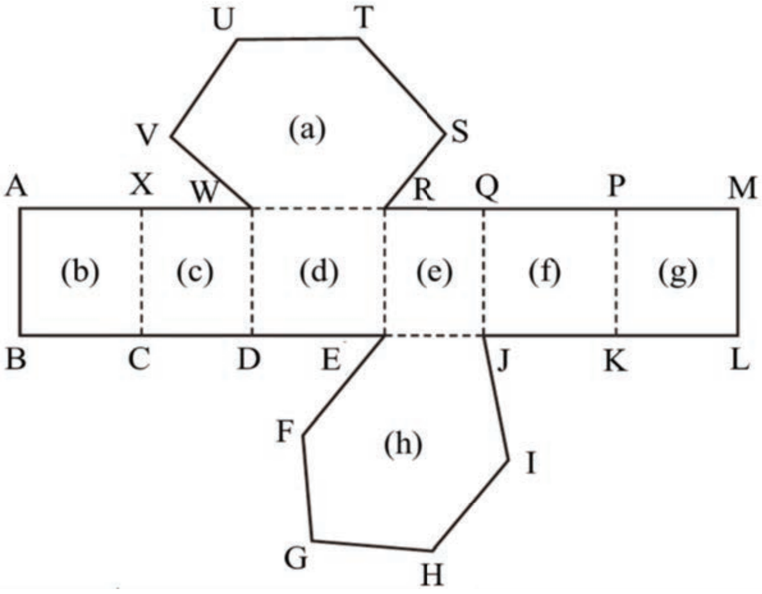
Answer:

(3) Which point will overlap point A when assembling the net?

Answer:

(4) Which side will overlap side GH?

Answer:



2. Look at the prisms below and answer each question. [4×10 marks = 40 marks]

(1) How many edges does (b) have?

Answer:

(2) What is the shape of the base of (c)?

Answer:

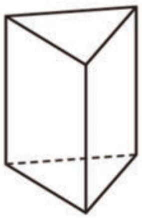
(3) Which prism has 5 faces?

Answer:

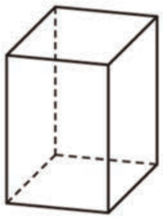
(4) Answer the relationship between bases of each prism.

Answer:

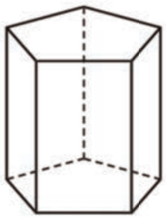
(a)



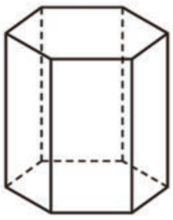
(b)



(c)



(d)



Chapter 15 Rates and Graphs

1. Content Standard

5.4.2 Extend their understanding of data and statistics to construct graphs to scale of given quantities.

2. Unit Objectives

- To understand percentage.
- To understand the meaning of rate, how to find and compare ratios and the meaning of percentage and how to express in percentage.
- To understand how to find basic quantities and compare quantities.
- To understand how to solve problems which involve a ratio expressed as a percentage.
- To gather and organise data according to their purposes and represent them by using pie graphs and band graphs and investigate features of graph.

3. Teaching Overview

In this topic, ratio is understood as a quantity compared to another quantity when the compared quantity is expressed as a value of 1 or 100.

Rates :

First, students compare 2 quantities in a relationship of inclusion. Next, they compare 2 quantities which are not in a relationship of inclusion.

They also handle a situation which gives more than 1 as the ratio.

Percentages :

Students compare 2 quantities when they take another quantity as 100.

Problems Using Rates :

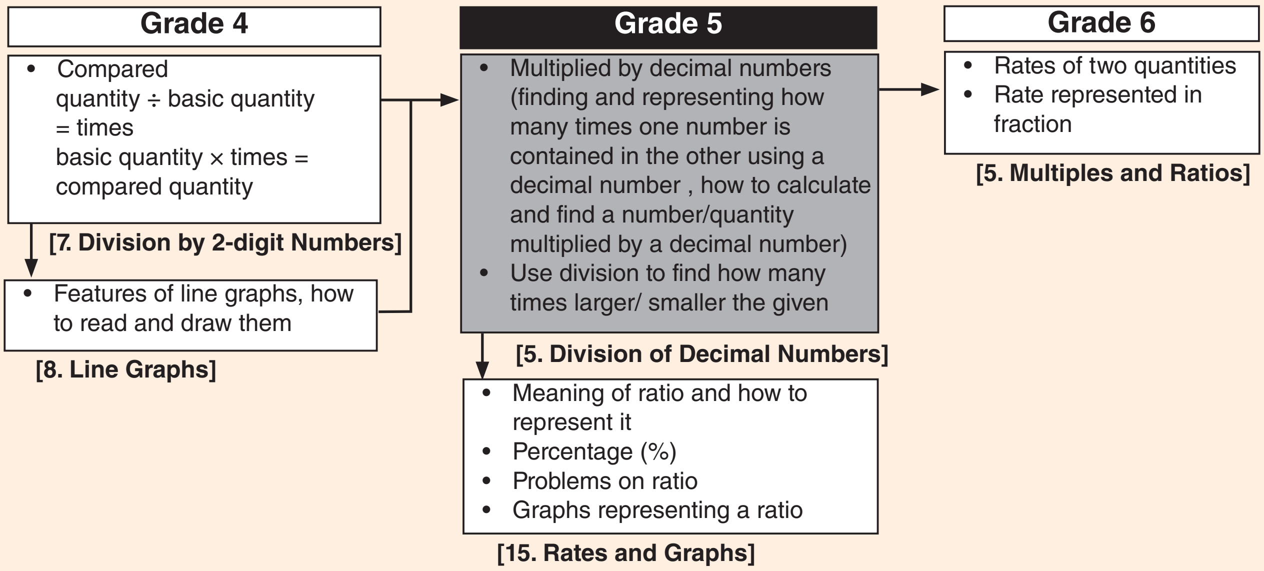
They find the quantity when they are given the ratio.

They also find the ratio of remaining part by subtracting the part ratio from 1.

Graphs Expressing Ratios :

Students will express ratio by pie charts and percentage bar charts.

4. Related Learning Contents



Grade 4

- Compared quantity ÷ basic quantity = times
  basic quantity × times = compared quantity

[7. Division by 2-digit Numbers]

- Features of line graphs, how to read and draw them

[8. Line Graphs]

Grade 5

- Multiplied by decimal numbers (finding and representing how many times one number is contained in the other using a decimal number , how to calculate and find a number/quantity multiplied by a decimal number)
- Use division to find how many times larger/ smaller the given

[5. Division of Decimal Numbers]

- Meaning of ratio and how to represent it
- Percentage (%)
- Problems on ratio
- Graphs representing a ratio

[15. Rates and Graphs]

Grade 6

- Rates of two quantities
- Rate represented in fraction

[5. Multiples and Ratios]

Unit
15

Unit: Rates and Graphs

Sub-unit 1: Rates

Lesson 1 of 3

Textbook Page :
192 to 194
Actual Lesson 134

Sub-unit Objective

- To understand the meaning of rate.

Lesson Objectives

- To think about how to compare the results of shots in a basketball game.
- To understand how to express rate of scored shots in numerals.

Prior Knowledge

- Line graphs (Grade 4)

Preparation

- Table that shows the record of shots, disc (if available)

Assessment

- Understand and explain the meaning of rate and its representation. F
- Compare and represent rate as a graph, decimal and reduced fraction. S

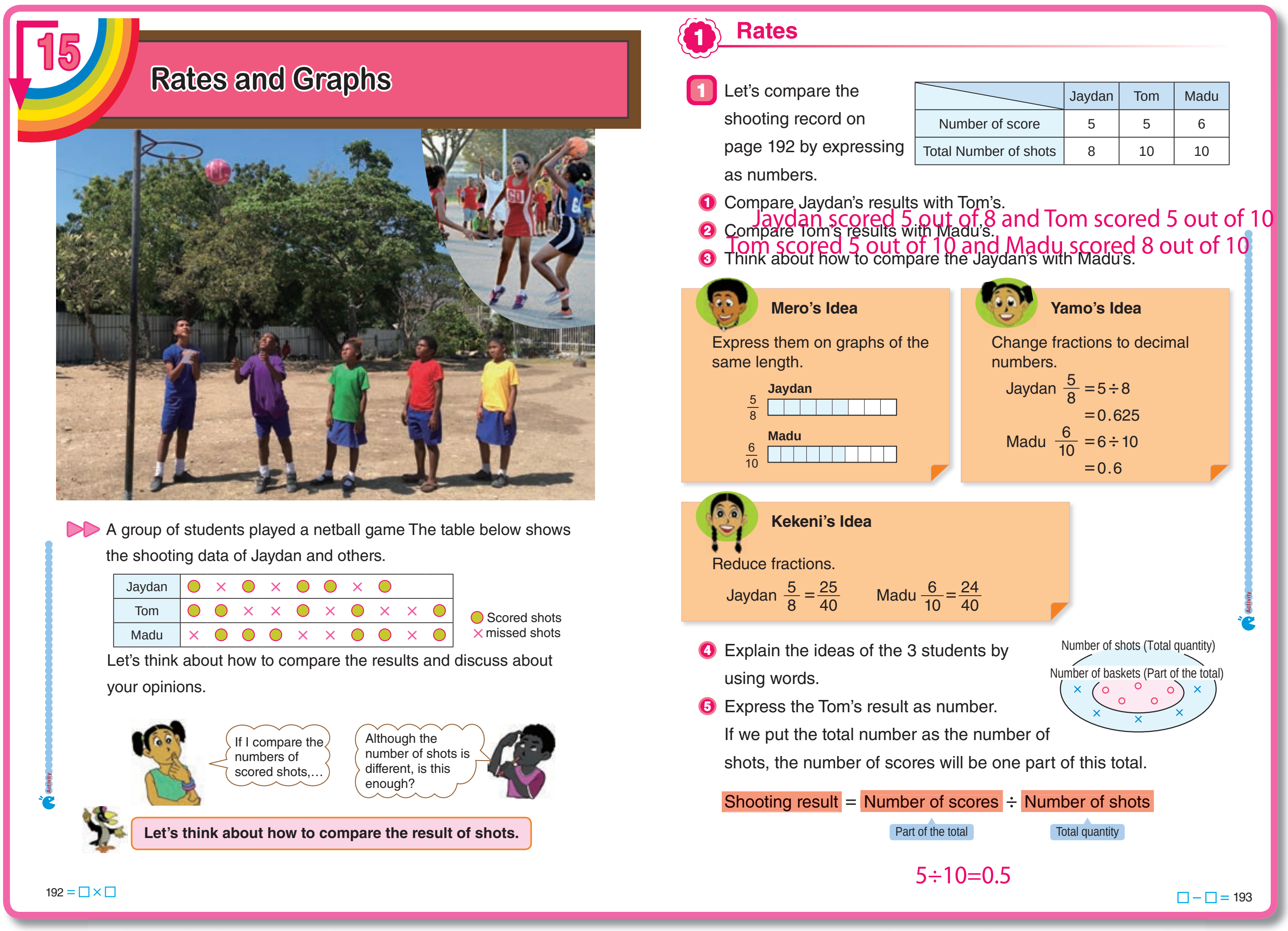
Teacher's Notes

- There are two aspects of rate:

1.Rate can be used to show the relationship of two quantities, that is the **total quantity** and the **part of the quantity**.
In this case, the rate should be less than1.

2. Rate can be used to show the proportional relationship of two quantities. In this case, one of them is considered as a **basic quantity** and the other as a **compared quantity**.

- Ensure students realise that it is better to use fractions as they are dealing with a set of two numbers for each students' record, which is the number of scores and that of shots.



15 Rates and Graphs

A group of students played a netball game The table below shows the shooting data of Jaydan and others.

Jaydan	●	×	●	×	●	●	×	●		
Tom	●	●	×	×	●	×	●	×	×	●
Madu	×	●	●	●	×	×	●	●	×	●

● Scored shots
× missed shots

Let's think about how to compare the results and discuss about your opinions.

Let's think about how to compare the result of shots.

192 = □ × □

① Rates

1 Let's compare the shooting record on page 192 by expressing as numbers.

	Jaydan	Tom	Madu
Number of score	5	5	6
Total Number of shots	8	10	10

① Compare Jaydan's results with Tom's.
Jaydan scored 5 out of 8 and Tom scored 5 out of 10
② Compare Tom's results with Madu's.
Tom scored 5 out of 10 and Madu scored 8 out of 10
③ Think about how to compare the Jaydan's with Madu's.

Mero's Idea
Express them on graphs of the same length.

Yamo's Idea
Change fractions to decimal numbers.

Jaydan $\frac{5}{8}=5\div8$
$=0.625$
Madu $\frac{6}{10}=6\div10$
$=0.6$

Kekeni's Idea
Reduce fractions.

Jaydan $\frac{5}{8}=\frac{25}{40}$ Madu $\frac{6}{10}=\frac{24}{40}$

④ Explain the ideas of the 3 students by using words.
⑤ Express the Tom's result as number.
If we put the total number as the number of shots, the number of scores will be one part of this total.

Shooting result = Number of scores ÷ Number of shots

5÷10=0.5

□ − □ = 193

Lesson Flow

1 Comparing Shooting records

T Let students see the pictures and discuss on the netball game.

T/S Read and understand the situation.

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

2 Comparing the results of the shots.

T How can we best express the results of each person's shots?

S Refer to table of results in textbook and give results.

3 1 Compare the shooting records by expressing as numbers.

S Compare the result using the table.

TN ① Jaydan and Tom.
The number of scores is same but Jaydan has less number of shot.

TN ② Tom and Madu.
The number of shots are same but Madu has more number of scores.

S ③ Think about how to compare the result of Jaydan and Madu.

T Let students discuss Mero, Yamo and Kekeni's ideas to compare results. (Refer to board plan)

S ④ Explain the 3 ideas by using words.

S ⑤ Express the result of Tom as a number.

4 2 Express result in table as numbers.

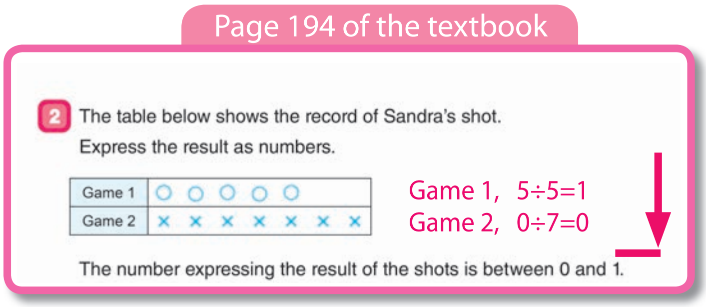
T Let students' to study the table of shooting record in textbook page 194.

S Express the shooting results as a number.
(Refer to board plan)

5 Summary

TN Similar to the summary flow in the next lesson.

Page 194 of the textbook



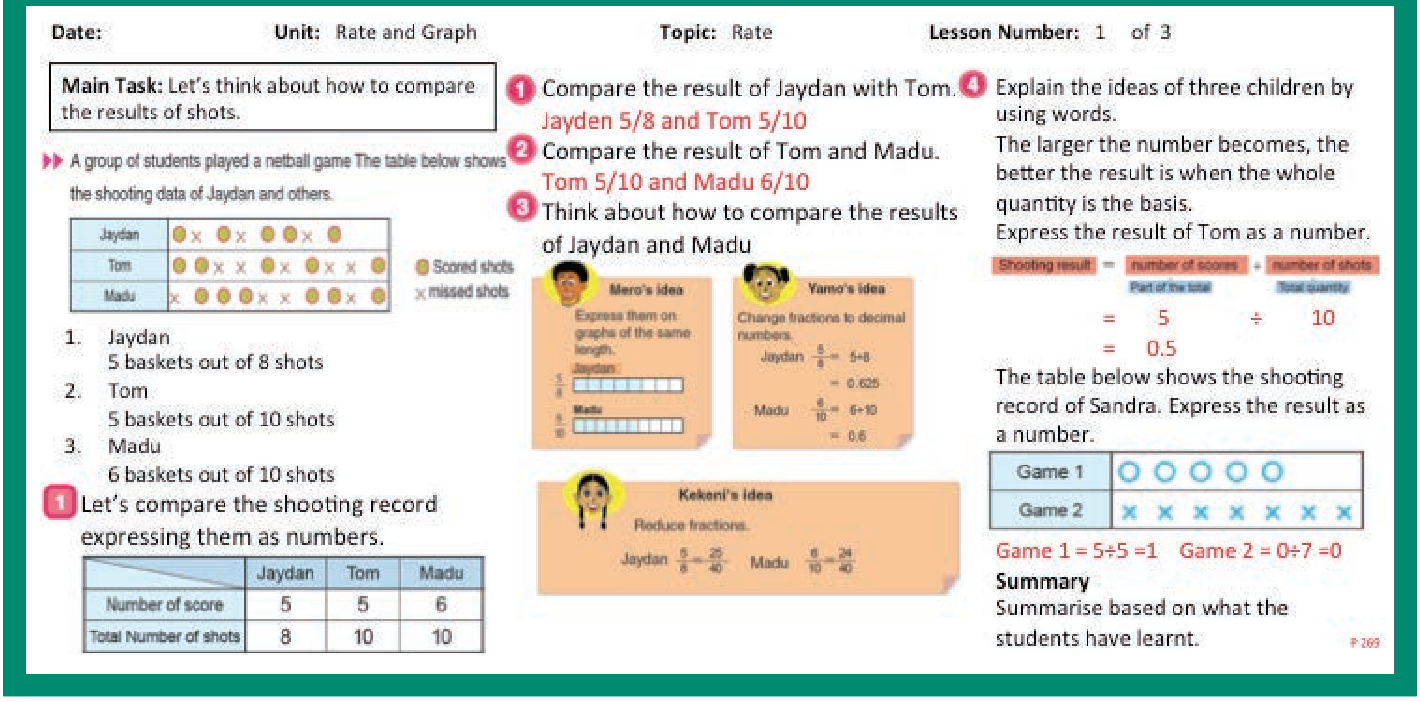
2 The table below shows the record of Sandra's shot.
Express the result as numbers.

Game 1	○ ○ ○ ○ ○
Game 2	× × × × × × ×

Game 1, 5÷5=1
Game 2, 0÷7=0

The number expressing the result of the shots is between 0 and 1.

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Rate **Lesson Number:** 1 of 3

Main Task: Let's think about how to compare the results of shots.

A group of students played a netball game The table below shows the shooting data of Jaydan and others.

Jaydan	● × ● × ● ● × ●
Tom	● ● × × ● × ● × × ●
Madu	× ● ● ● × × ● ● × ●

● Scored shots
× missed shots

1. Jaydan
5 baskets out of 8 shots
2. Tom
5 baskets out of 10 shots
3. Madu
6 baskets out of 10 shots

1 Let's compare the shooting record expressing them as numbers.

	Jaydan	Tom	Madu
Number of score	5	5	6
Total Number of shots	8	10	10

① Compare the result of Jaydan with Tom.
Jayden 5/8 and Tom 5/10

② Compare the result of Tom and Madu.
Tom 5/10 and Madu 6/10

③ Think about how to compare the results of Jaydan and Madu

Mero's idea
Express them on graphs of the same length.
Jaydan $\frac{5}{8}$
Madu $\frac{6}{10}$

Yamo's idea
Change fractions to decimal numbers.
Jaydan $\frac{5}{8} = 5÷8$
$= 0.625$
Madu $\frac{6}{10} = 6÷10$
$= 0.6$

Kekeni's idea
Reduce fractions.
Jaydan $\frac{5}{8} = \frac{25}{40}$ Madu $\frac{6}{10} = \frac{24}{40}$

④ Explain the ideas of three children by using words.
The larger the number becomes, the better the result is when the whole quantity is the basis.
Express the result of Tom as a number.

Shooting result = number of scores ÷ number of shots
Part of the total Total quantity
= 5 ÷ 10
= 0.5

The table below shows the shooting record of Sandra. Express the result as a number.

Game 1	○ ○ ○ ○ ○
Game 2	× × × × × × ×

Game 1 = 5÷5 =1 Game 2 = 0÷7 =0

Summary
Summarise based on what the students have learnt.

P 269

Unit 15

Unit: Rates and Graphs

Sub-unit 1: Rates

Lesson 2 of 3

Textbook Page :
194 and 195
Actual Lesson 135

Lesson Objective

- To understand how to compare and find rates.

Prior Knowledge

- Meaning of rate

Preparation

- Tape and number line diagrams to show the degree of crowdedness of planes
- Tables to show the relationships of the degree of crowdedness of each plane

Assessment

- Understand and explain the process in comparing and finding rates. F
- Think about how to express the degree of crowdedness. S
- Solve the exercises correctly. S

Teacher's Notes

Crowdedness means a number that is expressed by the derived quantity when the basic quantity is made 1. Further explanation is in page 209 of the textbook with examples.

2 The table below shows the record of Sandra's shot.
Express the result as numbers.

Game 1	○ ○ ○ ○ ○
Game 2	× × × × × × ×

The number expressing the result of the shots is between 0 and 1.

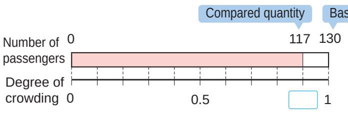
3 Let's investigate the number of passengers on planes in a day.
Which plane is more crowded?

Number of Passengers and Seats

	Small plane	Large plane
Number of passengers	117	442
Number of seats	130	520

The degree of crowding is represented as a number that allows comparing the number of passengers when the number of seats is made 1.

① Let's find the degree of crowding for the small plane.

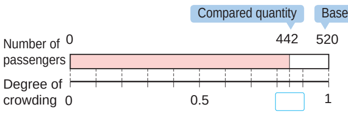


Number of passengers	130	117
Degree of crowding	1	?

÷130 ÷130

117 ÷ 130 = $\boxed{0.9}$

② Let's find the degree of crowding for the large plane.

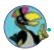


Number of passengers	520	442
Degree of crowding	1	?

÷520 ÷520

$\boxed{442} \div \boxed{520} = \boxed{0.85}$

The result of the shots in 1 is expressed by how many the derived quantities when the base quantity is made 1.



A number that is expressed by the derived quantity when the base quantity is made 1, like a shooting result or crowding, is called rate.

Rate = compared quantity ÷ base quantity

The degree of crowding for the small plane in the previous page is
117 ÷ 130 = 0.9
A degree of crowding for the 0.9 means that the number of passengers is 0.9 when we make the total number of seats 1.

Small Plane

	Number of seats	Number of passengers
Number of passengers	130	117
Rate	1	0.9

÷130 ÷130

Large Plane

	Number of seats	Number of passengers
Number of passengers	520	442
Rate	1	0.85

÷520 ÷520

To make130 become 1, we should divide by 130.

Exercise

1 Let's find the rates.

① A rate of correct answer, when 6 out of 10 problems were answered correctly. 6÷10=0.6

② A rate of games won when a team won 6 out of 6 soccer games. 6÷6=1

③ The rate of winning goals, when Tali missed 7 goals out of 7 shots. 0÷7=0

2 There are 75 students at a party including Ben. There are 15 students from the grade 5. Let's find the rate of the grade 5 students based on the total number of the students at the party.
15÷75=0.2

Lesson Flow

1 Review the previous lesson.

2 3 Investigating the number of passengers on planes in a day.

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

T/S Read and understand the situation.

T Have the students to think about and explain how they can find the degree of crowdedness of each plane.

S Identify that there are two quantities, 1) capacity of the plane and 2) number of passengers.

S Identify which quantity is the total quantity and which is the partial quantity.

3 How to express the degree of crowdedness.

S ① ② Think about how to express the degree of crowdedness.

T Assist students to understand that they can express the degree of crowdedness by setting the capacity as the total quantity 1 and the number of passengers as the partial quantity.

TN The expression can be written as 'the partial quantity÷the whole quantity'.
The degree of crowdedness＝the number of passengers÷capacity.
(Compared quantity)(Basic quantity)

S Write mathematical expressions, calculate them and express the degree of crowdedness in decimal numbers.

S ① Small plane .... 117÷130＝0.9
② Large plane .... 442÷520＝0.85

S The small plane is more crowded than the large plane.

T Which plane is more crowded?

S The smaller plane.

4 Important Point

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

5 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

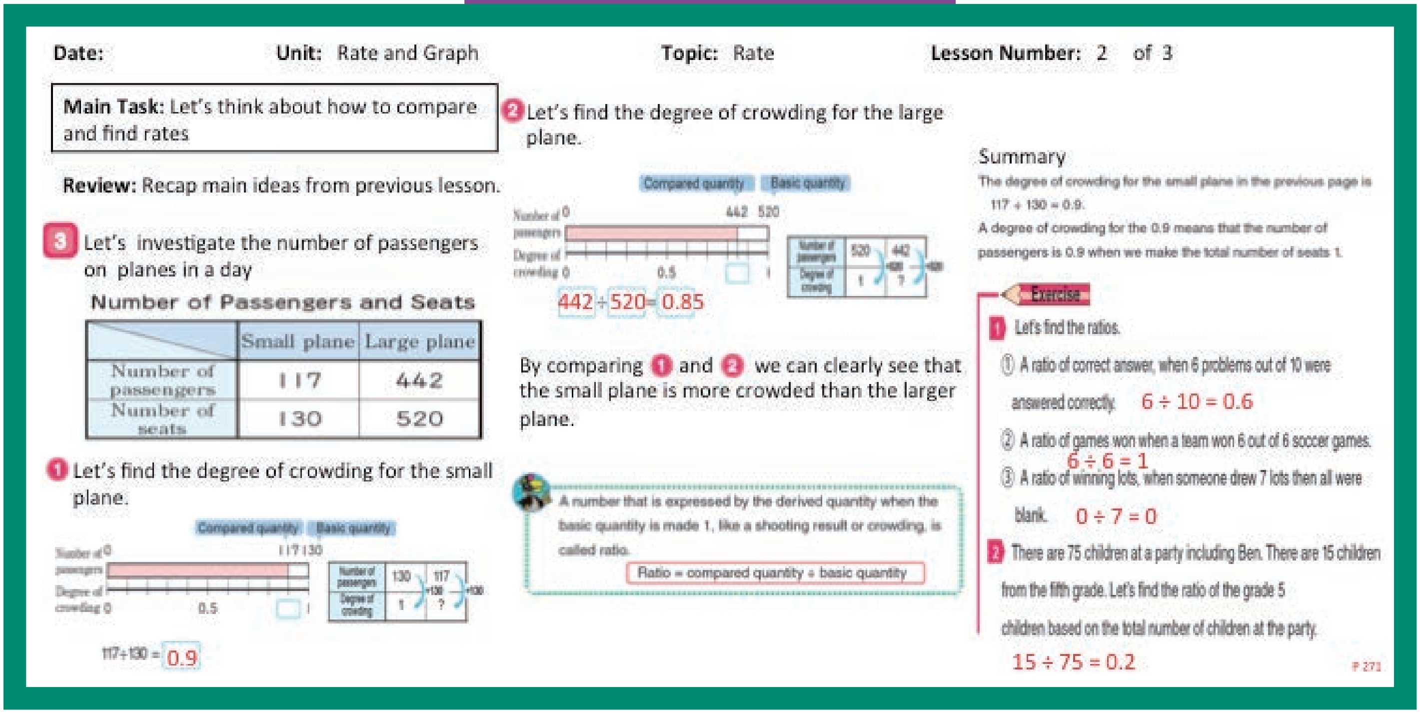
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Rate **Lesson Number:** 2 of 3

Main Task: Let's think about how to compare and find rates

Review: Recap main ideas from previous lesson.

3 Let's investigate the number of passengers on planes in a day

Number of Passengers and Seats

	Small plane	Large plane
Number of passengers	117	442
Number of seats	130	520

① Let's find the degree of crowding for the small plane.

117÷130 = 0.9

② Let's find the degree of crowding for the large plane.

442÷520= 0.85

By comparing ① and ② we can clearly see that the small plane is more crowded than the larger plane.

A number that is expressed by the derived quantity when the basic quantity is made 1, like a shooting result or crowding, is called ratio.

Ratio = compared quantity ÷ basic quantity

Summary

The degree of crowding for the small plane in the previous page is
117 ÷ 130 = 0.9.
A degree of crowding for the 0.9 means that the number of passengers is 0.9 when we make the total number of seats 1.

Exercise

1 Let's find the ratios.

① A ratio of correct answer, when 6 problems out of 10 were answered correctly. 6 ÷ 10 = 0.6

② A ratio of games won when a team won 6 out of 6 soccer games. 6 ÷ 6 = 1

③ A ratio of winning lots, when someone drew 7 lots then all were blank. 0 ÷ 7 = 0

2 There are 75 children at a party including Ben. There are 15 children from the fifth grade. Let's find the ratio of the grade 5 children based on the total number of children at the party.
15 ÷ 75 = 0.2

P 271

Unit 15

Unit: Rates and Graphs

Sub-unit 1: Rates

Lesson 3 of 3

Textbook Page : 196
Actual Lesson 136

Lesson Objectives

- To understand and express rate when comparing two quantities which one being the total quantity and the other being part of the total.
- To understand that there are cases where rate becomes larger than 1.

Prior Knowledge

- Meaning of rate
- How to find rate

Preparation

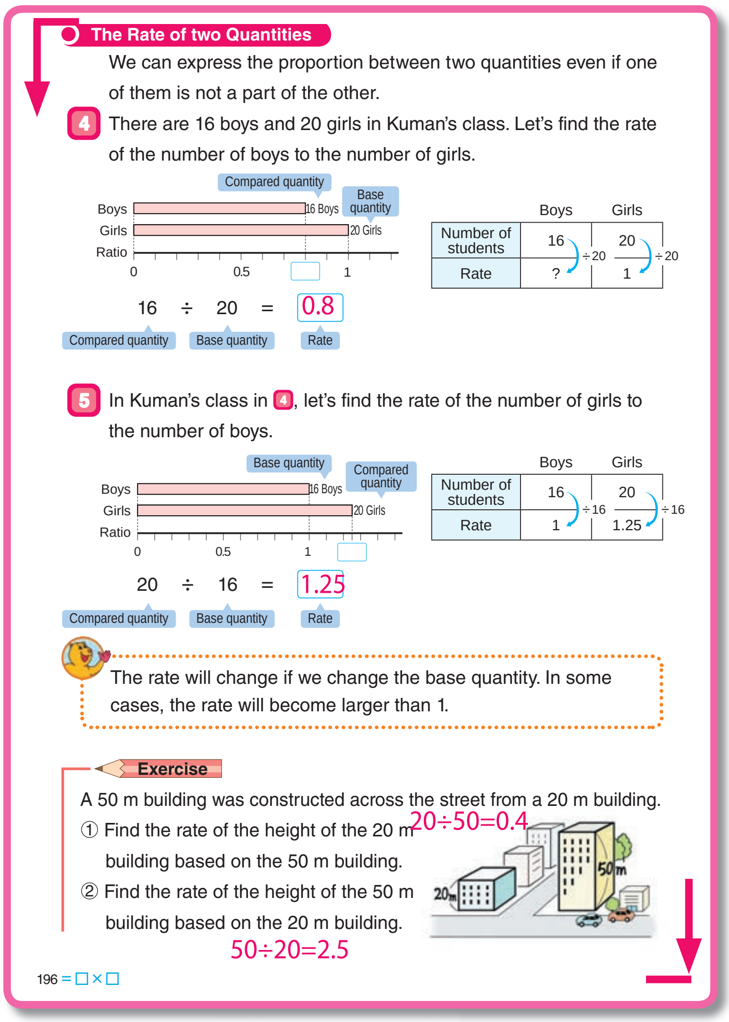
- Tape, number line diagrams and tables prepared for diagram representation of each task

Assessment

- Think about how to express rate when comparing two quantities. **F**
- Understand and explain the meaning of rate larger than 1. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

- If students think that a compared quantity = partial quantity (smaller) and a base quantity = total (larger), they may also find it strange to have the rate larger than 1.
- Teacher should facilitate well by advising students to use a tape, number line diagrams and table to further understand rate larger than 1.
- Students are yet to learn about percentages, therefore teacher should not introduce it in this lesson.



The Rate of two Quantities

We can express the proportion between two quantities even if one of them is not a part of the other.

4 There are 16 boys and 20 girls in Kuman's class. Let's find the rate of the number of boys to the number of girls.

	Boys	Girls
Number of students	16	20
Rate	?	1

÷20 ÷20

16 ÷ 20 = 0.8

Compared quantity　Base quantity　Rate

5 In Kuman's class in **4**, let's find the rate of the number of girls to the number of boys.

	Boys	Girls
Number of students	16	20
Rate	1	1.25

÷16 ÷16

20 ÷ 16 = 1.25

Compared quantity　Base quantity　Rate

The rate will change if we change the base quantity. In some cases, the rate will become larger than 1.

Exercise

A 50 m building was constructed across the street from a 20 m building.

① Find the rate of the height of the 20 m building based on the 50 m building.

20÷50=0.4

② Find the rate of the height of the 50 m building based on the 20 m building.

50÷20=2.5

196 = □ × □

Lesson Flow

1 Review the previous lesson.

2 The rate of two quantities smaller than 1.

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

T/S 4 Read and understand the situation.

T Confirm which quantities are base quantities and which are compared quantities.

S Use the table to write the mathematical sentence.

S Calculate and find the rate of the number of boys to that of girls. (Rate of boys to girls = 0.8).

T Present the tape diagram and table to confirm that the rate is smaller than 1.

TN Teacher can add and explain that in this case, we can say the number of boys is 0.8 times that of girls.

3 The rate of two quantities larger than 1.

T/S 5 Read and understand the situation.

T Confirm which quantities are base quantities and which are compared quantities.

S Use the table to write the mathematical sentence.

S Calculate and find the rate of the number of girls to that of boys. (Rate of girls to boys = 1.25).

T Guide students with the tape diagram and tables to calculate the rate.

S Notice that the rate is larger than 1.

T Let the students to compare the rates in 4 and 5.

S The rate of boys to girls is less than 1 and the rate of girls to boys is larger than 1.

4 Important Point

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

5 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

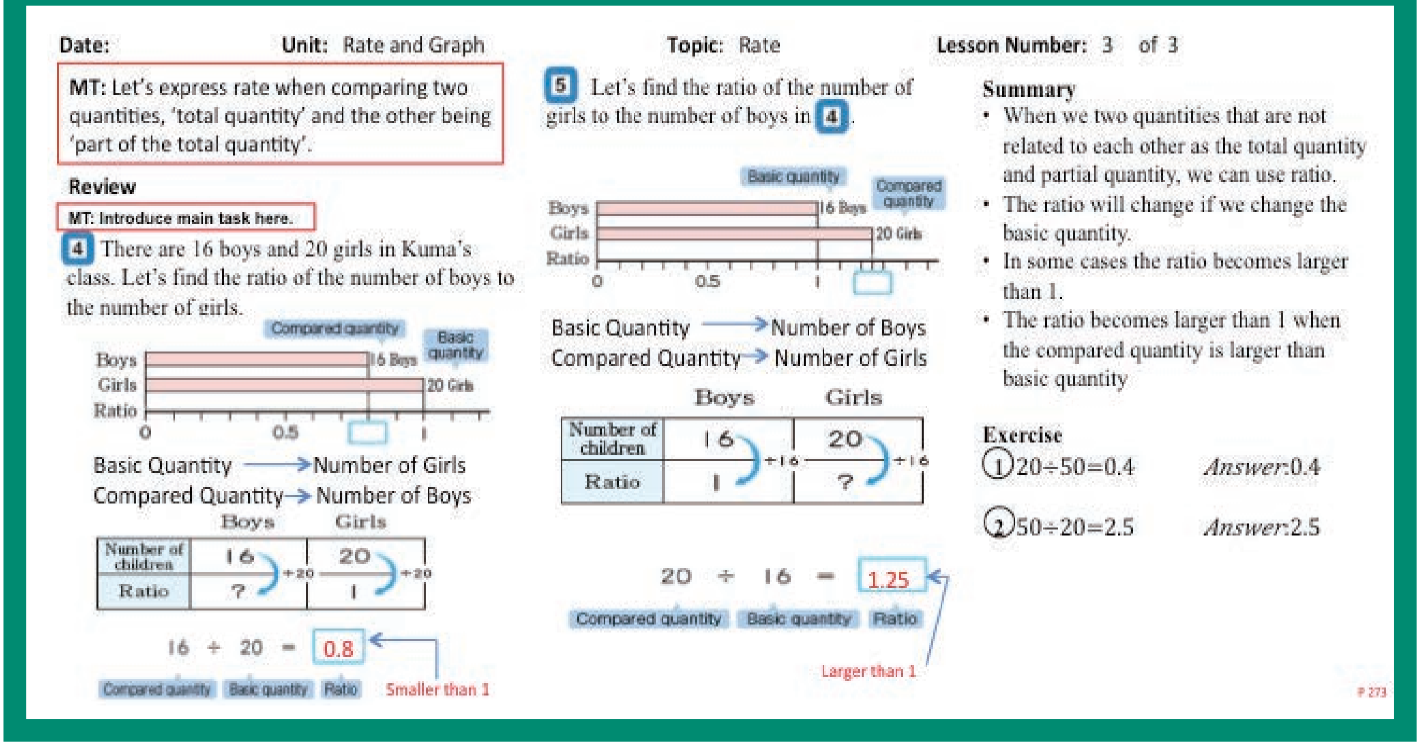
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Rate **Lesson Number:** 3 of 3

MT: Let's express rate when comparing two quantities, 'total quantity' and the other being 'part of the total quantity'.

Review

MT: Introduce main task here.

4 There are 16 boys and 20 girls in Kuma's class. Let's find the ratio of the number of boys to the number of girls.

Basic Quantity → Number of Girls
Compared Quantity → Number of Boys

	Boys	Girls
Number of children	16	20
Ratio	?	1

16 ÷ 20 = 0.8

Compared quantity Basic quantity Ratio Smaller than 1

5 Let's find the ratio of the number of girls to the number of boys in 4.

Basic Quantity → Number of Boys
Compared Quantity → Number of Girls

	Boys	Girls
Number of children	16	20
Ratio	1	?

20 ÷ 16 = 1.25

Compared quantity Basic quantity Ratio

Larger than 1

Summary

- When we two quantities that are not related to each other as the total quantity and partial quantity, we can use ratio.
- The ratio will change if we change the basic quantity.
- In some cases the ratio becomes larger than 1.
- The ratio becomes larger than 1 when the compared quantity is larger than basic quantity

Exercise

① 20÷50=0.4 *Answer*:0.4

② 50÷20=2.5 *Answer*:2.5

P 273

Unit 15

Unit: Rates and Graphs

Sub-unit 2: Percentages

Lesson 1 of 2

Textbook Page : 197 and 198
Actual Lesson 137

Sub-unit Objectives

- To understand that rates can also be expressed in percentage and understanding their meaning.
- To express various rates in percentages.

Lesson Objective

- To understand the meaning of percentage and how to express rate in percentage.

Prior Knowledge

- The Rates

Preparation

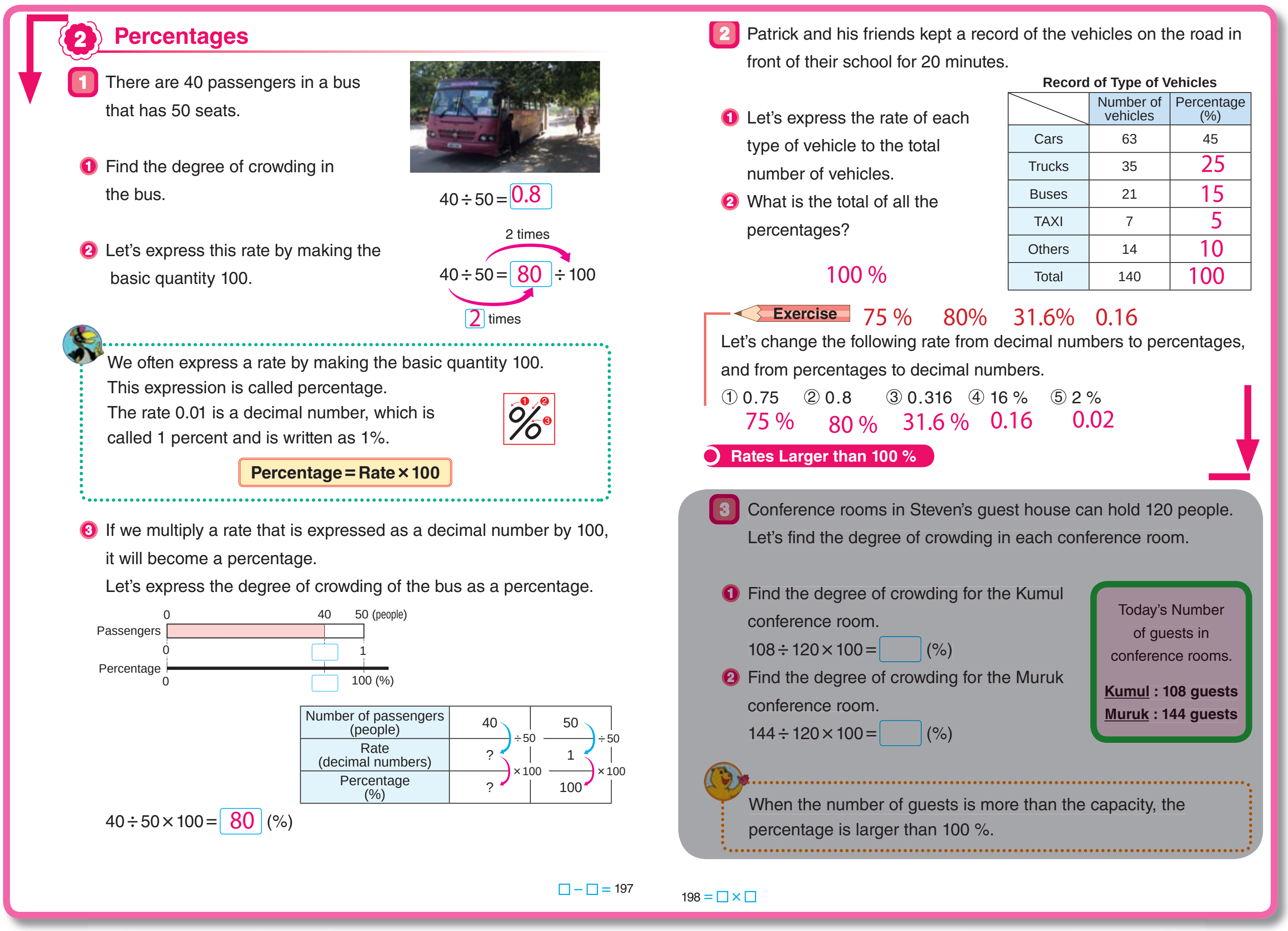
- Tape diagram that shows the number of passengers and rate and a table that shows the number of passengers and rate (decimal number and percentage)

Assessment

- Understand and explain the meaning of percentage and its symbol. F
- Understand and express rate in percentage. F
- Solve the exercises correctly. S

Teacher's Notes

- Rate = Compared quantitiy ÷ Base quantity.



2 Percentages

1 There are 40 passengers in a bus that has 50 seats.

① Find the degree of crowding in the bus.

$40 \div 50 = \boxed{0.8}$

② Let's express this rate by making the basic quantity 100.

$40 \div 50 = \boxed{80} \div 100$

2 times

$\boxed{2}$ times

We often express a rate by making the basic quantity 100.
This expression is called percentage.
The rate 0.01 is a decimal number, which is called 1 percent and is written as 1%.

Percentage = Rate × 100

③ If we multiply a rate that is expressed as a decimal number by 100, it will become a percentage.
Let's express the degree of crowding of the bus as a percentage.

Number of passengers (people)	40	50
Rate (decimal numbers)	?	1
Percentage (%)	?	100

$40 \div 50 \times 100 = \boxed{80}$ (%)

□ − □ = 197

2 Patrick and his friends kept a record of the vehicles on the road in front of their school for 20 minutes.

① Let's express the rate of each type of vehicle to the total number of vehicles.

② What is the total of all the percentages?

100 %

Record of Type of Vehicles

	Number of vehicles	Percentage (%)
Cars	63	45
Trucks	35	25
Buses	21	15
TAXI	7	5
Others	14	10
Total	140	100

Exercise 75 % 80% 31.6% 0.16

Let's change the following rate from decimal numbers to percentages, and from percentages to decimal numbers.

① 0.75 ② 0.8 ③ 0.316 ④ 16 % ⑤ 2 %
75 % 80 % 31.6 % 0.16 0.02

Rates Larger than 100 %

3 Conference rooms in Steven's guest house can hold 120 people.
Let's find the degree of crowding in each conference room.

① Find the degree of crowding for the Kumul conference room.

$108 \div 120 \times 100 = \boxed{}$ (%)

② Find the degree of crowding for the Muruk conference room.

$144 \div 120 \times 100 = \boxed{}$ (%)

Today's Number of guests in conference rooms.

Kumul : 108 guests
Muruk : 144 guests

When the number of guests is more than the capacity, the percentage is larger than 100 %.

198 = □ × □

Lesson Flow

1 Review the previous lesson.

2 The meaning of percentage and its symbol.

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

T/S **1** Read and understand the situation.

S ① Find the degree of crowding in the bus

T Confirm students' answers.

S ② Express the rate solved in ① by making the base quantity 100.

3 Important Point

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

4 Expressing the degree of crowding from rates to percentages.

S ③ Understand situation given and express the degree of crowding of the bus as a percentage using the tape diagram and table.

T Using the tape diagram and the table to confirm students' conversion from rate to percentage.

S Learn that a graph needs to be arranged to have the scale with 100 marks in order to convert from rate to percentage.

5 Problem involving calculating rate and converting rate to percentage.

T/S **2** Read and understand the situation.

S ① Express the rate of each type of vehicle to the total number of vehicles.

T Confirm students expression of rate.

S ② Calculate the total percentage of all the vehicles.

T Confirm that percentage is used to express a certain quantity per 100, having 100 as the total.

TN Teacher should emphasise that the total of all the percentages listed down should be 100 %.

6 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

7 Important Point

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

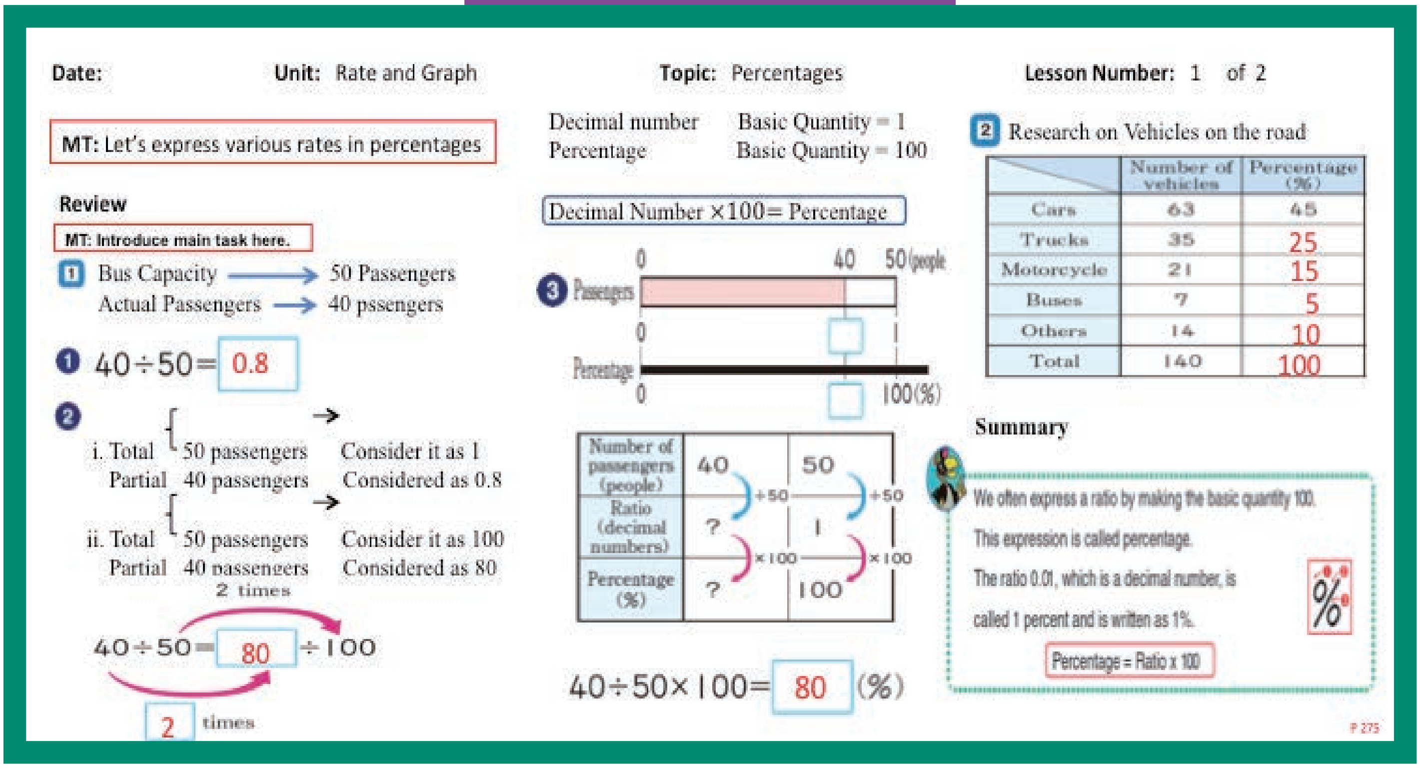
8 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Percentages **Lesson Number:** 1 of 2

MT: Let's express various rates in percentages

Review

MT: Introduce main task here.

1 Bus Capacity → 50 Passengers
Actual Passengers → 40 pssengers

① 40÷50= 0.8

②
i. Total 50 passengers → Consider it as 1
Partial 40 passengers → Considered as 0.8
ii. Total 50 passengers → Consider it as 100
Partial 40 passengers → Considered as 80
2 times

40÷50= 80 ÷100

2 times

Decimal number Basic Quantity = 1
Percentage Basic Quantity = 100

Decimal Number ×100= Percentage

③

Number of passengers (people)	40	50
Ratio (decimal numbers)	?	1
Percentage (%)	?	100

40÷50×100= 80 (%)

2 Research on Vehicles on the road

	Number of vehicles	Percentage (%)
Cars	63	45
Trucks	35	25
Motorcycle	21	15
Buses	7	5
Others	14	10
Total	140	100

Summary

We often express a ratio by making the basic quantity 100.
This expression is called percentage.
The ratio 0.01, which is a decimal number, is called 1 percent and is written as 1%.

Percentage = Ratio x 100

P 275

Unit
15

Unit: Rates and Graphs

Sub-unit 2: Percentages

Lesson 2 of 2

Textbook Page :
198 and 199
Actual Lesson 138

Lesson Objective

- To understand how to express the quantities that exceed 100 %.

Prior Knowledge

- Rate, Percentage

Preparation

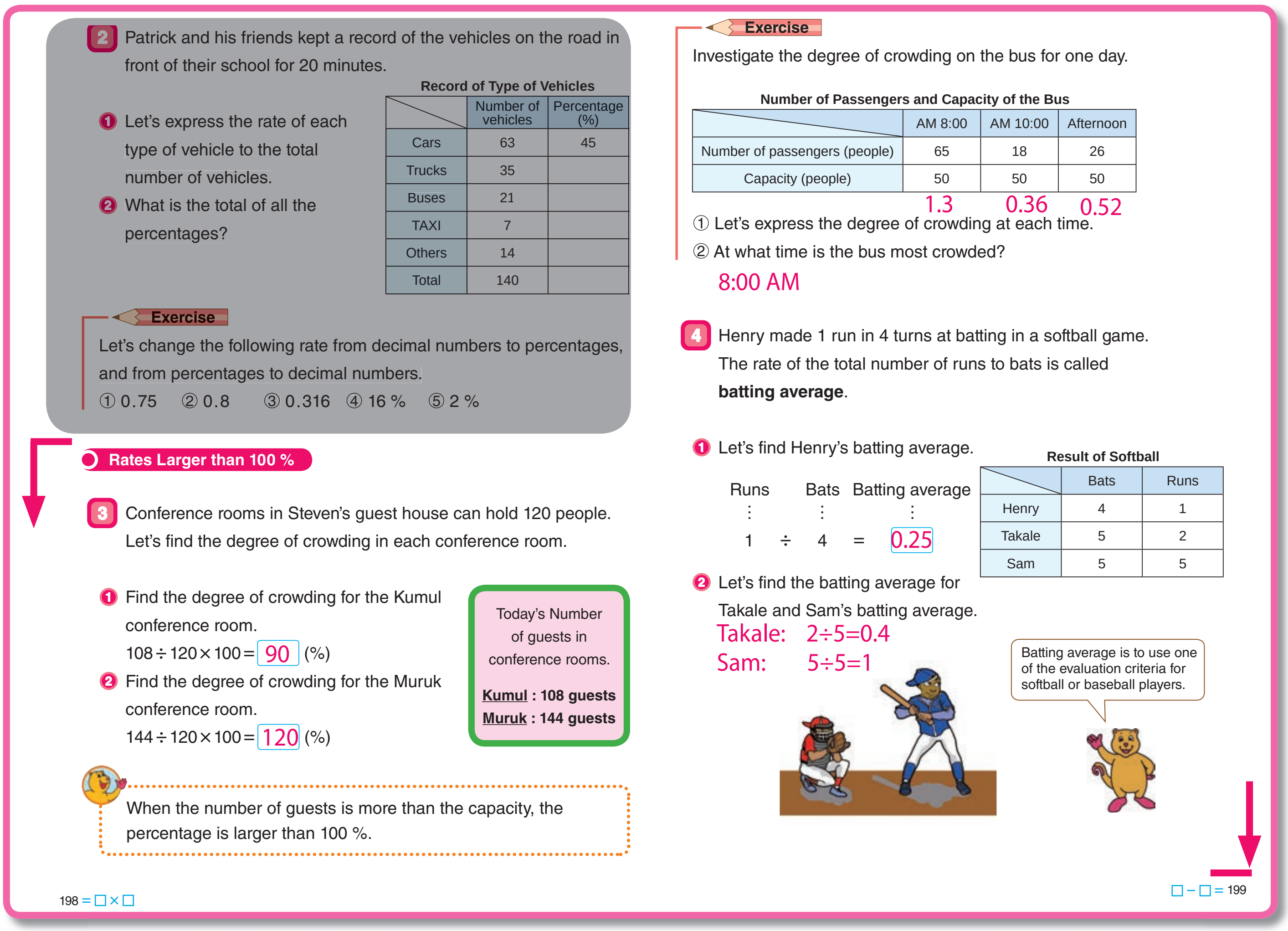
- Chart of table in the exercise

Assessment

- Calculate the degree of crowding in a given situation. F
- Think about how to express percentages that exceeds 100 %. F
- Solve the exercises correctly. S

Teacher's Notes

- Teacher can use a band graph and table as in the previous lessons to explain the concepts.
- If students are not clear with the term 'the degree of crowdedness' a teacher can use a term more common such as 'vehicle capacity'.



2 Patrick and his friends kept a record of the vehicles on the road in front of their school for 20 minutes.

① Let's express the rate of each type of vehicle to the total number of vehicles.

② What is the total of all the percentages?

Record of Type of Vehicles

	Number of vehicles	Percentage (%)
Cars	63	45
Trucks	35	
Buses	21	
TAXI	7	
Others	14	
Total	140	

Exercise

Let's change the following rate from decimal numbers to percentages, and from percentages to decimal numbers.

① 0.75 ② 0.8 ③ 0.316 ④ 16 % ⑤ 2 %

Rates Larger than 100 %

3 Conference rooms in Steven's guest house can hold 120 people. Let's find the degree of crowding in each conference room.

① Find the degree of crowding for the Kumul conference room.

108 ÷ 120 × 100 = $\boxed{90}$ (%)

② Find the degree of crowding for the Muruk conference room.

144 ÷ 120 × 100 = $\boxed{120}$ (%)

Today's Number of guests in conference rooms.

Kumul : 108 guests
Muruk : 144 guests

When the number of guests is more than the capacity, the percentage is larger than 100 %.

Exercise

Investigate the degree of crowding on the bus for one day.

Number of Passengers and Capacity of the Bus

	AM 8:00	AM 10:00	Afternoon
Number of passengers (people)	65	18	26
Capacity (people)	50	50	50
	1.3	0.36	0.52

① Let's express the degree of crowding at each time.

② At what time is the bus most crowded?

8:00 AM

4 Henry made 1 run in 4 turns at batting in a softball game. The rate of the total number of runs to bats is called **batting average**.

① Let's find Henry's batting average.

Runs ⋮ 1 ÷ Bats ⋮ 4 = Batting average ⋮ $\boxed{0.25}$

Result of Softball

	Bats	Runs
Henry	4	1
Takale	5	2
Sam	5	5

② Let's find the batting average for Takale and Sam's batting average.

Takale: 2÷5=0.4
Sam: 5÷5=1

Batting average is to use one of the evaluation criteria for softball or baseball players.

Lesson Flow

1 Review the previous lesson.

2 Find the rate that expresses the degree of crowdedness in a hotel.

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

T/S 3 Read and understand the situation.

S ① Calculate the degree of crowdedness in the Kumul conference room.

S ② Calculate the degree of crowdedness in the Kasawari conference room.

T Confirm students' answers.

3 Important Point

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

4 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

5 Calculate batting average in a softball game.

T/S 4 Read and understand the situation.

S ① Finding the batting average for Henry.

T Further express the answer 0.25 to percentage as 0.25 × 100 = 25 %.

S ② Calculate the batting average for Takale and Sam.

T Instruct and assist students to express their answers as percentages.

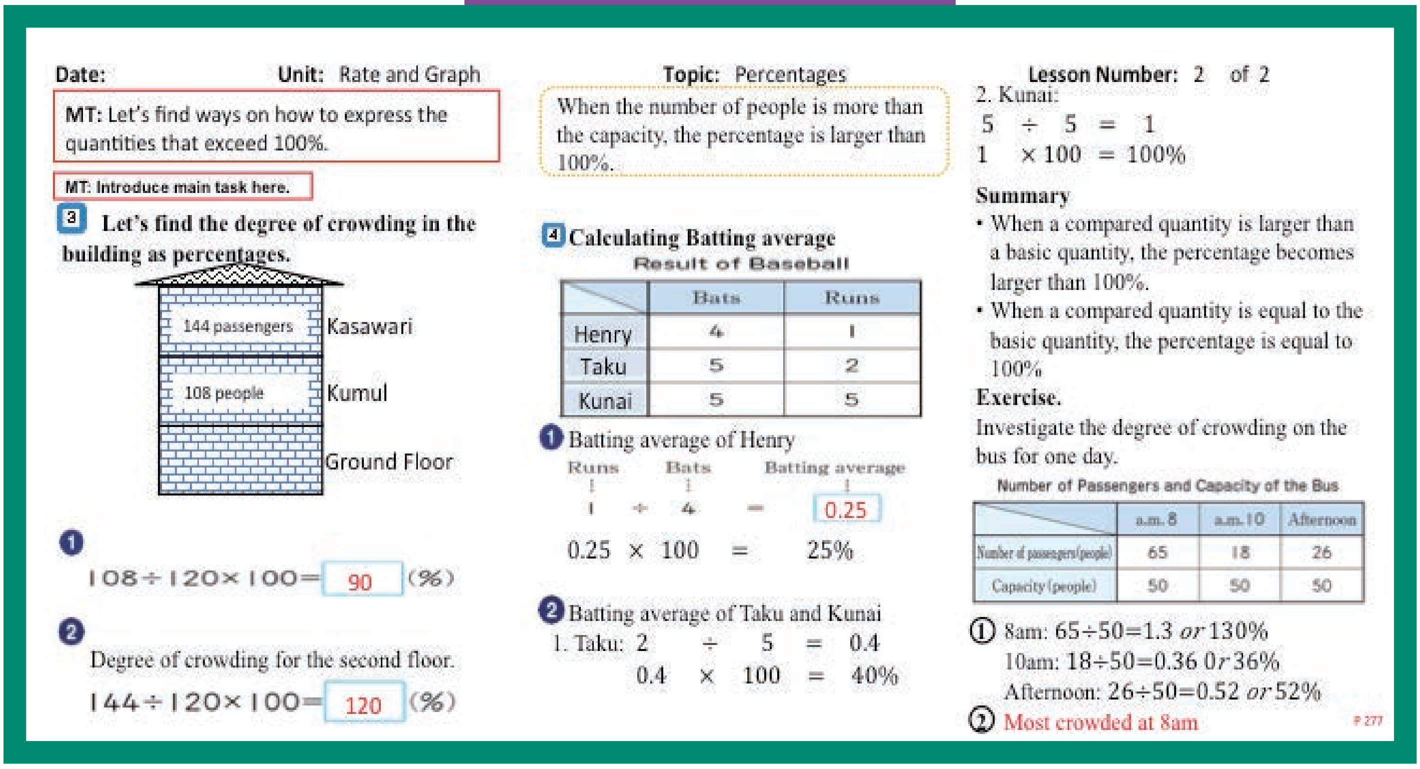
6 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph

Topic: Percentages

Lesson Number: 2 of 2

MT: Let's find ways on how to express the quantities that exceed 100%.

MT: Introduce main task here.

3 **Let's find the degree of crowding in the building as percentages.**

①

108 ÷ 120 × 100 = 90 (%)

②

Degree of crowding for the second floor.

144 ÷ 120 × 100 = 120 (%)

When the number of people is more than the capacity, the percentage is larger than 100%.

4 **Calculating Batting average**

Result of Baseball

	Bats	Runs
Henry	4	1
Taku	5	2
Kunai	5	5

① Batting average of Henry

Runs ÷ Bats = Batting average

1 ÷ 4 = 0.25

0.25 × 100 = 25%

② Batting average of Taku and Kunai

1. Taku: 2 ÷ 5 = 0.4

0.4 × 100 = 40%

2. Kunai:

5 ÷ 5 = 1

1 × 100 = 100%

Summary

- When a compared quantity is larger than a basic quantity, the percentage becomes larger than 100%.
- When a compared quantity is equal to the basic quantity, the percentage is equal to 100%

Exercise.

Investigate the degree of crowding on the bus for one day.

Number of Passengers and Capacity of the Bus

	a.m. 8	a.m. 10	Afternoon
Number of passengers (people)	65	18	26
Capacity (people)	50	50	50

① 8am: 65÷50=1.3 *or* 130%

10am: 18÷50=0.36 0*r* 36%

Afternoon: 26÷50=0.52 *or* 52%

② Most crowded at 8am

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Unit 15

Unit: Rates and Graphs

Sub-unit 3: Problems Using Rates

Lesson 1 of 3

Textbook Page : 200
Actual Lesson 139

Sub-unit Objectives

- To understand how to find compared quantity and basic quantities.
- To deepen ones understanding about how to solve discount problems that involves percentages.

Lesson Objective

- To think about how to find the compared quantity when the base quantity and the rate are given.

Prior Knowledge

- Previous two sub units on 'the rate' and 'percentages'

Preparation

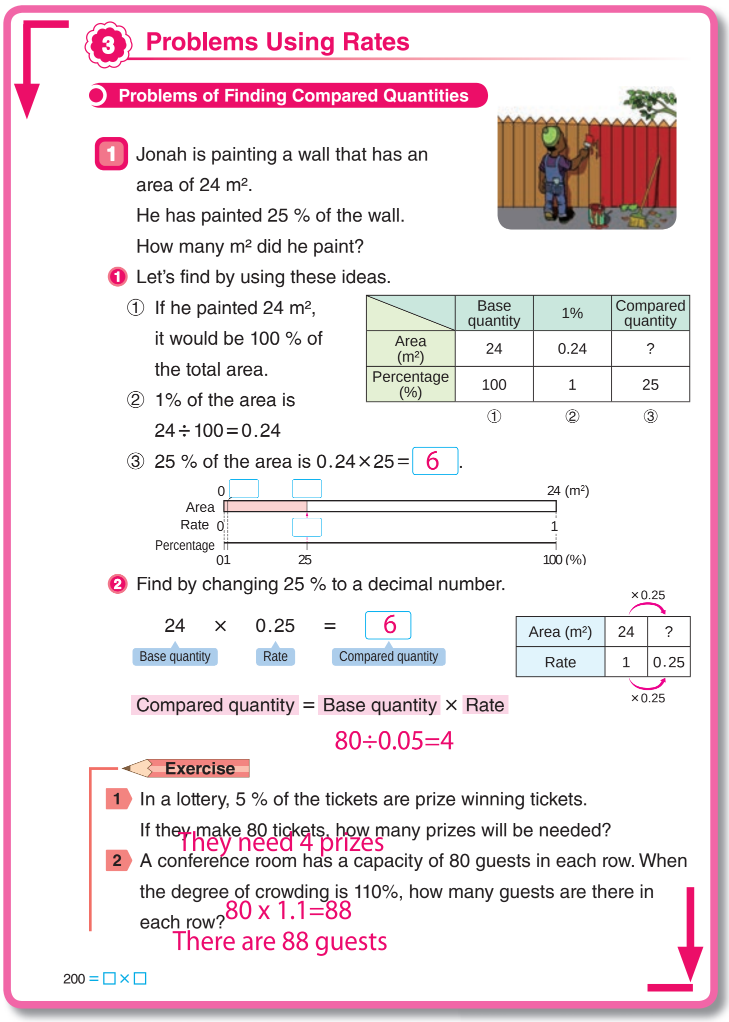
- Chart of the table, tape diagram and number line

Assessment

- Think about how to solve problems using rates. F
- Convert percentage to decimal numbers. F
- Solve the exercises correctly. S

Teacher's Notes

In activity ② remind the students that when changing percentage to decimal numbers, we divide by 100.



③ Problems Using Rates

Problems of Finding Compared Quantities

1 Jonah is painting a wall that has an area of 24 m².
He has painted 25 % of the wall.
How many m² did he paint?

1 Let's find by using these ideas.

① If he painted 24 m², it would be 100 % of the total area.

② 1% of the area is 24÷100=0.24

③ 25 % of the area is 0.24×25= $\boxed{6}$.

	Base quantity	1%	Compared quantity
Area (m²)	24	0.24	?
Percentage (%)	100	1	25
	①	②	③

2 Find by changing 25 % to a decimal number.

24 × 0.25 = $\boxed{6}$
Base quantity, Rate, Compared quantity

Area (m²)	24	?
Rate	1	0.25

×0.25
×0.25

Compared quantity = Base quantity × Rate

80÷0.05=4

Exercise

1 In a lottery, 5 % of the tickets are prize winning tickets.
If they make 80 tickets, how many prizes will be needed?
They need 4 prizes

2 A conference room has a capacity of 80 guests in each row. When the degree of crowding is 110%, how many guests are there in each row?
80 x 1.1=88
There are 88 guests

200 = □×□

Lesson Flow

1 Review the previous lesson.

2 Understand how to find the 'compared quantities'.

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

T/S 1 Read and understand the situation.

S ❶ Find the compared quantity by using the three ideas given.

TN Refer to blackboard plan for calculation.

1. $24\ m^2 = 100\ \%$ of the total area painted.
2. $1\ \%$ of the area painted is $= 24 \div 100 = 0.24$
3. $25\ \%$ of the area is $0.24 \times 25 = 6$

S Use the band graph and the table to help find the compared quantity.

3 Understand how to convert percentage to decimal numbers.

S ❷ Convert 25 % into decimal number and solve the problem.

TN Students can find the compared or partial quantity using the formula

Compared quantity = Base quantity × rate

4 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

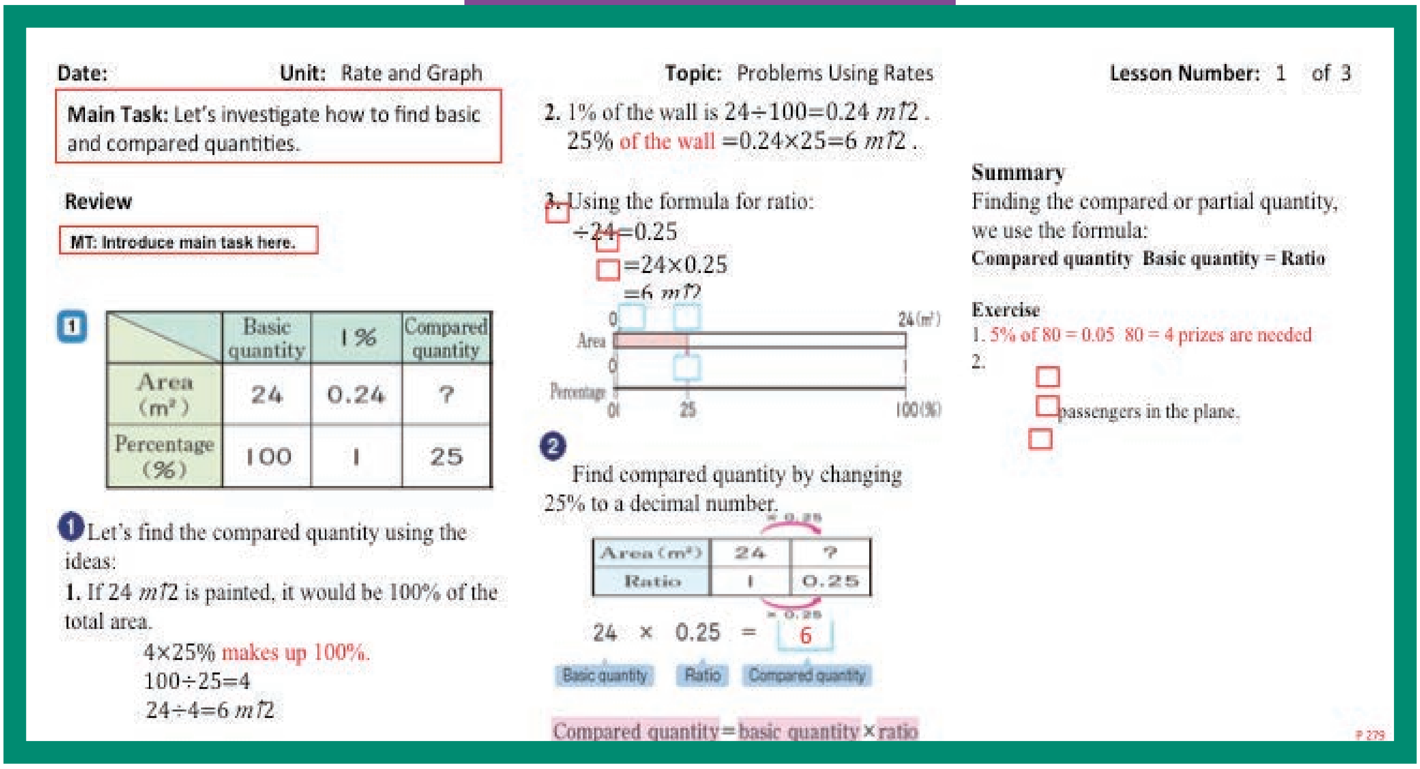
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Problems Using Rates **Lesson Number:** 1 of 3

Main Task: Let's investigate how to find basic and compared quantities.

Review

MT: Introduce main task here.

1

	Basic quantity	1 %	Compared quantity
Area (m²)	24	0.24	?
Percentage (%)	100	1	25

❶ Let's find the compared quantity using the ideas:

1. If 24 m↑2 is painted, it would be 100% of the total area.

4×25% makes up 100%.
100÷25=4
24÷4=6 m↑2

2. 1% of the wall is 24÷100=0.24 m↑2 .
25% of the wall =0.24×25=6 m↑2 .

~~3.~~ Using the formula for ratio:
☐÷24=0.25
☐=24×0.25
=6 m↑2

❷

Find compared quantity by changing 25% to a decimal number.

Area (m²)	24	?
Ratio	1	0.25

24 × 0.25 = 6

Basic quantity Ratio Compared quantity

Compared quantity = basic quantity × ratio

Summary
Finding the compared or partial quantity, we use the formula:
Compared quantity Basic quantity = Ratio

Exercise
1. 5% of 80 = 0.05 80 = 4 prizes are needed
2.
☐
☐passengers in the plane.
☐

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Unit 15

Unit: Rates and Graphs

Sub-unit 3: Problems Using Rates

Lesson 2 of 3

Textbook Page : 201
Actual Lesson 140

Lesson Objective

- To think about how to find compared quantities in the problems which involves rate.

Prior Knowledge

- Problems of finding compared quantities

Preparation

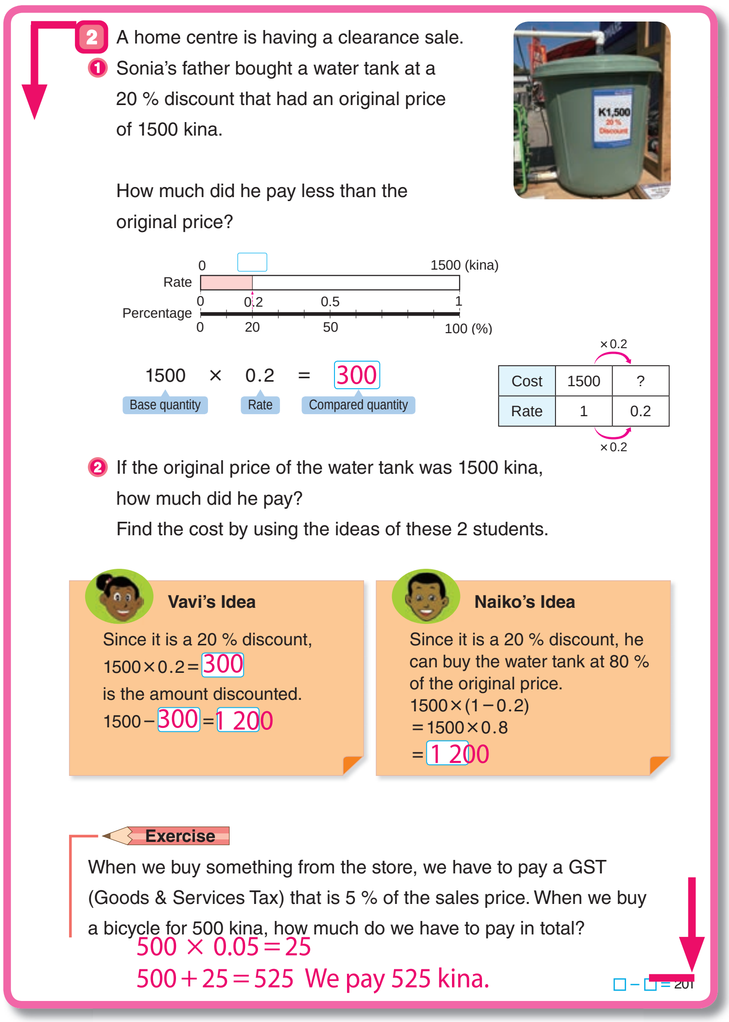
- Advertising leaflets and posters including descriptions about discounted items

Assessment

- Understand and explain the meaning of discount in a quantity. **F**
- Calculate the discounted quantity from a basic quantity using the formula 'base quantity × rate = compared quantity. **F**
- Solve the exercises correctly. **S**

Teacher's Notes

The compared quantity can be calculated as 'Base quantity × Rate = Compared quantity.'



2 A home centre is having a clearance sale.

① Sonia's father bought a water tank at a 20 % discount that had an original price of 1500 kina.

How much did he pay less than the original price?

1500 × 0.2 = 300

Base quantity | Rate | Compared quantity

×0.2

Cost	1500	?
Rate	1	0.2

×0.2

② If the original price of the water tank was 1500 kina, how much did he pay?
Find the cost by using the ideas of these 2 students.

Vavi's Idea

Since it is a 20 % discount,
1500 × 0.2 = 300
is the amount discounted.
1500 − 300 = 1 200

Naiko's Idea

Since it is a 20 % discount, he can buy the water tank at 80 % of the original price.
1500 × (1 − 0.2)
= 1500 × 0.8
= 1 200

Exercise

When we buy something from the store, we have to pay a GST (Goods & Services Tax) that is 5 % of the sales price. When we buy a bicycle for 500 kina, how much do we have to pay in total?

500 × 0.05 = 25
500 + 25 = 525 We pay 525 kina.

Lesson Flow

1 Review the previous lesson.

2 Find discount amount using the formula 'base quantity × rate = compared quantity'.

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

T/S 2 Read and understand the situation.

T Assist students to identify the known quantities in the problem:

1. The base quantity.
2. Percentage of the amount that was discounted from the original price.

S ① Think about how much less Sonia's mother paid than the original price.

T Ask students to work out the discounted amount using the band graph and the table.

S Represent 20 % of 1500 kina.

T Confirm students' answers.

3 ② Find the amount paid after discount.

S Think about how to find the amount paid after discounts.

T Let students to share Vavi's and Naiko's ideas to help them find the ways of calculation.

S Calculate the amount paid after discount using the ideas.

3 Complete the Exercise

S Solve the exercise.

T Confirm students' answers.

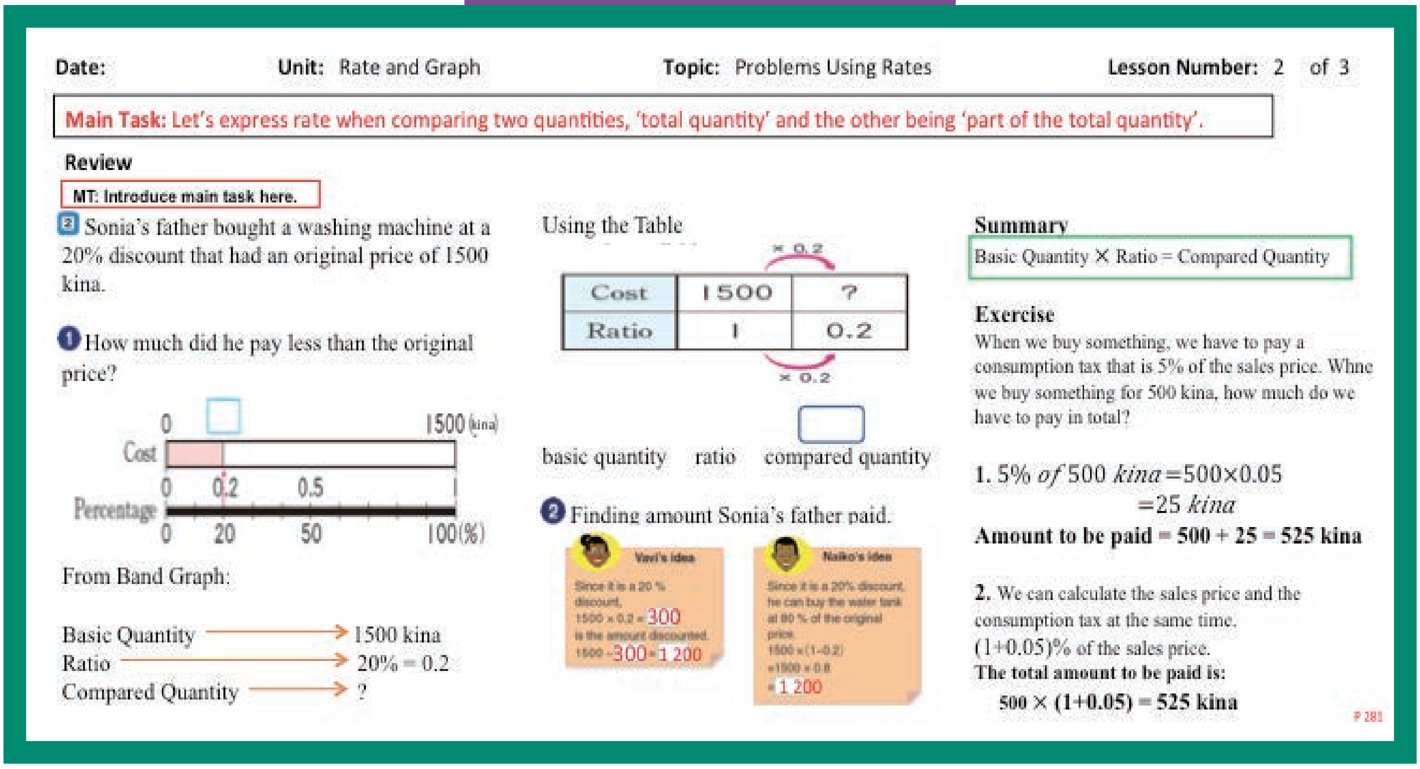
4 Summary

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: **Unit:** Rate and Graph **Topic:** Problems Using Rates **Lesson Number:** 2 of 3

Main Task: Let's express rate when comparing two quantities, 'total quantity' and the other being 'part of the total quantity'.

Review

MT: Introduce main task here.

2 Sonia's father bought a washing machine at a 20% discount that had an original price of 1500 kina.

① How much did he pay less than the original price?

From Band Graph:

Basic Quantity → 1500 kina
Ratio → 20% = 0.2
Compared Quantity → ?

Using the Table

Cost	1500	?
Ratio	1	0.2

× 0.2
× 0.2

basic quantity ratio compared quantity

② Finding amount Sonia's father paid.

Vavi's idea

Since it is a 20 % discount,
1500 × 0.2 = 300
is the amount discounted.
1500 − 300 = 1 200

Naiko's idea

Since it is a 20% discount, he can buy the water tank at 80 % of the original price.
1500 × (1−0.2)
= 1500 × 0.8
= 1 200

Summary

Basic Quantity × Ratio = Compared Quantity

Exercise

When we buy something, we have to pay a consumption tax that is 5% of the sales price. Whne we buy something for 500 kina, how much do we have to pay in total?

1. 5% *of* 500 *kina* = 500×0.05
= 25 *kina*

Amount to be paid = 500 + 25 = 525 kina

2. We can calculate the sales price and the consumption tax at the same time.
(1+0.05)% of the sales price.
The total amount to be paid is:
500 × (1+0.05) = 525 kina

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Unit 15

Unit: Rates and Graphs

Sub-unit 3: Problems Using Rates

Lesson 3 of 3

Textbook Page : 202
Actual Lesson 141

Lesson Objective

- To think about how to find base quantities when compared quantities and rates are made known.

Prior Knowledge

- Calculating the discounted quantity

Preparation

- Tape diagram, number line and tables

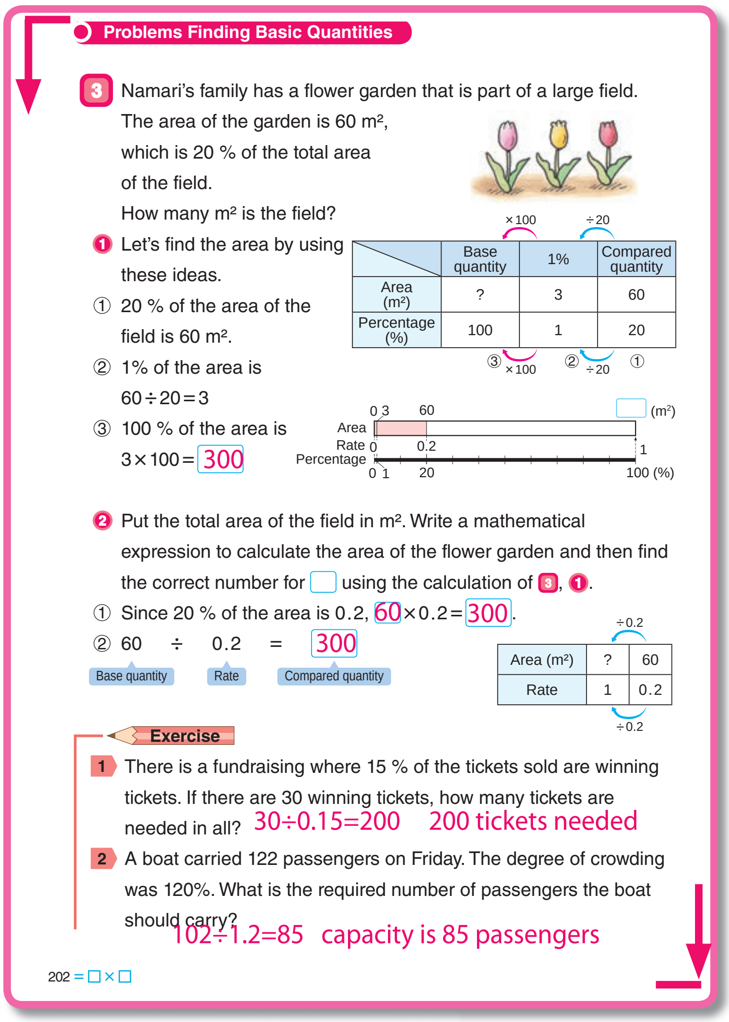
Assessment

- Calculate basic quantity when compared quantity and rate is given. F
- Solve the exercises correctly. S

Teacher's Notes

Rearranging the formula from the prevoius lesson, the Base quantity can be calculated as,

Compared Quantity ÷ Rate = Base Quantity



Problems Finding Basic Quantities

3 Namari's family has a flower garden that is part of a large field. The area of the garden is 60 m², which is 20 % of the total area of the field. How many m² is the field?

1 Let's find the area by using these ideas.

① 20 % of the area of the field is 60 m².

② 1% of the area is

60 ÷ 20 = 3

③ 100 % of the area is

3 × 100 = 300

× 100 ÷ 20

	Base quantity	1%	Compared quantity
Area (m²)	?	3	60
Percentage (%)	100	1	20

③ × 100 ② ÷ 20 ①

2 Put the total area of the field in m². Write a mathematical expression to calculate the area of the flower garden and then find the correct number for ☐ using the calculation of 3, 1.

① Since 20 % of the area is 0.2, 60 × 0.2 = 300.

② 60 ÷ 0.2 = 300

Base quantity Rate Compared quantity

÷0.2

Area (m²)	?	60
Rate	1	0.2

÷0.2

Exercise

1 There is a fundraising where 15 % of the tickets sold are winning tickets. If there are 30 winning tickets, how many tickets are needed in all? 30÷0.15=200 200 tickets needed

2 A boat carried 122 passengers on Friday. The degree of crowding was 120%. What is the required number of passengers the boat should carry? 102÷1.2=85 capacity is 85 passengers

202 = ☐ × ☐

Lesson Flow

1 Review the previous lesson.

2 Problems Finding Base Quantity.

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

T/S ③ Read and understand the situation.

T Assist students to identify the known quantities, compared quantity and rate.

S Identify from the table that compared quantity is 60 m^2 and rate is 20 %.

S ① Find the area of the field using the three ideas.

1. 20 of the area of the field is 60 m^2.
2. 1 % of the area is $60 \div 20 = 3$ m^2
3. 100 % of the area is $3 \times 100 = 300$ m^2

T Confirm the three ideas above with the band graph and the table.

3 Calculate the area of the field (Base Quantity).

S ② Write an expression to calculate the area of the flower garden.

T Assist students to write the expression using the formula 'compared quantity ÷ rate = base quantity.

S Since 20 % of the area is 0.2, $\boxed{} \times 0.2 = \boxed{}$

2.60	÷	0.2	=	300 m^2
Compared quantity		Rate		Base Quantity

4 Complete the Exercise

S Solve the exercises.

T Confirm students' answers.

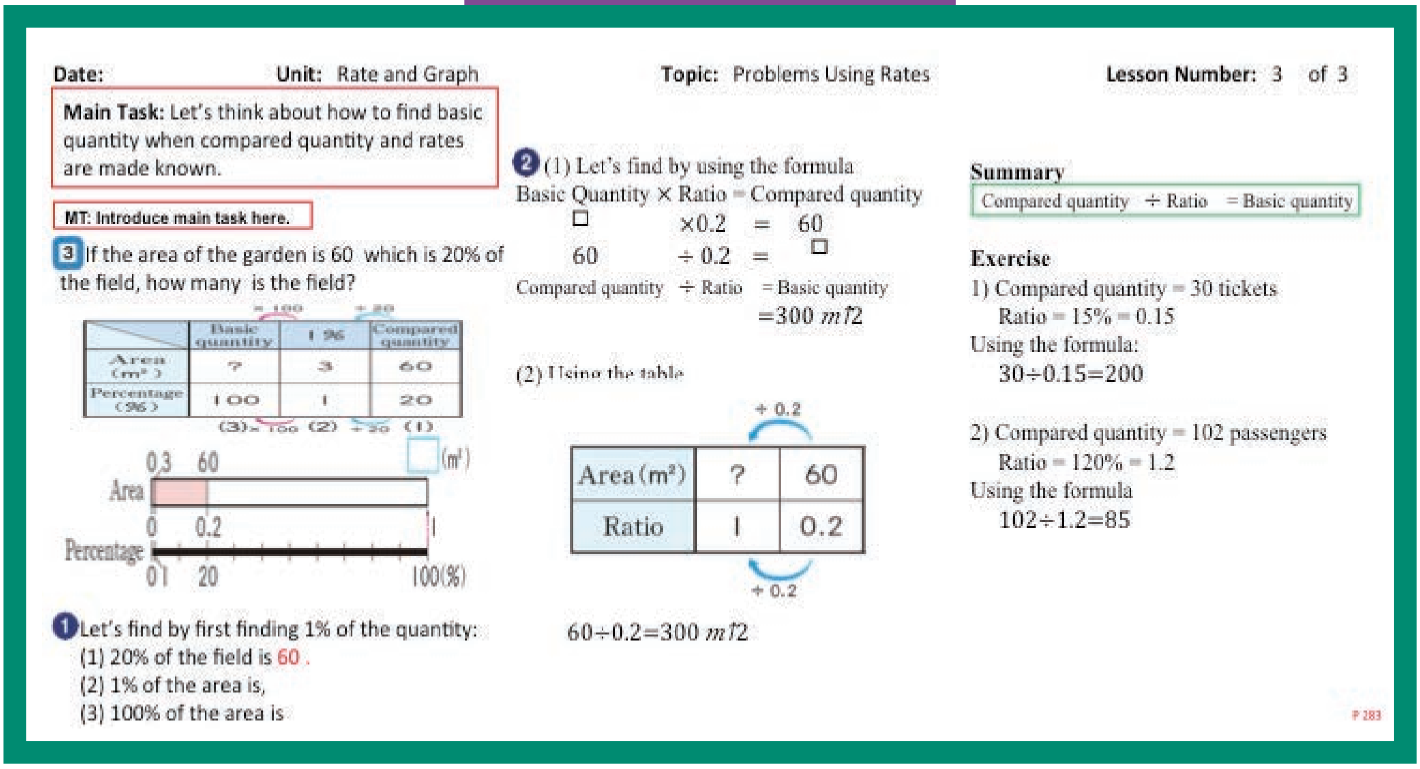
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Problems Using Rates **Lesson Number:** 3 of 3

Main Task: Let's think about how to find basic quantity when compared quantity and rates are made known.

MT: Introduce main task here.

③ If the area of the garden is 60 which is 20% of the field, how many is the field?

	Basic quantity	1 %	Compared quantity
Area (m^2)	?	3	60
Percentage (%)	100	1	20

① Let's find by first finding 1% of the quantity:
(1) 20% of the field is 60 .
(2) 1% of the area is,
(3) 100% of the area is

② (1) Let's find by using the formula
Basic Quantity × Ratio = Compared quantity
$\square \times 0.2 = 60$
$60 \div 0.2 = \square$
Compared quantity ÷ Ratio = Basic quantity
=300 $m↑2$

(2) Using the table

Area (m^2)	?	60
Ratio	1	0.2

60÷0.2=300 $m↑2$

Summary
Compared quantity ÷ Ratio = Basic quantity

Exercise
1) Compared quantity = 30 tickets
Ratio = 15% = 0.15
Using the formula:
30÷0.15=200

2) Compared quantity = 102 passengers
Ratio = 120% = 1.2
Using the formula
102÷1.2=85

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Unit 15

Unit: Rates and Graphs

Sub-unit 4: Graphs Expressing Rates

Lesson 1 of 2

Textbook Page :
203 and 204
Actual Lesson 142

Sub-unit Objective

- To understand the meaning and how to read and draw a band graph and circle graph.

Lesson Objectives

- To understand the meaning and features of a band graph.
- To understand how to read and draw a band graph.

Prior Knowledge

- Simple band graphs

Preparation

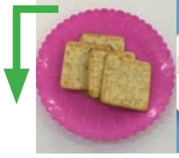
- Band graphs and tables
- Simple calculator

Assessment

- Understand and explain the features of a band graph. **F**
- Read and draw a band graph. **S**

Teacher's Notes

- There could be students answer as 80 % for the choice of bread which is incorrect. Measure the lengths for each band separately to get the percentages.
- Teacher should follow up with students who may make this mistake and advise them to write in mathematical expressions with subtraction.


Biscuit


Bread

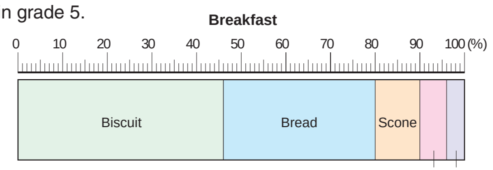

Scone


Noodles

4 Graphs Expressing Rates

Band Graph

1 The graph below shows the result of breakfast taken by students in grade 5.



① What is the percentage of biscuit compared to the total number of students? 46 %

② What percentage is bread, cereal and noodles compared to the total number of students, respectively?

Bread 34 %, Scone10 %, Noodles 6 %

③ There are 50 students in the grade 5.
Let's find the number of students for each type.

Biscuit 23, Bread 17, Scone 5, Noodles 3, Others 2

A graph that expresses the total as a rectangle-like band is called **band graph**.
With a band graph, it is easy to see the rate of each part of the total because the size of each part is shown by the area of its rectangle.

How to Draw a Band Graph

2 The tables below show the types of traffic accidents causes by students in Eriku, Lae.
Let's draw band graphs to express these numbers.

Causes of Accidents in Grade 1

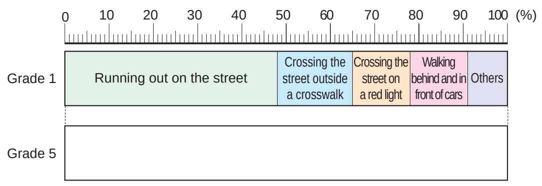
Cause	Number of students	Percentage (%)
Running out on the street	11	48
Crossing the street outside a crosswalk	4	17
Crossing the street on a red light	3	13
Walking behind and in front of cars	3	13
Others	2	9
Total	23	100

Causes of Accidents in Grade 5

Cause	Number of students	Percentage (%)
Running out on the street	8	29
Crossing the street outside a crosswalk	9	32
Crossing the street on a red light	4	14
Walking behind and in front of cars	2	7
Others	5	18
Total	28	100

① Let's find the rate of each cause of accidents to the nearest hundredth by rounding to the thousandth.
Then find each percentage and write them in the table.

② Draw a band graph of the grade 5.
Other is drawn last even if it is a large number.



③ Let's discuss your findings based on the two band graphs.

Lesson Flow

1 Review the previous lesson.

2 Understanding the meaning and how to read a band graph.

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

T/S 1 Read and understand the situation.

TN Questions teacher should ask to lead up in understanding the graph:

- What is this graph trying to examine? (Various kinds of breakfast students like)
- What are the kinds of breakfast examined and how many kinds? (There 5 types, namely, biscuit, bread, scone and noodles)
- How can we compare the rate of each part? (We can compare based on the size of each rectangular or band-like sections. The heights the same s we basically look at the width)

3 Find the percentage of each type of breakfast using the band graph.

S ① Based on the graph, find the percentage of rice compared to the total number of students.

T Confirm how students find the answer as 46 % using the graph.

S ② Find the percentage of bread, scone and noodles compared to the total number of children, respectively.

TN Bread: 80 − 46 = 34 %, scone: 90 − 80 = 10 % and noodles 96 − 90 = 6 %

T ③ If there are 50 students in Grade 5, let's find the number of students for each type?

S Before calculating, identify the compared and base quantity. The rate is found in ① and ②.

S Using the equation 'base quantity × rate = compared quantity, find the number of children for each type.

TN Biscuit: 50 × 0.46 = 23, bread: 50 × 0.34 = 17, scone: 50 × 0.1 = 5 noodles: 50 × 0.06 = 3

4 Important Point

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

5 Find the rate of quantities.

T/S 2 Read and understand the situation.

S ① Read the situation and find the percentage of students for each cause of accident.

TN Assist students to use the formula 'compared quantity ÷ base quantity × 100 = percentage'. e.g. for first grade in the first table, 11 ÷ 23 × 100 = 48 % or 11 ÷ 23 = 0.48 × 100 = 48 %

6 Draw a band graph using the information in the completed table from ①.

T Let students to determine how big the graph should be according to the information given.

S ② Construct the graph.

TN The graph should contain a title, scales, colour each rectangular section with a different colour pencil and label each section corresponding to each cause of accident.

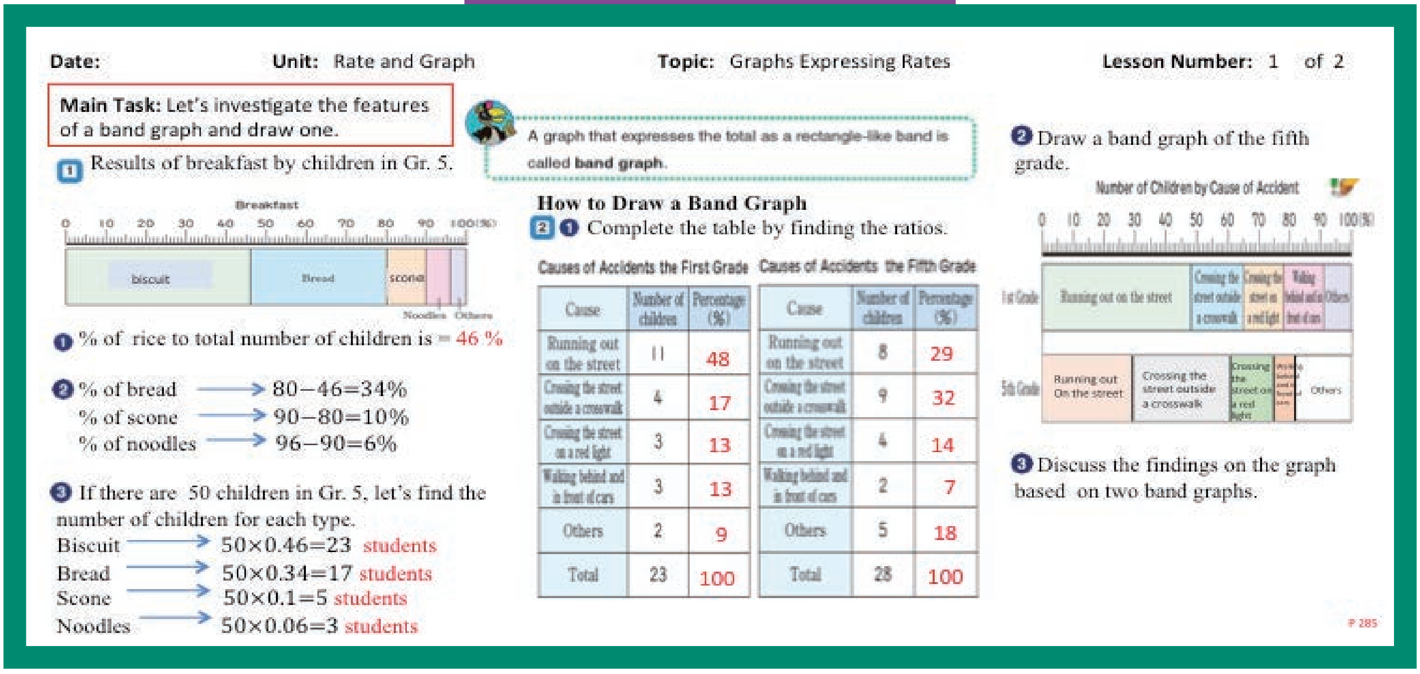
7 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Graphs Expressing Rates **Lesson Number:** 1 of 2

Main Task: Let's investigate the features of a band graph and draw one.

1 Results of breakfast by children in Gr. 5.

① % of rice to total number of children is = 46 %

② % of bread → 80−46=34%
% of scone → 90−80=10%
% of noodles → 96−90=6%

③ If there are 50 children in Gr. 5, let's find the number of children for each type.
Biscuit → 50×0.46=23 students
Bread → 50×0.34=17 students
Scone → 50×0.1=5 students
Noodles → 50×0.06=3 students

A graph that expresses the total as a rectangle-like band is called **band graph**.

How to Draw a Band Graph

2 ① Complete the table by finding the ratios.

Causes of Accidents the First Grade

Cause	Number of children	Percentage (%)
Running out on the street	11	48
Crossing the street outside a crosswalk	4	17
Crossing the street on a red light	3	13
Walking behind and in front of cars	3	13
Others	2	9
Total	23	100

Causes of Accidents the Fifth Grade

Cause	Number of children	Percentage (%)
Running out on the street	8	29
Crossing the street outside a crosswalk	9	32
Crossing the street on a red light	4	14
Walking behind and in front of cars	2	7
Others	5	18
Total	28	100

② Draw a band graph of the fifth grade.

③ Discuss the findings on the graph based on two band graphs.

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Unit 15

Unit: Rates and Graphs

Sub-unit 4: Graphs Expressing Rates

Lesson 2 of 2

Textbook Page : 205 and 206
Actual Lesson 143

Lesson Objectives

- To understand the meaning and features of a circle graph
- To understand how to read and draw a circle graph.

Assessment

- Understand and explain the meaning of circle graphs. F
- Construct a circle graph. S

Prior Knowledge

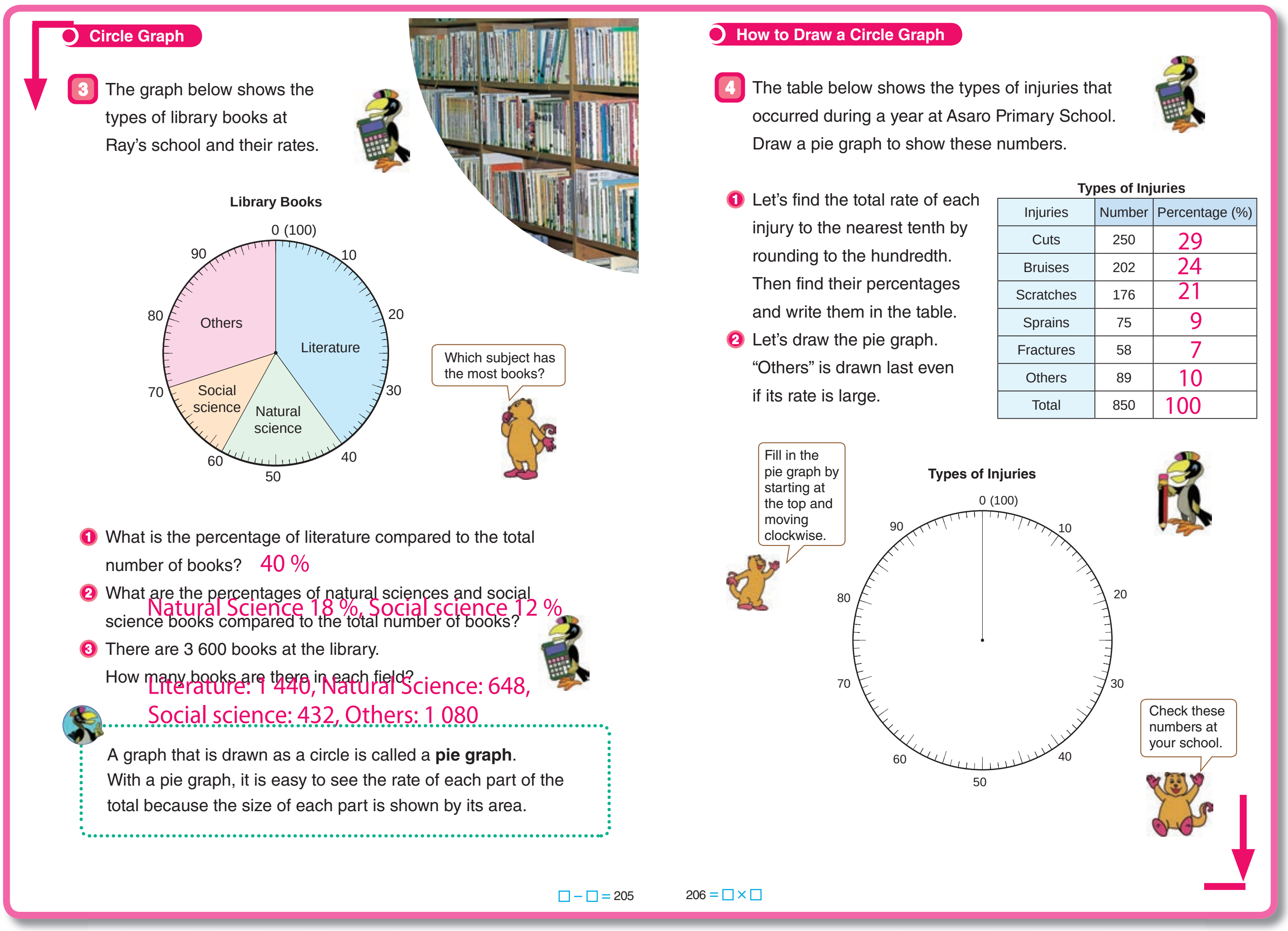
- The rate, equation of rates

Preparation

- Circle graph paper with 100 scale, basic calculator and chart on kinds of injury.

Teacher's Notes

- We can compare circle graphs based on the size of each section separated by two lines drawn towards the centre (radius).
- We read the scale written around the circumference.



Circle Graph

3 The graph below shows the types of library books at Ray's school and their rates.

① What is the percentage of literature compared to the total number of books? 40 %

② What are the percentages of natural sciences and social science books compared to the total number of books? Natural Science 18 %, Social science 12 %

③ There are 3 600 books at the library. How many books are there in each field? Literature: 1 440, Natural Science: 648, Social science: 432, Others: 1 080

A graph that is drawn as a circle is called a **pie graph**.
With a pie graph, it is easy to see the rate of each part of the total because the size of each part is shown by its area.

How to Draw a Circle Graph

4 The table below shows the types of injuries that occurred during a year at Asaro Primary School. Draw a pie graph to show these numbers.

① Let's find the total rate of each injury to the nearest tenth by rounding to the hundredth. Then find their percentages and write them in the table.

② Let's draw the pie graph. "Others" is drawn last even if its rate is large.

Types of Injuries

Injuries	Number	Percentage (%)
Cuts	250	29
Bruises	202	24
Scratches	176	21
Sprains	75	9
Fractures	58	7
Others	89	10
Total	850	100

□ − □ = 205 206 = □ × □

Lesson Flow

1 Review the previous lesson.

2 Understanding the meaning and how to read a circle graph.

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

T Put up the circle graph on the blackboard with its word problem.

T/S 3 Read and understand the situation.

S ① Find the percentage of literature compared to the total number of books using the circle graph.

S ② Find the percentages of Natural Science and Social Science compared to the total number of books. Natural Science $= 58 - 40 = 18$ % and Social Science $= 70 - 58 = 12$ %

T Confirm students' answers for ① and ② using the circle graph.

S ③ Find how many books are there in each field if there are 3 600 books at the library.

TN Let students to use the formula 'base quantity × rate = compared quantity'

S Literature, $3600 \times 0.4 = 1440$, Natural Science, $3600 \times 0.18 = 648$, Social Science, $3600 \times 0.12 = 432$ and Others are $3600 \times 0.3 = 1080$

3 Important Point

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

4 How to draw a Circle Graph

T/S 4 Read and understand the situation.

S ① Complete the table by finding the rate to the nearest tenth by rounding to the nearest hundredth.

TN Using the formula compare quantity ÷ base quantity = ☐ × 100.
e.g. for the first one, in the table is cuts where $250 \div 850 = 0.29 \times 100 = 29$ %.

S ② Draw a circle graph of kinds of injury using the information from the completed table in ①.

T Confirm students' answers.

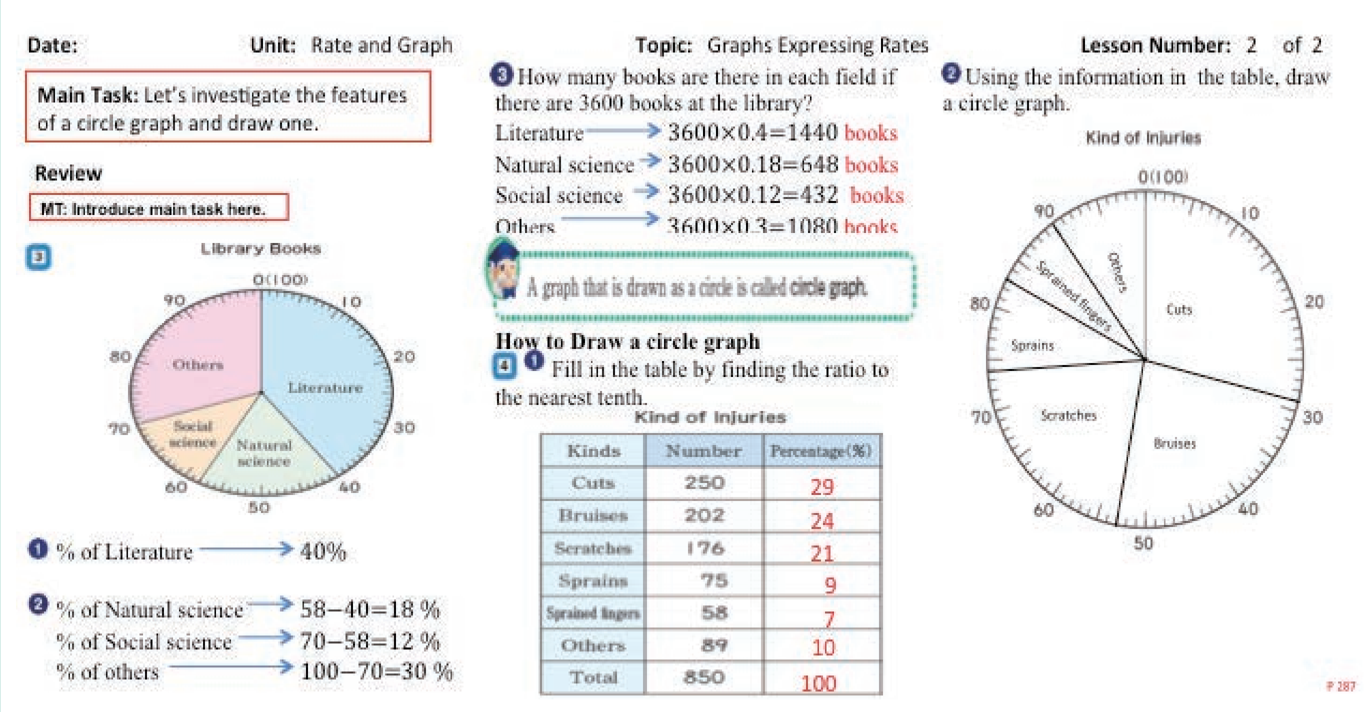
5 Summary

T What have you learned in this lesson?

S Present ideas on what they have learned.

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

Sample Blackboard Plan



Date: **Unit:** Rate and Graph **Topic:** Graphs Expressing Rates **Lesson Number:** 2 of 2

Main Task: Let's investigate the features of a circle graph and draw one.

Review

MT: Introduce main task here.

3

① % of Literature → 40%

② % of Natural science → 58−40=18 %
% of Social science → 70−58=12 %
% of others → 100−70=30 %

③ How many books are there in each field if there are 3600 books at the library?
Literature → 3600×0.4=1440 books
Natural science → 3600×0.18=648 books
Social science → 3600×0.12=432 books
Others → 3600×0.3=1080 books

A graph that is drawn as a circle is called circle graph.

How to Draw a circle graph

4 ① Fill in the table by finding the ratio to the nearest tenth.

Kind of Injuries

Kinds	Number	Percentage(%)
Cuts	250	29
Bruises	202	24
Scratches	176	21
Sprains	75	9
Sprained fingers	58	7
Others	89	10
Total	850	100

② Using the information in the table, draw a circle graph.

Unit 15

Unit: Rates and Graphs

Exercise and Evaluation

Lesson 1 and 2 of 2

Textbook Page : 207
Actual Lesson 144 and 145

Lesson Objective

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

Prior Knowledge

- All the contents covered in this unit

Preparation

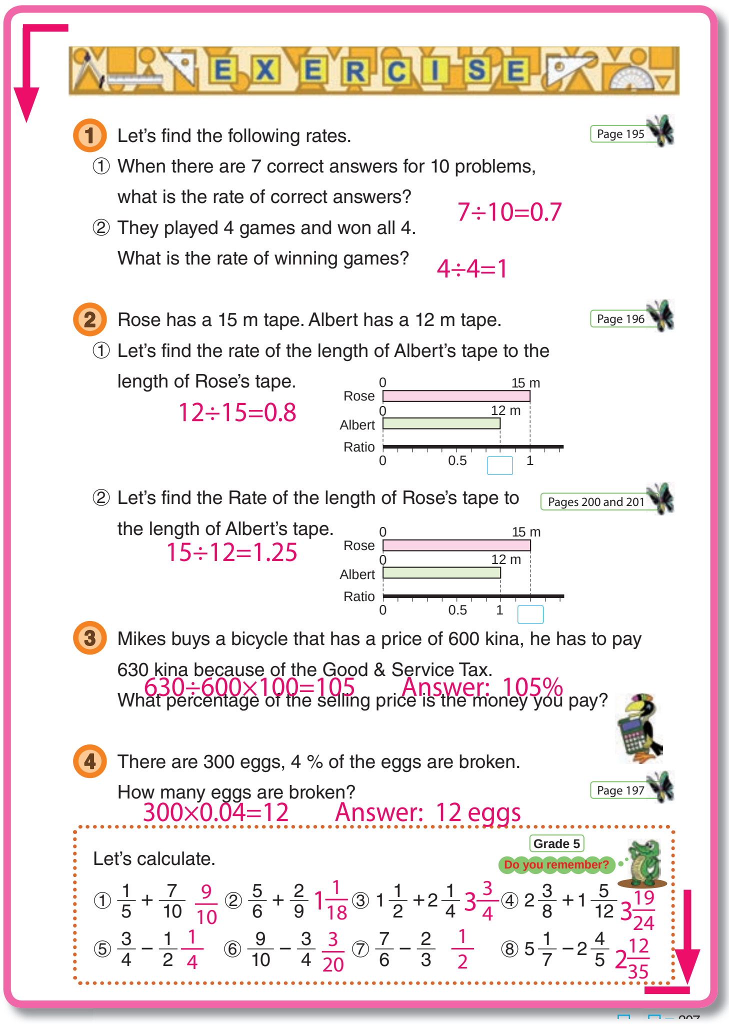
- Evaluation test copy for each student

Assessment

- Complete the Exercise correctly. S

Teacher's Notes

This is the last lesson of Chapter 15. Students should be encouraged to use the necessary skills learned in this unit to complete all the Exercises in preparation for the evaluation test.
The test can be conducted as assesment for your class after completing all the exercises.
Use the attached evaluation test to conduct assesment for your class after finishing all the exercises and problems as a seperate lesson.



EXERCISE

① Let's find the following rates. Page 195

① When there are 7 correct answers for 10 problems, what is the rate of correct answers? 7÷10=0.7

② They played 4 games and won all 4. What is the rate of winning games? 4÷4=1

② Rose has a 15 m tape. Albert has a 12 m tape. Page 196

① Let's find the rate of the length of Albert's tape to the length of Rose's tape. 12÷15=0.8

② Let's find the Rate of the length of Rose's tape to the length of Albert's tape. Pages 200 and 201 15÷12=1.25

③ Mikes buys a bicycle that has a price of 600 kina, he has to pay 630 kina because of the Good & Service Tax. What percentage of the selling price is the money you pay?
630÷600×100=105 Answer: 105%

④ There are 300 eggs, 4 % of the eggs are broken. How many eggs are broken? Page 197
300×0.04=12 Answer: 12 eggs

Let's calculate. Grade 5 Do you remember?

① $\frac{1}{5}+\frac{7}{10}$ $\frac{9}{10}$ ② $\frac{5}{6}+\frac{2}{9}$ $1\frac{1}{18}$ ③ $1\frac{1}{2}+2\frac{1}{4}$ $3\frac{3}{4}$ ④ $2\frac{3}{8}+1\frac{5}{12}$ $3\frac{19}{24}$

⑤ $\frac{3}{4}-\frac{1}{2}$ $\frac{1}{4}$ ⑥ $\frac{9}{10}-\frac{3}{4}$ $\frac{3}{20}$ ⑦ $\frac{7}{6}-\frac{2}{3}$ $\frac{1}{2}$ ⑧ $5\frac{1}{7}-2\frac{4}{5}$ $2\frac{12}{35}$

Lesson Flow

1 Complete the Exercise

S Solve all the exercises.

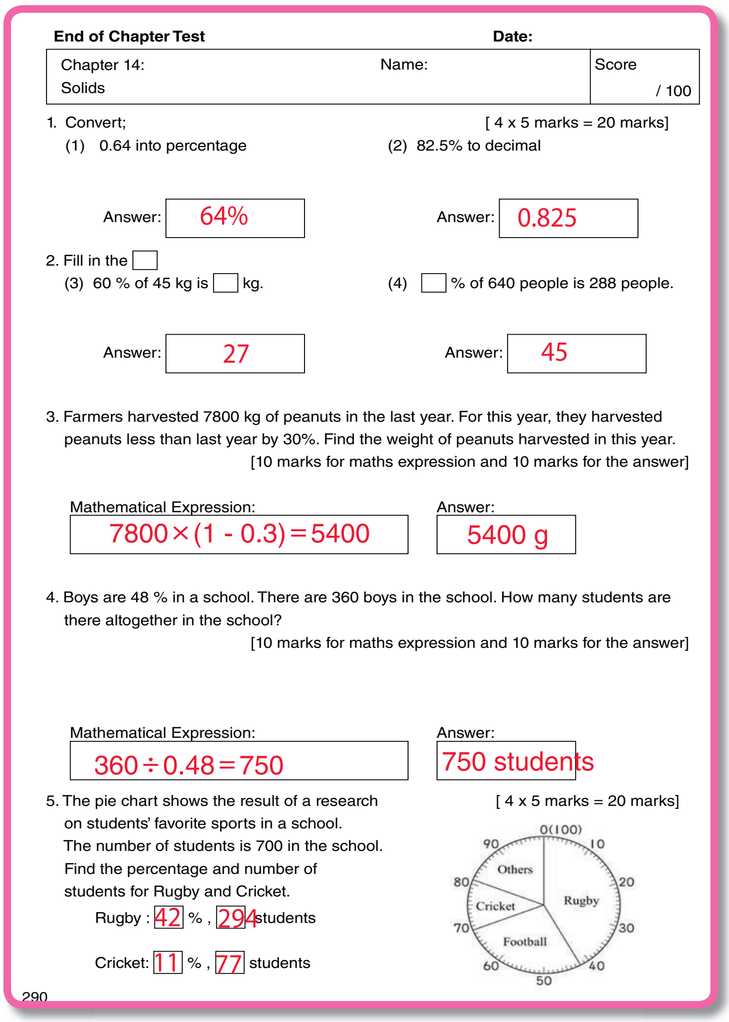
T Confirm students' answers.

TN ① Finding rates.
② Word problem involving rates.
③ Finding the percentage of selling price.
④ Deriving rate from the word problem.

2 Complete the Evaluation Test

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

S Complete the Evaluation Test.



End of Chapter Test **Date:**

Chapter 14: Solids	Name:	Score / 100

1. Convert; [4 x 5 marks = 20 marks]

(1) 0.64 into percentage

Answer: 64%

(2) 82.5% to decimal

Answer: 0.825

2. Fill in the ☐

(3) 60 % of 45 kg is ☐ kg.

Answer: 27

(4) ☐ % of 640 people is 288 people.

Answer: 45

3. Farmers harvested 7800 kg of peanuts in the last year. For this year, they harvested peanuts less than last year by 30%. Find the weight of peanuts harvested in this year.
[10 marks for maths expression and 10 marks for the answer]

Mathematical Expression: 7800 × (1 - 0.3) = 5400

Answer: 5400 g

4. Boys are 48 % in a school. There are 360 boys in the school. How many students are there altogether in the school?
[10 marks for maths expression and 10 marks for the answer]

Mathematical Expression: 360 ÷ 0.48 = 750

Answer: 750 students

5. The pie chart shows the result of a research on students' favorite sports in a school. The number of students is 700 in the school. Find the percentage and number of students for Rugby and Cricket. [4 x 5 marks = 20 marks]

Rugby : 42 % , 294 students

Cricket: 11 % , 77 students

290

End of Chapter Test **Date:**

Chapter 15: Rates and Graphs	Name:	Score / 100

1. Convert; [4×5 marks = 20 marks]

(1) 0.64 into percentage

Answer: ☐

(2) 82.5 % to decimal

Answer: ☐

2. Fill in the ☐

(3) 60 % of 45 kg is ☐ kg.

Answer: ☐

(4) ☐ % of 640 people is 288 people.

Answer: ☐

3. Farmers harvested 7800 kg of peanuts in the last year. For this year, they harvested peanuts less than last year by 30 %. Find the weight of peanuts harvested in this year.

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

Mathematical Expression: ☐

Answer: ☐

4. Boys are 48 % in a school. There are 360 boys in the school.
How many students are there altogether in the school?

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

Mathematical Expression: ☐

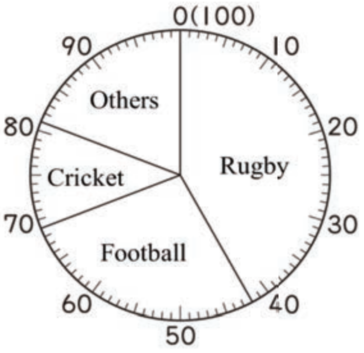
Answer: ☐

5. The pie chart shows the result of a research on students' favorite sports in a school.
The number of students is 700 in the school.
Find the percentage and number of students for Rugby and Cricket.

[4×5 marks = 20 marks]

Rugby: ☐ %, ☐ students

Cricket: ☐ %, ☐ students

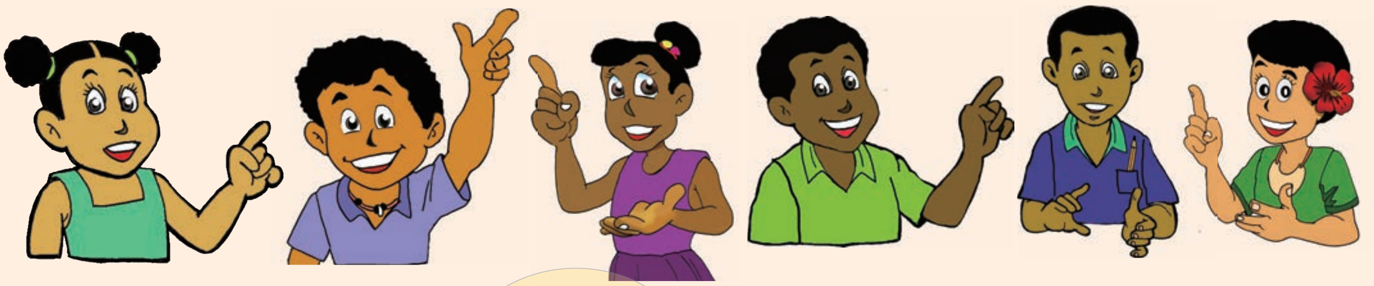


Chapter 16 Summary of Grade 5

This chapter is a summary of all the contents in Grade 5.

It is important for the students to acquire the mathematical knowledge and skills in Grade 5. Students have used various procedures and processes to deepen their understanding of mathematical concepts in problem solving and calculation methods in this grade level.

Various problems learned in Grade 5 are included in this chapter, so give sufficient time to students to solve all the problems.



Decimal Numbers and Whole Numbers

Multiplication of Decimal Numbers

Amount per Unit Quantity

Division of Decimal Numbers

Volume

Area of Figure

Rates and Graphs

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 5
Topic 1: Applying Mathematics in Daily Life
Lesson 1 of 5

Textbook Page : 208 and 209
Actual Lesson 146

Lesson Objective

- To relate and apply mathematical knowledge to daily life.

Prior Knowledge

- Large numbers, Multiplication of decimal numbers

Preparation

- A table for 1

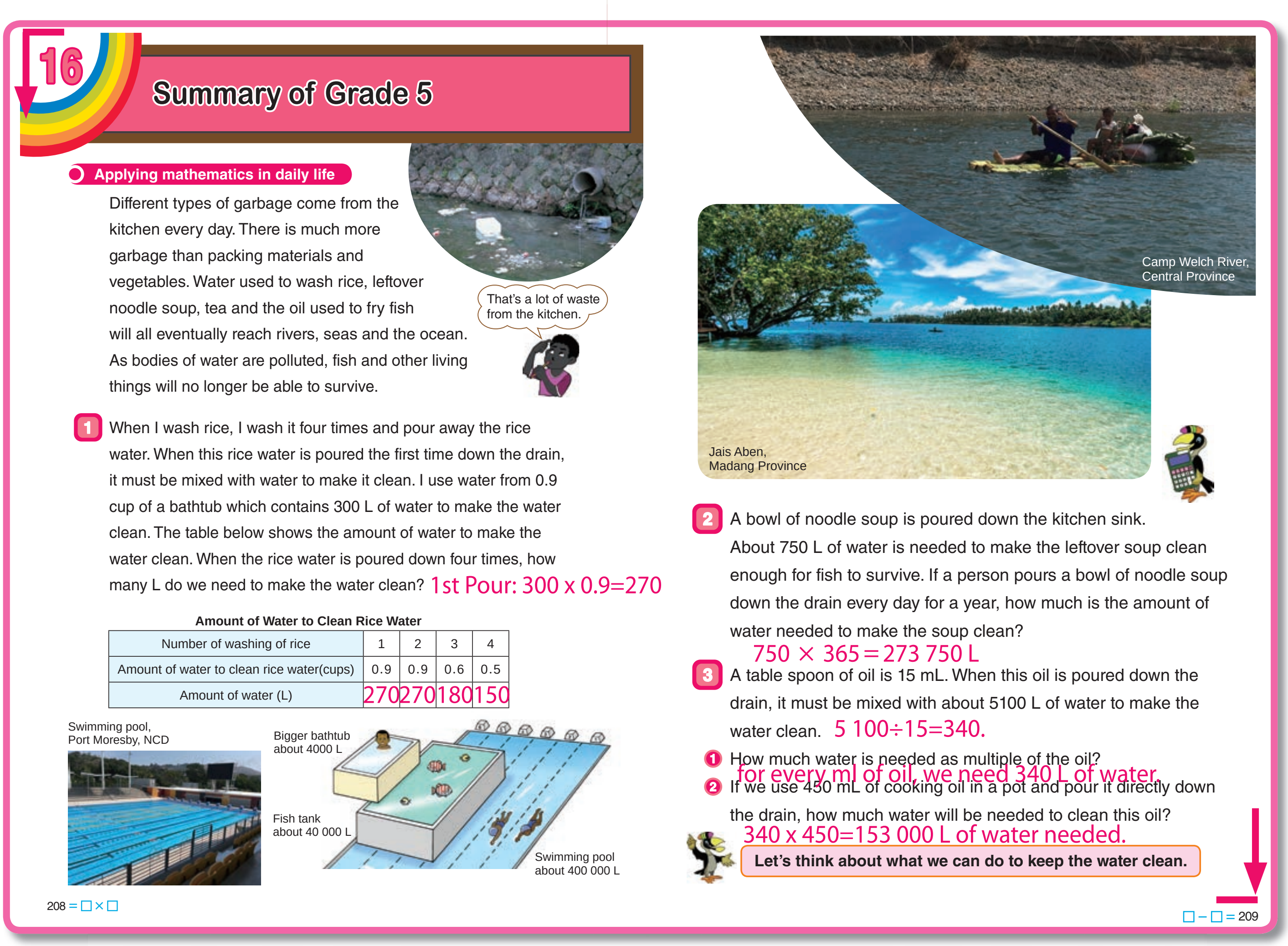
Assessment

- Think about how to calculate the amount of water needed to keep the water clean applying the mathematical knowledge. F S

Lesson Flow

1 Think about how many litres do we need to make the water clean when the rice water is poured down four times.

T/S 1 Read and understand the situation.
T Introduce the Main Task. (Refer to the BP)
S Rice is washed 4 times and the rice water is poured away.
S When the rice water is poured the first time down the drain, it must be mixed with water to make it clean.
T How much water did she use to make the water clean the first time?
S She used water from 0.9 cup of bathtub which contains 300L of water to make the water clean.



16 **Summary of Grade 5**

Applying mathematics in daily life

Different types of garbage come from the kitchen every day. There is much more garbage than packing materials and vegetables. Water used to wash rice, leftover noodle soup, tea and the oil used to fry fish will all eventually reach rivers, seas and the ocean. As bodies of water are polluted, fish and other living things will no longer be able to survive.

1 When I wash rice, I wash it four times and pour away the rice water. When this rice water is poured the first time down the drain, it must be mixed with water to make it clean. I use water from 0.9 cup of a bathtub which contains 300 L of water to make the water clean. The table below shows the amount of water to make the water clean. When the rice water is poured down four times, how many L do we need to make the water clean? 1st Pour: 300 x 0.9=270

Amount of Water to Clean Rice Water

Number of washing of rice	1	2	3	4
Amount of water to clean rice water(cups)	0.9	0.9	0.6	0.5
Amount of water (L)	270	270	180	150

Swimming pool, Port Moresby, NCD

208 = ☐ × ☐

Camp Welch River, Central Province

Jais Aben, Madang Province

2 A bowl of noodle soup is poured down the kitchen sink. About 750 L of water is needed to make the leftover soup clean enough for fish to survive. If a person pours a bowl of noodle soup down the drain every day for a year, how much is the amount of water needed to make the soup clean?

750 × 365 = 273 750 L

3 A table spoon of oil is 15 mL. When this oil is poured down the drain, it must be mixed with about 5100 L of water to make the water clean. 5 100÷15=340.

① How much water is needed as multiple of the oil?
for every ml of oil, we need 340 L of water.
② If we use 450 mL of cooking oil in a pot and pour it directly down the drain, how much water will be needed to clean this oil?
340 x 450=153 000 L of water needed.

Let's think about what we can do to keep the water clean.

☐ − ☐ = 209

Lesson Flow

S Let's think about how to calculate the amount of water in liters to clean rice water the first time.
0.9×300=270

T Have students to use the idea to complete the table by filling the amount of water in litres the second, third and finally the fourth time.

2 Think about the amount of water needed to make the soup clean when a bowl of coconut soup is poured down the kitchen sink.

T/S ② Read and understand the situation.

S When a bowl of coconut soup is poured down the kitchen sink, about 750 litres (L) of water is needed to make the leftover soup clean.

T If a person pours a bowl of soup down the drain every day for a year, how much amount of water is needed to make the soup clean?

T Have the students to think about how many days in a year?

S 365 days is 1 year.

S Let's think about how to work out the amount of water in litres to make the soup clean for a year?
750×365=273750

3 Think about how much water is needed to a millilitre of oil?

T/S ③ Read and understand the situation.

S A table spoon of oil is 15 mL and when it is poured down the drain, it must be mixed with 5100 L of water to make the water clean.

T What are we asked to find?

S We are asked to find how much water is needed to clean 1millitre of oil?

S There are two different units used to measure liquid, (oil 15 mL) and water (5100 Litres)

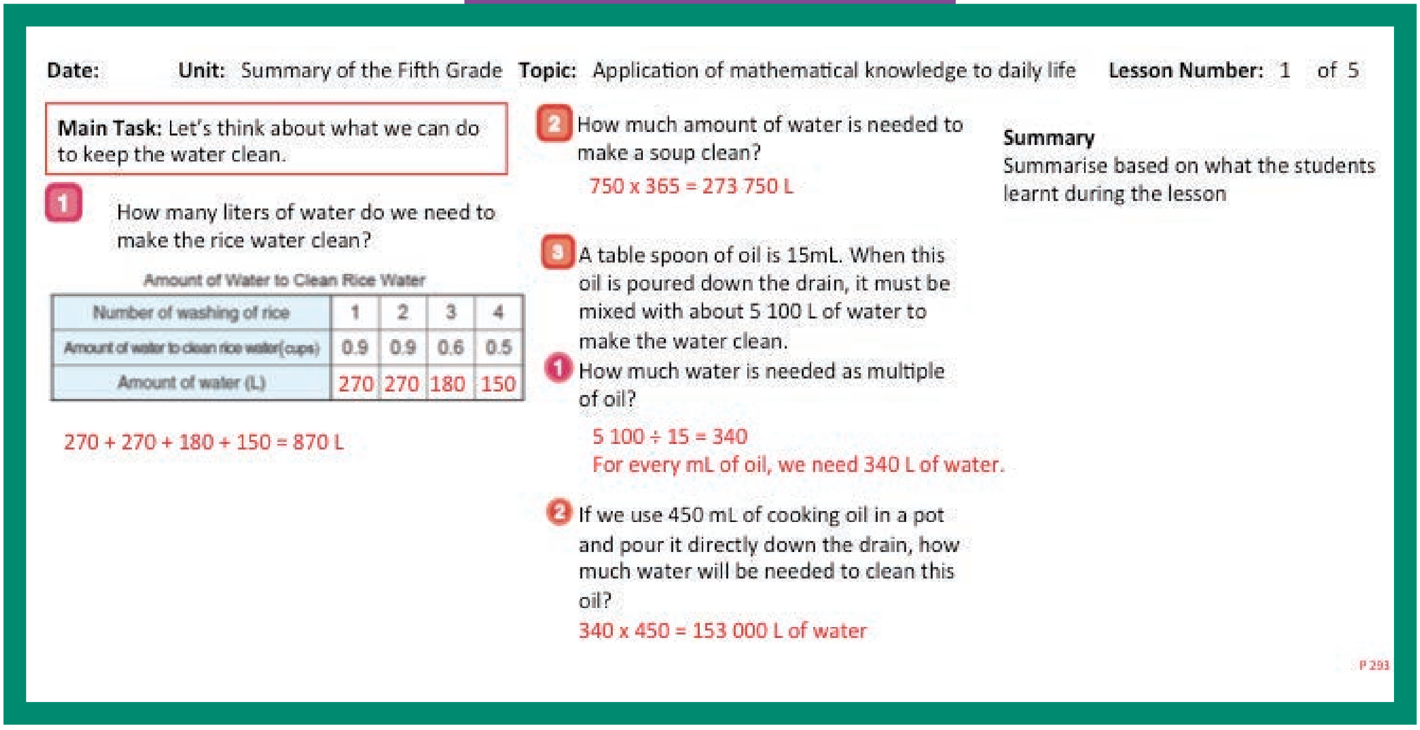
S Calculate how many millilitres of water is equal to 5100 litres? (Hint: 1000 mL=1 Liter)
5100×1000=5 100 000

T What kind of operation do we use to find the multiple of oil?
5 100 000÷15=340000
Ans: 340 000 mL (340 L) of water is mixed to clean 1 mL of oil.

T If we use 450 mL of peanut oil in a pot and pour it directly down the drain how much water will be needed to clean this oil?

S 450×340 000=153 000 000
Ans: 153 000 Litres (L)

Sample Blackboard Plan



Date: **Unit:** Summary of the Fifth Grade **Topic:** Application of mathematical knowledge to daily life **Lesson Number:** 1 of 5

Main Task: Let's think about what we can do to keep the water clean.

① How many liters of water do we need to make the rice water clean?

Amount of Water to Clean Rice Water

Number of washing of rice	1	2	3	4
Amount of water to clean rice water(cups)	0.9	0.9	0.6	0.5
Amount of water (L)	270	270	180	150

270 + 270 + 180 + 150 = 870 L

② How much amount of water is needed to make a soup clean?
750 x 365 = 273 750 L

③ A table spoon of oil is 15mL. When this oil is poured down the drain, it must be mixed with about 5 100 L of water to make the water clean.

① How much water is needed as multiple of oil?
5 100 ÷ 15 = 340
For every mL of oil, we need 340 L of water.

② If we use 450 mL of cooking oil in a pot and pour it directly down the drain, how much water will be needed to clean this oil?
340 x 450 = 153 000 L of water

Summary
Summarise based on what the students learnt during the lesson

P 293

Unit 16

Unit: Summary of Grade 5
Topic 2: Numbers and Calculations
Lesson 2 of 5

Textbook Page : 210 and 211
Actual Lesson 147

Lesson Objective

- To review the strand of number and calculation.

Prior Knowledge

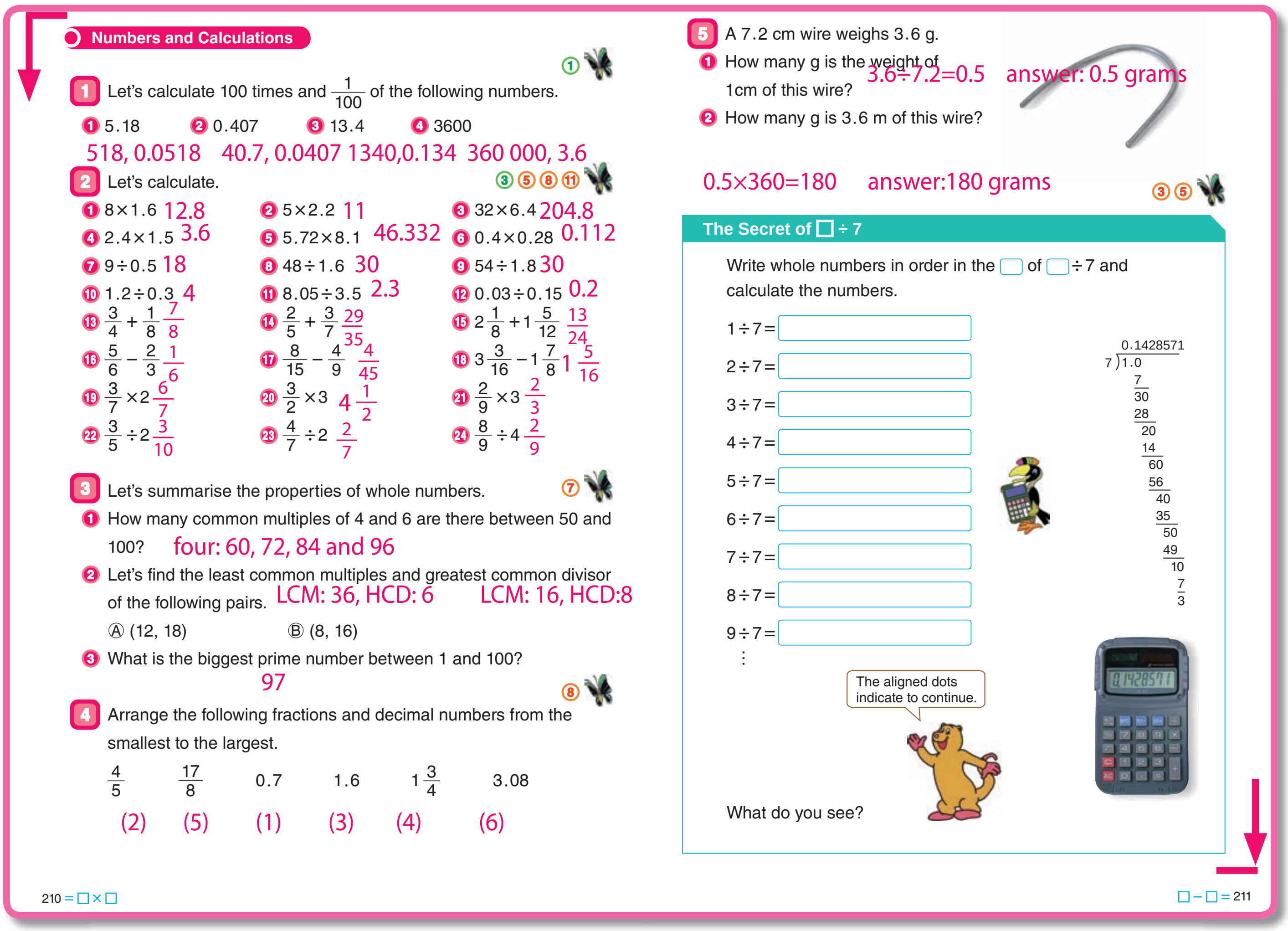
- Changing denominators by using decimal numbers
- How to calculate the multiplication and division of decimals
- How to calculate the addition, subtraction, multiplication and division of fractions

Preparation

- A table for 1

Assessment

- Review the domain of numbers and calculation.
  F S



Numbers and Calculations

①

1 Let's calculate 100 times and $\frac{1}{100}$ of the following numbers.

① 5.18 ② 0.407 ③ 13.4 ④ 3600

518, 0.0518 40.7, 0.0407 1340,0.134 360 000, 3.6

③ ⑤ ⑧ ⑪

2 Let's calculate.

① 8×1.6 12.8 ② 5×2.2 11 ③ 32×6.4 204.8

④ 2.4×1.5 3.6 ⑤ 5.72×8.1 46.332 ⑥ 0.4×0.28 0.112

⑦ $9\div0.5$ 18 ⑧ $48\div1.6$ 30 ⑨ $54\div1.8$ 30

⑩ $1.2\div0.3$ 4 ⑪ $8.05\div3.5$ 2.3 ⑫ $0.03\div0.15$ 0.2

⑬ $\frac{3}{4}+\frac{1}{8}$ $\frac{7}{8}$ ⑭ $\frac{2}{5}+\frac{3}{7}$ $\frac{29}{35}$ ⑮ $2\frac{1}{8}+1\frac{5}{12}$ $\frac{13}{24}$

⑯ $\frac{5}{6}-\frac{2}{3}$ $\frac{1}{6}$ ⑰ $\frac{8}{15}-\frac{4}{9}$ $\frac{4}{45}$ ⑱ $3\frac{3}{16}-1\frac{7}{8}$ $1\frac{5}{16}$

⑲ $\frac{3}{7}\times2$ $\frac{6}{7}$ ⑳ $\frac{3}{2}\times3$ $4\frac{1}{2}$ ㉑ $\frac{2}{9}\times3$ $\frac{2}{3}$

㉒ $\frac{3}{5}\div2$ $\frac{3}{10}$ ㉓ $\frac{4}{7}\div2$ $\frac{2}{7}$ ㉔ $\frac{8}{9}\div4$ $\frac{2}{9}$

⑦

3 Let's summarise the properties of whole numbers.

① How many common multiples of 4 and 6 are there between 50 and 100? four: 60, 72, 84 and 96

② Let's find the least common multiples and greatest common divisor of the following pairs. LCM: 36, HCD: 6 LCM: 16, HCD:8

Ⓐ (12, 18) Ⓑ (8, 16)

③ What is the biggest prime number between 1 and 100?

97

⑧

4 Arrange the following fractions and decimal numbers from the smallest to the largest.

$\frac{4}{5}$	$\frac{17}{8}$	0.7	1.6	$1\frac{3}{4}$	3.08
(2)	(5)	(1)	(3)	(4)	(6)

210 = □ × □

5 A 7.2 cm wire weighs 3.6 g.

① How many g is the weight of 1cm of this wire? 3.6÷7.2=0.5 answer: 0.5 grams

② How many g is 3.6 m of this wire?

0.5×360=180 answer:180 grams

③ ⑤

The Secret of □ ÷ 7

Write whole numbers in order in the □ of □÷7 and calculate the numbers.

1÷7= □

2÷7= □

3÷7= □

4÷7= □

5÷7= □

6÷7= □

7÷7= □

8÷7= □

9÷7= □

⋮

```
   0.1428571
7 )1.0
    7
    30
    28
     20
     14
      60
      56
       40
       35
        50
        49
         10
          7
          3
```

The aligned dots indicate to continue.

What do you see?

□ − □ = 211

Lesson Flow

1 ① Calculate.

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

T Have the students to calculate 100 times and $\frac{1}{100}$ of the following number.

S Complete exercise ① to ④.

2 ② Calculate.

T Let the students to do calculations for the following questions.

S Complete these selected exercises 1, 7, 13, 16, 19, 22. The rest do for homework.

3 ③ Summarise the properties of the whole number.

T Ask the students to do activity ① to ③.

S Do the activities.

4 ④ Arrange fractions and decimals from smallest to largest.

T Let the students to do this activity.

S Do the activities.

5 Calculate how many grams are there in 3.6 m of the wire.

S Use a table to interpret the situation.

S Identify the divisor and dividend from the table.

S Write an expression and think about how to calculate.

T ① How many grams is the weight of 1 cm of this wire?

S 3.6 ÷ 7.2 = 0.5
Answer: 0.5 grams

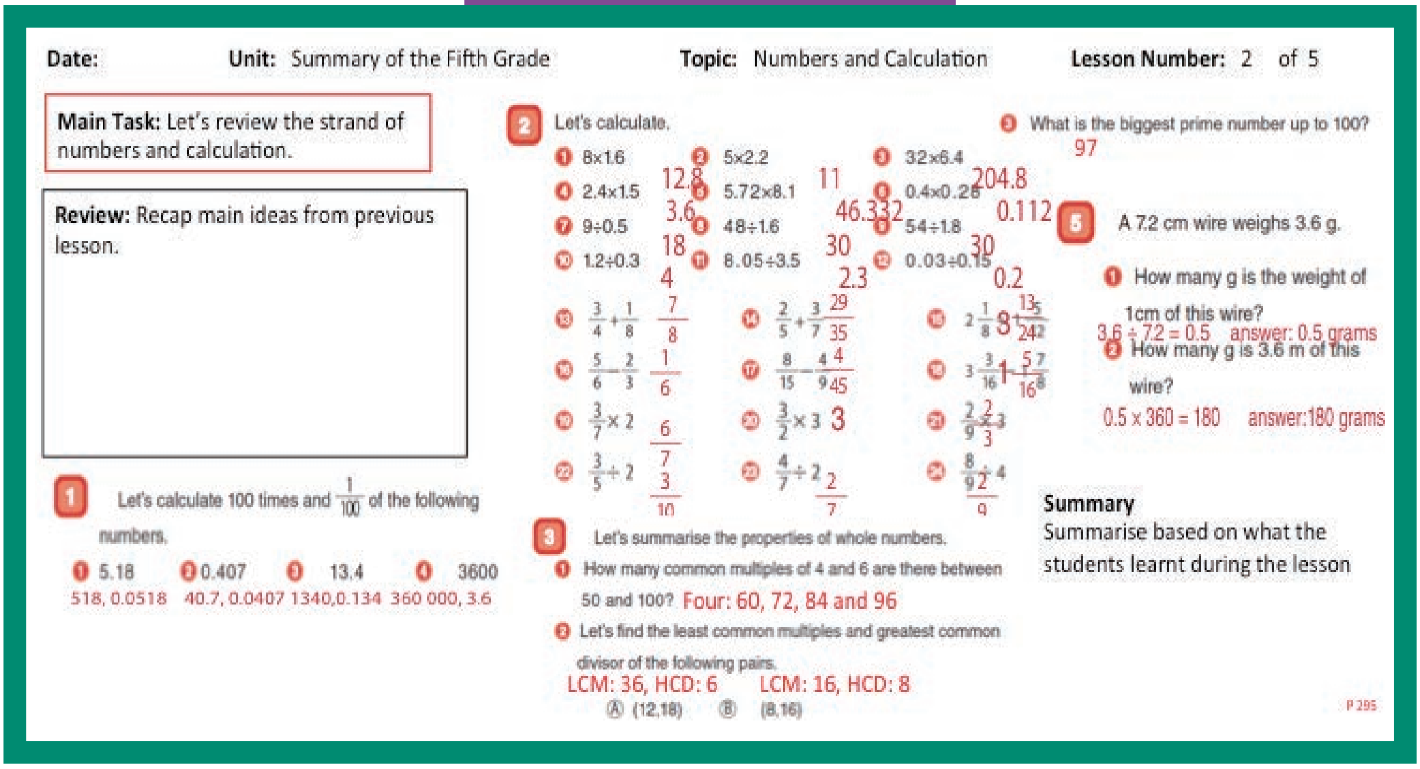
T ② How many grams is 3.6 m of this wire?

TN 100 centimetre (cm) = metre (m).

S 0.5 × 360 = 180
Answer: 180 grams.

6 Solve problem 5 ① and ②.

Sample Blackboard Plan



Date: **Unit:** Summary of the Fifth Grade **Topic:** Numbers and Calculation **Lesson Number:** 2 of 5

Main Task: Let's review the strand of numbers and calculation.

Review: Recap main ideas from previous lesson.

1 Let's calculate 100 times and $\frac{1}{100}$ of the following numbers.

① 5.18	② 0.407	③ 13.4	④ 3600
518, 0.0518	40.7, 0.0407	1340,0.134	360 000, 3.6

2 Let's calculate.

① 8×1.6 12.8	② 5×2.2 11	③ 32×6.4 204.8
④ 2.4×1.5 3.6	⑤ 5.72×8.1 46.332	⑥ 0.4×0.28 0.112
⑦ 9÷0.5 18	⑧ 48÷1.6 30	⑨ 54÷1.8 30
⑩ 1.2÷0.3 4	⑪ 8.05÷3.5 2.3	⑫ 0.03÷0.15 0.2
⑬ $\frac{3}{4}+\frac{1}{8}$ $\frac{7}{8}$	⑭ $\frac{2}{5}+\frac{3}{7}$ $\frac{29}{35}$	⑮ $2\frac{1}{8}+1\frac{5}{12}$ $3\frac{13}{24}$
⑯ $\frac{5}{6}-\frac{2}{3}$ $\frac{1}{6}$	⑰ $\frac{8}{15}-\frac{4}{9}$ $\frac{4}{45}$	⑱ $3\frac{3}{16}-1\frac{7}{8}$ $1\frac{5}{16}$
⑲ $\frac{3}{7}\times2$ $\frac{6}{7}$	⑳ $\frac{3}{2}\times3$ 3	㉑ $\frac{2}{9}\times3$ $\frac{2}{3}$
㉒ $\frac{3}{5}\div2$ $\frac{3}{10}$	㉓ $\frac{4}{7}\div2$ $\frac{2}{7}$	㉔ $\frac{8}{9}\div4$ $\frac{2}{9}$

3 Let's summarise the properties of whole numbers.

① How many common multiples of 4 and 6 are there between 50 and 100? Four: 60, 72, 84 and 96

② Let's find the least common multiples and greatest common divisor of the following pairs.

Ⓐ (12,18) LCM: 36, HCD: 6 Ⓑ (8,16) LCM: 16, HCD: 8

③ What is the biggest prime number up to 100? 97

5 A 7.2 cm wire weighs 3.6 g.

① How many g is the weight of 1cm of this wire?
3.6 ÷ 7.2 = 0.5 answer: 0.5 grams

② How many g is 3.6 m of this wire?
0.5 x 360 = 180 answer:180 grams

Summary
Summarise based on what the students learnt during the lesson

P 295

Unit
16

Unit: Summary of Grade 5

Topic 3: Measurement

Lesson 3 of 5

Textbook Page :
212 and 213
Actual Lesson 148

Lesson Objective

- To review what has been learned in measurement per unit quantity, volume of figures and area of shapes.

Prior Knowledge

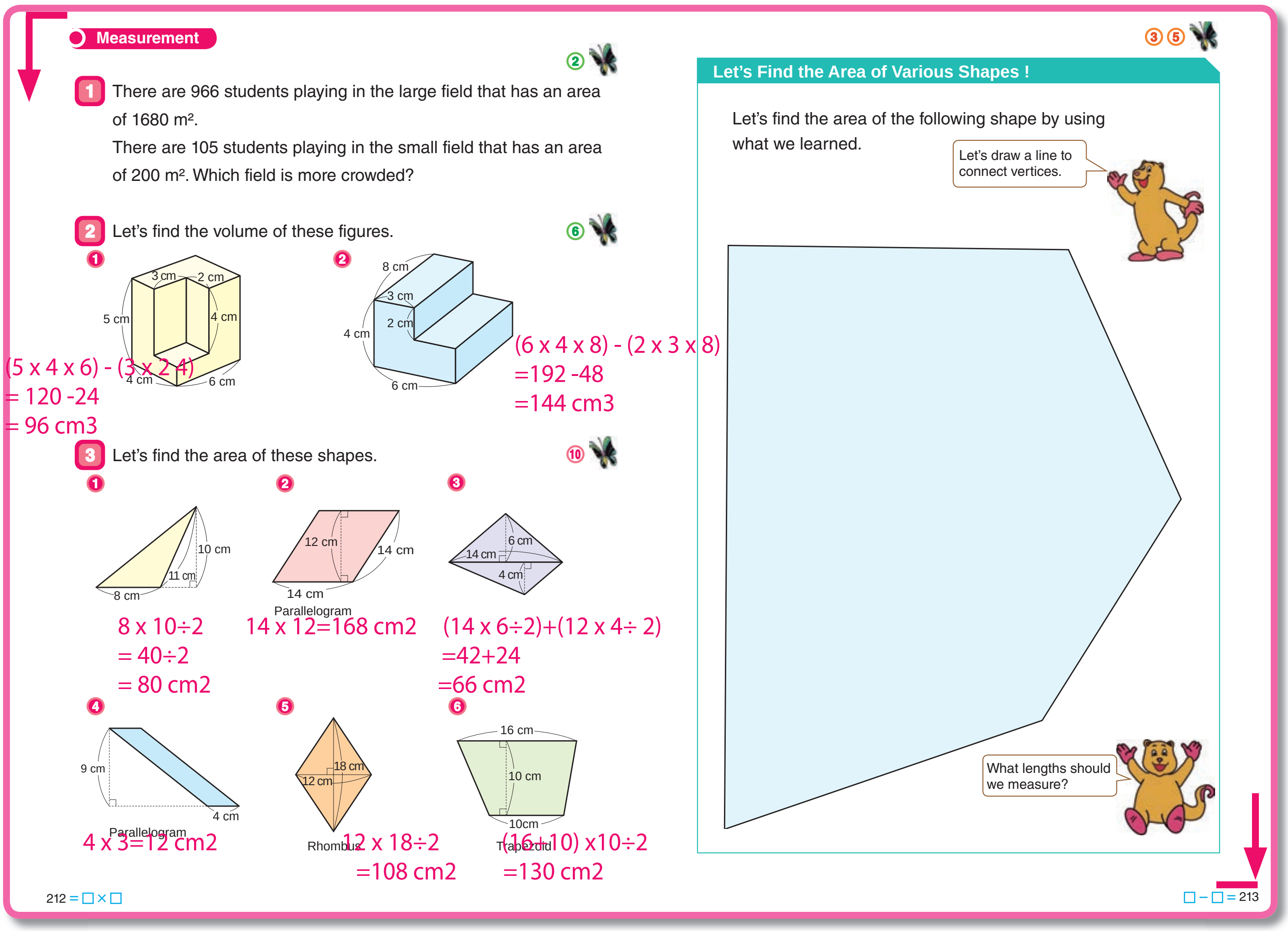
- Measurement per unit quantity
- Volume of figures
- Area of shapes

Preparation

- Work sheets with activities

Assessment

- Review the domain of measurement. F S



Measurement

②

1 There are 966 students playing in the large field that has an area of 1680 m².
There are 105 students playing in the small field that has an area of 200 m². Which field is more crowded?

2 Let's find the volume of these figures. ⑥

❶

(5 x 4 x 6) - (3 x 2 4)
= 120 -24
= 96 cm3

❷

(6 x 4 x 8) - (2 x 3 x 8)
=192 -48
=144 cm3

3 Let's find the area of these shapes. ⑩

❶

8 x 10÷2
= 40÷2
= 80 cm2

❷

14 x 12=168 cm2

❸

(14 x 6÷2)+(12 x 4÷ 2)
=42+24
=66 cm2

❹

4 x 3=12 cm2

❺

12 x 18÷2
=108 cm2

❻

(16+10) x10÷2
=130 cm2

③ ⑤

Let's Find the Area of Various Shapes !

Let's find the area of the following shape by using what we learned.

Lesson Flow

1 ① Solve the task.

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

T Let the student calculate which area is crowded using known knowledge.

S Compare the crowdedness.

2 ② Find the volume of the given figures.

S Complete activities ① and ②.

3 ③ Find the area of the given shapes.

S Complete activities ① to ⑥.

4 Solve the additional activity.

T Let the students find the area of the following shape using known knowledge.

S Draw lines to make three triangles.

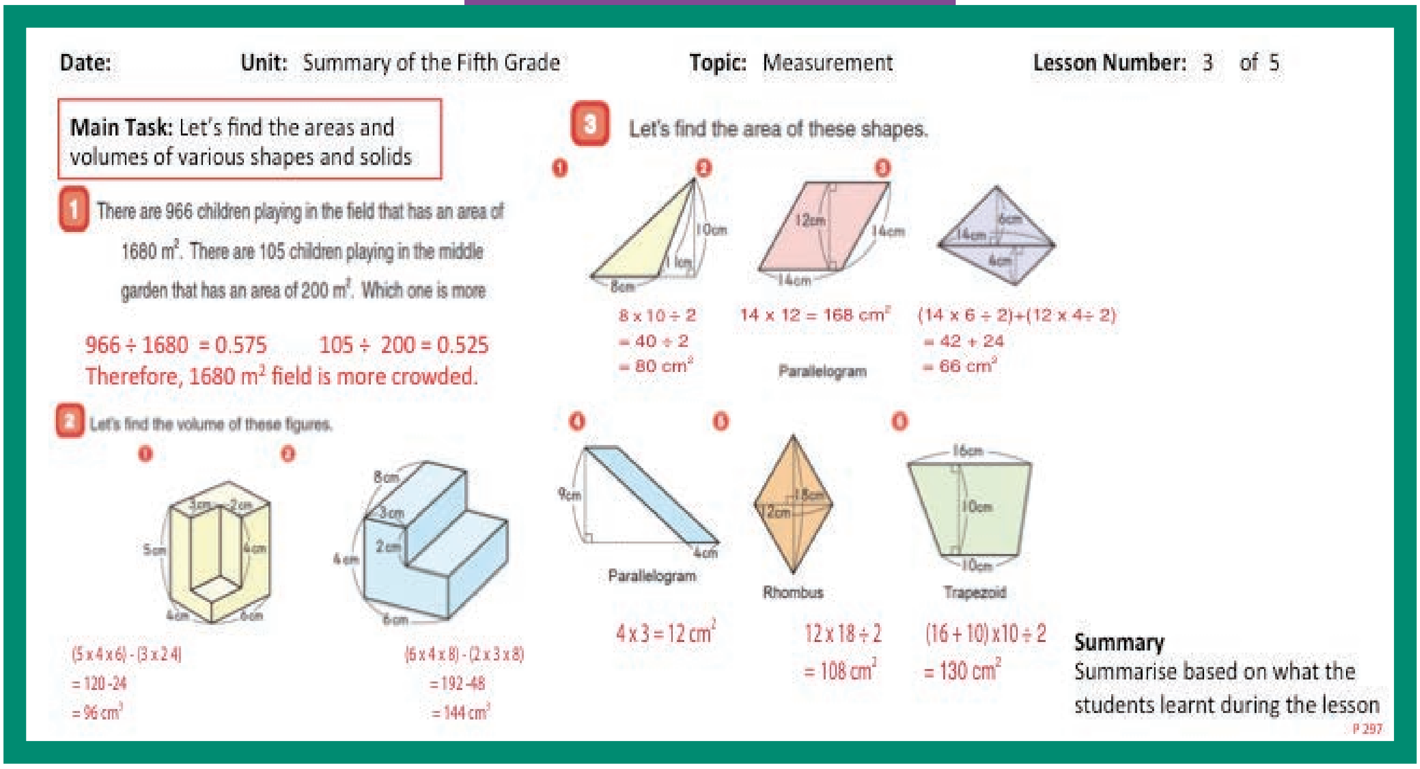
T Have the students to see that the lines show connected vertices.

5 Find the area of the shape.

T Allow students to discuss what lengths they should measure.

S Measure the lengths needed for calculations and finally using area formulas to find the area of the shape.

Sample Blackboard Plan



Date: **Unit:** Summary of the Fifth Grade **Topic:** Measurement **Lesson Number:** 3 of 5

Main Task: Let's find the areas and volumes of various shapes and solids

1 There are 966 children playing in the field that has an area of 1680 m². There are 105 children playing in the middle garden that has an area of 200 m². Which one is more

966 ÷ 1680 = 0.575 105 ÷ 200 = 0.525

Therefore, 1680 m² field is more crowded.

2 Let's find the volume of these figures.

① (5 x 4 x 6) - (3 x 2 4)

= 120 -24

= 96 cm³

② (6 x 4 x 8) - (2 x 3 x 8)

= 192 -48

= 144 cm³

3 Let's find the area of these shapes.

① 8 x 10 ÷ 2

= 40 ÷ 2

= 80 cm²

② 14 x 12 = 168 cm²

Parallelogram

③ (14 x 6 ÷ 2)+(12 x 4÷ 2)

= 42 + 24

= 66 cm²

④ Parallelogram

4 x 3 = 12 cm²

⑤ Rhombus

12 x 18 ÷ 2

= 108 cm²

⑥ Trapezoid

(16 + 10) x10 ÷ 2

= 130 cm²

Summary

Summarise based on what the students learnt during the lesson

P 297

Unit 16

Unit: Summary of Grade 5
Topic 4: Shapes and Figures
Lesson 4 of 5

Textbook Page : 214 and 215
Actual Lesson 149

Lesson Objective

- To review what has been learned in geometrical figures.

Assessment

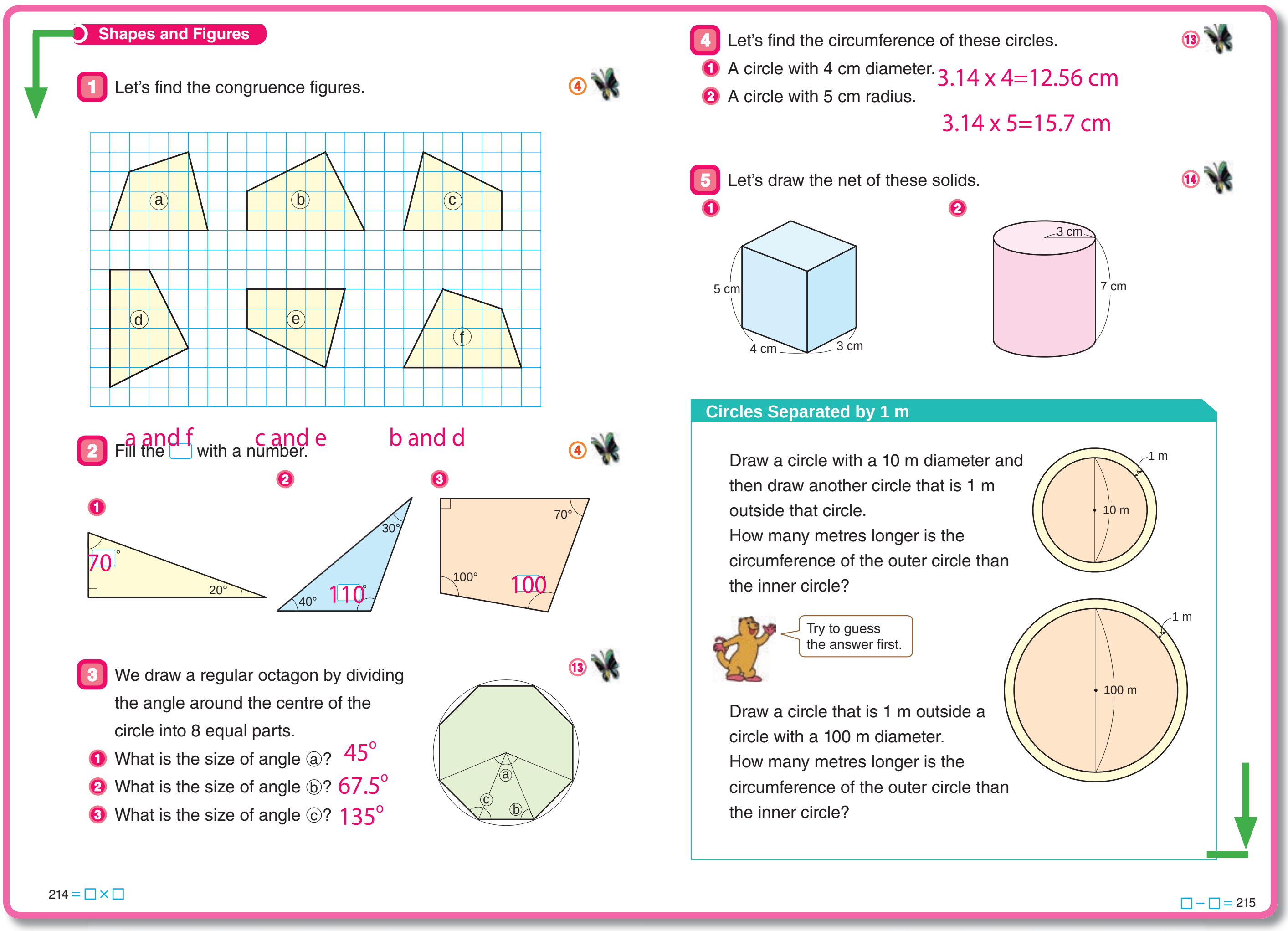
- Review the domain of shapes and figures. F S

Prior Knowledge

- Finding the area of various shapes using learned knowledge

Preparation

- Work sheets with activities



Shapes and Figures

1 Let's find the congruence figures. ④

2 Fill the ☐ with a number. ④

a and f　c and e　b and d

① 70°, 20°

② 30°, 40°, 110

③ 70°, 100°, 100

3 We draw a regular octagon by dividing the angle around the centre of the circle into 8 equal parts. ⑬

① What is the size of angle ⓐ? 45°

② What is the size of angle ⓑ? 67.5°

③ What is the size of angle ⓒ? 135°

4 Let's find the circumference of these circles. ⑬

① A circle with 4 cm diameter. 3.14 x 4=12.56 cm

② A circle with 5 cm radius. 3.14 x 5=15.7 cm

5 Let's draw the net of these solids. ⑭

Circles Separated by 1 m

Draw a circle with a 10 m diameter and then draw another circle that is 1 m outside that circle.
How many metres longer is the circumference of the outer circle than the inner circle?

Try to guess the answer first.

Draw a circle that is 1 m outside a circle with a 100 m diameter.
How many metres longer is the circumference of the outer circle than the inner circle?

214 = ☐ × ☐　　☐ − ☐ = 215

Lesson Flow

1 1 Find the congruence figures.

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

T Let the students to think about how to find the congruence figures and share ideas.

S b and d, c and e are congruent because they fit by overlapping exactly on top of one another.

2 2 Calculate the missing angle.

S Calculate the missing angles in 2 and 3 and share their workouts.

3 3 Analyse the interior angle of a regular octagon.

TN ① 360÷8×3=135 135°

② 360÷8=45 180−45÷2=67.5 67.5°

③ 67.5×2=135 135°

4 4 Find the circumference of the circles.

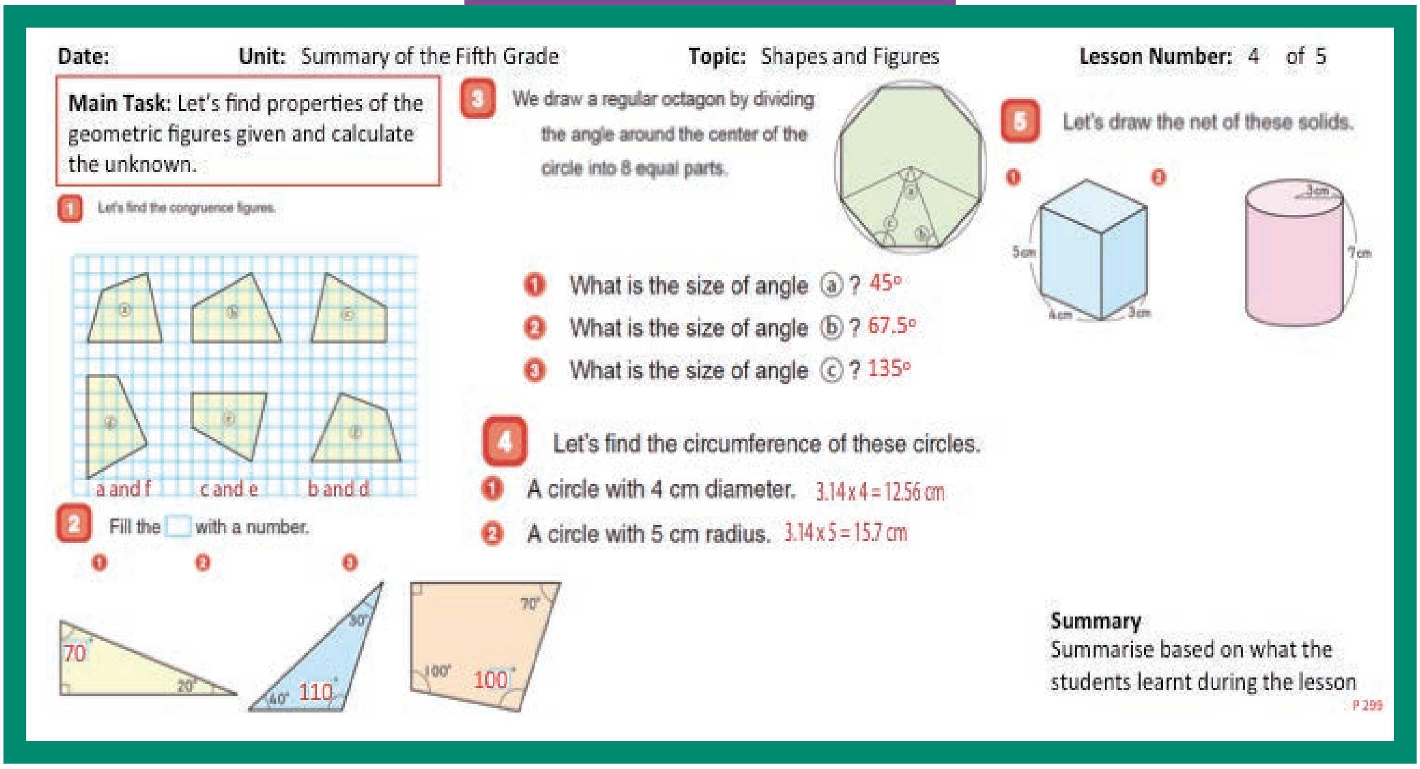
S Complete activities ① and ②.

5 5 Draw the net of the given solids.

S Complete activities ① and ②.

TN If there is enough time have the students to try and workout circles separated by 1 m.

Sample Blackboard Plan



Date: **Unit:** Summary of the Fifth Grade **Topic:** Shapes and Figures **Lesson Number:** 4 of 5

Main Task: Let's find properties of the geometric figures given and calculate the unknown.

1 Let's find the congruence figures.

a and f c and e b and d

2 Fill the ☐ with a number.

① ② ③

3 We draw a regular octagon by dividing the angle around the center of the circle into 8 equal parts.

① What is the size of angle ⓐ? 45°

② What is the size of angle ⓑ? 67.5°

③ What is the size of angle ⓒ? 135°

4 Let's find the circumference of these circles.

① A circle with 4 cm diameter. 3.14 x 4 = 12.56 cm

② A circle with 5 cm radius. 3.14 x 5 = 15.7 cm

5 Let's draw the net of these solids.

① ②

Summary
Summarise based on what the students learnt during the lesson

P 299

Unit 16

Unit: Summary of Grade 5

Topic 5: Relationship among Quantities

Lesson 5 of 5

Textbook Page : p. 210
Actual Lesson 150

Lesson Objective

- To review on making mathematical relationship among quantities.

Prior Knowledge

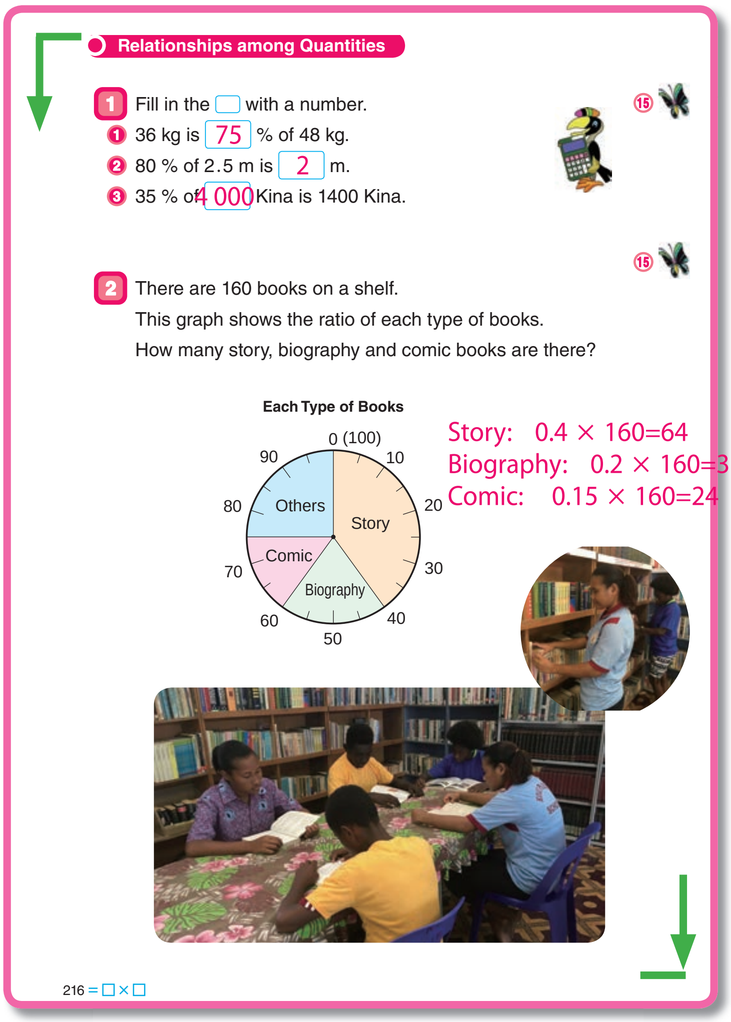
- Finding congruent figures, circumference of circles and drawing nets of solids
- Calculate the missing angle of geometrical figures

Preparation

- Simple calculators, pie chart

Assessment

- Review the domain of relationships among quantities. F S



Relationships among Quantities

1 Fill in the ☐ with a number. ⑮

① 36 kg is $\boxed{75}$ % of 48 kg.
② 80 % of 2.5 m is $\boxed{2}$ m.
③ 35 % of $\boxed{4\ 000}$ Kina is 1400 Kina.

2 There are 160 books on a shelf. ⑮
This graph shows the ratio of each type of books.
How many story, biography and comic books are there?

Each Type of Books

Story: 0.4 × 160=64
Biography: 0.2 × 160=32
Comic: 0.15 × 160=24

64 story books
32 biography books
24 comic books

216 = ☐×☐

Lesson Flow

1 ① Complete the task.

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

S Complete activities❶, ❷ and ❸.

T Let the students to represent a certain quantity as a ratio of 100 first.

S Calculate the percentage of the weight given?

S Find the length in metres.

S Work out what the amount should be in kina.

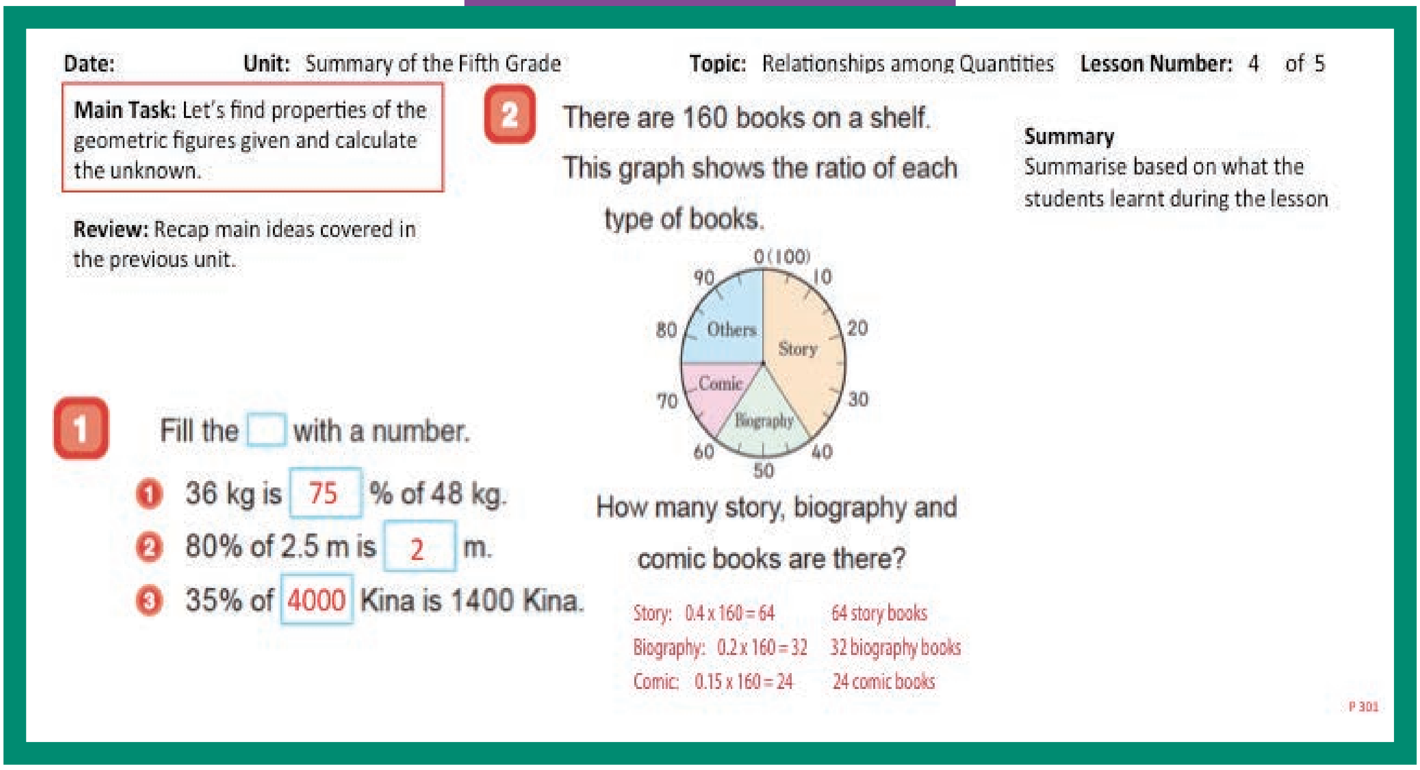
2 ② Complete the task.

T Let the students to represent a certain quantity as a ratio of 100 first.

S Calculate how many Story books, Biography and Comic books are there.

TN If there is enough time find out how many books are in Others?

Sample Blackboard Plan



Date: **Unit:** Summary of the Fifth Grade **Topic:** Relationships among Quantities **Lesson Number:** 4 of 5

Main Task: Let's find properties of the geometric figures given and calculate the unknown.

Review: Recap main ideas covered in the previous unit.

① Fill the ☐ with a number.

❶ 36 kg is 75 % of 48 kg.

❷ 80% of 2.5 m is 2 m.

❸ 35% of 4000 Kina is 1400 Kina.

② There are 160 books on a shelf.
This graph shows the ratio of each type of books.

How many story, biography and comic books are there?

Story: 0.4 x 160 = 64 64 story books
Biography: 0.2 x 160 = 32 32 biography books
Comic: 0.15 x 160 = 24 24 comic books

Summary
Summarise based on what the students learnt during the lesson

P 301

Unit 16

Unit: Summary of Grade 5
Supplementary Topic: Math Adventure

Textbook Page :
217 to 221
Topic: 1 and 2

Introduction to Supplementary Topic

Sub-Unit: Math Adventure is a supplimentary topic for students to explore mathemaics skills and ideas through stories. Students will travel some places in the world with Prof. Steven and our friends to learn mathematics ideas from shapes of buildings and global warming issues through world heritage.

Supplementary Topic Objectives

- To apply mathematics knowledge and skills which were learned to solve problems around us.
- To apply daily life experiences to solve problems.

Topic Objectives 1

T1: To calculate volume using top view and bottom pictures or shapes.
T1: To find mean with specific conditions from data.
T2: To find unknown number ☐ through making mathematical sentencesusing ☐ to connect problems.
T3: To learn units for large amount of volume.
T3: To think about how many cubic metre equals 1 km³.
T4: To solve problems using the idea of divisors.
T5: To solve problems by changing fractions to common denominators.

Topic Objectives 2

T6: To develop interest on how people in the past represented fractions in old mathematics documents.
T7: To find areas and volumes of various objects using drawings.
T8: To solve problems using the relationship between proportion and the length of circumference.
T9: To estimate the area of shapes formed by natural shapes.
T10: To find the change of amount per unit quantity using the relationship of proportions.

Preparation

- Copies of enlarged pictures, maps and drawings in the textbook for each topic.

Math Adventure has two parts. Part 1 consists of Topic 1 to 5 and Part 2 with Topics 6 to 10. In the adventure, students will visit world heritage sites in places likeToky, Italy UK, USA and Egypt. They will apply mathematical skills in real life situations in these interesting places as part of their adventure. (See maps below)

Math Adventure Part 1

All over the world. people are trying to keep valuable buildings and natural environment as 'World Heritage'. Now, let's go on a journey by plane to clear up mysteries in the world.

Professor Steven

The places of the fragments

① Cathedral from Birds' Eyes
② World Heritage Site – Comparing Height
③ Sinking Islands
④ Roman Empire Cities with Water Supply
⑤ Pentagon by Fractions

Let's go to the places to find the fragments of the key !

At the end of every topic, there are pieces of a puzzle which will be obtained by cutting out after answering the given question correctly.

Each puzzle is a piece of the key for the adventure and will be completed at the end of the adventure where the puzzles will be placed together to reveal the key.

Math Adventure Part 2

There are phenomena (things) which make us wonder why they happen on earth. We sometimes think 'why did they make this kind of things. What did the ancient people see and think about while they were making these things?

The places of the fragments

⑥ The Oldest Scroll of Mathematics
⑦ Ayers Rock the Center of the Earth
⑧ A Mysterious Circle of Stones
⑨ World Heritage – Comparing Areas of the Lakes
⑩ Disappearing Lake from Map

Let's go to the places to find the fragments of the key !

☐ – ☐ = 229

① Cathedral from Birds' Eyes

Old city area in Florence, Italy, is approved as one of the World Heritage Sites. The building which can be seen from anywhere in this city is St. Maria del Fiore Cathedral.

This Cathedral's appearance varies differently depending on the position of the viewer. What kind of shape can we see from the top view?
The most Christian church's top view is cross-shaped. Appearances of buildings is dependent upon the viewer's positions.

Yes, there is a story that the number of chimneys is viewed as one, but actually there are two.

A cylinder also has a circle shape from the top view, but a rectangle from the side view.

I will give you a problem now. If we create a solid which consists of the front view "山", the side view "田" and the top view "+" using cubic blocks, you can access the fragment key.
The design of solid is on the next page.

Design

A. Front view

		5		
		3		
1		5		1
1		3		1
1	1	5	1	1

B. Side view

1	1	1	1	1
1		1		1
1	1	3	1	1
1		3		1
1	1	5	1	1

C. Top view

		5		
		3		
3	1	5	1	3
		3		
		5		

The numbers in the design indicate the number of blocks used for the corresponding slots.

We can imagine the shape, can't we?
Let's make those shapes.

We did it!

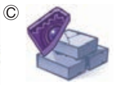
Well done. So, divide the numbers of all blocks by the number of slots with numbers in each A, B, and C to get the average for one slots of each.

I got the answer without calculation!

Why did she get the answer without calculation? Write your reasoning in your exercise book.

Ⓐ

Ⓑ

Ⓒ


- Let's cut out fragments on page 246 and paste on the last page.

② World Heritage Sites – Comparing Height


Ⓐ Eiffel Tower

The Eiffel Tower in Paris, France, was built in 1889, when the Paris International exhibition was held. Its roof top height is about 300 metres.

I want to go up there one day.

But, Tokyo Tower is a little bit taller.

Let's find out the heights of the following buildings in World Heritage sites. In this activity, there is a hint to get to another key fragment.


Ⓑ The Leaning Tower of Pisa in Italy:
It has a lean of 5° towards the south.


Ⓒ Big Ben in the England


Ⓓ King Khufu's Pyramid in Egypt


Ⓔ The Statue of Liberty in the United States of America
(the height included a part of plinth)

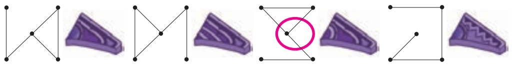
There are 4 sentences below. If the heights of B to E is represented by □, write expressions for calculating their heights.
The height of the 'Eiffel Tower is known.

① The height which is 1 metre less than the Leaning Tower of Pisa is 0.18 times of the Eiffel Tower.
② The height which is 4 times the Statue of Liberty is 72 metres higher than the Eiffel Tower.
③ The height of Big Ben is 0.72 metre less than the height which is 1.04 times the Statue of Liberty.
④ If we add the heights of King Khufu's Pyramid and the Leaning Tower of Pisa, it is twice the height of Big Ben.

If the height of the Leaning Tower of Pisa is □ m, the height which is 1 metre less than □ m is (□ − 1) m.
The height which is 0.18 times as high as the Eiffel Tower is expressed as 300×0.18, therefore, we can make the expression,
□ − 1 = 300×0.18
Using this expression, we can get □.

If the height of The Statue of Liberty is □ m, the height which is 4 times □ is the same as the answer of the addition between 72 and the height of the Eiffel Tower.
Therefore, we can represent it as follows □×4 = (The height of Eiffel Tower) + 72

Likewise, calculate the heights of the 4 buildings and in the order of their heights from tallest, draw lines.
What kind of shapes can we make?



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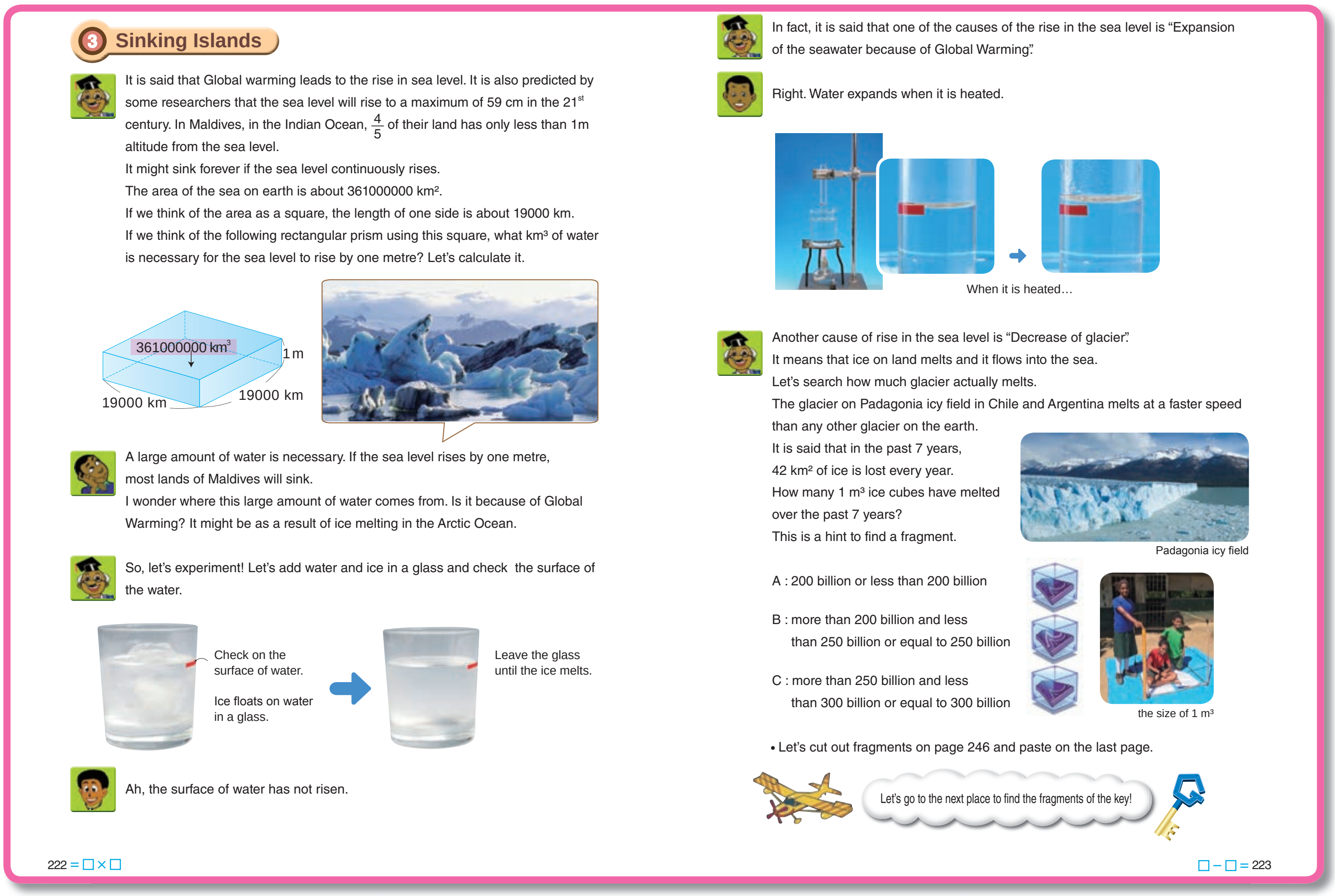
Unit 16

Unit: Summary of Grade 5
Supplementary Topic: Mathematics Adventure

Textbook Page : 222 to 231
Topic: 4 to 6



③ Sinking Islands

It is said that Global warming leads to the rise in sea level. It is also predicted by some researchers that the sea level will rise to a maximum of 59 cm in the 21st century. In Maldives, in the Indian Ocean, $\frac{4}{5}$ of their land has only less than 1m altitude from the sea level.

It might sink forever if the sea level continuously rises.

The area of the sea on earth is about 361000000 km^2.

If we think of the area as a square, the length of one side is about 19000 km.

If we think of the following rectangular prism using this square, what km^3 of water is necessary for the sea level to rise by one metre? Let's calculate it.

A large amount of water is necessary. If the sea level rises by one metre, most lands of Maldives will sink.

I wonder where this large amount of water comes from. Is it because of Global Warming? It might be as a result of ice melting in the Arctic Ocean.

So, let's experiment! Let's add water and ice in a glass and check the surface of the water.

Ah, the surface of water has not risen.

222 = ☐ × ☐

In fact, it is said that one of the causes of the rise in the sea level is "Expansion of the seawater because of Global Warming".

Right. Water expands when it is heated.

When it is heated…

Another cause of rise in the sea level is "Decrease of glacier".
It means that ice on land melts and it flows into the sea.
Let's search how much glacier actually melts.
The glacier on Padagonia icy field in Chile and Argentina melts at a faster speed than any other glacier on the earth.
It is said that in the past 7 years, 42 km^2 of ice is lost every year.
How many 1 m^3 ice cubes have melted over the past 7 years?
This is a hint to find a fragment.

Padagonia icy field

A : 200 billion or less than 200 billion

B : more than 200 billion and less than 250 billion or equal to 250 billion

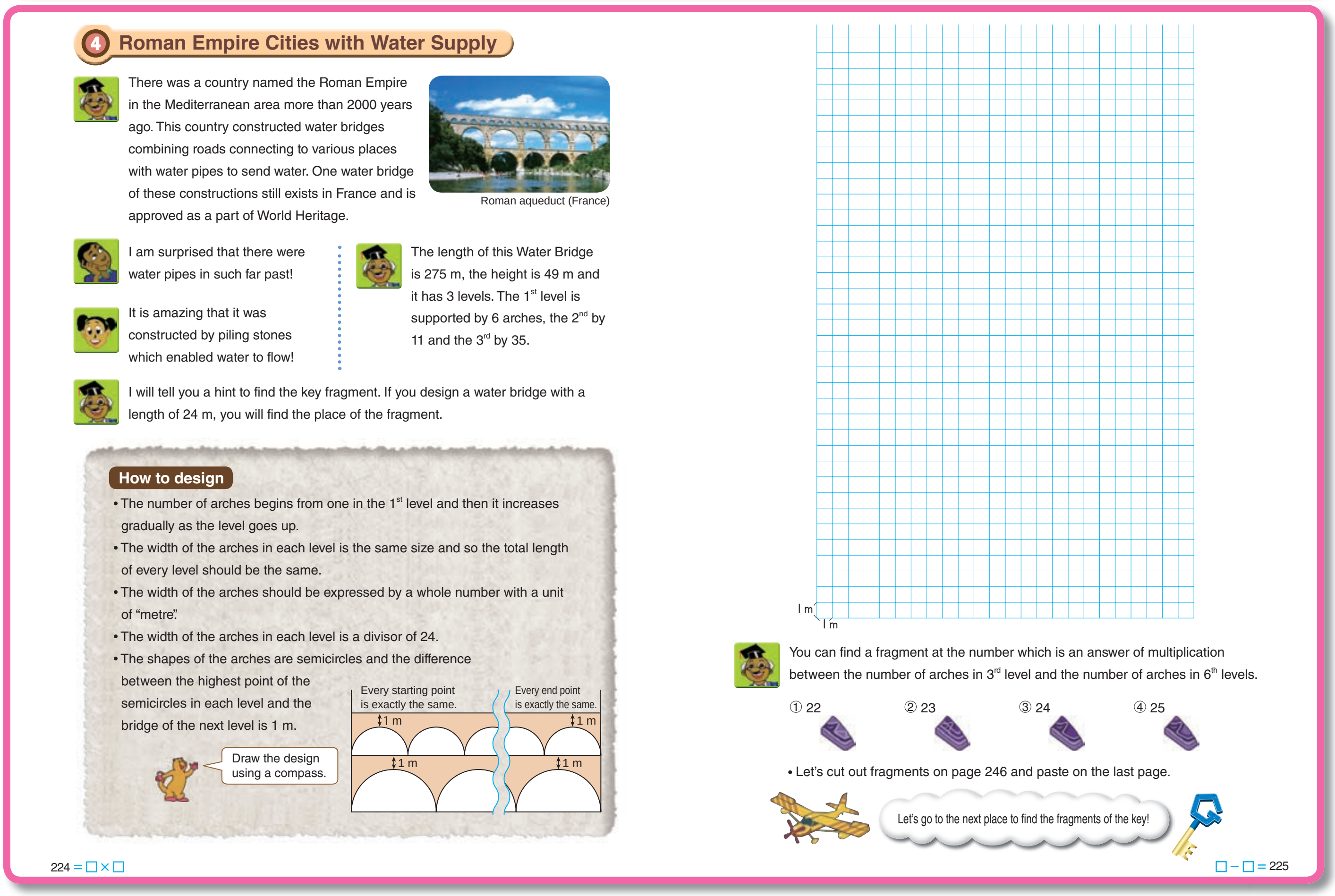
C : more than 250 billion and less than 300 billion or equal to 300 billion

the size of 1 m^3

- Let's cut out fragments on page 246 and paste on the last page.

Let's go to the next place to find the fragments of the key!

☐ − ☐ = 223



④ Roman Empire Cities with Water Supply

There was a country named the Roman Empire in the Mediterranean area more than 2000 years ago. This country constructed water bridges combining roads connecting to various places with water pipes to send water. One water bridge of these constructions still exists in France and is approved as a part of World Heritage.

Roman aqueduct (France)

I am surprised that there were water pipes in such far past!

It is amazing that it was constructed by piling stones which enabled water to flow!

The length of this Water Bridge is 275 m, the height is 49 m and it has 3 levels. The 1st level is supported by 6 arches, the 2nd by 11 and the 3rd by 35.

I will tell you a hint to find the key fragment. If you design a water bridge with a length of 24 m, you will find the place of the fragment.

How to design

- The number of arches begins from one in the 1st level and then it increases gradually as the level goes up.
- The width of the arches in each level is the same size and so the total length of every level should be the same.
- The width of the arches should be expressed by a whole number with a unit of "metre".
- The width of the arches in each level is a divisor of 24.
- The shapes of the arches are semicircles and the difference between the highest point of the semicircles in each level and the bridge of the next level is 1 m.

Draw the design using a compass.

224 = ☐ × ☐

You can find a fragment at the number which is an answer of multiplication between the number of arches in 3rd level and the number of arches in 6th levels.

① 22 ② 23 ③ 24 ④ 25

- Let's cut out fragments on page 246 and paste on the last page.

Let's go to the next place to find the fragments of the key!

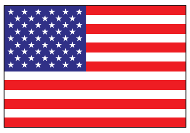
☐ − ☐ = 225

5 Pentagon by Fractions

The shape of stars is frequently used in the national flags in the world.
The United States, which has "The Statue of Liberty" as a part of World Heritage also use stars indicating each state in their national flag.
In Japan, Nagasaki city also has stars in their flag.


The Statue of Liberty


Peace Statue (Nagasaki city, Japan)


The national flag of the USA


Nagasaki city's flag

There is an interesting way to draw a star. It is $\frac{5}{2}$.

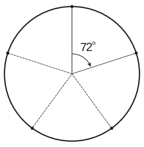
What? How can we draw stars by fractions?

The denominator and the numerator indicate the way to draw it, right?

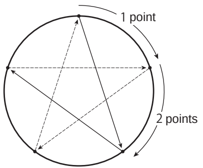
You have an eye on good points. I will show you the way now, so let's do it together.

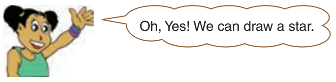
At first, the numerator (5) indicates that drawing 5 points divides a circle equally into 5 sectors.

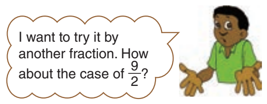
A circle has 360 degrees, so 360÷5=72, we can divide by 72 degrees for each.

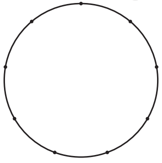


Next, I will explain the meaning of the denominator (2). Decide a starting point and then draw a line connecting the starting point and a point (end point) locating 2 points after the starting point and line connecting the end point with a point locating 2 points after the point again, and continue until it reaches the starting point!





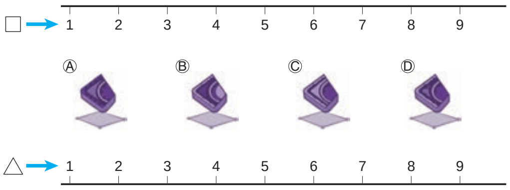




Awesome! If we use $\frac{9}{3}$, we can draw a triangle!

$\frac{9}{3}$ reduces to $\frac{3}{1}$. We divide a circle to 3 sectors and draw a line one by one, so it will surely be a triangle.

So, to find the fragment of the key, we should find it by $\frac{\square}{\triangle}$ which enable us to draw a "square". The line between the denominator and the numerator is found in the following diagram. The fragment can be found on the line you drew.



- Let's cut out fragments on page 246 and paste on the last page and make the key completed.

6 The Oldest Scroll of Mathematics

There are many sites of the ancient Egyptian Royal Dynasty in Egypt. These huge pyramids are all royal sites.


Pyramids (Egypt)

About 3700 years ago, the scribe Ahmose, who worked under a pharaoh, recorded the mathematics knowledge of that period on a papyrus paper scroll.
In 1858, an English explorer Alexander Henry Rhind found the scroll and it was deciphered 20 years later.
The scroll shows questions about various fractions which are written as the sum of different unit fractions.

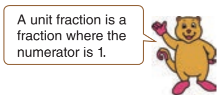
For example, you express $\frac{2}{3}$ as addition of unit fractions as;

$$\frac{2}{3}=\frac{1}{\square}+\frac{1}{\triangle}$$

Put different numbers in □ and △.

So, we need to express $\frac{2}{3}$ as a sum of different unit fractions.

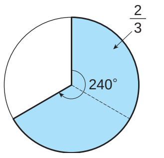
How about putting any number in the blanks.
See if it's right or not.



Imagine a circle. How many degrees is $\frac{2}{3}$?

One circle means 360° so dividing it by 3 and two pieces of that are $\frac{2}{3}$.

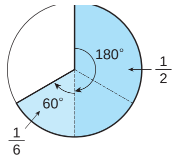
Then, 360÷3×2=240 so, it is 240°.



240° is 180°+60°, right?

Oh, 180° is, $\frac{180}{360}=\frac{1}{2}$. 60° is $\frac{60}{360}=\frac{1}{6}$.

I see! The answer is $\frac{2}{3}=\frac{1}{2}+\frac{1}{6}$.



This is a quiz to find the key fragment.
You can find the hint to the hiding place by expressing $\frac{2}{5}$ as unit fractions.

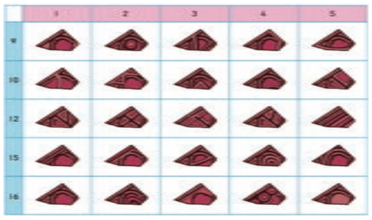
$$\frac{2}{5}=\frac{1}{\bigcirc}+\frac{1}{⬠}$$

Let's study the relationship between fractions and angles. You can calculate the addition of fractions by the addition of angles after we study fractions by dividing a circle and the angle.

Fraction	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{8}$	$\frac{1}{9}$	$\frac{1}{10}$	$\frac{1}{12}$
Angle	360°	180°	120°	90°	72°					
	$\frac{1}{15}$	$\frac{1}{16}$	$\frac{1}{18}$	$\frac{1}{20}$	$\frac{1}{24}$					
						14.4°	12°	10°	9°	8°
	6°	5°	4°	3°	2°	1°				

$\frac{2}{5}$ is 114° so,
I see!

The column represents the denominator of the bigger angle and the row represents the denominator of the smaller angle.



- Let's cut out a fragment on page 246 and paste on the last page.

Unit 16

Unit: Summary of Grade 5

Supplementary Topic: Mathematics Adventure

Textbook Page : 232 to 239
Topic: 7 to 10

7 Ayers Rock the Center of the Earth

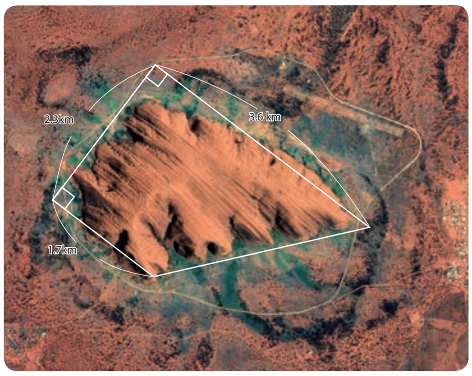
There is a famous rocky mountain called Ayers Rock in Australia.

How big is it?

I can see how big it is as I'm getting closer.

It is a huge monolith. It is said that the monolith is 9 km around, 348 m in height, 3.6 km in length and 2.4 m wide.

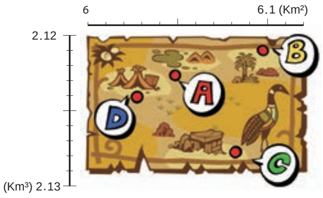
Let's consider Ayers Rock to be a trapezoid looked from straight above. The upper base is 3.6 m and the lower base is 1.7 m as shown below.



232 = □×□

The location of the key fragment is shown on the following map. The area of Ayers Rock seen from straight above defines a number of the horizontal line and the volume defines a number of the straight lines. (The number of horizontal lines shows an approximate area of Ayers Rock seen from straight above and the number of vertical lines shows the approximate volume.) Round off the value of the volume to three decimal places.

You can find out the location with these two answers.

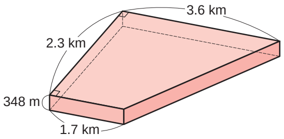


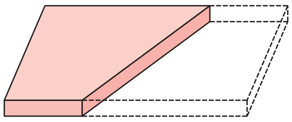
I see, the point where two lines intersect is the place of the fragment!

But, how can we find the approximate area and volume?

Imagine a figure as shown below.

Oh yeah, joining two of these shapes together it becomes a rectangular prism!





- Let's cut out a fragment on page 245 and paste on the last page.

□−□= 233

8 A Mysterious Circle of Stones

At the Stonehenge in the southern part of the England, there are ruins composed of a circle of large stones.
This was built about 3600 to 5000 years ago.
The weight of a stone pillar is about 25 tonnes and there is another stone which weighs 7 tonnes on the top of this.
It seems that these stones were carried from a place about 38 km away from this place. It is said that it took 600 people and 1 year to carry 1 stone.
If there were 1800 people to carry stones, how many years did it take to carry 120 stones?

1800 people could carry 3 stones in 1 year.

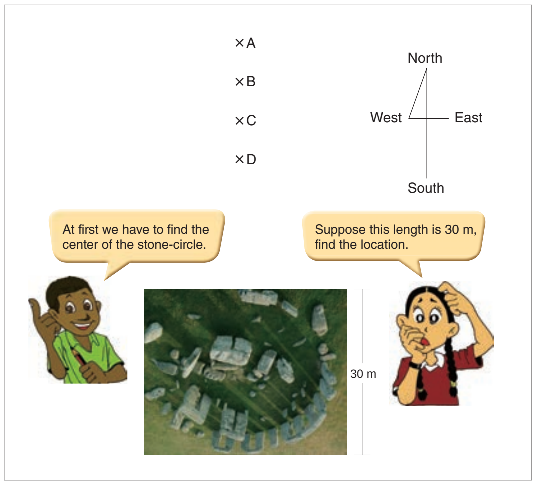
Then, 120÷3=40 so, it takes 40 years.

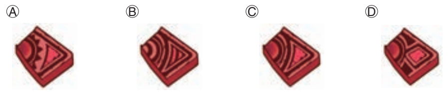
But how did they carry these stones?

Even in modern science it cannot be explained.

234 = □×□

The key fragment is hidden near this stone circle. You will find the location when you go half way round the circumference from the centre of the stone-circle facing North. The stone-circle is 30 m in diameter but in this quiz let the diameter be 5 cm. Draw a figure then find the answer.





- Let's cut out a fragment on page 245 and paste on the last page.

□−□= 235

9 World Heritage – Comparing the Areas of the Lakes


Lake Baikal, Russia


Lake Malawi, Malawi

Lake Baikal in Russia and Lake Malawi in Africa are both far away from each other but their shape is similar. This is because the two lakes were made in the same way.

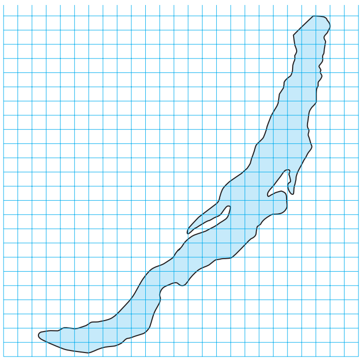
There are many other lakes in the World Heritage list. Lake Ohrid in Macedonia and Yellowstone Lake in the United States are famous. Let's compare the areas of these lakes.
While Lake Ohrid is 350 km² big, Lake Baikal is 90 times bigger. The area of Yellowstone Lake is 1.2 % of Lake Malawi, 360 km².

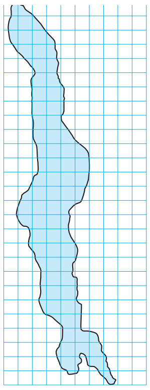
Lake Ohrid and Yellowstone Lake are approximately the same in area.
The areas of Lake Baikal and Lake Malawi are almost the same.
Let's calculate their areas.

You can calculate the area of Lake Baikal by using the area of Lake Ohrid.

You can divide the area of Yellowstone Lake by 0.012 to find the area of Lake Malawi.

Count the squares on the next page to find the approximate areas of Lake Baikal and Lake Malawi. Compare the calculated value and the counted value of each lake. Which pair has less difference?
Choose the right pair to get a broken piece of the key (The key fragment is hidden in the one with the closer area.).


A：Lake Baikal


B：Lake Malawi

The side of each square is 20 km for each figure.

Both lakes look equal.

The incomplete squares are counted as half an area.

To begin with, put x on incomplete squares and o on complete squares.
Then calculate.

We can calculate area of 1 square as $20 \times 20 = 400$ (km²).

Ⓐ


Ⓑ

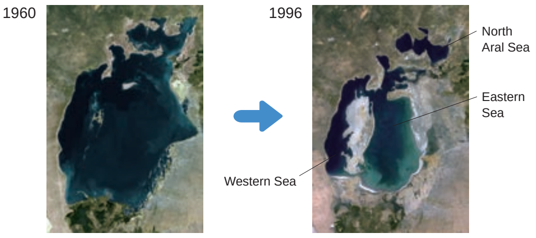

- Let's cut out a fragment on page 245 and paste on the last page.

10 Disappearing Lake from Map

The Aral Sea is a salt lake that lies between Kazakhstan and Uzbekistan.


An abandoned ship that was once at the bottom of the lake.

This lake used to have a water volume of 1090 km³ containing 10 g salt per litre in 1960. However, the water volume has been reducing because of the constructions of canals for agricultural water supply.
Consequently, the amount of salt per litre has been increasing. In short, the salt water is more concentrated. In 1989, the lake separated into the South Aral Sea and the North Aral Sea and in 2003, the total volume of water in the two lakes decreased to 109 km³. Even at the locations of low salt concentration in the South Aral Sea it contains 80 g of salt per litre.



What is the percentage of the volume of water in 2003 compared to the volume of water in 1960?

You can apply the knowledge of proportion to find the answer.

The chart below shows how the salt concentration has increased since 1987. Study when (from what year to what year) the salt concentration became equal to that of the sea and you can find the key fragment.

How many grams of salt does the sea water contain?

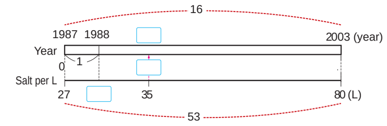
It is 35 g per litre in average.

The Change in the Concentration of Salt in Aral Sea

Year	1987	1988	1989		2003
The salt per litre (g)	27	?	?		80

Suppose that the concentration of salt increases at the constant rate every year from 1987 to 2003…

The amount of salt per litre in 1987 is 27 g per 1 L and the salt per 1 L in 2003 is 80 g per 1 L. So, there is an increase of 53 g in 16 years.



There are four jars with the key fragment inside. The final key fragment is in the jar made in the same year as the salt concentration was 35 g per litre.


A 1989


B 1992


C 1995


D 1997

- Let's cut out a fragment on page 245 and paste on the last page and make the key completed.

Unit 16

Unit: Summary of Grade 5

Supplementary Topic: Mathematics Adventure

**Textbook Page :
228 to 240
Keys and Math Extras**

Value of Toral Shell Money (Tabu)

Papua New Guinea had the practice of buying and selling using their own traditional money before the introduction of Kina and Toea in 1975. Different province and regions in Papua New Guinea have their own way of paying for goods, we call Barter system. When there is need for payments such as bride price ceremony or compensation, the people pay using the goods they produce or raised or pay with the traditional money they have. The Rabaul people use Tabu or shell money as shown in the picture. During a ceremony, rings of Tabu are displayed. The value of Tabu is 10 toea for 12 tabu beads per stick. One arm span is 5 kina. In a bundled ring Tabushell, there are 40 rings with a diameter of 80 cm. If 70 cm of tabu (one arm length) is 5 kina, what is the total value of this bundle ring?

228 = □ × □

At the end of the Adventure Part 1, there will be 5 purple pieces of the puzzle that should be collected after answering the given questions correctly.

When each pieces of the puzzle are combined together, they will reveal the key of friendship. Having this key indicates that the students can utilise the necessary knowledge and skills learned to move onto Adventure Part 2.

Area of Lake Kutubu

Papua New Guinea has many lakes. The two largest lakes are Lake Murray and Lake Kutubu. Lake Kutubu is famous because of its location which is near to the Kutubu Oil Project, in the Southern Highlands Province. The water is clear and the lake reaches a depth of 70 m (230 feet) and is about 800 m above sea level.

The picture shows the map of Lake Kutubu. For each square grid, the area is 10 km^2. Find the total area of the Lake using the method of calculating the approximate area learned in this grade.

240 = □ × □

At the end of the Adventure Part 2, there will be 5 maroon pieces of the puzzle that should be collected after answering the given questions correctly.

When each pieces of the puzzle are combined together, they will reveal the key of reliability. Having this key indicates that the students can utilise the necessary knowledge and skills learned to advance onto the next grade level and apply them in their daily lives.

Appendices

Let's have fun with Math Game for improving Math Skills

Some interesting games are introduced in the Teacher's Manual for improving students mathematics thinking skills. Teachers are encouraged to facilitate these games during lesson time, recess, lunch and after lessons. Two (2) games, materials and answers are introduced page 309 to 313. The first game is an example of addition, subtraction and multiplication in a number card game to improve students' mental calculation skills. The second game is square calculations.

Math game 1

Let's Play 'Number Card Game'

Objective: Students will be able to do mental calculations of addition (up to 9 + 9), subtraction(up to 18 − 9), and the multiplication(up to 9 × 9).

When to play

It is very effective if you play the game 5 minutes at the beginning of every lesson.

How to play

1. Addition

Teacher gives the students a number to be added. Teacher shows different number cards and the students do mental calculation to add the number mentioned to the number shown as quickly as possible.

Example:

Teacher: "Please add 5 to the shown number card". Show a number card (3).

Students: "8"

Teacher: Show a number card (6).

Students: "11"

2. Subtraction

Teacher gives the students a number to be subtracted from. Teacher shows different number cards and the students do mental calculation to subtract the number mentioned to the number shown as quickly as possible.

Example:

Teacher: "Please subtract the number shown on the card from 15".

Teacher: Show a number card (8).

Students: "7"

Teacher: Show a number card (6).

Students: "9"

3. Multiplication

Teacher gives the students a number to be multiplied. Teacher shows different number cards and the students do mental calculation to multiply the number given by the teacher with the number in the card and answer as quickly as possible.

Example:

Teacher: "Please multiply 3 to the shown number card".

Teacher: Show a number card (8).

Students: "24"

Teacher: Show a number card (5)

Students: "15"

Number card samples, 0 - 9

0

1

2

3

4

5

6

7

8	**9**

Math game 2

Let's enjoy SQUARE CALCULATION!!!

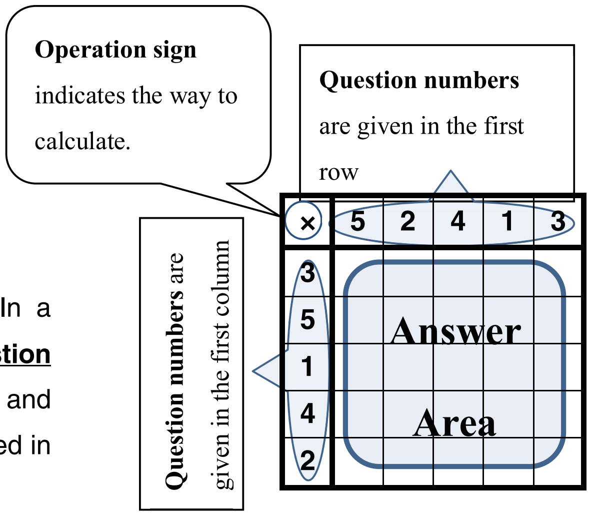
Background

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** (＋, ー or ×), **question numbers** written in the first row and first column at random and **answer space** for students to fill. Division sign (÷) cannot be used in this activity because remainders appear many times.

Multiplication

Multiply the left numbers by the above numbers.

×	4	5	1	7	9
8	32	40	8	56	72
2	8	10	2	14	18
3	12	15	3	21	27
7	28	35	7	49	63
4	16	20	4	28	36

Addition

Add the above numbers to the left numbers.

+	4	5	1	7	9
8	12	13	9	15	17
2	6	7	3	9	11
3	7	8	4	10	12
7	11	12	8	14	16
4	8	9	5	11	13

Subtraction

Subtract the above numbers from the left numbers.

–	3	2	8	9	10
18	15	16	10	9	8
11	8	9	3	2	1
15	12	13	7	6	5
20	17	18	12	11	10
16	13	14	8	7	6

Note: Write numbers from 11 to 20 in the first column.

*Note: Students should calculate from left to right and row by row without missing a space in Answer area.

How to use Square Calculation

(A) During activity

Teacher should;

1. select a size of square (5×5, 7×7 or 10×10)[*1] and then write down the square on the blackboard.
2. give the operation sign (＋, ー 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;

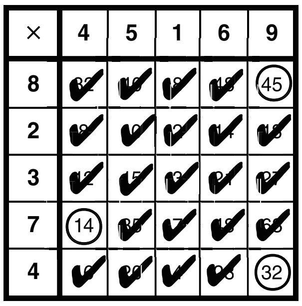
1. mark their friend’s answers by putting ✓ on a correct answer or ○ on a wrong answer and a blank square.
2. write their score on the activity sheet.

(C) During recording

Teacher should;

1. collect their activity sheets.
2. record children’s score into recording sheet at least once a week.

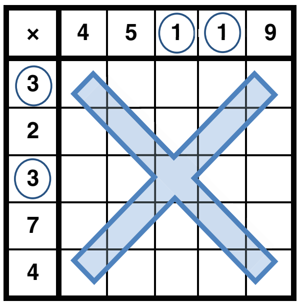
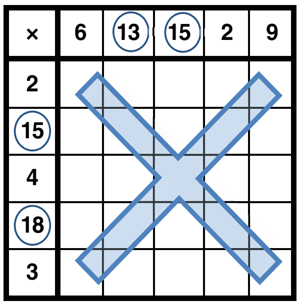
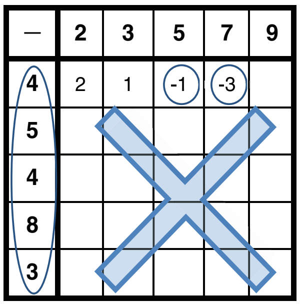
Time 0:47 Score 22/25



×	4	5	1	6	9
8	✓	✓	✓	✓	㊺
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
7	⑭	✓	✓	✓	✓
4	✓	✓	✓	✓	㉜

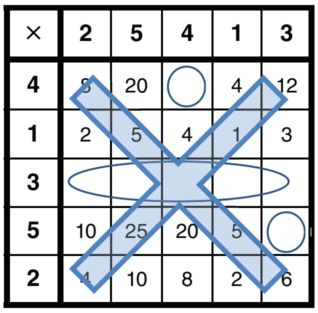
Example of correction

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.
 	 	

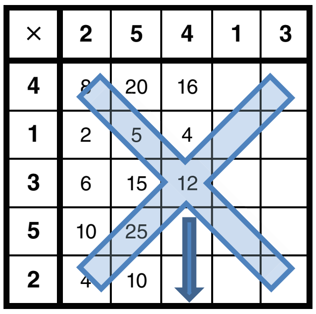
Note: **Bad examples** when students write answers on their activity sheets.

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**.

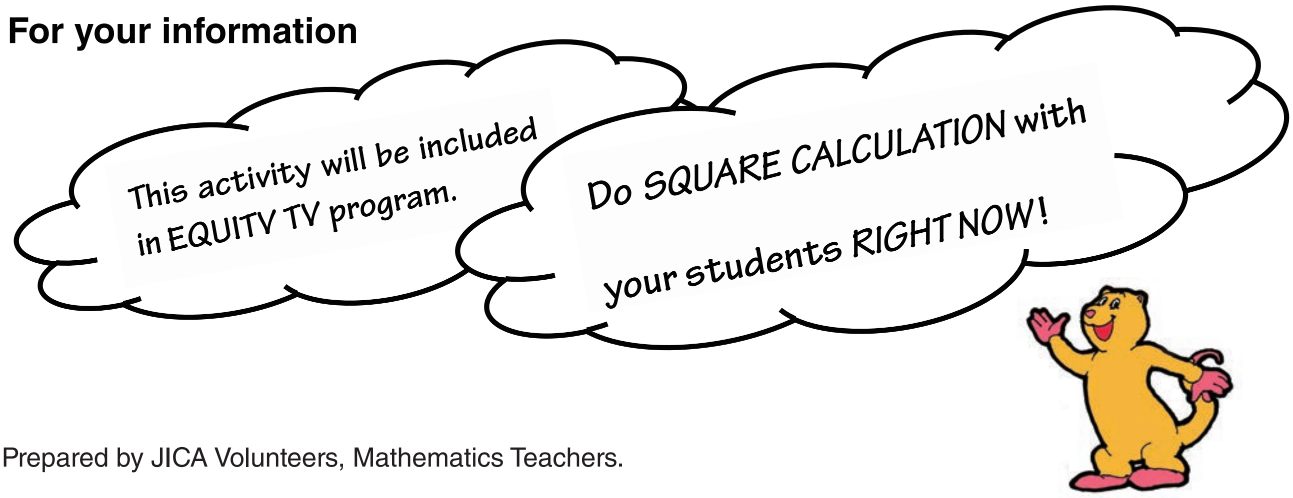
Sample teaching plan for Grade 3

	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



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: ______/

1cm^2 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		
Elementary 2 • Circle, sphere		**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

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, histogram	**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 or symbols			

Mathematics Grade 5 Teacher's Manual Development Committees

The Mathematics Teacher's Manual was developed by Curriculum Development Division (CDD), Department of Education in partnership with Japan International Cooperation Agency (JICA) through the Project for Improving the Quality of Mathematics and Science Education (QUIS-ME Project). The following stakeholders have contributed to manage, write, validate and make quality assurance for developing quality Textbooks and Teacher's Manuals for students and teachers of Papua New Guinea.

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