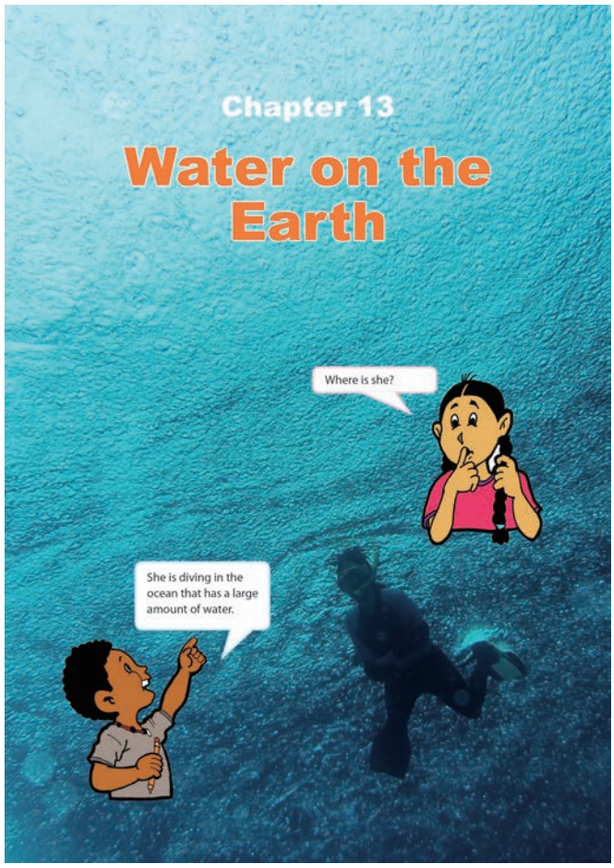
Strand : EARTH AND SPACE
Unit : WEATHER & CLIMATE

Chapter 13. Water on the Earth

Chapter Objectives

Students will be able to understand the cycle of water between the atmosphere and Earth as water changes its state.

Students will also be able to understand how human activities pollute water and how they can keep water clean from pollution.



The picture at the chapter heading in the textbook shows a woman diving and swimming in the ocean.

Topic Objectives

13.1 Water in Natural World

Students will be able to;

- Identify the different sources of water around them.
- Define what evaporation is.
- Define what condensation is.
- Explain the process of water cycle through evaporation, condensation and precipitation.

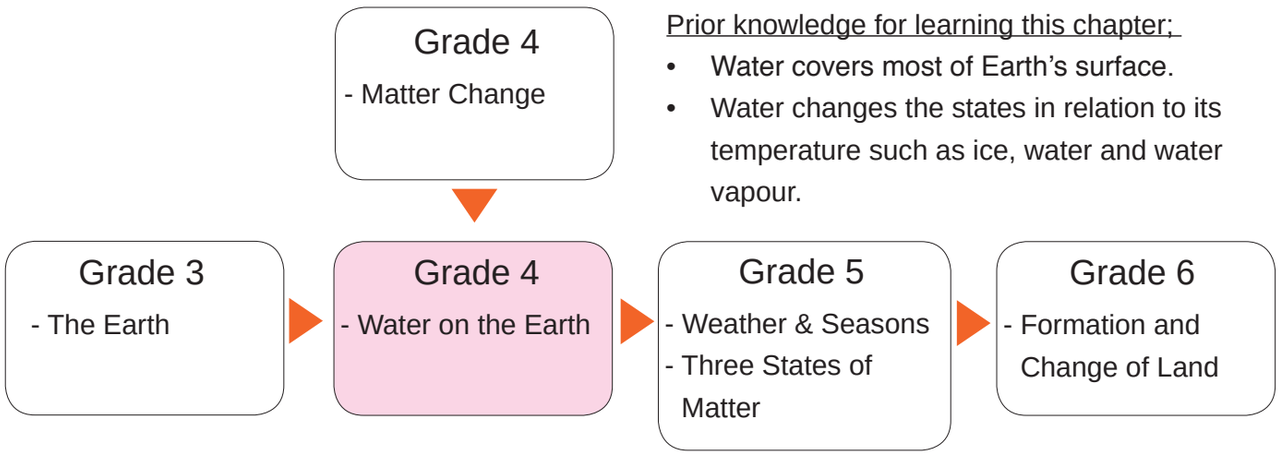
13.2 Water and Human

Students will be able to;

- Describe the ways that water is used by humans.
- Identify water pollution and its causes.
- Identify the different ways in which people can solve water pollution.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Prior knowledge for learning this chapter;

- Water covers most of Earth's surface.
- Water changes the states in relation to its temperature such as ice, water and water vapour.

Teaching Overview

This chapter consists of 10 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
13.1 Water in Natural World	1	**Sources of Water** Where does water come from?	4.3.2	159 - 160
	2	**Puddles is Gone!** Where has the puddle gone to?		161 - 162
	3	**Water in Air** How can we find water vapour in air?		163 - 164
	4	**Water Cycle** Where does water on Earth go and come from?		165 -166
	5	Summary and Exercise		167 - 168
13.2 Water and Human	6	**Importance of Water for Our Life** How do we use water in our daily lives?		169 - 170
	7	**Water Pollution** What makes water dirty?		171 - 172
	8	**Keeping Water Clean** How can we solve the problems of water pollution?		173 - 174
	9	Summary and Exercise		175 - 177
Chapter Test	10	Chapter Test		178 - 179

Unit	Chapter : **13. Water on the Earth**	Total lesson No: 63 / 97
Weather and Climate	Topic : **13.1. Water in Natural World**	Textbook page: 159 - 160

Lesson 1 / 10

Lesson Title

Sources of Water

Preparation

- Other pictures showing sources of water

Lesson Flow

1 Introduction (10 min.)

- Recall the Gr 3 lesson in the chapter 'Observing our Environment' by asking the following questions:

Q:How do people depend on non-living things?

- Encourage students to think about the sources of water by asking:

Q:Where do you get water when you need it?

2 Introduce the key question

Where does water come from?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Refer students to their daily experiences on where they find water for their use.
- Have students do the activity and ask them to record their findings in the table.
- Give enough time to the students to explore ideas through activity.

4 Discussion for findings (20 min.)

- Ask students to present the results of their activity.
- Write down students' findings on the blackboard.

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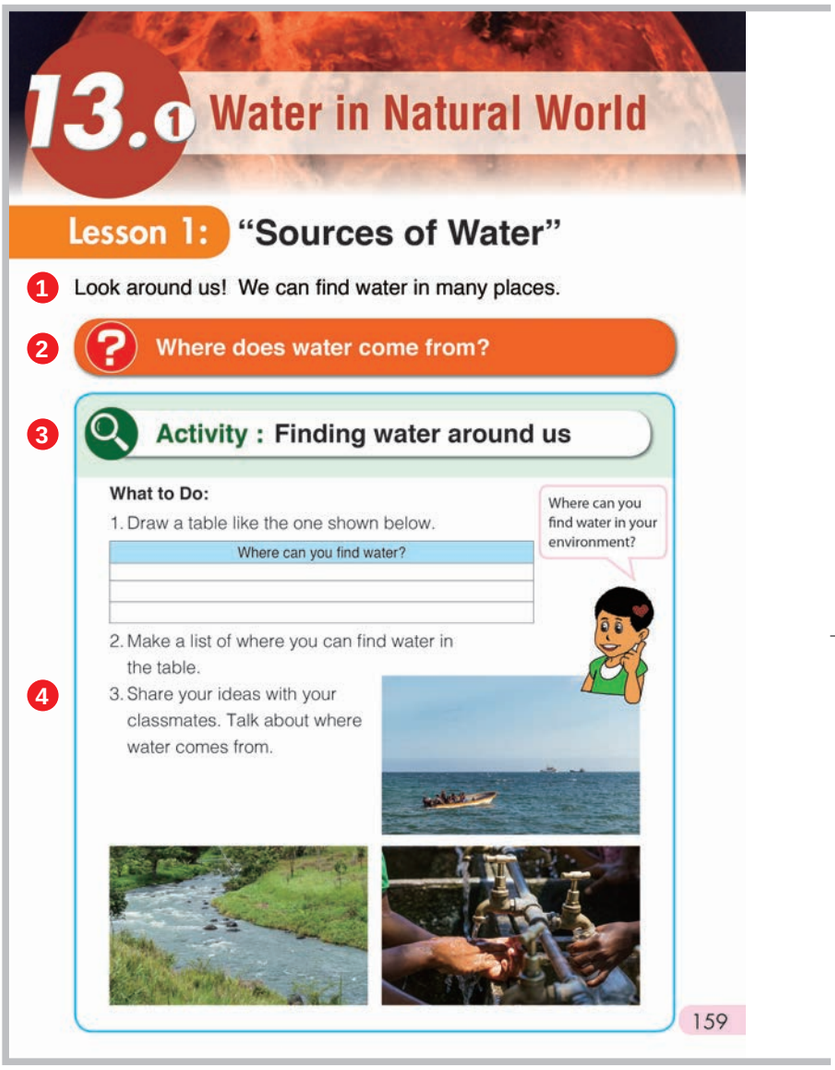


Teacher's Notes

- Water is a valuable natural resource that is found in different forms in the environment. The main sources of water for drinking, washing, agriculture and industry are surface water. Ground water and collected rainwater, all which are dependent on rain and snow falling on the Earth's surface. Water that comes naturally depends entirely on the role of the **Water Cycle**.

3 main types of natural sources of water	Description
Rain water	It is collected on the Earth in the form of surface and groundwater.
Surface water	Water on the surface of the Earth like oceans, rivers, ponds and streams.
Underground water	Life is possible on earth due to the existence of this type of water. For example bore water.

Definitions of man-made sources of water

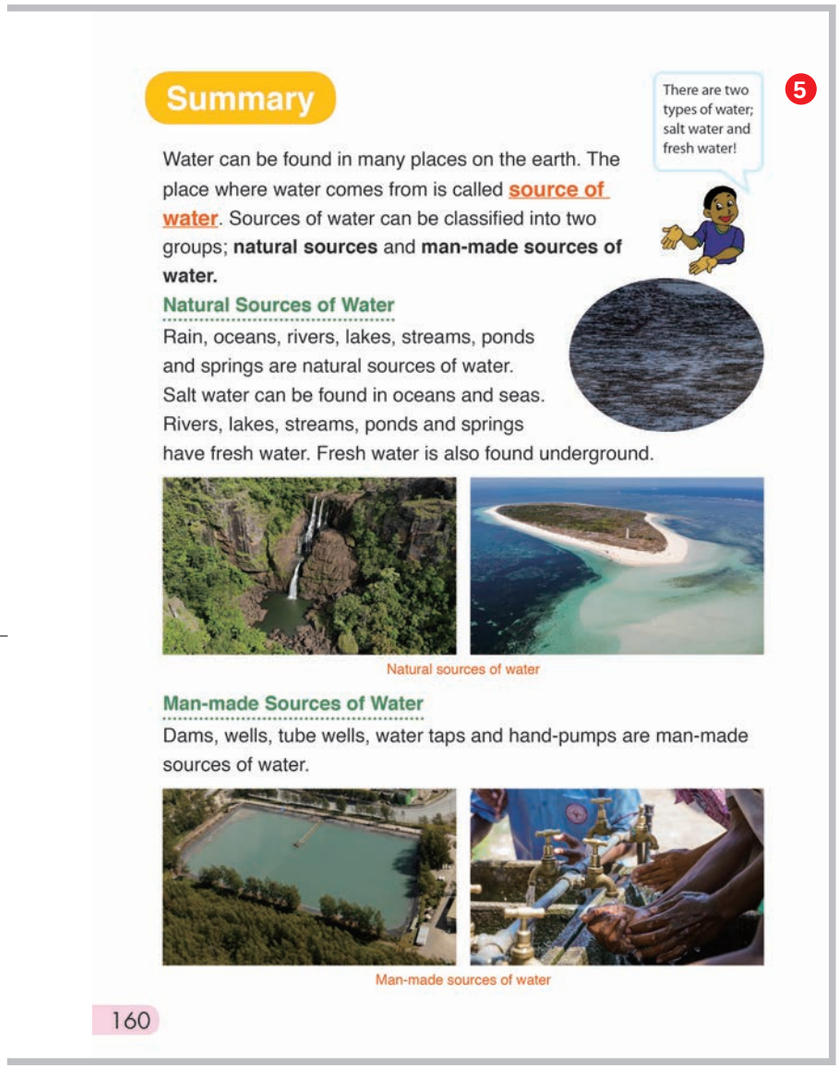
Dam- is a barrier that stops the flow of water.
Water wells- are excavations or structures created in the ground by digging or drilling to access ground water, underground.
Hand- pumps- Water lifting device used to withdraw water from surface water sources.
Water tap- Is water that is supplied to a tap.

Lesson Objectives

Students will be able to:
- Identify the different sources of water around them.
- Classify sources of water into natural and man-made.

Assessment

Students are able to:
- List the different sources of water on earth.
- State examples of sources of water in nature and man-made.
- Show eagerness to investigate the sources of water.



Summary

There are two types of water; salt water and fresh water!

Water can be found in many places on the earth. The place where water comes from is called **source of water**. Sources of water can be classified into two groups; **natural sources** and **man-made sources of water.**

Natural Sources of Water

Rain, oceans, rivers, lakes, streams, ponds and springs are natural sources of water. Salt water can be found in oceans and seas. Rivers, lakes, streams, ponds and springs have fresh water. Fresh water is also found underground.

Natural sources of water

Man-made Sources of Water

Dams, wells, tube wells, water taps and hand-pumps are man-made sources of water.

Man-made sources of water

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- Confirm findings with students.
- **Based on their findings,** ask these questions as discussion points.

Q:Where do you find water? (Oceans, rivers, streams, lakes, rain and underground, water taps, water tanks, wells, water pumps and dams)

- Explain the source of water and let students classify the sources of water into two groups; natural and man-made sources of water.
- Ask the following questions:

Q:Which sources of water are natural? (Oceans, rivers, streams, lakes, rain, and underground)

Q:Which sources of water are man-made? (Water taps, water tanks, wells, water pumps and dams)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: How can the source of water be classified?
  Q: What are some examples of natural and man-made sources of water?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Sources of Water"

Key question
Where does water come from?

Activity
Finding water around us.

Where can you find water?
Rain, ocean, rivers, dames, wells, ponds, lakes and water tanks

Discussion

Q: Where do you find water?
Oceans, rivers, streams, lakes, rain and underground, Water taps, water tanks, wells, water pumps and dams, etc.

✧ Classify the sources of water into natural and man-made sources of water

Natural source of water	Man-made sources of water
Oceans, rivers, streams, lakes, rain and underground	Water taps, water tanks, wells, water pumps and dams

Summary
- The place where water is found on earth is called source of water.
- The sources of water can be classified into two: natural sources of water and man-made sources of water.
- Examples of natural sources of water are rain, oceans, rivers etc.
- Examples of man-made sources of water are dams, wells, water taps etc.

Unit	Chapter : **13. Water on the Earth**	Total lesson No: 64 / 97
Weather and Climate	Topic : **13.1. Water in Natural World**	Textbook page: 161 - 162

Lesson 2 / 10

Lesson Title

Puddle is Gone!

Preparation

- Two glasses or plastic container, water
- Rubber bands and markers pen (any colour)
- Plastic wrap or plastic bag

Lesson Flow

1 Introduction (10 min.)

- Review previous lesson by asking:

Q:How can the source of water be classified?

Q:What are some examples of natural and man-made sources of water?

- Provoke students to think about a puddle on the ground by asking:

Q:Why does a puddle disappear after a while?

2 Introduce the key question

Where has the puddle of water gone to?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Tell students to make a prediction by asking this question.

Q:What will happen to the water in Glass A and B after 5~6 hours?

- Write students predictions on the board.
- Have students do the activity and ask them to record their findings in the table.

4 Discussion for findings (20 min.)

- Ask students to present the results of their activity.
- Write down students' findings on the blackboard.

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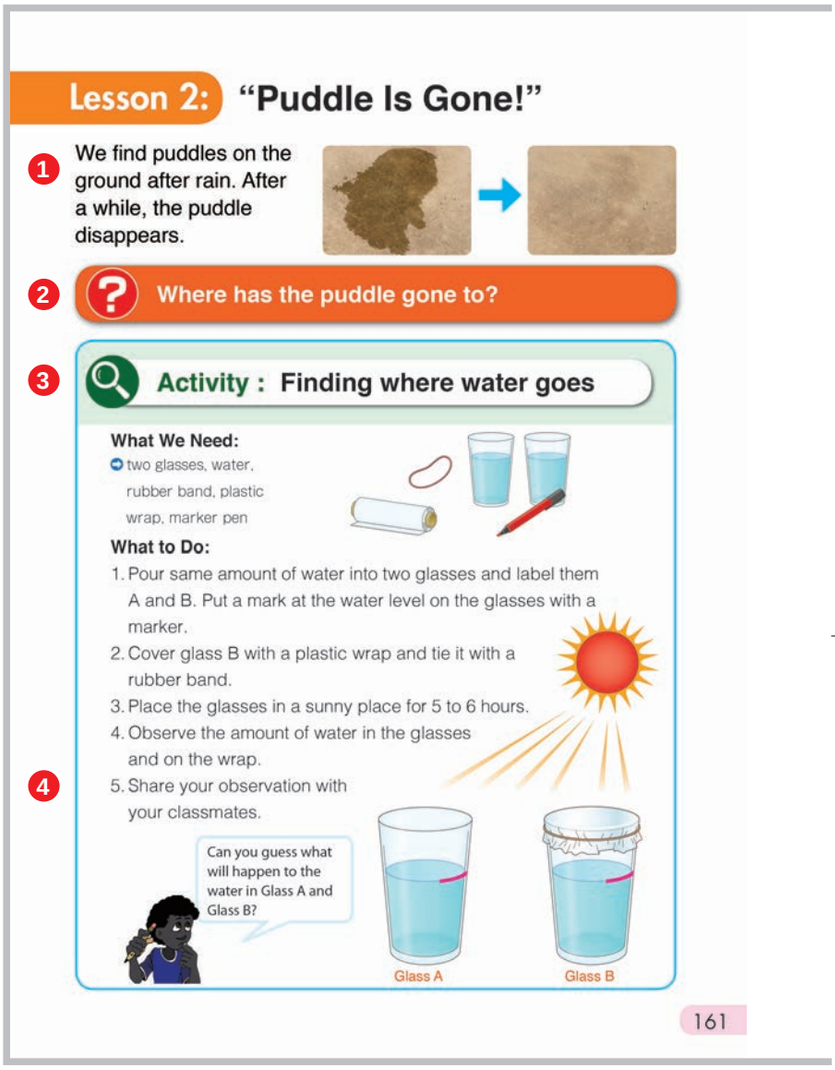
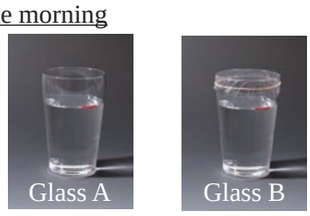


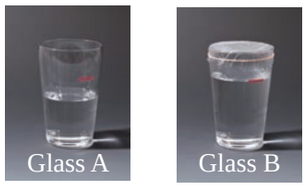
Teacher's Notes

- Separate this lesson into two parts;
  First part should be done in the morning for introduction and activity.
- In the afternoon, the second part should be done for result, discussion and summary.
- This kind of the observations and recording that is expected to be done by students in their exercise books.
- An explanation should be written below to describe what happens to the water in Glass A and B.

In the morning



In the afternoon

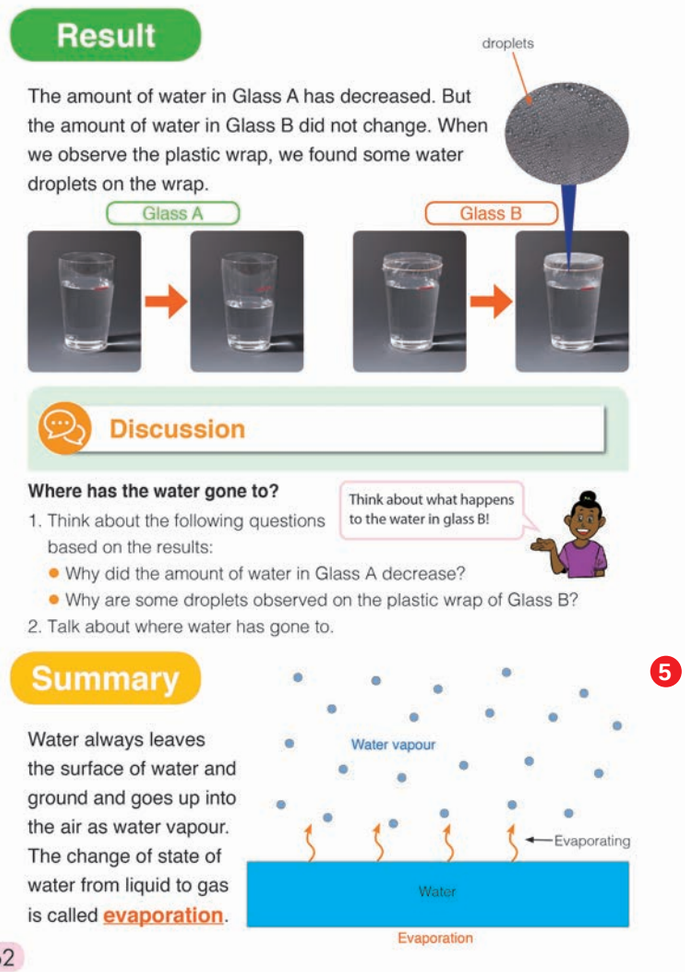


Lesson Objectives

Students will be able to:
- Define evaporation.
- Infer where a puddle of water has gone based on the results of the activity.
- Describe how the puddle of water has gone to.

Assessment

Students are able to:
- Explain the process of evaporation.
- Relate the results of the activity to the disappearance of a puddle.
- Investigate collaboratively with classmates.



- Confirm findings with students. And ask students to compare their prediction and results.
- **Based on their findings,** ask these question as discussion points.

Q:What happened to the amount of water in Glass A and B? (The amount of water in Glass A decreased, but in Glass B did not change.)

Q:Why does the amount of water in Glass A decrease? (Water escapes into the air as water vapour when the sun heated the water.)

Q:Why are some droplets observed inside the plastic wrap of Glass B? (When the water vapour comes in contact with the wrap it changes into water droplets.)

Q:Where has a puddle of water gone? (In the air)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is the meaning of evaporation?
  Q: How does water evaporate?
  Q: Why does a puddle of water disappear?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Puddle is Gone!"

Key question
Where has the puddle of water gone to?

Activity: Finding where water goes?

Draw water level before 5-6 hours	Draw water level after 5-6 hours
Drawing A B	Drawing A B

Discussion

Q: What happened to the amount of water in Glass A and B? The amount of water in Glass A decreased, but in Glass B didn't change.

Q: Why does the amount of water in Glass A decrease? Water escaped into the air as water vapour when the sun heated the water

Q: Why are some droplets observed inside the plastic wrap of Glass B? When the water vapour comes in contact with the wrap it changes into water droplets)

Q: Where has the puddle of water gone? Into the air

Summary
- Water changes into water vapour when heat is added to water.
- The process of changing water from liquid state to gaseous state is called evaporation.

Unit	Chapter : **13. Water on the Earth**	Total lesson No: 65 / 97
Weather and Climate	Topic : **13.1. Water in Natural World**	Textbook page: 163 - 164

Lesson 3 / 10

Lesson Title

Water in Air

Preparation

- Two glasses (or clear plastic containers), Ice cubes, water

Lesson Flow

1 Introduction (5 min.)

- Review previous lesson by asking:

Q:What is the meaning of evaporation?

Q:How does water evaporate?

- Arouse students to think about the existence of water in air by asking:

Q:Water evaporates and turns into air, but is that true?

2 Introduce the key question

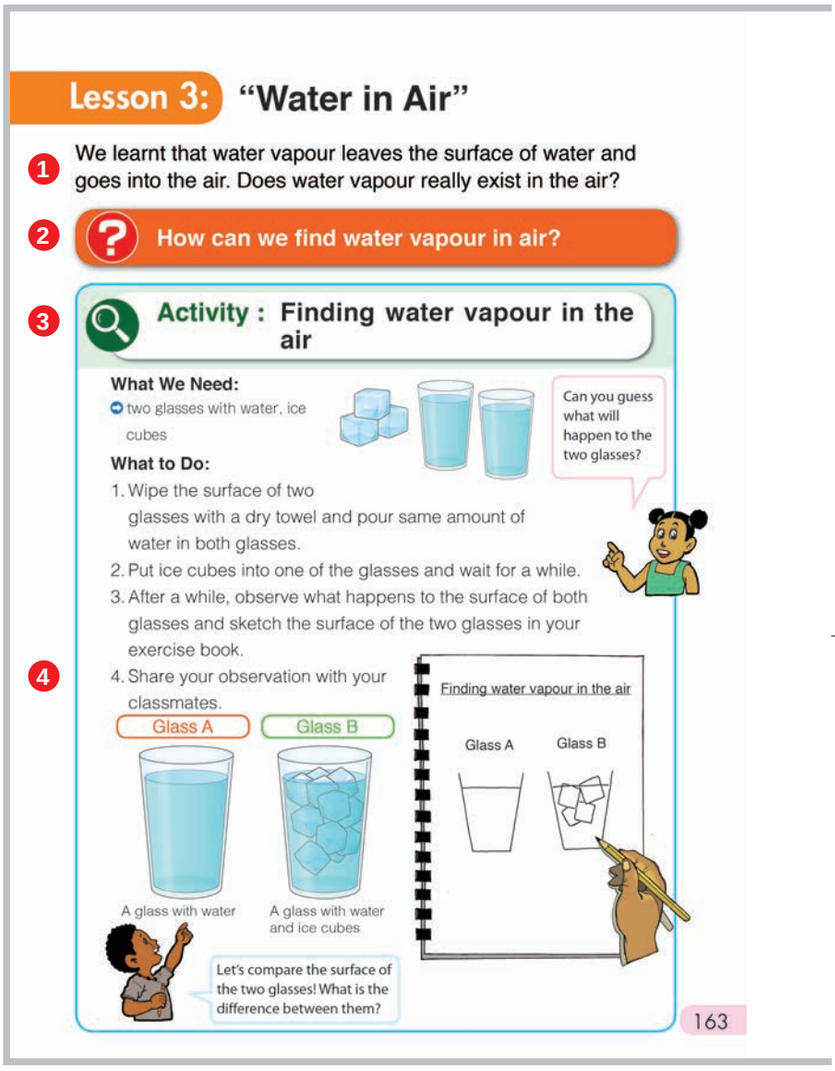
How can we find water vapour in air?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Tell students to make predictions by asking: "What would happen to the surfaces of Glass A and Glass B?"
- Write students predictions on the blackboard.
- Have students do the activity. Ask them to observe and sketch the surfaces of the two glasses. Let students to write their findings in their exercise books.
- Allow enough time for students to do the activity by themselves.

4 Discussion for findings (20 min.)

- Ask students to present the results of their activity.
- Write down students' findings on the blackboard. **(Continue)**



Teacher's Notes

- Expected diagrams of the experiment in the students exercise book.

Glass A

Glass B

Water vapour is the gaseous phase of water. It is one state of water within the hydrosphere. Water vapour can be produced from the evaporation or boiling of liquid water or from sublimation of ice. Unlike other forms of water, water vapour is invisible. Under typical atmospheric conditions, water vapour is continuously generated by evaporation.

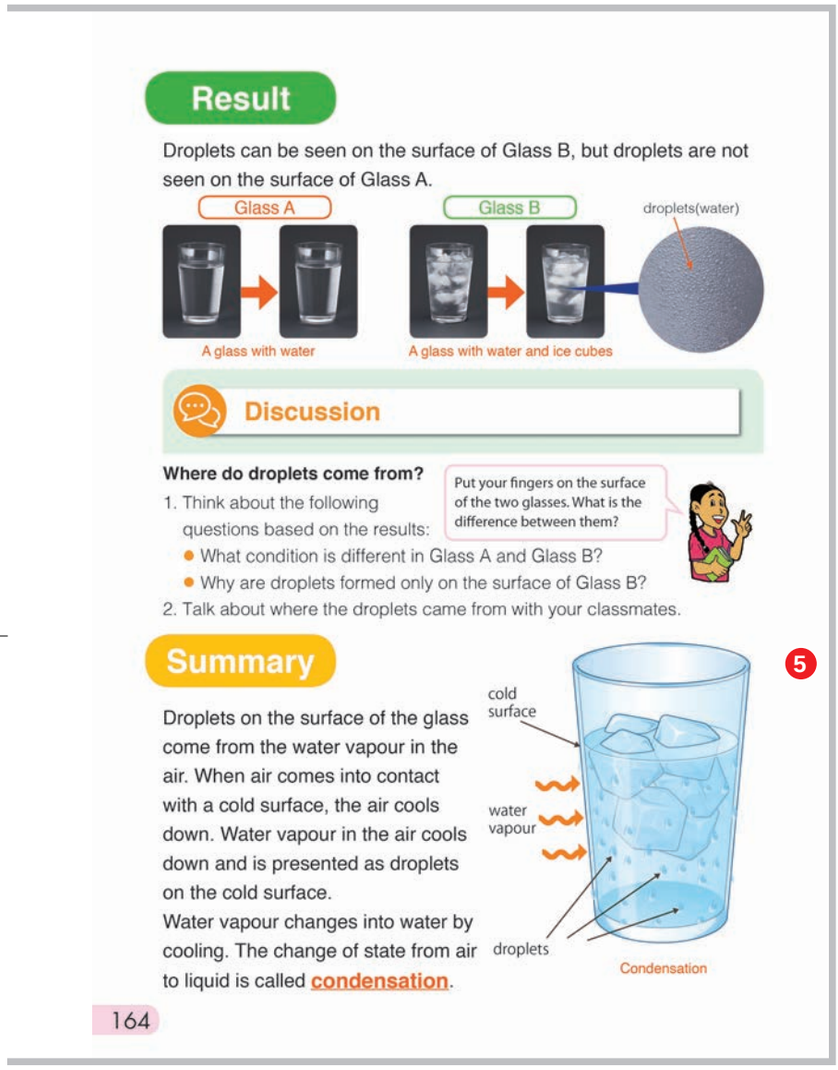
- Students write an explanation to their observation.
- Teacher has to prepare and use water that has same temperature with the room temperature. When the temperature of water in Glass A is lower than the room temperature, some water droplets would be observed on Glass A.

Lesson Objectives

Students will be able to:
- Define condensation.
- Infer that water is in air as water vapour based on the results of the activity.
- Describe why droplets are observed on the cold surface of the glass.

Assessment

Students are able to:
- Sketch the differences between the surfaces of two glasses.
- Explain the process of condensation.
- Relate the results of the activity to the existence of water in the air.
- Participate actively in setting up their experiments.



- Confirm findings with students.
- Ask them to compare their predictions and results.
- **Based on their findings**, ask the following questions as discussion point.

Q:What happened to the surface of Glass A and B? (Some droplets can be observed on the surface of Glass B, but no droplets on the surface of Glass A)

Q:What condition is different between Glass A and Glass B? (The surface of Glass B is colder than Glass A.)

Q:Why are droplets only formed on the surface of Glass B? (The water vapour in the air is cooled down by the cold surface of Glass B and it changes its state to water as droplets).

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is the meaning of condensation?
  Q: How does water vapour in air change its state to water?
  Q: Where do the droplets on the cold surface come from?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Water in Air"

Key question
Q: How can we find water vapour in air?
Activity: Finding water vapour in the air.

Drawing of glass A and B	
Drawing	Drawing
A	B

Discussion
Q: What happened to the surface of Glass A and B? Some droplets cane be observed on the surface of Glass B, but no droplets on the surface of Glass A
Q: What condition is different between Glass A and Glass B? The surface of Glass B is colder than Glass A.
Q: Why are droplets only formed on the surface of Glass B? The water vapour in the air is cooled down by the cold surface of Glass B and it changes its state to water as droplets

Summary
- The droplets come from water in air, not leaking from inside glass. Water cannot pass through glass materials.
- Water vapour in the air changes into water by cooling.
- The process of changing water from gaseous state to liquid state is called condensation.

Unit	Chapter : **13. Water on the Earth**	Total lesson No: 66 / 67
Weather and Climate	Topic : **13.1. Water in Natural World**	Textbook page : 165 - 166

Lesson 4 / 10

Lesson Title

Water Cycle

Preparation

- Plastic wrap/clear plastic bag, Glass/clear glass container, Ice cubes, Rubber band

Lesson Flow

1 Introduction (5 min.)

- Review the last lesson by asking:

Q:What is condensation?

Q:Where do the droplets on the cold surface of the glass come from? Why?

- Arouse students to think about the movement of water in nature by asking:

Q:Where does rain come from? Where does water in rivers and oceans go and come from?

2 Introduce the key question

Where does water on Earth go and come from?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Tell students to make predictions by asking: What would happen to the inside of the glass?
- Write students predictions on the board.
- Have students do the activity. Ask them to observe and record their findings in their exercise books.
- Give enough time to students to explore new ideas.

4 Discussion for findings (20 min.)

- Ask students to present their results of their activity.
- Write down students' findings on the blackboard.

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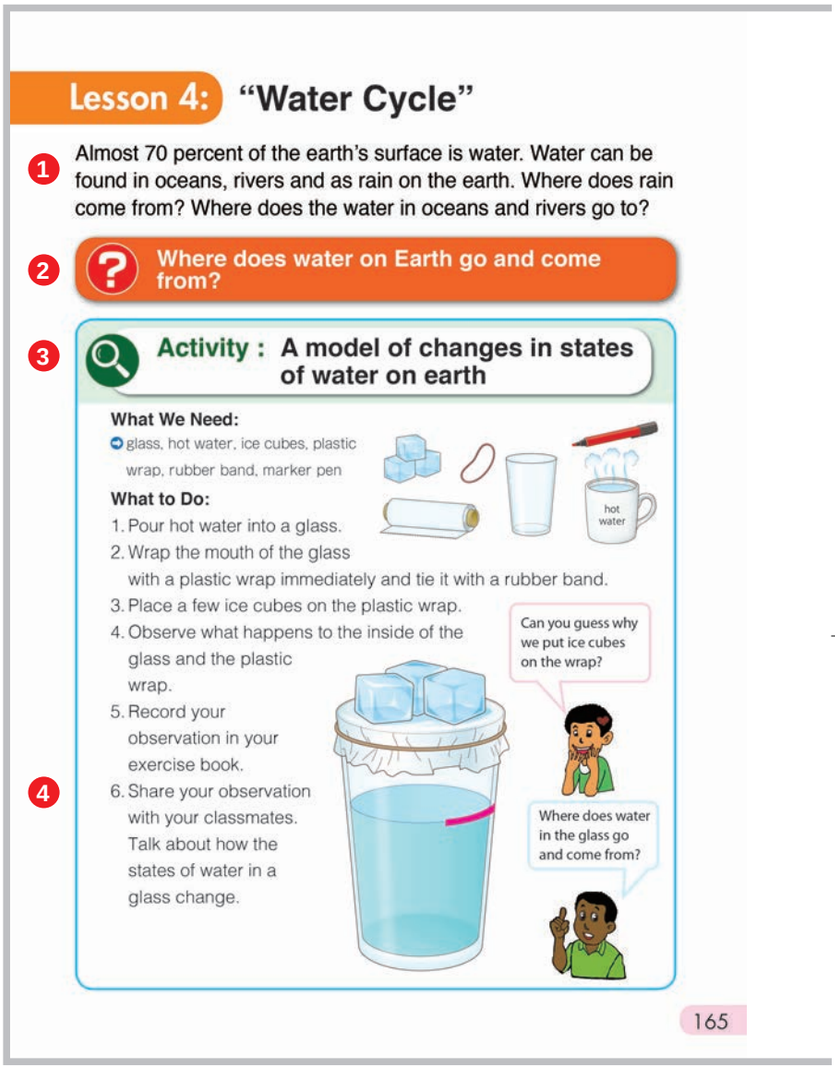

Lesson 4: "Water Cycle"

1 Almost 70 percent of the earth's surface is water. Water can be found in oceans, rivers and as rain on the earth. Where does rain come from? Where does the water in oceans and rivers go to?

2 Where does water on Earth go and come from?

3 Activity : A model of changes in states of water on earth

What We Need:
glass, hot water, ice cubes, plastic wrap, rubber band, marker pen

What to Do:
1. Pour hot water into a glass.
2. Wrap the mouth of the glass with a plastic wrap immediately and tie it with a rubber band.
3. Place a few ice cubes on the plastic wrap.
4. Observe what happens to the inside of the glass and the plastic wrap.
5. Record your observation in your exercise book.
6. Share your observation with your classmates. Talk about how the states of water in a glass change.

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Teacher's Notes

Water Cycle

- The Water Cycle is powered by the Sun's energy and by gravity. The Sun kick starts the whole cycle by heating all the Earth's water and making it evaporate. Gravity makes the moisture fall back to the Earth.
- There are four main stages in the Water Cycle. They are evaporation, condensation, precipitation and collection.

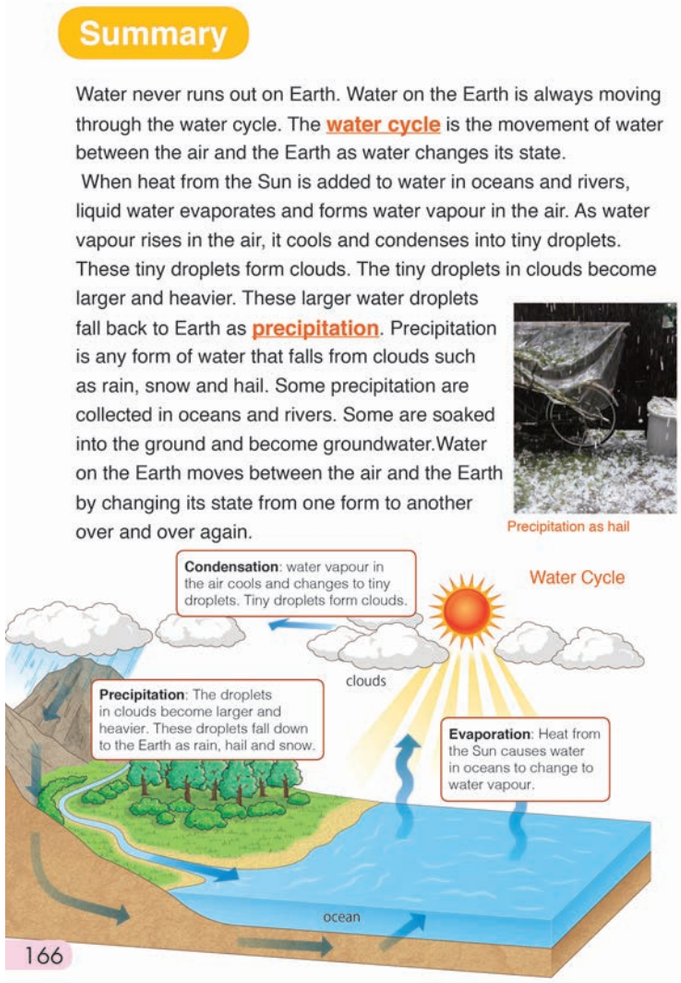
1. Evaporation- Evaporation from the oceans is the primary mechanism supporting the surface-to-atmosphere portion of the water cycle. This is when warmth from the sun causes water from oceans, lakes, streams, ice and soil to rise into the air and turn into water vapour (gas) . Water vapour droplets join together to make clouds.
2. Condensation- This is when water vapour in the air cools down and turns back into liquid water.
3. Precipitation- It is the primary connection in the water cycle that provides for the delivery of atmospheric water to the Earth. This is when water (in the form of rain, snow, hail or sleet) falls from the clouds in the sky.
4. Collection- This is when water that falls from the clouds as rain, snow, hail or sleet collects into the oceans, rivers, lakes and streams. Most will infiltrate (soak into) the ground and will collect as underground water.

Lesson Objectives

Students will be able to:
- Explain the process of water cycle.
- Identify the different types of precipitation.
- Relate the changes in states of water in nature to the changes in the temperature.
- Describe how clouds and precipitations are formed.

Assessment

Students are able to:
- Illustrate the movement of water in nature using the water cycle.
- Explain the formation of clouds and precipitation.
- Observe how water in a model changes its states.
- Listen to the opinions from others with respect.



Summary 5

Water never runs out on Earth. Water on the Earth is always moving through the water cycle. The **water cycle** is the movement of water between the air and the Earth as water changes its state.

When heat from the Sun is added to water in oceans and rivers, liquid water evaporates and forms water vapour in the air. As water vapour rises in the air, it cools and condenses into tiny droplets. These tiny droplets form clouds. The tiny droplets in clouds become larger and heavier. These larger water droplets fall back to Earth as **precipitation**. Precipitation is any form of water that falls from clouds such as rain, snow and hail. Some precipitation are collected in oceans and rivers. Some are soaked into the ground and become groundwater.Water on the Earth moves between the air and the Earth by changing its state from one form to another over and over again.

Precipitation as hail

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- Confirm student's findings with students. Ask them to compare their predictions and results.
- **Based on their findings,** asks the following questions as discussion points.

Q:How did the steam from hot water change its state in the model? (From steam to water vapour)

Q:What did you observe on the surface of the plastic wrap? (Water droplets were formed on the surface of the plastic wrap and dropped back in the hot water again.)

Q:How did the states of water change near the surface of the wrap? Why? (The state of water changed from water vapour to liquid water because water vapour is cooled by ice cubes.)

Q:How did the states of water change in the model? (From hot water to water vapour, to liquid water)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is water cycle?
  Q: What is precipitation?
  Q: Explain the process of water cycle in natural world.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Water Cycle"

Key question

Where does water on Earth go and come from?

Activity A model of changes in states of water on Earth.

Changes in states of water
➤ The steam came from hot water. ➤ Many droplets were formed on the surface of the wrap. ➤ When the droplets became bigger, they dropped to hot water again.

Discussion

Q: How did the steam from hot water change its state in the model? From steam to water vapour

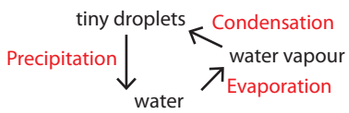
Q: What did you observe on the surface of the plastic wrap? Water droplets were formed on the surface of the plastic wrap and dropped back in the hot water again.

Q: How did the states of water change near the surface of the wrap? Why? From water vapour to liquid water. It's because water vapour is cooled by ice cubes.

Q: How did the states of water change in the model? From hot water to water vapour, to liquid water

Summary

- Water cycle is the movement of water between the air and the Earth as water changes states over and over again.
- Precipitation is any form of water that falls from clouds such as rain, snow and hail.



Unit
Weather and Climate

Chapter : **13. Water on the Earth**
Topic : **13.1. Water in Natural World**

Total lesson No: 67 / 97
Textbook page: 167 - 168

Lesson
5 / 10

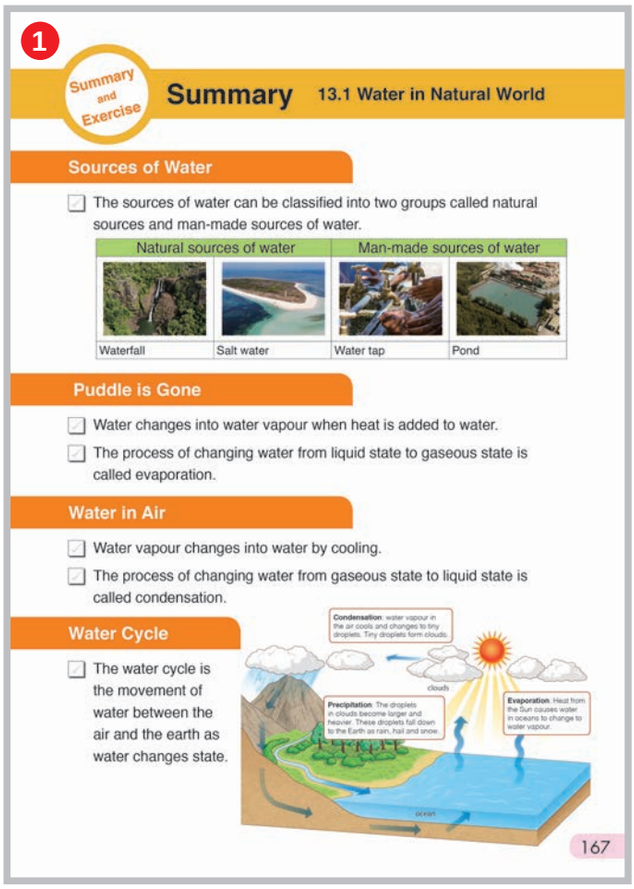
Lesson Title

Summary and Exercise

Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some questions to students and verify students understanding. Explain and correct learning contents again if they still have misconception.
- Provoke students to think about the sources of water as natural and man-made.
- Have students to give examples of natural and man – made sources of water.
- Have students to define the process of evaporation and condensation.
- Guide students to understand how water is moved between the atmosphere and the Earth's surface.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Summary and Exercise

Summary 13.1 Water in Natural World

Sources of Water

The sources of water can be classified into two groups called natural sources and man-made sources of water.

Natural sources of water		Man-made sources of water	
Waterfall	Salt water	Water tap	Pond

Puddle is Gone

Water changes into water vapour when heat is added to water.

The process of changing water from liquid state to gaseous state is called evaporation.

Water in Air

Water vapour changes into water by cooling.

The process of changing water from gaseous state to liquid state is called condensation.

Water Cycle

The water cycle is the movement of water between the air and the earth as water changes state.

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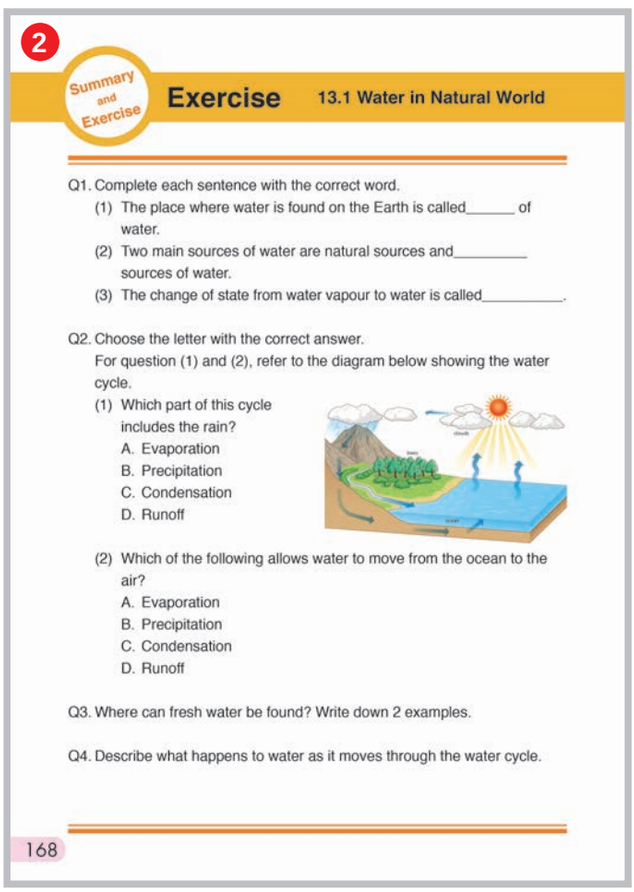
2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time in response to students understanding
- After the test, give them answer of the questions and explain how to solve. Then, ask their answers and thoughts.
- Guide students to understand the main ideas or concepts in response to their answers.
- If students find concept on water cycle difficult use a simple diagram on the blackboard to explain again showing how water is moved in a cycle between the earth and the atmoshere.
- Remind students this is the test for the end of the topic on water in natural world. We will be moving into a new topic in our next science lesson.


2

Summary and Exercise

Exercise 13.1 Water in Natural World

Q1. Complete each sentence with the correct word.

(1) The place where water is found on the Earth is called_____ of water.

(2) Two main sources of water are natural sources and_____ sources of water.

(3) The change of state from water vapour to water is called_____.

Q2. Choose the letter with the correct answer.

For question (1) and (2), refer to the diagram below showing the water cycle.

(1) Which part of this cycle includes the rain?

A. Evaporation
B. Precipitation
C. Condensation
D. Runoff

(2) Which of the following allows water to move from the ocean to the air?

A. Evaporation
B. Precipitation
C. Condensation
D. Runoff

Q3. Where can fresh water be found? Write down 2 examples.

Q4. Describe what happens to water as it moves through the water cycle.

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Exercise answers

Q1.
(1) **source**
(2) **man-made**
(3) **condensation**

Q2.
(1) **B**
As water vapour rises into the air it cools and condenses into tiny droplets. Tiny droplets form clouds, becomes heavier and fall back to Earth as rain, snow and hail and is known as precipitation.
(2) **A**
When the sun shines, water leaves the surface of the Earth and goes up into air as water vapour. This process is called evaporation.

Q3. **(Example of answer)**
Rivers, lakes, streams, ponds and springs, etc.
Salt water found in oceans and seas are not fresh water as they contain salt that makes sea water more salty.

Q4. **(Example of the answer)**
1) Evaporation: Heat from the Sun causes water in ocean to change to water vapour.
2) Condensation: The water vapour in the air cools and change to tiny droplets that form clouds.
3) Precipitation: The droplets in clouds become larger and fall down as rain, snow and hail.
The answer should include the words such as evaporation, condensation and precipitation.

Unit	Chapter : **13. Water on the Earth**	Total lesson No: 68 / 97
Weather and Climate	Topic : **13.2. Water and Human**	Textbook page: 169 - 170

Lesson 6 / 10

Lesson Title

Importance of Water for Our Lives

Preparation

- Some other pictures showing how water is important to humans

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:What is water cycle?

Q:Explain the process of water cycle.

- Provoke students to think about the importance of water by asking:

Q:What do people need to survive?

Q:Why is water so important for people?

2 Introduce the key question

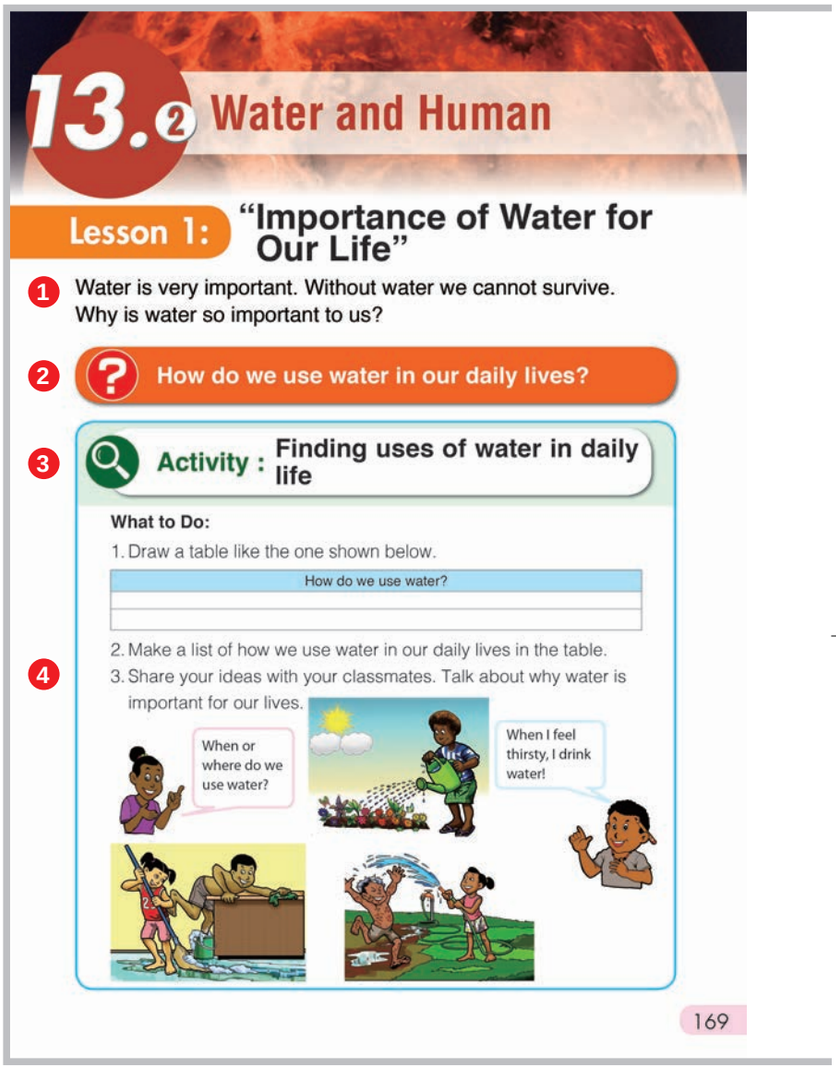
How do we use water in our daily lives?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Tell students to recall their daily experiences on how they use water.
- Have students do the activity and ask them to record their findings in the table.
- Give enough time to students to explore new ideas.

4 Discussion for findings (20 min.)

- Ask students to present the results of their activity.
- Write down students' findings on the blackboard.
- Confirm findings with students. **(Continue)**


13.2 Water and Human

Lesson 1: "Importance of Water for Our Life"

1 Water is very important. Without water we cannot survive. Why is water so important to us?

2 How do we use water in our daily lives?

3 Activity : Finding uses of water in daily life

What to Do:

1. Draw a table like the one shown below.

How do we use water?

2. Make a list of how we use water in our daily lives in the table.
3. Share your ideas with your classmates. Talk about why water is important for our lives.

4

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Teacher's Notes

Water is one of the important substances on earth. All plants and animals must have water to survive. If there was no water there would be no life on earth. Apart from cooking, washing and drinking it to survive, people have many more uses for water.

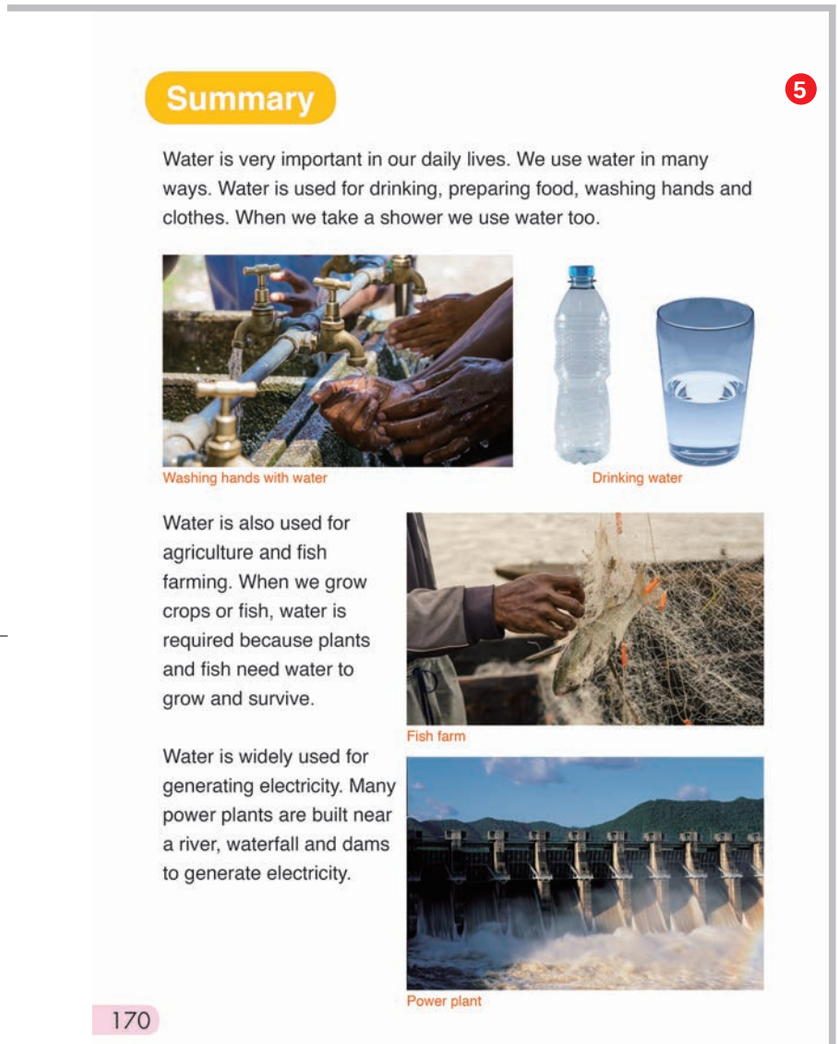
1. Industries and factories also used water. Fruits and vegetables must be cleaned before they can be processed and sold in supermarkets.
2. In many dry areas farmers must bring water to the fields through canals and expensive irrigation systems.
3. Water is used for cooling in many areas, for example in steel production.
   Water is important for our free time. People enjoy themselves at seaside resorts or on cruise trips.

Lesson Objectives

Students will be able to:
- Describe the ways that water is used by humans.
- Explain how water is important for human.

Assessment

Students are able to:
- List the different ways that humans use water in daily lives.
- State the importance of water for humans according to students' daily lives, agriculture, fish farms, and electric power generation.
- Appreciate the opinions of others.



Summary

5

Water is very important in our daily lives. We use water in many ways. Water is used for drinking, preparing food, washing hands and clothes. When we take a shower we use water too.

Washing hands with water

Drinking water

Water is also used for agriculture and fish farming. When we grow crops or fish, water is required because plants and fish need water to grow and survive.

Fish farm

Water is widely used for generating electricity. Many power plants are built near a river, waterfall and dams to generate electricity.

Power plant

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- **Based on their findings,** let students to classify the uses of water into some groups based on their ideas.
- After a while, ask the questions:

Q:How can you group the uses of water? (It depends)

- Explain that the uses of water can be mainly grouped into 1) daily life like drinking or washing 2) agriculture or fish farming and 3) electric power generation. (There are many ways to classify the uses of water, but this lesson should focus on three groups.)
- Ask the following questions:

Q:How is water used for crop farming? (When we grow crop water is a basic need for them to survive)

Q:Why is water used for fish farming? (Fish need water to survive because they can only live in water to grow).

Q:Do you have any ideas how water is used to generate electricity? (Water current turns blades in a turbine and spins a generator to produce electricity).

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: How do people use water?
  Q: Why is water important for people?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Importance of Water for our Lives"

Key question
How do we use water in our daily life?

Activity
Finding uses of water in daily life

How do we use water?
Drinking
Washing dish
Planting
Swimming, etc

Discussion
Q: How can we group the uses of water?
Our daily life, agriculture or farming, electric power generation
Q: How is water used for crop farming? When we grow crops, water is a basic need for them to survive.
Q: Why is water used for fish farming? Fish need water to survive because they can only live in water to grow.
Q: How is water used to generate electricity?
Water current turns blades in a turbine and spins a generator to produce electricity.

Summary
- People use water in many ways for their daily life.
- We use water in many ways such as for:
  - Our daily life: Drinking, cooking and washing, etc
  - Agriculture or Farming: Growing crops, farming fish for food, etc
  - Electric Power Generation: Generating electricity to use
- Water is very important for people to survive.

Unit	Chapter : **13. Water on the Earth**	Total lesson No: 69 / 97
Weather and Climate	Topic : **13.2. Water and Human**	Textbook page: 171 - 172

Lesson 7 / 10

Lesson Title

Water Pollution

Preparation

- Nil

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:How do people use water?

Q:How is water important to people?

- Arouse students to think about water pollution by asking:

Q:Have you ever seen dirty water?

Q:Where do you find dirty water?

2 Introduce the key question

What makes water dirty?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity.
- Advise students to refer to the picture in "Activity" in the textbook and characters' talking for their investigation.
- Tell students to recall their daily experiences on how they use water.
- Give enough time to student to explore new ideas through activity.

4 Discussion for findings (20 min.)

- Ask students to present the results of their activity.

(Continue)

Lesson 2: "Water Pollution"

1 Water is very important to us. We need clean water to survive but sometimes we find dirty water in rivers or oceans.

2 What makes water dirty?

3 Activity : Finding the causes of dirty water

What to Do:

1. Draw a table like the one shown below.

Causes of dirty water

2. Look at the picture below and find the causes that make water dirty.
3. Make a list of your findings in the table.
4. Share your ideas with your classmates. Talk about what makes water dirty.

4

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Teacher's Notes

Effects of Water Pollution

- The main problem caused by water pollution is that it kills organisms that depend on these water bodies. Fish, crab, birds and seagulls, dolphins and many other animals often wind up on beaches, killed by pollutants in their habitat (living environment).

- Pollution disrupts the natural food chain as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later, these animals are consumed by fish and shellfish. The food chain continues to be disrupted at all higher levels.

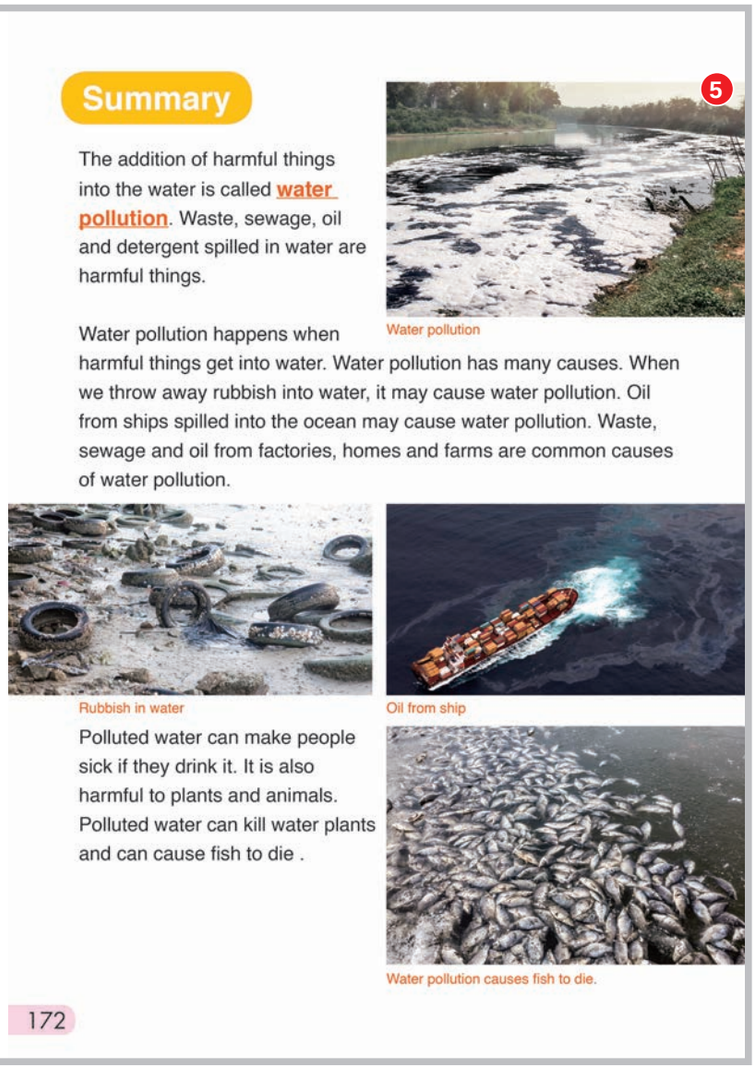
- Diseases – Humans are affected by this process as well. People can get diseases such as hepatitis by eating seafood that has been poisoned. In many poor nations, there is always outbreak of cholera and diseases as a result of poor drinking water treatment from the contaminated waters.

Lesson Objectives

Students will be able to:
- Define water pollution.
- Identify the causes of water pollution.
- Discuss how water pollution affects living things.

Assessment

Students are able to:
- List the things that cause dirty water.
- Describe how water pollution occurs.
- Give examples of the effects of water pollution on humans, plants and animals.
- Investigate the causes and effects of water pollution with interest.



Summary

The addition of harmful things into the water is called **water pollution**. Waste, sewage, oil and detergent spilled in water are harmful things.

5

Water pollution

Water pollution happens when harmful things get into water. Water pollution has many causes. When we throw away rubbish into water, it may cause water pollution. Oil from ships spilled into the ocean may cause water pollution. Waste, sewage and oil from factories, homes and farms are common causes of water pollution.

Rubbish in water

Oil from ship

Polluted water can make people sick if they drink it. It is also harmful to plants and animals. Polluted water can kill water plants and can cause fish to die .

Water pollution causes fish to die.

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- Write down students' findings on the blackboard.
- Confirm findings with students.
- **Based on their findings,** ask questions as discussion points.

Q:What causes the dirty water? (Waste, sewage, oil, detergent, etc.)

Q:What happens to the water when those things are put into the water? (The water becomes dirty or is polluted).

Q:What happens when water gets dirty? (Bad smell, living things die or get sick, etc.)

Q:What makes water dirty? (Human activities)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is water pollution?
  Q: What are the causes of water pollution?
  Q: How does water pollution affect humans, animals and plants?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Water Pollution"

Key question
What makes water dirty?

Activity
Finding the causes of dirty water.

Causes of dirty water
Throwing trash
Oil spilled into ocean
Wastes from homes
Wastes from factories
etc.

Discussion

Q: What causes the dirty water?
Waste, sewage, oil, detergent, etc

Q: What happens to the water when those things are put into the water?
The water becomes dirty or is polluted.

Q: What happens when water gets dirty?
Bad smell, living things die or get sick, etc

Q: What makes water dirty?
Human activities

Summary

- The addition of harmful things to water is called water pollution.
- Water can be polluted in many ways such as:
  - ➤ Throwing rubbish into water.
  - ➤ Oil from ships spilled into the ocean.
  - ➤ Waste and oil from factories.
  - ➤ Sewage from homes.
  - ➤ Insecticides and fertilisers from farms.
- Polluted water make:
  - ➤ People get sick.
  - ➤ Plants and animals get sick or die.

Unit	Chapter : **13. Water on the Earth**	Total lesson No: 70 / 97
Weather and Climate	Topic : **13.2. Water and Human**	Textbook page: 173 - 174

Lesson
8 / 10

Lesson Title

Keeping Water Clean

Preparation

- Nil

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:What is water pollution?
Q:How is water polluted?
Q:What happens to living things when harmful things get into the water?

- Encourage students to think about how to prevent water pollution by asking:

Q:How can we keep water clean?

2 Introduce the key question

How can we solve the problems of water pollution?

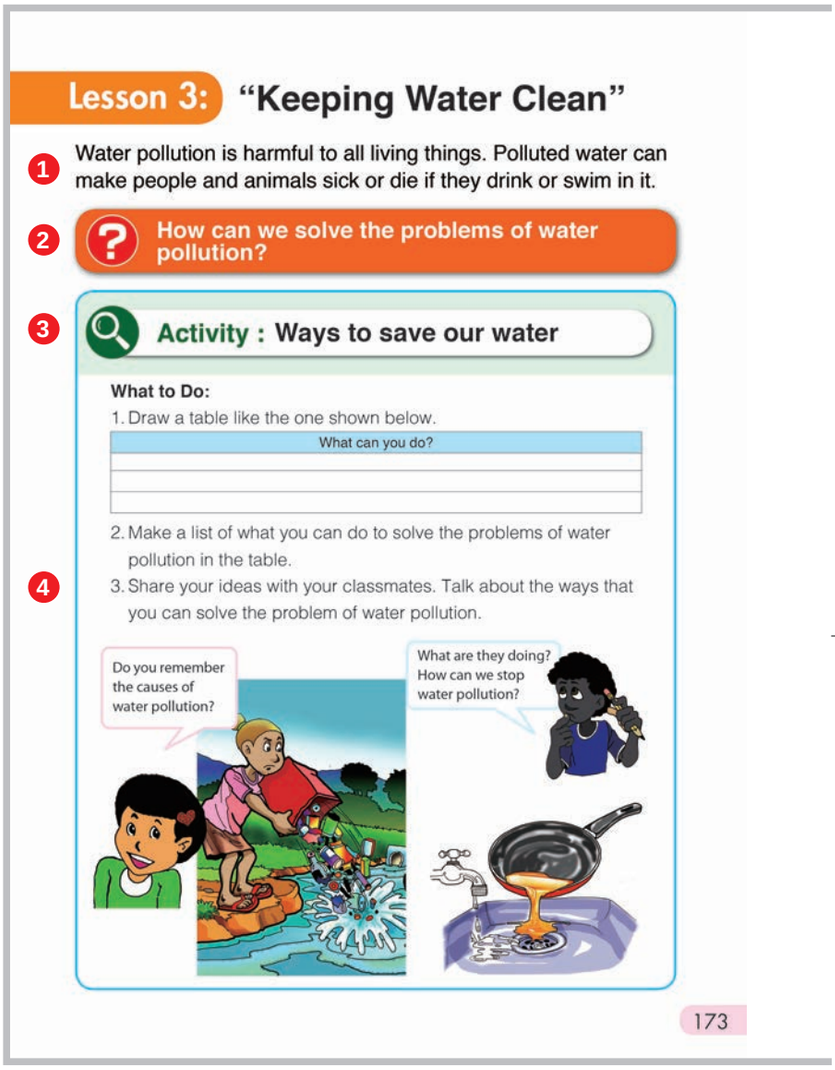
3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity.
- Direct students attention to the pictures in the activity and characters' talking for their investigation.
- Tell students to recall their daily experiences on how they use water.
- Give enough time to student to explore new ideas through activity by themselves.

4 Discussion for findings (20 min.)

- Ask students to present the results of their activity.
- Write down students' findings on the blackboard.

(Continue)



Lesson 3: "Keeping Water Clean"

1 Water pollution is harmful to all living things. Polluted water can make people and animals sick or die if they drink or swim in it.

2 How can we solve the problems of water pollution?

3 Activity : Ways to save our water

What to Do:

1. Draw a table like the one shown below.

What can you do?

2. Make a list of what you can do to solve the problems of water pollution in the table.
3. Share your ideas with your classmates. Talk about the ways that you can solve the problem of water pollution.

4

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Teacher's Notes

Other ways to help prevent water pollution

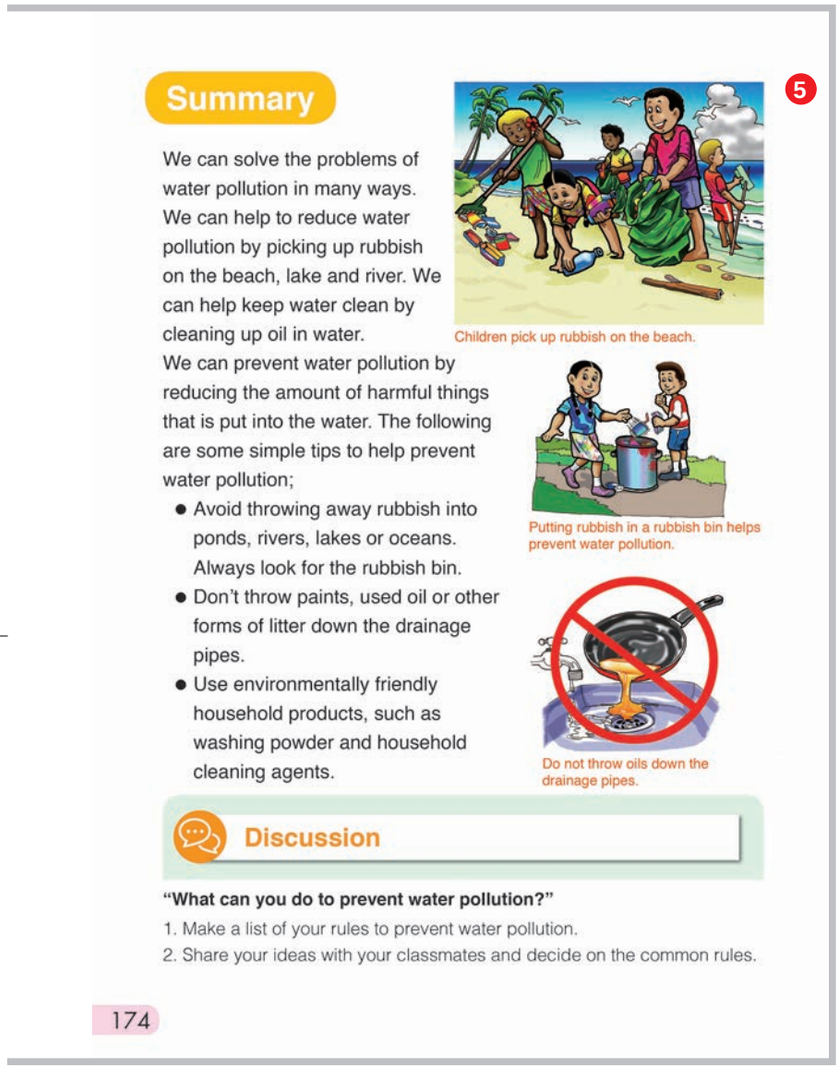
- **Use Less Plastic** - It is very difficult to break down plastic after it is produced. Much of the plastic we use ends up in the world's water supply, where it is even harder to remove out and safely throw away. If you can use as few plastic items as possible, you are helping the environment. Plastic waste also spreads decay in the water supply.
- **Reuse Items** - Whenever you buy something that is not recyclable, such as plastic, it is better to reuse this item as many times as possible. This limits your consumption and means less of those products ending in the world's rivers, lakes and oceans.
- **Recyclable Options** - If there are two options for a particular item, pick the one that is easily recyclable. For example glass bottles are much better for the environment than plastic.

Lesson Objectives

Students will be able to:
- Identify the different ways to solve water pollution.

Assessment

Students are able to:
- List what they can do to prevent water pollution.
- Make rules to prevent water pollution among classmate.
- Show responsible attitude to keep water clean.



Summary

We can solve the problems of water pollution in many ways. We can help to reduce water pollution by picking up rubbish on the beach, lake and river. We can help keep water clean by cleaning up oil in water.

Children pick up rubbish on the beach.

We can prevent water pollution by reducing the amount of harmful things that is put into the water. The following are some simple tips to help prevent water pollution;

- Avoid throwing away rubbish into ponds, rivers, lakes or oceans. Always look for the rubbish bin.
- Don't throw paints, used oil or other forms of litter down the drainage pipes.
- Use environmentally friendly household products, such as washing powder and household cleaning agents.

Putting rubbish in a rubbish bin helps prevent water pollution.

Do not throw oils down the drainage pipes.

Discussion

"What can you do to prevent water pollution?"

1. Make a list of your rules to prevent water pollution.
2. Share your ideas with your classmates and decide on the common rules.

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- Confirm findings with students.
- **Based on their findings,** ask questions as discussion points;

Q:How can we clean polluted water? (By picking up rubbish at the beach, river and oceans, cleaning up oil in water, etc.)

- Review the Lesson 4 'Preventing Soil Pollution' in Chapter 3 and ask the question.

Q:What is the best way to prevent water pollution before water gets dirty? (Reducing the amount of harmful things put in the water).

Q:How can we reduce the amount of harmful things that is put in the water? (Don't throw away rubbish in water, paints and oil down the drain and use environmentally friendly detergent, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What are some examples of the ways to prevent water pollution?
- Let students make classroom rules for preventing water pollution.
- Confirm the rule with students and ask them to practise the rules at school and at home.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Keeping Water Clean"

Key question
How can we solve the problems of water pollution?

Activity
Ways to save our water

What you can do?
Pick up rubbish
Clean up oil in water
Put rubbish in a bin
etc

Discussion
Q: How can we clean polluted water?
By picking up rubbish at the beach, river and oceans, cleaning up oil in water, etc.
Q: What is the best way to prevent water pollution before water gets dirty? Reducing the amount of harmful things put in the water.
Q: How can we reduce the amount of harmful things that is put in the water?
Don't throw away rubbish in water, paints and oil down the drain and use environmentally friendly detergent, etc.

Summary
The following ways can be used to prevent water pollution:
- Pick up rubbish.
- Avoid throwing away rubbish into ponds, rivers, lakes or oceans. Place them correctly in waste bins.
- Don't throw paints, oils or other forms of litter into drains.
- By reducing the amount of harmful things that is put into water.

Our Rules
1. .....

Unit
Weather and Climate

Chapter : **13. Water on the Earth**
Topic : **13.2. Water and Human**

Total lesson No: 71 / 97
Textbook page: 175 - 177

Lesson
9 / 10

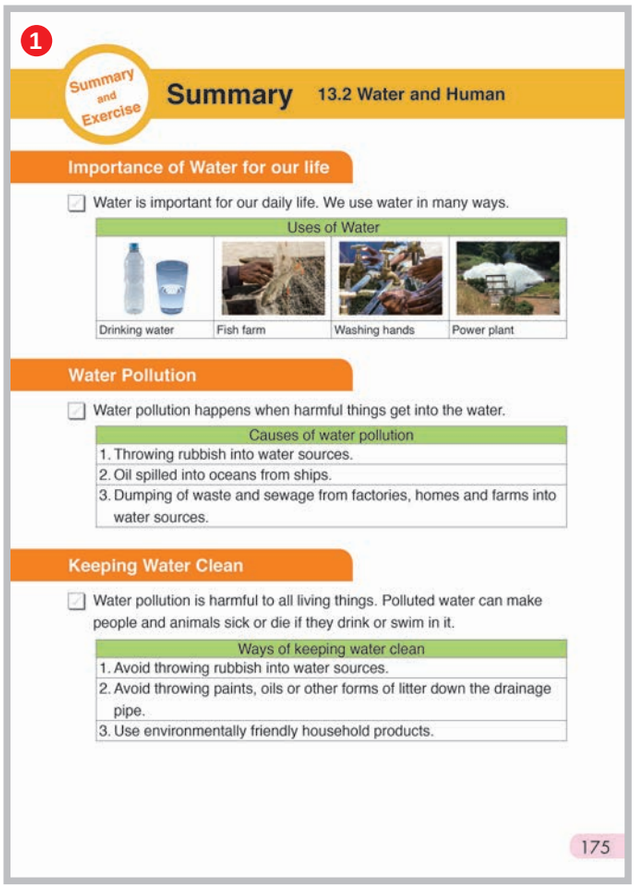
Lesson Title

Summary and Exercise

Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some questions to students and verify students understanding. Explain and correct learning contents again if they still have misconception.
- Provoke students to think about their experiences on how water is important to them.
- Have students to realise that water is important to them. If they don't look after it well by causing it to be dirty then it becomes polluted.
- Explain that once water becomes polluted then it is not safe for humans and plants
- Guide students to understand that there are ways they can help to make water become clean.



1

Summary and Exercise

Summary 13.2 Water and Human

Importance of Water for our life

Water is important for our daily life. We use water in many ways.

Uses of Water			
Drinking water	Fish farm	Washing hands	Power plant

Water Pollution

Water pollution happens when harmful things get into the water.

Causes of water pollution
1. Throwing rubbish into water sources.
2. Oil spilled into oceans from ships.
3. Dumping of waste and sewage from factories, homes and farms into water sources.

Keeping Water Clean

Water pollution is harmful to all living things. Polluted water can make people and animals sick or die if they drink or swim in it.

Ways of keeping water clean
1. Avoid throwing rubbish into water sources.
2. Avoid throwing paints, oils or other forms of litter down the drainage pipe.
3. Use environmentally friendly household products.

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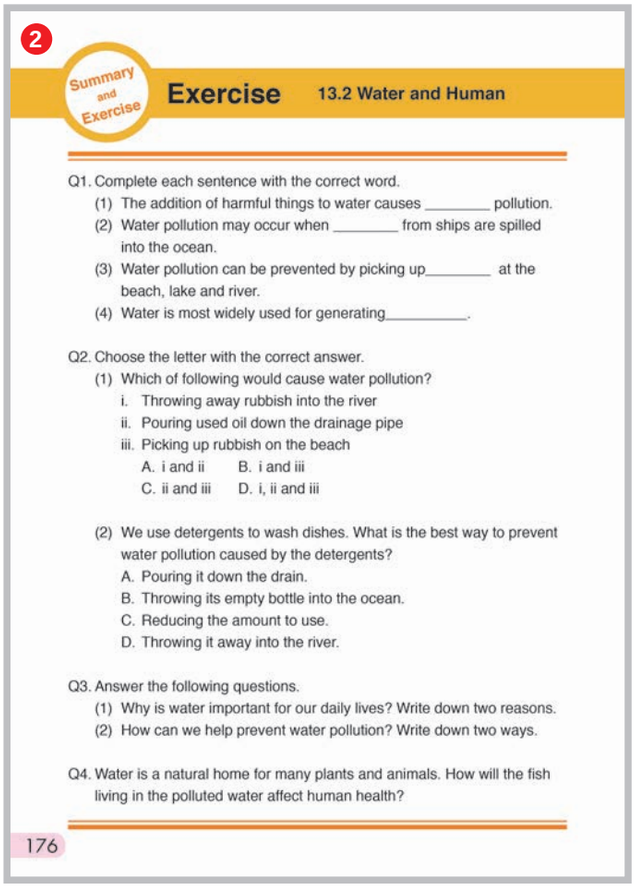
2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time in response to students understanding.
- After the test, give them answer of the questions and explain how to solve them, using student's answers and thoughts.
- Guide students to understand the main ideas or concepts in response to their answers.
- If students find question 4 concept difficult then use diagram of food chain to explain how the polluted chemicals are passed from one living thing to another. (Food chain is to be covered in grade 5 so avoid mentioning it but represent it in diagram only.)
- Remind students this is the test for the end of the topic on water and human. We will be moving into a new topic in our next science lesson.



2

Summary and Exercise

Exercise 13.2 Water and Human

Q1. Complete each sentence with the correct word.
(1) The addition of harmful things to water causes _____ pollution.
(2) Water pollution may occur when _____ from ships are spilled into the ocean.
(3) Water pollution can be prevented by picking up_____ at the beach, lake and river.
(4) Water is most widely used for generating_____.

Q2. Choose the letter with the correct answer.
(1) Which of following would cause water pollution?
i. Throwing away rubbish into the river
ii. Pouring used oil down the drainage pipe
iii. Picking up rubbish on the beach
A. i and ii B. i and iii
C. ii and iii D. i, ii and iii

(2) We use detergents to wash dishes. What is the best way to prevent water pollution caused by the detergents?
A. Pouring it down the drain.
B. Throwing its empty bottle into the ocean.
C. Reducing the amount to use.
D. Throwing it away into the river.

Q3. Answer the following questions.
(1) Why is water important for our daily lives? Write down two reasons.
(2) How can we help prevent water pollution? Write down two ways.

Q4. Water is a natural home for many plants and animals. How will the fish living in the polluted water affect human health?

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Exercise answers

Q1.
(1) **water**
(2) **oil**
(3) **rubbish**
(4) **electricity**

Q2.
(1) **A**
(2) **C**
We can prevent water pollution by reducing the amount of harmful things that are put into the water.

Q3.
(1) **Water is important because human use water to:**
- **Drink**
- **Wash body and clothes**
- **Water plants**
- **Do fish farming**
- **Generating electricity**

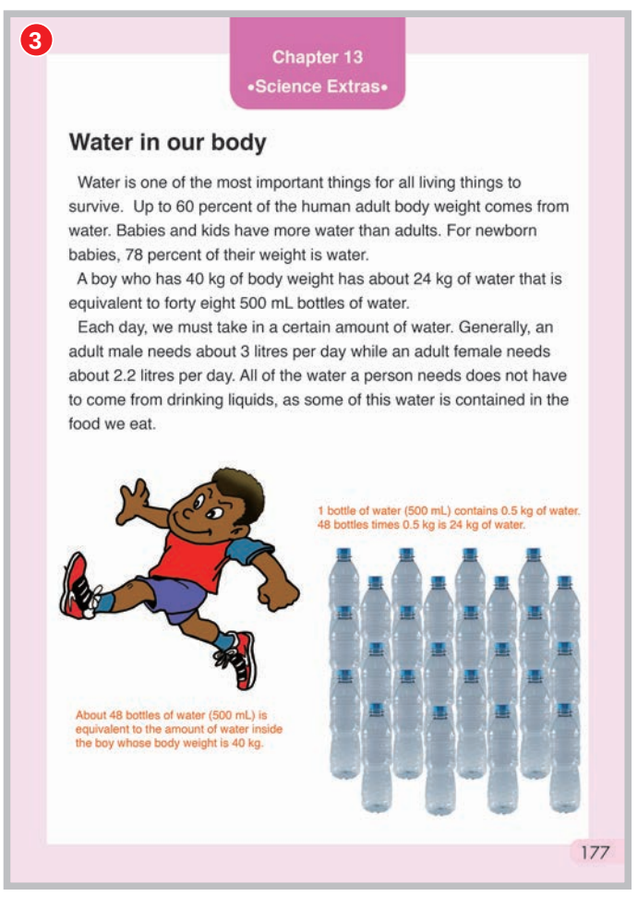
(2) Example of the answer
Water pollution can be prevented by:
- **Avoid dumping rubbish into ponds, rivers, lakes or oceans.**
- **Don't throw paints, oils or other forms of litter down the drain.**
- **Use environmentally friendly household products such as washing powder and household cleaning agents.**
- **Minimizing the amount of harmful things that is put into water.**

Q4. Example of the answer
The harmful materials are absorbed in fish living in polluted water. When people eat the fish, people also absorb the harmful materials from the fish that affects human health.
Harmful materials are passed from one living thing to another and finally humans are affected with seriously illness.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give students opportunities to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extra.


3

Chapter 13
•Science Extras•

Water in our body

Water is one of the most important things for all living things to survive. Up to 60 percent of the human adult body weight comes from water. Babies and kids have more water than adults. For newborn babies, 78 percent of their weight is water.

A boy who has 40 kg of body weight has about 24 kg of water that is equivalent to forty eight 500 mL bottles of water.

Each day, we must take in a certain amount of water. Generally, an adult male needs about 3 litres per day while an adult female needs about 2.2 litres per day. All of the water a person needs does not have to come from drinking liquids, as some of this water is contained in the food we eat.

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Lesson
10 / 10

Lesson Title

Chapter Test

Answer of the Chapter Test

Chapter Test

13. Water on the Earth

Q1 Complete each sentence with the correct word.

(1) Sources of water can be classified into natural sources of water and man-made sources of water.

(2) Precipitations is any form of water that falls from clouds.

(3) Water pollution is the addition of harmful things into water.

Q2 Choose the letter with the correct answer.

(1) Which of the following shows the change of state of evaporation?

A. From gas to liquid.
B. From solid to liquid.
C. From liquid to gas.
D. From solid to gas.

(2) What is the function of clouds in the water cycle?

A. Clouds carry water from the ocean and drop it as rain.
B. Clouds fall down on Earth to cool the temperature.
C. Clouds prevent the heat from the sun to protect the fish in the ocean.
D. Clouds take in polluted water from the ocean and keep its water clean.

(3) Which is not a cause of water pollution?

A. Sewage
B. Compost
C. Rubbish
D. Oils from ships

(4) Which action can prevent water pollution?

A. Don't drink natural water because it might be dirty.
B. Throw away plastic bags into the river after shopping.
C. Throw cooking oils down the drain because it is liquid.
D. Use environmentally friendly household products.

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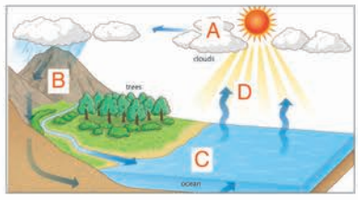
Q3

For question (1) and (2), refer to the diagram below showing the water cycle.



(1) Which letter shows water condensing?

A

(2) How can water vapour in air return to Earth?

It condense and precipitates in the form of rain, snow or hail

Q4

(1) When you arrive at school on a rainy day, your rain hat is covered with water drops. At the end of the day, your rain hat is dry. What kind of change has taken place?

Evaporation has taken place

(2) Grace put some ice in a glass and left them for a few minutes as shown on the right. After that, she observed droplets on the surface of the glass.
Where did the droplets come from?
And how are they formed?

The droplets came from water in air. Ice and the cold surface cool the air down and condensation has taken place.

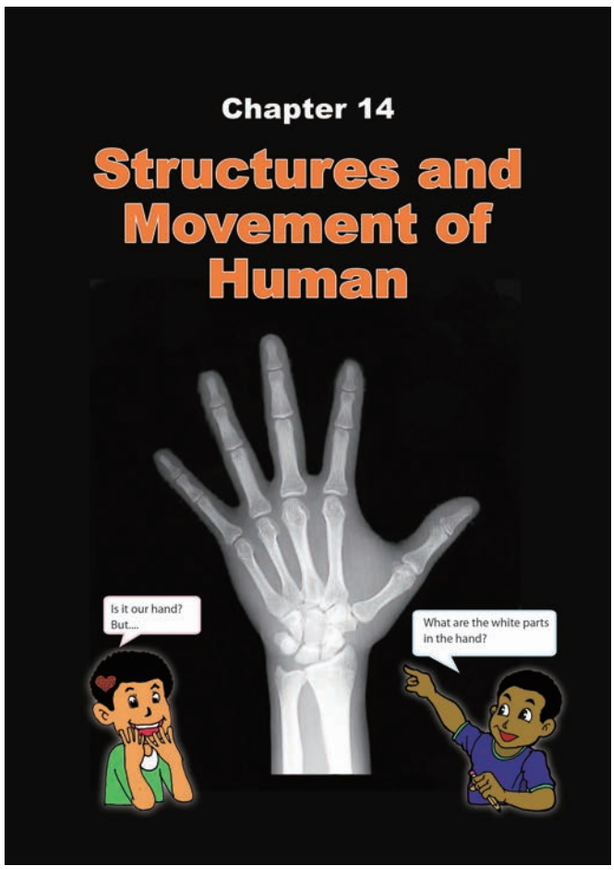
Strand : LIFE
Unit : HUMAN BODY

Chapter 14. Structures and Movement of Human

Chapter Objectives

Students will be able to understand the structures of human bones, muscles and how bones and muscles work together when we move our body.

Students will be able to infer the movement of an arm from a simple model made in the activity.



The picture at the chapter heading in the textbook shows a picture of a hand taken by X-Ray. X-Ray is a kind of light that can pass through low density matters. X-Ray cannot pass through bones because of its high density so that we can see only the bones as shown in the picture.

Topic Objectives

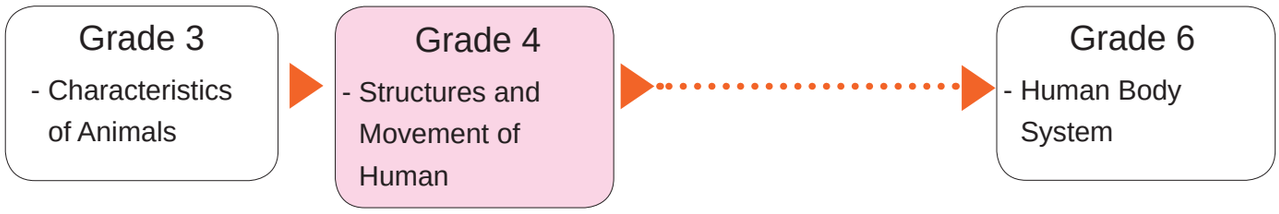
14.1 Bones and Muscle

Students will be able to;

- Explain the functions of bones in the human body.
- Explain the structures of joints.
- Classify animals with backbone and without backbone.
- Describe the structures and functions of muscles.
- Explain how bones and muscles work together when humans move.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Prior knowledge for learning this chapter;

- Animals use their body parts for moving.
- Mammals have legs that help them walk, run, hop and hold on things.

Teaching Overview

This chapter consists of 7 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
14.1 Bones and Muscle	1	**Our Bones** What are bones?	4.1.3	181 - 182
	2	**Bending Body Parts** Why can we bend our body?		183 - 184
	3	**Animals with or without Bones** Do all animals have bones?		185 -186
	4	**Our Muscles** What are muscles?		187 -188
	5	**Moving Body Parts** How do bones and muscles move our body parts?		189 - 190
	6	Summary and Exercise		191 - 193
Chapter Test	7	Chapter Test		194 - 195

Unit	Chapter : **14. Structures and Human Movement**	Total lesson No: 73 / 97
Human Body	Topic : **14.1. Bones and Muscle**	Textbook page: 181 - 182

Lesson 1 / 7

Lesson Title

Our Bones

Preparation

- Pictures of bones, A3 papers (Cartridge papers)

Lesson Flow

1 Introduction (5 min.)

- Encourage students to think about human body by asking questions. For example:

Q:What do you know about bones?
Q:Why do we have bones?
Q:How do our bones work?

2 Introduce the key question

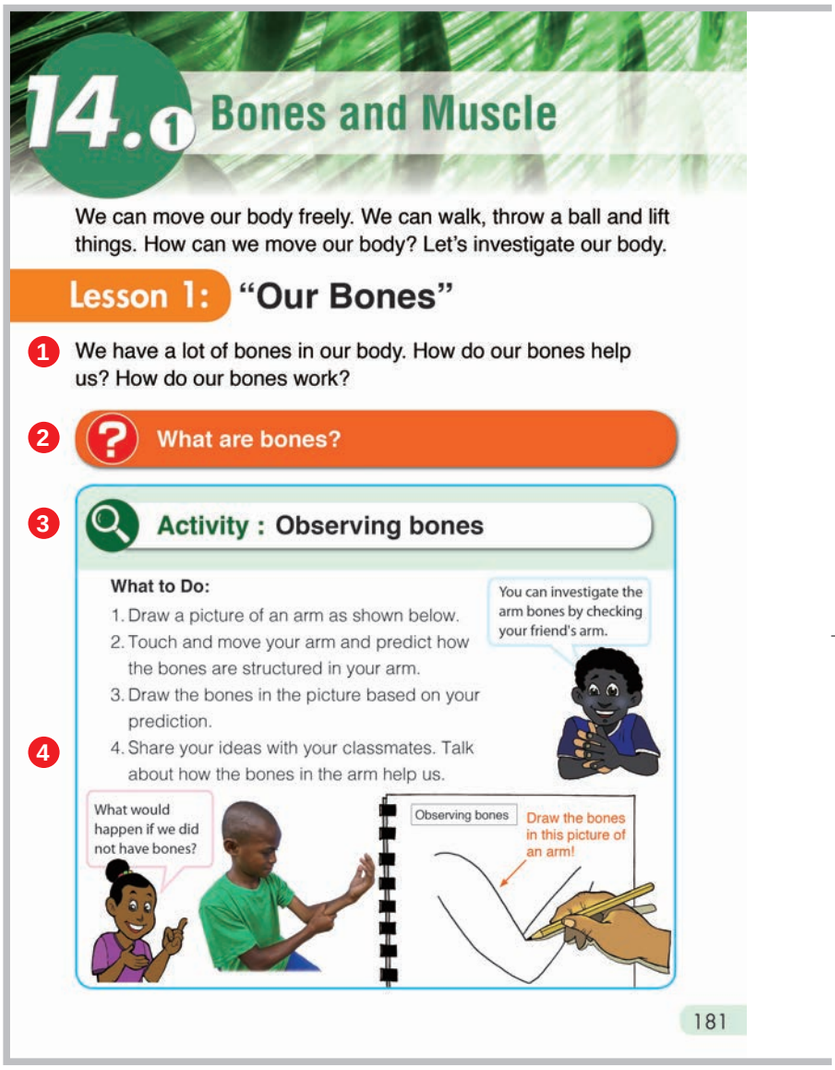
What are bones?

3 Activity (30 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Draw a picture of an arm in their exercise books.
- Tell students to make predictions by asking: "How are the bones structured in your arm?"
- Have students do the activity. Ask them to draw the bones in the picture.
- Give enough time to students to draw the bones in the picture.

4 Discussion for findings (20 min.)

- Ask students to present their drawings of the bones in an arm.
- Ask students to see the picture of 'Bones in an arm' in 'Summary' and to compare their drawings with the picture. **(Continue)**



Teacher's Notes

- Below is an example of the traced arm

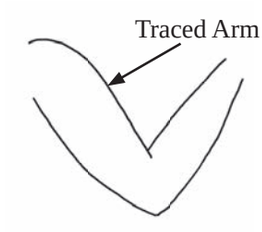


Diagram 1

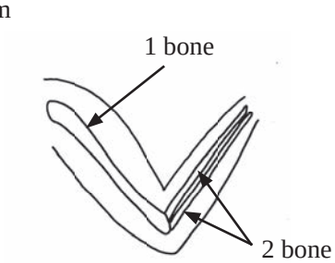


Diagram 2

- Artistic features to these drawings are **NOT** important.
- Let students focus on exploring how structures of bones.

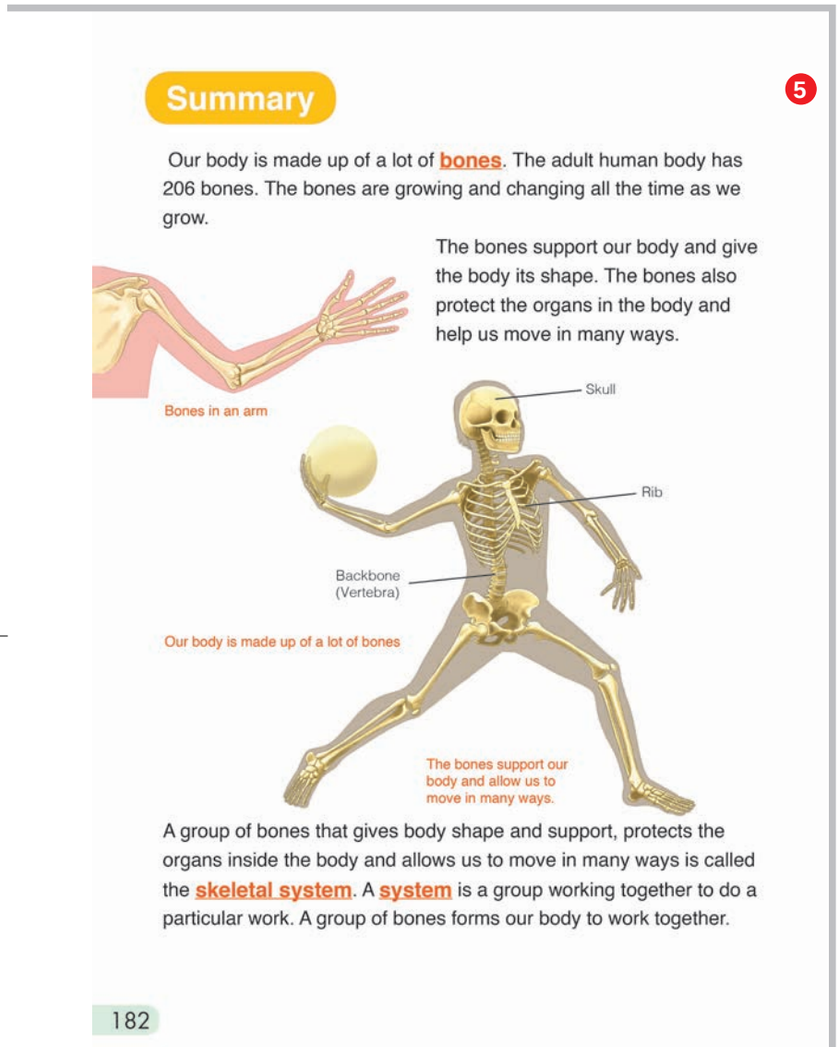
- Diagram 1 is drawn first before diagram 2

Lesson Objectives

Students will be able to:
- Define the skeletal system.
- Infer the structure of the bones in an arm.
- Explain the functions of bones in the human body.

Assessment

Students are able to:
- Illustrate the structure of bones in a diagram of the arm.
- Describe how a group of bones help us and work together.
- Show curiosity to know about bones in their body.



Summary

Our body is made up of a lot of **bones**. The adult human body has 206 bones. The bones are growing and changing all the time as we grow.

The bones support our body and give the body its shape. The bones also protect the organs in the body and help us move in many ways.

Bones in an arm

Skull
Rib
Backbone (Vertebra)
Our body is made up of a lot of bones
The bones support our body and allow us to move in many ways.

A group of bones that gives body shape and support, protects the organs inside the body and allows us to move in many ways is called the **skeletal system**. A **system** is a group working together to do a particular work. A group of bones forms our body to work together.

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- Ask the following questions.

Q:What did you find about the bones in an arm? (There are two bones, the size of bones are different, the shape of the bones are different, etc.)

- Confirm student's findings with students.
- **Based on their findings,** ask these questions as discussion points.

Q:Do you know how many bones a human has? (It depends.)

- Ask students to see the picture of bones in a whole body's in 'summary' and to explain each part of bones.
- Ask the following questions again:

Q:What would happen if we do not have bones? (We cannot stand, we cannot support our body, we cannot walk, etc.)

Q:How do our bones help us? (They support our body, they keep our body shape, they help us to move, etc)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these question as assessment:
  Q: What is the skeletal system?
  Q: How do our bones help us?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Our Bones"
Key question
What are Bones?
Activity
Observing Bones

Drawings
(Students' drawings of the arm bones)

Discussion
Q: What did you find about the bones in an arm? There are two bones, the size of bones are different, the shape of the bones are different, etc.
Q: What would happen if we don't have bones? We cannot stand, we cannot support our body, we cannot walk, etc.
Q: How do our bones help us?
They support our body, they keep our body shape, they help us to move, etc

Summary
- Our body is made up of many bones.
- The bones
  - ➲Support our body
  - ➲Give the body shape
  - ➲Protect organs in our body
  - ➲Help us move in many ways
  - ➲A group of bones that gives body shape and support and protect the inside parts of the body is called skeletal system.
- The system is a group of parts combined to form a whole and to work together.

Unit	Chapter : **14. Structures and Human Movement**	Total lesson No: 74 / 97
Human Body	Topic : **14.1. Bones and Muscle**	Textbook page: 183 - 184

Lesson 2 / 7

Lesson Title

Bending Body Parts

Preparation

- Nil

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:What is a skeletal system?

Q:How do our bones help us?

- Encourage students to think about the joints by asking questions.

Q:Why can we bend and stretch our body parts freely?

2 Introduce the key question

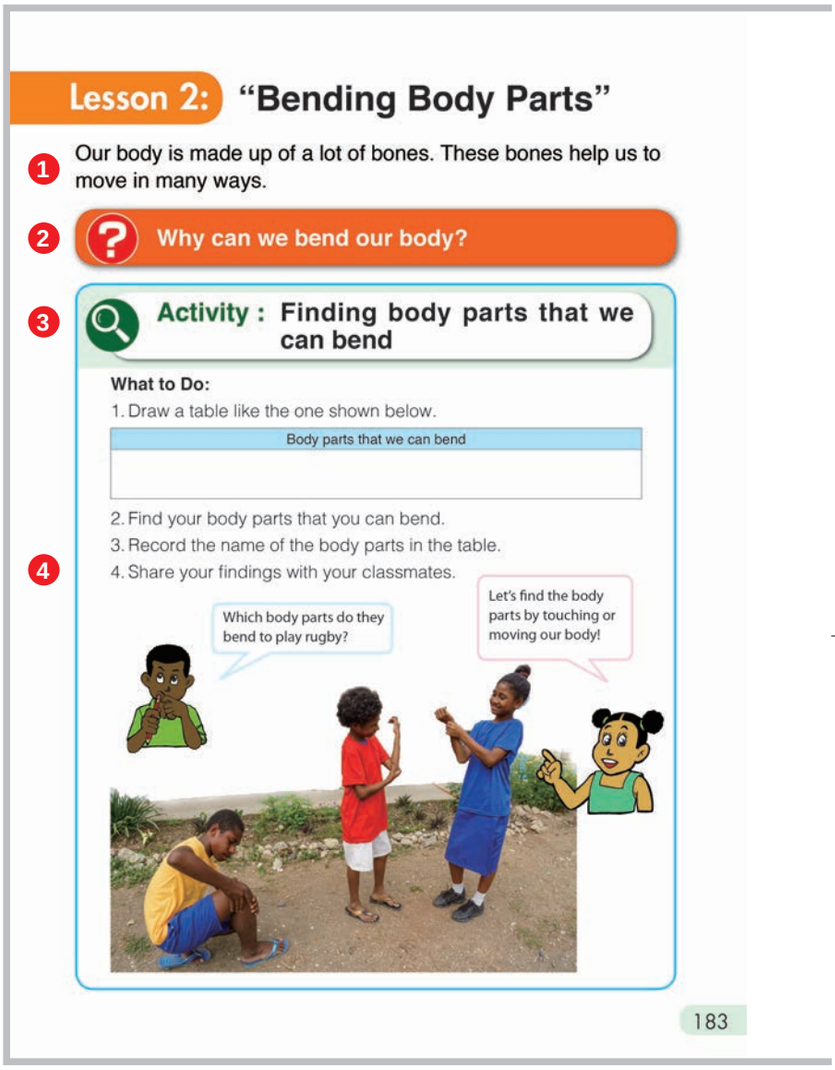
Why can we bend our body?

3 Activity (20 min.)

- Organise students into pairs.
- Ask students to look at the picture in the activity. Let students think about the body parts where humans can bend.
- Explain the steps of the activity.
- Have students do the activity. Ask them to write their findings in the table.
- Give enough time to students to explore new ideas through the activity.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Write down students' findings on the blackboard.
- Confirm the findings with students. **(Continue)**



Lesson 2: "Bending Body Parts"

1 Our body is made up of a lot of bones. These bones help us to move in many ways.

2 Why can we bend our body?

3 Activity : Finding body parts that we can bend

What to Do:

1. Draw a table like the one shown below.

Body parts that we can bend

2. Find your body parts that you can bend.
3. Record the name of the body parts in the table.
4. Share your findings with your classmates.

4

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Teacher's Notes

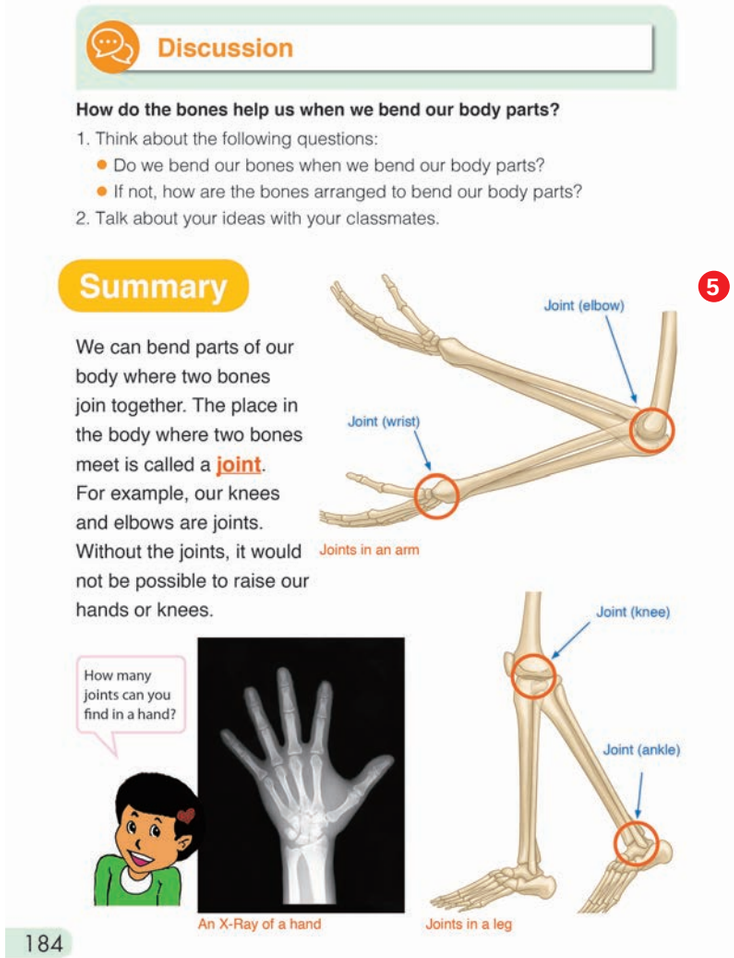
- Joints are strong connections that join the bones, teeth and cartilage of the body to one another. Each joint is specialised in its shape and structural components to control the range of motion between the parts that it connects. Joints may be classified functionally based upon how much movement they allow.
- The first type of joint permits no movement like the joints in the skull.
- The second type of joint allows a slight amount of movement at the joint like the intervertebral disks of the spine.
- The third type are freely movable joints that have the highest range of motion of any joint. This include the elbow, knee, shoulder and wrist.

Lesson Objectives

Students will be able to:
- Define joint.
- Explain the structure of joints.
- Identify the different joints in our body.

Assessment

Students are able to:
- Explain why humans can bend their body parts.
- Find the different joints in their body.
- Listen and appreciate other students' responses.



Discussion

How do the bones help us when we bend our body parts?

1. Think about the following questions:
   - Do we bend our bones when we bend our body parts?
   - If not, how are the bones arranged to bend our body parts?
2. Talk about your ideas with your classmates.

Summary

We can bend parts of our body where two bones join together. The place in the body where two bones meet is called a **joint**. For example, our knees and elbows are joints. Without the joints, it would not be possible to raise our hands or knees.

Joint (elbow)
Joint (wrist)
Joints in an arm

How many joints can you find in a hand?

An X-Ray of a hand

Joint (knee)
Joint (ankle)
Joints in a leg

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- **Based on their findings,** ask the following questions as discussion points.

Q:Do we bend our bones when we bend our body parts? (No)→If students cannot understand the meaning of this question, ask the question by showing a bar or pencil to represent a bone; "Can you bend a bar or a pencil?"

Q:How are the bones arranged to bend our body parts? (The bones are arranged in a way that when two bones meet they are able to bend)

- Explain the arrangement of two bones by showing a drawing compass to represent the joint and two bones.
- Conclude the discussion.

5 Summary (10 min.)

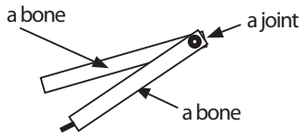
- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these question as assessment:
  Q: What is a joint?
  Q: How is a joint arranged?
  Q: How does a joint work?
  Q: What are some examples of the parts of joints in your body.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Bending Body parts"
Key question
Q: Why can we bend our body?
Activity
Finding body parts that we can bend

Body Parts where we can bend
Elbow, Knee, Ankle, Wrist, Fingers Back, Neck

Discussion
Q: Do we bend our bones when we bend our body parts?
(No)
Q: How are the bones arranged to bend our body parts? (The bones are arranged in a way that when two bones meet they are able to bend)



Summary
- We can bend the parts of our body where two bones join together.
- The place where two bones meet is called joint.
- Examples of joints are:
  knees, elbows, ankles, wrists, etc
- Without joints there would not be any movement in our body.

Unit	Chapter : **14. Structures and Human Movement**	Total lesson No: 75 / 97
Human Body	Topic : **14.1. Bones and Muscle**	Textbook page: 185 - 186

Lesson 3 / 7

Lesson Title

Animals With or Without Bones

Preparation

- Nil

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking;

Q:What is a joint?
Q:How is a joint arranged?
Q:How does a joint work?

- Encourage students to think about the bones of animals by asking questions.

Q:Do other animals also have bones like us?

2 Introduce the key question

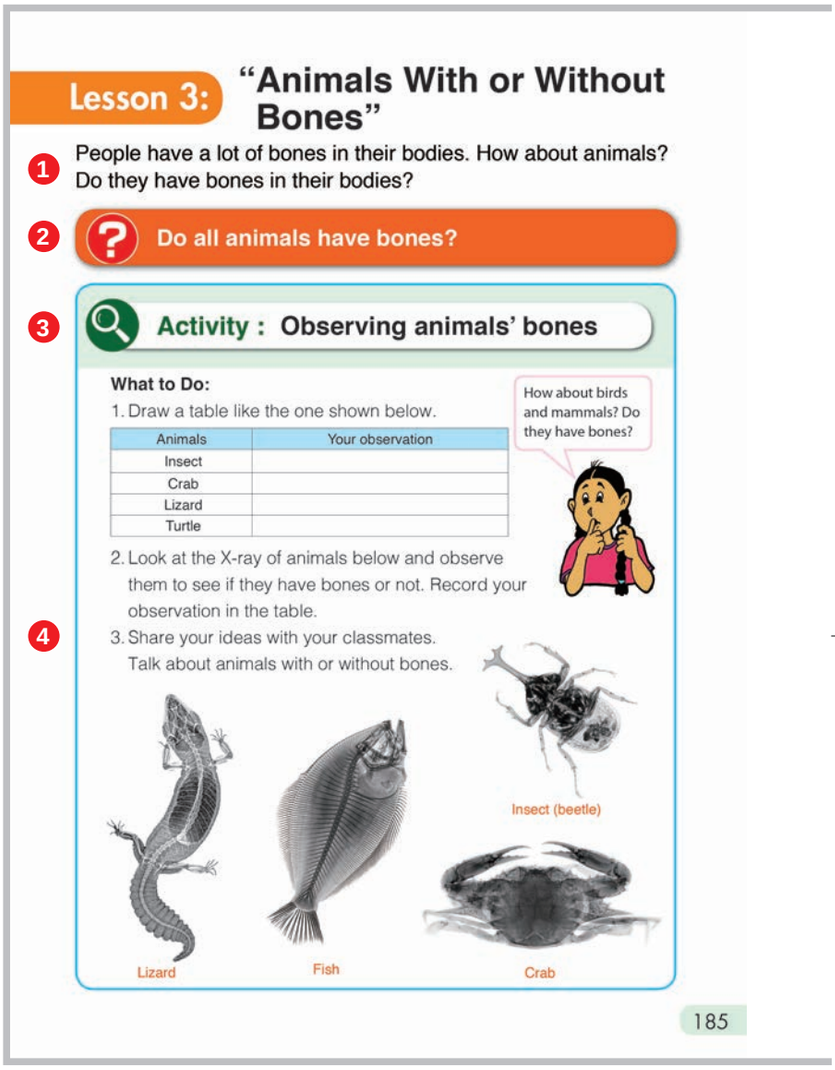
Do all animals have bones?

3 Activity (20 min.)

- Organise students in pairs.
- Explain the steps of the activity.
- Instruct students to pay attention to the inside of the animal body in the X-ray of animals.
- Have students do the activity. Ask them to write their findings in the table.
- Give enough time to students to explore new ideas through the activity.
- Ask students to discuss the findings in their group.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Write down students' findings on the blackboard.
- Confirm their findings with students. **(Continue)**



Lesson 3: "Animals With or Without Bones"

1 People have a lot of bones in their bodies. How about animals? Do they have bones in their bodies?

2 Do all animals have bones?

3 Activity : Observing animals' bones

What to Do:

1. Draw a table like the one shown below.

Animals	Your observation
Insect	
Crab	
Lizard	
Turtle	

How about birds and mammals? Do they have bones?

2. Look at the X-ray of animals below and observe them to see if they have bones or not. Record your observation in the table.

4 3. Share your ideas with your classmates. Talk about animals with or without bones.

Insect (beetle)

Lizard Fish Crab

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Teacher's Notes

Vertebrates

Animals with an internal skeleton made of bone are called vertebrates. Vertebrates include fish, amphibians, reptiles, birds, mammals, primates, rodents and marsupials. Although vertebrates represent only a very small percentage of all animals, their size and mobility often allow them to dominate their environment.

Invertebrates

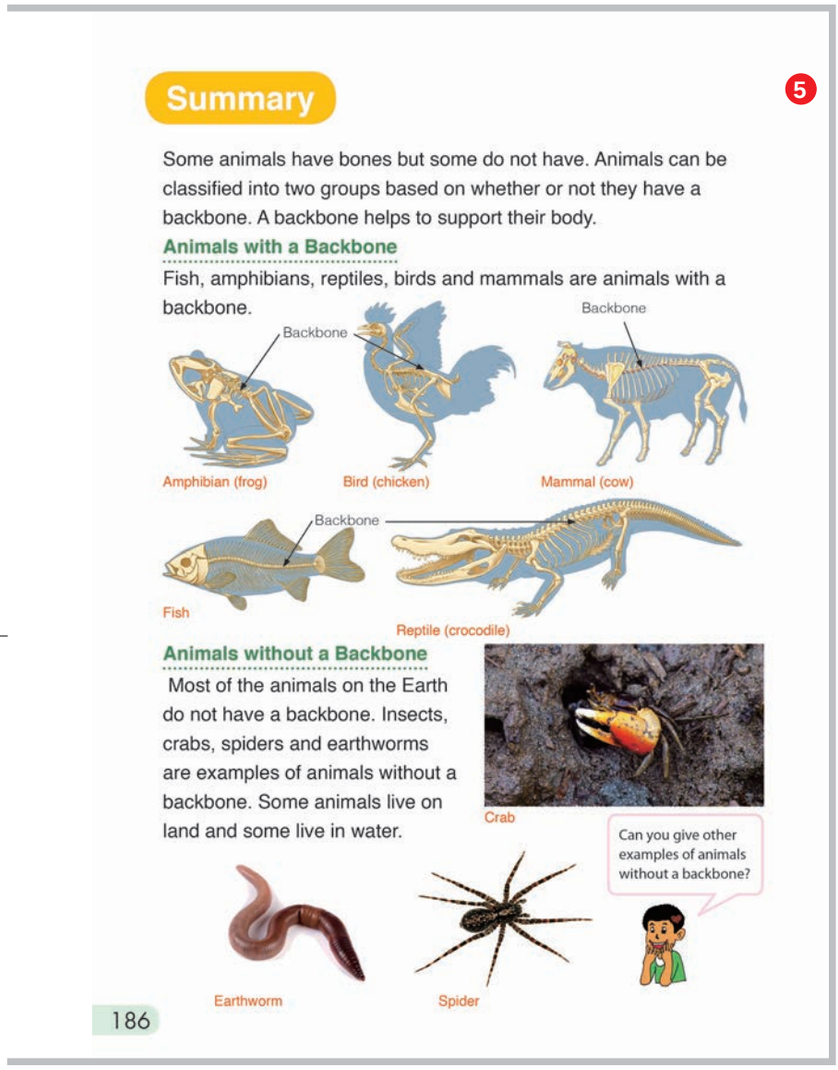
Animals without backbones are called invertebrates. They range from well-known animals such as jellyfish, corals, slugs, snails, mussels, octopuses, crabs, shrimps, spiders, butterflies and beetles to much less well-known animals such as flatworms, tapeworms, sipuncula, sea-mats and ticks.

Lesson Objectives

Students will be able to:
- Classify animals into the animals with backbones and without bones.
- Describe the way to classify animals.

Assessment

Students are able to:
- State the differences and the similarities of X-rays of animals according to with or without bones.
- Give some examples of animals with or without a backbone.
- Investigate animals with or without bones with interest.



Summary

Some animals have bones but some do not have. Animals can be classified into two groups based on whether or not they have a backbone. A backbone helps to support their body.

Animals with a Backbone

Fish, amphibians, reptiles, birds and mammals are animals with a backbone.

Backbone
Amphibian (frog)
Bird (chicken)
Backbone
Mammal (cow)
Backbone
Fish
Reptile (crocodile)

Animals without a Backbone

Most of the animals on the Earth do not have a backbone. Insects, crabs, spiders and earthworms are examples of animals without a backbone. Some animals live on land and some live in water.

Crab
Can you give other examples of animals without a backbone?
Earthworm
Spider

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- **Based on their findings,** ask these questions as discussion points.

Q:Which animals have bones? (lizard and fish)
Q:Which animals do not have bones? (insect (beetle) and crab)
Q:Lizards are examples of reptiles. What other group of animals would have bones? (Fish, amphibians, birds and mammals)
Q:How are the X-ray of the insect and the crab similar? (They both have a hard covering that covers their whole body but no bones inside their body)
Q:Insects and crabs do not have bones. How can they keep their body shape? (They have hard scale.)
Q:How can we classify animals? (With or without bones)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these question as assessment:
  Q: How can we classify animals?
  Q: Give some examples of animals with backbones
  Q: What are some examples of animals without bones?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Animals With or Without Bones"

Key question
Do all animals have bones?
Activity: Observing animals bones

X-ray of Animals	Your Observation
Lizard	Has backbone
Fish	Has backbone
Insect	No backbone, has hard covering
Crab	No backbone, has hard covering

Discussion
Q: Which animals have bones? lizard and Fish
Q: Which animals do not have bones? Insect (beetle) and crab
Q: What other group of animals would have bones? amphibians, birds and mammals
Q: How are the X-ray of the insect and the crab similar? They both have a hard covering their whole body but no bones inside their body
Q: Insects and crabs don't have bones. How can they keep their body shape? They have hard scale.

Summary
- Animals can be classified into two groups: Animals with backbone and Animals without backbone.
- Animals with backbone are:
- Fish, Amphibians, Reptiles, Birds and Mammals
- Animals without backbone are:
- Insects, lobsters, shrimp, crab, spiders, earthworms, snails, etc

Unit	Chapter : **14. Structures and Human Movement**	Total lesson No: 76 / 97
Human Body	Topic : **14.1. Bones and Muscle**	Textbook page: 187 - 188

Lesson 4 / 7

Lesson Title

Our Muscles

Preparation

- A4 papers, pencils, colour pencils, illustration of the upper arm with its bones

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:How can we classify animals?

Q:Give some examples of animals with backbones

Q:Give some examples of animals without bones.

- Encourage students to think about muscles by asking questions.

Q:Do you remember how our bones work?

Q:How do our muscles work?

2 Introduce the key question

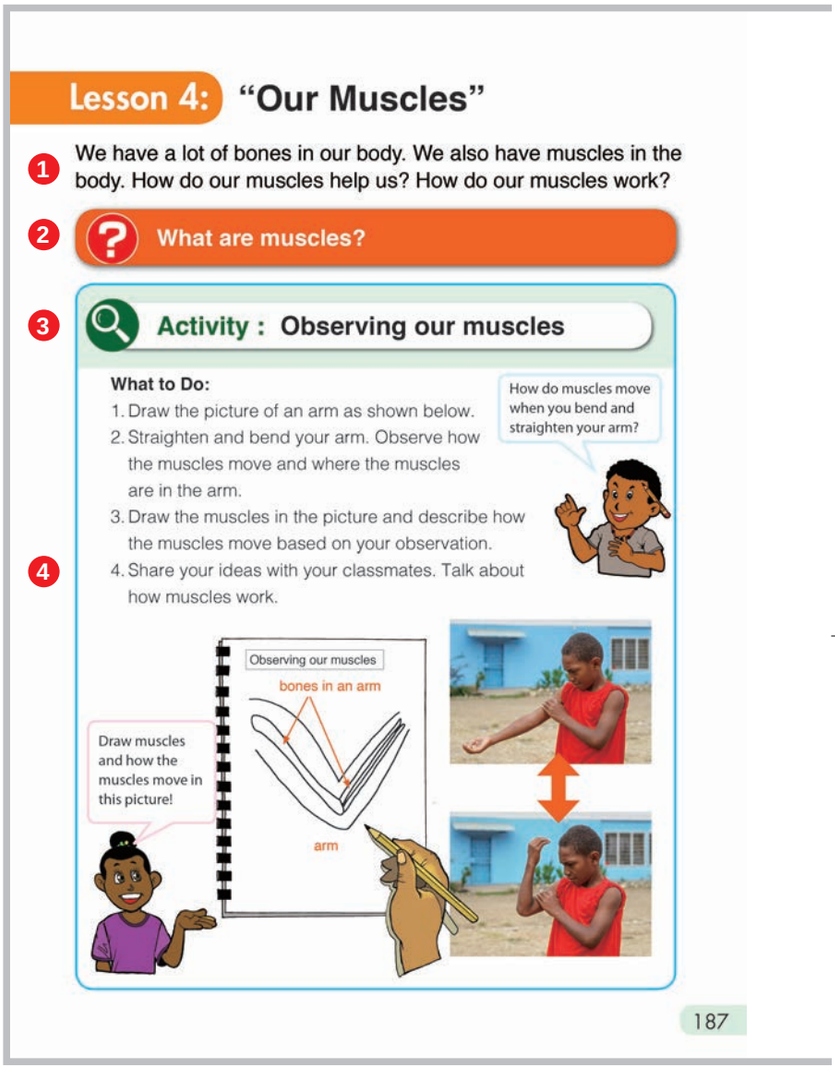
What are Muscles?

3 Activity (20 min.)

- Organise students to work in pairs.
- Explain the steps of the activity.
- Ask the students to focus on the upper arm to find the structure and work of muscles.
- Have students do the activity. Ask them to draw the bones in the picture and record how muscles move when they stretch and curl their arm.
- Give enough time to students to explore new ideas through the activity.

4 Discussion for findings (20 min.)

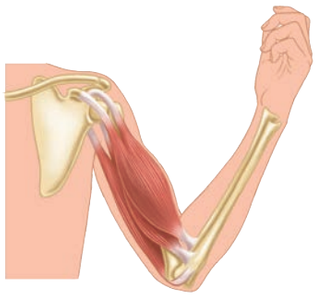
- Ask students to present their drawings of muscles in an arm. **(Continue)**



Teacher's Notes

Points of the activity

- Students realise that muscles cover our bones and are under our skin.
- Students would not draw accurate figure of muscle in the upper arm because the structure of muscle is complicated.
- For common findings, teacher facilitates that muscles cover our bones and are under our skin, through the activity and discussion.
- There are muscles in most of our body parts because we use them when we do various activities.
- Some body parts have muscles that we do not use at all (eg. Ear muscle)
- Other body parts of humans do not have muscle (like body hairs) but other animals (like dogs) do have them because they use body hair to show aggression.



Lesson Objectives

Students will be able to:
- Define the muscular system.
- Describe the structure and function of muscles.
- Explain how muscles help us.

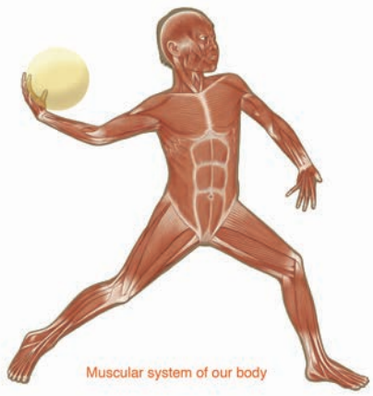
Assessment

Students are able to:
- Describe how muscles move when they stretch or curl their arm.
- Illustrate muscles in a picture of an arm.
- Infer how muscles are formed and work based on their investigation.
- Co-operate with classmates to investigate muscles.

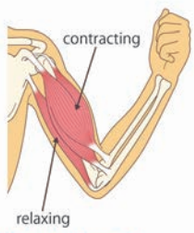
Summary

5

Our body is made up of **muscles**. The muscles are under our skin and they cover our bones. We have more than 600 muscles in our body. Muscles work by **contracting** and **relaxing**. When muscles contract, they get shorter and thicker. When muscles relax, they get longer and thinner. Muscles work together to help us move. Muscles help keep us upright. They also give our body the power to lift and push things. A group of muscles that make the parts of our body move is called the **muscular system**. Exercise helps keep our muscles strong. If we do not use our muscles they can become weak.



Muscular system of our body



Movement of muscles

Exercise helps keep our muscles strong.

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- By showing an illustration of the upper arm with its bones, ask students to compare their drawings with the illustration.
- **Based on their observation,** ask these questions as discussion points.

Q:How does your muscle move when you curl your arm? (The muscles shrinks, they swell, etc.)

Q:How does your muscle move when you stretch your arm? (The muscles get longer, they get thinner, etc.)

Q:What would happen if we do not have muscles? (We cannot stand, we cannot bring something, we cannot lift or push things, etc.)

Q: How do our muscles help us? (They help us move, keep our body, they give us power to lift or push things, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these question as assessment:
  Q: What is the muscular system?
  Q: How do muscles work?
  Q: How do our muscles help us?
  Q: What characteristics do muscles have?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Our Muscles"
Key question
What are muscles?
Activity: Observing our muscles

Drawings
(Students' drawings)

Discussion

Q: How does your muscle move when you curl your arm? The muscles shrinks, they swell, etc

Q: How does your muscle move when you stretch your arm? The muscles get longer, they get thinner, etc

Q: What would happen if we do not have muscles? We cannot stand, we cannot bring something, we cannot lift or push things, etc.

Q: How do our muscles help us?
They help us move, keep our body, they give us power to lift or push things, etc

Summary

- Muscles are under our skin and cover the bones.
- Exercises help keep our muscles strong.
- We have more than 600 muscles in our body.
- Muscles work by contracting and relaxing.
- Contracting → The muscles get shorter and thicker.
- Relaxing → The muscles get longer and thinner.
- Muscles help us move, keep us upright, give us power to push and lift things.
- A group of muscles that make our body move is called Muscular System.

Unit	Chapter : **14. Structures and Human Movement**	Total lesson No: 77 / 97
Human Body	Topic : **14.1. Bones and Muscle**	Textbook page: 189 - 190

Lesson 5 / 7

Lesson Title

Moving Body Parts

Preparation

- cardboard, rubber band, 4 drawing pins

Lesson Flow

1 Introduction (5 min.)

- Review the previous lessons on bones and muscles by asking:

Q:How do our bones help us?
Q:How can we bend our body?
Q:How do our muscles help us?

- Encourage students to think about the relationship between bones and muscles by asking questions.

Q:How do bones and muscles work together to help us to move?

2 Introduce the key question

How do bones and muscles move our body parts?

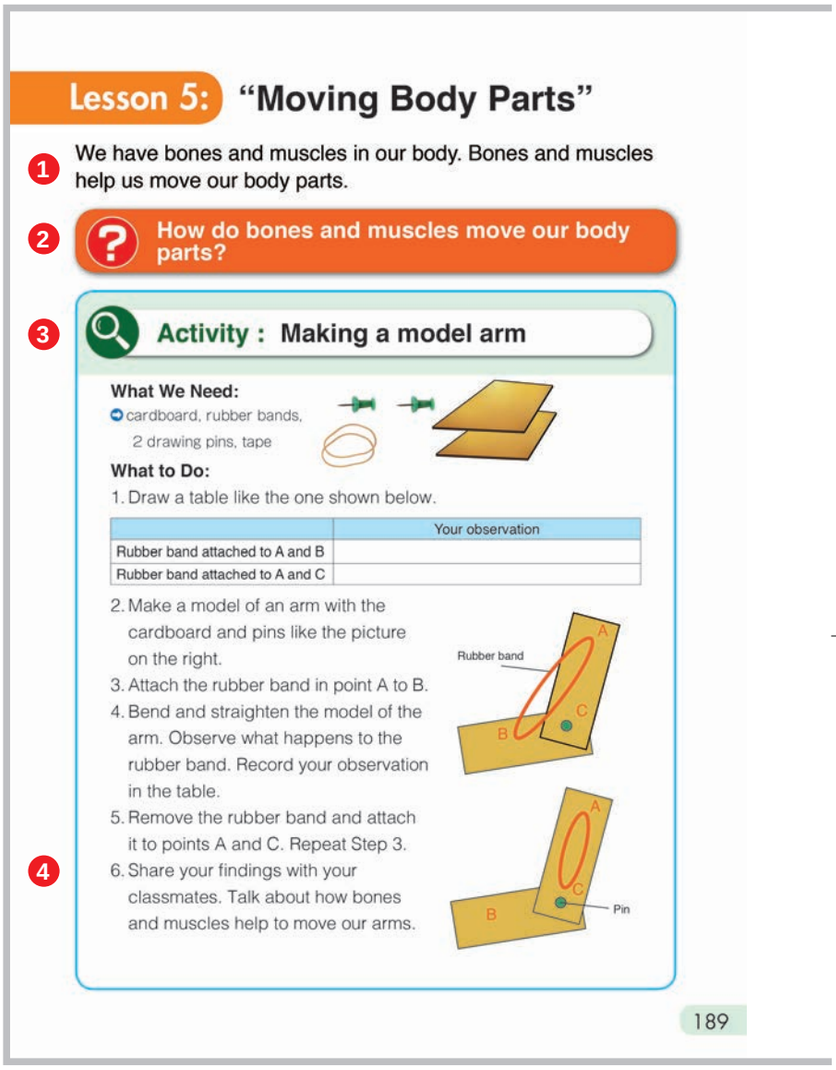
3 Activity (25 min.)

- Organise students to work in groups.
- Explain the steps of the activity.
- Demonstrate how to make an arm model with cardboards, rubber band and pins.
- Have students do the activity. Ask them to record their findings in the table.
- Let students to discuss the findings in their groups.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Write down students' findings on the blackboard.

(Continue)



Lesson 5: "Moving Body Parts"

1 We have bones and muscles in our body. Bones and muscles help us move our body parts.

2 How do bones and muscles move our body parts?

3 Activity : Making a model arm

What We Need:
cardboard, rubber bands, 2 drawing pins, tape

What to Do:
1. Draw a table like the one shown below.

	Your observation
Rubber band attached to A and B	
Rubber band attached to A and C	

2. Make a model of an arm with the cardboard and pins like the picture on the right.
3. Attach the rubber band in point A to B.
4. Bend and straighten the model of the arm. Observe what happens to the rubber band. Record your observation in the table.
5. Remove the rubber band and attach it to points A and C. Repeat Step 3.
6. Share your findings with your classmates. Talk about how bones and muscles help to move our arms.

4

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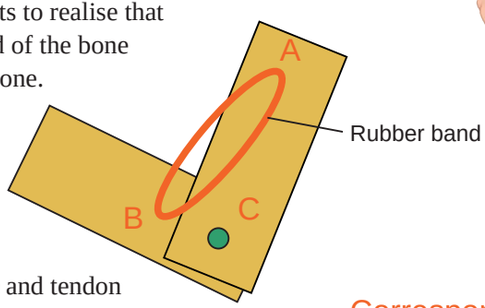
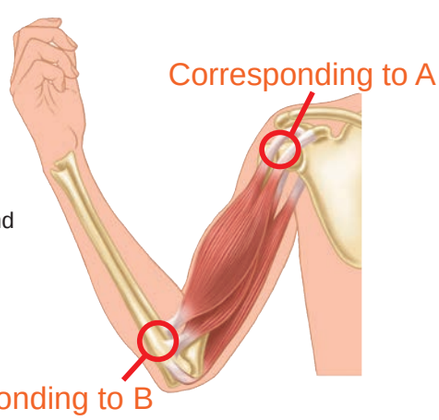
Teacher's Notes

Comparison the arm modle with real arm

- As the result of the activity by using the arm modle, It is important for students to realise that the muscle is attached at one end of the bone and at the other end of another bone.





- Cardboards = bones
- Rubber band = muscle and tendon
- Deawing pin = joint

Lesson Objectives

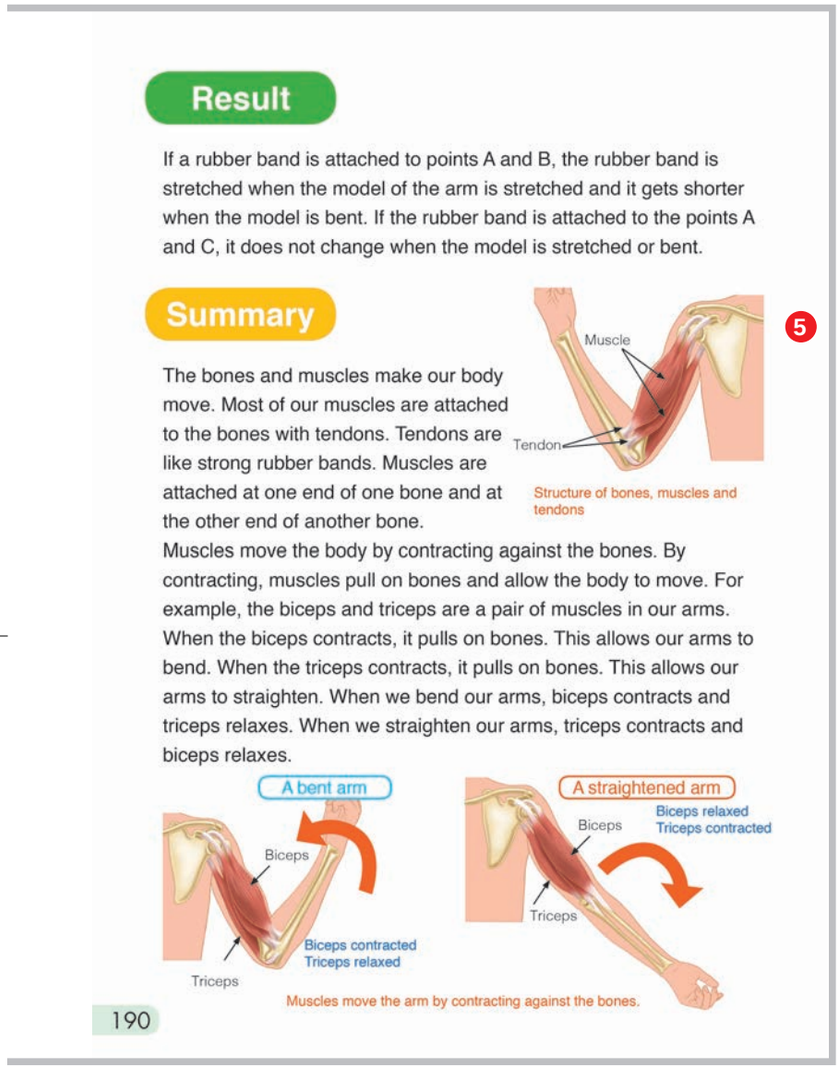
Students will be able to:

- Explain how bones and muscles work together when humans move.
- Describe how two different muscles work together when an arm is curled and stretched.

Assessment

Students are able to:

- State that muscles move the bones by contracting and relaxing based on the observation of an arm model.
- Relate the movement of a rubber band and the card boards to the work of bones and muscles in an arm.
- Infer how muscles are attached to bones from the activity.
- Take part in the activity in co-operation with classmates.



Result

If a rubber band is attached to points A and B, the rubber band is stretched when the model of the arm is stretched and it gets shorter when the model is bent. If the rubber band is attached to the points A and C, it does not change when the model is stretched or bent.

Summary

The bones and muscles make our body move. Most of our muscles are attached to the bones with tendons. Tendons are like strong rubber bands. Muscles are attached at one end of one bone and at the other end of another bone.

Muscle
Tendon

Structure of bones, muscles and tendons

Muscles move the body by contracting against the bones. By contracting, muscles pull on bones and allow the body to move. For example, the biceps and triceps are a pair of muscles in our arms. When the biceps contracts, it pulls on bones. This allows our arms to bend. When the triceps contracts, it pulls on bones. This allows our arms to straighten. When we bend our arms, biceps contracts and triceps relaxes. When we straighten our arms, triceps contracts and biceps relaxes.

A bent arm
Biceps
Biceps contracted
Triceps relaxed
Triceps

A straightened arm
Biceps
Biceps relaxed
Triceps contracted
Triceps

Muscles move the arm by contracting against the bones.

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- Confirm the findings with students.
- **Based on their findings,** asks questions as discussion points.

Q:If the rubber band represents muscles and the cardboards represent bones in an arm, how do muscle move when the arm is bend or stretched? (Muscles get shorter and contract when an arm is curled. Muscles get longer and thinner when an arm is stretched.)

Q:How do muscle and bones work together? (When muscle contracts, it pulls on bone and the arm is curled.)

Q:How is the muscle attached to the bones? (Muscle is attached at one end to one bone and at the other end to another bone.)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these question as assessment:
  Q: What is tendon?
  Q: How are muscle attached to bones?
  Q: What kinds of muscles are included in an arm?
  Q: How do muscles and bones in an arm work together when an arm is bend and stretched?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Moving Body Parts"

Key question How do bones and muscles move our body parts?

Activity: Making an arm model

	Your observations
Rubber band attached to A & B	It becomes long when cardboards are stretched. It gets shorter when cardboards are bended.
Rubber band attached to A & B	The rubber band does not change.

Discussion

Q: If the rubber band represents muscle and the cardboards represent bones in an arm, how do muscle move when the arm is curled or stretched? Muscles get shorter and contract when an arm is curled. Muscles get longer and thinner when an arm is stretched.

Q: How do muscle and bones work together? When muscle contracts, it pulls on bone and the arm is curled.

Q: How is the muscle attached to the bones? Muscle is attached at one end to one bone and at the other end to another bone.

Summary

- Most muscles are attached to the bones with tendons.
- Muscle is attached at one end to one bone and at the other end to another bone.
- By contracting, muscles pull the bones with the tendons and allow the body to move.
- The biceps and triceps are pair muscles in our arm.
- When the biceps contracts, it pulls on bones and our arm is curled.
- When the triceps contracts, it pulls on bones and our arm is stretched.

Lesson
6 / 7

Lesson Title

Summary and Exercise

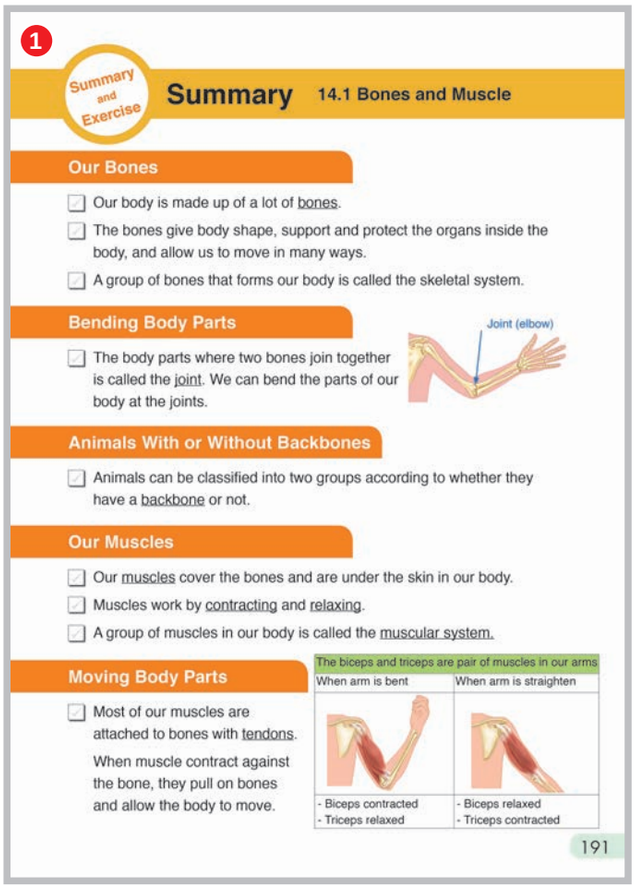
Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some focus questions to students and verify student understanding on;

Q: How do the bones changes?
Q: What will happen to our body if we do not have bones?
Q: How are joints important to us?
Q: Where are our muscles located in our body?

- Explain and correct learning contents again if they still have misconception.
- Provoke student to give some example of the function of bones and muscles in the human body.
- Ask students to explain what happens to the muscles of the arm when it is 'bent' and 'straightened'.



1

Summary and Exercise

Summary 14.1 Bones and Muscle

Our Bones

- Our body is made up of a lot of bones.
- The bones give body shape, support and protect the organs inside the body, and allow us to move in many ways.
- A group of bones that forms our body is called the skeletal system.

Bending Body Parts

- The body parts where two bones join together is called the joint. We can bend the parts of our body at the joints.

Joint (elbow)

Animals With or Without Backbones

- Animals can be classified into two groups according to whether they have a backbone or not.

Our Muscles

- Our muscles cover the bones and are under the skin in our body.
- Muscles work by contracting and relaxing.
- A group of muscles in our body is called the muscular system.

Moving Body Parts

- Most of our muscles are attached to bones with tendons.

When muscle contract against the bone, they pull on bones and allow the body to move.

The biceps and triceps are pair of muscles in our arms

When arm is bent	When arm is straighten
- Biceps contracted - Triceps relaxed	- Biceps relaxed - Triceps contracted

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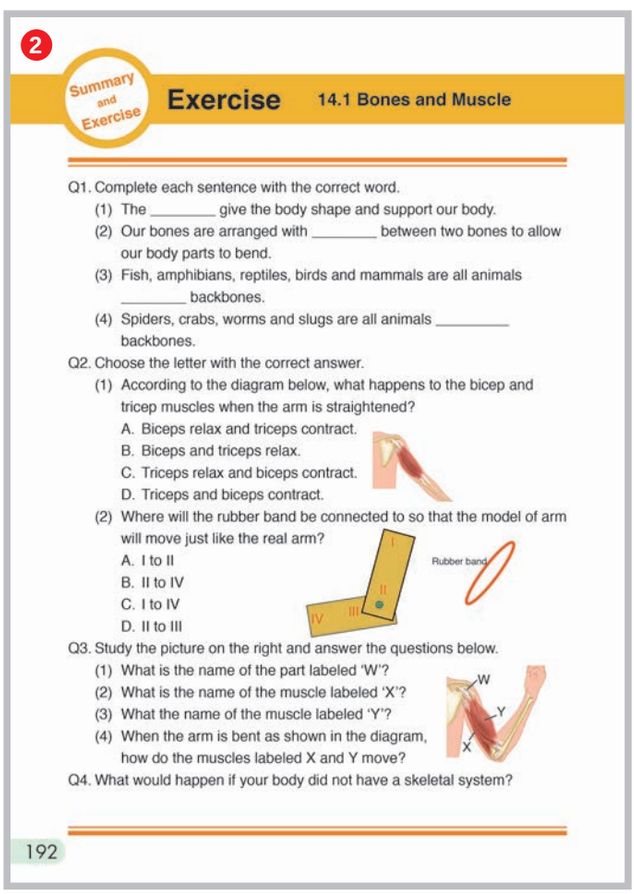
2 Exercise & Explanation (30 min.)

- Explain to students that they will have to answer all the parts of four (4) questions in the exercise even if they are not completely sure of the answer(s).
- If they come across a difficult question, they should skip it and move on to the next question.
- If there some time at the end of the exercise, they can come back and try to answer the difficult question(s).
- Allow student to try answering questions individually with enough time in response to students understanding
- After the test, use student's answers to answer the question.



2

Summary and Exercise

Exercise 14.1 Bones and Muscle

Q1. Complete each sentence with the correct word.
(1) The _____ give the body shape and support our body.
(2) Our bones are arranged with _____ between two bones to allow our body parts to bend.
(3) Fish, amphibians, reptiles, birds and mammals are all animals _____ backbones.
(4) Spiders, crabs, worms and slugs are all animals _____ backbones.

Q2. Choose the letter with the correct answer.
(1) According to the diagram below, what happens to the bicep and tricep muscles when the arm is straightened?
A. Biceps relax and triceps contract.
B. Biceps and triceps relax.
C. Triceps relax and biceps contract.
D. Triceps and biceps contract.
(2) Where will the rubber band be connected to so that the model of arm will move just like the real arm?
A. I to II
B. II to IV
C. I to IV
D. II to III

Rubber band

Q3. Study the picture on the right and answer the questions below.
(1) What is the name of the part labeled 'W'?
(2) What is the name of the muscle labeled 'X'?
(3) What the name of the muscle labeled 'Y'?
(4) When the arm is bent as shown in the diagram, how do the muscles labeled X and Y move?

Q4. What would happen if your body did not have a skeletal system?

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Exercise answers

Q1.
(1) **bones**
(2) **joints**
(3) **with**
(4) **without**

Q2.
(1) **A**
(2) **C**

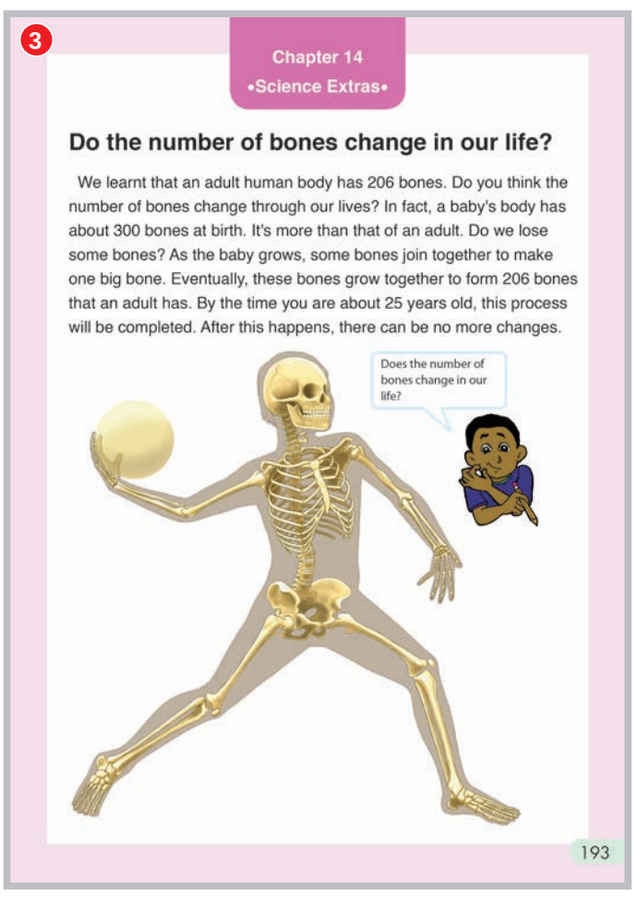
Q3.
(1) **Tendons**
(2) **Triceps**
(3) **Biceps**
(4) **Muscle Y contract and muscle X relax.**

Q4. **Example of the answer**
If there is no bones in our bodies, we cannot keep our body shape. We cannot stand, we cannot stand and even cannot move. Our organs inside body are not protected and face dangerous situation. As a result, we simply die.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give students opportunities to students observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extra.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Chapter 14
•Science Extras•

Do the number of bones change in our life?

We learnt that an adult human body has 206 bones. Do you think the number of bones change through our lives? In fact, a baby's body has about 300 bones at birth. It's more than that of an adult. Do we lose some bones? As the baby grows, some bones join together to make one big bone. Eventually, these bones grow together to form 206 bones that an adult has. By the time you are about 25 years old, this process will be completed. After this happens, there can be no more changes.

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Lesson
7 / 7

Lesson Title

Chapter Test

Answer of the Chapter Test

Chapter Test

14. Structure and Movement of Human

Q1 Complete each sentence with the correct word.

(1) The Bones protect the organs inside the body and allow us to move in many ways.

(2) When we raise our hands, which joint do we bend Joint (Elbow)

(3) If we don't use our Muscles, they can become weak. To keep them strong, we need to exercise.

Q2 Choose the letter with the correct answer.

(1) Which of these animals has a backbone?

A. Spider
B. Crab
C. Frog
D. Worm

(2) Which sentence is true about the tendon?

A. Muscles are attached at two ends of one bone with a tendon.
B. Muscles are attached to different bones with tendons.
C. Bones are attached to other bones with tendons.
D. Muscles are attached to other muscles with tendons.

(3) Which sentence is not true about the bones?

A. The adult human body has 206 bones.
B. The bones are hard and do not change during a person's life time.
C. The bones allow us to move in many ways.
D. Skeletal system is a group of bones that forms our body.

(4) Which of following is not an example of a joint?

A. Tongue
B. Wrist
C. Knee
D. Elbow

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Q3

(1) The picture on the right shows the changes of arm muscles when you bend your arm. Describe what happens to your bicep and tricep muscles.

When we fold our arm, the biceps contract to become thick and short while the triceps relax to become thin and long.

(2) Observe the two pictures on the right. Describe the differences of their skeleton between the crab and lizard.

Crab

Lizard

The crab does not have backbones and other bones, but it has hard covering shell outside the body. Lizard has back bones and other bones, but no shell coves body.

(3) According to the 'hand x-ray' picture on the right, how many finger joints are there?

There are total of 14 finger joints in one hand.

Q4

(1) Why is it better for an adult's skull to have immovable joints and not movable joints.

If skull bones do not move, they can protect soft brain issues more properly.

(2) What would happen if the muscles in our body do not contract?

If our muscles could not contract, there would be no movement of muscles. It means we could not stand, move, raise hands, breathe and function hearts. We would die.

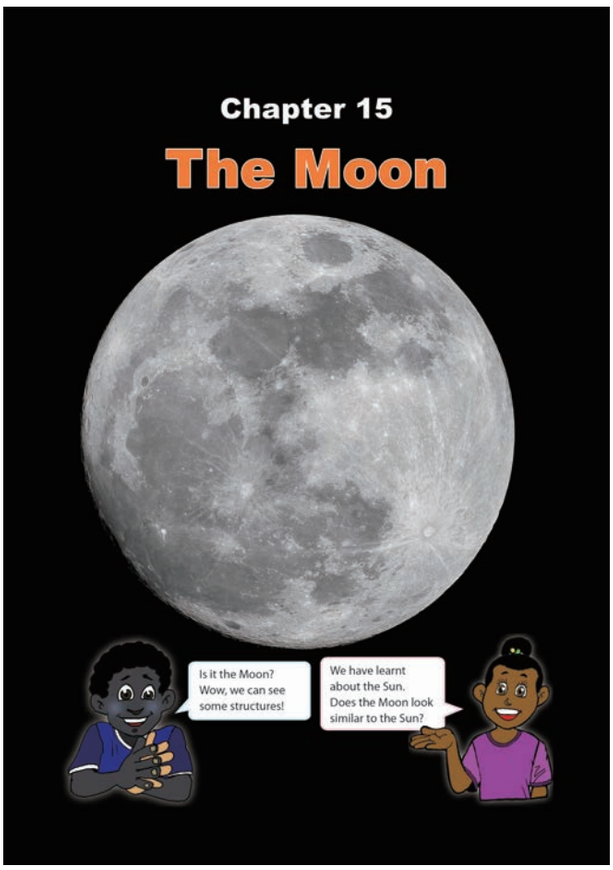
Strand : EARTH AND SPACE
Unit : SPACE

Chapter 15. The Moon

Chapter Objectives

Students will be able to understand the chacteristics of the Moon, its movement across the sky and its phases.

Students will also be able to record the movement of the Moon in the sky.



The picture at the chapter heading in the textbook shows the full Moon with its detailed surface when observed by using a telescope.

Topic Objectives

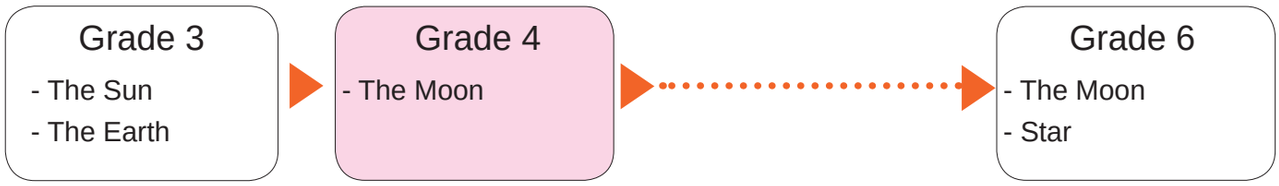
15.1 Moon in the Sky

Students will be able to;

- Describe the characteristics of the Moon such as its surface structure, size and how it shines.
- Explain movement of the Moon across the sky.
- Identify the different phases of the Moon.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Prior knowledge for learning this chapter;

- The Sun is a big burning ball of hot gases that give off energy.
- The Sun rises into the sky from the east, moves across the sky and sets in the west.

Teaching Overview

This chapter consists of 5 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
15.1 Moon in the Sky	1	**Moon** What is the Moon?	4.3.3	197 - 198
	2	**Movement of the Moon in the Sky** How does the Moon move in the sky?		199 - 200
	3	**Changing Moon** How does the Moon seem to change its shape?		201 -202
	4	Summary and Exercise		203 -205
Chapter Test	5	Chapter Test		206 - 207

Unit	Chapter : **15. The Moon**	Total lesson No: 80 / 97
Space	Topic : **15.1. Moon in the Sky**	Textbook page: 197 - 198

Lesson 1 / 5	**Lesson Title** **Moon**

Preparation

- Nil

Lesson Flow

1 Introduction (10 min.)

- Ask the following questions by asking:

Q:What objects do you see in the night sky?

Q:Do you know what the Moon is?

- Motivate students to think about what is the Moon to introduce the key question.

2 Introduce the key question

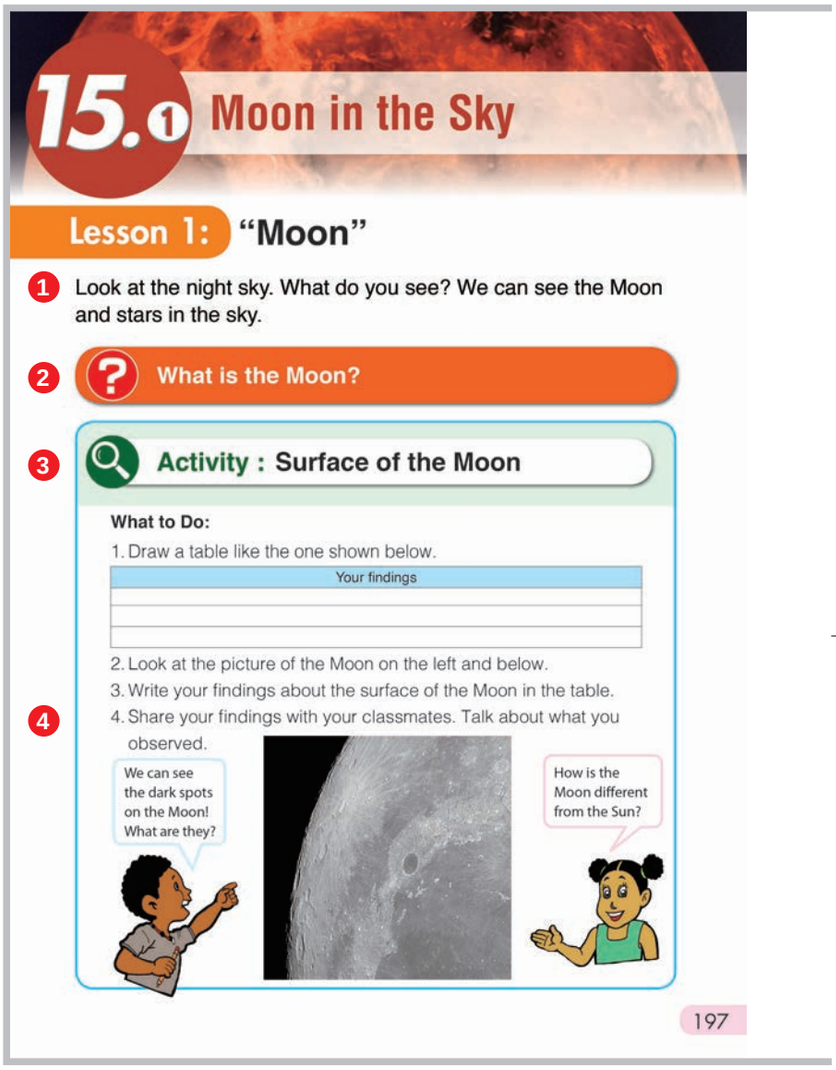
What is the Moon?

3 Activity (20 min.)

- Organise students in pairs.
- Explain the steps of the activity.
- Instruct students to focus on the moon's colour, size and shape when they investigate the Moon
- Have students do the activity and fill their findings in the table.
- Give enough time to students to complete the activity.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Write down students' findings on the blackboard.
- Facilitate active students discussion.
- Confirm the findings with students.
- **Based on their findings,** ask the following questions. **(Continue)**



15.1 Moon in the Sky

Lesson 1: "Moon"

1 Look at the night sky. What do you see? We can see the Moon and stars in the sky.

2 What is the Moon?

3 Activity : Surface of the Moon

What to Do:

1. Draw a table like the one shown below.

Your findings

2. Look at the picture of the Moon on the left and below.
3. Write your findings about the surface of the Moon in the table.
4. Share your findings with your classmates. Talk about what you observed.

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Teacher's Notes

- In this lesson you only talk about the features of the moon seen from the earth.
- Also stress that the surface of the moon is covered by craters that are a bowl-shaped depression caused by the impact of the meteors. Meteors are rocks from outer space that hit the moon's surface creating craters.

Additional knowledge for the teacher:

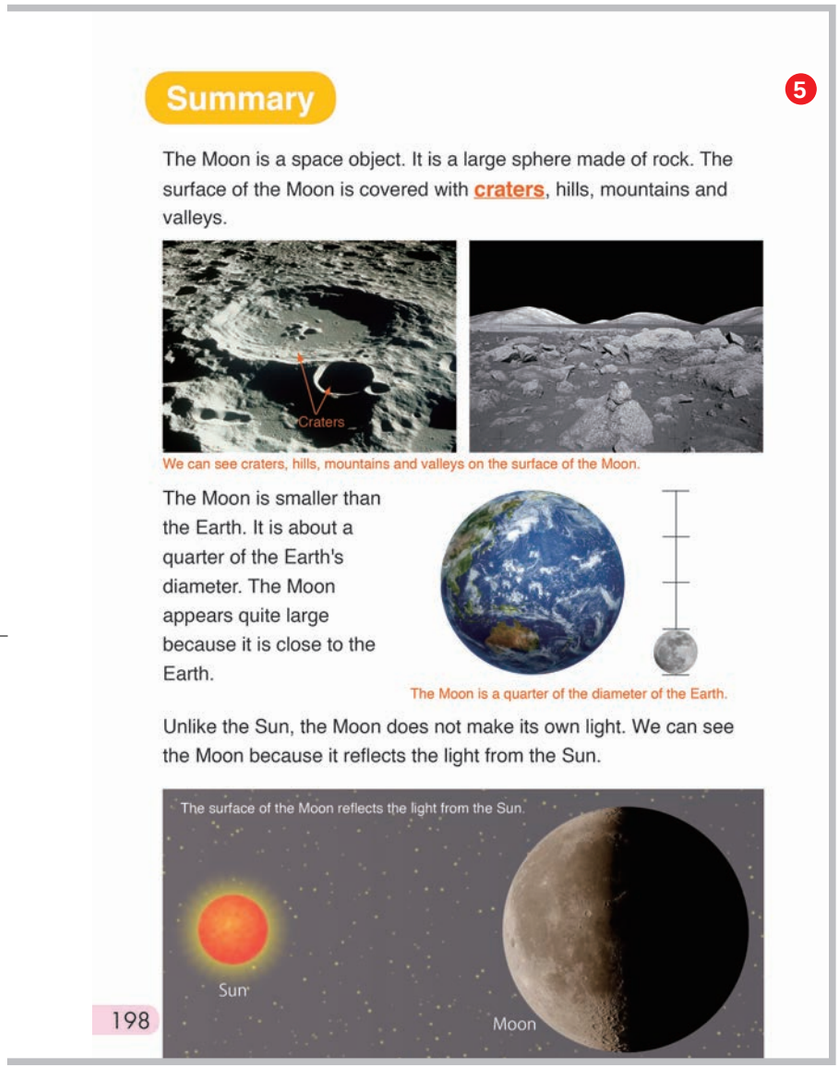
- The dark spots on the moon are called "Maria".
- The light spots on the moon are called the lunar Highlands.
- The dark material filling the Maria is actually dark, solidified lava from earlier periods of lunar volcanism.
- Both the Maria and the Highlands exhibit Large Craters that are the result of meteor impacts.
- The Maria are younger than the Highlands, because they have fewer craters.

Lesson Objectives

Students will be able to:
- Describe the characteristics of the Moon.

Assessment

Students are able to:
- Compare the size of the Moon and the Earth.
- Describe the characteristics of the surface of the Moon.
- State the difference of the characteristics between the Moon and the Sun.
- Show eagerness to learn about the Moon.



Summary

The Moon is a space object. It is a large sphere made of rock. The surface of the Moon is covered with **craters**, hills, mountains and valleys.

We can see craters, hills, mountains and valleys on the surface of the Moon.

The Moon is smaller than the Earth. It is about a quarter of the Earth's diameter. The Moon appears quite large because it is close to the Earth.

The Moon is a quarter of the diameter of the Earth.

Unlike the Sun, the Moon does not make its own light. We can see the Moon because it reflects the light from the Sun.

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Q:Can you guess why the surface of the Moon has light and dark area? (Light and dark areas are covered with different kinds of rocks.)
- Explain the characteristics of the surface of the Moon.
- Ask the following questions.

Q:Which is bigger, the Moon or the Earth? (The Moon is smaller than the Earth.)
- Explain the size of the Moon.
- By showing the pictures of the Moon and the Sun, ask the question:

Q:What difference do you find between the Moon and the Sun? (The Sun gives off light but the Moon does not.)
- Explain the difference between the Sun and the Moon.
- Conclude the discussion.

5 Summary (10 min.)
- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What are the characteristics of the Moon?
  Q: How are the Sun and the Moon different?
- Ask students to copy the notes on the blackboard into their exercise books.
- 5 days before Lesson 3 'Changing Moon', ask students to observe and record the shape of the Moon.

Sample Blackboard Plan

Title:
"Moon"
Key question
What is the Moon?
Activity
Surface of the Moon

Your findings
1. The moon is round or circle.
2. The moon has black and white areas.
3. The moon has small holes.
4. There are different patterns. etc

Discussion
Q: Why does the surface of the Moon have light and dark area?
Light and dark areas are covered with different kinds of rocks.
Q: Which is bigger, the moon or the earth?
The moon is smaller than the earth.
The Moon is about 1/4 diameter of Earth.
Q: What difference do you find between the Moon and the Sun?
The Sun gives off light but the Moon does not.

Summary
1. What is the Moon?
➤It is a large sphere space object made of rocks.
2. Characteristics of Moon
(1) Surface
➤It is covered by craters, hills, mountains and valleys.
➤Light and dark areas are covered with different kinds of rocks.
(2) Size
➤The Moon is about 1/4 diameter of Earth.
(3) Other
➤The Moon reflect light from the Sun.

Unit	Chapter : **15. The Moon**	Total lesson No: 81 / 97
Space	Topic : **15.1. Moon in the Sky**	Textbook page: 199 - 200

Lesson 2 / 5

Lesson Title

Movement of the Moon in the sky

Preparation

- Compass

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking.

Q:How can we describe the Moon?

- Recap Grade 3 lesson on 'Movement of the Sun' by asking;

Q:How does the Sun move?

- Motivate students to think about the movement of the Moon to introduce the Key Question.

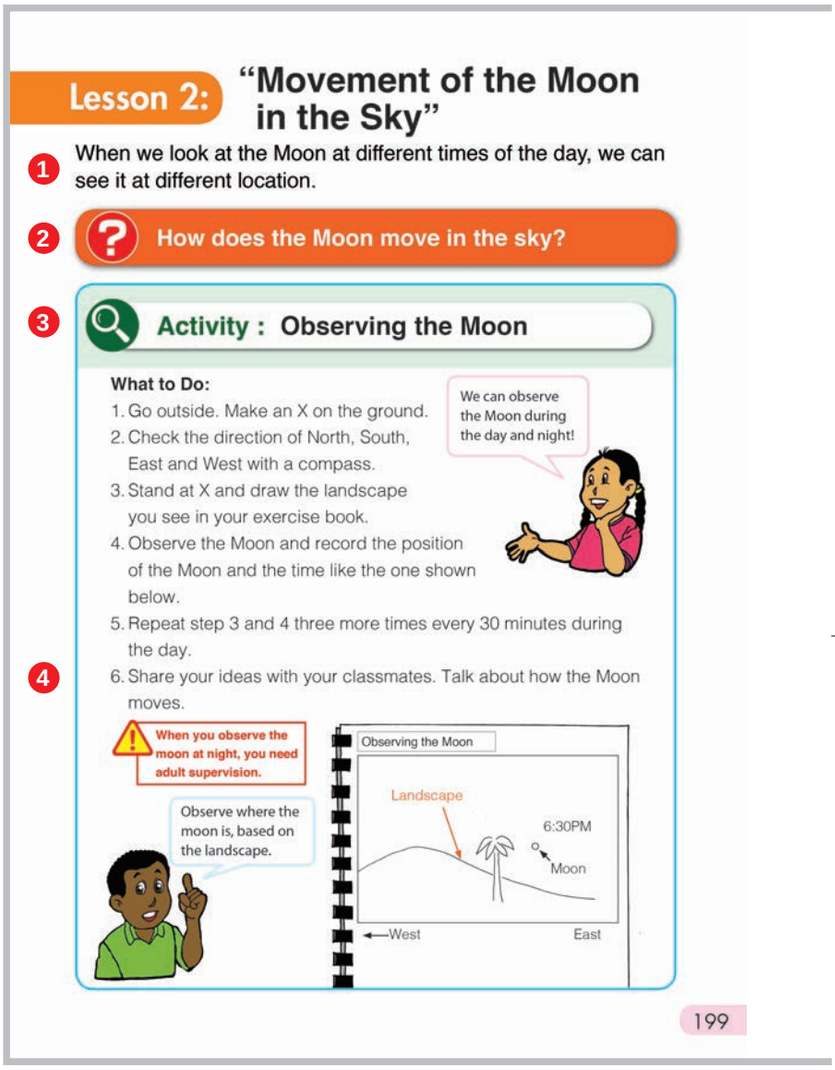
2 Introduce the key question

How does the moon move in the sky?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Demonstrate how students observe the moon in the same place at all times. (Refer to 'Science Toolbox: How to use a compass' in the textbook, on how to draw a landscape, and how to mark an X on the ground.)
- Remind students to do Step 5 of the activity within the day.
- Have students do the activity and ask them to record the changes of Moon's postion in the sky.
- Give enough time for the students to complete their observation.

(Teacher must observe the Moon one day before the lesson, and understand when and where the Moon can be observed in the sky. If the Moon can be observed at the night, ask students to oberve at their home with adults supervision)



Teacher's Notes

Motion of the Moon

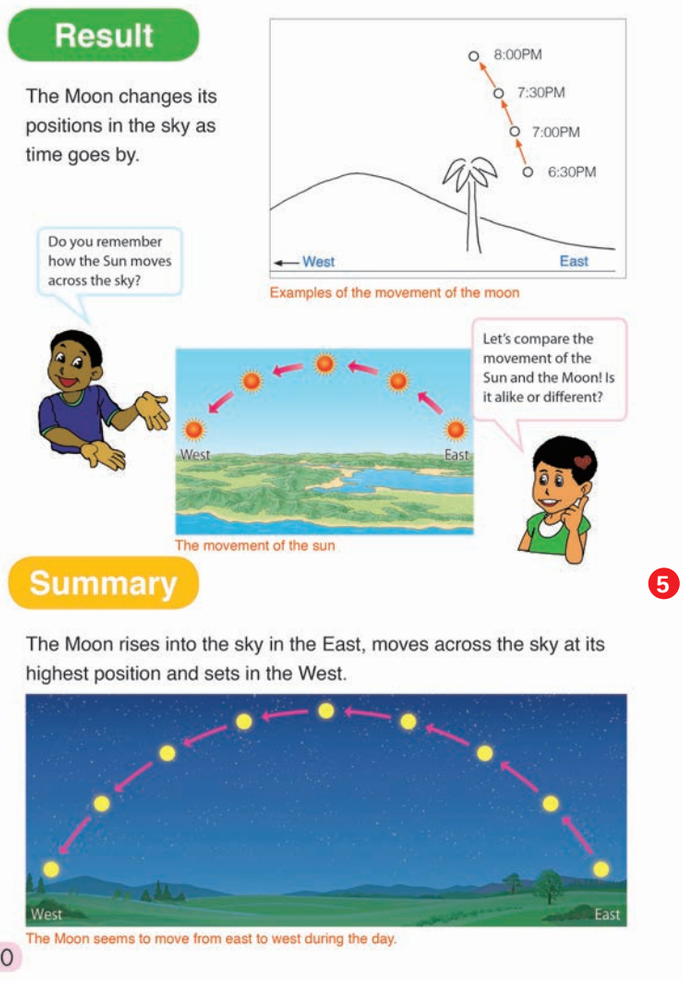
- **Moon** is the only known satellite of the Earth.
- Moons rotation time (on its axis) and revolution time (around the Earth) is same (i.e. 27 days, 7 hours, 43 minutes, and 11.47 seconds.) This is the reason that we always see only one side of the Moon.
- Although the moon rises in the east and sets in the west each day (due to Earth's spin), it's also moving on the sky's dome each day due to its own motion in orbit around Earth.
- The Moon has a nearly circular orbit which is tilted about 5° to the plane of the Earth's orbit.
- Moon revolves around the Earth once in every 27.3 days, which is known as '**Sidereal Month**;' however, it takes 29.5 days to return to the same point on the celestial sphere in reference to the Sun (due to revolution motion of the Earth around the Sun) and it is known as '**Synodic Month**.'

Lesson Objectives

Students will be able to:
- Observe the movement of the Moon.
- Explain how the Moon moves during the day.

Assessment

Students are able to:
- Record the movement of the Moon in the chart.
- State that the moon rises in the east, moves across the sky and sets in the west.
- Relate the movement of the Moon to that of the Sun.
- Appreciate each others answers about the Moon.



4 Discussion for findings (20 min.)

- Students present their results of the observation.
- Confirm their drawings of the change in the positions of the Moon on the blackboard.
- **Based on their findings,** ask the following questions.

Q:What happened to the positions of the Moon with time? (The positions of the Moon changed)

Q:What direction do you think the moon moves? (The moon moves from the east to the west.)

Q:How are the movement of the Sun and the Moon alike or different? (Both the Sun and the Moon move from the east to the west.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: How does the Moon move during the day?
  Q: How are the movements of the Sun and the Moon alike or different?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

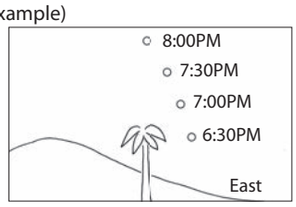
"Movement of Moon in the sky."

Key question

How does the moon moves in the sky?

Activity: Observing the Moon.

(An Example)



Discussion

Q: What happened to the positions of the Moon with time?

The positions of the Moon changed.

Q: What direction do you think the moon moves?

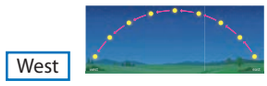
The moon rises into the sky in the east and moves across the sky and sets in the west during the day.

Q: How are the movement of the Sun and the Moon alike or different?

Both the Sun and the Moon move from the east to the west.

Summary

1. Movement of the Moon:
   - ➤The moon changes its position in the sky as time goes by.
   - ➤The moon rises in the east, moves across the sky and sets in the west.



2. Comparing the Sun and the Moon
   - ➤Both the Sun and the Moon move from the east to the west.

Unit	Chapter : **15. The Moon**	Total lesson No: 82 / 97
Space	Topic : **15.1. Moon in the Sky**	Textbook page: 201 - 202

Lesson 3 / 5

Lesson Title

Changing Moon

Preparation

- Colour pencils (yellow, black), chart paper, marker (black and yellow)

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:Which direction does the moon move?

- Encourage students to think about the change in the shapes of the Moon by asking the question:

Q:How does the moon's shape look like every night?

2 Introduce the key question

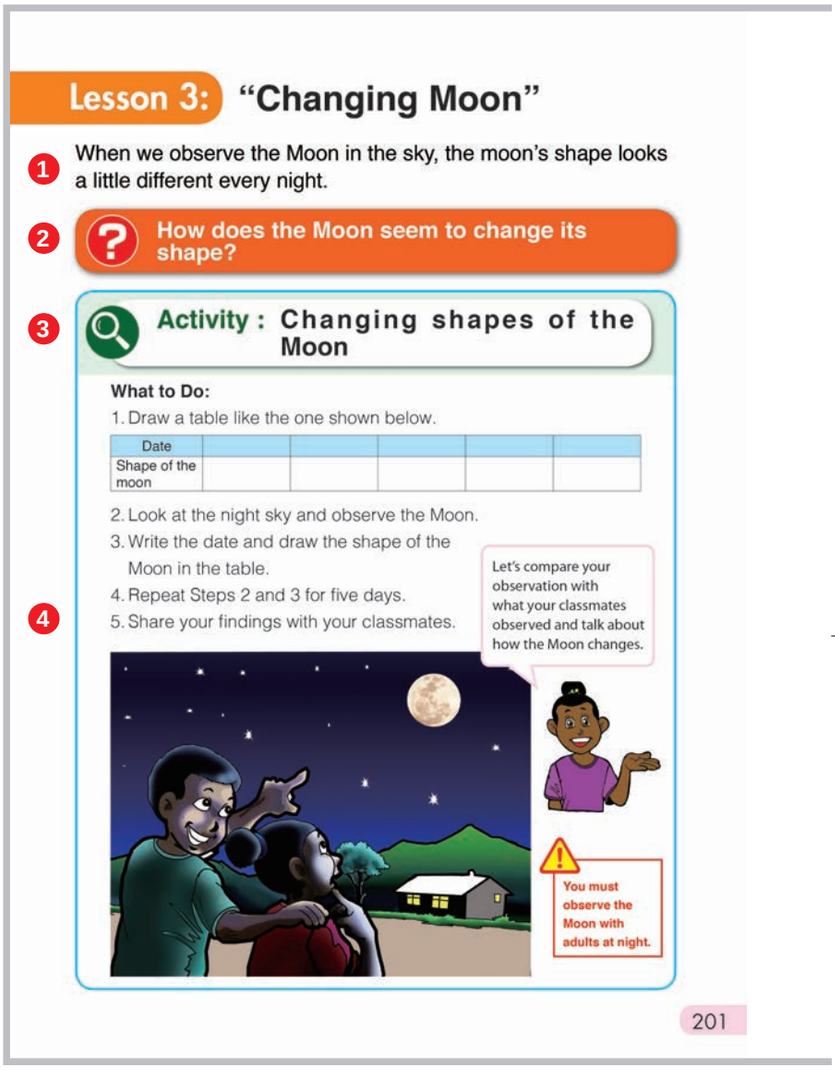
How does the moon seem to change its shape?

3 Activity (20 min.)

- Prior to this lesson, students have already recorded the shape of the Moon for the past five days. In this lesson, students study about the changing moon based on their 5 days observations.
- Organise students into groups.
- Ask students to share the results of their observation in a group.
- Ask each group to draw the shape of the Moon they observed on the chart paper.

4 Discussion for findings (20 min.)

- Ask each group to present their drawings of the Moon. **(Continue)**



Lesson 3: "Changing Moon"

1 When we observe the Moon in the sky, the moon's shape looks a little different every night.

2 How does the Moon seem to change its shape?

3 Activity : Changing shapes of the Moon

What to Do:

1. Draw a table like the one shown below.

Date					
Shape of the moon					

2. Look at the night sky and observe the Moon.
3. Write the date and draw the shape of the Moon in the table.
4. Repeat Steps 2 and 3 for five days.
5. Share your findings with your classmates.

4

Let's compare your observation with what your classmates observed and talk about how the Moon changes.

You must observe the Moon with adults at night.

201

Teacher's Notes

The Moon Phases

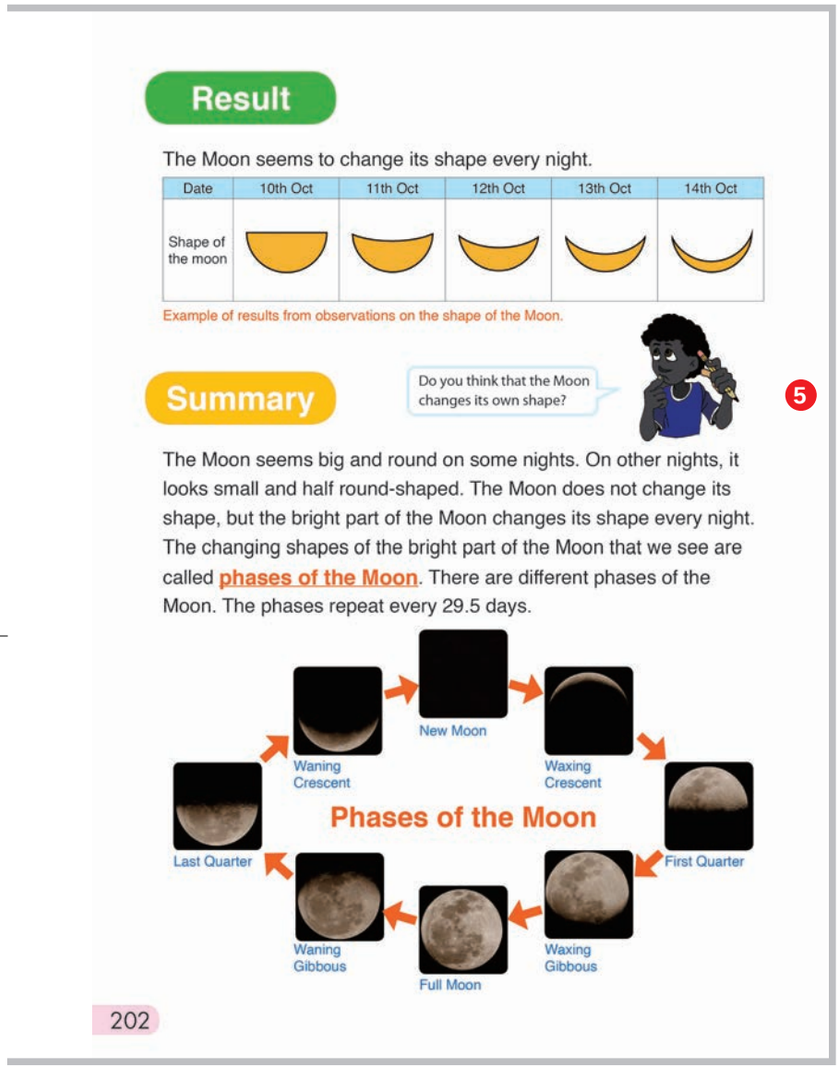
- **First Quarter**- The first quarter moon really shows half of the Moon lit up.
- **Waxing Gibbous**- The Moon is still waxing because the part we see lit up is getting larger.
- **Full Moon**- Since the moon is now on the other side of its orbit around the earth, it is fully lit by the Sun.
- **Waning Gibbous**- Waning means to 'become smaller' and the part of the moon that is lit up is decreasing at this point in the cycle.
- **Last Quarter**- The moon has moved another quarter of the way around the earth, to the third quarter position. The sun's light is now shining on the other half of the visible face of the moon.
- **Waning Crescen**t- Less than half of the moon's face appears to be getting sunlight and the amount is decreasing.
- **New Moon**- The cycle is now complete and will begin with again with another new moon.
- **Waxing Crescent**- The Moon is less than half, but the amount of sunlight is increasing.

Lesson Objectives

Students will be able to:
- Observe the different phases of the moon.
- Define the phases of the moon.
- Identify the different phases of the Moon.

Assessment

Students are able to:
- Sketch the different phases of the Moon.
- Explain what the phases of the Moon are.
- State that which part of the Moon changes the shape.
- Show interest to lean more about the different phases of the Moon.



Result

The Moon seems to change its shape every night.

Date	10th Oct	11th Oct	12th Oct	13th Oct	14th Oct
Shape of the moon					

Example of results from observations on the shape of the Moon.

Summary

Do you think that the Moon changes its own shape?

The Moon seems big and round on some nights. On other nights, it looks small and half round-shaped. The Moon does not change its shape, but the bright part of the Moon changes its shape every night. The changing shapes of the bright part of the Moon that we see are called **phases of the Moon**. There are different phases of the Moon. The phases repeat every 29.5 days.

202

- Confirm the changes in the shapes of the Moon every night for the last 5 days.
- **Based on their findings,** asks questions.

Q:How does the bright part of the moon change its shape? (It becomes bigger every night)

Q:Does the shape of the Moon change its shape? (No)

Q:Which part of the Moon change the shape? (The bright part of the moon)

Q:Can you guess why a part of the Moon is bright? (It is because the part of the moon surface reflects the light from the Sun.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What are the different phases of the Moon?
  Q: How does the bright part of the Moon change its shape?
  Q: Which part of the Moon change the shape?
  Q: Why is a part of the Moon bright?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Changing Moon"

Key question
Q: How does the Moon seem to change its shape?

Activity: Changing shape of the moon.

Date	10th Sep	11th Sep	12th Sep	13th Sep	14th Sep
Shape of the moon	Refer to the textbook copy as the example.				

Discussion
Q: How does the bright part of the moon change its shape?
It becomes bigger every night.
Q: Does the shape of the Moon change its shape? No
Q: Which part of the Moon change the shape?
The bright part of the moon
Q: Can you guess why a part of the Moon is bright?
It is because the part of the moon surface reflects the light from the Sun.

Summary
- Phases of the Moon
  - ➤ The changing shapes of the bright part of the Moon
  - ➤ The phases repeat every 29.5 days.
  - ➤ The Moon does not change its shape.
  - ➤ The bright part of the Moon changes its shape.
  - ➤ The bright part of the Moon reflects the light from the Sun.

Unit	Chapter : **15. The Moon**	Total lesson No: 83 / 97
Space	Topic : **15.1. Moon in the Sky**	Textbook page: 203 - 205

Lesson 4 / 5

Lesson Title

Summary and Exercise

Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some questions to students and verify students understanding. Explain and correct learning contents again if they still have misconception.
- Provoke students to think about what the surface of the moon is covered with and its size compared to earth.
- Have students to realise that moon changes its position as time goes by.
- Explain that the bright part of the moon changes it shape every night.
- Guide students to understand that the moon does not change its shape.

1

Summary and Exercise

Summary 15.1 Moon in the Sky

Moon

- ☐ The moon is a space object. It is a large sphere made of rock.
- ☐ The surface of the moon is covered by craters, hills, mountains and valleys.
- ☐ The moon is smaller than the Earth and does not make its own light.
- ☐ The moon reflects light from the sun.

Movement of the Moon in the Sky

- ☐ The moon changes its position in the sky as time goes by.
- ☐ The moon rises into the sky in the East, moves across the sky and sets in the West during the day.

The Changing Moon

- ☐ The moon does not change its shape. The bright part of the moon changes its shape every night.
- ☐ The bright part of the moon are called **phases of the moon**. The following diagrams show the different phases of the moon.

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2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time in response to students understanding.
- After the test, give them answers of the questions and explain how to solve with asking student's answers and thought.
- Guide students to understand the main ideas or concepts in response to their answers.
- If students find the concept on the different moon phases questions difficult to understand than present it again using a model explaining the waxing and waning crescents.
- For question 4 the lessons on the Sun were covered in grade 3. With that background knowledge on un
- they should identify the differences between the moon and the sun.
- Remind students that this is the test for the end of the topic on moon in the sky. We will be moving into a new topic in our next science lesson.

2

Summary and Exercise

Exercise 15.1 Moon in the Sky

Q1. Complete each sentence with the correct word.

(1) The_____ is the closest space object to the Earth, that is a large sphere made of rocks.

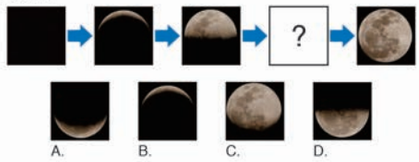
(2) The changing shapes of the brighter part of the moon are called_____ of the moon.

(3) The moon rises in the_____, moves across the sky and sets in the_____.

Q2. Choose the letter with the correct answer.

(1) Look at the picture on the right and answer the question.
What is the name of the round shaped structure on the moon surface?
A. Ocean C. Valley
B. Crater D. Lake

(2) What phase of the moon will come next in the sequence shown below?



Q3. Answer the following questions.

(1) What is the name of the last moon phase before the new moon?

(2) Why does the moon shine?

(3) How many days does it take for the phases of the Moon to repeat?

Q4. What is the similarity between the Moon and the Sun's movement in the sky?

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Exercise answers

Q1.
(1) **moon**
(2) **phases**
(3) **east, west**

Q2.
(1) **B**
Explain that the round structures of moon's surface are craters. But hills, mountains and valleys are also found on the surface.
(2) **C**
Explain that the phase of the moon goes through a cycle from new moon, waxing crescent, first quarter, waxing gibbous and then to full moon. The waxing part of the moon happens when that the lit up is getting bigger.

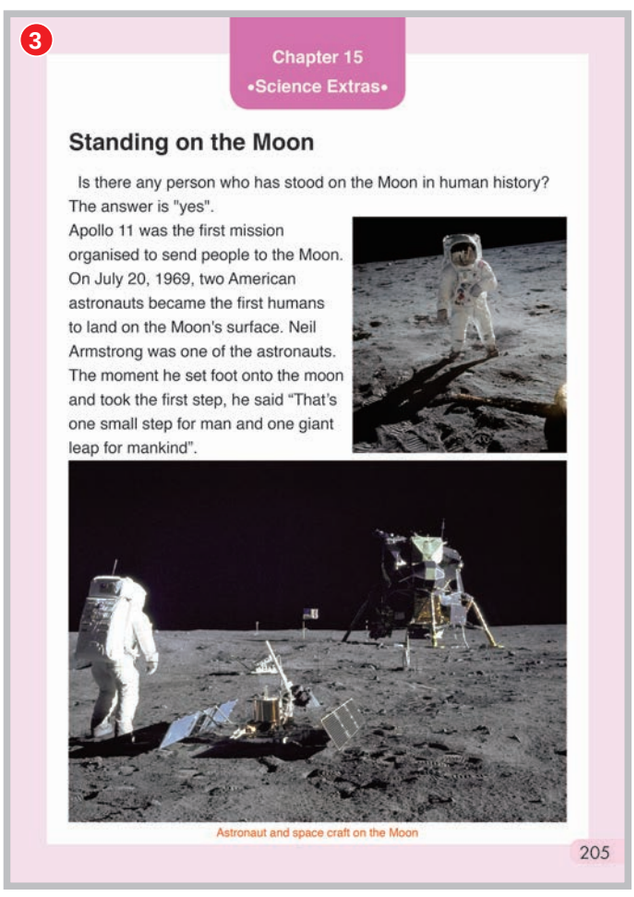
Q3.
(1) **Waning Crescent**
(2) **It reflects light from the Sun.**
(3) **29.5 days**

Q4.
Both the Moon and the Sun rises into the sky in the east, moves across the sky at highest position and sets in the west.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give students' opportunities closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extra.


3

Chapter 15
•Science Extras•

Standing on the Moon

Is there any person who has stood on the Moon in human history? The answer is "yes".
Apollo 11 was the first mission organised to send people to the Moon. On July 20, 1969, two American astronauts became the first humans to land on the Moon's surface. Neil Armstrong was one of the astronauts. The moment he set foot onto the moon and took the first step, he said "That's one small step for man and one giant leap for mankind".

Astronaut and space craft on the Moon

205

Lesson
5 / 5

Lesson Title

Chapter Test

Answer of the Chapter Test

Chapter Test

15. The Moon

Q1 Complete each sentence with the correct word.

(1) The Moon is a space object.

(2) The surface of the Moon is covered with craters, hills, mountains and valleys.

(3) The Moon reflects the light from the Sun.

Q2 Choose the letter with the correct answer.

(1) What is the Moon made of?

A. Water
B. Rocks
C. Air
D. Plants

(2) From what direction does the Moon seem to move in the sky during the day?

A. From east to west
B. From west to east
C. From north to south
D. From south to north

(3) How often can a full Moon be seen?

A. Once a year
B. Once each session of the year
C. About once each month
D. About once each week

(4) How many days does the Moon take to orbit the Earth?

A. 27days
B. 28 days
C. 29.5 days
D. 30 days

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Q3

(1) Dave observed the night sky and noticed that the Moon appears quite large. Why does the moon appear quite large?

The moon appears quite large because it is close to the Earth.

(2) What is the name of the Moon phase shown in the diagram on the right?

Waxing Crescent

(3) Which of following letters is the correct order of phases of the Moon?

1. 
New Moon

2. 
Full Moon

3. 
Waning Crescent

4. 
Last Quarter

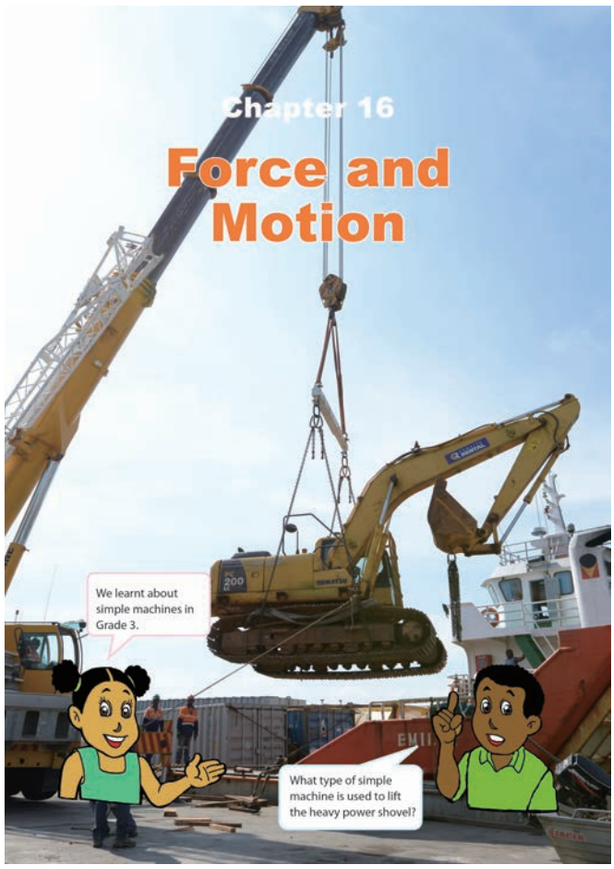
A. 1 ⇒ 3 ⇒ 4 ⇒ 2
B. 1 ⇒ 4 ⇒ 2 ⇒ 3
C. 2 ⇒ 1 ⇒ 3 ⇒ 4
D. 2 ⇒ 4 ⇒ 3 ⇒ 1

Strand : PHYSICAL SCIENCE
Unit : FORCE and MOTION

Chapter 16. Force and Motion

Chapter Objectives

Students will be able to understand how the position and motion of an object is described, measured and classify simple machines into six groups.



The picture at the chapter heading in the textbook shows a crane lifing a heavy vehicle at a construction site. To lift such heavy object, a crane basically uses both fixed and movable pulleys.

Topic Objectives

16.1 Describing and Measuring Motion

Students will be able to;

- Describe the position of an object.
- Explain how the motion of an object can be described by its distance, speed and direction.
- Explain how the distance and speed of an object can be measured.

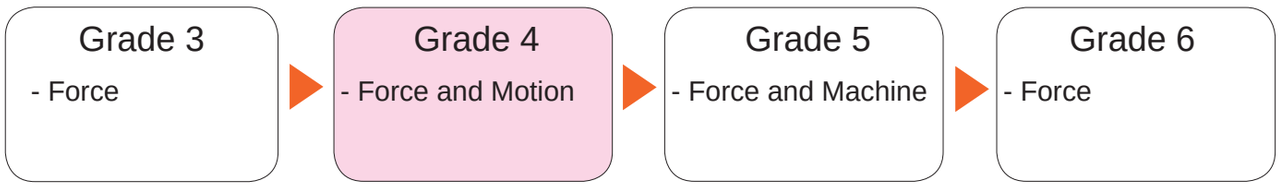
16.2 Machine and its Work

Students will be able to;

- Identify the different types of simple machines.
- Describe how a lever works.
- Describe how a pulley works.
- Describe how an incline plane works.
- Describe how a wheel and axle works.
- Describe how a wedge works.
- Describe how a screw works.

Related Learning Contents

The learning contents in this chapter connect into the following chapters.



Prior knowledge for learning this chapter;

- Force can change speed and direction of moving objects.
- A tools that helps us do some things easily is called a simple machine.

Teaching Overview

This chapter consists of 13 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
16.1 Describing and Measuring Motion	1	**Position and Motion of Objects** What is the motion of an object?	4.2.3	209 -210
	2	**Describing Motion of an Object** How can we describe the motion of an object?		211 - 212
	3	**Measuring Motion of an Object** How can we measure the distance and speed of an object?		213 -214
	4	Summary and Exercise		215 -216
16.2 Machine and its Work	5	**Six Simple Machines** What types of simple machines are there?		217 - 218
	6	**Lever** How does a lever make work easier?		219 - 220
	7	**Inclined Plane** How does an inclined plane make work easier?		221 - 222
	8	**Pulleys** How does a pulley make work easier?		223 - 224
	9	**Wheel and Axle** How does a wheel and axel work?		225 - 226
	10	**Wedge** How does a wedge make work easier?		227 - 228
	11	**Screw** How does a screw work?		229 - 230
	12	Summary and Exercise		231 - 233
Chapter Test	13	Chapter Test		234 - 235

Unit	Chapter : **16. Force and Motion**	Total lesson No: 85 / 97
Force and Motion	Topic : **16.1. Describing and Measuring Motion**	Textbook page: 209 - 210

Lesson 1 / 13

Lesson Title

Position and Motion of Objects

Preparation

- Nil

Lesson Flow

1 Introduction (10 min.)

- Recall the Gr 3 lesson on 'Force':

Q:What is force?

Q:What can force do when force is applied to an object?

- Explain the part of the introduction, and ask:

Q:When an object is in motion, what is happening to the object?

2 Introduce the key question

What is the motion of an object?

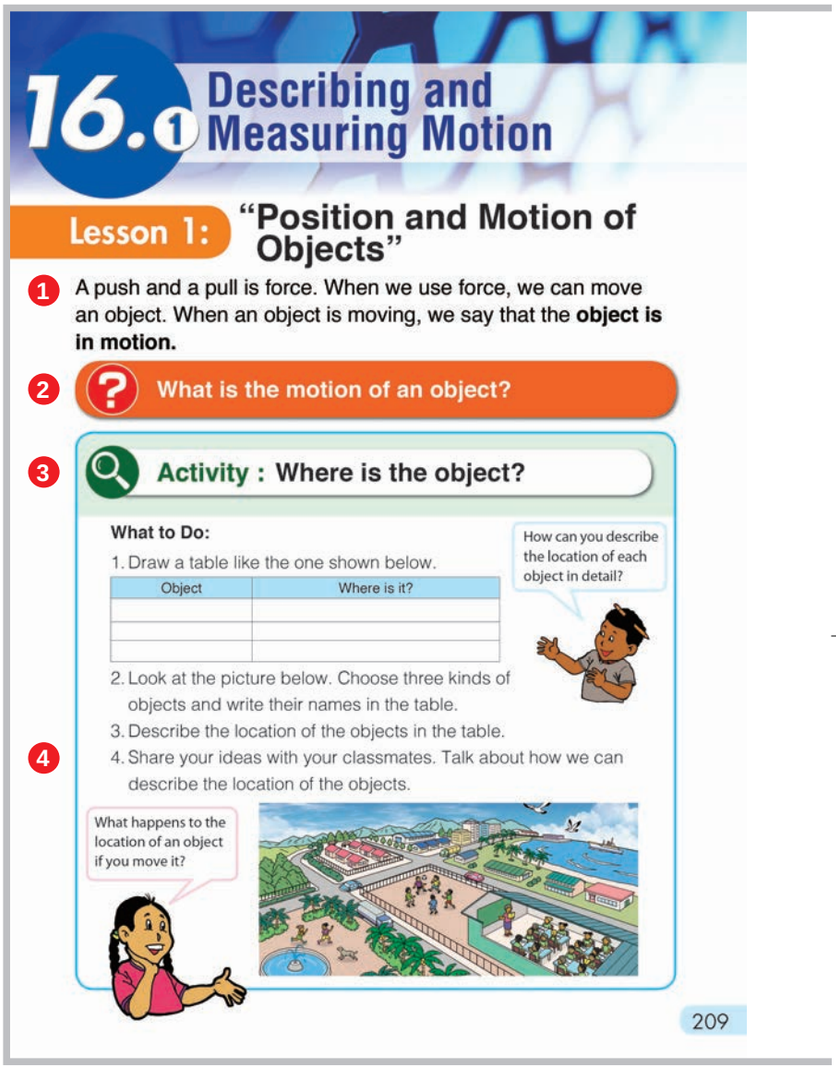
3 Activity (20 min.)

- Organise students to work in groups.
- Explain the steps of the activity.
- Ask students to look at the picture in the textbook and choose three kinds of objects and describe where they are located or placed in detail.
- Have students do the activity. Ask them to record their findings in the table.
- Let students discuss the findings in their group.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Write down students' findings on the blackboard.

(Continue)


16.1 Describing and Measuring Motion

Lesson 1: "Position and Motion of Objects"

1 A push and a pull is force. When we use force, we can move an object. When an object is moving, we say that the **object is in motion.**

2 What is the motion of an object?

3 Activity : Where is the object?

What to Do:

1. Draw a table like the one shown below.

Object	Where is it?

How can you describe the location of each object in detail?

2. Look at the picture below. Choose three kinds of objects and write their names in the table.
3. Describe the location of the objects in the table.
4. Share your ideas with your classmates. Talk about how we can describe the location of the objects.

4

What happens to the location of an object if you move it?

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Teacher's Notes

Motion of objects

Motion may be divided into three basic types — Rectilinear Motion, Circular Motion and Periodic Motion.

1. Rectilinear Motion
   All the objects move along a single line. Some common examples of rectilinear motion are marching soldiers, moving cars and moving animals. The common thing in all these examples is that they move in a single line.
2. Circular Motion
   In the circular motion, the objects follow a circular path of motion without changing their position. Some examples of circular motion are the motion of a ferry wheel, satellites and rotation of planets around the sun.
3. Periodic Motion
   The motion that repeats after a specific period of time is known as periodic motion. In the periodic motion, the movement made by these objects is called oscillation. The examples of the periodic motion are a child's motion on swings, the motion of the earth around the Sun and clocks.

Lesson Objectives

Students will be able to:
- Describe the position of objects.
- Define motion.
- Explain the relationship between the position and the motion of an object.

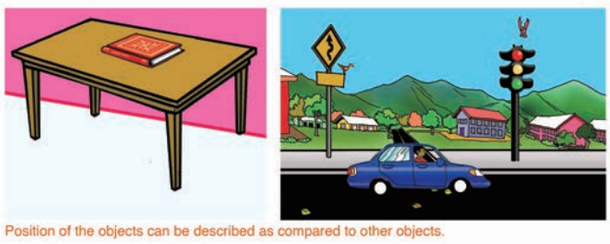
Assessment

Students are able to:
- Describe the position of an object by comparing to other objects.
- Explain what an object in motion is.
- Relate an object in motion to the change in its position.
- Discuss how to describe the position of an object with classmates.

Summary

5

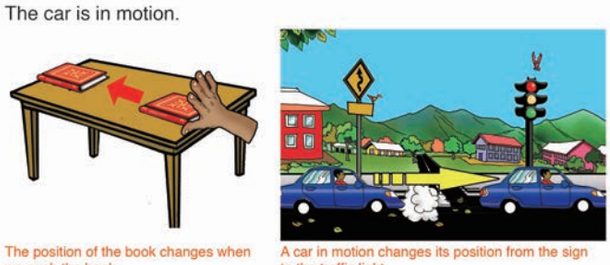
The place or location of an object is called the **position**. We can describe the position of an object as compared to other objects. For example, the position of the red book is on a desk in front of a pink wall. The position of the blue car is on the road 1m from the road sign.



Position of the objects can be described as compared to other objects.

What happens to the position of an object if it moves? The position of the object may change. The change in the position of an object is called the **motion**. An object in motion moves from one place to another.

For example, the position of a book changes from an edge to another edge of the desk when we move the book on the desk. When the car is moving, its position changes from the road sign to the traffic light. The car is in motion.



The position of the book changes when we push the book.

A car in motion changes its position from the sign to the traffic light.

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- Confirm the findings with students.
- **Based on their findings,** ask the questions as discussion points.

Q:How did you describe the place where the object is? (By comparing it to other objects, etc.)

- Encourage students to think of what happens when the object is moving by asking:

Q:What would happen to the place of an object if it is moving? (The place or position will change.)

Q:What is happening to an object when the object is in motion? (An object is changing its position or place.)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  - Q: What is a position?
  - Q: How can we describe the position of an object?
  - Q: What is motion?
  - Q: What happens to an object when it is in motion?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Position and Motion of Objects"

Key question

What is the motion of an object?

Activity

Where is the object?

Object	Where is it?
Red lamp	On a purple table
Pillow	On the bed
Clock face	On the wall above book shelf
Teddy bear	Near the window on the shelf
Yellow book	Under the purple table

Discussion

Q: How did you describe the place where an object is?

By comparing it to other objects, etc.

Q: What would happen to the place of an object if it is moving?

The place or position will change.

Q: What is happening to an object when the object is in motion?

An object is changing its position or place.

Summary

- The place or location of an object is called position.
- The position of an object can be described by comparing the position of other objects.
- The change in the position of an object is called a motion.
- An object in motion moves from one place to another.

Unit	Chapter : **16. Force and Motion**	Total lesson No: 86 / 97
Force and Motion	Topic : **16.1. Describing and Measuring Motion**	Textbook page: 211 - 212

Lesson 2 / 13

Lesson Title

Describing Motion of an Object

Preparation

- Ball

Lesson Flow

1 Introduction (10 min.)

- Review the previous lessons by asking:

Q:How can we describe the position of an object?

Q:What happens to an object when it is in motion?

- Encourage students to think about how to describe the motion of objects by asking the questions:

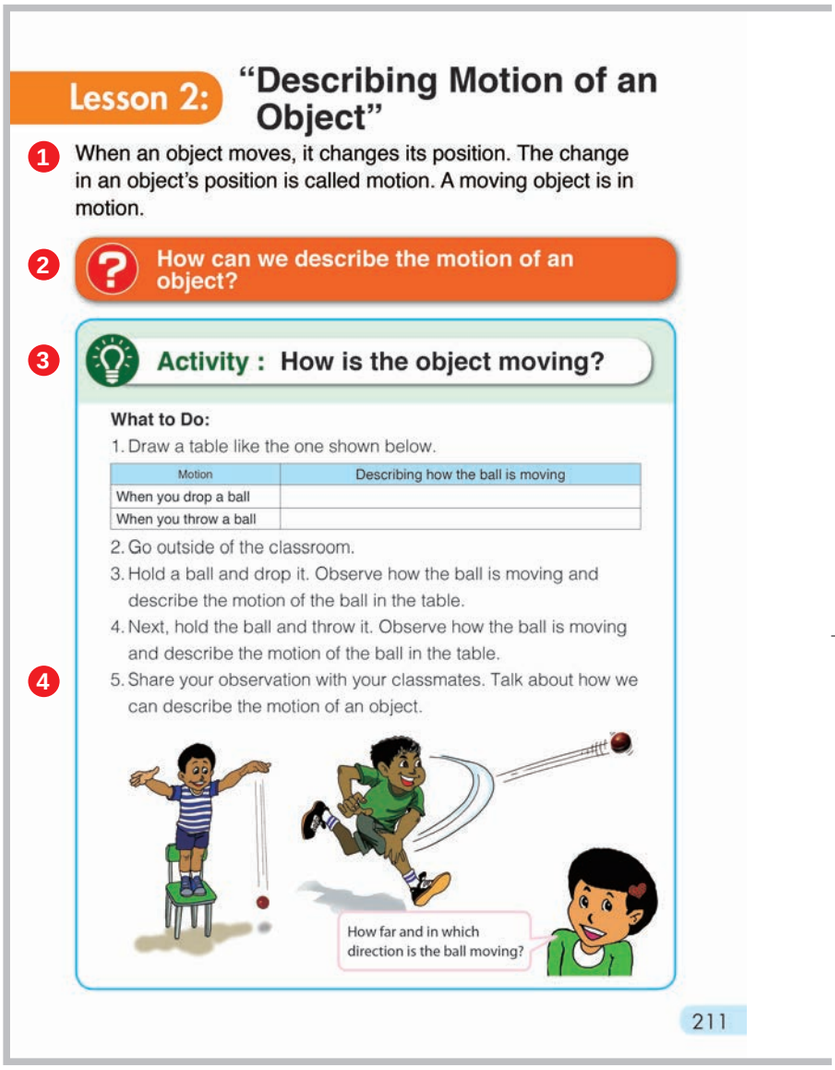
Q:How can we describe an object in motion?

2 Introduce the key question

How can we describe the motion of an object?

3 Activity (20 min.)

- Organise students to work in pairs.
- Explain the steps of the activity.
- Allow the students to draw the table.
- Before taking the students outside remind them of some safety tips.
- Take the students outdoor and observe the motion of the ball,
  - Firstly drop the ball to the ground and record how the ball is moving.
  - Next throw the ball to your friend and record how it also moves.
- Encourage students to take turns in dropping and throwing the ball.
- Ask students to record their observations in the table.



Lesson 2: "Describing Motion of an Object"

1 When an object moves, it changes its position. The change in an object's position is called motion. A moving object is in motion.

2 How can we describe the motion of an object?

3 Activity : How is the object moving?

What to Do:

1. Draw a table like the one shown below.

Motion	Describing how the ball is moving
When you drop a ball	
When you throw a ball	

2. Go outside of the classroom.
3. Hold a ball and drop it. Observe how the ball is moving and describe the motion of the ball in the table.
4. Next, hold the ball and throw it. Observe how the ball is moving and describe the motion of the ball in the table.
5. Share your observation with your classmates. Talk about how we can describe the motion of an object.

4

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Teacher's Notes

How to describe motion of objects

The motion of an object can be described by its position, distance, speed, time, velocity, direction and acceleration.

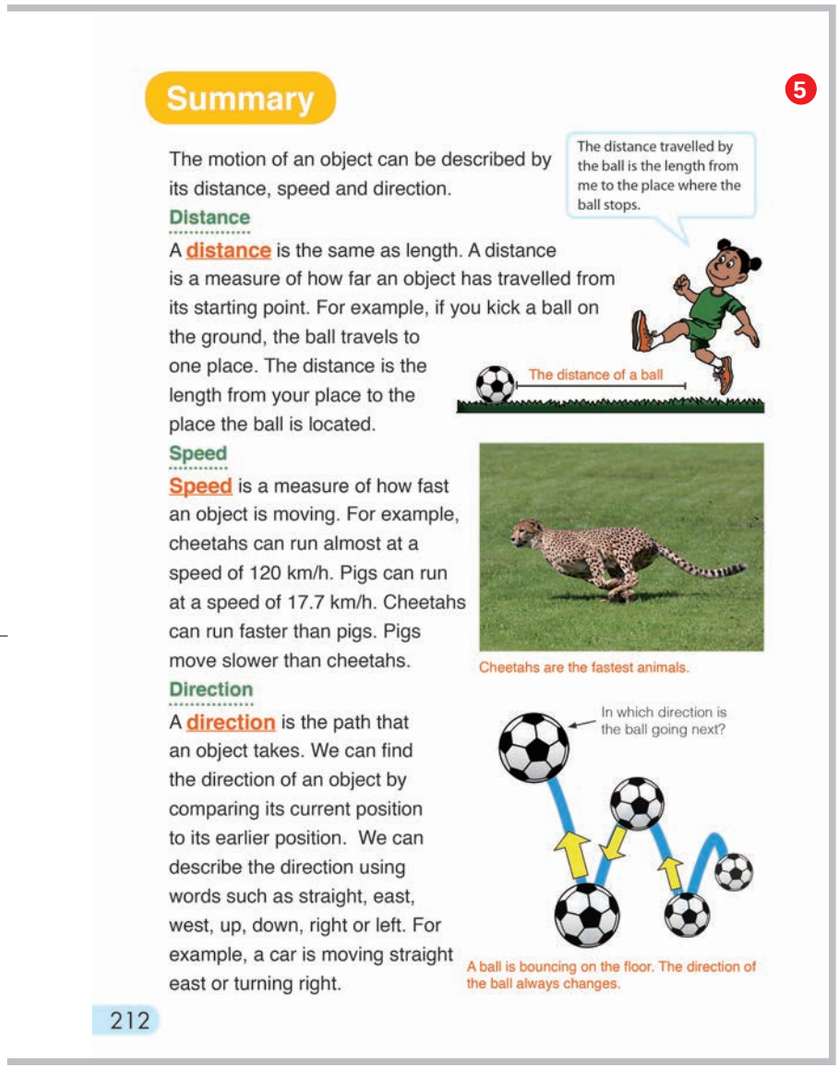
1. Position: The first concept to describing motion is that of position. In order to describe how far an object has moved, or in what direction it has moved, or the objects velocity, we have to first define an objects position.
2. Distance: The next concept is distance, which is a unique quantity. Distance that an object has traveled – which is measured in some unit of distance such as the meter (m), kilometer (km), centimeter (cm), or mile (Mi)
3. Speed and Time: In describing motion with the concepts of speed is where our units of time become important. Speed is a concept of the amount of distance and object covers per some amount of time – which is measured in m/s or km/h.
4. Velocity and Direction: Velocity is speed in a given direction. In other words, velocity is how fast and in what direction it moves. When we say a car moves at 60 km/h to the north, we are specifying its velocity.
5. Acceleration: Acceleration is the rate at which the velocity is changing. The term acceleration applies to decreases as well as increases in speed.

Lesson Objectives

Students will be able to:
- Explain how the motion of an object can be described.
- Define distance, speed and direction.

Assessment

Students are able to:
- Describe the movement of a ball by observing.
- State that the motion of an object can be described by its distance, speed and direction.
- Investigate the motion of an object with interest.



Summary

The motion of an object can be described by its distance, speed and direction.

Distance

A **distance** is the same as length. A distance is a measure of how far an object has travelled from its starting point. For example, if you kick a ball on the ground, the ball travels to one place. The distance is the length from your place to the place the ball is located.

The distance travelled by the ball is the length from me to the place where the ball stops.

The distance of a ball

Speed

Speed is a measure of how fast an object is moving. For example, cheetahs can run almost at a speed of 120 km/h. Pigs can run at a speed of 17.7 km/h. Cheetahs can run faster than pigs. Pigs move slower than cheetahs.

Cheetahs are the fastest animals.

Direction

A **direction** is the path that an object takes. We can find the direction of an object by comparing its current position to its earlier position. We can describe the direction using words such as straight, east, west, up, down, right or left. For example, a car is moving straight east or turning right.

In which direction is the ball going next?

A ball is bouncing on the floor. The direction of the ball always changes.

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4 Discussion for findings (20 min.)

- Ask students to present their findings.
- Write down students' findings on the blackboard.
- Confirm the findings with students.
- **Based on their findings,** ask the following questions as discussion points.

Q:What happened to the ball when you dropped the ball? (It fell down to the ground, it moved from my hand to the ground, etc.)

Q:What happened to the ball when you threw the ball? (It was flying away from me, it was moving faster, etc.)

Q:How can you describe the movement or motion of a ball? (By how far the object travelled, how fast an object is moving and which way it is moving.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is a distance, speed and direction?
  Q: How can we describe the motion of an object?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Describing Motion of an Object"

Key question How can we describe the motion of an object?

Activity

How is an object moving?

Motion	Describing how the ball is moving
When you drop a ball	
When you throw a ball	

Discussion

Q: What happened to the ball when you dropped the ball? It fell down to the ground, it moved from my hand to the ground, etc.

Q: What happened to the ball when you threw the ball? It was flying away from me, it was moving faster, etc.

Q: How can you describe the movement or motion of a ball? By how far the object travelled, how fast an object is moving and which way it is moving.

Summary

- The motion of an object can be describe by its distance, speed and distance:

1.Distance - how far?
A measure of how far an object has travelled from its starting point.

2.Speed - how fast?
A measure of how fast an object is moving.

3.Direction - which way it is moving
The path that an object takes.

Unit	Chapter : **16. Force and Motion**	Total lesson No: 87 / 97
Force and Motion	Topic : **16.1. Describing and Measuring Motion**	Textbook page: 213 - 214

Lesson 3 / 13

Lesson Title

Measuring Motion of an Object

Preparation

- Toy car, tape measure (1 metre ruler), tape, stopwatch (watch, clock)

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by throwing a ball to a student across the classroom.

Q: Can you describe the movement of the ball?

- Ask the student to throw the ball back and tell the students to try to work out how far and fast the ball moved.

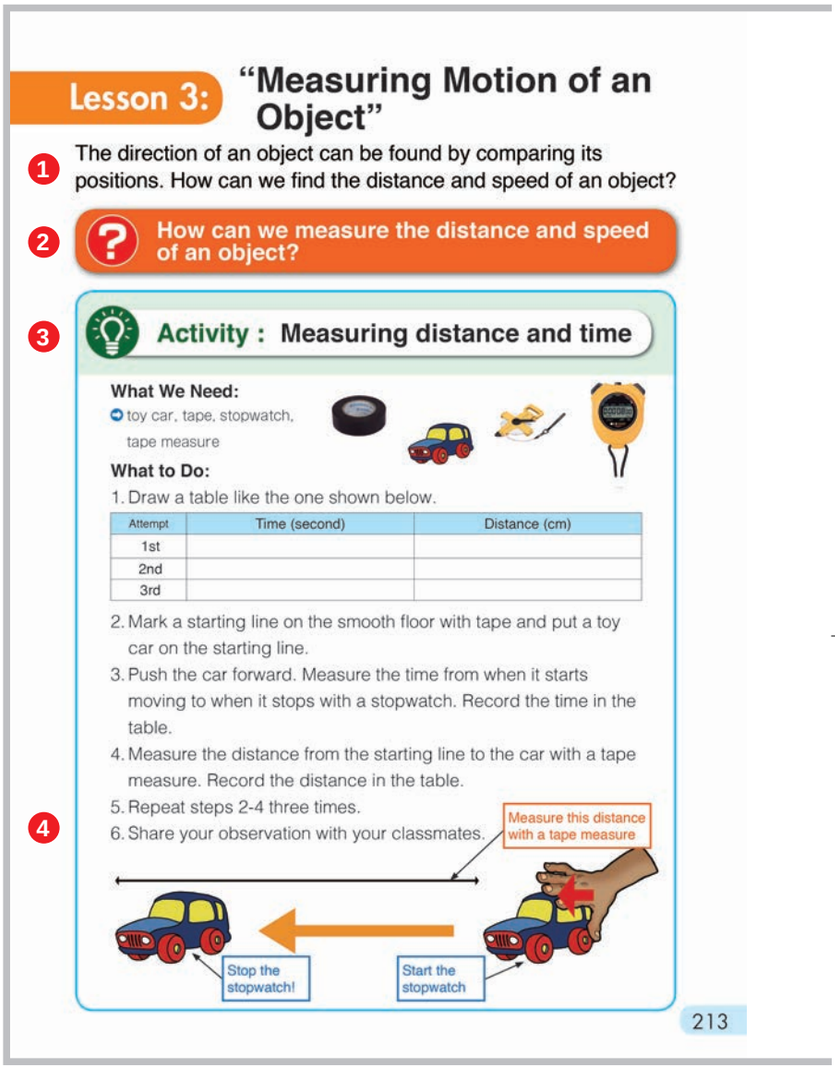
Q:How far and how fast do you think the ball moved?

2 Introduce the key question

How can we measure the distance and speed of an object?

3 Activity (20 min.)

- Arrange students into groups and explain the steps of the activity.
- Ask the students to draw the table.
- Mark a start line on the smooth floor with a tape for each group.
- Direct the students to measure the time and distance from the starting point when the car was pushed forward to when it stops using a measuring tape or 1m ruler.
- Allow students to do the activity and record the time and distance measured in the table.
- Repeat the same process three times.
- Allow enough time for students to do the activity by themselves.



Lesson 3: "Measuring Motion of an Object"

1 The direction of an object can be found by comparing its positions. How can we find the distance and speed of an object?

2 How can we measure the distance and speed of an object?

3 Activity : Measuring distance and time

What We Need:
toy car, tape, stopwatch, tape measure

What to Do:

1. Draw a table like the one shown below.

Attempt	Time (second)	Distance (cm)
1st		
2nd		
3rd		

2. Mark a starting line on the smooth floor with tape and put a toy car on the starting line.
3. Push the car forward. Measure the time from when it starts moving to when it stops with a stopwatch. Record the time in the table.
4. Measure the distance from the starting line to the car with a tape measure. Record the distance in the table.
5. Repeat steps 2-4 three times.
6. Share your observation with your classmates.

4

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Teacher's Notes

Activity tips

- Prior to this lesson the teacher must set up in some corner of the classroom:
  - Starting point with a masking tape.
  - Measuring the distance on the floor from the starting point to as far as 120 centimetre (cm) long.
- This will allow the students to get straight into the activity instead of wasting time setting up.
- The result will depend on the type of toy car and how it is pushed.
- All groups should have the same type of toy car.
- Make sure students start timing the distance from the time the car is pushed and stop the time when it stops moving. Try to get the distance within seconds.
- Each group may have different answers; they may use their answers to find the speed of each attempt and the average speed. The answers may vary but the core of the lessons is on how to calculate the motion of an object.
- Use 'stop watch' in a mobile phone to control timing if you don't have wall clocks in your classroom.

Note: If students answers end up with decimal numbers, always round off to the nearest whole number.

Lesson Objectives

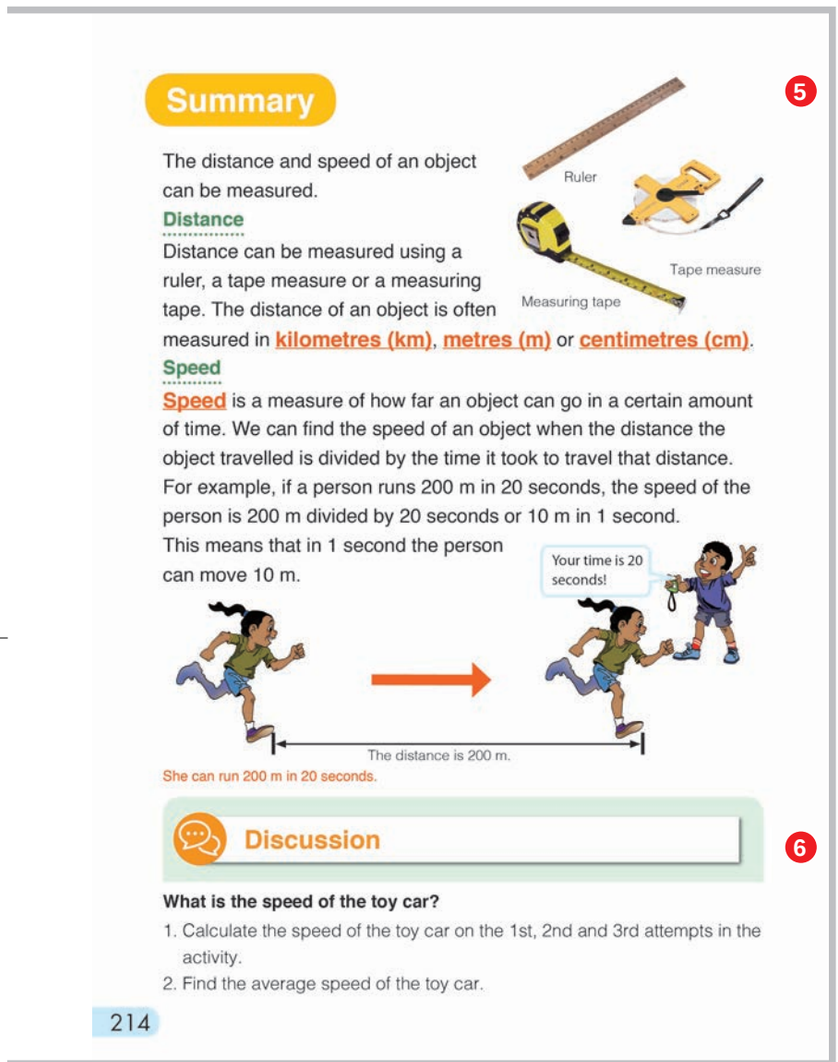
Students will be able to:

- Explain how the distance and speed of an object is measured.
- Measure the difference in time.
- Calculate the speed of an object.
- State the unit of a distance.

Assessment

Students are able to:

- Record the distance that a toy car travelled and the time that it took to travel that distance.
- State how to measure distance using correct units.
- Calculate the average speed of a toy car.
- Develop an attitude to describe daily motions using time and distance.



Summary

The distance and speed of an object can be measured.

Distance

Distance can be measured using a ruler, a tape measure or a measuring tape. The distance of an object is often measured in kilometres (km), metres (m) or centimetres (cm).

Ruler

Tape measure

Measuring tape

Speed

Speed is a measure of how far an object can go in a certain amount of time. We can find the speed of an object when the distance the object travelled is divided by the time it took to travel that distance. For example, if a person runs 200 m in 20 seconds, the speed of the person is 200 m divided by 20 seconds or 10 m in 1 second. This means that in 1 second the person can move 10 m.

Your time is 20 seconds!

The distance is 200 m.

She can run 200 m in 20 seconds.

Discussion

What is the speed of the toy car?

1. Calculate the speed of the toy car on the 1st, 2nd and 3rd attempts in the activity.
2. Find the average speed of the toy car.

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5

6

4 Discussion for findings (20 min.)

- Ask students to present their results.
- Write down students' results on the blackboard.
- **Based on their findings,** ask the following questions for discussion.

Q:How did you measure the distance of the toy car? (By using a measuring tape, tape measure and the ruler.)

Q:What unit is used to measure distance? (Metres (m) and centimetres (cm))

Q:How did you measure the time of the toy car? (By using a stopwatch)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: How can we measure distance?
  Q: What units are used to measure distance?
  Q: How can we measure the speed of an object?
- Ask students to copy the notes on the blackboard into their exercise books.

6 Further Discussion(10 min.)

- Explain how to calculate the average speed of an object.
- Ask students to calculate the average speed of a toy car based on the results.
- Confirm answers with students.

Sample Blackboard Plan

Title:

"Measuring Motion of an Object"

Key question

How can we measure the distance and speed of an object?

Activity

Measuring distance and time

Attempt	Time (second)	Distance (cm)
1st	It depends	It depends
2nd	It depends	It depends
3rd	It depends	It depends

Discussion

Q: How did you measure the distance of the toy car? By using a measuring tape, tape measure and ruler

Q: What unit is used to measure distance? Metres (m) and centimetres (cm)

Q: How did you measure the time of the toy car? By using a stopwatch

Summary

- Distance and speed of an object can be measured.
- Distance:
  - ➤ It can be measured by using ruler, tape measure, etc.
  - ➤ It can be measured in kilometres (km), metres (m), and centimetres (cm).
- Speed can be calculated as: "The distance the object travelled divided by the time it took to travel that distance

Further Discussion: (Example)

1st time: 100 cm ÷4 sec =25 cm in 1 sec
2nd time: 120 cm ÷6 sec =20 cm in 1 sec
3rd time: 110 cm ÷65sec =22 cm in 1 sec
Average speed = (25+20+22)÷3 =22.3cm in 1 sec

Lesson
4 / 13

Lesson Title

Summary and Exercise

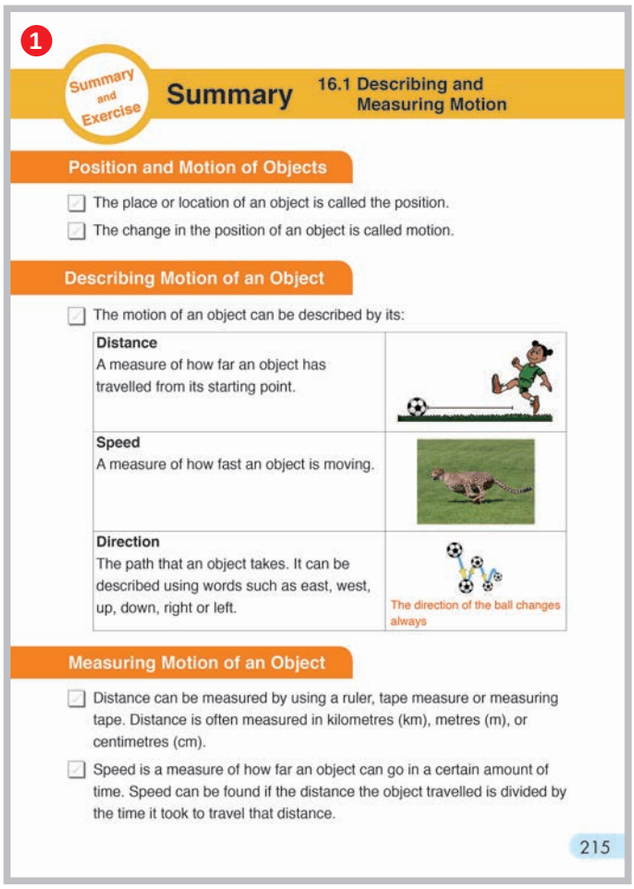
Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some questions to students and verify student understanding.

Q:What is motion?
Q:How can we describe motion of an object?
Q:How can we measure motion of an object?

- Explain and correct learning contents again if they still have misconceptions.
- Allow students to define the terms; distance, speed and direction.
- Ask students to explain how speed can be measured.



1

Summary and Exercise

Summary 16.1 Describing and Measuring Motion

Position and Motion of Objects

- The place or location of an object is called the position.
- The change in the position of an object is called motion.

Describing Motion of an Object

- The motion of an object can be described by its:

Distance A measure of how far an object has travelled from its starting point.	
Speed A measure of how fast an object is moving.	
Direction The path that an object takes. It can be described using words such as east, west, up, down, right or left.	 The direction of the ball changes always

Measuring Motion of an Object

- Distance can be measured by using a ruler, tape measure or measuring tape. Distance is often measured in kilometres (km), metres (m), or centimetres (cm).
- Speed is a measure of how far an object can go in a certain amount of time. Speed can be found if the distance the object travelled is divided by the time it took to travel that distance.

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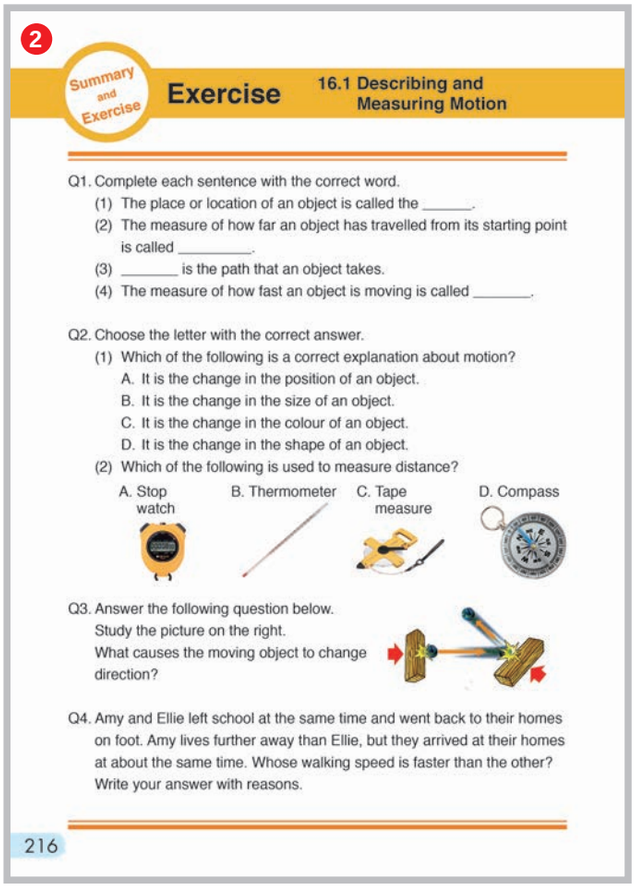
2 Exercise & Explanation (30 min.)

- Explain to students that they will have to answer all the questions in the exercise even if they are not completely sure of the answer(s).
- Tell students;
  - that if they come across a difficult question, they should skip it and move on to the next question.
  - not to spend too much time on the difficult question(s).
  - If they have some time at the end of the exercise, they can come back and try to answer the difficult question(s).
- Allow student to try answering questions individually with enough time in response to students understanding
- After the test, use student's answers and to answer the question.



2

Summary and Exercise

Exercise 16.1 Describing and Measuring Motion

Q1. Complete each sentence with the correct word.
(1) The place or location of an object is called the _____.
(2) The measure of how far an object has travelled from its starting point is called _____.
(3) _____ is the path that an object takes.
(4) The measure of how fast an object is moving is called _____.

Q2. Choose the letter with the correct answer.
(1) Which of the following is a correct explanation about motion?
A. It is the change in the position of an object.
B. It is the change in the size of an object.
C. It is the change in the colour of an object.
D. It is the change in the shape of an object.
(2) Which of the following is used to measure distance?
A. Stop watch B. Thermometer C. Tape measure D. Compass

Q3. Answer the following question below.
Study the picture on the right.
What causes the moving object to change direction?

Q4. Amy and Ellie left school at the same time and went back to their homes on foot. Amy lives further away than Ellie, but they arrived at their homes at about the same time. Whose walking speed is faster than the other? Write your answer with reasons.

216

Exercise answers

Q1.

(1) **position**

(2) **distance**

(3) **Direction**

(4) **Speed**

(1) The place or location of an object is called the position.

(2) Distance is a measure of how far an object has travelled from its starting point.

(3) The path that an object takes is its direction.

(4) Speed is the measure of how fast an object is moving.

Q2.

(1) **A**

Motion is the change in the position of an object.

(2) **C**

Distance can be measured using a ruler, tape measure and measuring tape.

Q3.

Force

Force affects how objects move. They may cause motion, they may also slow down, stop or change the direction of an object that is already moving.

Q4.

(Example of the answer)

Walking speed of Amy is faster than that of Ellie. Amy travelled longer distance than Elli, while their time to travel are same. It means Amy can walk faster than Ellie.

Unit	Chapter : **16. Force and Motion**	Total lesson No: 89 / 97
Force and Motion	Topic : **16.2. Machine and Its Work**	Textbook page: 217 - 218

Lesson 5 / 13

Lesson Title

Six Simple Machines

Preparation

- Pictures that shows simple machines

Lesson Flow

1 Introduction (10 min.)

- Let students recall Gr 3 lesson on 'What is a Simple Machine?' by asking;

Q:What is a simple machine?

Q: What kinds of simple machines do you know?

- Encourage students to think about different types of simple machines by asking questions:

Q:How can we classify simple machines?

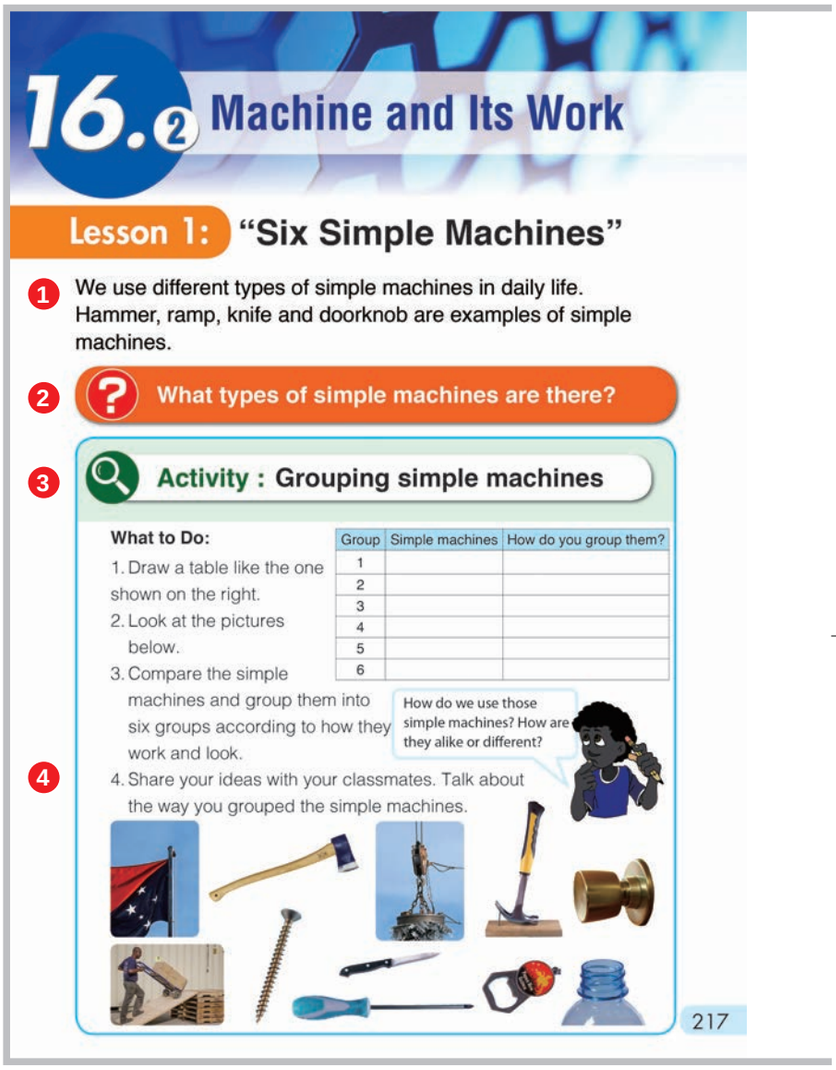
Q:What other kinds of simple machines are there?

2 Introduce the key question

What types of simple machines are there?

3 Activity (20 min.)

- Arrange students into groups.
- Explain the steps of the activity.
- Ask students to make a table in their exercise books.
- Instruct students to pay more attention to how simple machines work and how they are classified.
- Give enough time for their investigations.
- Ask students to discuss their findings in their group.



16.2 Machine and Its Work

Lesson 1: "Six Simple Machines"

1 We use different types of simple machines in daily life. Hammer, ramp, knife and doorknob are examples of simple machines.

2 What types of simple machines are there?

3 Activity : Grouping simple machines

What to Do:

1. Draw a table like the one shown on the right.
2. Look at the pictures below.
3. Compare the simple machines and group them into six groups according to how they work and look.
4. Share your ideas with your classmates. Talk about the way you grouped the simple machines.

Group	Simple machines	How do you group them?
1		
2		
3		
4		
5		
6		

How do we use those simple machines? How are they alike or different?

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Teacher's Notes

There are six types of simple machines.

1. Pulley- A pulley is a simple machine that uses grooved wheels and a rope to raise, lower or move a load.
2. Lever- A lever is a stiff bar that rests on a support called a fulcrum which lifts or moves loads.
3. Inclined plane- An inclined plane is a slanting surface connecting a lower level to a higher level.
4. Wedge- A wedge is an object with at least one slanting side ending in a sharp edge, which cuts materials apart.
5. Wheel and Axle- A wheel with a rod, called an axle, through its centre lifts or moves loads.
6. Screw- A screw is an inclined plane wrapped around a pole which holds things together or lifts materials

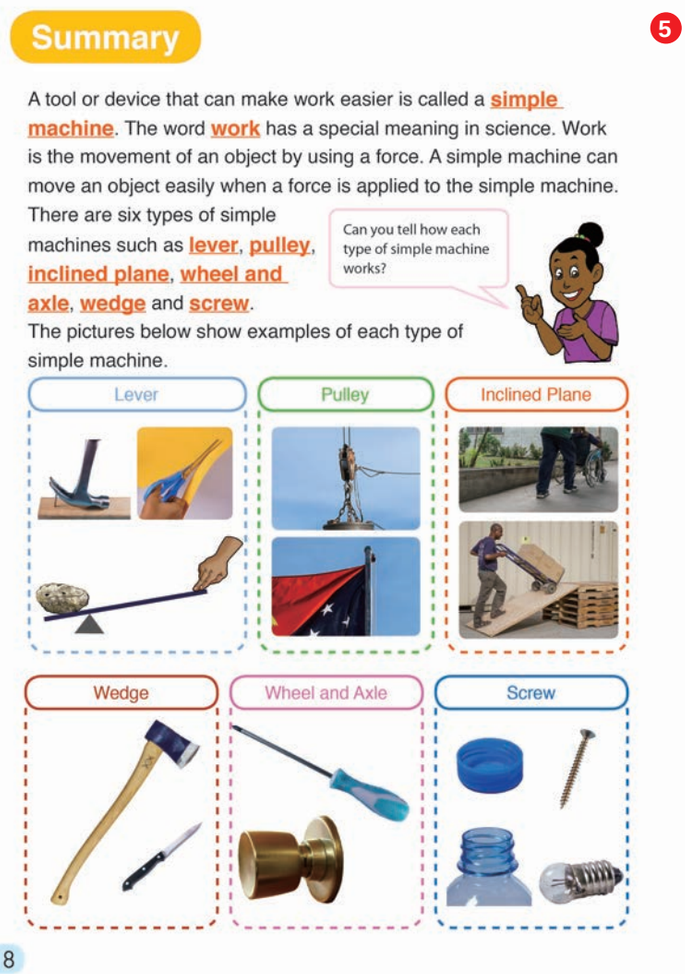
- Basic contents of the three simple machines below were taught in Grade 3.
  - Inclined plane
  - Levers
  - Pulleys

Lesson Objectives

Students will be able to:
- Identify the different types of simple machines.
- Classify the simple machines into six groups.
- Define a simple machine.
- Explain work.

Assessment

Students are able to:
- Name the six types of simple machines.
- Give some examples of the six types of simple machines.
- Explain what a simple machine is.
- State how the meaning of work in science is different from that used in daily life.
- Appreciate the ideas from classmates.


Summary

A tool or device that can make work easier is called a **simple machine**. The word **work** has a special meaning in science. Work is the movement of an object by using a force. A simple machine can move an object easily when a force is applied to the simple machine. There are six types of simple machines such as **lever**, **pulley**, **inclined plane**, **wheel and axle**, **wedge** and **screw**.

Can you tell how each type of simple machine works?

The pictures below show examples of each type of simple machine.

Lever

Pulley

Inclined Plane

Wedge

Wheel and Axle

Screw

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4 Discussion for findings (20 min.)

- Ask students to present their findings on grouping simple machines.
- Write down students' findings on the blackboard.
- Confirm the findings with students.
- **Based on their findings,** ask the following questions.

Q:How did you classify the simple machines into 6 groups? (Simple machines are grouped according to how they work and look.)

Q:What characteristics does each group have? (It depends on students' answers)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What are the six types of simple machines?
  Q: How can we classify simple machines?
  Q: What is a simple machine?
  Q: What is the meaning of 'Work' in science?
  Q: What are some examples of each type of simple machines?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Six Simple Machines"

Key question

What types of simple machines are there?

Activity: Grouping simple machines

Simple machines	How do you goup them?
Hammer, bottle opener	
Flag, crane	It depends on
Ramp	students'
Axe, knife	answers
Screw driver, door knob	
Screw, container with lid	

Discussion

Q: How did you classify the simple machines into 6 groups?

Simple machines are grouped according to how they work and look.

Q: What characteristics does each group have?

(It depends on students' answers)

Summary

- A simple machine is a tool or device that can make work easier.
- Work is the movement of an object by a force.
- There are six types of simple machines.
  1. Lever- e.g. hammer, bottle opener
  2. Pulley- e.g. flag pole, well
  3. Inclined plane- e.g. ramp, slide, stairs
  4. Wedge- e.g. knife, axe
  5. Wheel and Axle- e.g. screw driver, tap, door knob
  6. Screw- e.g. screw, lid

Unit	Chapter : **16. Force and Motion**	Total lesson No: 90 / 97
Force and Motion	Topic : **16.2. Machine and Its Work**	Textbook page: 219 - 220

Lesson 6 / 13

Lesson Title

Lever

Preparation

- Claw hammer
- 3-inch Nails and Wooden board.

Lesson Flow

1 Introduction (5 min.)

- Review the previous lesson by asking.

Q:What are the six types of simple machines?

- Encourage students to think about a lever by asking questions:

Q:How does a lever work?

2 Introduce the key question

How does a lever make work easier?

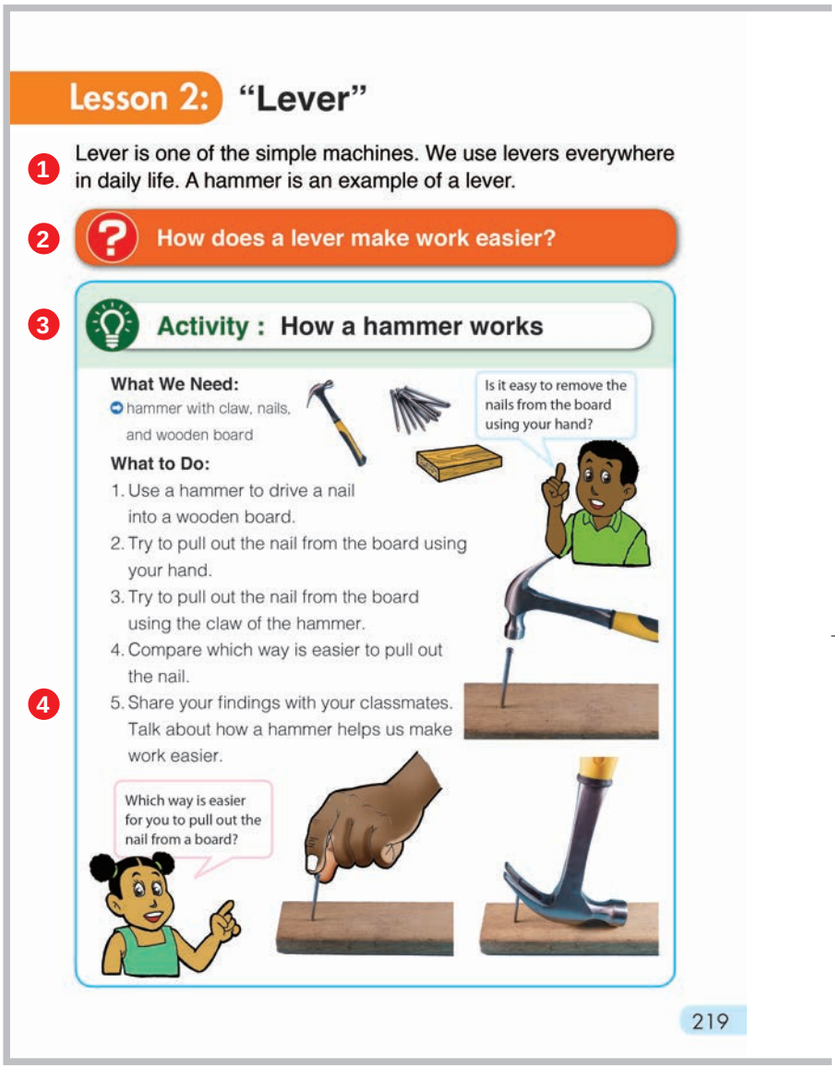
3 Activity (25 min.)

- Arrange students into groups.
- Remind the students of the safety rules for using a hammer.
- Explain the steps of the activity.
- Have the students hammer about $\frac{1}{3}$ of the nail into the wood.
- Ask the students to firstly try to remove the nail with their hands.
- Ask students to use the hammer to remove the nail.
- Have students record their findings in their exercise book.
- Let students think about how a hammer makes work easier in their group.

4 Discussion for findings (20 min.)

- Ask students to present their findings about which way is easier to remove a nail in their activity.

(Continue)



Lesson 2: "Lever"

1 Lever is one of the simple machines. We use levers everywhere in daily life. A hammer is an example of a lever.

2 How does a lever make work easier?

3 Activity : How a hammer works

What We Need:
hammer with claw, nails, and wooden board

What to Do:
1. Use a hammer to drive a nail into a wooden board.
2. Try to pull out the nail from the board using your hand.
3. Try to pull out the nail from the board using the claw of the hammer.
4. Compare which way is easier to pull out the nail.
5. Share your findings with your classmates. Talk about how a hammer helps us make work easier.

4

Is it easy to remove the nails from the board using your hand?

Which way is easier for you to pull out the nail from a board?

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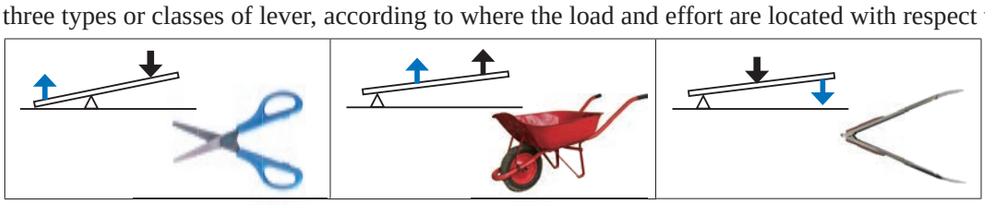
Teacher's Notes

Safety rules:

1. Try not to pull the nail too hard using your fingers or bare hands because it might cause injury.
2. Be careful when handling the hammer.

Description of were to find the fulcrum and arm on a lever.

- Fulcrum is a pivot point or point of support on which a lever turns in raising or moving something.
- The arm (effort) is the handle or bar, it's the part that you push or pull on.
- There are three types or classes of lever, according to where the load and effort are located with respect to the fulcrum.

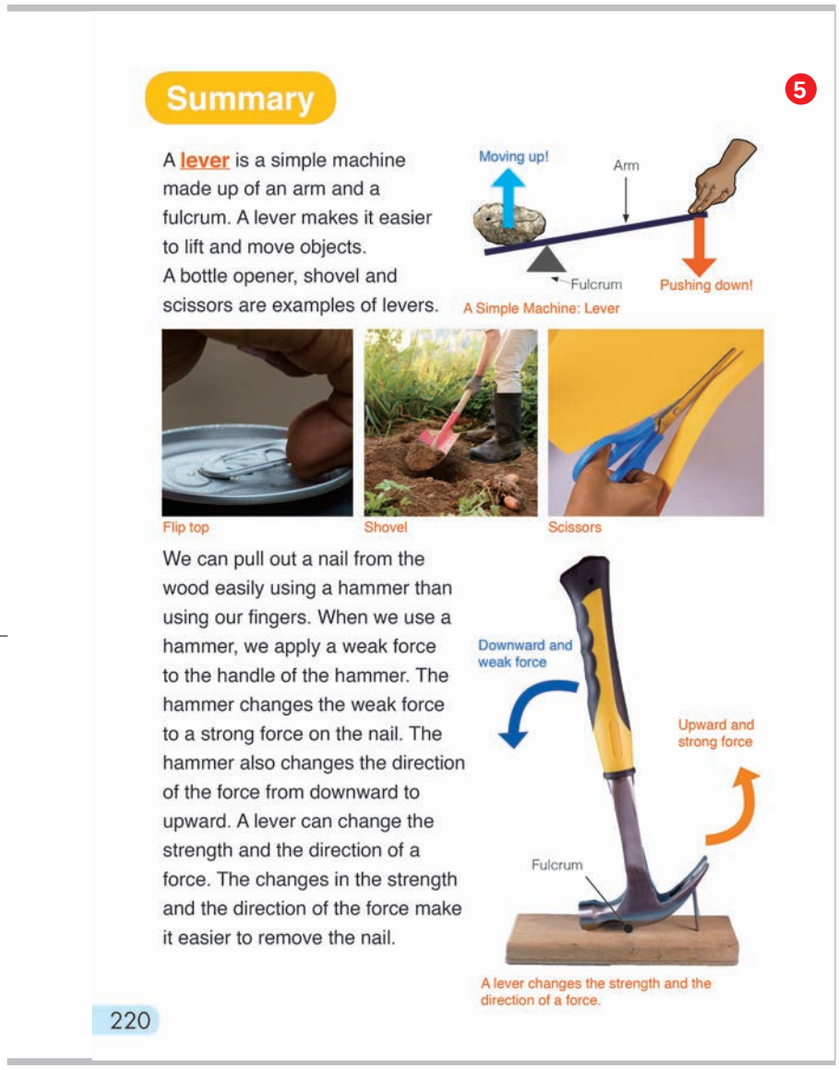


Lesson Objectives

Students will be able to:
- Define a lever.
- Describe how a lever works.
- Identify levers from different simple machines.

Assessment

Students are able to:
- State how a lever is structured and how it helps make work easier.
- Explain how a lever changes the amount and the direction of the force.
- Give some examples of levers used in daily life.



Summary

5

A lever is a simple machine made up of an arm and a fulcrum. A lever makes it easier to lift and move objects. A bottle opener, shovel and scissors are examples of levers.

A Simple Machine: Lever

Flip top | Shovel | Scissors

We can pull out a nail from the wood easily using a hammer than using our fingers. When we use a hammer, we apply a weak force to the handle of the hammer. The hammer changes the weak force to a strong force on the nail. The hammer also changes the direction of the force from downward to upward. A lever can change the strength and the direction of a force. The changes in the strength and the direction of the force make it easier to remove the nail.

A lever changes the strength and the direction of a force.

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- Students present their findings about removing a nail with their hand and by using a hammer in the activity.
- Confirm the findings with students.
- **Based on their findings,** ask the following questions.

Q:Which way needs more or less force to remove the nail? (By using hand need more force. By using a hammer needs less force.)

Q:How does the hammer change the amount of force which is applied by hand? (From weak to strong force)

Q:How does a hammer change the direction of the force which is applied by hand? (From downward to upward)

Q: Can you give some examples of other levers that people use every day? (Bottle opener, shovel, scissors, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is a lever?
  Q: How does a lever work?
  Q: What are some examples of levers that people use every day?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Lever"
Key question
How does a lever make work easier?
Activity
How a hammer works
Observation:
Which way is easy to pull out a nail from a board?
1.Using hands- hard to remove
2.Using hammer- easy to remove

Discussion
Q: Which way needs more or less forces?
- Using hands need more force
- Using hammer needs less force.

Q: How does a hammer change the amount of the force which is applied by hand?
From weak force to strong force
Q: How does a hammer change the direction of the force which is applied by hand? From downward to upward, etc
Q: Give examples of other levers people use every.
- Shovel, Bottle opener, Scissors, seesaw, etc

Summary
- A lever is a simple machine made up of an arm and a fulcrum.
- A lever makes it easier to lift and move objects.
- A lever changes:
  ➤ The strength of force: from weak to strong force.
  ➤ The direction of a force:
- Examples of levers are:
  - Bottle opener,
  - Shovel
  - Scissor
  - Hammer, etc

Unit	Chapter : **16. Force and Motion**	Total lesson No: 91 / 97
Force and Motion	Topic : **16.2. Machine and Its Work**	Textbook page: 221 - 222

Lesson 7 / 13

Lesson Title

Inclined Plane

Preparation

- String, flat board, book
- tape measure(1m ruler), bench (table)

Lesson Flow

1 Introduction (5 min.)

- Revise the previous lesson by asking:

Q:What is a lever?

Q:How does a lever work?

- Encourage students to think about an inclined plane by asking questions:

Q:How can an inclined plane work?

2 Introduce the key question

How does an inclined plane make work easier?

3 Activity (30 min.)

- Prior to this activity teacher should set up the activity for the students.
- The smooth surface of a flat board should be prepared.
- Arrange students into groups.
- Explain the steps of the activity.
- Have students do the activity and record their results in the table.
- Let students compare which way needed more or less force and think about how an inclined plane make work easier.

4 Discussion for findings (20 min.)

- Ask students to present the results from their activity.
- Write down students' findings on the blackboard.

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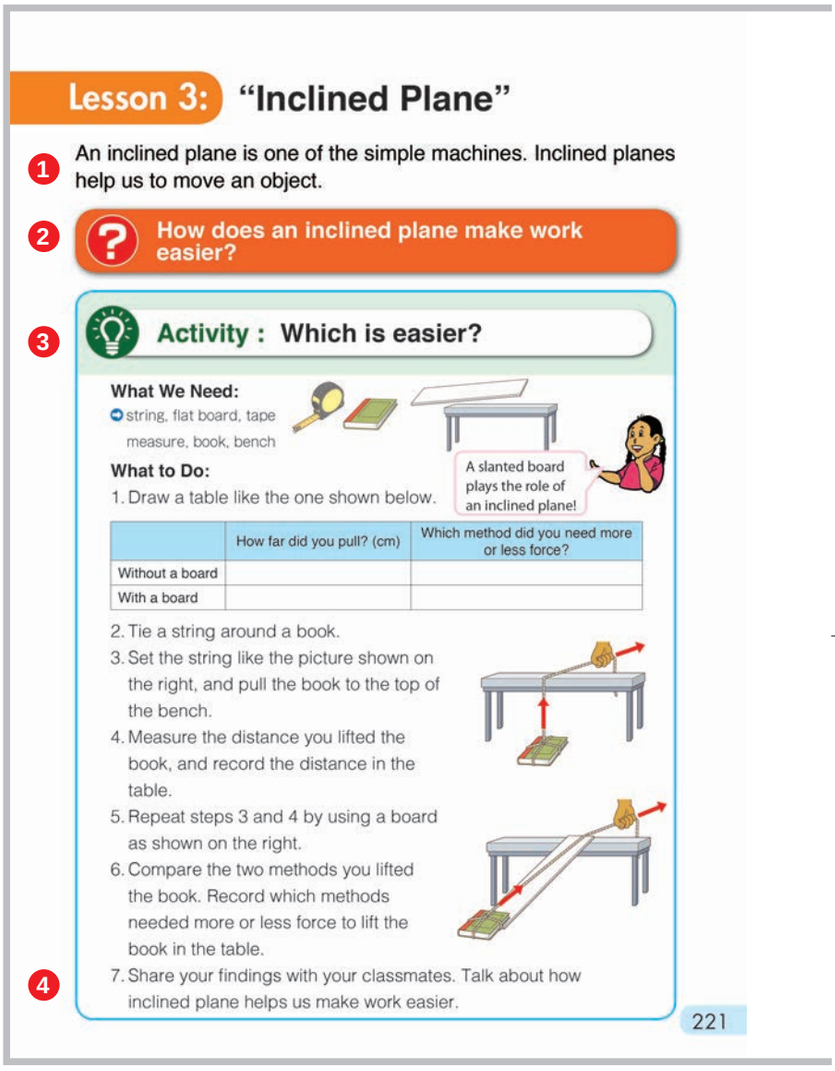

Lesson 3: "Inclined Plane"

1 An inclined plane is one of the simple machines. Inclined planes help us to move an object.

2 How does an inclined plane make work easier?

3 Activity : Which is easier?

What We Need:
string, flat board, tape measure, book, bench

What to Do:
1. Draw a table like the one shown below.

A slanted board plays the role of an inclined plane!

	How far did you pull? (cm)	Which method did you need more or less force?
Without a board		
With a board		

2. Tie a string around a book.
3. Set the string like the picture shown on the right, and pull the book to the top of the bench.
4. Measure the distance you lifted the book, and record the distance in the table.
5. Repeat steps 3 and 4 by using a board as shown on the right.
6. Compare the two methods you lifted the book. Record which methods needed more or less force to lift the book in the table.
7. Share your findings with your classmates. Talk about how inclined plane helps us make work easier.

4

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Teacher's Notes

Optional material to use for the activity:

- a bag of soil, sand or a litre of water
- plank should be more than 1.5m
- Size of rope should be 3-10mm thick.

Background information:

- An inclined plane, also known as ramp, is a flat supporting surface tilted at an angle, with one end higher than the other, used as an aid for raising or lowering a load.
- An inclined plane is one of the basic machines. It reduces the force necessary to move a load a certain distance up by providing a path for the load to move at a low angle to the ground. This lessens the needed force but increases the distance involved, so that the amount of work stays the same.
- An inclined plane is a simple machine with no moving parts. It makes it easier for us to move objects to higher or lower surface, than if we lift the objects directly upwards.

Lesson Objectives

Students will be able to:
- Define an inclined plane.
- Describe how an inclined plane works.
- Measure the distances of the object moved with the board and without the board.

Assessment

Students are able to:
- State how an inclined plane is structured and how it makes work easier.
- Explain the relationship between the amount of force applied to an object and the distance that the object moves.
- Record the measurement of the distance with and without a board.

Result

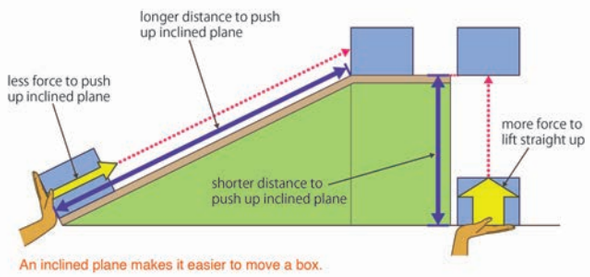
Without a board, we used more force but we moved the book a shorter distance. When we pulled the book up the slanted board or inclined plane, we used less force and the book was moved a longer distance.

	How far did you pull? (cm)	Which method did you need more or less force?
Without a board	e.g. 60 cm	e.g. More force without a board
With a board	e.g. 120 cm	e.g. Less force with a board

Summary

Inclined Plane

An inclined plane is a simple machine made up of a slanted surface. An inclined plane decreases the force and increases the distance to move an object to a higher position. When a heavy object is lifted straight up to a higher position, we use a stronger force but we move the object a shorter distance. By pushing the object up an inclined plane to a higher position, we need less force but the object must be moved over a longer distance. Ladders, stairs and a wheelchair ramp are examples of an inclined plane.



An inclined plane makes it easier to move a box.

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- Confirm the findings with students.
- **Based on their findings,** ask the questions.

Q:Which way did you need more or less force to lift a book? (Without the board we needed more force. With the board we need less force.)

Q:Which way did you pull a book longer or shorter distance? (Without the board, the distance we pulled was shorter. With the board, the distance we pulled was longer.)

Q:What relationship do you find between the force we need and the distance to pull a book when we use an inclined plane? (We need less force but we must pull a book a longer distance.)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is an inclined plane?
  Q: How does an inclined plane work?
  Q: What are some examples of inclined planes that people use every day?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Black board Plan

Title:

"Inclined Plane"

Key question

How does an inclined plane make work easier?

Activity: Which is easier?

	How far did you pull? (cm)	Which way did you need more or less force?
Without a board	e.g. 60cm	More force needed
With a board	e.g. 150cm	Less force need

Discussion

Q: Which way did you need more or less force to lift a book? Without the board we need more force. With the board we need less force.

Q: Which way did you pull a book longer or shorter? Without the board, the distance we pulled was shorter. With the board, the distance we pulled was longer.

Q: What relationship do you find between the force we need and the distance to pull a book when we use an inclined plane? We need less force but we must pull a book a longer distance.

Summary

- An inclined plane is a simple machine made of a slant surface.
- An inclined plane decreases a force and increases the distance to move an object to a higher position.
- Examples of Inclined Planes:
  ➲ Ramp, slide, ladder, stairs, etc

Unit	Chapter : **16. Force and Motion**	Total lesson No: 92 / 97
Force and Motion	Topic : **16.2. Machine and Its Work**	Textbook page: 223 - 224

Lesson 8 / 13

Lesson Title

Pulleys

Preparation

- Two pulleys, a bottle of water, tape measure
- 3 metre string (rope)

Lesson Flow

1 Introduction (5 min.)

- Review the previous lesson by asking:

Q:How does an inclined plane work?

- Encourage students to recall a pulley by asking questions:

Q:When we sing the National anthem, how do we raise the flag?

Q:What makes it easy to pull the rope?

2 Introduce the key question

How does a pulley make work easier?

3 Activity (30 min.)

- Prior to this activity, a pulley should be attached firmly to a higher place. For a movable pulley, one end of the rope should be attached firmly to a higher place.
- Arrange students into groups.
- Explain the steps of the activity.
- Have students do the activity and record the results in the table.
- Let students compare which way needed more or less force and think about how a pulley helps make us work easier.

4 Discussion for findings (20 min.)

- Ask students to present their results from their activity.
- Write down students' findings on the blackboard.

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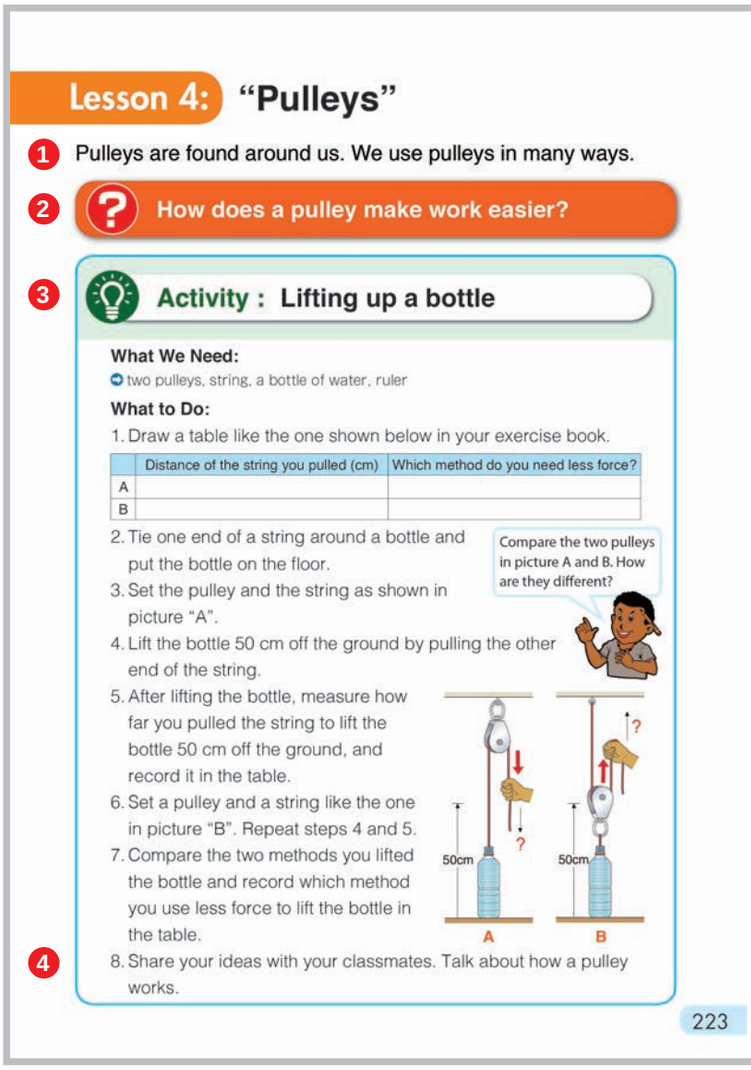

Lesson 4: "Pulleys"

1 Pulleys are found around us. We use pulleys in many ways.

2 How does a pulley make work easier?

3 Activity : Lifting up a bottle

What We Need:

two pulleys, string, a bottle of water, ruler

What to Do:

1. Draw a table like the one shown below in your exercise book.

	Distance of the string you pulled (cm)	Which method do you need less force?
A		
B		

2. Tie one end of a string around a bottle and put the bottle on the floor.
3. Set the pulley and the string as shown in picture "A".
4. Lift the bottle 50 cm off the ground by pulling the other end of the string.
5. After lifting the bottle, measure how far you pulled the string to lift the bottle 50 cm off the ground, and record it in the table.
6. Set a pulley and a string like the one in picture "B". Repeat steps 4 and 5.
7. Compare the two methods you lifted the bottle and record which method you use less force to lift the bottle in the table.

Compare the two pulleys in picture A and B. How are they different?

50cm 50cm

A B

4 8. Share your ideas with your classmates. Talk about how a pulley works.

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Teacher's Notes

- Pulley can be used in two different ways - refer to textbook.

Fixed Pulley

A fixed pulley is one in which the drum is secured to a single spot. While the force required to lift or move an object is no different than if you were lifting it by hand, the fixed pulley allows you to change the direction of the force needed. For example, when attached to a bucket pulling water from a well, a fixed pulley allows you to pull laterally to raise the bucket in a more convenient manner.

Movable Pulley

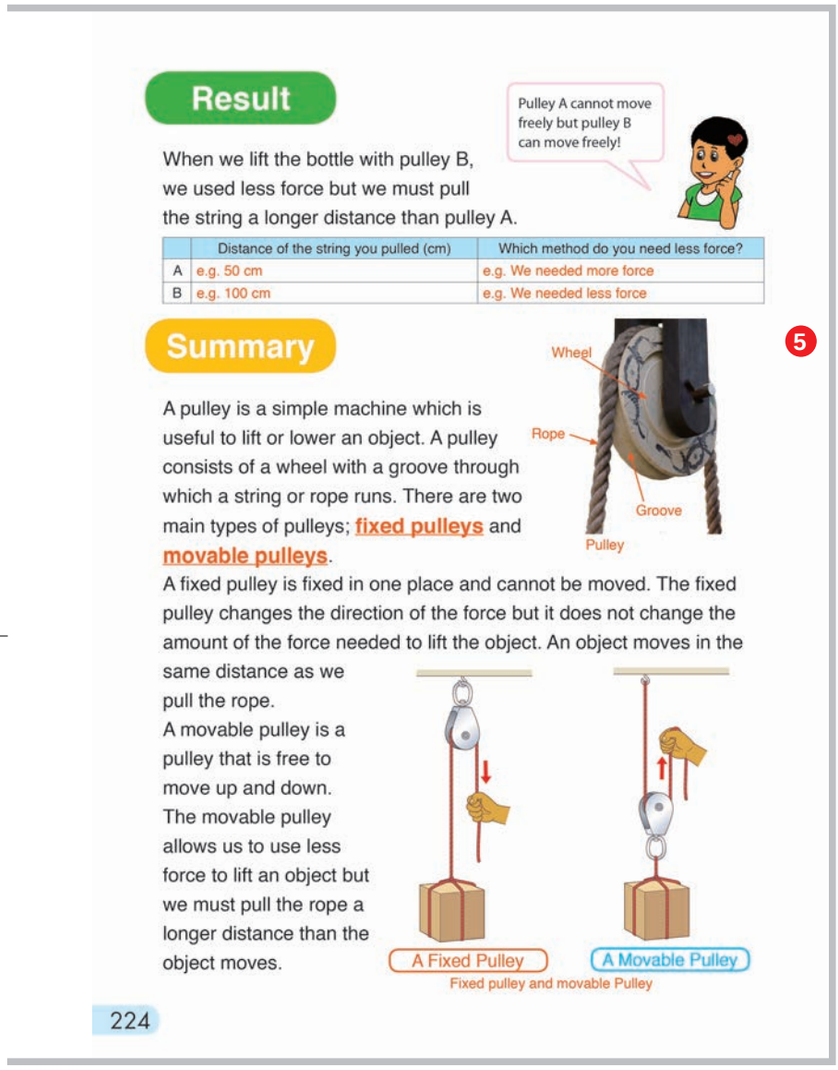
Movable pulleys can help you lift heavier things. A movable pulley is one in which drum moves as you are moving the load. If you were hauling a heavy hay bale up into the loft of a barn, for example, a movable pulley would make the load feel much lighter, although the length we must pull the rope is longer distance than object moves.

Lesson Objectives

Students will be able to:
- Define a pulley.
- Identify how two types of pulleys work.
- Compare the differences and the similarities between fixed and movable pulley.

Assessment

Students are able to:
- State how a pulley is structured and how it helps make work easier.
- Explain the relationship between an amount of force applied and a distance that the object moves when a fixed and a movable pulley is used.
- Describe how a fixed and movable pulley is similar and different.



Result

When we lift the bottle with pulley B, we used less force but we must pull the string a longer distance than pulley A.

Pulley A cannot move freely but pulley B can move freely!

	Distance of the string you pulled (cm)	Which method do you need less force?
A	e.g. 50 cm	e.g. We needed more force
B	e.g. 100 cm	e.g. We needed less force

Summary

A pulley is a simple machine which is useful to lift or lower an object. A pulley consists of a wheel with a groove through which a string or rope runs. There are two main types of pulleys; **fixed pulleys** and **movable pulleys**.

Wheel, Rope, Groove, Pulley

A fixed pulley is fixed in one place and cannot be moved. The fixed pulley changes the direction of the force but it does not change the amount of the force needed to lift the object. An object moves in the same distance as we pull the rope.

A movable pulley is a pulley that is free to move up and down. The movable pulley allows us to use less force to lift an object but we must pull the rope a longer distance than the object moves.

A Fixed Pulley, A Movable Pulley

Fixed pulley and movable Pulley

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- Confirm the findings with students.
- **Based on their findings,** ask the questions.

Q:Which way did you need more or less force to lift a bottle? (We need more force with pulley A. We need less force with pulley B.)

Q:Which way did you pull a bottle longer or shorter? (With pulley A we pulled shorter. With pulley B we pulled longer.)

Q:What characteristics did you find about pulley A and B? (Pulley A: It cannot move, the bottle moves to the opposite direction of pulling, we need more force to pull, etc. Pulley B: It can move freely, the bottle moves to the same direction of pulling, we need less force to pull, etc.)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is a pulley?
  Q: What kinds of pulley are there?
  Q: How does a fixed pulley work?
  Q: How does a movable pulley work?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Pulleys"

Key question

How does a pulley make work easier?

Activity

Lifting up a bottle

	Distance of the string you pulled	Which way do you need less force?
A	50 cm	Pulley B needs less force
B	100cm	

Discussion

Q: Which way did you need more or less force to lift a bottle? We need more force with pulley A. We need less force with pulley B.

Q: Which way did you pull a bottle longer or shorter? With pulley A we pulled shorter. With pulley B we pulled longer.

Q: What characteristics did you find about pulley A and B? Pulley A: It cannot move, the bottle moves to the opposite direction of pulling, we need more force to pull, etc. Pulley B: It can move freely, the bottle moves to the same direction of pulling, we need less force to pull, etc.

Summary

- There are two main types of pulley:

1.Fixed pulleys:
It cannot be moved.
It changes the direction of the force.
The amount of force doesn't change.
An object moves as same distance as we pull a rope.

2.Movable pulleys
It moves up and down freely.
It needs less force to lift an object.
We must pull a rope a longer distance than the object moves.

Unit	Chapter : **16. Force and Motion**	Total lesson No: 93 / 97
Force and Motion	Topic : **16.2. Machine and Its Work**	Textbook page: 225 - 226

Lesson 9 / 13

Lesson Title

Wheel and Axle

Preparation

- Two chairs, handled broom, string, bucket with a handle, stones

Lesson Flow

1 Introduction (5 min.)

- Review the previous lesson by asking:

Q:What is a pulley?

Q:What kinds of pulley are there?

- Encourage students to think about a wheel and axle by asking questions:

Q:Do you know a wheel and axle?

Q:How can a wheel and axle make our work easier?

2 Introduce the key question

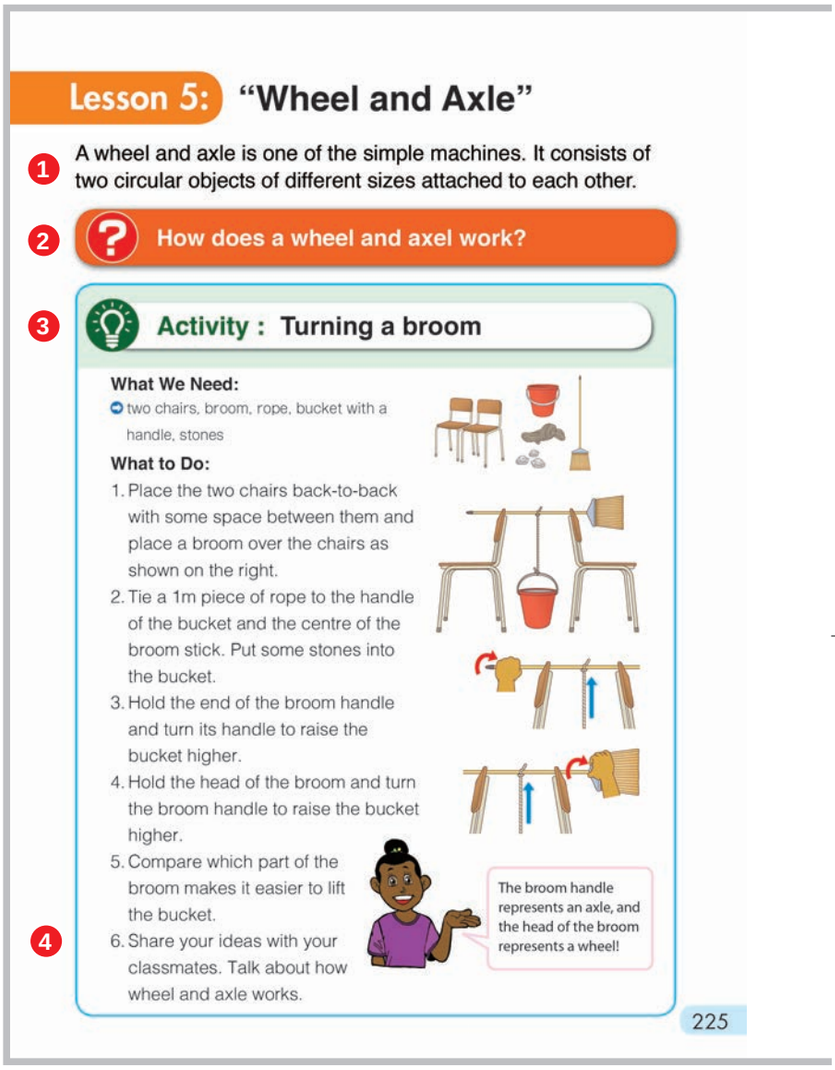
How does a wheel and axle work?

3 Activity (30 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Tie a broom and a bucket with a string and set up the activity. The broom represents a wheel and axle.
- Have students do the activity step by step and ask them to record their results in the table.
- Encourage students to compare which way is easier to lift the bucket and ask them to record their results.
- Ask students to discuss how a wheel and axle works in a group

4 Discussion for findings (20 min.)

- Ask students to present the results from their activity. **(Continue)**



Lesson 5: "Wheel and Axle"

1 A wheel and axle is one of the simple machines. It consists of two circular objects of different sizes attached to each other.

2 How does a wheel and axel work?

3 Activity : Turning a broom

What We Need:

two chairs, broom, rope, bucket with a handle, stones

What to Do:

1. Place the two chairs back-to-back with some space between them and place a broom over the chairs as shown on the right.
2. Tie a 1m piece of rope to the handle of the bucket and the centre of the broom stick. Put some stones into the bucket.
3. Hold the end of the broom handle and turn its handle to raise the bucket higher.
4. Hold the head of the broom and turn the broom handle to raise the bucket higher.
5. Compare which part of the broom makes it easier to lift the bucket.
6. Share your ideas with your classmates. Talk about how wheel and axle works.

4

The broom handle represents an axle, and the head of the broom represents a wheel!

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Teacher's Notes

Things to consider prior to this lesson

1. Make sure the chairs are the same type.
2. The rope must not be soft or it might break easily.
3. If there is no broom like the one in the textbook, you can use a rake or something similar.
4. Try not to use a very big bucket but a reasonable size.
5. Use enough stones just to give enough weight.
6. Make sure to tie the rope to the centre of the broom.

Background information

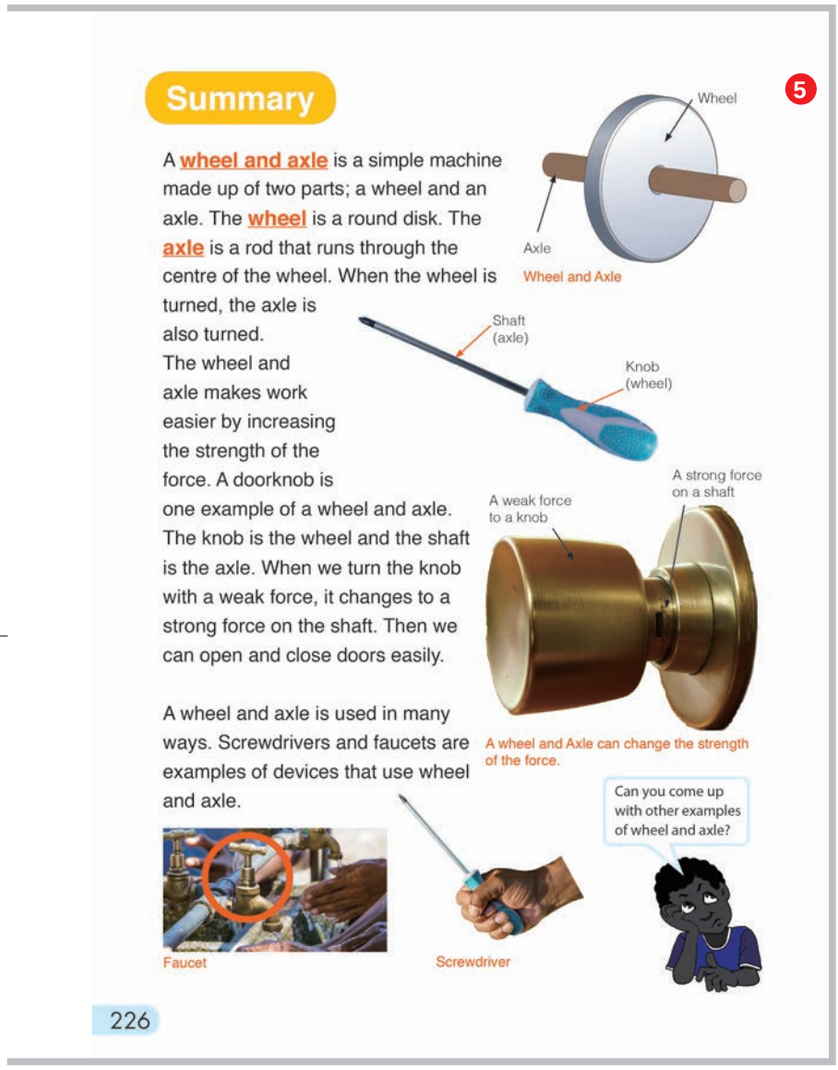
- The wheel and axle consists of a wheel attached to a smaller axle so that these two parts rotate together in which a force is transferred from one to another. A major application is in vehicles, in which the wheel and axle is used to reduce friction of the moving vehicle with the ground.

Lesson Objectives

Students will be able to:
- Define a wheel and axle.
- Observe how a wheel and axle works.

Assessment

Students are able to:
- State how a wheel and axle is structured and how it makes work easier.
- Explain how a wheel and axle changes an amount of force.
- Give some examples of a wheel and axle in daily life.
- Relate the usefulness of a wheel and axle to the daily use.



Summary

5

A **wheel and axle** is a simple machine made up of two parts; a wheel and an axle. The **wheel** is a round disk. The **axle** is a rod that runs through the centre of the wheel. When the wheel is turned, the axle is also turned. The wheel and axle makes work easier by increasing the strength of the force. A doorknob is one example of a wheel and axle. The knob is the wheel and the shaft is the axle. When we turn the knob with a weak force, it changes to a strong force on the shaft. Then we can open and close doors easily.

Wheel
Axle
Wheel and Axle

Shaft (axle)
Knob (wheel)

A weak force to a knob
A strong force on a shaft
A wheel and Axle can change the strength of the force.

A wheel and axle is used in many ways. Screwdrivers and faucets are examples of devices that use wheel and axle.

Faucet
Screwdriver

Can you come up with other examples of wheel and axle?

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- Write down students' results on the blackboard.
- Confirm their findings with students.
- **Based on their findings,** ask the questions.

Q:Which way did you lift a bucket more easily? (When turning the head of the broom)

Q:What is different between the head and the end of a broom when you compare their size? (The head of a broom is bigger than the end of a broom.)

Q:The head of a broom represents a wheel and the end of a broom represents an axle. Can you guess how a wheel and axle works? (When we turn the wheel with a weak force, we can turn an axle easily, etc)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is a wheel and axle?
  Q: How does a wheel and axle work?
  Q: What are some examples of a wheel and axle that we use every day?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Wheel and Axle"

Key question
How does a wheel and axle make work?

Activity
Turning a broom

✧ Let's compare which way makes it easier to lift the bucket.
- End of the broom handle- hard to lift
- Head of the broom- easy to lift

Discussion
Q: Which way did you lift a bucket more easily?
When turning the head of the broom.
Q: What is different between the head and the end of a broom when you compare their size?
The head of a broom is bigger than the end of a broom.
Q: The head of a broom represents a wheel and the end of a broom represents an axle. Can you guess how a wheel and axle works?
When we turn the wheel with a weak force, we can turn an axle easily, etc

Summary
- A wheel and axle is a simple machine made up of two parts:
  ➤ Wheel- a round or circular part
  ➤ Axle- rod that runs through the centre of the wheel.
- When a wheel is turned, an axle is also turned.
- The wheel and axle makes work easier by increasing the strength of the force by turning.
- Examples of a wheel and axle:
  door knobs, screwdrivers, faucets, etc.

Unit	Chapter : **16. Force and Motion**	Total lesson No: 94 / 97
Force and Motion	Topic : **16.2. Machine and Its Work**	Textbook page: 227 - 228

Lesson 10 / 13

Lesson Title

Wedge

Preparation

- Rectangular block, clay

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:What is a wheel and axle?

Q:How does a wheel and axle work?

- Make a simple explanation of a wedge by showing a knife and ask:

Q:How does a wedge work?

2 Introduce the key question

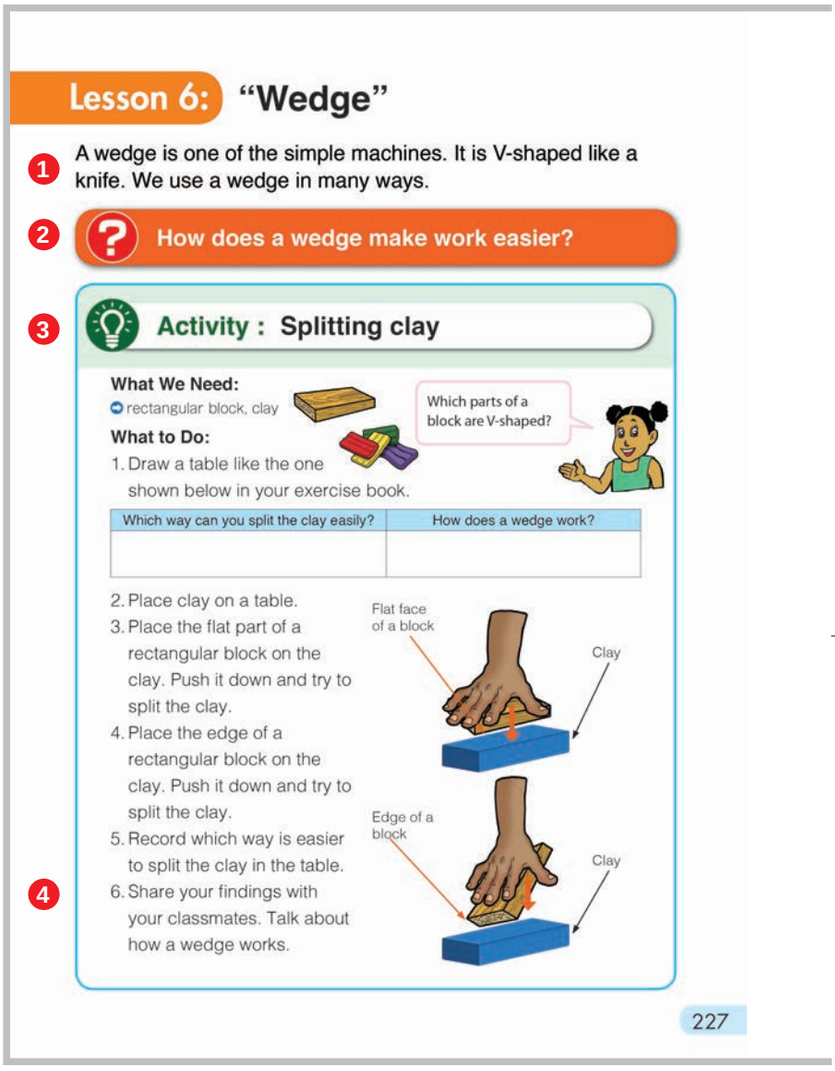
How does a wedge make work easier?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Provide block and clay to each group.
- Let the students try to spit the clay by pushing down the flat face of the block then repeat the same process with the edge of a block.
- Ask students to record which way was easier to split the clay.
- Let students think about how a wedge works and record their ideas in the table.
- Ask students to discuss their ideas in a group.

4 Discussion for findings (20 min.)

- Ask students to present the results from their activity.
- Write down students' results on the blackboard. **(Continue)**



Lesson 6: "Wedge"

1 A wedge is one of the simple machines. It is V-shaped like a knife. We use a wedge in many ways.

2 How does a wedge make work easier?

3 Activity : Splitting clay

What We Need:
- rectangular block, clay

What to Do:

1. Draw a table like the one shown below in your exercise book.

Which way can you split the clay easily?	How does a wedge work?

2. Place clay on a table.
3. Place the flat part of a rectangular block on the clay. Push it down and try to split the clay.
4. Place the edge of a rectangular block on the clay. Push it down and try to split the clay.
5. Record which way is easier to split the clay in the table.
6. Share your findings with your classmates. Talk about how a wedge works.

4

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Teacher's Notes

Wedge is a piece of wood, metal, or other material with a pointed edge at one end and a wide edge at the other, used to keep two things apart or, when forced between two things, to break them apart: A wedge under the door kept it open.

What is the purpose of the wedge?

A **wedge** is really an inclined plane turned on its side. But instead of helping you move things to a higher level, a **wedge** helps you push things apart. The blades of a knife or a shovel are both **wedges**. A **wedge** can also be round, like the tip of a nail, or the tines on a fork

Some examples of wedges that are used for separating might be a shovel, knife, axe, pick axe, saw, needle, scissors or ice pick. But wedges can also hold things together as in the case of a staple, push pins, tack, nail, doorstop or a shim.

A wedge can be used in many ways:

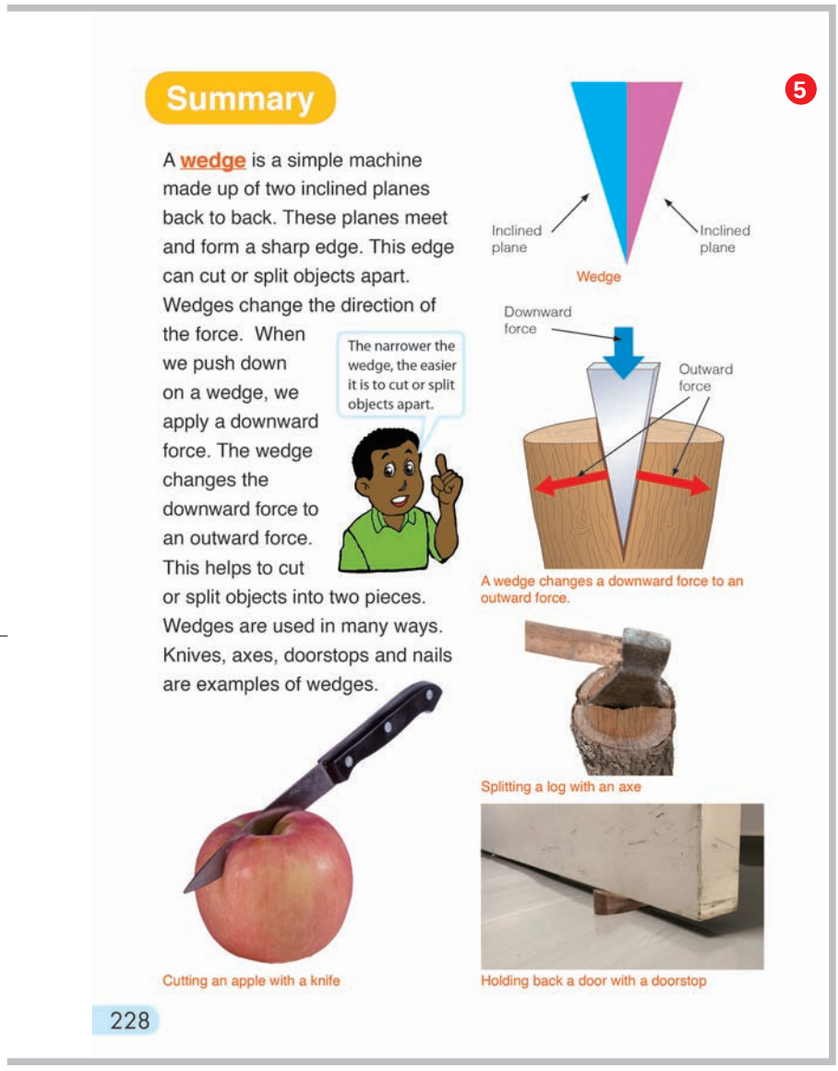
- To cut (knife)
- To split (axe)
- To tighten and to hold back (doorstopper)
- To hold together (nail)
- To scrape (blades on the snowplough or farm grader)

Lesson Objectives

Students will be able to:
- Define wedge.
- Observe how a wedge works

Assessment

Students are able to:
- Describe how a wedge is structured and helps work easier.
- Explain how a wedge changes a direction of force.
- Realize that an edge of a block splits clay more easily than the flat face of the block.
- Give some examples of a whedge in daily life.
- Take part in an activity in collaboratively with classmates.



Summary

A **wedge** is a simple machine made up of two inclined planes back to back. These planes meet and form a sharp edge. This edge can cut or split objects apart. Wedges change the direction of the force. When we push down on a wedge, we apply a downward force. The wedge changes the downward force to an outward force. This helps to cut or split objects into two pieces. Wedges are used in many ways. Knives, axes, doorstops and nails are examples of wedges.

5

A wedge changes a downward force to an outward force.

Splitting a log with an axe

Cutting an apple with a knife

Holding back a door with a doorstop

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- Confirm their findings with students.
- **Based on their findings,** ask the question as discussion point;

Q:Which parts of a block are edges? (The edges of a block)

Q:What shape do the edges look like? (V-shaped, acute, sharp, etc)

Q:How did the clay split when you pushed the edge of the block down to the clay? (The clay split outward or sideward.)

Q:How does the wedge change the direction of force? (From downward to outward)

Q:Can you guess how a wedge works? (A wedge can cut or split objects. A wedge can change the direction of force from downward to outward or sideward, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is a wedge?
  Q: How does a wedge works?
  Q: What are some examples of a wedge that we use every day?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Wedge"

Key question

How does a wedge make work easier?

Activity

Splitting clay

Which way can you split the clay easily?	How does a wedge work?
By using the edge of the block	It helps to spit the clay easily. It can cut the clay with less force, etc

Discussion

Q: Which parts of a block are edges?
The edges of a block

Q: What shape do the edges look like? V-shaped, acute, sharp, etc

Q: How did the clay split when you pushed the edge of the block down to the clay?
The clay split outward or sideward.

Q: How does the wedge change the direction of force?
From downward to outward

Q: Can you guess how a wedge works?
A wedge can cut or split objects. A wedge can change the direction of force from downward to outward or sideward, etc.

Summary
- Wedge is simple machine
- Wedge is made two incline plane back to back.
- Wedge can cut or split objects apart.
- A wedge can change the direction of force.
- Example of edges:

Knife, axe, pick axe, doorstop, etc

Unit	Chapter : **16. Force and Motion**	Total lesson No: 95 / 97
Force and Motion	Topic : **16.2. Machine and Its Work**	Textbook page: 229 - 230

Lesson 11 / 13

Lesson Title

Screw

Preparation

- Nail, screw, hammer, screwdriver, a piece of wood

Lesson Flow

1 Introduction (5 min.)

- Review the previous lesson by asking:

Q:What is a wedge?

Q:How does a wedge work?

- Make a brief explanation of a screw by showing a model of a screw and ask:

Q:How does a screw work?

2 Introduce the key question

How does a screw work?

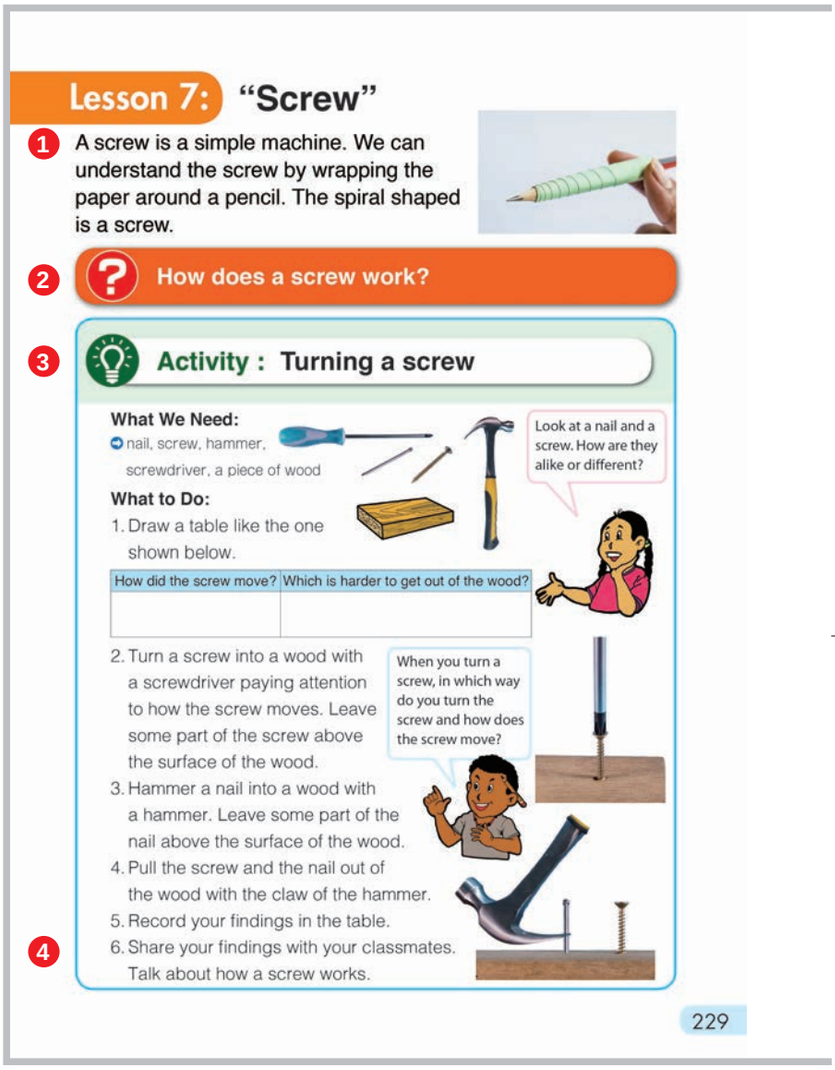
3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Let the students turn a screw with a screwdriver. Encourage students to pay attention to how the screw moves.
- Let students hammer the nail into the wood.
- Ask student to guess which would be easier to remove from the wood.
- Let students pull out both the screw and nail with the hammer.
- Ask students to record which was harder to remove screw or the nail from the wood.

4 Discussion for findings (20 min.)

- Ask students to present the results from their activity.
- Write down students' results on the blackboard.

(Continue)



Lesson 7: "Screw"

1 A screw is a simple machine. We can understand the screw by wrapping the paper around a pencil. The spiral shaped is a screw.

2 How does a screw work?

3 Activity : Turning a screw

What We Need:
nail, screw, hammer, screwdriver, a piece of wood

What to Do:
1. Draw a table like the one shown below.

How did the screw move?	Which is harder to get out of the wood?

2. Turn a screw into a wood with a screwdriver paying attention to how the screw moves. Leave some part of the screw above the surface of the wood.
3. Hammer a nail into a wood with a hammer. Leave some part of the nail above the surface of the wood.
4. Pull the screw and the nail out of the wood with the claw of the hammer.
5. Record your findings in the table.
6. Share your findings with your classmates. Talk about how a screw works.

4

Look at a nail and a screw. How are they alike or different?

When you turn a screw, in which way do you turn the screw and how does the screw move?

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Teacher's Notes

Safety:

- Be careful when handling the hammer.
- Provide a longer piece of wood about 50 cm for the activity as this will have enough clearance to drive the nail and screw into the wood and to hold stead when removing them.

Difference between a nail and screw

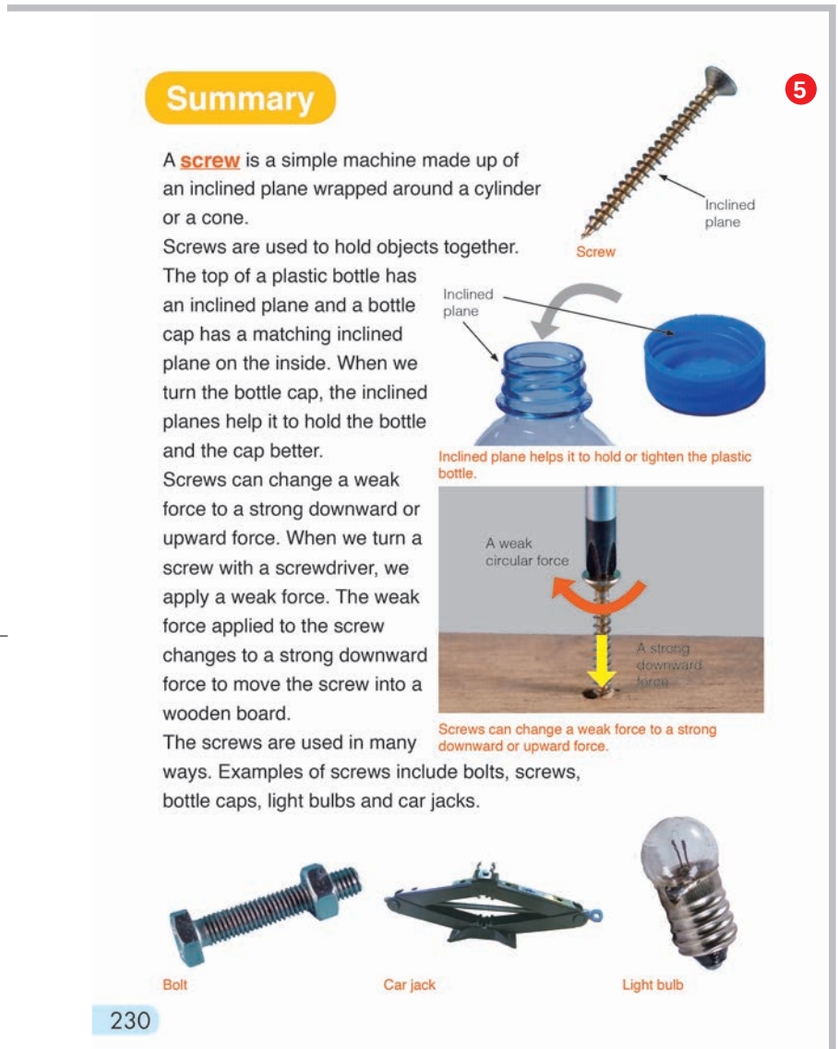
- These two are not the same. Unlike the nail, a screw has ridges around the shaft. It is harder to drive a screw into a piece of wood because the ridges on the screw create a lot of friction and resistance. To drive a screw into the wood, it has to turn in a circular motion by a screw-driver.
- A screw is a combination of simple machines—it is in essence an inclined plane wrapped around a central shaft, but the inclined plane (thread) also comes to a sharp edge around the outside, which acts a wedge as it pushes into the fastened material and the shaft and helix also form a wedge in the form of the point. The most common uses of screws are to hold objects together and to position objects.

Lesson Objectives

Students will be able to:
- Define a screw.
- Observe how a screw works.

Assessment

Students are able to:
- Describe how a screw is structured.
- Explain how a screw changes amount and the direction of force.
- Find the functions of a screw based on the results of activity.
- Value the opinions from others.



Summary

A **screw** is a simple machine made up of an inclined plane wrapped around a cylinder or a cone.
Screws are used to hold objects together.
The top of a plastic bottle has an inclined plane and a bottle cap has a matching inclined plane on the inside. When we turn the bottle cap, the inclined planes help it to hold the bottle and the cap better.
Screws can change a weak force to a strong downward or upward force. When we turn a screw with a screwdriver, we apply a weak force. The weak force applied to the screw changes to a strong downward force to move the screw into a wooden board.
The screws are used in many ways. Examples of screws include bolts, screws, bottle caps, light bulbs and car jacks.

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Inclined plane
Screw

Inclined plane

Inclined plane helps it to hold or tighten the plastic bottle.

A weak circular force
A strong downward force

Screws can change a weak force to a strong downward or upward force.

Bolt
Car jack
Light bulb

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- Confirm the findings with students.
- **Based on their findings,** ask the question as discussion point.

Q:When you compared the shape of a nail and screw, how are they different? (A screw has an inclined plane around a cylinder or cone.)
Q:Which direction did you turn a screw? (Clockwise, circular, etc)
Q:Which direction did the screw move when you turned it into the wood? (Downward, etc)
Q:How does a screw change the direction of force? (A screw changes the circular force to downward force.)
Q:Which was harder to pull out of the wood, a nail or a screw? (A screw)
Q:Can you guess how a screw works? (A screw changes the direction of force, it helps hold or tighten an object, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
  Q: What is a screw?
  Q: How does a screw work?
  Q: What are some examples of a screw that we use every day?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:
"Screw"
Key question
How does a screw work?
Activity
Turning a screw

How did the screw move?	Which was harder to get out of the wood?
It moved to the right (clock wise)	screw

Discussion
Q: When you compared the shape of a nail and screw, how are they different? A screw has an inclined plane around a cylinder.
Q: Which direction did you turn a screw? Clockwise, circular, etc
Q: Which direction did the screw move when you turned a screw into the wood? Downward, etc
Q: How does a screw change the direction of force? A screw changes the circular force to downward force.
Q: Which was harder to pull out of the wood, a nail or a screw? A screw
Q: Can you guess how a screw works? A screw changes the direction of force, it helps hold or tighten an object, etc

Summary
- A screw is a simple machine.
- A screw is made up of an inclined plane wrapped around a cylinder or cone.
- A screw holds objects together.
- A screw changes a weak force to a strong downward or upward force.
- Examples of screws include:
  - Bolts, Screws, Bottle caps, Light bulbs, Car jack

Lesson
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Lesson Title

Summary and Exercise

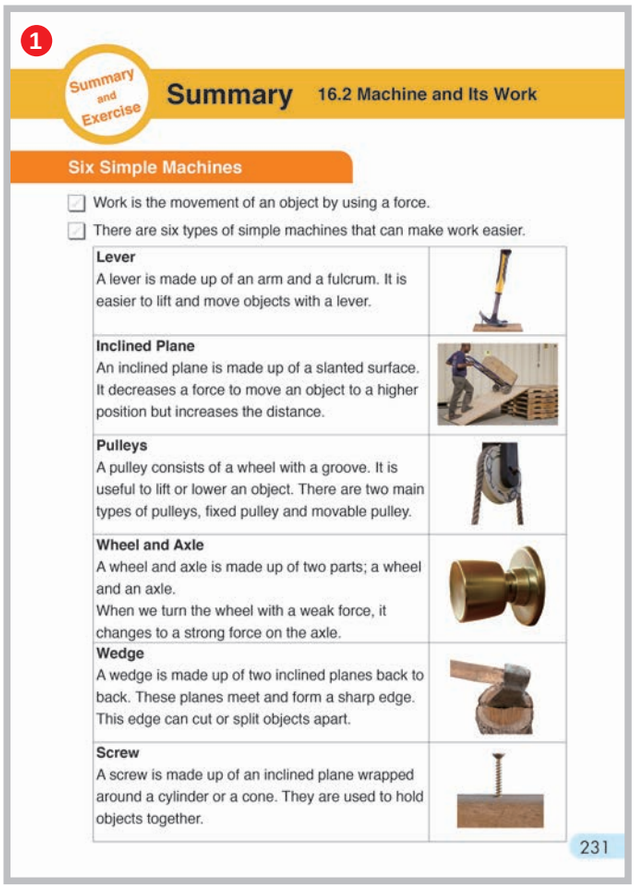
Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some questions to students and verify student understanding.

Q:What is a simple machine?
Q:How many types of simple machines are there?
Q:What are the names of the simple machines?

- Explain and correct learning contents again if they still have misconception.
- Provoke student to define each of the simple machine and give some examples of each.
- Ask students what the term work means.



1

Summary and Exercise **Summary** 16.2 Machine and Its Work

Six Simple Machines

- Work is the movement of an object by using a force.
- There are six types of simple machines that can make work easier.

Lever A lever is made up of an arm and a fulcrum. It is easier to lift and move objects with a lever.	
Inclined Plane An inclined plane is made up of a slanted surface. It decreases a force to move an object to a higher position but increases the distance.	
Pulleys A pulley consists of a wheel with a groove. It is useful to lift or lower an object. There are two main types of pulleys, fixed pulley and movable pulley.	
Wheel and Axle A wheel and axle is made up of two parts; a wheel and an axle. When we turn the wheel with a weak force, it changes to a strong force on the axle.	
Wedge A wedge is made up of two inclined planes back to back. These planes meet and form a sharp edge. This edge can cut or split objects apart.	
Screw A screw is made up of an inclined plane wrapped around a cylinder or a cone. They are used to hold objects together.	

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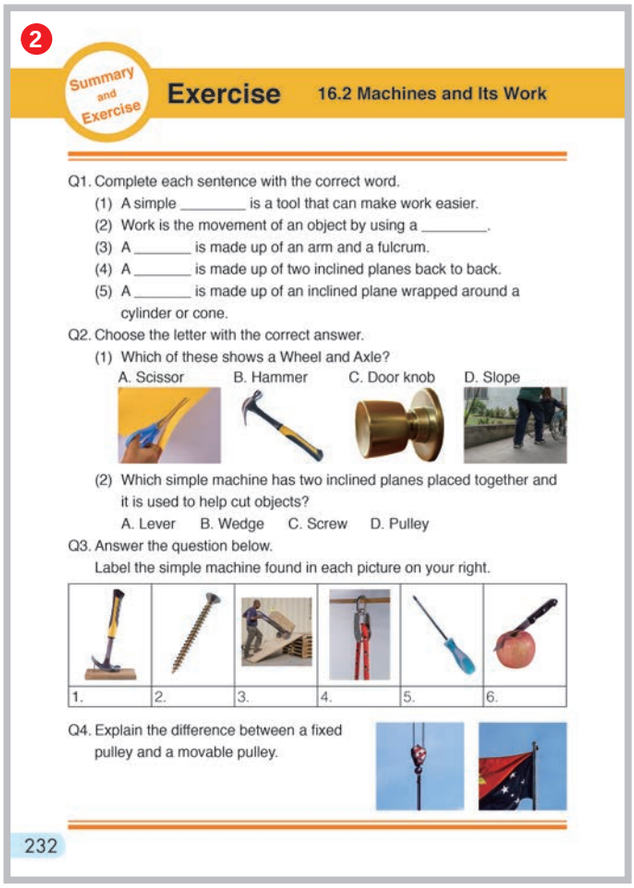
2 Exercise & Explanation (30 min.)

- Explain to students that they will have to answer all the parts of questions in the exercise even if they are not completely sure of the answer(s).
- Tell students;
  - that if they come across a difficult question, they should skip it and move on to the next question.
  - not to spend too much time on the difficult question(s).
  - If they have some time at the end of the exercise, they can come back and try to answer the difficult question(s).
- Allow student to try answering questions individually with enough time in response to students understanding
- After the test, use student's answers and to answer the question.



2

Summary and Exercise **Exercise** 16.2 Machines and Its Work

Q1. Complete each sentence with the correct word.
(1) A simple _____ is a tool that can make work easier.
(2) Work is the movement of an object by using a _____.
(3) A _____ is made up of an arm and a fulcrum.
(4) A _____ is made up of two inclined planes back to back.
(5) A _____ is made up of an inclined plane wrapped around a cylinder or cone.

Q2. Choose the letter with the correct answer.
(1) Which of these shows a Wheel and Axle?
A. Scissor B. Hammer C. Door knob D. Slope

(2) Which simple machine has two inclined planes placed together and it is used to help cut objects?
A. Lever B. Wedge C. Screw D. Pulley

Q3. Answer the question below.
Label the simple machine found in each picture on your right.

1.	2.	3.	4.	5.	6.

Q4. Explain the difference between a fixed pulley and a movable pulley.

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Exercise answers

Q1.
(1) **machine**
(2) **force**
(3) **lever**
(4) **wedge**
(5) **screw**
(1) A tool or device that can make work easier is called simple machine.
(2) Work is the movement of an object by using force. A simple machine can move an object easily when a force is applied to the simple machine.
(3) A lever is a simple machine made up of an arm and fulcrum. A lever makes it easier to lift and move objects.
(4) A wedge is a simple machine made up of two inclined planes back to back. These planes meet and form a sharp edge. This edge can cut or split objects apart.
(5) A screw is a simple machine made up of an inclined plane wrapped around a cylinder or cone. Screws are used to hold objects together.

Q2.
(1) **C**
(2) **B**
Wedge has two inclined planes back to back and is used to cut or split objects.

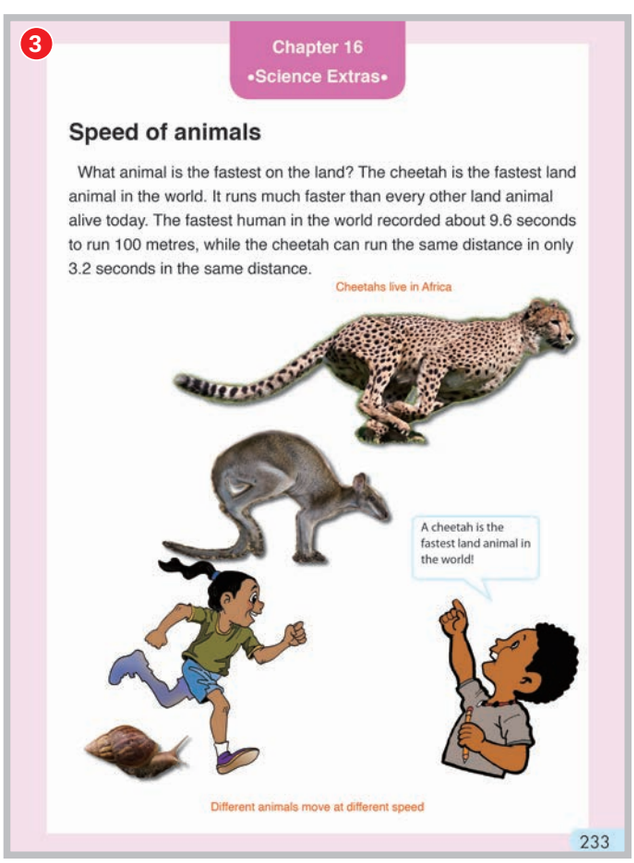
Q3.
(1) **Lever**
(2) **Screw**
(3) **Inclined plane**
(4) **Pulley**
(5) **Wheel and axle**
(6) **Wedge**
(1) A hammer changes a weak force to a strong force on the nail.
(2) A screw is used to hold objects together.
(3) A slope decreases a force to move an object to a higher position.
(4) A fixed pulley is useful to lift or lower an object.
(5) A screwdriver makes work easier by increasing the strength of the force.
(6) A knife has a sharp edge that is used to cut objects.

Q4. **Example of the answer**
- **Fixed pulley is fixed in one place and cannot be moved. It changes the direction of the force but it does not change the amount of force needed to lift the object.**
- **A movable pulley is a pulley that is free to move up and down. It lets us use less force to lift an object but we must pull the rope a longer distance than the object moves.**

Explanation of Science Extras

3 Science Extras (10 min.)

- Give students opportunities to observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extra.



Lesson
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Lesson Title

Chapter Test

Answer of the Chapter Test

Chapter Test

16. Force and Motion

Q1 Complete each sentence with the correct word.

(1) An object's position is its location or place.
(2) The measure of how fast an object is moving is its speed.
(3) A simple machine is a tool that can make work easier.

Q2 Choose the letter with the correct answer.

(1) Which of these tools is a type of screw?
A. Flagpole
B. Doorknob
C. Scissor
D. Jar lid

(2) Which one of these would be best to use to move a box out of the truck?
A. A pulley
B. A lever
C. A wheel and axle
D. An inclined plane

(3) Which of the following describes the change in the position of an object?
A. Force
B. Motion
C. Distance
D. Direction

(4) Which of the following defines the path that an object takes?
A. Direction
B. Motion
C. Distance
D. Force

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Q3

(1) What is a type of simple machine often used to hold things together?

Screw

(2) A doorknob is an example of what kind of simple machine?

Wheel and axis

(3) Label the simple machine found in each picture below.

		
A lever	B wedge	C pulley

(4) What are the three things that describe the motion of an object?

Distance, speed and direction

Q4

(1) How does a pulley make work easier?

A movable pulley is free to move up and down. The moveable pulley lets us use less force to lift an object.

(2) Ellanie wants to move a clock face from her room to the living room. What happens to the position of the clock face if she moves it?

The position of the clock face changes and as she moves the clock face, it is now in motion.

Science Tool Box

1. How to use a Thermometer
2. How to use a Compass
3. How to use a measuring cylinder

I would like to use these science tools in the lesson!

Let's check and learn how to use the science tools here.

Compass

Measuring cylinder

Thermometer

How to use a Thermometer

1. What is a thermometer?

A thermometer is an instrument we use to measure temperature. A thermometer consists of a glass tube with marks on it. When the liquid in the glass tube is heated, it expands and begins to rise up the tube. Temperature is measured in degree Celsius [°C].

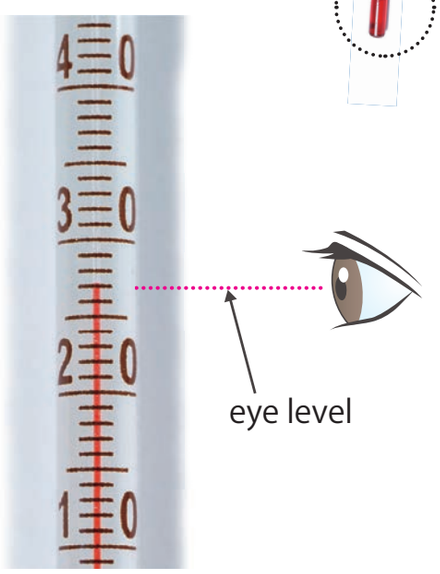
2. Measuring temperature

STEP 1:

Place the bulb in the place where you want to measure the temperature. Make sure that there are no bright lights or direct sunlight shining on the bulb.

STEP 2:

Wait for a few minutes until the liquid in the tube stops moving. Position your eyes at the same level with the top of the liquid in the tube.



STEP 3:

Read the scale line that is closest to the top of the liquid. The thermometer as shown on the right shows 27 °C.

How to use a Compass

Compass

1. What is a compass?

A compass is an instrument you use for finding directions (North, South, East and West). It has a dial and a magnetic needle that always points to the north/south. This helps you to locate your position on a map and to set the direction you wish to travel.

2. Finding directions

STEP 1:

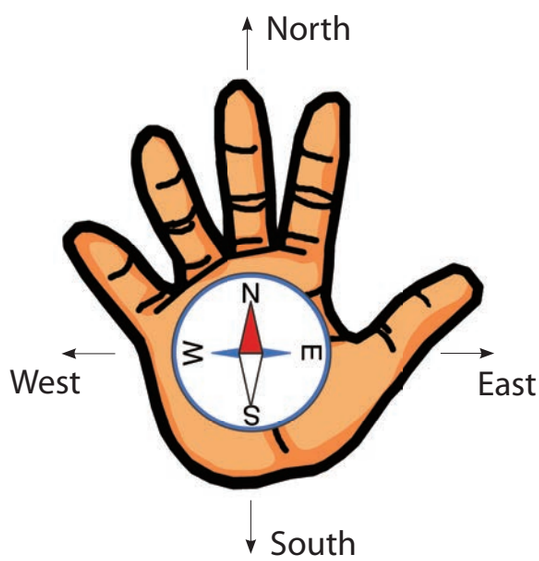
When you want to face North, place the compass flat on your palm and hold your palm in front of your chest as shown in the picture on the right.

STEP 2:

Turn your body until the magnetic needle comes to the North sign on the dial. When the needle overlaps the North sign on the dial, you are facing North.

STEP 3:

Find other directions when you are facing North. Your right side points to East and left side points to West, and your back is facing the South when you are facing North.



How to use a measuring cylinder

1. What is a measuring cylinder?

Measuring cylinder, beaker and measuring jar are used to measure the volume of water.

Volume of water is often measured in millilitre (mL) or in litre (L).

2. Measuring Volume of Water

STEP 1:

Pour some water into a measuring container.

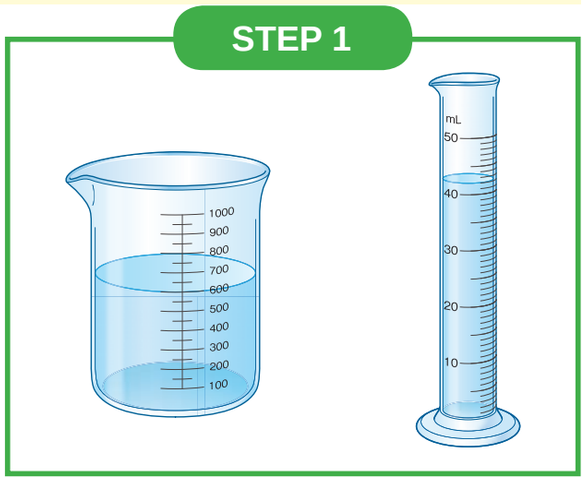
STEP 2:

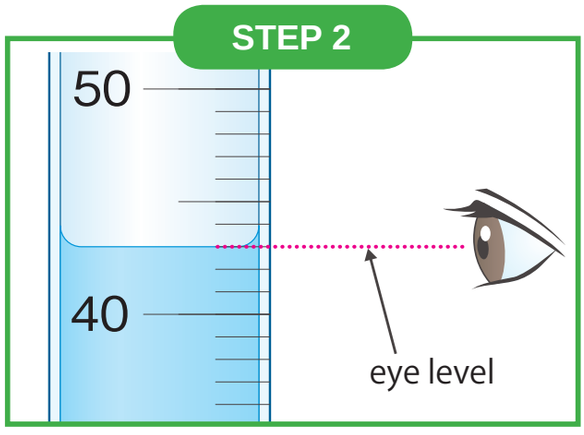
Position your eyes at the level with the top of the water. Read the scale line that is closest to the surface of the water.

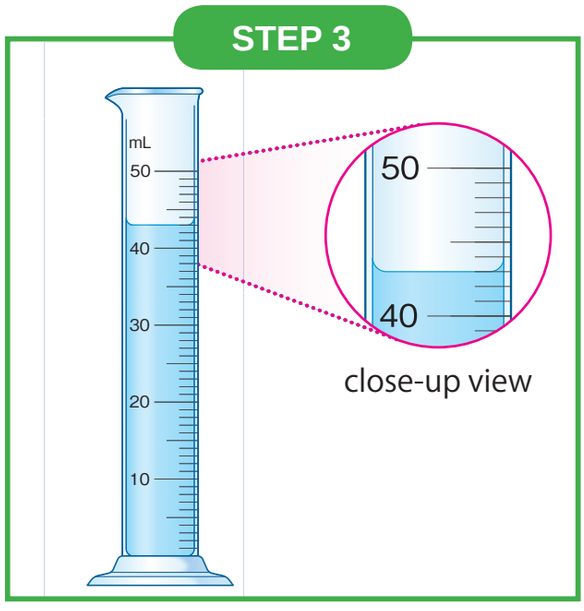
If the surface of the water is curved up on the sides, look at the lowest point of the curved water surface.

STEP 3:

Read the measurement on the scale. The volume of water in the figure on the right is 43 mL.







(Introduced in Grade 3 Textbook)

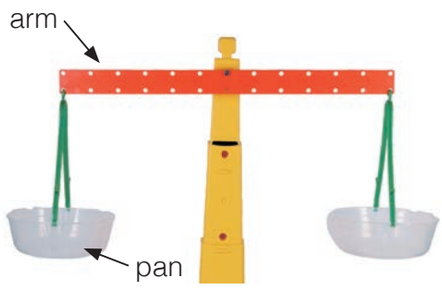
How to use a Balance

Balance

1. What is a balance?

A balance is an instrument that is used to compare weight. Weight is a property of matter in an object. A balance has two pans, on the left and right of the arm. To compare the weight of two objects, place an object on the left and another on the right pan. The arm tilts down to the heavier side. If two objects have equal weight, then the left and right pans are balanced.

This type of balance has similar function.



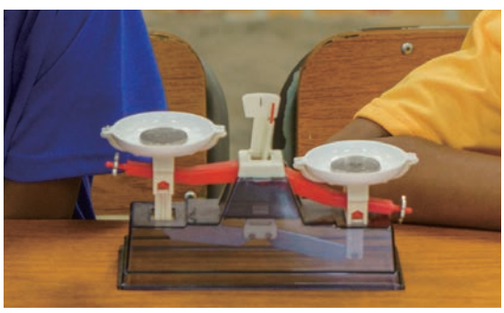
2. Comparing the weight of coins

STEP 1:

Check that the empty pans are balanced. If it needs to be adjusted, move the slider or adjuster until the pans are balanced.

STEP2:

Place a coin on the left pan and another coin on the right pan. When the arm tilts down to the right, then it means the coin on the right pan is heavier than the left side. If the left and right pans are balanced, the two coins have the same weight.



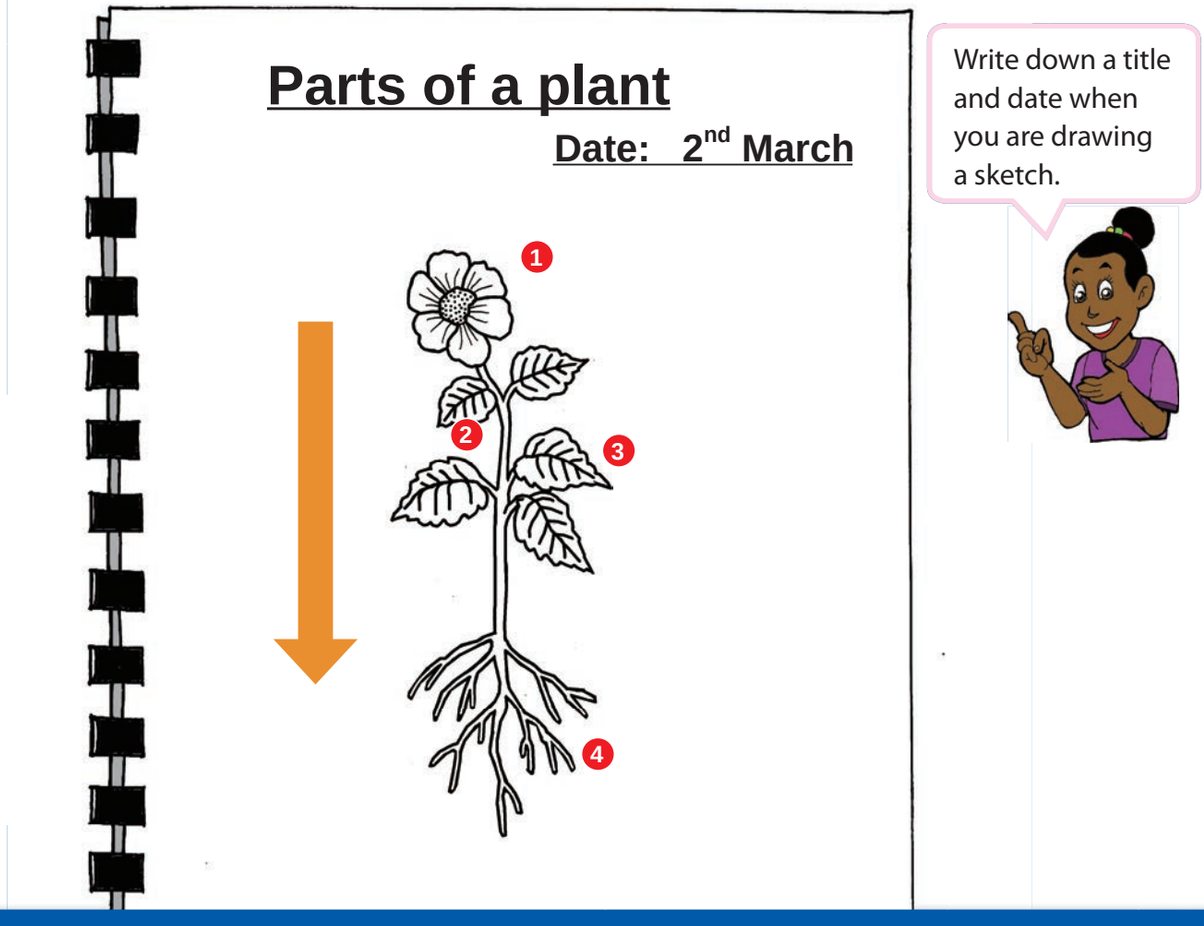
(Introduced in Grade 3 Textbook)

How to draw a sketch

Scientific sketch is NOT an artwork. The sketch requires precise drawing. If the plant has two leaves, the sketch should have two leaves only as they are.

The principle of sketch is “top to bottom” and “front side to back side”. For example, look at the sample below;

STEP 1: **Start by drawing the flower of the plant.**
STEP 2: **Next draw the stem.**
STEP 3: **Next the leaf. Draw from front leaves to back.**
STEP 4: **Lastly draw the root.**



Glossary

Anther is the part of a male flower which contains pollen. 72

Battery is a device that makes it easy to carry electricity any where you go. 78

Boiling of water means that large bubbles are formed in the water actively. 78

Boiling point of water is the point at which the water boils actively, which is 100°C 146

Bones support our body and give the body shape. 182

Chemical change is a change in matter in which new kind of matter is formed. ... 138

Chemical property is the ability to change into new matter that has different properties. 138

Chrysalis is a special case which a pupa makes to protect itself. 106

Compost is a mixture of naturally decaying matter such as plants and animals. ... 34

Condensation is a change of state from air to liquid. 164

Conductor is a material that electric current easily flows through. 86

Crater is a round hole in the surface of the moon. 198

Direction is the path that an object takes. Direction is expected by comparing its current position to its past position. 212

Distance is a measure of how far an object has travelled from its starting point. ... 212

Electric circuit is the circle of a pathway that electricity flows. 82

Electric current is the flow of electricity. 84

Evaporation is a change of state from liquid to gas. 162

Fruit comes from flowers and they contain seeds. 96

Gas of water is the invisible form of water. 152

Inclined plane is one of the simple machines that uses slanted surface to move objects from a lower position to a higher position with less force. 218

Insulator is a material that electric current does not flow through easily. 86

Joint is the body part where two bones join together. 184

Landfill is an area where garbage is an area where garbage is thrown. 28

Larva is called a caterpillar, hatches from an egg. 106

Lever is a simple machine made up of an arm and a fulcrum. 218,220

Life cycle is the series of changes that a plant goes through during its life. 24

Liquid water means water that we are most familiar with at room temperature. ... 152

Medium is a matter that transports sound. 122

Melting means changing a form from solid to liquid. 150

Melting point of water is the point at which the ice starts to melt, which is 0°C. ... 150

Metal is a material such as iron and aluminum. 86

Motion is the change in the position of an object. An object in motion moves from one place to another. 210

Muscle is under our skin and covers our bones. We use our muscles when we play and work. 188

Nymph is the young insect in the stage before the adult insect. 106

Oxygen is one of the gases in the air. 12

Petal is the bright colourful parts of a flower. 72

Phases of the moon mean a series of changing shapes of the bright part of the moon that we can see. 202

Physical change is a change in physical properties of matter. It may make the matter look different, but it does not change the material of matter itself. 136

Physical property is a characteristic of matter that can be measured or observed with the five senses without changing the matter itself. 134

Pistil is a female part of a flower. 72

Pitch means how high or low a sound is. 126

Pollen is a fine powder produced by flowers, which is carried by the wind or by insects to other flowers. 72

Position is the place or location of an object. 210

Precipitation is any form of water that falls from clouds such as rain, snow, and hail. 62,166

Pulley is a wheel to lift or lower an object easily. 218

Pupa is one of stage in the life cycle before an insect becomes adult, when it is protected by a special case. 106

Screw is a simple machine made up of an inclined plane wrapped around a cylinder or cone to change a weak force to a strong downward or upward force. 218,230

Seed is the part produced by plants from which a new plant grows. 24

Seedling is a young plant that grows from a seed. 42

Glossary

Shelter is a place where animals can be safe. 12

Simple machine is a tool or device that can make work easier. 218

Soil pollution is the addition of harmful materials to the soil. 29

Solid of water means iced water. 152

Sound is a form of energy that you can hear. 120

Speed is a measure of how fast an object is moving. 212,214

Stamen is a male part of a flower. 72

Steam are the visible tiny water droplets floating in the air when water is boiling. 148

Stigma is the top of the centre part of a flower that receives the pollen. 72

Tadpole is the stage of the frog when the frog eggs hatches. 108

Thermometer is a tool to measure temperature 62

Three R's means "Reduce", "Reuse things", and "Recycle things". 34

Vibration is a quick movement back and forth. 120

Volume is the amount of a space in a container. Or it means the amount of sound, such as soft or loud. 48

Volume of sound is how soft or loud. 124

Water cycle is the movement of water between the air and the Earth as water changes its state. 166

Water pollution is the addition of harmful things to water. Waste, sewage, oil, and detergent spilled in water can be harmful things. 172

Water vapour is gaseous state of water. 148

Weather is the conditions of the air and the sky at a particular time and place. ... 60

Wedge is a simple machine made up of two inclined planes back to back to form a sharp edges. 218,228

Wheel and axle is one of the simple machines to make work easier by increasing the strength of the force. 228,226

Wind is moving air. 46,62

Work in science means the movement of an object by using force. 218

Glossary

Page number corresponds to Grade 3 Textbook

Amphibian is an animal whose body is covered with moist skin. 88

Axis in the Earth is an imaginary straight line that passes through the North pole and South pole of the Earth. 130

Balance is a tool to compare the weight of matters. 36

Bird is an animal that has feathers and wings. 88

Compass is an instrument you use for finding directions.....168

Direction is the path that an object takes. The direction tells us where the object is going. 184

Energy is the ability to do work. Energy can change and move things. 110

Environment is everything that makes up our surroundings. 12

Man-made environment is the environment that is made of man-made things. ... 14

Natural environment is the environment made of natural things. 14

Nonmagnetic object is an object that is not attracted by a magnet. 160

Fibrous root is a root that has many smaller roots that spread out in different directions. 76

Fish is an animal that lives in water and has scales and gills. 88

Force is a push or a pull. 176

Forest is a place with many trees that grow close together. 22

Friction is force that makes an object slow down and stop when two surfaces of objects are rubbed against each other. 180

Fulcrum is the point on which the lever turns or balances. 194

Gravity is the force that pulls objects toward Earth's centre.....176

Herbs are plants that have soft and green stems. 78

Humus is tiny bit of dead plants and animals in soil. 208

Inclined plane is a simple machine made up of a flat and slanted surface. 192

Insect is an animal that has 6 legs and hard outer covering. 88

Leaf is a part of plants made up of a leaf stalk, a leaf blade, and veins..... 70

Leaf blade is the main flat area of the leaf. 80

Leaf margin is shape of leaf edges. 80

Leaf vein is a tube that can help carry water and nutrients throughout the leaf. ... 80

Lever is a simple machine made up of arm and fulcrum. 194

Glossary

Page number corresponds to Grade 3 Textbook

Light is energy that we can see. 138

Living things are things that grow, change and breathe, can move by themselves and produce new living things. 16

Magnet is an object that attracts magnetic object. 158

Magnetic object is made of iron and attracts to a magnet. 160

Magnetic poles are the parts where a magnet attracts objects most strongly. All magnets have north and south pole. 162

Mammal is an animal that has fur or hair and breathe by lungs. 88

Man-made things are things made by people. 14

Matter is everything around us. 32

Mineral is a non-living thing found in nature such as gold, diamond and copper. 206

Mixture is something made of two or more kinds of matters. 58

Natural things are things that come from nature and not made by people. Plants, animals, soil, air and water. 14

Non-living things are things that do not grow, change, breathe and cannot produce new ones. 16

Nutrient is a material in the soil that living things need to grow 72

Object is a thing that we can see and touch. 41

Ocean is the vast body of salt water. 22

Opaque objects do not let any light travel through them. 142

Property is anything that we learn about a matter such as weight, size, colour, and texture. 34

Pulley is a simple machine made up of a wheel through which a rope moves. 196

Reflection is what occurs when light bounces off an object. 148

Reptile is an animal whose skin is covering with dry scales. 88

Rock is made of one or more minerals. 206

Roots are a part of plants that are usually found under the soil. 70

Shrubs are small to medium sized plants with hard and woody stems. 78

Simple machine is a tool that helps us do some things easier. 190

Soil is the top layer that covers Earth's surface. 208

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Speed is a measurement of how fast or slow an object is moving. 182

Stem is a part of plants that connects the roots to other plant parts. 70

Sun is the brightest object in the day sky. 120

Taproot is a root that has one major root that grows very deep into the ground. ... 76

Temperature is how warm or cool something is. Temperature is measured in degrees Celsius(℃) 122

Thermometer is an instrument we use to measure temperature. 122

Translucent objects allow some light to travel through them. 142

Transparent objects allow light to travel through them. 142

Trees are plants that have hard and woody stems. 78

Volume is the amount of space that a matter takes up. 46

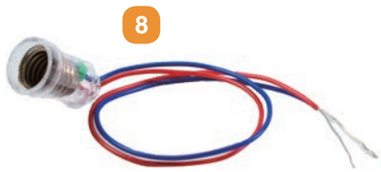
Weight is a measure of how heavy an object is. 35

Wetland is a place that is very wet. 22

Basic Science Instruments

Basic science instruments introduced in the textbook are listed below.

1. Magnifying lens
2. Measuring cylinder
3. Beaker
4. Thermometer
5. Compass
6. Pulley
7. Bulb
8. Bulb socket
9. Dry cell holder
10. Switch
11. Electrical wire



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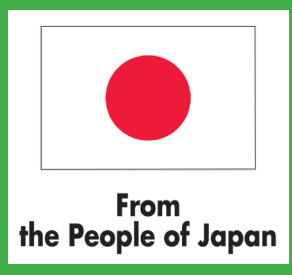
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