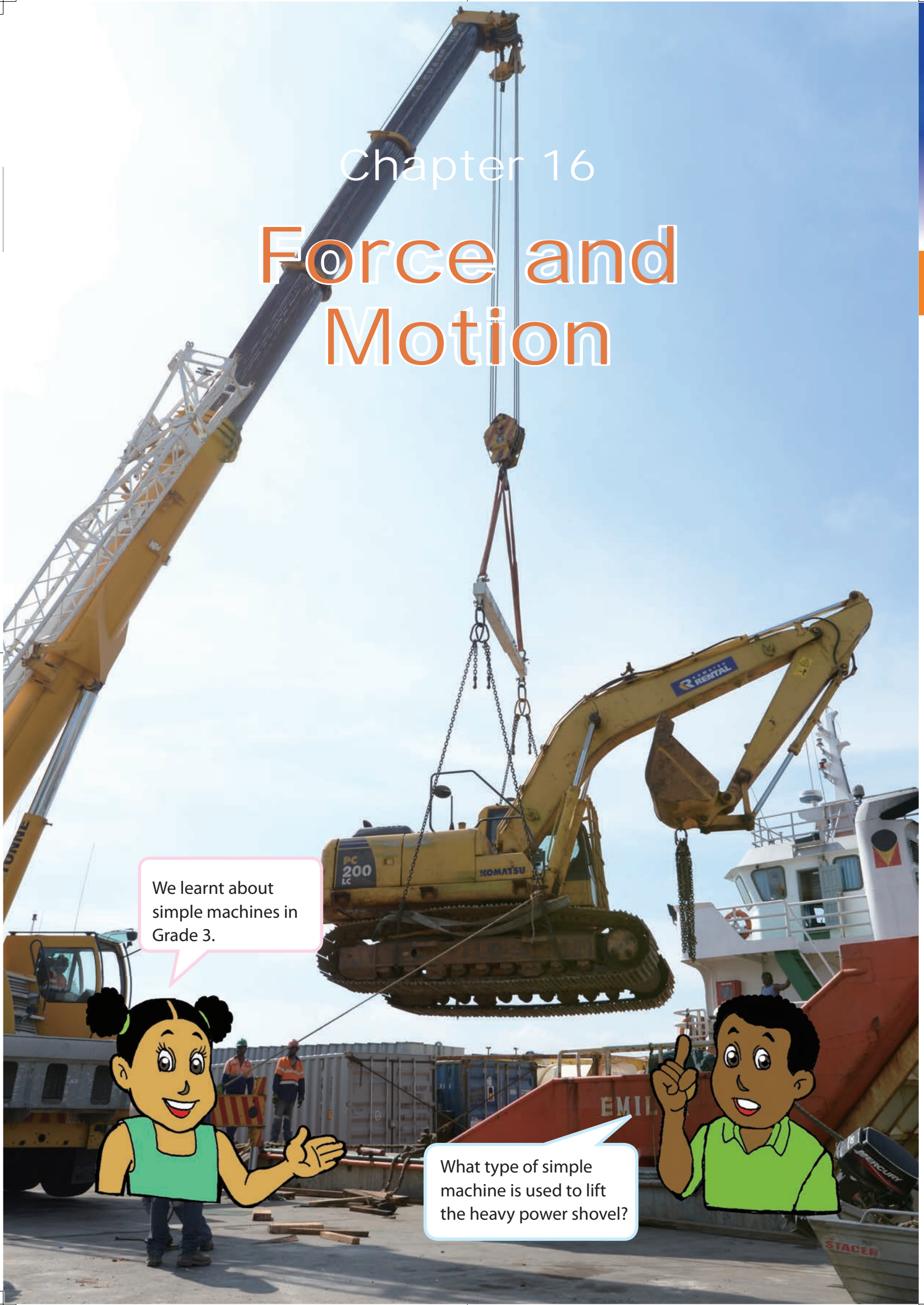


Chapter 16

Force and Motion

We learnt about simple machines in Grade 3.

What type of simple machine is used to lift the heavy power shovel?



16.1

Describing and Measuring Motion

Lesson 1:

“Position and Motion of Objects”

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**.



What is the motion of an object?



Activity : Where is the object?

What to Do:

1. Draw a table like the one shown below.

Object	Where is it?

2. Look at the picture below. Choose three kinds of objects and write their names in the table.

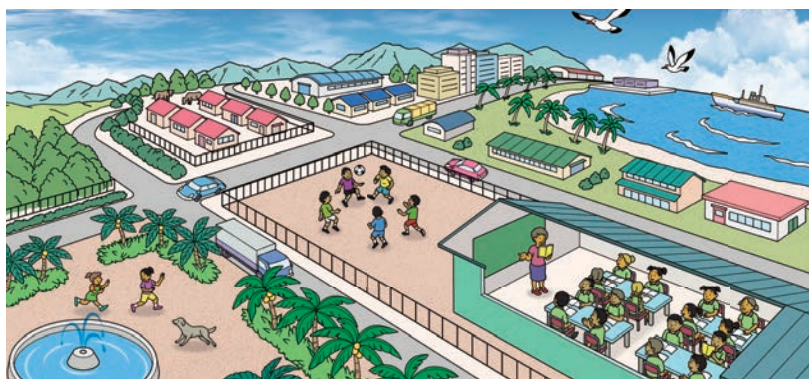
3. Describe the location of the objects in the table.

4. Share your ideas with your classmates. Talk about how we can describe the location of the objects.

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

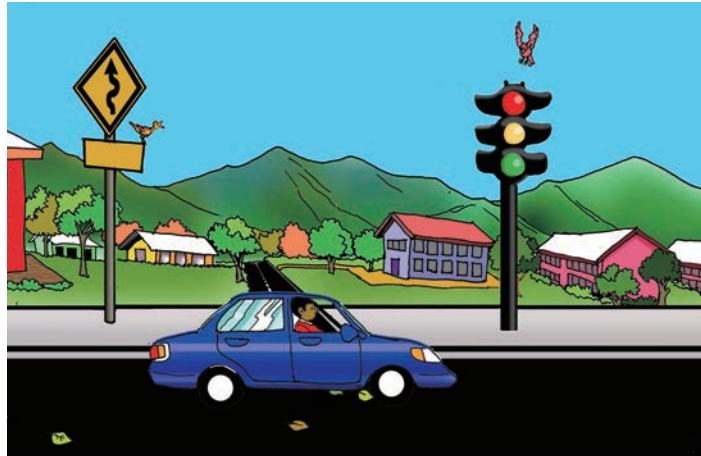


What happens to the location of an object if you move it?



Summary

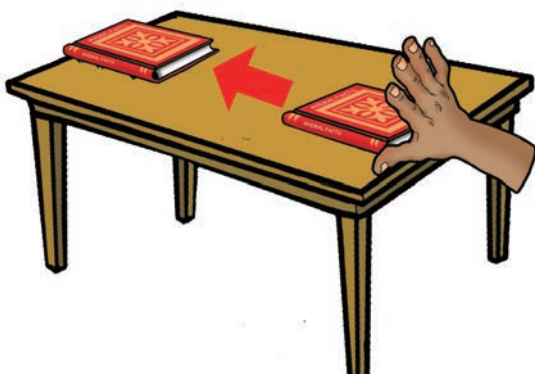
The place or location of an object is called the **position**. We can describe the position of an object as compared to other objects. For example, the position of the red book is on a desk in front of a pink wall. The position of the blue car is on the road 1m from the road sign.



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.

Lesson 2:

“Describing Motion of an Object”

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



How can we describe the motion of an object?



Activity : How is the object moving?

What to Do:

1. Draw a table like the one shown below.

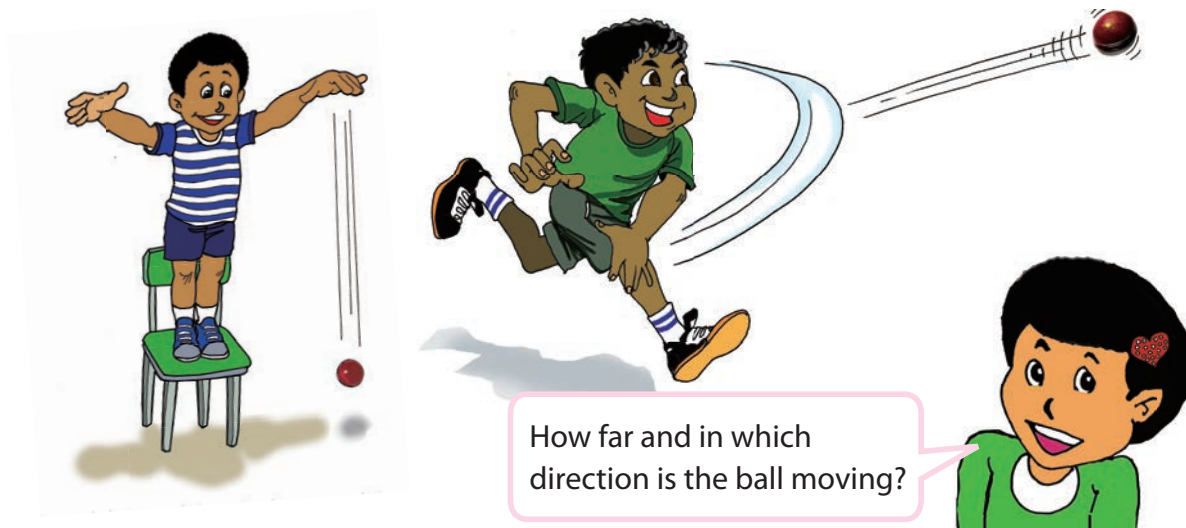
Motion	Describing how the ball is moving
When you drop a ball	
When you throw a ball	

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.



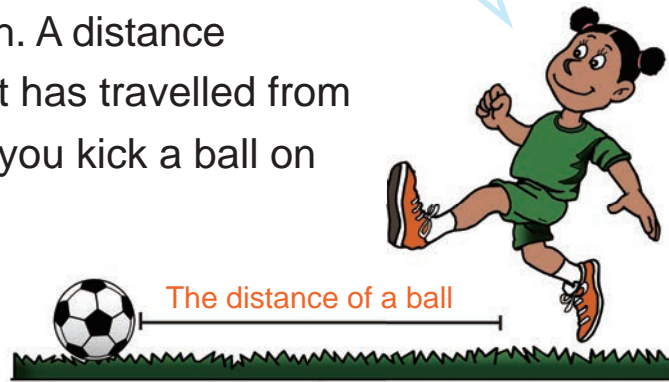
Summary

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.



Speed

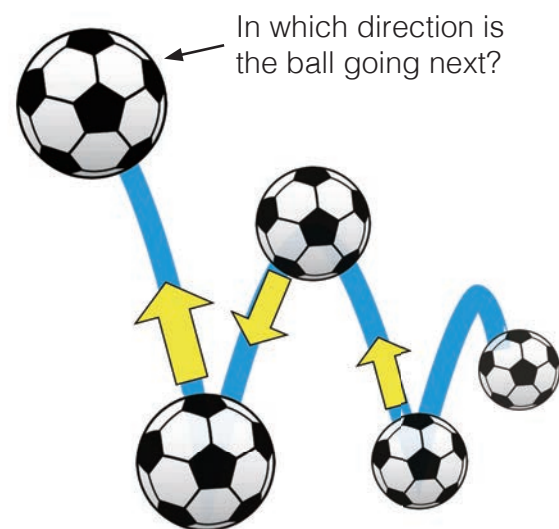
Speed is a measure of how fast an object is moving. For example, cheetahs can run almost at a speed of 120 km/h. Pigs can run at a speed of 17.7 km/h. Cheetahs can run faster than pigs. Pigs move slower than cheetahs.



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.



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

Lesson 3:

“Measuring Motion of an Object”

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



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



Activity : Measuring distance and time

What We Need:

- toy car, tape, stopwatch, tape measure

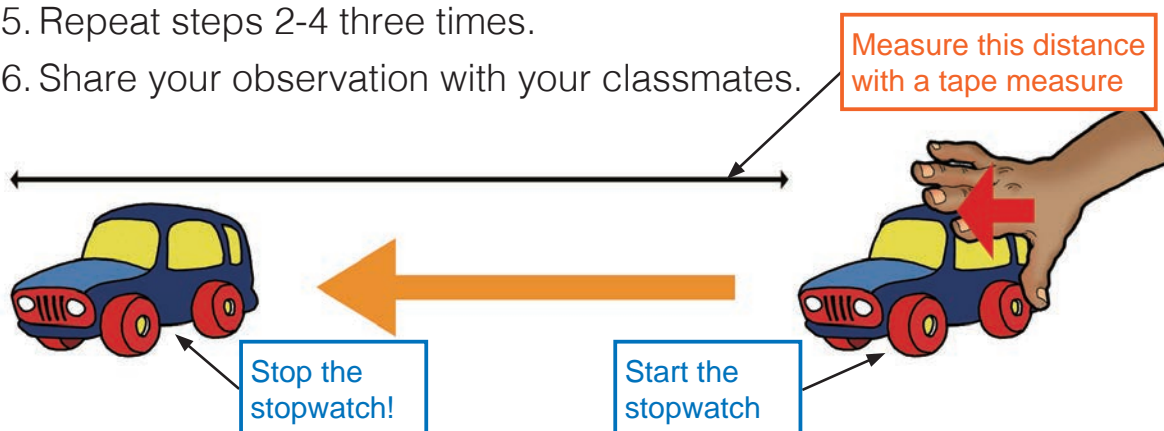


What to Do:

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.



Summary

The distance and speed of an object can be measured.

Distance

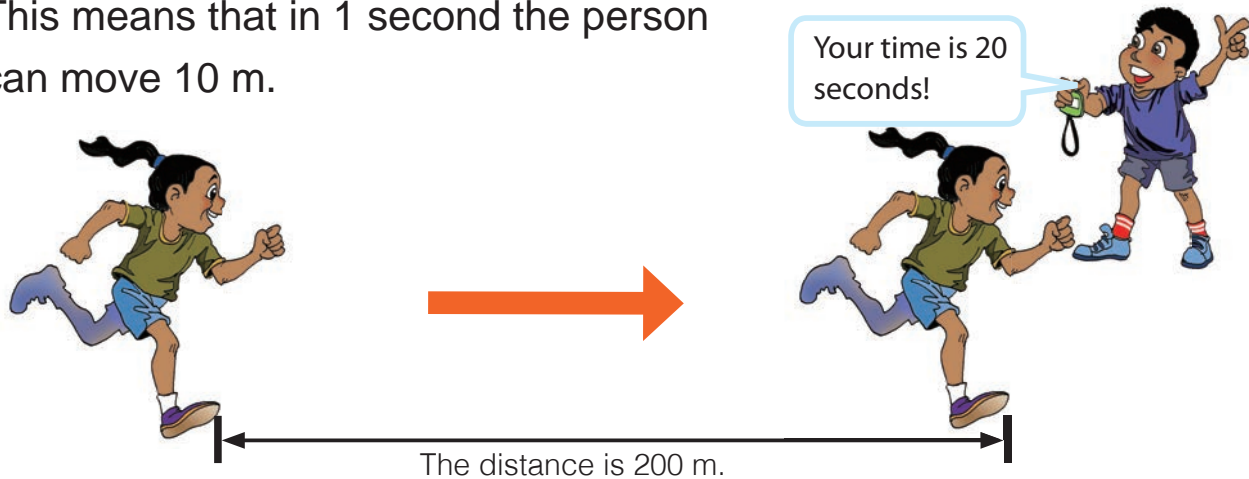
Distance can be measured using a ruler, a tape measure or a measuring tape. The distance of an object is often measured in **kilometres (km)**, **metres (m)** or **centimetres (cm)**.



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.



She can run 200 m in 20 seconds.



Discussion

What is the speed of the toy car?

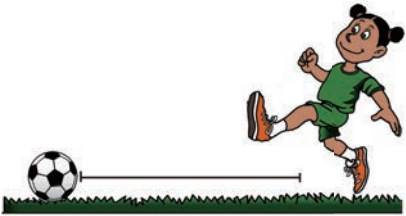


1. Calculate the speed of the toy car on the 1st, 2nd and 3rd attempts in the activity.
2. Find the average speed of the toy car.

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:

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

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.

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



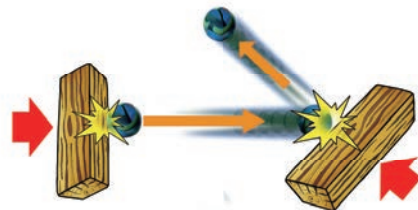
D. Compass



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.

16.2 Machine and Its Work

Lesson 1: “Six Simple Machines”

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



What types of simple machines are there?



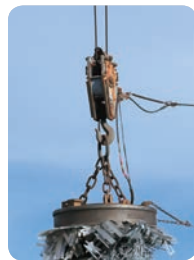
Activity : Grouping simple machines

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?



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?

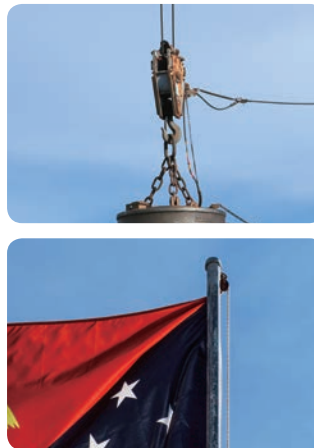


The pictures below show examples of each type of simple machine.

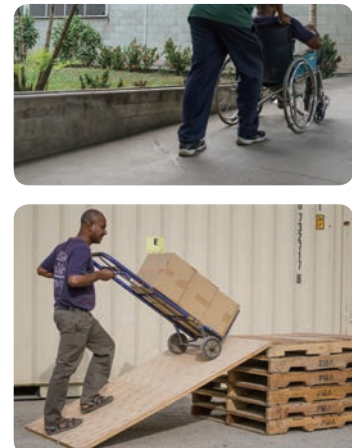
Lever



Pulley



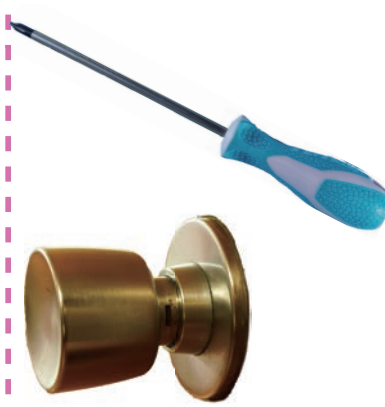
Inclined Plane



Wedge



Wheel and Axle



Screw



Lesson 2: “Lever”

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



How does a lever make work easier?



Activity : How a hammer works

What We Need:

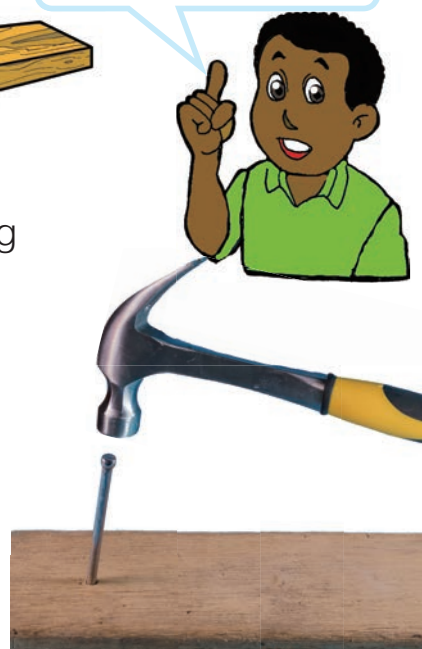
- ➔ hammer with claw, nails, and wooden board



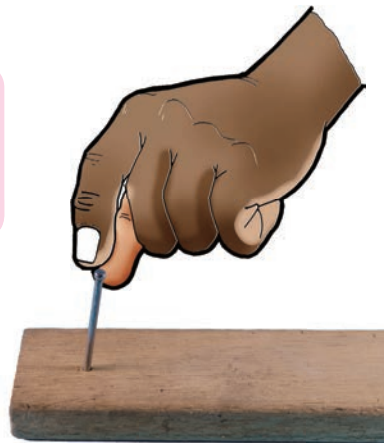
Is it easy to remove the nails from the board using your hand?

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.

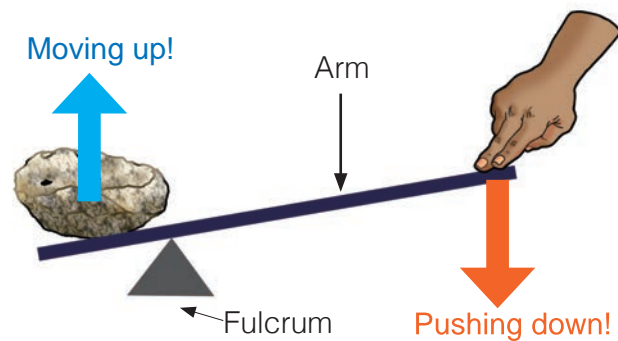


Which way is easier for you to pull out the nail from a board?

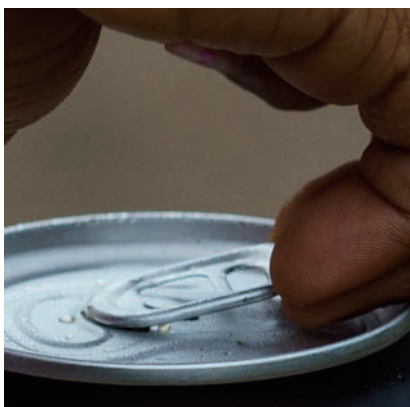


Summary

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 bottle opener, shovel and scissors are examples of levers.



A Simple Machine: Lever



Flip top

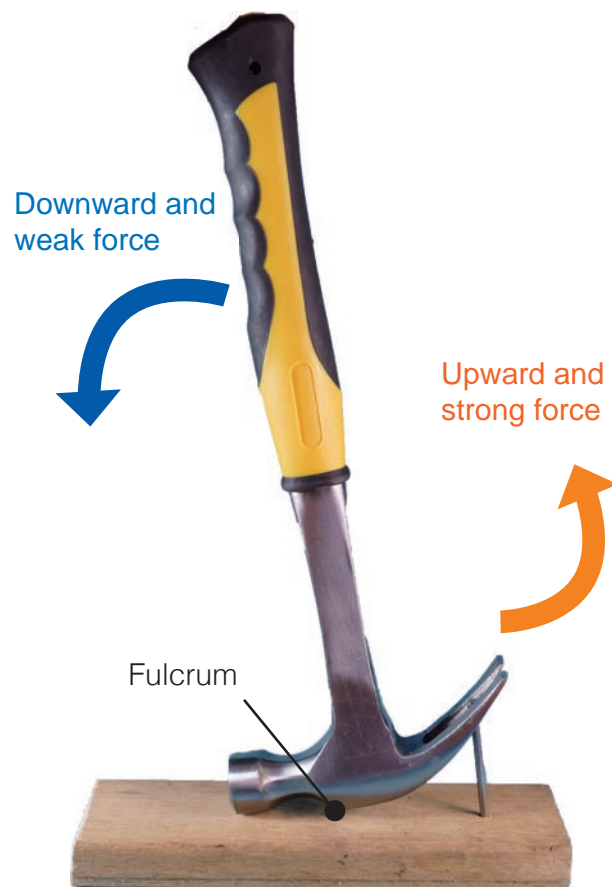


Shovel



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.

Lesson 3: “Inclined Plane”

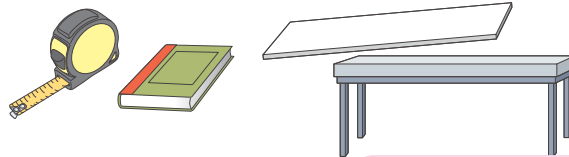
An inclined plane is one of the simple machines. Inclined planes help us to move an object.

? How does an inclined plane make work easier?

Activity : Which is easier?

What We Need:

- ➔ string, flat board, tape measure, book, bench



What to Do:

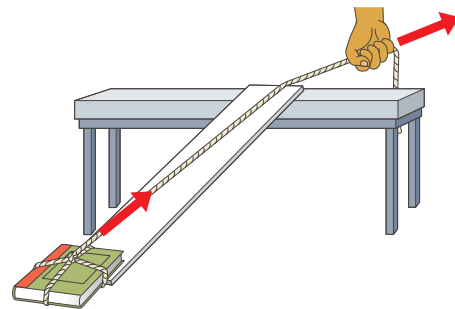
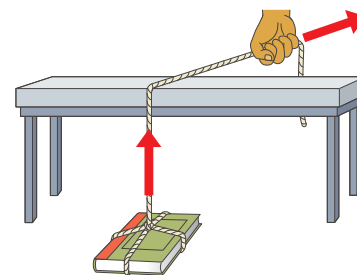
1. Draw a table like the one shown below.

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

A slanted board plays the role of an inclined plane!



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.



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.

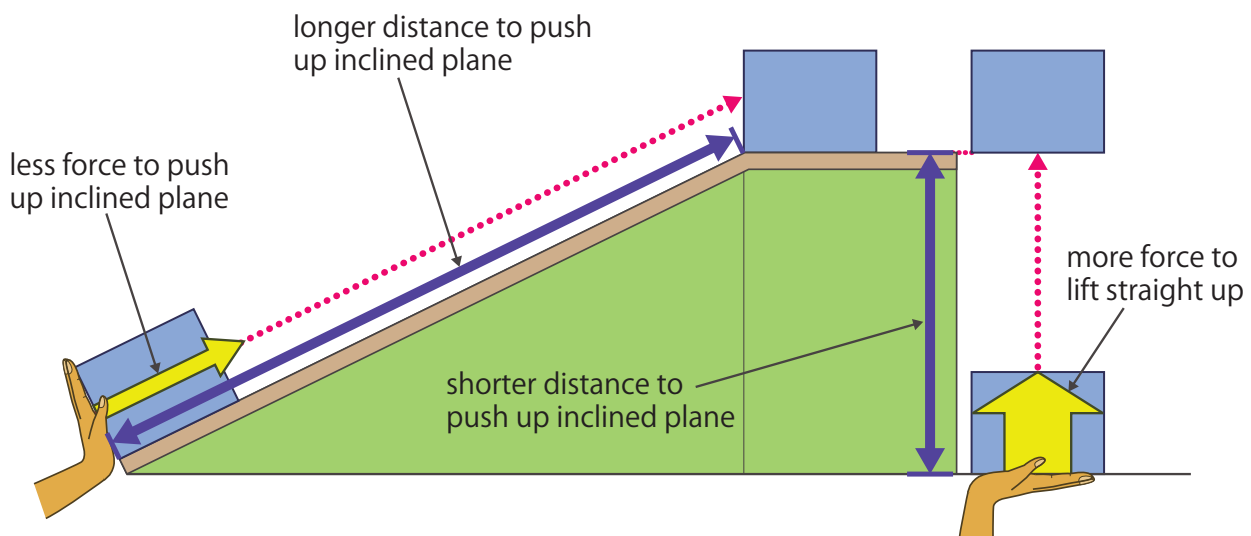
	How far did you pull? (cm)	Which method did you need more or less force?
Without a board	e.g. 60 cm	e.g. More force without a board
With a board	e.g. 120 cm	e.g. Less force with a board

Summary

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.



Inclined Plane



An inclined plane makes it easier to move a box.

Lesson 4: “Pulleys”

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



How does a pulley make work easier?



Activity : Lifting up a bottle

What We Need:

- two pulleys, string, a bottle of water, ruler

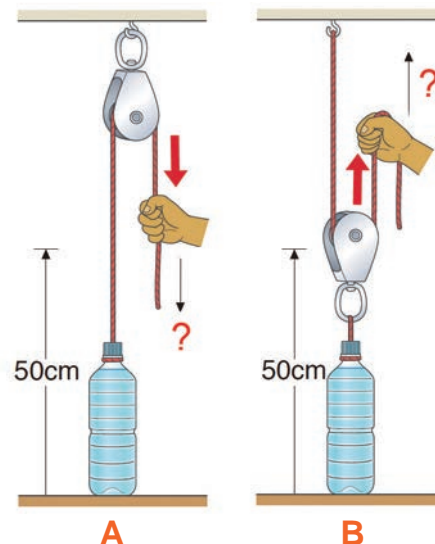
What to Do:

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?



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

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.

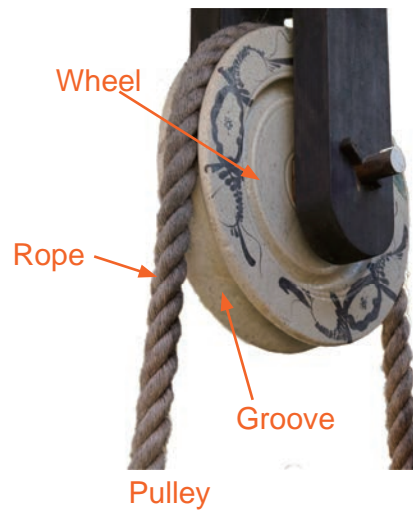
Pulley A cannot move freely but pulley B can move freely!



	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

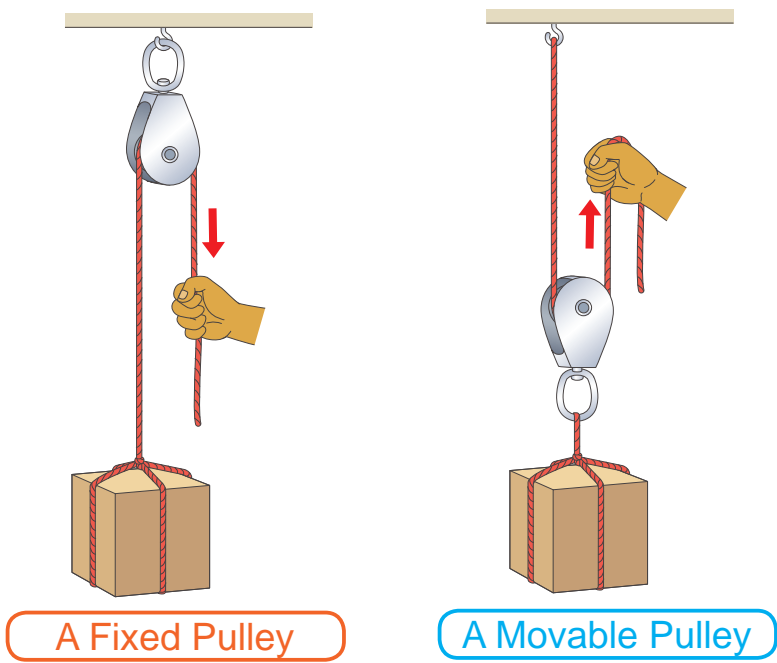
Summary

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**.



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.



Fixed pulley and movable Pulley

Lesson 5: “Wheel and Axle”

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



How does a wheel and axle work?



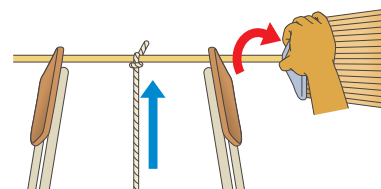
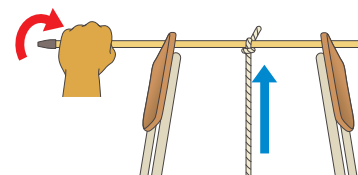
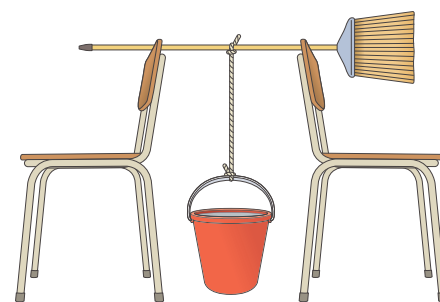
Activity : Turning a broom

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.



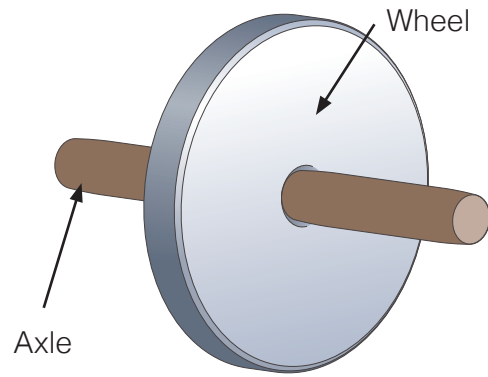
The broom handle represents an axle, and the head of the broom represents a wheel!

Summary

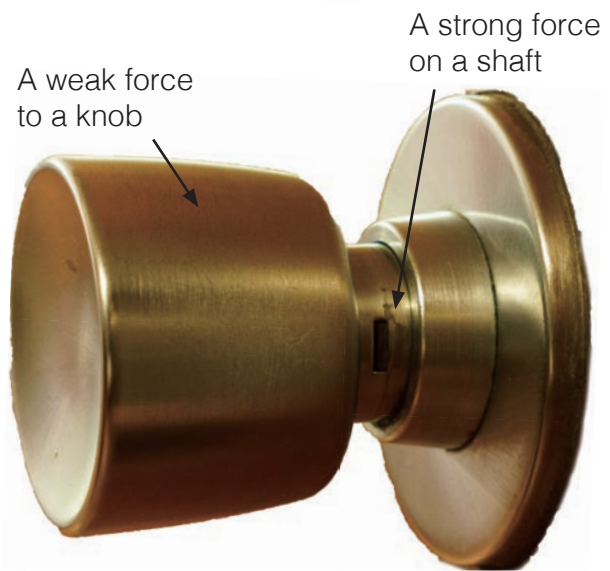
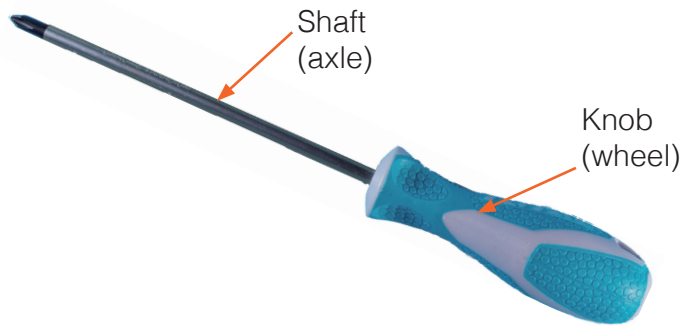
A **wheel and axle** is a simple machine made up of two parts; a wheel and an axle. The **wheel** is a round disk. The **axle** is a rod that runs through the centre of the wheel. When the wheel is turned, the axle is also turned.

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.

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



Wheel and Axle



A wheel and Axle can change the strength of the force.



Faucet



Screwdriver

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



Lesson 6: "Wedge"

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



How does a wedge make work easier?



Activity : Splitting clay

What We Need:

- rectangular block, clay



Which parts of a block are V-shaped?

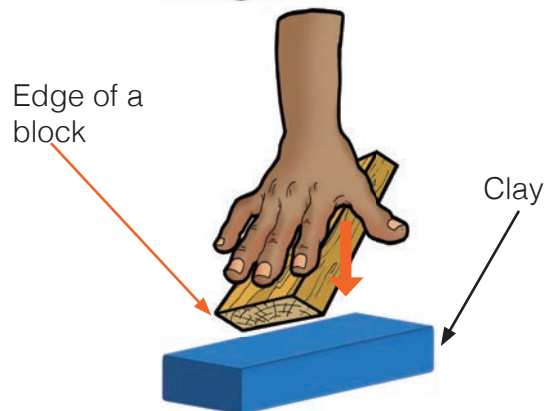
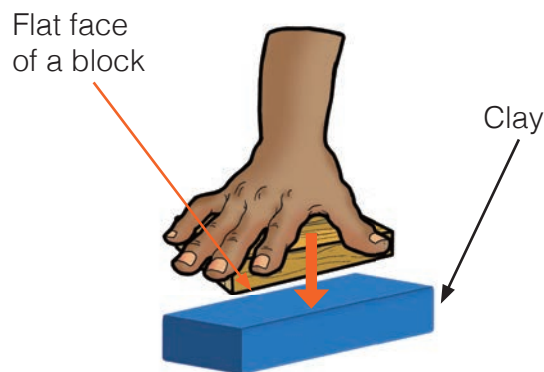
What to Do:



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.



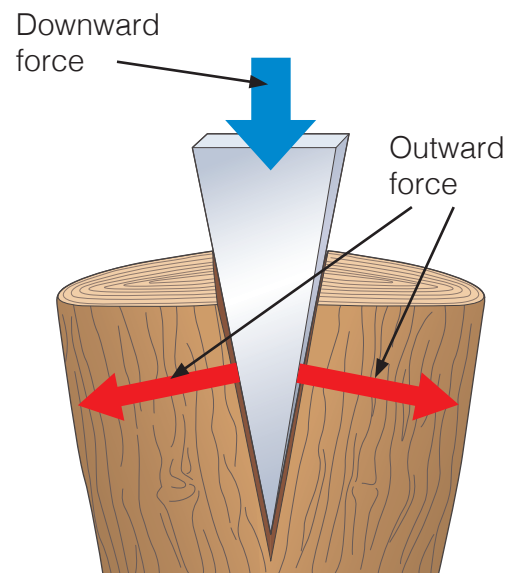
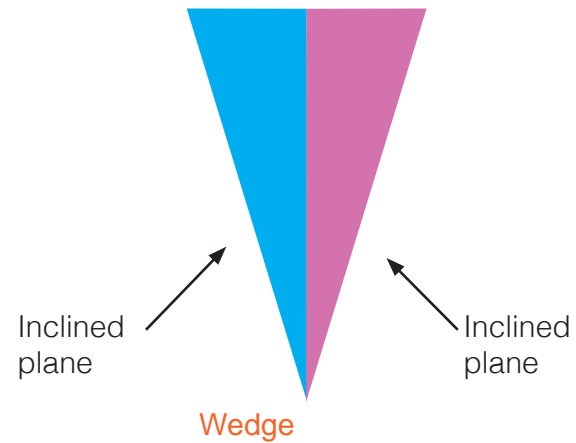
Summary

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.

The narrower the wedge, the easier it is to cut or split objects apart.



A wedge changes a downward force to an outward force.



Cutting an apple with a knife



Splitting a log with an axe



Holding back a door with a doorstop

Lesson 7: "Screw"

A screw is a simple machine. We can understand the screw by wrapping the paper around a pencil. The spiral shaped is a screw.



? How does a screw work?



Activity : Turning a screw

What We Need:

- ➔ nail, screw, hammer, screwdriver, a piece of wood



Look at a nail and a screw. How are they alike or different?

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.

When you turn a screw, in which way do you turn the screw and how does the screw move?



Summary

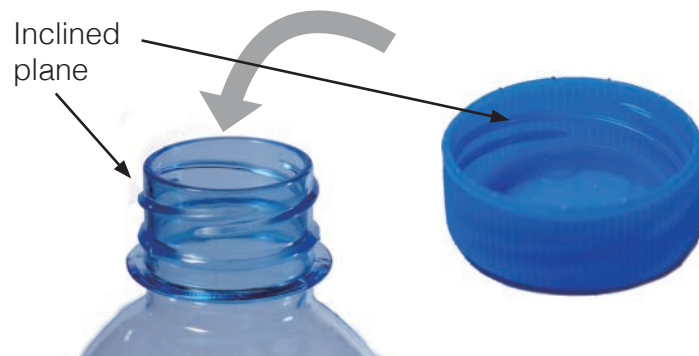
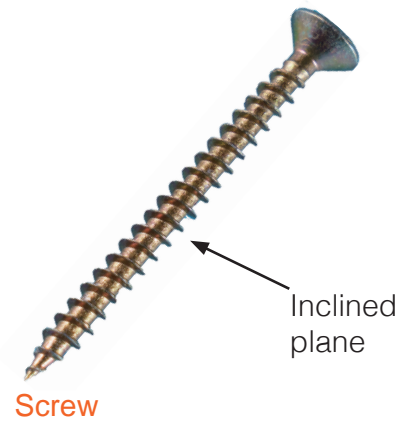
A **screw** is a simple machine made up of an inclined plane wrapped around a cylinder or a cone.

Screws are used to hold objects together.

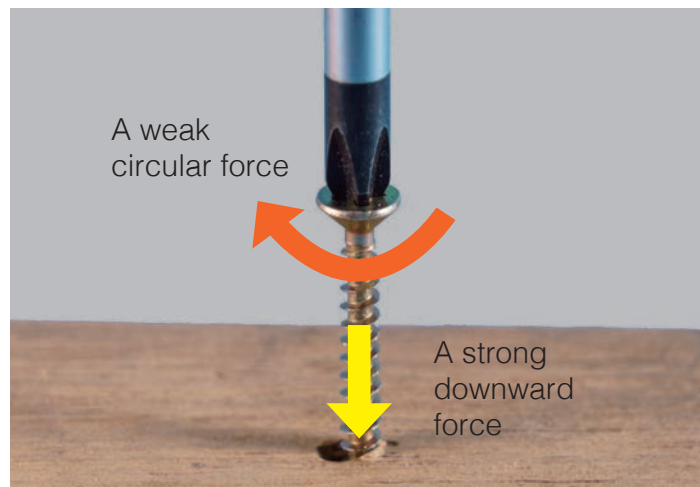
The top of a plastic bottle has an inclined plane and a bottle cap has a matching inclined plane on the inside. When we turn the bottle cap, the inclined planes help it to hold the bottle and the cap better.

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.



Inclined plane helps it to hold or tighten the plastic bottle.



Screws can change a weak force to a strong downward or upward force.



Bolt









Car jack



Light bulb

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.

<p>Lever</p> <p>A lever is made up of an arm and a fulcrum. It is easier to lift and move objects with a lever.</p>	
<p>Inclined Plane</p> <p>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.</p>	
<p>Pulleys</p> <p>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.</p>	
<p>Wheel and Axle</p> <p>A wheel and axle is made up of two parts; a wheel and an axle.</p> <p>When we turn the wheel with a weak force, it changes to a strong force on the axle.</p>	
<p>Wedge</p> <p>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.</p>	
<p>Screw</p> <p>A screw is made up of an inclined plane wrapped around a cylinder or a cone. They are used to hold objects together.</p>	

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 a cone.

Q2. Choose the letter with the correct answer.

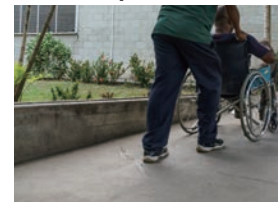
(1) Which of these shows a Wheel and Axle?

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




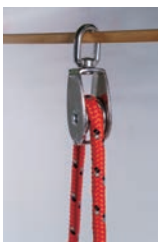


B. Wedge

C. Screw

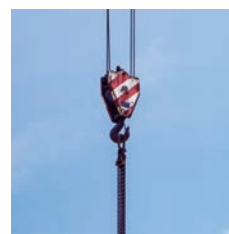
D. Pulley

Q3. Answer the question below.

What type of simple machines are shown in the pictures?

					
1.	2.	3.	4.	5.	6.

Q4. Explain the difference between a fixed pulley and a movable pulley.



Chapter 16

•Science Extras•

Speed of animals

What animal is the fastest on the land? The cheetah is the fastest land animal in the world. It runs much faster than every other land animal alive today. The fastest human in the world recorded about 9.6 seconds to run 100 metres, while the cheetah can run the same distance in only 3.2 seconds in the same distance.

Cheetahs live in Africa



A cheetah is the fastest land animal in the world!



Different animals move at different speed

Chapter Test

16. Force and Motion

Q1

Complete each sentence with the correct word.

- (1) An object's _____ is its location or place.
- (2) The measure of how fast an object is moving is its _____.
- (3) A simple machine is a tool that can make _____ 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

Q3

(1) What is a type of simple machine often used to hold things together?

(2) A doorknob is an example of what kind of simple machine?

(3) Label the simple machine found in each picture below.



(4) What are the three things that describe the motion of an object?

Q4

(1) How does a pulley make work easier?

(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?

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 [$^{\circ}\text{C}$].



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:

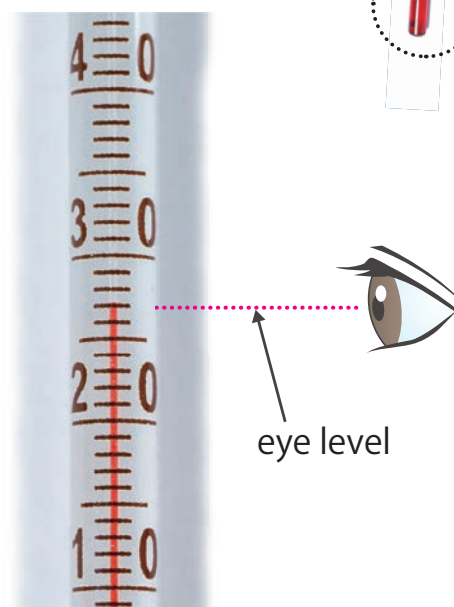
Wait for a few minutes until the liquid in the tube stops moving. Position your eyes at the same level with the top of the liquid in the tube.

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 .

Thermometer

bulb



eye level

How to use a 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.



Compass

2. Finding directions

STEP 1:

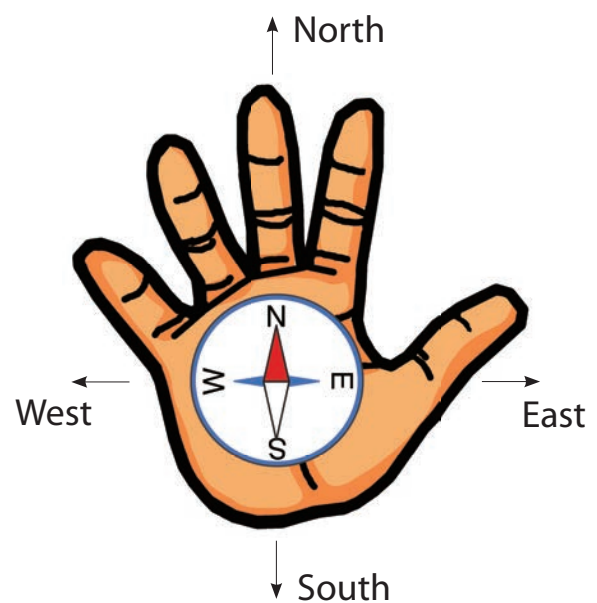
When you want to face North, place the compass flat on your palm and hold your palm in front of your chest as shown in the picture on the right.

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:

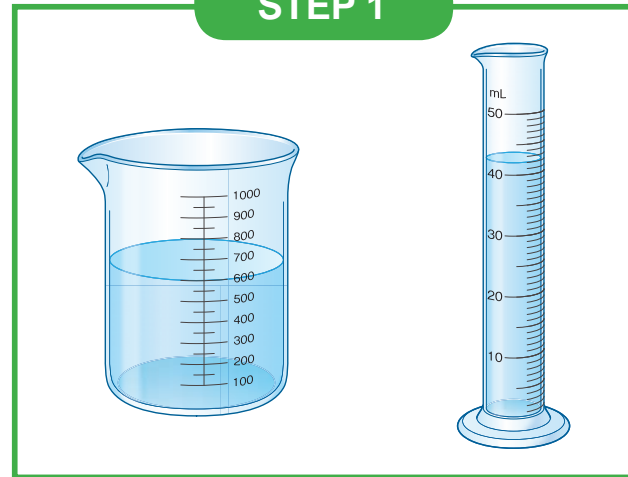
Position your eyes at the level with the top of the water. Read the scale line that is closest to the surface of the water.

If the surface of the water is curved up on the sides, look at the lowest point of the curved water surface.

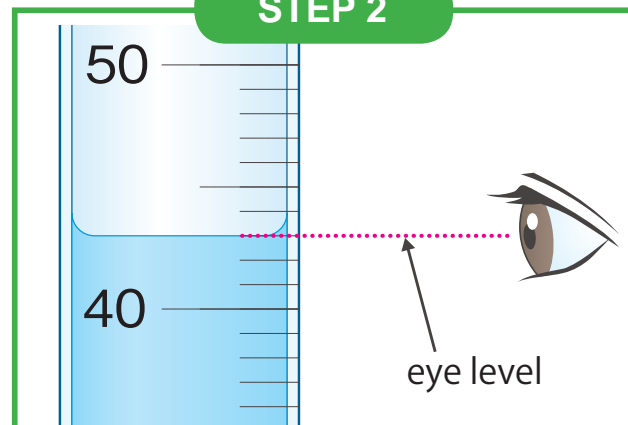
STEP 3:

Read the measurement on the scale. The volume of water in the figure on the right is 43 mL.

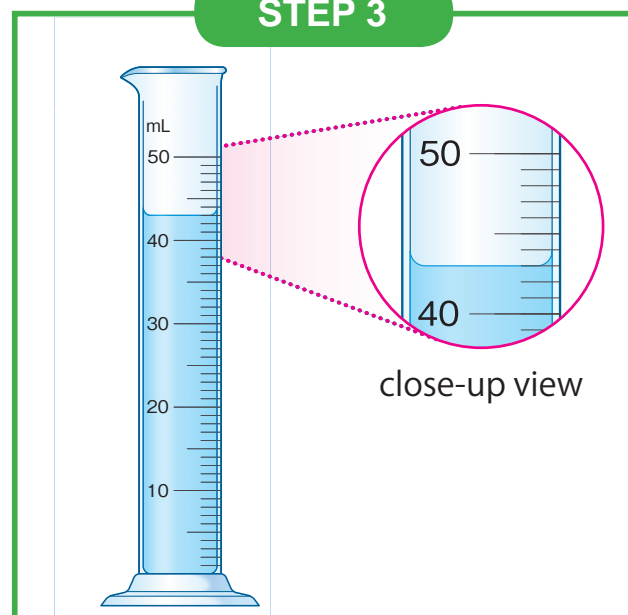
STEP 1



STEP 2



STEP 3



Answer of Exercise

Chapter 1, Topic 1, Page 18

- Q1 (1) energy (2) oxygen (3) shelter (4) food (5) food
- Q2. (1) D (2) A
- Q3. (1) The bird eats insects living on the skin of the buffalo. (2) When the bird eats insects on his skin, he can be free from parasites.
- Q4. (Example of the answers) Our people eat fish, chicken, pigs, taro, potato, sago, and vegetables. We use palm trees and banana leaves for making house and make clothes from cotton and animal furs.

Chapter 3, Topic 1, Page 36

- Q1. (1) pottery (2) pollution (3) landfill (4) compost
- Q2. (1) D (2) A
- Q3 (1) People use it for growing plants / People build houses and buildings on it / People make pottery and art work / People use it to burry rubbish (2) (Example of the answer) Waste disposal on the soil / To many uses of fertilizer or insecticides in agriculture / Harmful materials left behind in soil after mining of natural resource.
- Q4. (Example of answer) Soil pollution can be prevented by: picking up trash or rubbish / putting trash or rubbish in correct places / using the 3R's (reduce, reuse and recycle) / using compost instead of fertilizers, etc.

Chapter 5, Topic 1, Page 54

- Q1. (1) Air (2) Wind (3) compressed (4) volume
- Q2. (1) C (2) C
- Q3. Pump for tyre, balloon, a tyre, a ball
- Q4 (Example of the answer) Air can be seen through the moving leaves of palm trees.

Chapter 6, Topic 1, Page 66

- Q1. (1) Temperature (2) Clouds (3) Precipitation (4) Wind
- Q2. (1) D (2) D
- Q3. (1) Thermometer (2) temperature (3) It is used to measure strength and direction of wind.
- Q4. (Example of the answer) On a sunny day people can go swimming, go to the market or gar-

den, and play outdoor sports and so on / On a rainy day people use umbrella to cover themselves from getting wet, stay indoors and so on / On a cold day people wear warm clothes and sit by a fire place to keep warm and so on.

Chapter 8, Topic 1, Page 80

- Q1. (1) electricity (2) Thomas Edison (3) electricity (4) outlet (5) battery
- Q2. (1) D (2) B
- Q3. (1) The cord of the TV has to be connected to the outlet (2) Because it uses dry cells/ battery as a power source.
- Q4. (Example of the answer) No dry cells(battery) inside / Flat dry cells (battery)

Chapter 8, Topic 2, Page 90

- Q1. (1) electricity(2) negative (3) metal (4) conductors (5) insulator
- Q2. (1) D (2) B
- Q3. (1) Bulb socket (2) Bulb (3) Wires (4) Battery (5) Switch
- Q4. (Example of the answer) The rubber is an insulator. It prevents the electric current from flowing through our body and getting electric shocks.

Chapter 2,4,7,9, Page 100

- Q1. (1) seed (2) Plant (3) Fruits (4) Life cycle
- Q2. (1) A (2) D
- Q3.

	Peanut	Water melon
Colour	Brown	Green skin and red fruits
Shape	Beans shape	Ball shape
Juicy or dry	Dry	Juicy
Hard or soft	Hard	Soft

- Q4. Herbs normally die after producing seeds, but many new herbs will grow from the seeds.

Chapter 10, Topic 1, Page 114

- Q1. (1) Egg (2) Fish (3) Larva
- Q2. (1) D (2) C
- Q3 The living things cannot lay eggs and their offspring cannot start their life cycles and maintain their numbers. The living things will disappear from the world.
- Q4. Both plants and animals start to grow from small shape called seeds or eggs. They gradu-

ally grow by changing shapes and finally reproduce their seeds or eggs and continue life cycle of next generations.

Chapter 11, Topic 1, Page 128

Q1. (1) vibrate (2) Vibration (3) Volume (4) medium (5) pitch

Q2. (1) B (2) D

Q3. Sound

Q4. (Example of the Answer) Because there is not enough medium which the vibrations of their small voice travels through.

Chapter 12, Topic 1, Page 142

Q1. (1) physical properties (2) new (3) five

Q2. (1) C (2) D

Q3. A chemical change

Q4 (Example of the answer) By folding the coloured A4 paper to make the paper plane.

Chapter 12, Topic 2, Page 154

Q1. (1) states (2) Melting (3) Water vapour

Q2. (1) A (2) B

Q3. 100 °C

Q4 Tiny water droplets would be formed on the surface of the mirror.

Chapter 13, Topic 1, Page 168

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

Q2. (1) B (2) A

Q3. (Example of the answer) Rivers, lakes, streams, ponds and springs, etc.

Q4. (Example of the answer) 1) Evaporation: Heat from the Sun cause 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.

Chapter 13, Topic 2, Page 176

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

Q2. (1) A (2) C

Q3. (1) We use water to drink and water plants, etc. (2) Avoid throwing trash, avoid throwing oils down the drain, etc.

Q4. We will absorb the harmful materials if we eat

polluted fish.

Chapter 14, Topic 1, Page 192

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 body, we cannot keep our body shape. We cannot stand and even cannot move. Our organs inside the body are not protected and face the dangerous situation. As a result, we simply die.

Chapter 15, Topic 1, Page 204

Q1. (1) moon (2) phases (3) east / west

Q2. (1) B (2) C

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

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

Chapter 16, Topic 1, Page 216

Q1. (1) position (2) Distance (3) direction (4) Speed

Q2. (1) A (2) C

Q3. (1) Force

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.

Chapter 16, Topic 2, Page 232

Q1. (1) machine (2) force (3) lever (4) wedge (5) screw

Q2. (1) C (2) B

Q3. (1) Lever (2) Screw (3) Inclined plane (4) Pulley (5) Wheel and axle (6) Wedge

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 moved.

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
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

Animals of PNG



▲ Raggiana bird of paradise



■ New guinea crocodile



● Common spotted cuscus



▲ White-naped friarbird



◎ Emerald green snail



▲ Papuan hornbill



▲ Blue crowned pigeon



● Flying fox



▲ Southern cassowary



● Agile wallaby



● Goodfellow's tree kangaroo



● Barramundi



■ Pig-nosed turtle



■ Salvadori monitor



▲ Australian pelican



▲ Black-capped lory



★ Golden stag beetle



■ Green sea turtle



◆ White's tree frog



○ Yellowfin tuna



○ Whale shark



■ Green tree python



▲ Red-knobbed imperial pigeon



★ Rhinoceros beetle



○ Skipjack tuna



◎ Coconut crab



○ Lacey scorpionfish



○ Map puffer



● Bottlenose dolphin



★ Queen alexandra's birdwing



○ Clownfish



■ Saltwater crocodile



● Dugong

continued →

● Mammals

▲ Birds

■ Reptiles

◆ Amphibians

● Fish

★ Insects

◎ Others

Animals in Land and River



● Short-beaked echidna



● New Guinea quoll



● Sugar glider



● Chestnut tree mouse



▲ Fawn breasted bowerbird



▲ Papuan frogmouth



▲ Azure kingfisher



▲ Grey crow



■ Slender emo skink



■ Ground gecko



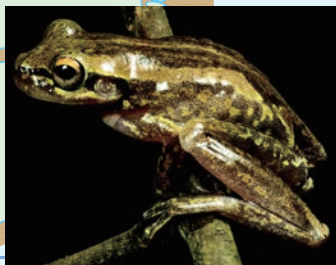
■ Papuan tree dragon



■ Slaty-grey snake



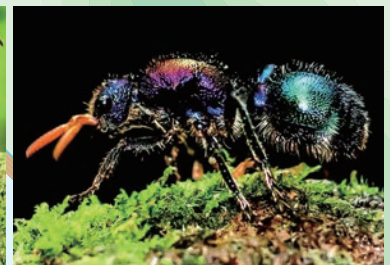
◆ Striped rocket frog



◆ Brown river tree frog



★ Longhorn beetle



★ Rainbow ant



★ New Guinea birdwing



★ Katydid



◎ New Guinea tarantula



◎ Freshwater crab

Animals of PNG

Animals in Ocean



● False killer whale



■ Leatherback turtle



● Pacific crown toby



● Blue-girdled angelfish



● Teira batfish



● Yellow and blueback fusilier



● Purple anthias



● Grey reef shark



● Manta ray



● Blackfin barracuda



● Denise's pygmy seahorse



● Ornate ghost pipefish



● Cuttlefish



● Nudibranch



● Painted spiny lobster



● Squat shrimp



● Giant clam



● Cushion seastar

National Science Grade 4 Textbook Development Committee

The National Science Textbook was developed by Curriculum Development Division (CDD), Department of Education in partnership with Japan International Cooperation Agency (JICA) through the Project for Improving the Quality of Mathematics and Science Education (QUIS-ME Project). The following stakeholders have contributed to manage, write, validate and make quality assurance for developing quality Textbook and Teacher's Manual for students and teachers of Papua New Guinea.

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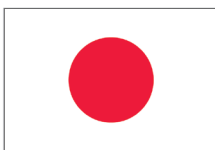
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Cooperation

Japan International Cooperation Agency (JICA), Department of National Planning & Monitoring (DNPM), PNG Conservation & Environment Protection Authority (CEPA-JICA Biodiversity Project), PNG Forest Authority (PNGFA-JICA, PNG FRIMS Project), Piku Biodiversity Network Inc., Okayama University, Naruto University of Education, Gakko Toshu Co.,Ltd., Bank of Papua New Guinea, Gaire Primary School, Iobuna Kouba Primary School, Koki Primary School, Koiari Park Primary School, St. John Primary School, St. Peter Primary School, St. Therese Primary School, Soger Primary School, Tubuseria Primary School and Wardstrip Primary School





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