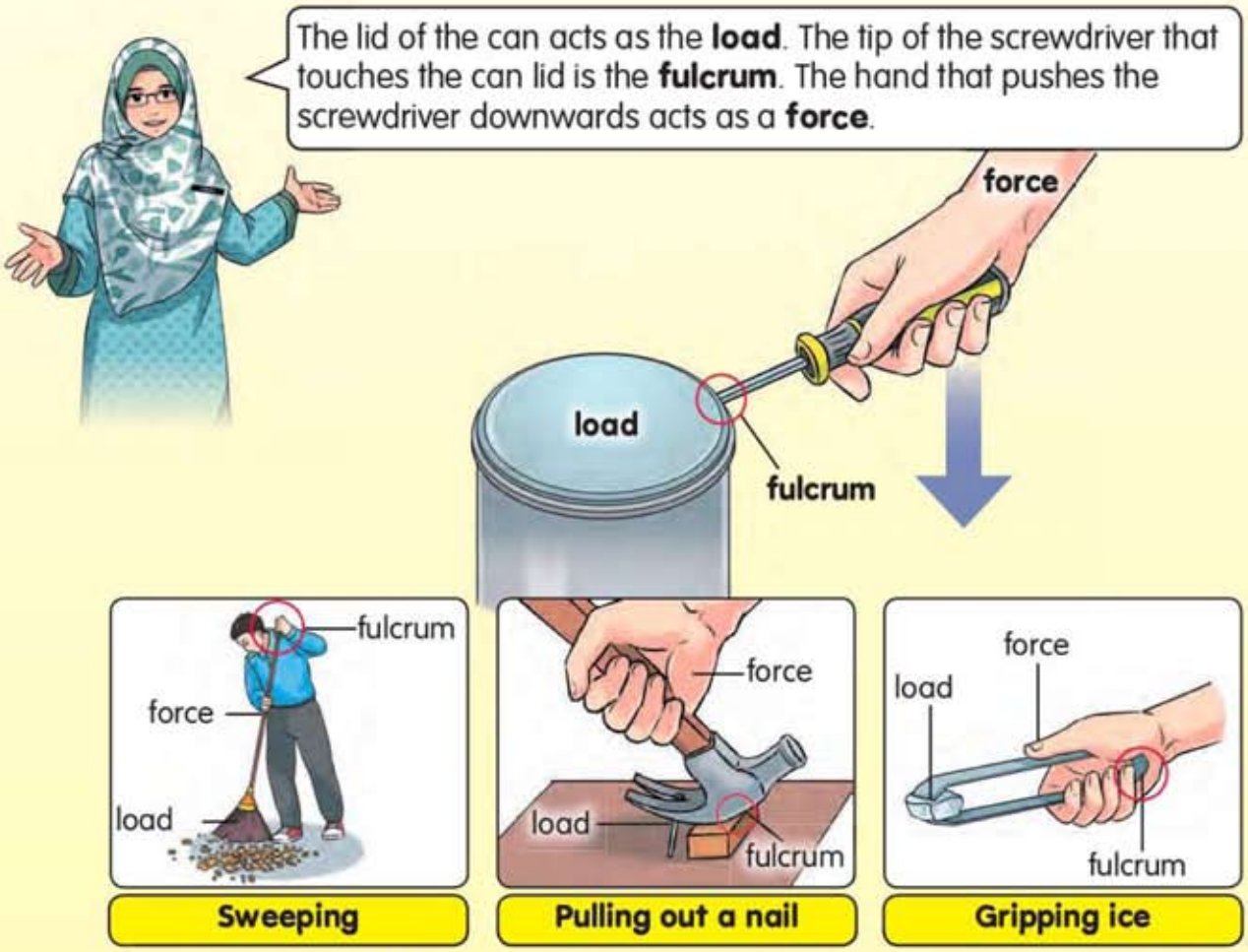
UNIT 10

MACHINES

What are the machines found in the pictures below that facilitate our daily work?

Lever

Siva wants to open the lid of a can of paint using a screwdriver. Do you know that the screwdriver Siva uses functions as a lever? A lever is used to lift or pry out an object. The lever consists of three parts; **load**, **fulcrum**, and **force**.



- Load is the weight of an object.
- Fulcrum is a point on a beam that functions to support and balance the beam.
- Force is the push and pull action which gives effects to an object.

FUN ACTIVITY Determining the Positions of Load, Fulcrum, and Force

GROUP ACTIVITY

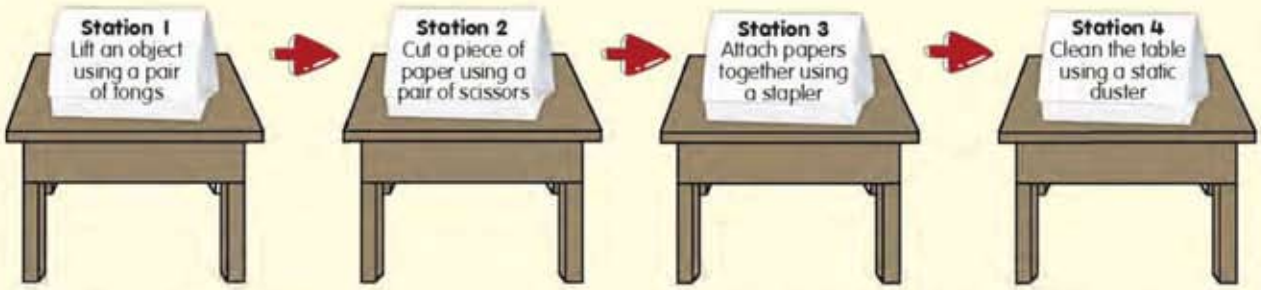
Apparatus and Materials

Task cards, answer cards, tongs, scissors, stapler, static duster, pencil, paper

Example of an answer card

Steps

1. Each group is provided with a piece of answer card as shown in the example.
2. Each group takes turns to move to every station to perform the activities.
3. A team member performs the activity based on the task card at each station as follows:



4. The other group members observe and determine the positions of the load, fulcrum, and force for each object. Record the results of the discussion by labelling the group's answer card.
5. After completing the activities in all the stations, compare the results of your group discussions with the other groups.

Question

Based on the activities above, are the positions of the fulcrum, force, and load that you have identified the same for all the objects?

TEACHER'S NOTES

The answer cards can be accessed through the QR code. Teachers are encouraged to print the cards before conducting the activities.

Relationship between Load, Fulcrum, and Force

Do you know that the position of fulcrum from the load affects the force needed to lift an object? Observe the situation below.

Based on the situation above, what can you conclude about the relationship between the distance of the load from the fulcrum and the force needed to lift the load?

The closer the load from the fulcrum, the lesser the force that is needed to lift the load.

LET'S TEST — Relationship Between Distance of Load from Fulcrum and Force

GROUP ACTIVITY

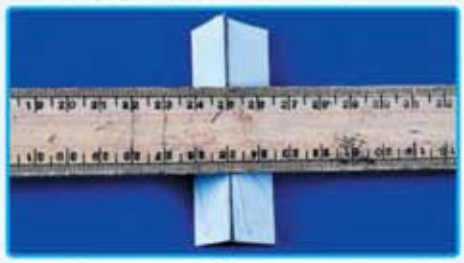
Aim To investigate the relationship between the distance of load from the fulcrum and the force needed to lift the load.

Apparatus and Materials 50 cm-ruler, wooden block (5 cm x 5 cm x 5 cm), fulcrum triangle

Guide to make a fulcrum triangle

Steps

1. Place the wooden block at one end of the ruler.



2. Place the fulcrum triangle at a position of 25 cm from the wooden block.

3. Press the other end of the ruler to lift the wooden block.
4. Repeat the step by placing the fulcrum triangle at a distance of 20 cm and 15 cm from the wooden block.
5. Identify the difference in the force needed for each change in the position of the fulcrum triangle.
6. Present the result of the investigation in the form of MS PowerPoint slides.

Questions

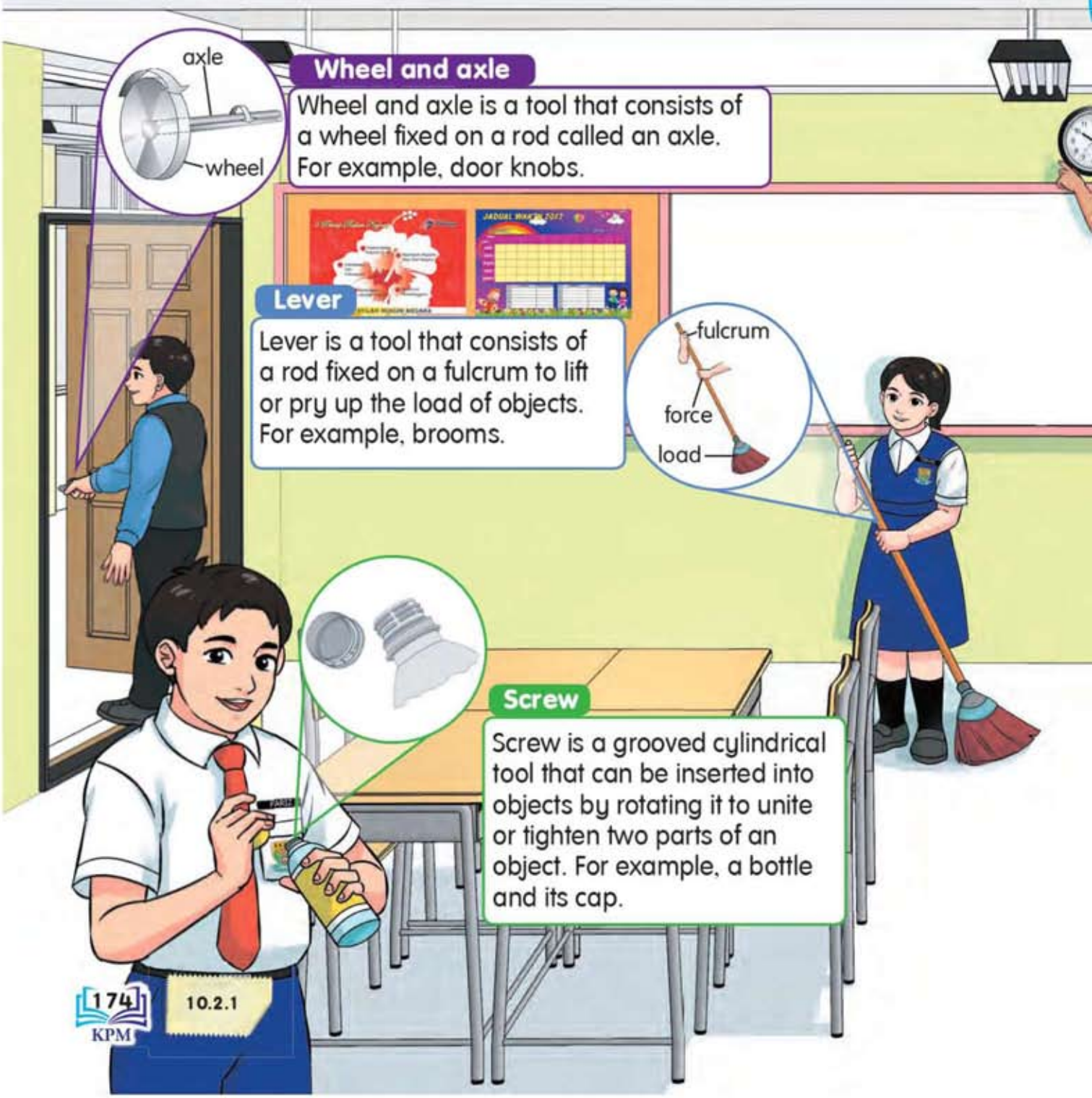
1. In which position of the fulcrum triangle would the wooden block be difficult to lift?
2. What is the relationship between the difficulty in lifting the wooden block and the force needed?
3. What is the relationship between the distance of load from the fulcrum triangle and the force needed?

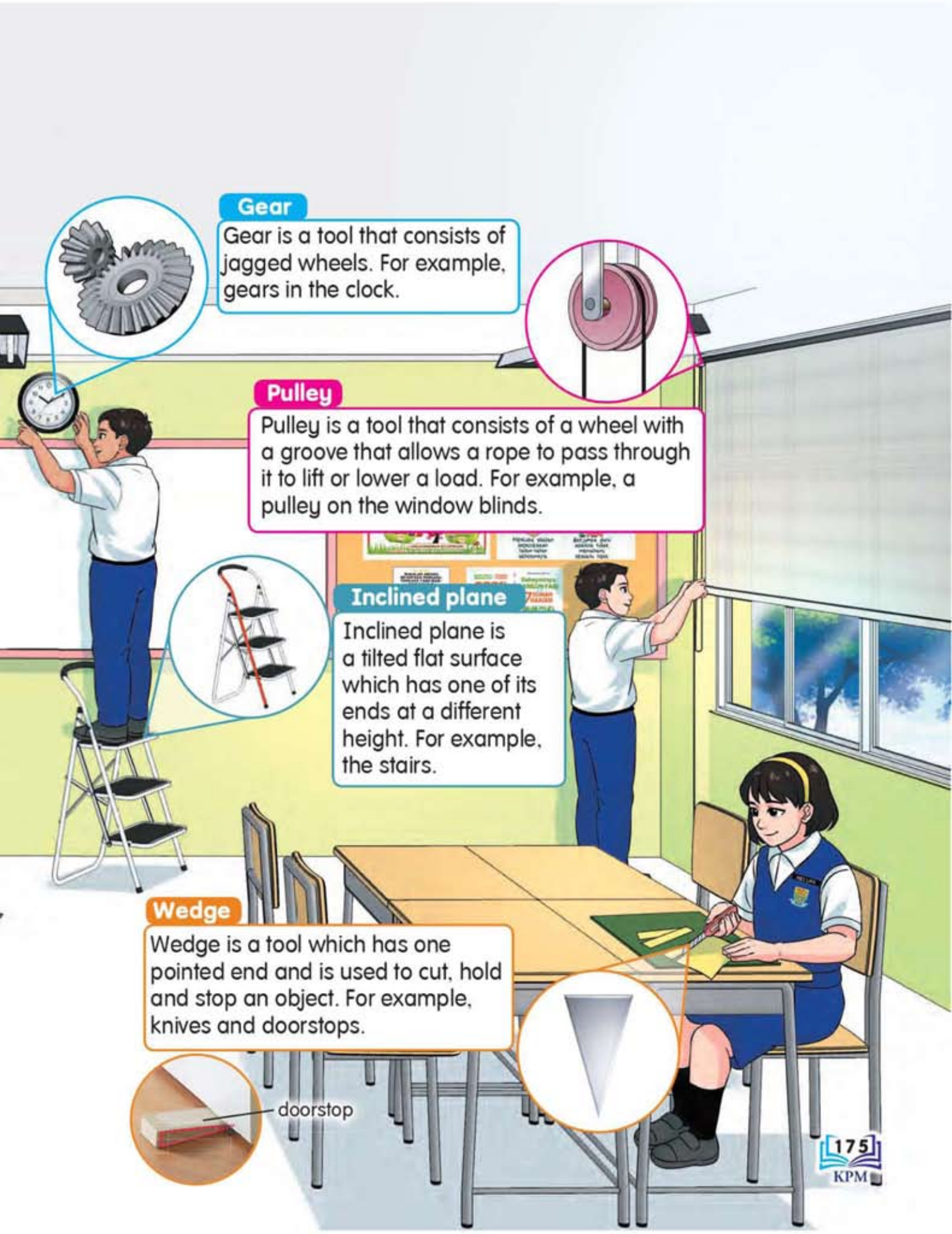
TEACHER'S NOTES

The fulcrum triangle may be replaced with other suitable objects.

Simple Machines

The simple machine is a tool that helps us to work more easily and quickly. There are various types of simple machines around us. Each simple machine has its own specific use. Let us learn about the types of simple machines in the situation below.




Gear
Gear is a tool that consists of jagged wheels. For example, gears in the clock.
Pulley
Pulley is a tool that consists of a wheel with a groove that allows a rope to pass through it to lift or lower a load. For example, a pulley on the window blinds.
Inclined plane
Inclined plane is a tilted flat surface which has one of its ends at a different height. For example, the stairs.
Wedge
Wedge is a tool which has one pointed end and is used to cut, hold and stop an object. For example, knives and doorstops.
doorstop

FUN ACTIVITY Simple Machines and Their Uses

Tools and Materials

Manila card, various coloured marker pens

GROUP ACTIVITY

Steps

1. 

Every group identifies simple machines that are found all around the school.

2. List the simple machines on the manila card in the form of a table as shown below.

No.	Object	Type of simple machine	Use
1	chopsticks	lever	pick up pieces of food
2			

3. Discuss the types of simple machines and their uses. Present the result of discussion in front of the class.

Question

Give one example for each type of simple machine that is found in your daily life. Explain the uses of these simple machines.

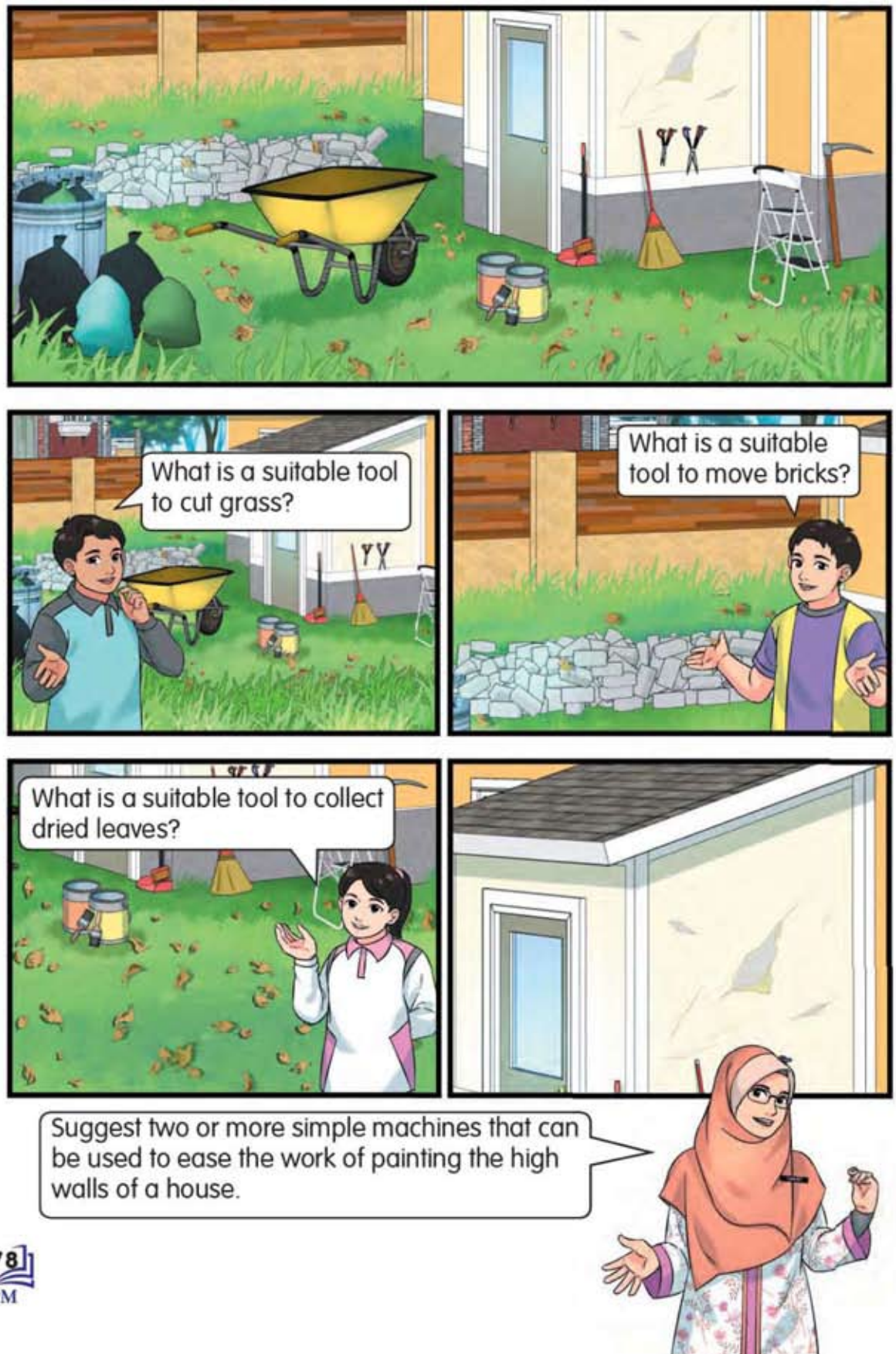
Is a rubber able to lift a textbook using the lever machine? Explain.

Uses of Simple Machines to Solve Problems

Teruni and her father are having a problem moving heavy things into the lorry. Observe the situations below.

The problem in the situation above can be solved by using two types of simple machines; a tilted board and a trolley. The tilted board is an inclined plane, while the trolley is a wheel and axle. The more the number of simple machines used, the easier and faster the work can be done.

Observe the situations below.



FUN ACTIVITY The Problem Solver Machine

GROUP ACTIVITY

Apparatus and Materials

Manila card, various coloured marker pens

Steps

1. 

Each group identifies a problem faced in their daily lives. Then, discuss ways to solve the problem by designing model of a machine.

2. 

Sketch the design of the model based on the group discussion.

3. 

The group work is presented in front of the class.

Question

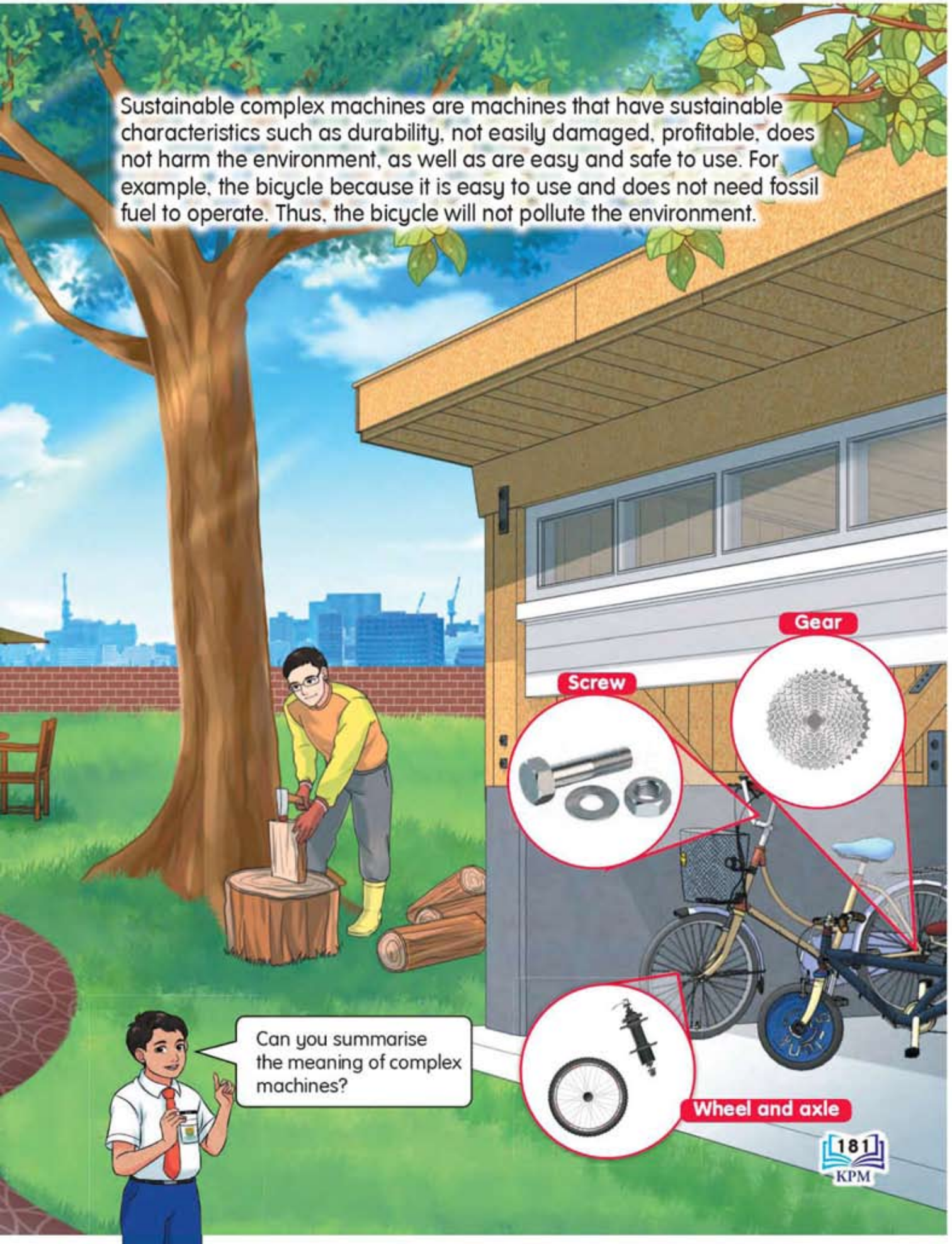
Based on the design of your model, what are the types of simple machines that can be found in it?

Why do the hands of a clock (seconds, minutes, and hours) move at different speeds?

Complex Machines

Do you know that some of the tools used in our daily lives consist of a combination of a few types of simple machines? Let us identify the simple machines found in the objects below.

Sustainable complex machines are machines that have sustainable characteristics such as durability, not easily damaged, profitable, does not harm the environment, as well as are easy and safe to use. For example, the bicycle because it is easy to use and does not need fossil fuel to operate. Thus, the bicycle will not pollute the environment.



FUN ACTIVITY Past and Present

PAIR WORK ACTIVITY

Apparatus and Materials

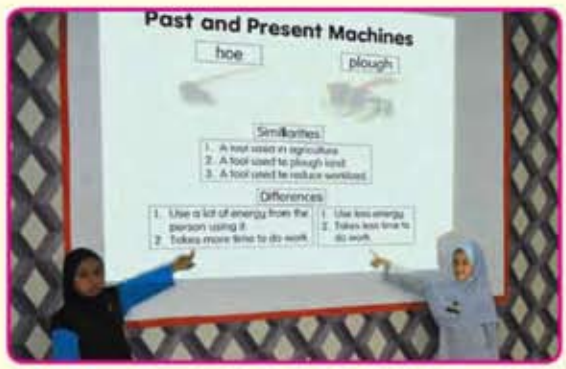
Picture cards, flip chart paper, marker pen

Steps

1. Each pair is given two picture cards of machines used in the past and present.

2. Gather information on the importance of inventing a sustainable machine based on picture cards received from various sources.

3. Share the information with your partner.



4. Present creatively in the form of a graphic organizer using MS PowerPoint slides.

Question

Why is the invention of a sustainable machine important?

FUN SCIENCE — The Robotic Hand

Steps

Build a simple machine in the form of a robotic hand using hot glue gun and recycled materials such as popsicle sticks, skewer, and bottle caps. The design of the robotic hand can be modified depending on your creativity.

MIND REFLECTION

1. Lever is an example of a simple machine that consists of three parts; **load**, **fulcrum**, and **force**.

2. A fulcrum placed near to the load needs only a little force to lift the load.
3. A simple machine is a tool that enables us to do things faster and easier.
4. There are various types of simple machines such as **lever**, **gear**, **pulley**, **wedge**, **screw**, **inclined plane** as well as **wheel and axle**.
5. A complex machine consists of a combination of more than one simple machine.
6. Sustainable machines are machines that are durable, not easily damaged, profitable, have no harmful effects on the environment as well as easy and safe to use.

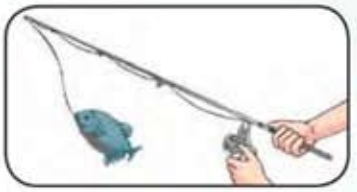
MIND TEST

Answer all questions in the Science exercise book.

1. Label the load, fulcrum, and force on the lever machine below.

(a) 

(b) 

(c) 

2. (a) Simple machines consist of wedge, _____, wheel and axle, _____, gear, _____, and lever.

   (b) _____ is a tool consists of a wheel fixed on a rod called an axle.

   (c) The screw is a grooved cylindrical tool that can be inserted into an object by rotating it to _____ two parts of an object.

3. State the simple machines found in the following tools:

(a) 

Mechanical pencil sharpener

(b) 

Bicycle

4. What is a complex machine?

5. Tick (✓) the most suitable tool to open the object below.

(a)  ☐

(b)  ☐

(c)  ☐