Chapter 12: Simple Machines

EXERCISE [PAGE 90]

Exercise | Q 1.01 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
A wedge

SOLUTION

A wedge – An inclined plane

Exercise | Q 1.02 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
A needle

SOLUTION

A needle – An inclined plane

Exercise | Q 1.03 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
A staircase

SOLUTION

A staircase – An inclined plane

Exercise | Q 1.04 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
A slide

SOLUTION

A slide – An inclined plane

Exercise | Q 1.05 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
The wheel of a flagpole

SOLUTION

The wheel of a flagpole – A pulley

Exercise | Q 1.06 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
Nutcrackers

SOLUTION

Nutcrackers – A lever

Exercise | Q 1.07 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
Scissors

SOLUTION

Scissors – A lever

Exercise | Q 1.08 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
An opener

SOLUTION

An opener – A lever

Exercise | Q 1.09 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
An axe

SOLUTION

An axe – An inclined plane

Exercise | Q 1.10 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
A crane

SOLUTION

A crane – A pulley

Exercise | Q 1.11 | Page 90
Classify the following as a lever, a pulley and an inclined plane:
A knife

SOLUTION

A knife – An inclined plane

Exercise | Q 2.1 | Page 90
Fill in the blanks using the proper word and complete the statement.
The _____ in the centre, the _____ on one side and the _____ on the other side make a lever of the first order.

SOLUTION

The **fulcrum** in the centre, the **load** on one side and the **effort** on the other side make a lever of the first order.

Exercise | Q 2.2 | Page 90
Fill in the blanks using the proper word and complete the statement.
The _____ in the centre, the _____ on one side and the _____ on the other side make a lever of the second order.

SOLUTION

The **load** in the centre, the **fulcrum** on one side and the **effort** on the other side make a lever of the second order.

Exercise | Q 2.3 | Page 90
Fill in the blanks using the proper word and complete the statement.
The _____ in the centre, the _____ on one side and the _____ on the other side make a lever of the third order.

SOLUTION

The **effort** in the centre, the **load** on one side and the **fulcrum** on the other side make a lever of the third order.

Exercise | Q 3.1 | Page 90
Which machine will you use to do the following work? Write their type.
To remove the lid of a tin.

SOLUTION

To remove the lid of a tin, we should use an opener which is a second-order lever

Exercise | Q 3.2 | Page 90
Which machine will you use to do the following work? Write their type.
To lift bricks to the top of a tall building.

SOLUTION

To lift bricks to the top of a tall building, we should use a crane which is a pulley.

Exercise | Q 3.3 | Page 90
Which machine will you use to do the following work? Write their type.
To cut vegetables.

SOLUTION

To cut vegetables, we should use a knife which is a wedge.

Exercise | Q 3.4 | Page 90
Which machine will you use to do the following work? Write their type.

To draw water from a well.

SOLUTION

To draw water from a well, we should use a pulley system or wheel-axle.

Exercise | Q 3.5 | Page 90
Which machine will you use to do the following work? Write their type.
To hold a papad for roasting it.

SOLUTION

To hold a papad for roasting it, we should use a tong which is a third-order lever.

Exercise | Q 4.1 | Page 90
Write the answer to the following question in your own words.
What is meant by simple machines?

SOLUTION

Simple machines are tools that help people work faster and better. These help us lift heavy loads, change the speed of the motion or the direction of the force. Examples are simple machines are knife, nutcrackers, etc.

Exercise | Q 4.2 | Page 90
Write the answer to the following question in your own words.
Mention the advantages of using a machine.

SOLUTION

The advantages of using a machine are:

- More work can be done in lesser time as well as with great accuracy
- Less effort has to be applied to accomplish the task

Exercise | Q 4.3 | Page 90
Write the answer to the following question in your own words.
What is meant by complex machines?

SOLUTION

A machine made up of two or more simple machines is called a complex machine. It consists of different parts that carry out different tasks and together contribute to the working of the machine. The most common example is that of a bicycle.

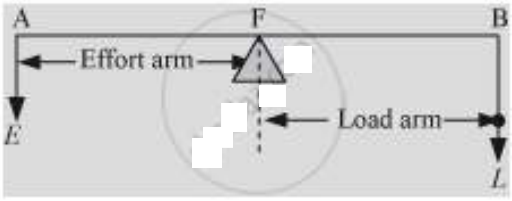
Exercise | Q 4.4 | Page 90
Write the answer to the following question in your own words.
What is a lever? How are the orders of the lever determined?

SOLUTION

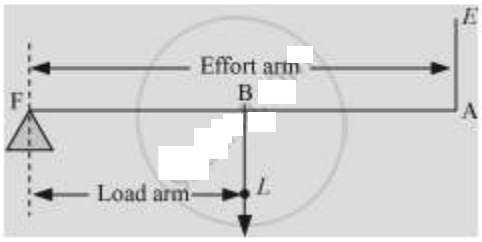
A lever is a simple machine consisting of a rigid rod that is capable of turning around a pivot called a fulcrum. It has three parts, namely, effort, load, and fulcrum.

- Fulcrum: The rod of the lever rests on it and the lever rotates about it.
- Load: The weight lifted by the liver is called the load.
- Effort: The force applied on the other end of the rod to lift the load is called the effort.

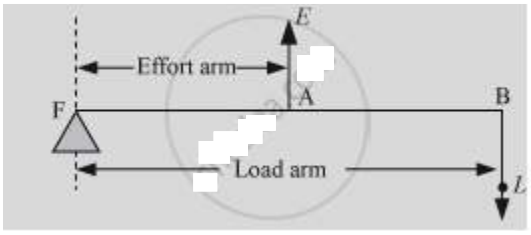
The orders of the lever are determined depending on the position of the effort, the fulcrum, and the load.
Lever of the first order: When the fulcrum is situated between load and effort, we call it a lever of the first order. For example, beam balance, a crowbar, a see-saw.



Lever of second-order: When the fulcrum and effort are situated at the two opposite ends of the lever and a load is placed in between them, we call it a lever of second order. For example, a nutcracker, a wheel-barrow, etc.



Lever of third-order: When the fulcrum and load are situated at the opposite ends of the lever and an effort is applied somewhere between them, we call it a lever of the third order. For example, a pair of tongs, a fishing rod, etc.



Exercise | Q 5.1 | Page 90
Why is this so traveller's bags have wheels?

SOLUTION

Traveller's bag has wheels so that it can be dragged easily because of reduced friction between the ground and the wheel. Thus, the wheel, a simple machine, helps to decrease the effort to be applied on the load which is a bag here.

Exercise | Q 5.2 | Page 90

Why is this so machines have to be maintained?

SOLUTION

A machine is composed of many parts. These parts rub against one another when in use. Due to this, these parts wear out with time. Also, soil and dust creates more friction between the parts which further deteriorates their condition. Even, some parts get affected by weather and thus rust and erode. Because of these factors, the machine can become useless if proper care is not given to it. So, it is very necessary that we have proper equipments and methods for the maintenance of machines. Thus, machines should be sent for maintenance check at fixed interval of time to ensure their proper working.

Exercise | Q 5.3 | Page 90

Why is this so a bicyle is said to be a complex machine?

SOLUTION

A bicycle is composed of many simple machines, such as a screw, wheel and axle, lever, pulley, which carry out different task and together contribute to its working. Thus, the bicycle is said to be a complex machine.

Exercise | Q 6 | Page 90

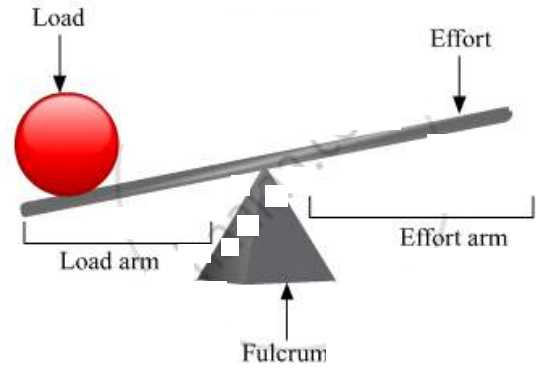
Name the levers mentioned in the following passage. Identify the fulcrum, load, and effort of each and say which type of lever it is.

Ravi and Savita sit on a see-saw in a garden. In the meantime, a gardener is trimming trees in the garden. He puts the leaves and other garbage in the wheelbarrow. Later, Ravi gets thirsty and he buys lemon sherbet. The sherbet seller cuts the lemon and squeezes it using a lemon squeezer. He puts small pieces of ice in the glass with the help of the tongs.

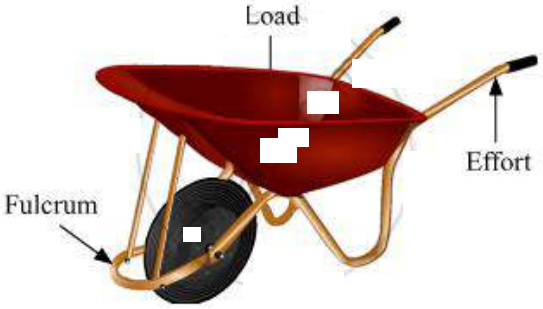
SOLUTION

Levers mentioned in the passage are:

(a) **Sea-saw:** It is a first-order lever.



(b) **Wheelbarrow:** It is a second-order lever.



(c) **Lemon squeezer:** It is a second-order lever.