2 Lever

Figure 2.1

Write the names of simple machines used in different parts of bicycle on the basis of its fingure.

Part used in bicycle / Name of part	Simple machine
Brake	
Wheel	
Nut-bolt	
Paddle.	

Thus, bicycle is prepared using different simple machines. Let us try to know more about lever, one of the types of simple machines.

- Try to push a heavy stone as shown in the figure 2.2 and note your experience here.

Figure 2.2

Now try to push the same heavy stone using big rod as shown in the figure 2.3.
Note here your experiences.

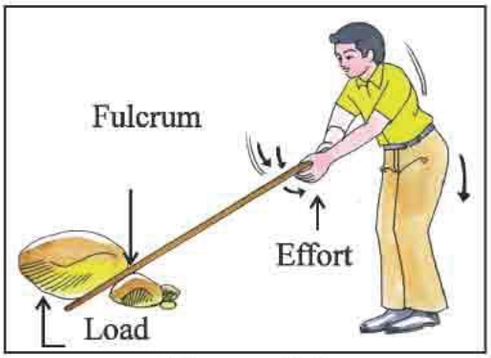

Figure 2.3

- **"A strong rod which can move with foce around point of support is known as lever".**
- **Lever is a simple machine. Lever can be used to get work done easily, quickly and with less amount of efforts.**

Parts of lever :

- **Fulcrum** : The point with respect to which rod can move freely is called fulcrum.
- **Load** : The object which can be pushed or lifted using one of the ends of lever is known as load.
- **Effort** : The force applied at one of the ends of the lever to do work is known as effort.
- **Distance of efforts** : The distance from effort to fulcrum is known as distance of effort.
- **Distance of load** : Distance from fulcrum to the load is known as distance of load.
- **Load end** : The end of the lever with which work is done is known as load end.
- **Effort End** : The end of the lever where force of effort is applied is known as effort end.

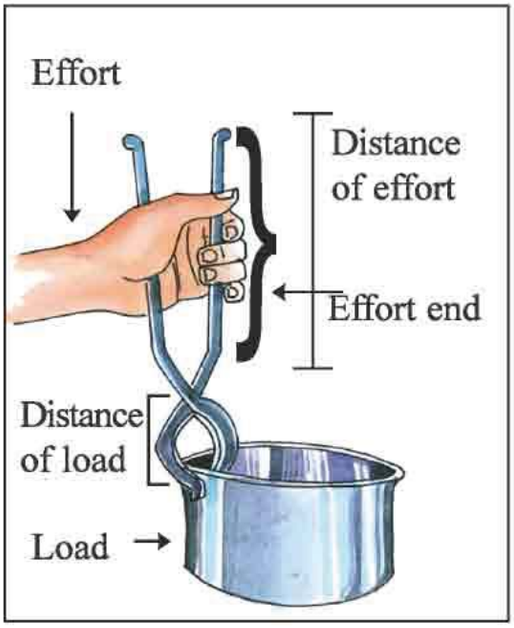

Figure 2.4

With this knowledge of parts of lever, let us try to understand how lever can be used to get work done easily and quickly.

What is required?

Approximately two ft. long and one cm thick wooden stick, masses of 20 gm, 50 gm, 100 gm and 200 gm, iron hooks, a wooden stand.

What to do?

- Scale the wooden stick 'o' at the centre and write the numbers, 10,20,30 .....at equal distances, on both the sides of the wooden stick as shown in fig. 2.5.

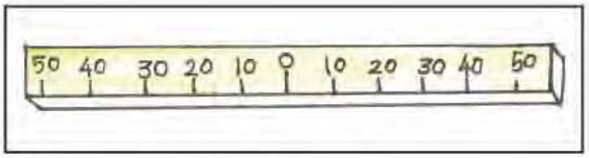

Figure 2.5

- Place the iron hooks at the marks 10, 20, 30 as shown in fig. 2.6.
- Fit this wooden stick, which can have free movement , keep in mind that wooden stick is balanced.

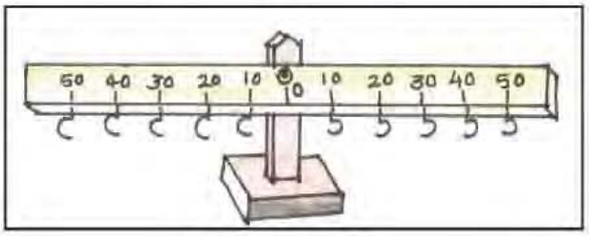

Figure 2.6

- Hang a 100 gm mass at one of the ends of wooden stick at marked 10 and observe what happened (as in fig. 2.7).

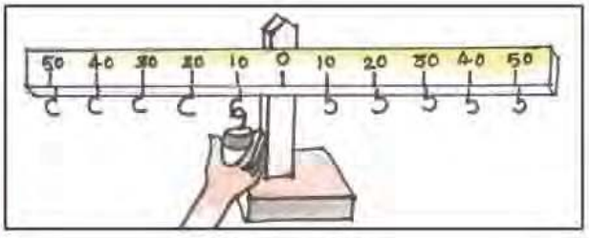

Figure 2.7

- Hang another 100 gm mass at the other side marked '10' and observe what happens. Note your observation.

- Now remove 100 gm other side and replace 50 gm mass at a distance marked 20. What happens ? Note your observation.

How has this happened?

If 100 gm mass is considered as a load and '10' unit distance as load distance from fulcrum at '0' then (100 x 10) = 1000 gm. cm the product of load and load distance (if load distance is measured in cm.) Thus, again when at the other end, 100 gm mass is considered as an effort and '10' unit distance as distance of effort from fulcrum at '0' then the product of effort and distance of effort will be 100 x 10 = 1000 gm.cm.

Thus, the product of load & load distance is equal to the product of effort and distance of effort [load x load distance = effort x distance of effort]

Thus, in similar, way 150 gm mass at unit mark '10' is replaced by 50 gm mass at unit mark '20' we get load (100 gm) x load distance (10 cm)

= effort (50 gm) x distance of effort (20 cm)

= 1000 gm cm.This causes the horizontal balance of the wooden stick.

Principle of lever :

Load x load distance = effort x distance of effort

Fill in the details in the following table using the apparatus of lever :

Obs No.	Load (gm) L	Distance of load DL (cm)	Product of load and load distance L x DL (gm/cm)	Effort E (gm)	Distance of effort DE (cm)	Product of effort & distance of effort EX DE (gm cm)
1	200	10	--------	100	--------	--------
2	400	10	--------	--------	80	--------
3	400	--------	8000	200	--------	--------

It is clear from this activity that higher distance of effort will be more useful with less effort to lift or push the load easily and quickly. Thus, work can be done easily, quickly and with less efforts using principles of lever.

What is required?

Lemon juicer, scissors, nut cracker, fork,utensil plucker, long handled broom plier-etc.

What to do?

- Complete the following table by observing the above list of objects.

object	Mark ' ✓' what is at the centre?		
	Flucrum	Load	Effort

(1) Prepare a list of objects having fulcrum at the centre

"The type of lever in which fulcrum is between the centre of load and effort is known as type-1 lever.

(2) Prepare a list of objects having load at the centre.

"The type of lever in which load is between the fulcrum and effort is known as type-2 lever.

(3) Prepare a list of objects in which position of effort is at the centre

"The type of lever in which effort is between the centre of load and fulcrum is known as type-3 lever.

Uses in daily life :

Observe the following pictures with reference to types of lever.

List the objects other than given in the previous picture where principles of different types of lever are used

We use many objects, in which the principles of lever are used in daily life. Have you noticed or observed such objects ? List them in the following table.

Sr. No.	Name of object	What is at centre?	Type of lever	Use

(1) Name of the object :

(2) Show load, effort and fulcrum in the fig. 2.8.

(3) What is the type of lever?

Figure 2.8

(4) Which part of lever is at the centre in the object shown in figure?

(5) What is the type of lever (fig. 2.9) ?

Figure 2.9

(6) Which part of the lever is at the centre in this object?

Figure -2.10

(7) What is the type of lever fig. 2.10?

Give the explanations of the following words with reference to lever :
effort, load, fulcrum

(8) Give scientific reasons :

1. The length of the hands of scissors used to cut the metal sheets are kept longer.

2. The length of the hands of scissors used by tailor is less than the length of blades is more.