



STEPPING STONE SCHOOL(HIGH)

Class : 10

Sub : Physics

Chapter : Machine (Part 2)

Date : 17.06.2020

Day : 11

Worksheet :11

Topic :Levers

Please read the notes carefully and on the basis of it copy down the questions and solve them on a clean sheet of paper arranged data wise and keep the worksheet ready in a file to be submitted on the opening day.

Definition : A lever is a rigid straight or bent bar which is capable of turning about a fixed axis.

Classes of lever

i) Class I levers

For Class I levers , the mechanical advantage and velocity ratio can have any value either greater than 1 , equal to 1 or less than 1.

E.g. see saw ,crowbar, scissors etc.

In this class of lever the fulcrum is in between the effort and the load.

ii) Class II levers

For class II levers the mechanical advantage and velocity ratio are always more than 1.

E.g. nut cracker, bottle opener, wheel barrow etc.

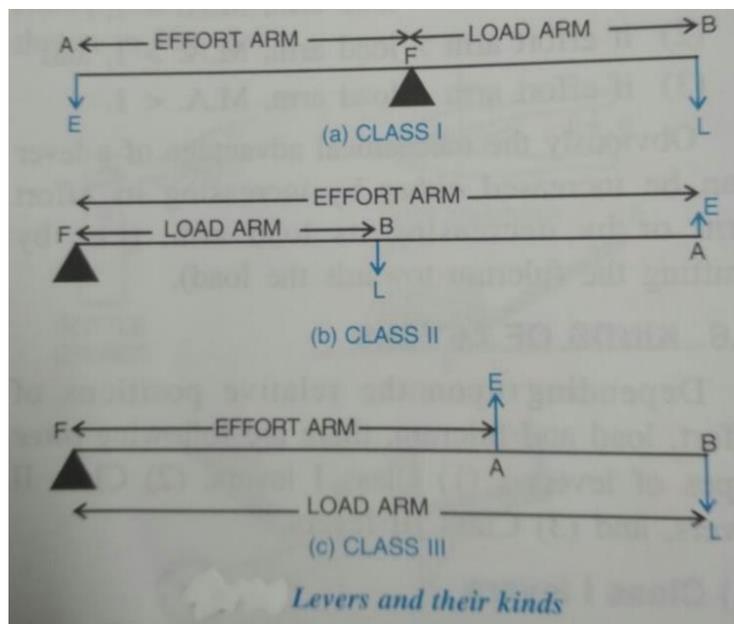
In this class of lever, the load is in between Fulcrum and effort.

iii) Class III levers

For Class III levers, the mechanical advantage and velocity ratio are always less than 1.

E.g. sugar tongs, fore arm etc.

In this class of lever the effort is in between fulcrum and load.



Principle of a lever:

Clockwise moment of load about the fulcrum = Anticlockwise moment of effort about the fulcrum.

i.e. Load x load arm = Effort x effort arm.

Numericals based on lever

A crowbar of length 120cm has its fulcrum situated at a distance of 20cm from the load. Calculate the mechanical advantage of the crowbar.

Solution:

$$\begin{aligned}\text{Load arm} &= 20\text{cm} \\ \text{effort arm} &= 120 - 20 \\ &= 100\text{cm}\end{aligned}$$

By principle of lever

$$L \times LA = E \times EA$$

Or $L/E = EA / LA$

$$\text{Or M.A} = 100/20 = 5$$

Exercise

- 1) What is a lever ? State its principle.
- 2) Explain why mechanical advantage of class III lever is always less than 1.
- 3) Give an example of each class of lever in a human body.
- 4) A pair of scissors has its blades 15cm long while its handles are 7.5cm long. What is its mechanical advantage?
- 5) Classify the following into levers as Class I, Class II or Class III
 - (i) A door
 - (ii) A catapult
 - (iii) Claw hammer
 - (iv) A wheel barrow
 - (v) A fishing rod
 - (vi) Sugar tongs

6) A force of 5kgf is required to cut a metal sheet. A pair of shears used to cut the metal sheet has its blades 5cm long. While its handles are 10cm long. What effort is needed to cut the sheet?

Please tap on the hyperlink below to see the video content.

<https://youtu.be/DXtr9-S3lxw>
