

PHYSICS - X-PART-3 CLASS 38



Mirror Equation and Focal Length

The distance of the object from the mirror = u

The distance to the image from the mirror = v

The focal length of the mirror = f

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

This is known as mirror equation

$$\begin{aligned} \frac{1}{f} &= \frac{1}{u} + \frac{1}{v} \\ &= \frac{(u + v)}{uv} \end{aligned}$$

$$f = \frac{uv}{(u+v)}$$

$$\begin{aligned} \frac{1}{u} &= \frac{1}{f} - \frac{1}{v} \\ &= \frac{(v - f)}{vf} \end{aligned}$$

$$u = \frac{vf}{(v-f)}$$

$$\begin{aligned} \frac{1}{v} &= \frac{1}{f} - \frac{1}{u} \\ &= \frac{(u - f)}{uf} \end{aligned}$$

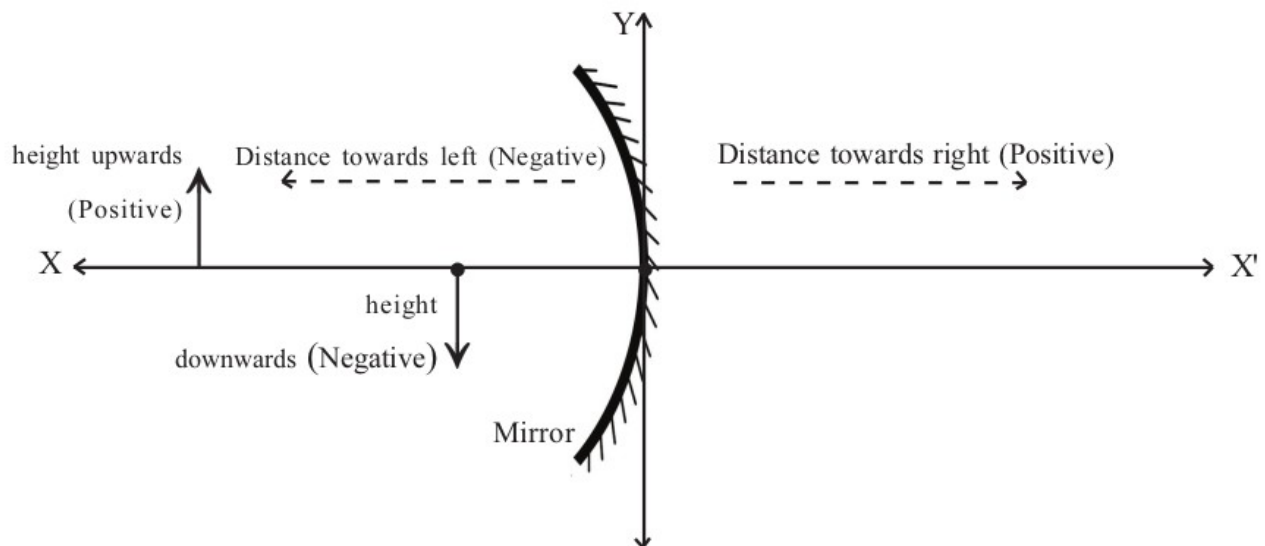
$$v = \frac{uf}{(u-f)}$$

New Cartesian Sign Convention

In all experiments related to lenses and mirrors the distances are measured in the same way as in graphs.

- Distances are measured considering the Pole of the mirror as the origin (O).
- Those measured to the right from O are positive and those in the opposite direction are negative.
- Distances measured upwards from X axis are positive and those downwards are negative. The incident ray is to be considered as travelling from left to right.

Record the measurements shown in the figure using the New Cartesian Sign Convention.



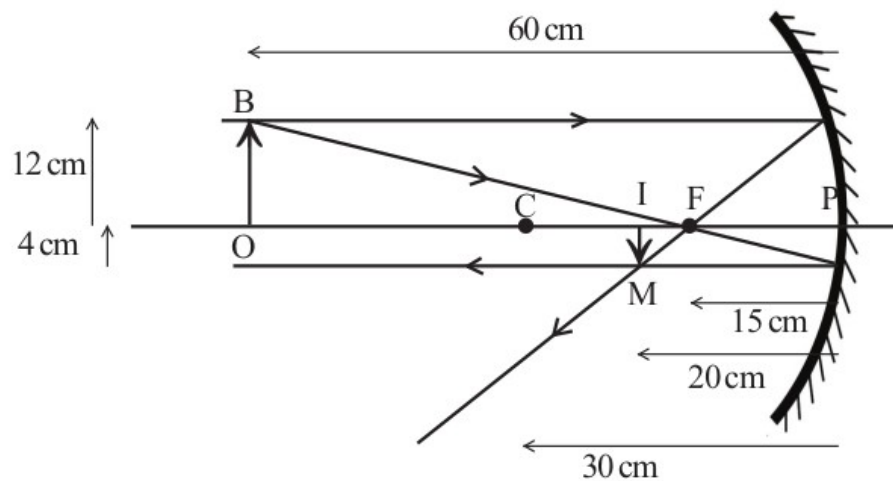
Distance to the object from the mirror (u) = **Negative**

Distance to the image from the mirror (v) = **Negative**

Height of object (OB) = **Positive**

Height of image (IM) = **Negative**

The given figure shows the image formation by a concave mirror. Analyse the figure and write down different measures using New Cartesian Sign Convention.



Distance of object from the mirror, (u)	-60 cm
Distance of image from the mirror, (v)	-20 cm
Focal length (f)	-15 cm
Radius of curvature (r)	-30 cm
Height of object (OB)	+12 cm
Height of image (IM)	-4 cm

Assignment

1. Height of image is expressed with a positive sign what are the peculiarities of the image that you can understand from this?