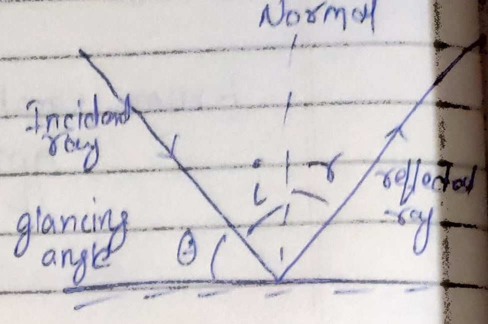
Reflection → The bouncing back of light in the same medium.

Laws of ~~Refraction~~ Reflection



1. The angle of incidence is equal to the angle of Reflection
2. The Normal, incident ray and reflected ray lie in the Same plane.

Relation between f and R

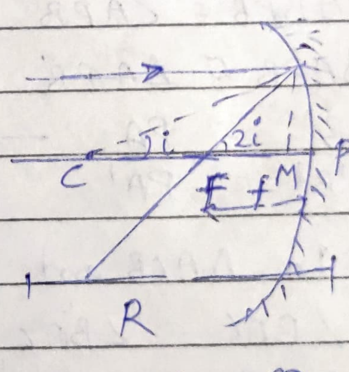
1) Using Concave mirror

In ΔAFM,

$$\tan 2i = \frac{AM}{FM} \approx \frac{AM}{PF}$$

$$2i = \frac{AM}{PF} \quad (\because 2i \text{ is Small})$$

$$i = \frac{AM}{2PF} \quad \text{—(1)}$$



In ΔACM

$$\tan i = \frac{AM}{MC} \approx \frac{AM}{PC}$$

$$i = \frac{AM}{PC} \quad \text{—(2)}$$

from equations (1) and (2)

$$\frac{AM}{2PF} = \frac{AM}{PC}$$

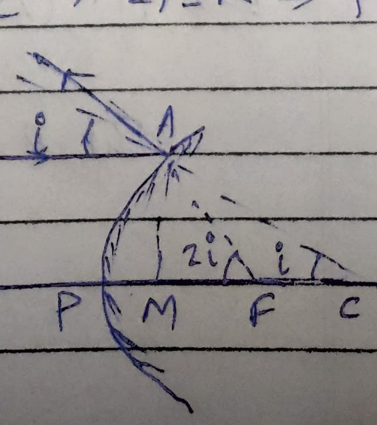
$$2PF = PC \Rightarrow 2f = R \Rightarrow f = \frac{R}{2}$$

II) using Convex mirror

In ΔAFM,

$$\tan 2i = \frac{AM}{MF} \approx \frac{AM}{PF}$$

$$2i = \frac{AM}{PF} \quad \text{—(1)}$$



In ΔAMC, $\tan i = \frac{AM}{MC} \approx \frac{AM}{PC}$

$i = \frac{AM}{PC}$ —— (2)

from equations (1) and (2)

$\frac{AM}{PC} = \frac{AM}{2PF} \Rightarrow PC = 2PF$

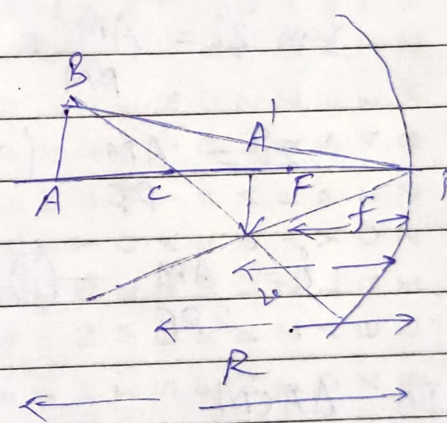
$R = 2f$

$f = \frac{R}{2}$

- Radius of Curvature of a plane mirror is infinity

Mirror Formula

1) Due to Concave Mirror



In ΔAPB & $\Delta A'PB'$

$\angle BAP = \angle PA'B'$ (90°)

$\angle ABPB = \angle A'PB'$

$\therefore \Delta APB \sim \Delta A'PB'$

$\frac{AB}{A'B'} = \frac{PA}{PA'}$ —— (1)

In ΔACB and $\Delta A'CB'$

$\angle BAC = \angle B'A'C$

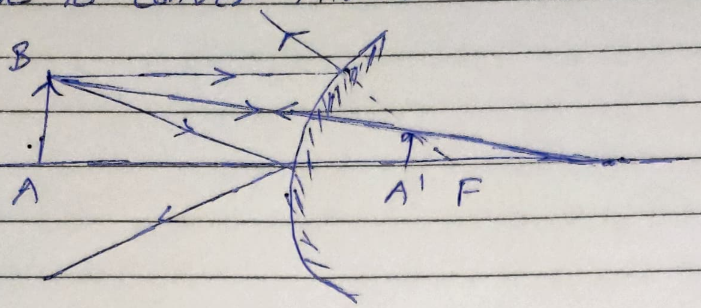
$\angle ACB = \angle A'CB'$

$\Delta ACB \sim \Delta A'CB' \Rightarrow \frac{AB}{AB'} = \frac{AC}{A'C}$ —— (2)

from (1), (2) $\Rightarrow \frac{PA}{PA'} = \frac{AC}{A'C} \Rightarrow \frac{-u}{v} = \frac{-u+R}{-R+v}$

Put $R = 2f$ and solve $\Rightarrow$ $\boxed{\frac{1}{f} = \frac{1}{v} + \frac{1}{u}}$

ii) Due to Convex Mirror



The Triangle $\Delta A'B'P$ and ABP are similar

$$\therefore \frac{A'B'}{AB} = \frac{PA'}{PA} \quad -(1)$$

also, the $\Delta A'B'C$ and ABC are similiar

$$\frac{A'B'}{AB} = \frac{A'C}{AC} = \frac{PC-PA'}{PC+PA} \quad -(2)$$

from eqn (1) & (2) $\Rightarrow$ $$\frac{PA'}{PA} = \frac{PC-PA'}{PC+PA}$$

$$\frac{+v}{+(-u)} = \frac{+R-(v)}{+R+(-u)}$$

Put $R = 2f$ $\Rightarrow$ $$\boxed{\frac{1}{f} = \frac{1}{v} + \frac{1}{u}}$$

Real Image → Image which can be obtained on Screen

Virtual Image → an image that cannot be obtained on a Screen is Called a virtual Image.

Magnification – The Ratio of Size of image to the Size of object.

$$\boxed{M = \frac{h_i}{h_o} = \frac{-v}{u}}$$

→ Magnification of Real image is +ve

→ Magnification of Virtual image is −ve.