

Reflection of Light

VSAT

1- 2m

2- At Infinity

3a) Virtual, erect

b) Real, inverted

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

5- Mirror formula - $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$
 (v = image dist from pole)
 (u = obj. dist from pole)
 (f = focus of the mirror)

6- $\frac{h_i}{h_o} = \text{magnification} = \frac{-v}{u}$

7- Linear magnification produced in mirrors is the ratio of height of image by height of object.

8-a) $m = \frac{h_{img}}{h_{obj}}$ b) $m = \frac{-v}{u}$

9- Obj is at centre of curvature, so img will also form on the centre of ~~curvature~~ ^{curvature}.

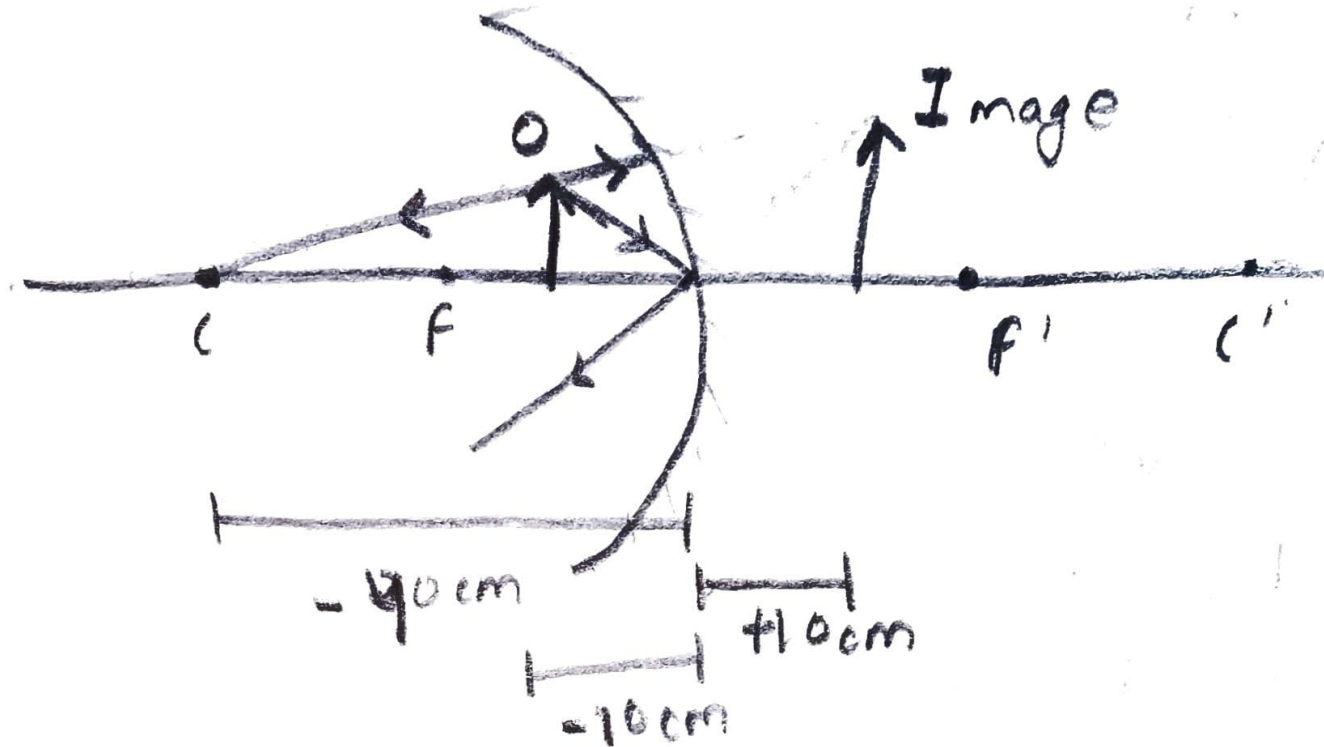
10a) Virtual, erect

b) Real, inverted

SAT

11b) $\frac{1}{v} + \frac{1}{-10} = \frac{1}{-20} = \frac{1}{10} - \frac{1}{20} = \frac{1}{10} \Rightarrow v = +10$

11a)



c) Image is virtual, magnified and erect.

$$12- \frac{1}{v} + \frac{1}{-36} = \frac{1}{-12}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{-18}$$

$$\Rightarrow \underline{v = -18 \text{ cm}}$$

$$\Rightarrow h_i = m h_o = \frac{-v h_o}{u} = \frac{18}{-12} (10) = \underline{-15 \text{ cm} = h_i}$$

\Rightarrow Nature :- ~~Virtual~~ Real, inverted, diminished

$$13- \underline{m} = \frac{-v}{u} = \frac{h_i}{h_o} = \frac{+6}{+2} = +3$$

$$\Rightarrow v = -30$$

$$\Rightarrow \frac{1}{30} - \frac{1}{u} = \frac{1}{f}$$

$$\Rightarrow \frac{-2}{30} = \frac{1}{f}$$

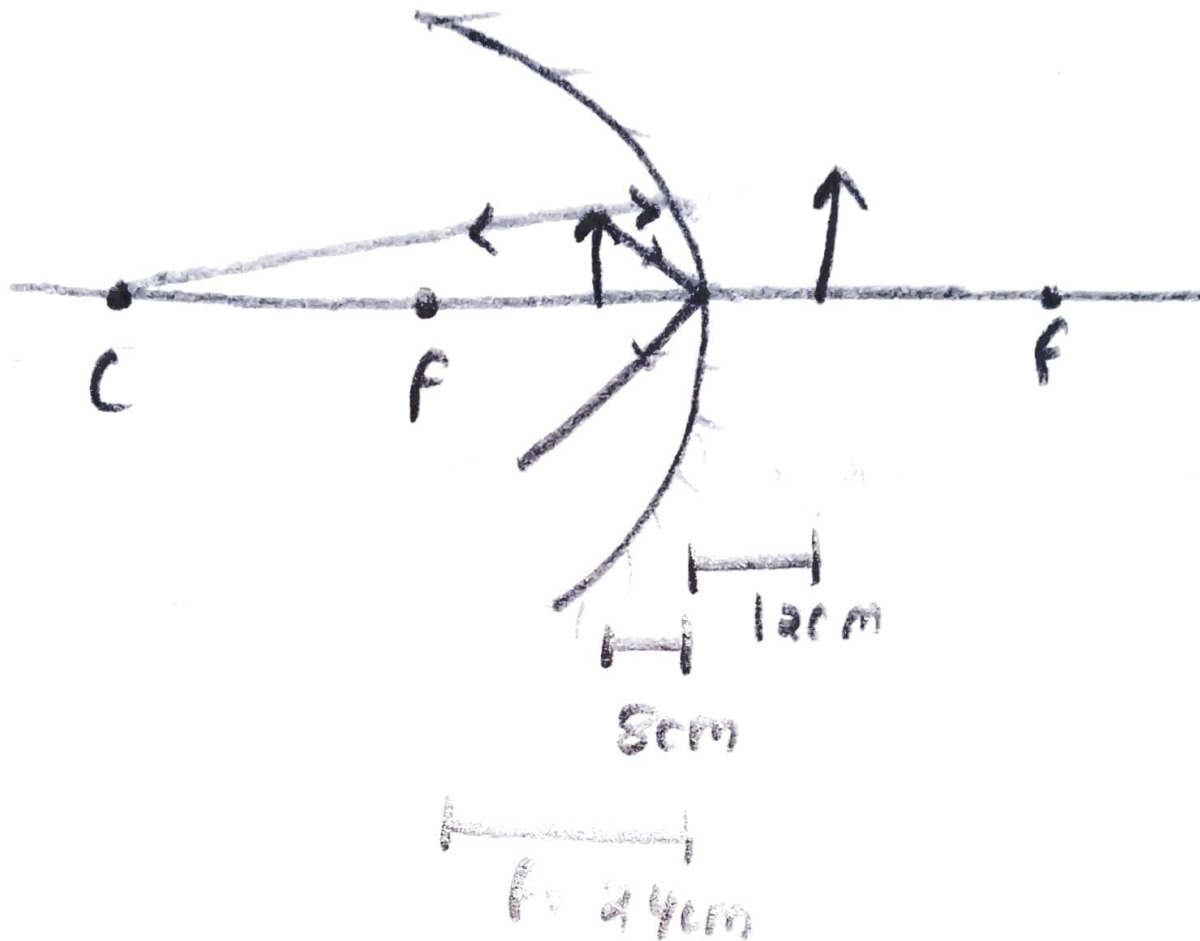
$$\Rightarrow v = \frac{-2f}{3} = \frac{-2}{3} \times 10 = \underline{\frac{-20}{3} \text{ cm}}$$

$\Rightarrow \underline{v = +20 \text{ cm}}$, Nature :- Virtual, erect

~~Virtual~~

\Rightarrow u is -6.66 cm which is on left side of concave mirror.

45) (iii) -



$$(14) \quad \frac{1}{-10} - \frac{1}{15} = \frac{1}{f}$$

$$\Rightarrow \frac{-3-2}{30} = \frac{1}{f}$$

$$\Rightarrow f = -5 \text{ cm}$$

$\Rightarrow f = 5 \text{ cm}$ in front of mirror.

$$(15-i) \quad \frac{f}{f-u} = m = \frac{4.5}{3} = \frac{3}{2}$$

$$\Rightarrow \frac{f}{f-8} = \frac{3}{2}$$

$$\Rightarrow 2f = 3f - 24$$

$$\Rightarrow \underline{f = -24 \text{ cm}}$$

$$(ii) \quad v = ?$$

$$\Rightarrow \frac{1}{v} - \frac{1}{8} = \frac{-1}{24}$$

$$\Rightarrow \frac{1}{v} = \frac{2}{24} = \frac{1}{12}$$

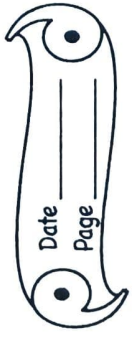
$$\Rightarrow \underline{v = 12 \text{ cm}}$$

~~(iii)~~

$$(16) (i) \quad m = \frac{-v}{u} = \frac{h_i}{h_o} \Rightarrow \frac{4}{1} = \frac{-v}{20}$$

$$\Rightarrow \underline{v = -80 \text{ cm}}$$

~~$$(ii) \quad m = \frac{f}{f-u} \Rightarrow \frac{4}{1} = \frac{f}{f-20} \Rightarrow 3f = 40 \Rightarrow \underline{u = -60 \text{ cm}}$$~~



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(i) ~~$\frac{1}{v} = \frac{1}{u} + \frac{1}{f}$~~
 $\frac{f}{f-v} = \frac{y}{v}$

$$\Rightarrow f = 4f + 80$$

$$\Rightarrow -80 = 3f$$

$$\Rightarrow f = -\frac{80}{3} \text{ cm}$$

$$\Rightarrow \underline{\underline{f = -26.66 \text{ cm}}}$$

(7) $\frac{1}{v} = \frac{1}{u} + \frac{1}{f}$

$$\Rightarrow \frac{1}{v} = \frac{2-3}{54} = -\frac{1}{54}$$

$$\Rightarrow v = -54 \text{ cm}$$

\Rightarrow Position of screen is at 54 cm on left of mirror.

(8) $\frac{1}{v} = \frac{1}{u} + \frac{1}{f}$

$$\Rightarrow v = 20 \text{ cm}$$

$$\Rightarrow \frac{h_i}{h_o} = \frac{-20}{-10} = 2$$

$$\Rightarrow h_i = 6 \text{ cm}$$

\Rightarrow Nature \therefore 6 cm in height, at a dist 10 cm behind mirror,
, virtual, erect, magnified.

$$19) \frac{1}{v} - \frac{1}{u} = \frac{1}{-4}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{9} - \frac{1}{4} = \frac{-5}{36}$$

$$\Rightarrow v = -7.2 \text{ cm}$$

$$\Rightarrow h_i = m h_o = \frac{-v h_o}{u} = \frac{7.2 \times 2}{-9} = -1.6 \text{ cm}$$

\Rightarrow Nature: ~~Virtual~~ Real, diminished, at a dist 7.2 cm in front of mirror of height 1.6 cm

$$20) a) \frac{-v}{u} = 3$$

$$\Rightarrow v = -3u = -60 \text{ cm}$$

$$\Rightarrow \frac{1}{60} + \frac{1}{30} = \frac{-1}{f}$$

$$\Rightarrow \frac{4}{60} = \frac{-1}{f}$$

$$\Rightarrow f = \underline{\underline{-15 \text{ cm}}}$$

$$b) \frac{-v}{u} = m = 3$$

$$\Rightarrow v = -3u$$

$$\Rightarrow \frac{1}{-3u} + \frac{1}{u} = \frac{1}{-15}$$

$$\Rightarrow \frac{-2}{3u} = \frac{1}{-15}$$

$$\Rightarrow \underline{\underline{u = -10 \text{ cm}}} \text{ (in front of mirror)}$$



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$$21) \frac{-v}{50} = 5 \quad \left\{ \Rightarrow v = -50 \right.$$

$$\Rightarrow \frac{1}{-50} + \frac{1}{u} = \frac{2}{3}$$

$$\Rightarrow \frac{y}{50} = \frac{2}{3}$$

$\Rightarrow v = \underline{1.2 \text{ cm}}$ in front of mirror

\Rightarrow

$$22) \frac{1}{v} - \frac{1}{10} = -\frac{4}{3}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{10} - \frac{4}{3} = -\frac{37}{30}$$

$$\Rightarrow v = \frac{-30}{37} \text{ cm} = \underline{\underline{-0.81 \text{ cm}}}$$

is image

\Rightarrow Person stand 0.81 cm behind the mirror

$$23) \frac{1}{v} + \frac{1}{-20} = \frac{1}{-15}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{20} - \frac{1}{15} = \frac{-5}{300}$$

$$\Rightarrow \left. \begin{array}{l} v = -60 \text{ cm} \\ h_i = 15 \text{ cm} \end{array} \right\}$$

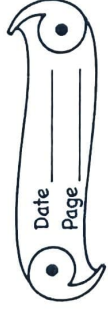
$$24) \frac{-v}{v} = 3$$

$$\Rightarrow v = +30 \text{ cm}$$

$$\Rightarrow \frac{1}{30} - \frac{1}{10} = \frac{2}{R}$$

$$\Rightarrow \frac{-2}{30} = \frac{2}{R}$$

$$\Rightarrow R = \underline{\underline{-30 \text{ cm}}}$$



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$$25) m = \frac{-100}{-100 + 300} = \frac{-1}{2} = \frac{h_i}{h_o}$$

$$\Rightarrow h_i = \underline{\underline{-25 \text{ mm}}}$$

$$26) \frac{-v}{u} = \frac{-1}{4} \left\{ \Rightarrow \frac{y}{u} + 1 = \frac{1}{-20} \right.$$

$$\Rightarrow v = \frac{+u}{4} \Rightarrow \frac{+8}{4} = f_{sp}$$

$$\Rightarrow \Rightarrow |u| = |-60 \text{ cm}|$$

$$\Rightarrow \frac{5}{u} = \frac{-1}{20}$$

$$\Rightarrow u = -100 \text{ cm}$$

$$\Rightarrow v = -25 \text{ cm}$$

\Rightarrow Obj is at a dist 100 cm in front of mirror.

$$27) \left. \begin{aligned} \frac{f}{f+50} &= \frac{-1}{2} & \Rightarrow \frac{750}{3} \\ & & \frac{-50}{3} - u = \frac{-1}{5} \\ \Rightarrow f &= \frac{-50}{3} \text{ cm} & \Rightarrow \frac{300}{3} = u \\ & & \Rightarrow \underline{\underline{u = 100 \text{ cm}}} \end{aligned} \right\}$$

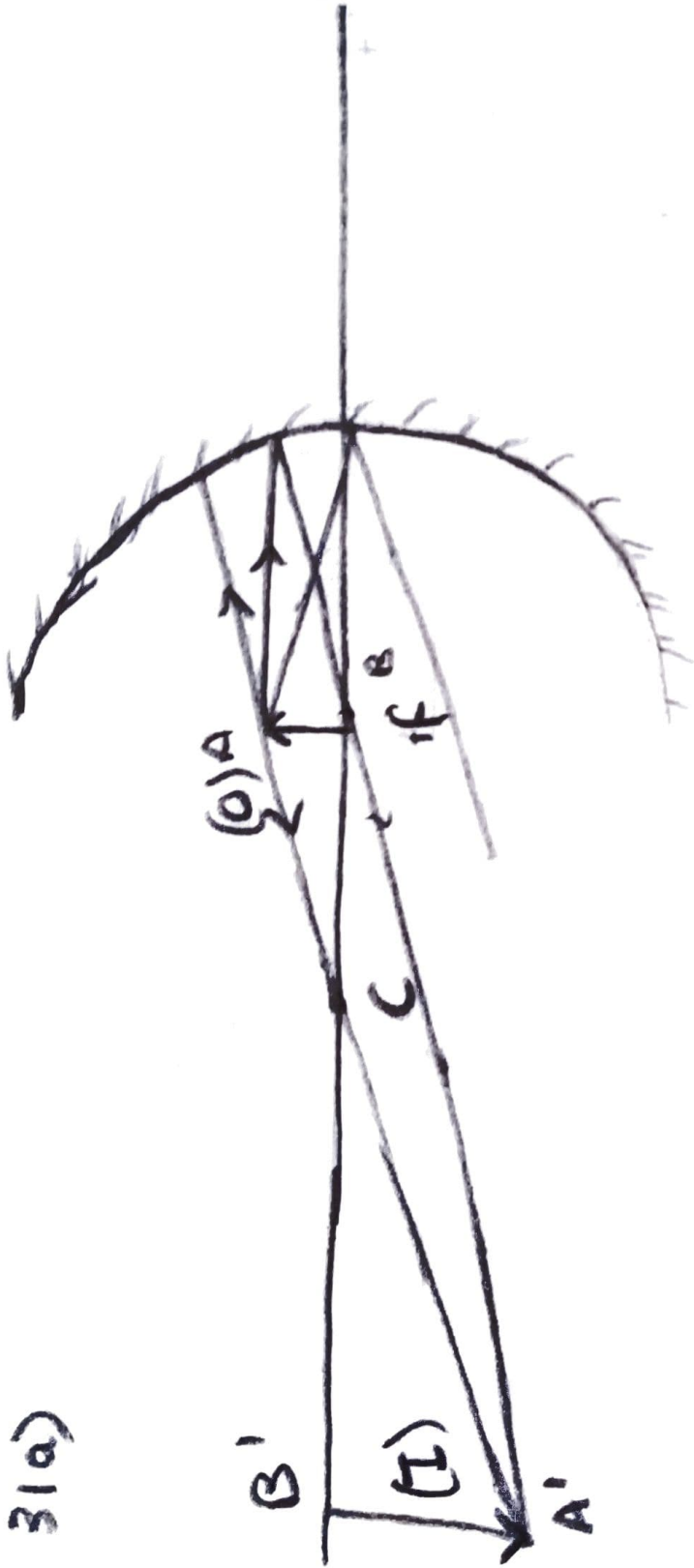
$$28) a) \frac{1}{v} - \frac{1}{20} = \frac{-1}{12}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{20} - \frac{1}{12} = \frac{-2}{60}$$

$$\Rightarrow v = -30 \text{ cm}$$

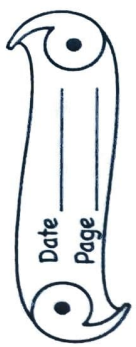
\Rightarrow Nature \therefore Real, ~~is~~ magnified

31a)



⇒ Characteristics

- : Real
- : Inverted
- : Magnified



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b) $\frac{1}{v} - \frac{1}{u} = \frac{1}{-12}$

$\Rightarrow \frac{1}{v} = \frac{3}{12} = \frac{1}{+6}$

$\Rightarrow v = +6 \text{ cm}$

Nature \therefore Virtual, ~~erect~~ erect

29) $m = \frac{1}{4} = \frac{-v}{-5}$

$\Rightarrow v = \frac{5}{4} \text{ cm}$

$\Rightarrow f = \frac{5(-5)}{5-5} = \frac{-25}{4} = \frac{4}{5} \text{ cm}$

30) $\frac{1}{v} - \frac{1}{15} = \frac{1}{30}$

$\Rightarrow \frac{1}{v} = \frac{1}{30}$

$\Rightarrow v = +30 \text{ cm}$

$\Rightarrow m = 2$

LATQ

31) ~~31~~

31(a) $\frac{1}{-16} - \frac{1}{29} = \frac{1}{f}$

$\Rightarrow \frac{-5}{48} = \frac{1}{f}$

$\Rightarrow f = -9.6 \text{ cm}$

$C = 2f = -19.2 \text{ cm}$

$\Rightarrow m = \frac{-v}{u} = \frac{-3}{3}$