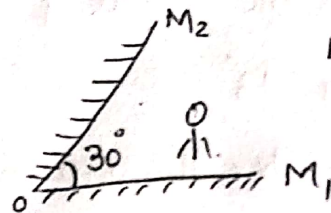


7th integrated ws-2 Light

Task

①

Given the two mirrors are inclined at an angle = 30°



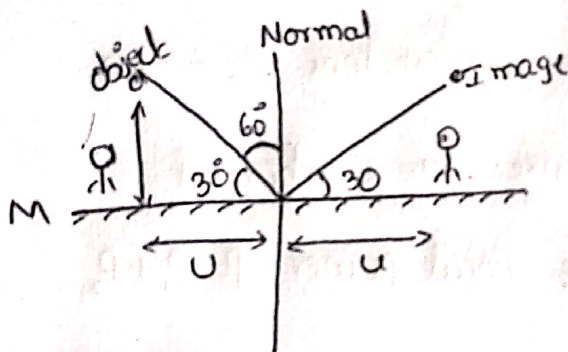
$$\text{No. of images } n = \frac{360}{\theta} - 1$$

$$= \frac{360}{30} - 1$$

$$= 12 - 1$$

$$= 11$$

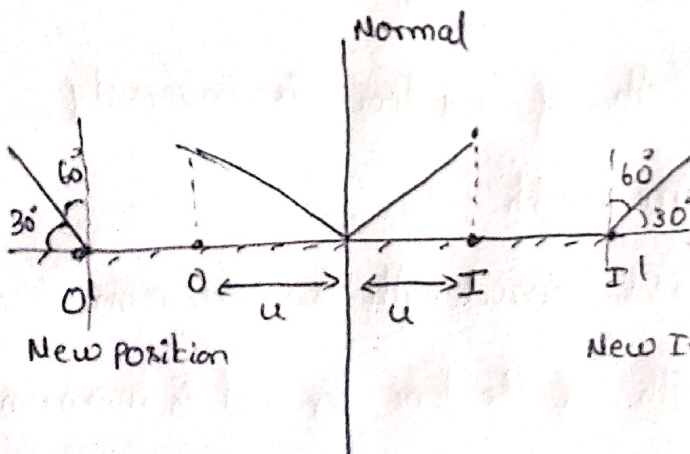
②



From the diagram the distance between object and image is given as

$$d_1 = u + u = 2u$$

Now when the object is displaced by 0.8 m Parallel to the line which is making 30° an angle with mirror, hence the new distance becomes.



$$d_2 = OD + u + II' + u$$

$$= 0.8 \cos 60^\circ + u + 0.8 \cos 60^\circ + u$$

$$= 1.6 \cos 60^\circ + 2u$$

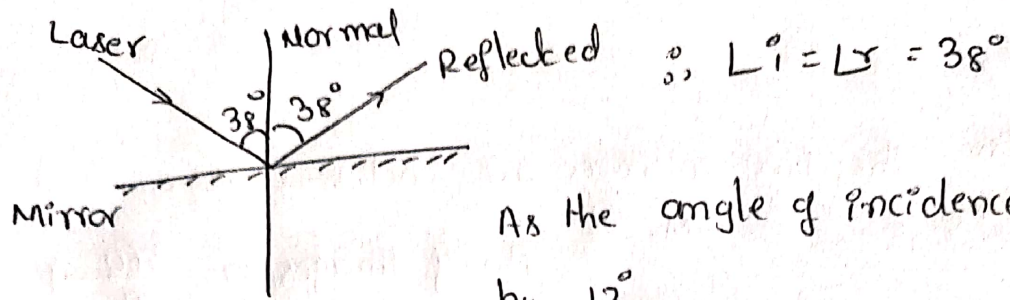
$$= \frac{0.8}{1.6} \times \frac{1}{2} + 2u$$

$$= 0.8 + 2u$$

$$\Rightarrow d_2 = 0.8 + d_1 \Rightarrow d_2 - d_1 = 0.8 \text{ m}$$

③

we know that Angle of incidence = Angle of reflection



$$\therefore L_i = L_r = 38^\circ$$

As the angle of incidence is increased by 13°

Then the new angle of incidence

$$L_i' = 38 + 13 = 51^\circ$$

$\therefore$ The angle of reflection $L_r' = 51^\circ$

④

Focal power of convex lens $P_1 = 4D$

Focal power of concave lens $P_2 = -3D$

when two lenses are combined

The effective focal power $P = P_1 + P_2$

$$= 4D - 3D$$

$$= 1D$$

$$\therefore \text{Focal length} = \frac{1}{P} \text{ m} = \frac{1}{1} = 1 \text{ m}$$

⑤

Since focal length of any lens is inversely

Proportional to wavelength

$\therefore$ For red wavelength is maximum.

so focal length of the lens for red is minimum

(7)

A zoom lens is a system of camera lens elements for which the focal length [and thus angle of view] can be varied, as opposed to a fixed focal length lens [prime lens]. It maintains focus when its focal length changes.

(15)

(a) if $\theta = 60^\circ$ No. of images $n = \frac{360}{\theta} - 1$
 $= \frac{360}{60} - 1$
 $= 5$

(b) if $\theta = 45^\circ \Rightarrow n = \frac{360}{\theta} - 1$
 $= \frac{360}{45} - 1$
 $= 8 - 1$
 $= 7$

(c) if $\theta = 90^\circ \Rightarrow n = \frac{360}{\theta} - 1 = \frac{360}{90} - 1 = 4 - 1 = 3$

(d) if $\theta = 20^\circ \Rightarrow n = \frac{360}{20} - 1 = 18 - 1 = 17$

In the given question all values of θ shows the object is placed symmetrically. That's why we had taken $n = \frac{360}{\theta} - 1$.

(17)

For symmetric position of an object

$$\text{No. of. images } n = \frac{360}{\theta} - 1$$

$$\text{Given } \theta = 72^\circ$$

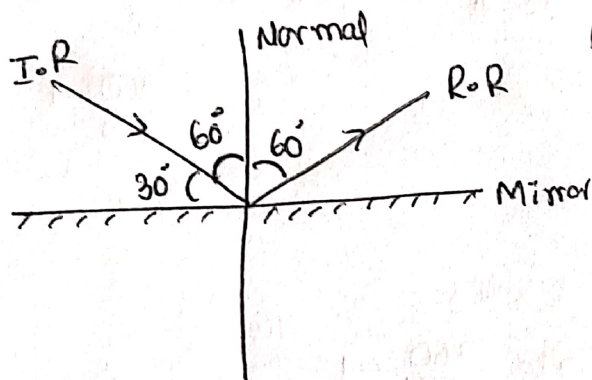
$$\therefore n = \frac{360}{72} - 1$$

$$= 5 - 1$$

$$= 4$$

(18)

Acc to given data



Angle of incidence is the angle between Incident ray (I.R) and Normal to the plane mirror.

Given the I.R making an angle 30° with mirror. i.e. with normal it makes 60° $\therefore L_i = 60^\circ$

Acc to laws of reflection $L_i = L_r = 60^\circ$

$$\begin{aligned} \text{Angle of deviation} &= L_i + L_r \\ &= 60^\circ + 60^\circ \\ &= 120^\circ \end{aligned}$$

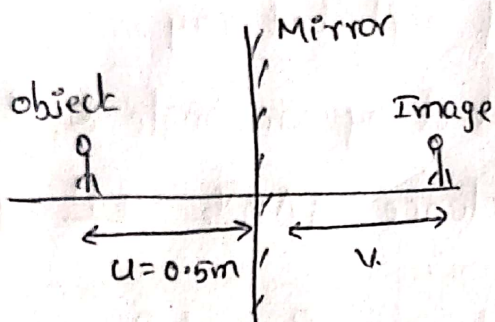
Ex 10.11

CUQ's

- ⑧ when two mirrors are arranged parallel to each other
Then the angle b/w them $\theta = 0^\circ$

$$\therefore \text{No. of images } n = \frac{360}{\theta} = \frac{360}{0} = \infty$$

- ⑨ Acc to Given data



$$\therefore u = v = 0.5 \text{ m}$$

we know that if an object is placed in front of a plane mirror at a distance 'x', then the mirror forms image at same distance from the mirror but behind of it.

$$\begin{aligned} \therefore \text{The distance between object and image} &= u + v \\ &= 0.5 + 0.5 \\ &= 1 \text{ m} \end{aligned}$$

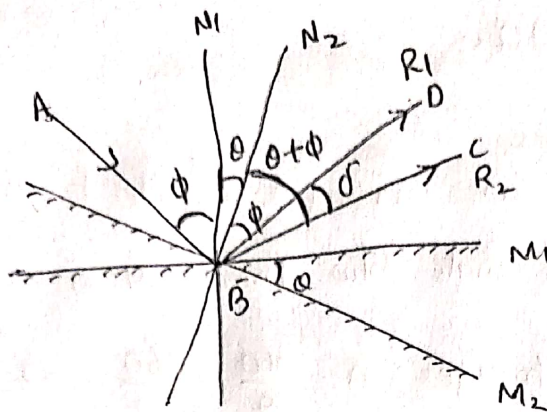
The Main level

- ⑩ Given that the angle between the mirrors $\theta = 45^\circ$

$\therefore$ when an object is placed between the mirrors, it can be symmetric.

$$\begin{aligned} \therefore \text{No. of images } n &= \frac{360}{\theta} - 1 \\ &= \frac{360}{45} - 1 = 8 - 1 = 7 \end{aligned}$$

(a)



Here M_1 , N_1 and R_1 are the initial positions of mirror, Normal and direction of Reflected ray

$$\text{Angle of incidence} = \angle i = \phi$$

$$\therefore \text{Angle of reflection} = \angle r = \phi$$

M_2 , N_2 , and R_2 indicate the final positions of mirror, normal and direction of reflected ray.

If the mirror is rotated by an angle θ , then

$$\text{new angle of incidence } \angle ABN_2 = \angle i' = \phi + \theta$$

δ is the angle between R_1 and R_2

$$\begin{aligned} \therefore \delta &= \angle ABC - \angle ABD \\ &= 2(\phi + \theta) - 2\phi \quad [\text{From diagram}] \\ &= 2\phi + 2\theta - 2\phi \\ \delta &= 2\theta \end{aligned}$$

$\therefore$ The reflected ray turned through an angle 2θ

(4)

For asymmetrical position of an object in between the mirrors, the no. of images $n = \frac{360}{\theta}$

$$\text{Given } \theta = 90^\circ$$

$$\Rightarrow n = \frac{360}{90}$$

$$\Rightarrow n = 4$$

③

we know that the no. of images formed by the two mirrors inclined towards each other at an angle θ by

$$n = \frac{360}{\theta} - 1$$

we know that the angle between two adjacent walls of a rectangular room is 90° . (i.e.) $\theta = 90^\circ$.

$$\therefore n_1 = \frac{360}{90} - 1 = 4 - 1 = 3. \rightarrow \textcircled{1}$$

Again, there is a mirror on the ceiling as well.

The wall and the ceiling mirror also are inclined at an angle 90° .

$$\therefore \text{No. of images in this case } n_2 = \frac{360}{90} - 1$$

$$= 4 - 1$$

$$n_2 = 3 \rightarrow \textcircled{2}$$

Apart from this the observer himself also has his image formed on the ceiling. Therefore there will be one more extra image (i.e.) $n_3 = 1$.

$$\text{Hence the total no. of images} = n_1 + n_2 + n_3$$

$$= 3 + 3 + 1$$

$$= 7.$$



⑤

The angle between the two mirrors $\theta = 40^\circ$

No. of images formed $n = \frac{360}{\theta} - 1$

Here the position of the object is symmetric

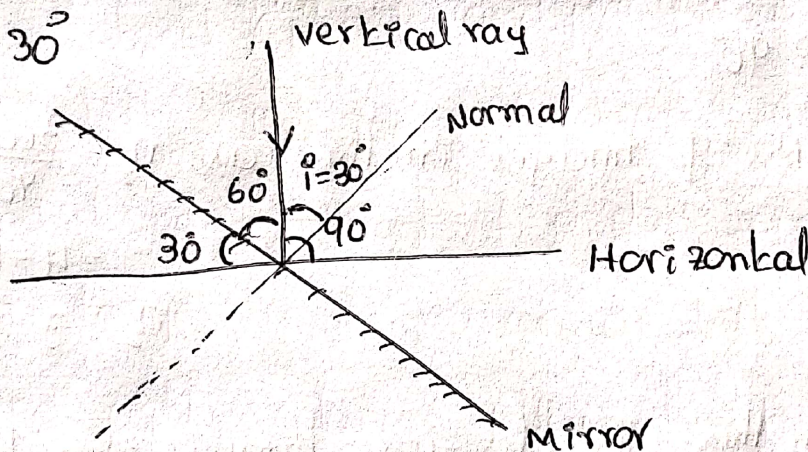
$$\therefore n = \frac{360}{40} - 1$$

$$= 9 - 1$$

$$= 8$$

⑥

Given that Angle between mirror and horizontal is 30°



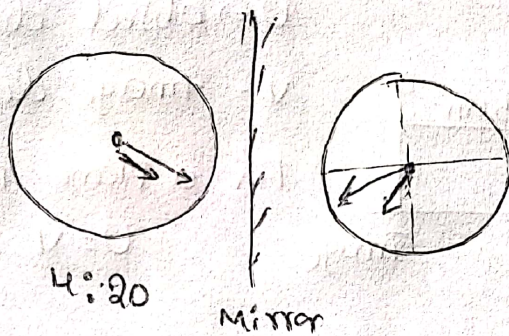
As the vertical ray strikes the mirror at an angle $\theta (= 60^\circ)$ then the angle between normal to the mirror and vertical ray which is acting as incident ray becomes $90 - \theta [90 - 60 = 30]$

$\therefore$ The angle of incidence $i = 30^\circ$

Angle of reflection $= r = i = 30^\circ$

$\therefore$ The reflected ray makes an angle $(90 - 30)$ with mirror which is equal to 60°

7



The time in the clock is as much ahead of 12 hrs zero minute as the time in actual clock is behind 12 hrs zero minute.

$$\begin{aligned}\therefore \text{So the time in actual clock is} &= 12 \text{ hrs } 0 \text{ min} - 4 \text{ hrs } 20 \text{ min} \\ &= 7 \text{ hrs } 40 \text{ min} \\ &= 7:40\end{aligned}$$

8

when a man wearing yellow coloured glass for left eye and red coloured glass for right eye and stands in front of a plane mirror, he observes his image in the mirror as left eye coloured red and right coloured yellow due to "lateral inversion"

16

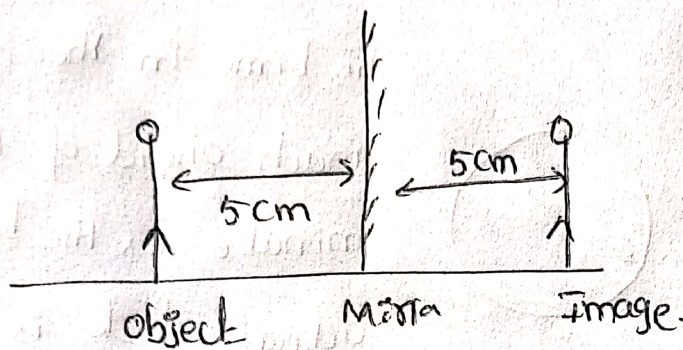
For a plane mirror

$$\text{object distance} = \text{image distance}$$

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

As the object is moved 5 cm towards the mirror then the image also moves 5 cm towards the mirror

(17)



$U \Rightarrow$ object distance

$V =$ image distance

For a plane mirror

$$U = V$$

If the mirror is moved 5cm away from the object

so the object is at a distance $(U+5)$ cm from mirror.

$\therefore$ The image distance becomes $(V+5)$ cm.

$\Rightarrow$ (i.e) The increase in distance between object (face) and image is 10 cm