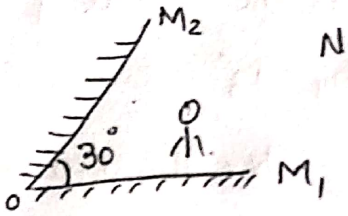
7th integrated ws-2 Light

Task

(1)

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



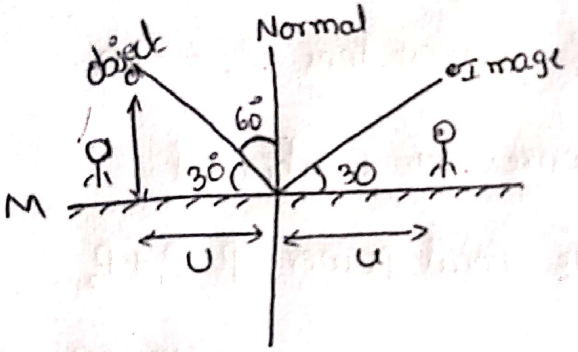
No. of images $n = \frac{360}{\theta} - 1$

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

$= 12 - 1$

$= 11.$

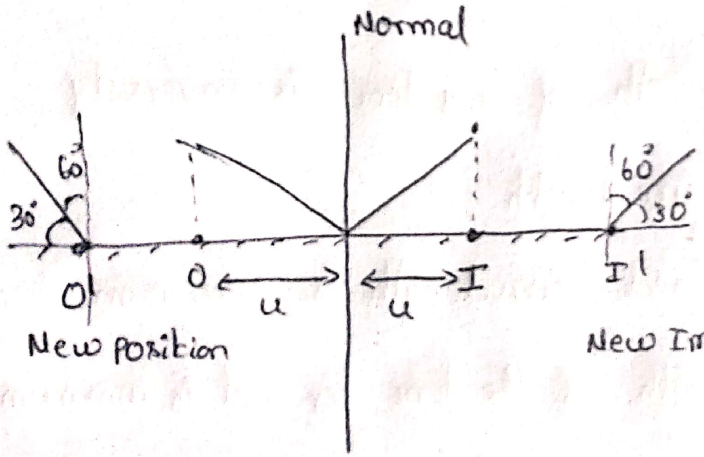
(2)



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.



$d_2 = OO' + U + II' + U$

$= 0.8\cos 60° + U + 0.8\cos 60° + U$

$= 1.6\cos 60° + 2U$

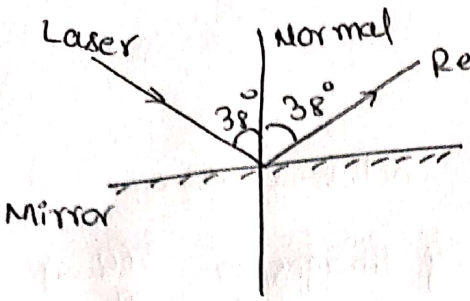
$= \frac{0.8}{1.6} \times \frac{1}{2} + 2U$

$= 0.8 + 2U$

$\Rightarrow d_2 = 0.8 + d_1 \Rightarrow d_2 - d_1 = 0.8\,m$

(3)

we know that Angle of incidence = Angle of reflection



$\therefore \angle i = \angle r = 38^\circ$

As the angle of incidence is increased by 13°

Then the new angle of incidence

$\angle i' = 38 + 13 = 51^\circ$

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

(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 $P = P_1 + P_2$

$= 4D - 3D$

$= 1D$

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

(5)

Since focal length of any lens is inversely Proportional to wavelength

$\because$ 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 it's 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

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

Given $\theta = 72^\circ$

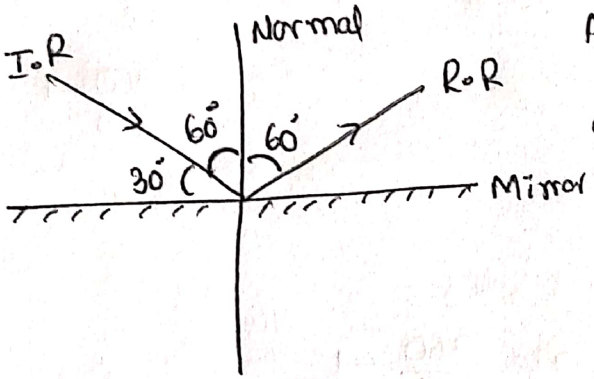
$\therefore n = \frac{360}{72} - 1$

$= 5 - 1$

$= 4.$

(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 $L^i = L^r = 60^\circ$

Angle of deviation = $L^i + L^r$

$= 60^\circ + 60^\circ$

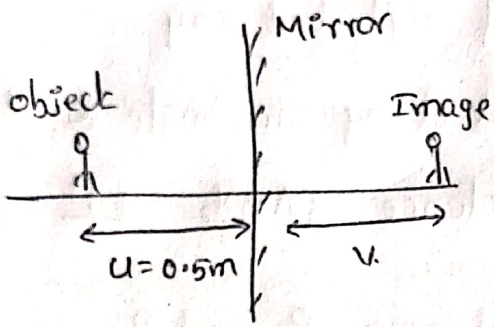
$= 120^\circ$

CUQ's

(8) when two mirrors are arranged Parallel to each other Then the angle blw them $\theta = 0^\circ$

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

(9) Acc to Given data



$\therefore$ $u = v = 0.5\,m$

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

$\therefore$ The distance between object and image $= u + v$

$= 0.5 + 0.5$

$= 1\,m$

Jee Main level

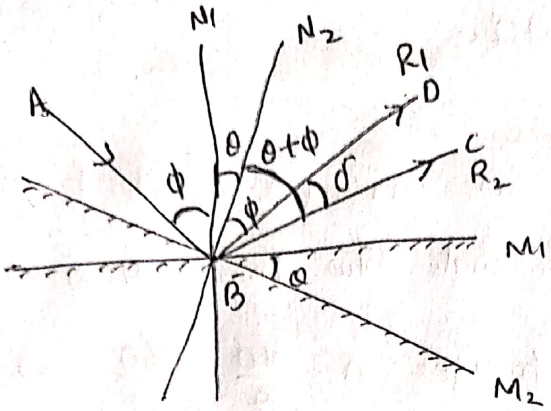
(1) Given that the angle between the mirrors $\theta = 45^\circ$

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

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

$= \frac{360}{45} - 1 = 8 - 1 = 7.$

(2)



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

Angle of incidence = $\angle i = \phi$

$\therefore$ 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

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

δ' is the angle between R_1 and R_2

$\therefore \delta = \angle ABC - \angle ABD$

$= 2(\theta+\phi) - 2\phi$ [From diagram]

$= 2\theta + 2\phi - 2\phi$

$\delta = 2\theta$.

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

(4)

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

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) $\theta = 90^\circ$.

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

Again, there is a mirror on the ceiling as well. The wall and the ceilling mirror also are inclined at an angle 90°

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

$$= 4 - 1$$

$$n_2 = 3 \rightarrow (2)$$

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

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

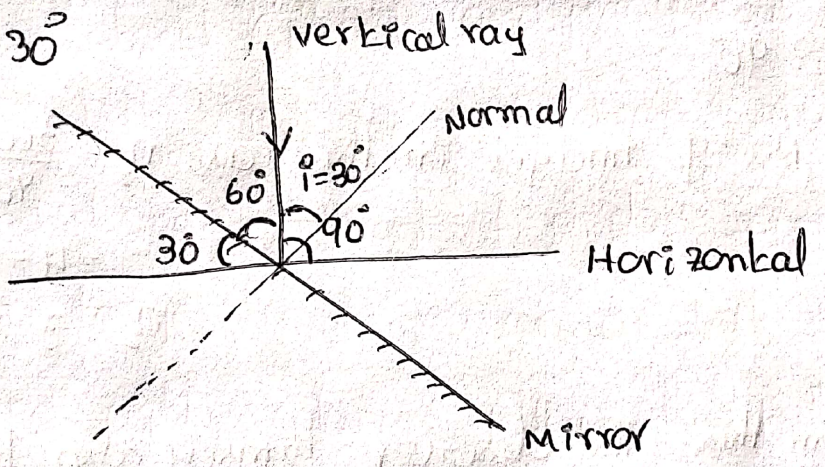
$\therefore \quad n = \frac{360}{40} - 1$

$= 9 - 1$

$= 8$

(6)

Given that Angle between mirror and horizontal is 30°



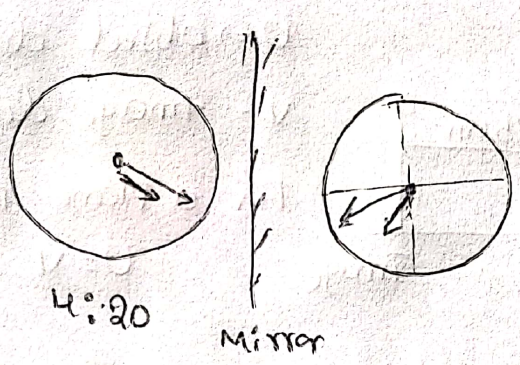
As the vertical ray strikes the mirror at an angle $\theta [= 60^\circ]$ then the angle between Normal to the mirror and vertical ray which is acting as incident ray becomes $90 - \theta$ [$90 - 60 = 30^\circ$]

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

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

$\therefore$ The reflected ray makes an angle $(90^\circ - 30^\circ)$ 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.

∴ So the time in actual clock is = 12 hrs 0 min − 4 hrs 20 min

= 7 hrs 40 min

= 7:40

(8)

when a man wearing yellow coloured glass for left eye and red coloured glass for right eye and stands infront 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)

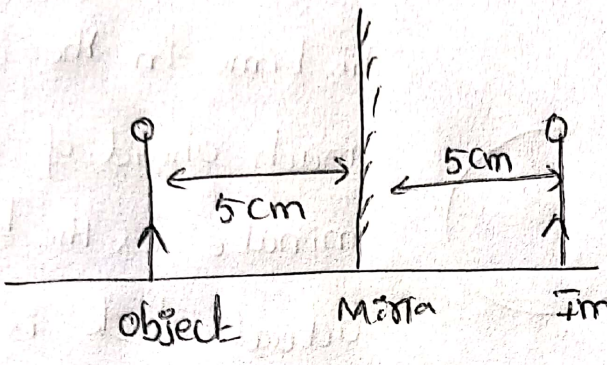
For a plane mirror

object distance = image distance

$\Rightarrow u = v = 30$ cm

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

(17)



U ⇒ 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.

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

⇒ (i.e) The increase in distance between object (FACE) and image is 10 cm