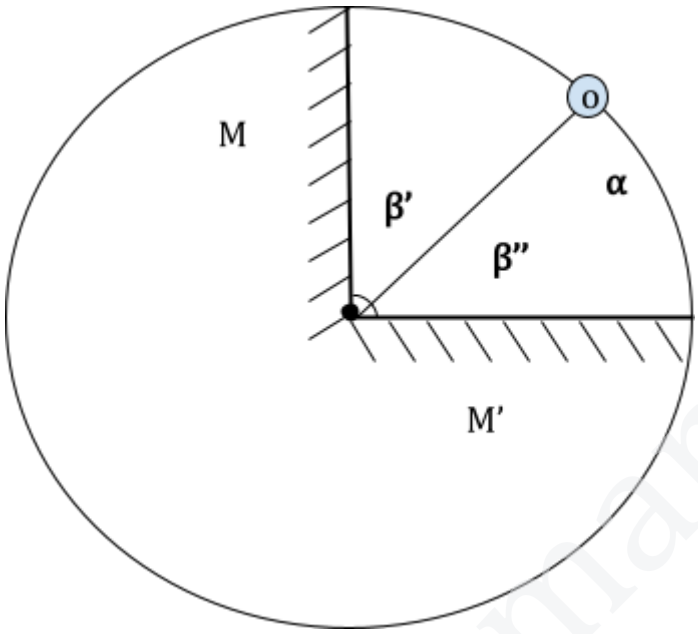
Divyam's N(Image) Formula



Explanation:

Let the ∠ between two mirrors M and M' be α

∠ between mirror M and object O be β'

∠ between mirror M' and object O be β''

Then the number of images formed of object O

$$n = \left\lfloor \frac{\pi sin\alpha}{\beta} \right\rfloor$$

$\lfloor . \rfloor$ *represents the greatest integer function.*

$$\beta' > \beta'' \Rightarrow \beta' \equiv \beta$$

$$\beta'' > \beta' \Rightarrow \beta'' \equiv \beta$$

$$\beta'' = \beta' \Rightarrow (\beta' or\ \beta'') \equiv \beta$$

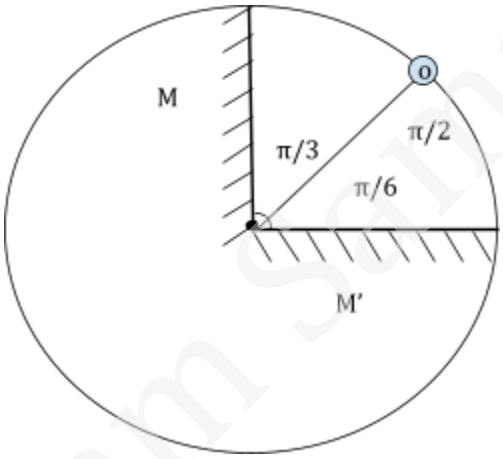
Here ∠ (β,β' and β'') are measured in radians (not to scale) and ⌊.⌋ represents Greatest integer function.

Formula Examples:

Example 1

Find the total number of images formed if the two plane mirrors are inclined at an angle of $\frac{\pi}{2}$ and object is situated at an angle of $\frac{\pi}{6}$ from one of them?

Sol.



$$As \angle b/w\ mirror\ M\ \&\ O\ >\ M'\ \&\ O\ then\ \beta \equiv \frac{\pi}{3}\ and\ \alpha = \frac{\pi}{2}$$

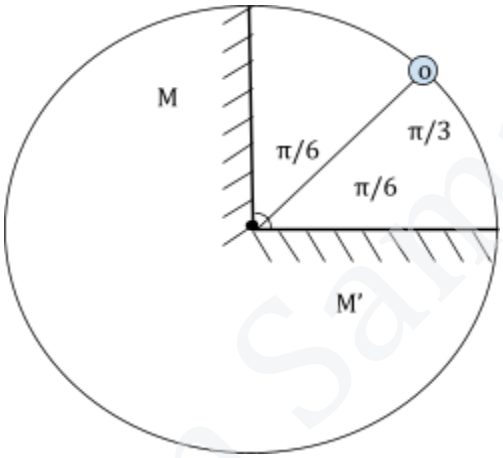
$$n = \left\lfloor \frac{\pi sin\alpha}{\beta} \right\rfloor = \left\lfloor \frac{\pi sin(\frac{\pi}{2})}{\frac{\pi}{3}} \right\rfloor = \lfloor 3 \rfloor \equiv 3$$

Here $\angle$ (β,β' and β'') are measured in radians (not to scale) and ⌊.⌋ represents Greatest integer function.

Example 2

Find the total number of images formed if the two plane mirrors are inclined at an angle of $\frac{\pi}{3}$ and object is situated at an angle of $\frac{\pi}{6}$ from one of them?

Sol.



$$As \angle b/w\ mirror\ M\ \&\ O = M'\ \&\ O\ then\ \beta \equiv \frac{\pi}{6}\ and\ \alpha = \frac{\pi}{3}$$

$$n = \left\lfloor \frac{\pi sin\alpha}{\beta} \right\rfloor = \left\lfloor \frac{\pi sin(\frac{\pi}{3})}{\frac{\pi}{6}} \right\rfloor = \left\lfloor \frac{6\sqrt{3}}{2} \right\rfloor = \lfloor 3\sqrt{3} \rfloor = \lfloor 5.1961 \rfloor \equiv 5$$

References:

Examples (1 and 2) : Physics Megacosm Geometrical Optics[XI-XII]

Greatest Integer function : Floor & Ceil Function

Here $\angle$ (β,β' and β'') are measured in radians (not to scale) and ⌊.⌋ represents Greatest integer function.