

Image Conjecture

Divyam Samarwal
B.Tech in Mathematics & Computing
Netaji Subhas University of Technology, New Delhi
 New Delhi, India
 divyamsamarwal@gmail.com

I. INTRODUCTION

This formula is used to calculate the number of images formed by two mirrors when kept at some angle α .

A. Explanation

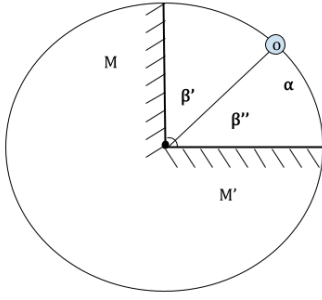


Fig. 1: Sample Diagram

Let the angle between mirrors M and M' be α . Angle between mirror M and object O be β' . Angle between mirror M' and object O be β'' . Then the number of images formed will be

$$n = \left\lfloor \pi \frac{\sin \alpha}{\beta} \right\rfloor \quad (1)$$

where $\lfloor x \rfloor$ denotes the greatest integer less than or equal to x and all angles are taken in radians. Conditions for β :

- If $\beta' > \beta''$ then β' will be taken as β in the formula.
- If $\beta'' > \beta'$ then β'' will be taken as β in the formula.
- If $\beta' = \beta''$ then any can be taken as β in the formula.

II. EXAMPLES [1]

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

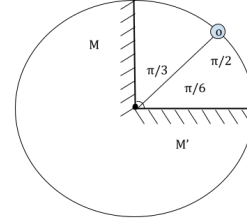


Fig. 2: Solution 1

As angle between mirror M and O is greater than angle between M' and O . Then $\alpha = \frac{\pi}{2}$ and $\beta = \frac{\pi}{3}$.

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

Number of images formed will be 3.

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

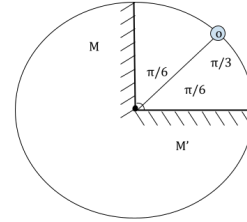


Fig. 3: Solution 2

As angle between mirror M and O is equal to angle between M' and O . Then $\alpha = \frac{\pi}{3}$ and $\beta = \frac{\pi}{6}$.

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

Number of images formed will be 5.

REFERENCES

- [1] M. C. P. Limited, “Physics and Its Dynamics,” *Geometrical Optics*, vol. 5, pp. 2–3, 2022.