

GEOMETRIC OPTICS DAY 1: RAY MODEL AND PLANE MIRRORS

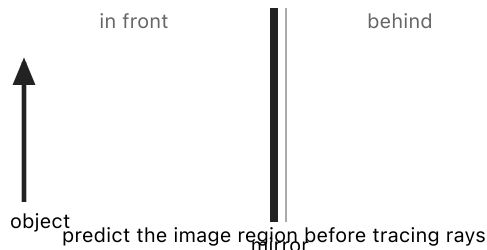
CED 13.1 · Skill 1.A · FRQ: TBR

PREDICT BEFORE TRACING

Look at your reflection in a plane mirror and reach toward the apparent face. Where is the image located: **in front of the mirror / on its surface / behind it**? Commit before the ray construction is shown.

Observation source: a plane mirror; projected Optics Bench; or this printed prediction panel.

OBJECT AND MIRROR - IMAGE NOT YET SHOWN



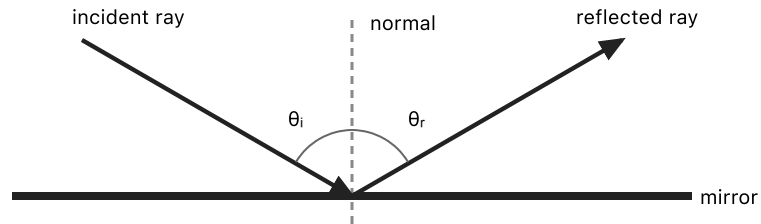
THE RAY MODEL

A light ray is a line showing the direction in which light travels. In one uniform medium, the ray is straight. At a smooth mirror, the ray changes direction according to the law of reflection.

$$\theta_i = \theta_r$$

Both angles are measured from the **normal**, the line perpendicular to the mirror at the point of reflection.

NOTES / REASONING

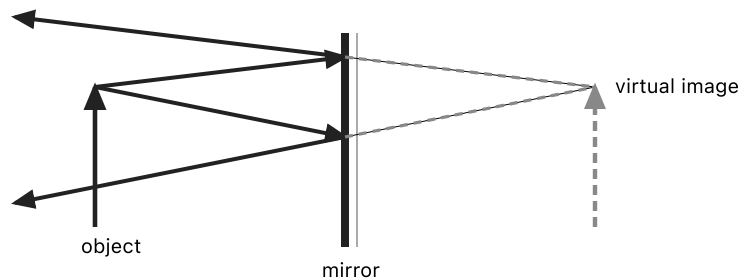
REFLECTION GEOMETRY**ANGLES ARE MEASURED FROM THE NORMAL**

WE DO An incident ray makes 38° with the normal. Find the reflected angle and the angle between the incident and reflected rays.

Angle check: an angle stated from the mirror surface is complementary to the angle from the normal.

LOCATING AN IMAGE

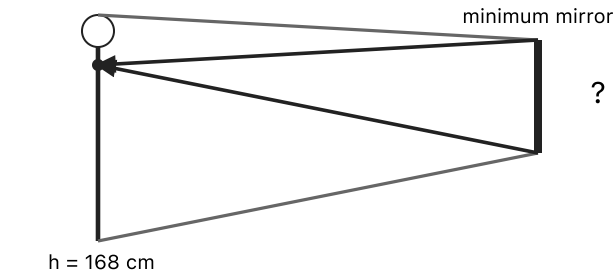
1. Draw two rays from the same point on the object.
2. Reflect each ray using $\theta_i = \theta_r$.
3. Extend the reflected rays backward with dashed lines.
4. The extensions meet at the virtual image point.

PLANE-MIRROR IMAGE**TWO RAYS LOCATE ONE VIRTUAL IMAGE**

The dashed lines locate the image but are not physical light paths.

Property	Plane mirror
signed image distance	$d_i = -d_o$
distance behind mirror	$ d_i = d_o$
orientation	upright
magnification	$m = +1$, same size

YOU DO An object is 36 cm in front of a plane mirror and is 24 cm tall. State d_i , the positive distance behind the mirror, and the image height.

HOW MUCH MIRROR?**SIGHTLINES TO THE TOP OF THE HEAD AND FEET; MIRROR LENGTH WITHHELD**

Use the two reflection points to determine the required mirror length.

1. Find the minimum mirror height for a 168 cm person.

2. An object moves from 52 cm to 42 cm in front of a plane mirror. Find the final object-image separation.

3. Explain why a plane-mirror image can be seen but cannot be projected onto a screen placed behind the mirror.