Where Images Move

Trace reflected rays and predict image distance

HS-PSII-8.1 "Develop graphical, mathematical, and pictorial representations (e.g., ray diagrams) that describe the relationships between the focal length, the image distance, and the object distance for planar, converging..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the sentence that tells you how to locate a real image. Circle the equation, then number the table rows from smallest to largest image distance to track what happens as the object moves.

A Mirror at the Bicycle Shop

1. At a bicycle shop, a curved security mirror gives a wide view, while a makeup mirror can enlarge a nearby face. To compare mirrors, measure object distance d_o from the object to the mirror and image distance d_i from the mirror to where reflected rays meet, or seem to meet. Focal length f measures the distance from the mirror to its focus.

2. For a converging (concave) mirror, a ray parallel to the axis reflects through the focus. A ray aimed through the focus reflects parallel to the axis. Where reflected rays cross, a real image forms. Use $1/f = 1/d_o + 1/d_i$, with positive distances for a real object and image. The table uses f = 10 cm.

CONVERGING MIRROR, F = 10 CM

Object distance (cm)	Image distance (cm)
15	30
20	20
30	15

3. Move an object farther from a converging mirror while keeping it beyond the focus: its real image moves toward the focus. At the focus, reflected rays are parallel, so no image forms at a finite distance. A planar mirror makes a virtual image equally far behind it. A diverging mirror makes a virtual image behind it, between mirror and focus.

2 ANSWER WITH EVIDENCE

Use the passage

1. In the table, the object moves from 15 cm to 30 cm from the mirror. How does the image distance change?

2. Use the equation to find the image distance when the object is 60 cm from this converging mirror.

3. For the 30 cm object distance in the table, where do the reflected rays cross relative to the focus?

4. An object stands 24 cm from a planar mirror. Where is its image?

3 YOUR TURN

Your own words

In two panels, sketch this converging mirror with objects at 25 cm and 50 cm. In each panel, show the focus, two reflected rays, and the image; label the image distance, then explain how it changes.

Where Images Move

PART 1 · READ AND MARK

Underline the sentence that tells you how to locate a real image. Circle the equation, then number the table rows from smallest to largest image distance to track what happens as the object moves. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In the table, the object moves from 15 cm to 30 cm from the mirror. How does the image distance change?	**It decreases from 30 cm to 15 cm.**
2	Use the equation to find the image distance when the object is 60 cm from this converging mirror.	**$1/d_i = 1/10 - 1/60 = 1/12$, so $d_i = 12$ cm.**
3	For the 30 cm object distance in the table, where do the reflected rays cross relative to the focus?	**They cross 15 cm in front of the mirror, which is 5 cm beyond the 10 cm focus.**
4	An object stands 24 cm from a planar mirror. Where is its image?	**The virtual image is 24 cm behind the mirror.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Object at 25 cm; one ray parallel to the axis reflects through the 10 cm focus, and a second ray aimed through the focus reflects parallel to the axis. They cross 16.7 cm in front of the mirror. Panel 2: The same two ray paths from an object at 50 cm cross 12.5 cm in front of the mirror. Moving the object farther away moves its image closer to the focus.

Accept rounded image distances near 16.7 cm and 12.5 cm in Part 3. Sketches need not be to scale, but both reflected rays should meet at the labeled real image.