

Reflection in Plane Mirrors

Objectives: Investigate reflection in plane mirrors

Verify the “1st Law of Reflection”

Compare image size and location to object size and location

Equipment: paper, small plane mirrors, mirror holders, pins, ruler, protractor, cardboard

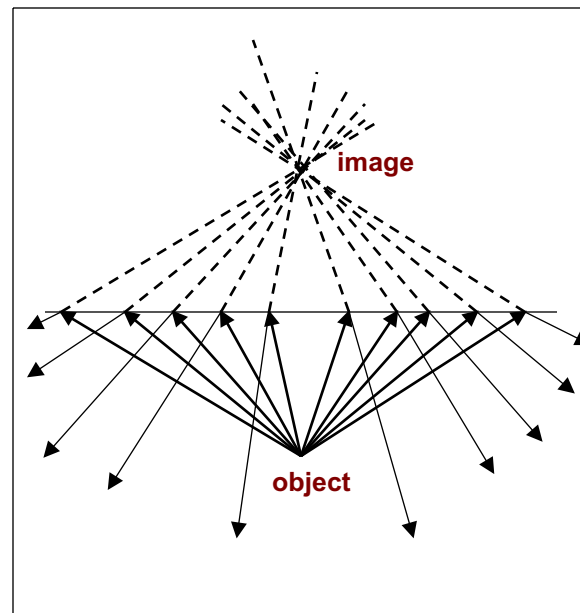
PART 1: REFLECTING RAYS

Procedure:

1. Draw a line across your page.
2. Place your mirror so that the reflecting surface is on the line, making sure that the mirror is straight and vertically upright.
3. Place a pin about 10-15 cm in front of the mirror. This is your object pin. Label it “object.”
4. Look at the reflection of this pin from one side. Place your ruler on the paper so that its edge points straight toward the image you see in the mirror. Trace along the edge of the ruler with your pen or pencil.
5. Repeat this procedure until you have 5 lines on one side of the mirror; then do the same from the other side of the mirror.
6. Remove the mirror and extend these lines until they reach the “mirror line.”
7. Now connect these lines from where they hit the mirror to the hole where the “object pin” was located.
8. Place “arrowheads” on your lines showing how rays of light went 1) from the pin, 2) to the mirror, and then 3) to your eye. The rays going toward the mirror are known as the **incident rays** and the rays reflecting from the mirror are known as the **reflected rays**.
9. Extend the reflected rays behind the mirror as **dotted lines**. These should all intersect in the same place behind the mirror, showing where the image of the pin is located. Label the point of intersection “image”.

Questions:

- A. Do all of your lines intersect in the same point? What would be reasons why the lines might not all intersect in the exact same place?
- B. Is this image real or virtual? How do you know?



PART 2: 1st LAW OF REFLECTION

Procedure:

1. Set up your mirror and paper with a pin in front as before. Label the object pin “object.”
2. Use your ruler to draw **one** sight line from **each side** of the mirror.
3. Remove the mirror and extend these rays to the mirror and then to the pin as before, showing the direction of the rays with arrowheads.
4. Extend the reflected rays as **dotted lines** behind the mirror in order to locate the image. Label the image location “image.”
5. Draw dotted lines **normal (perpendicular) to the mirror** where the rays reflected from the mirror. Label these lines “n” for “normal.”
6. Label and measure the angles of incidence ($\angle i$) and reflection ($\angle r$) for each ray.
7. Measure the distance from the object to the mirror. Label this “ d_o .”
8. Measure the distance from the image to the mirror. Label this “ d_i .”
9. Make sure all distances and angle measurements are recorded on your ray diagram.

Questions:

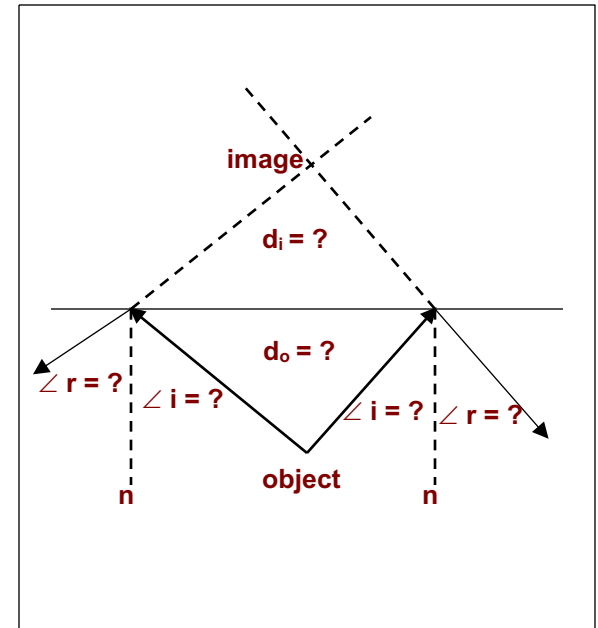
A. How does the image distance compare with the object distance?

B. What might cause the image distance to be less than the object distance?

What might cause the image distance to be greater than the object distance?

C. Does your diagram verify the 1st Law of Reflection?

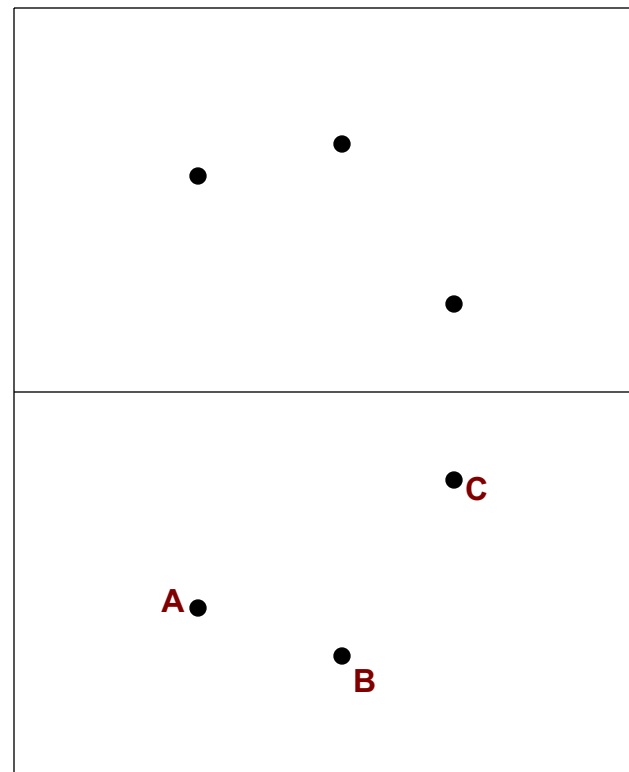
D. What are some reasons why your angles may not have been exactly equal?



PART 3: COMPARISON OF OBJECT AND IMAGE SIZES

Procedure:

1. Set up your paper and mirror as in Parts 1 and 2.
2. Place 3 pins on your paper to form a triangle.
Try to place your pins so that none of them line up horizontally or vertically with the paper.
3. Label these pins A, B, and C.
4. Using one pin (vertex of triangle) at a time, use sight lines to find the image of the pin behind the mirror.
5. Once all three image vertices are found, complete the sides of the image triangle and label these A', B', and C'.
6. Measure all three sides of the object triangle.
Label these a, b, and c and record on the triangle.
7. Measure all three sides of the image triangle.
Label these a', b', and c' and record on the triangle.
8. Measure and label all three angles of the object triangle.
9. Measure and label all three angles of the image triangle.
10. Measure all three vertex distances of the object triangle.
Label these dA, dB, and dC.
11. Measure all three vertex distances of the image triangle.
Label these dA', dB', and dC'.



***Write a general statement comparing your image to the object.
Is yours truly a “mirror image”?***