

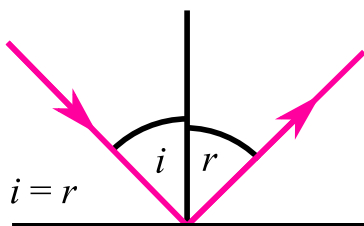
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39 Reflection – Plane Mirrors

From Isaac Covid lessons archive:
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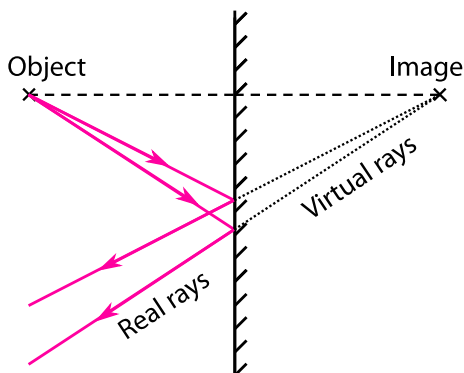
Reflections can be of two types: **diffuse** and **specular**. **Diffuse** reflections are from rough surfaces, where the light rays are **scattered** in all directions. **Specular** reflections are from smooth surfaces, where the **law of reflection** can be easily verified.

The law of reflection states that the **angle of incidence is equal to the angle of reflection**. The **angle of incidence** is the angle between the incident ray and the normal. The **angle of reflection** is the angle between the reflected ray and the normal at the point where the reflection occurs.



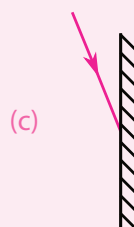
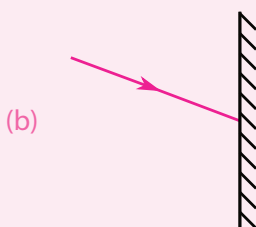
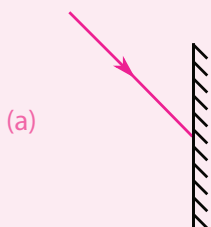
A normal is an imaginary line that is **90°** to the surface.

An image is a point in space from where light rays can be considered to **cross each other**. Plane mirrors produce a **virtual image** - that is, an image that **does not have light rays actually passing through it**; the light rays appear to meet but they actually do not.

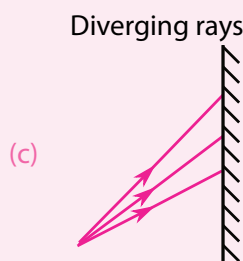
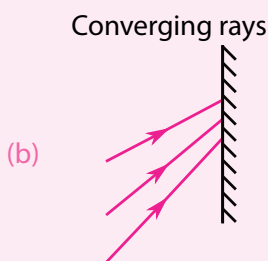
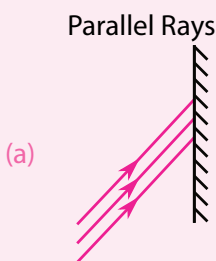


Virtual rays are extrapolated real rays. Light does not actually emerge from a virtual image, but an observer does not know that just by looking.

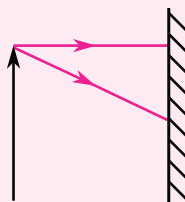
- 39.1** Copy and complete the following ray diagrams, each showing a ray incident on a plane mirror, by drawing in the reflected ray at the correct angle to the normal.



- 39.2** For each of the ray diagrams which show three rays of light incident on a plane mirror, copy and complete the diagram by drawing in the reflected rays.



- 39.3** Copy and complete the ray diagram to show how the plane mirror makes a virtual image of the object (black arrow).



What do you notice about the distance of the image from the mirror compared to the distance of the object from the mirror?

39.4 An object is 10 cm away from a plane mirror. An observer is the same distance away from the mirror, and 10 cm away from the object.

- (a) Sketch a ray diagram of the situation.
- (b) How far has the light travelled from the object to the observer via the plane mirror?
- (c) What is the angle of incidence?
- (d) How far away from the image is the observer?

39.5 An object is placed at a mystery distance from a plane mirror. An observer is 15 cm away from the mirror. The angle of incidence is 15° . The ray that travels from the object to the observer is incident on the plane mirror a perpendicular distance of 4.0 cm from the imaginary line that connects the object to the image.

- (a) Sketch a ray diagram of the situation.
- (b) What is the length of the ray from the object to the mirror?
- (c) What is the distance between the object and the image?
- (d) What is the total distance the ray has travelled from the object to the observer?
- (e) How far away from the observer is the image?

39.6 (a) What does the term 'lateral inversion' mean?

- (b) Return to question 39.4, but now consider an object that is not just a point, but also has a shape. Answer part (a) of that question again; consider light from the parts of the object. How do these lead to a difference in appearance of the image compared with the object?

39.7 A common question is, 'why is writing, when viewed in a mirror, reflected from left to right, not from top to bottom?' What is the best response to this question, using the physics detailed here?