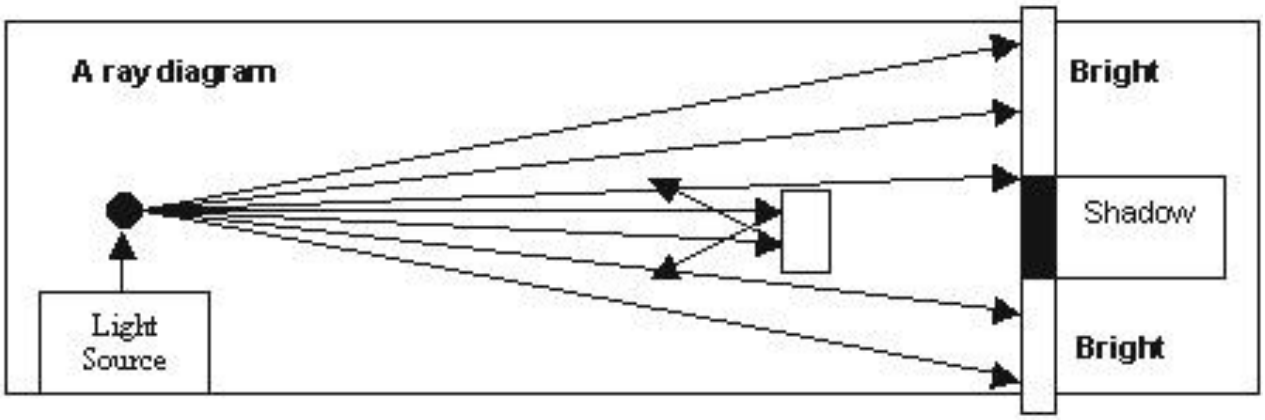
Light Travels in Rays and Interacts with Materials

Ray Diagrams

'Light travels in straight lines.' Because of this principle, the ray model of light can help to explain certain properties of light. A ray is a straight line that represents the path of a beam of light. Ray diagrams can help to demonstrate brightness or intensity of light through changes in distance. The ray model helps to explain how shadows can be formed when an object blocks the ray of light.



Light Interacts with Materials

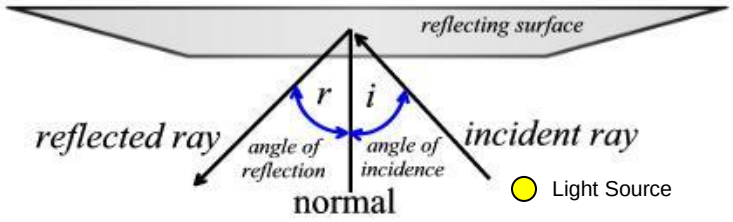
Light travels in straight lines until it strikes a surface. The type of surface the light hits will determine how the light will continue.

If a surface is ***translucent***, light passes through it but is diffused so that one cannot see clearly the details of whatever is on the other side (a frosted glass window is *translucent*). If a surface is ***transparent***, light passes through it nearly or wholly undiffused, so that one can see clearly the details of whatever is on the other side (an ordinary glass window is *transparent*). A surface that permits no light to pass through it is ***opaque***; you can see nothing through it at all (a door is *opaque*).

Luminous objects give off light (they are light sources).
Non-luminous objects do not.

The Law of Reflection

Reflection is the process in which light strikes a surface and bounces back off that surface. How it bounces off the surface depends on the *Law of Reflection* and the type of surface it hits. Light coming from a light source is called an *incident ray* and the light that bounces off the surface is called a *reflected ray*. A line that is perpendicular (90° with the surface) to the plane mirror is called the normal line. The angle between the incident ray and the normal line is called the angle of incidence (*i*). The angle between the reflected ray and the normal line is called the angle of reflection (*r*).

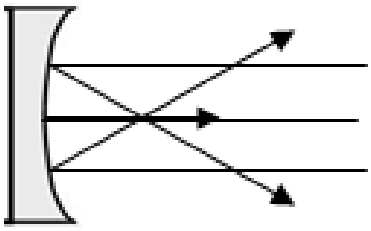


The Law of reflection states that:
the angle of incidence equals the angle of reflection
the incident ray, the normal line and the reflected ray all lie in the same **plane** **(an imaginary flat surface)**

Reflecting Light with Curved Mirrors

An image is formed in a mirror because light reflects off all points on the object being observed in all directions. The rays that reach your eye appear to be coming from a point behind the mirror. Because your brain knows that light travels in a straight line, it interprets the pattern of light that reaches your eye as an image of an object you are looking at.

Mirrors that cave in are called Concave mirrors

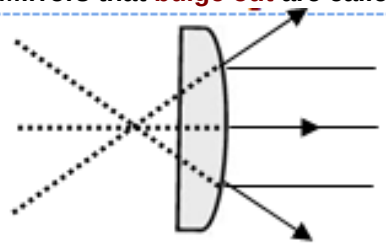


Concave mirrors form an image that appears to be closer than it actually is and can be useful because it can also reflect light from a large area

Focal point is in front of mirror

security devices, flashlights, telescopes, cosmetic mirrors and car headlights

Mirrors that bulge out are called Convex mirrors



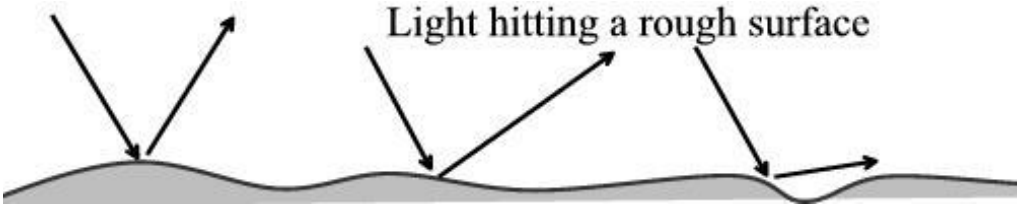
Convex mirrors form images that appear much smaller and farther away than the object - but they can reflect light from a large area

Focal point is behind mirror

rear-view mirrors and side mirrors on automobiles

Types of Reflection

Diffuse reflection occurs **If light hits a rough or uneven surface, the light is *scattered*.**



When light hits a smooth surface **regular reflection** occurs, **the light reflects at an opposite angle to the angle it hits.**