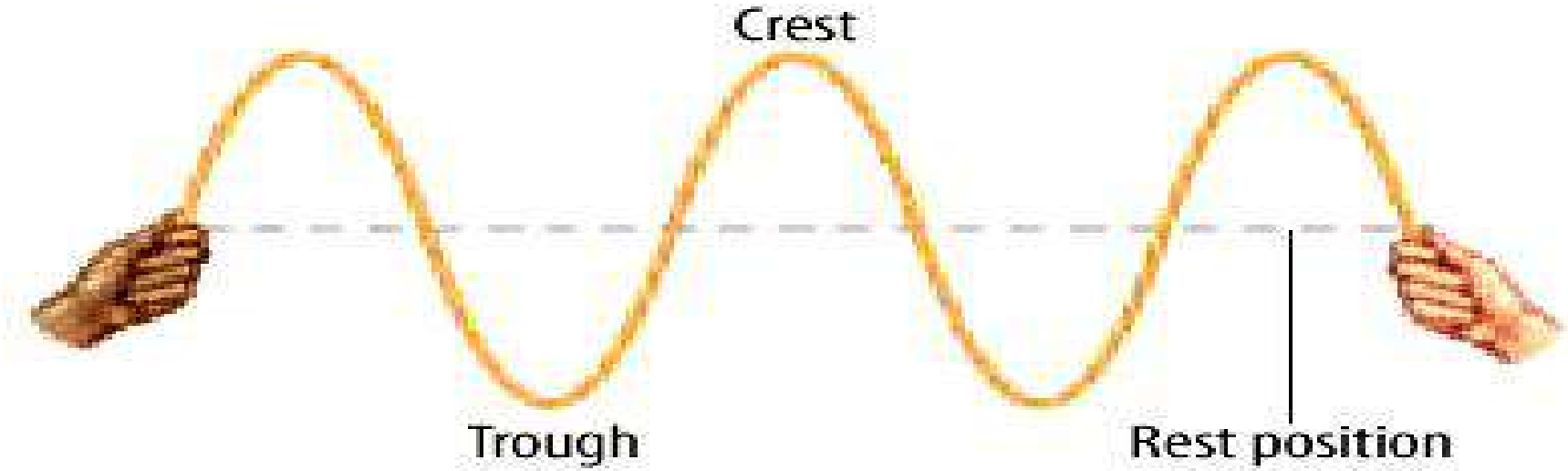
Reflection

Transverse Wave- Light

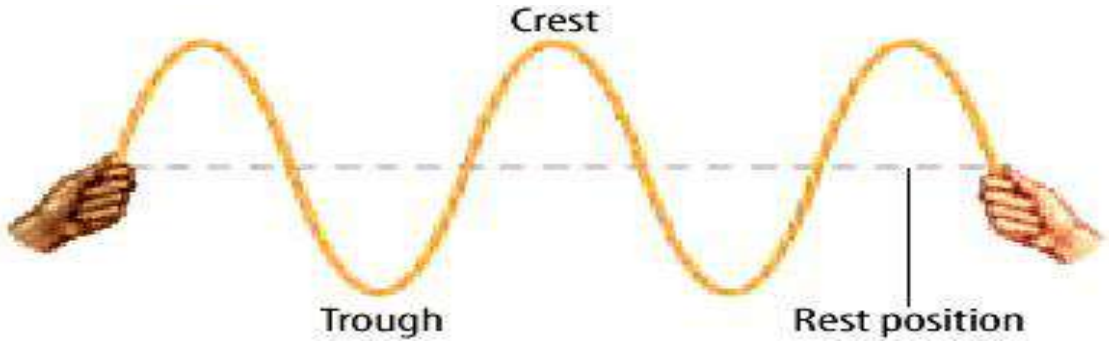


Speed of Light = 3×10^8 m/s

Wave properties:

Wavelength – (meters)

Lambda λ



b. Frequency - # of waves that pass per second (Hertz Hz).

Wave behavior:

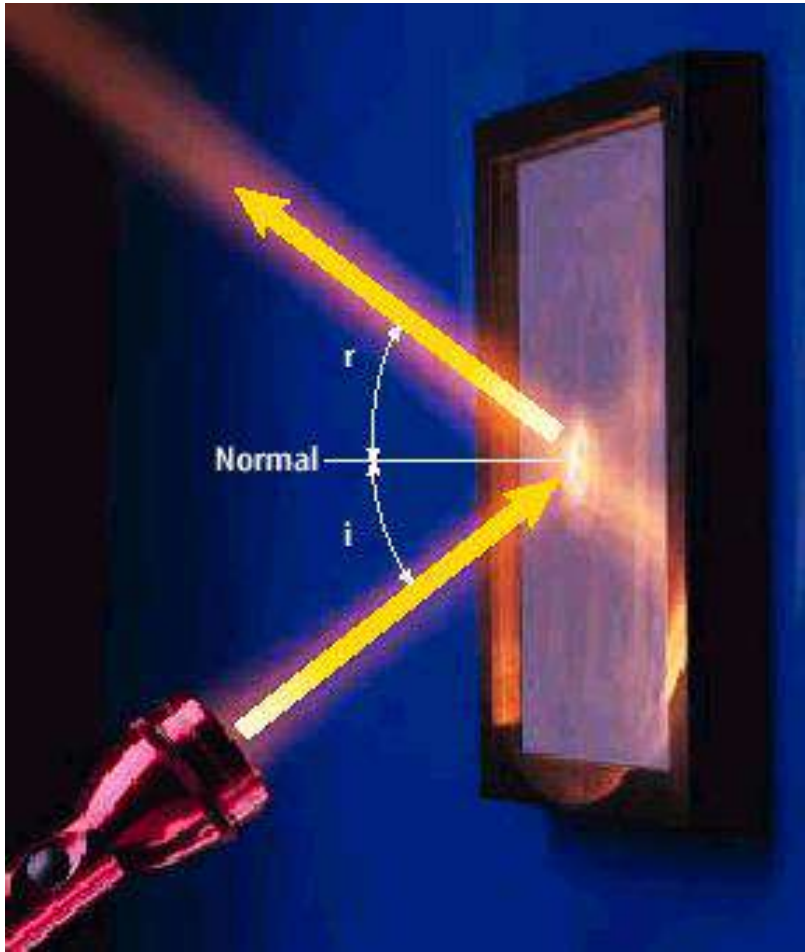
Reflection - the ***bouncing back*** of a wave.

1) Sound echoes

2) Light images in mirrors

3) Law of reflection

$i = r$



Reflection

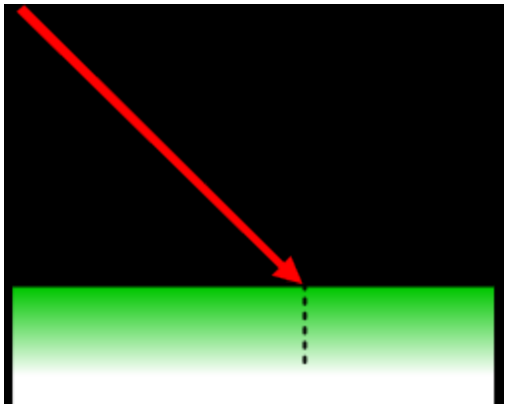
- Light always travels in a straight line.
- However, when light hits another substance, it will change direction.
- If a material is opaque, the light will not pass through but instead bounce off.
- The change in the direction of the light is called reflection.

Texture of Surface

- The manner in which the light reflects depends on the surface's smoothness.
- Light that hits a rough surface is reflected in many directions. This is called diffuse reflection. (Aluminum foil Demo)
- Light reflected off a smooth surface is reflected in one direction and is called specular reflection. (disco ball/cd Demo)

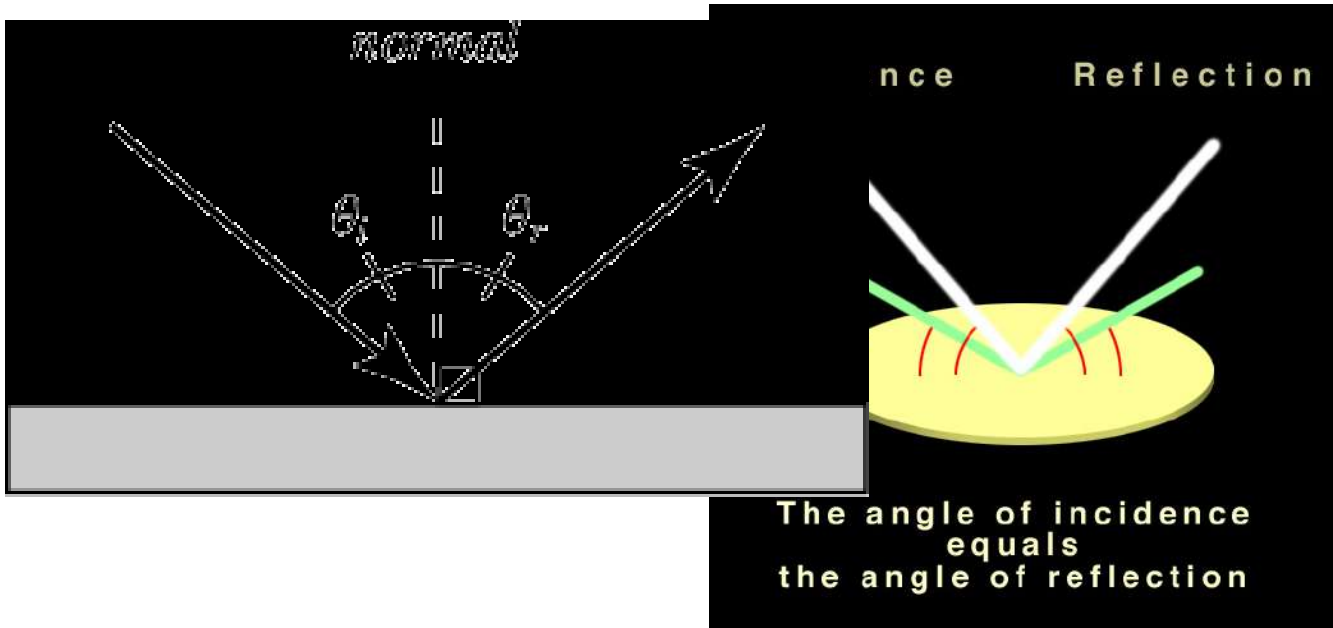
Reflected Angles

- Angle of incidence – the angle between a ray that strikes a surface and the normal to that surface at the point of contact.



Angle of Reflection

- Angle of reflection – the angle formed by the line normal to a surface and the direction which a reflected ray moves.

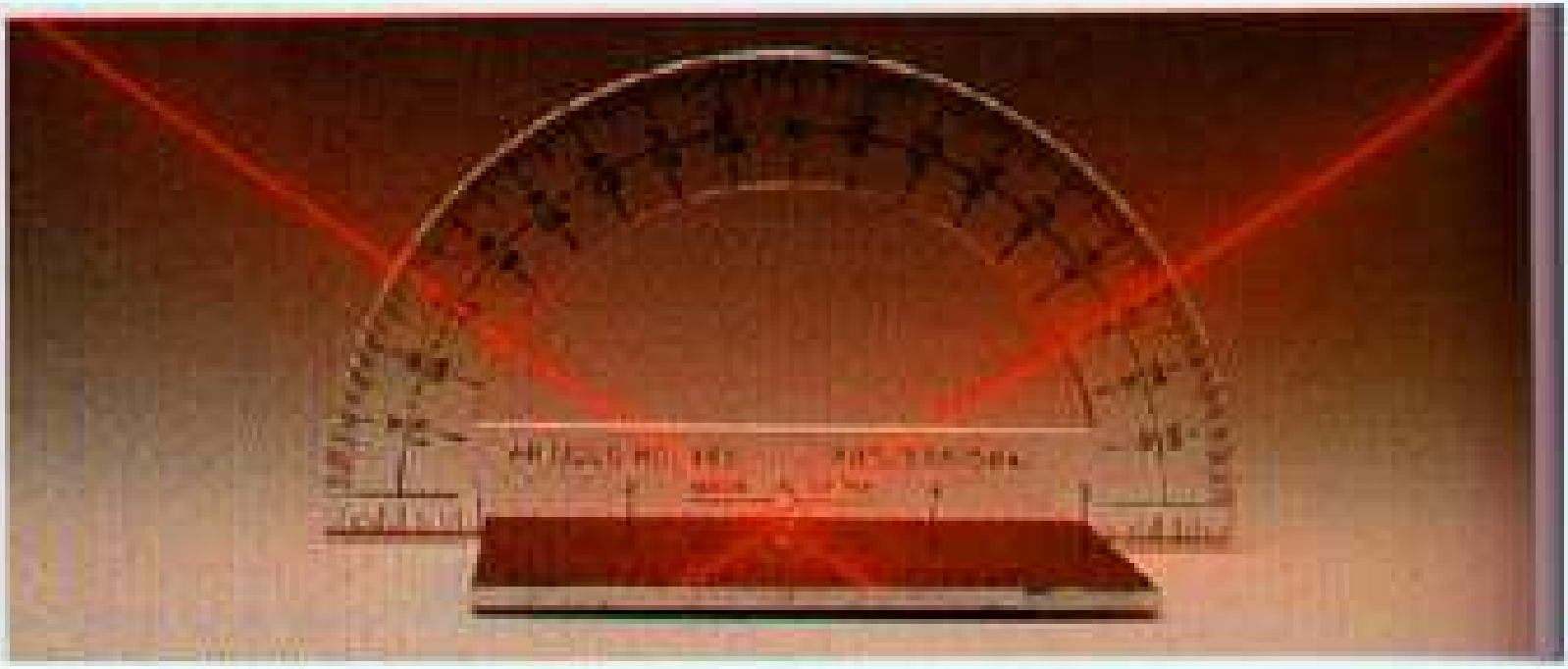


Incoming and reflected angles are equal.

Law of Reflection

Reflection:

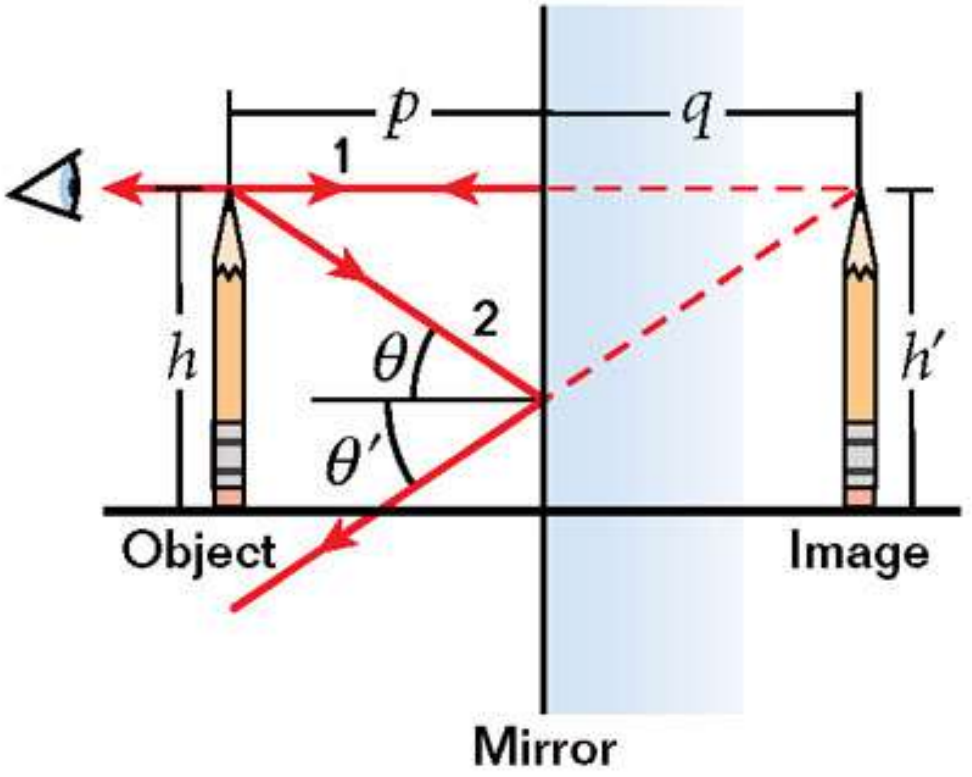
The angle of incidence = the angle of reflection.



Demos

- Khet Chess
- Periscope
- 90 degree mirrors
- Reflection Glasses
- Sound Laser machine
- Zoetrope / original films
- Illusions (mirror and bank)

Flat Mirror Reflection



Reflection Rules

- Angle 1 = Angle 2
- H1 = H1 but on opposite sides
- p = q but on opposite sides
- The image formed by a flat mirrors has right to left reversal.

- Concave Mirror – An inwardly curved, mirrored surface that is a portion of a sphere and that converges incoming light.
- Concave mirrors create a magnified image.
- How big the image appears depends on how curved the mirror.
- R is the radius of curvature
- C is the center of curvature

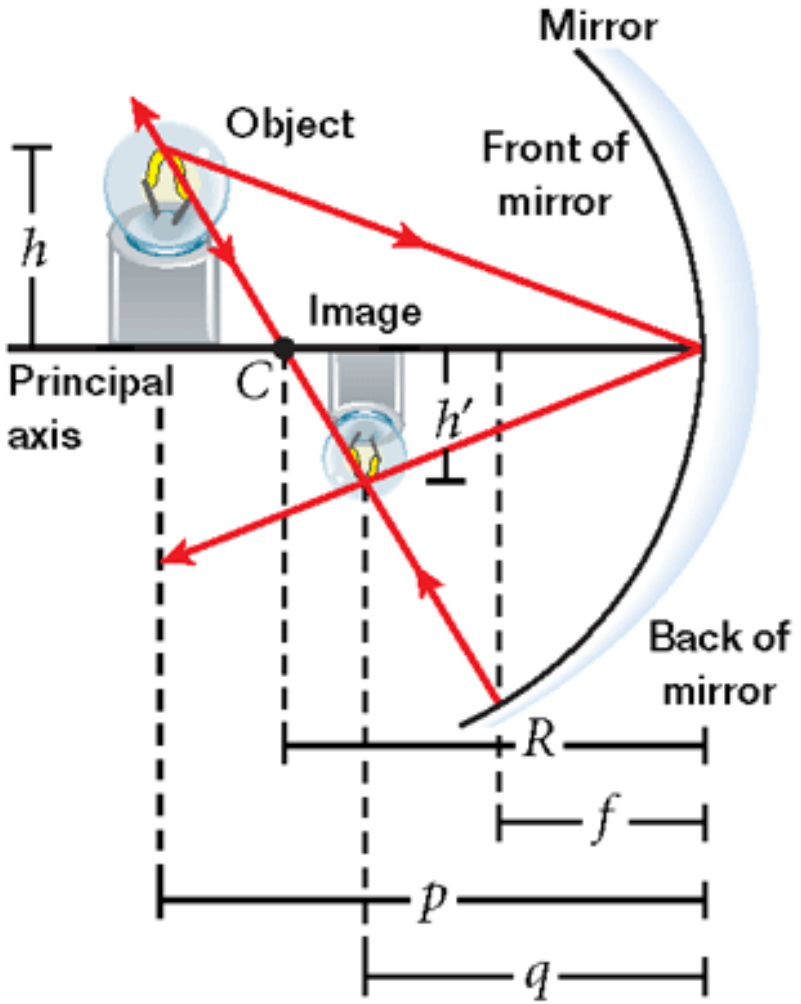
- Real image – an image formed when rays of light actually intersect at a single point.
- Real image is a clear crisp image that is formed.
- Image location can be predicted with the mirror equation
- $1 / p + 1 / q = 1 / f$
- $1 / p + 1 / q = 2 / R$
- p = object distance; q = image distance
- f = focal length; R = Radius

- Unlike flat mirrors, the images formed are not the same size as the original image.
- How big or small they appear can be calculated:
- $M = h' / h$
- $M = q / p$
- M = Magnification; h’ = image height
- h = object height; q = image distance
- p = object distance

- If M is + then the image is Upright and Virtual.
- If M is – then the image is Inverted and Real

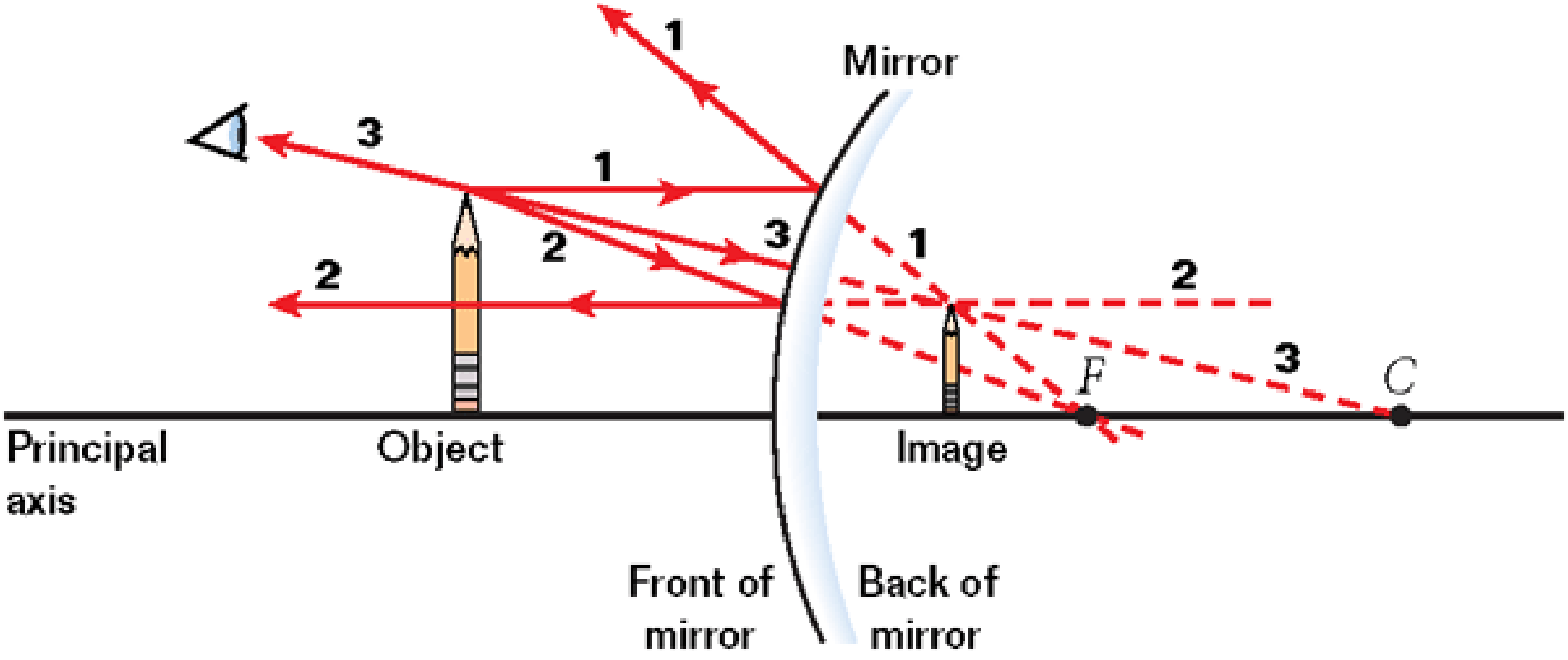
- A concave mirror has a focal length of 30 cm. Calculate the image position of a cologne bottle placed in front of the mirror at a distance of 50 cm. Calculate the magnification of this image.

Must draw the concave mirror with image and rays:



- Convex Mirror – An outwardly curved mirror that is a portion of a sphere that diverges incoming light rays.
- The image appears smaller.
- The focal point and center of curvature are behind the mirror's surface.
- A virtual, upright image forms where three rays meet.
- Magnification for convex mirrors is always less than 1.

- Must Draw for test: Convex



Demos

- Skewers – Focal point
- Bendable Mirrors
- Security mirrors
- Make up Mirror
- Virtual mirror –owl
- Deep concave
- Concave / Convex mirrors

- Adding primary colors of light creates white light
- An object of a particular color, such as a green leaf, absorbs light of all colors except for green which it reflects.
- So since there are Red, Orange, Yellow, Green, Blue, Indigo, and Violet the leaf absorbs all these except Green.
- For test you must list the colors absorbed and colors reflected. Remember colors by ROYGBIV.

Demos

- Laser on black and clear balloons
- Red and Blue filter

- One type of telescope uses curved mirrors and small lenses to form an image – this is called a reflecting telescope.
- Another type of telescope uses only lenses to form an image and is called a refracting telescope.