

Little Star Hr. Sec. School
CLASS-10
SUBJECT-SCIENCE(PHYSICS)
CHAPTER-10(LIGHT:REFLECTION AND REFRACTION)

Learning Material Content cREATED BY ZAVINUO (PHYSICS TEACHER),LSHSS

LIGHT: Reflection and Refraction

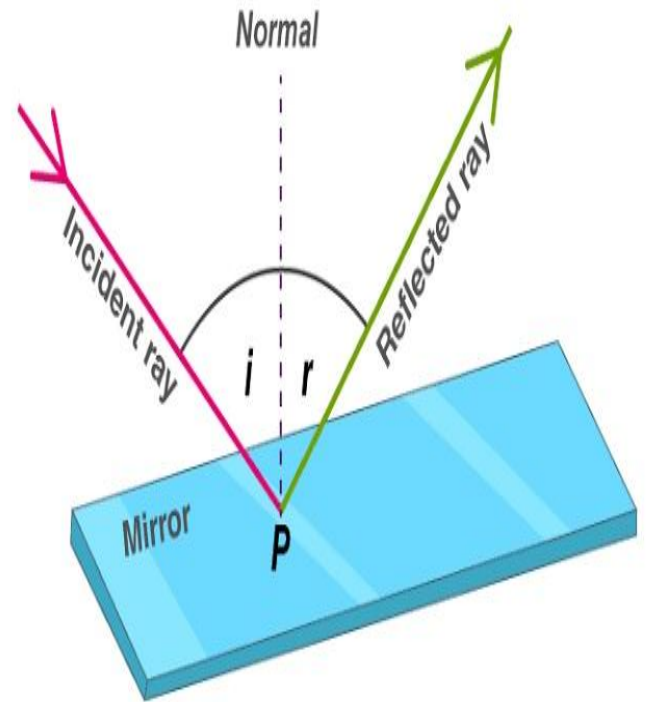
Topics to be covered:

- Laws of reflection
- Spherical mirrors:
 - Types
 - Ray diagrams : Rules
 - Image formation by mirror
 - New cartesian sign convention
- Mirror formula and its magnification
- Laws of refraction
- Spherical lens
 - Types
 - Ray diagrams
 - Image formation by mirror
 - New cartesian sign convention
- Lens formula and its magnification
- Refractive Index

Reflection of Light

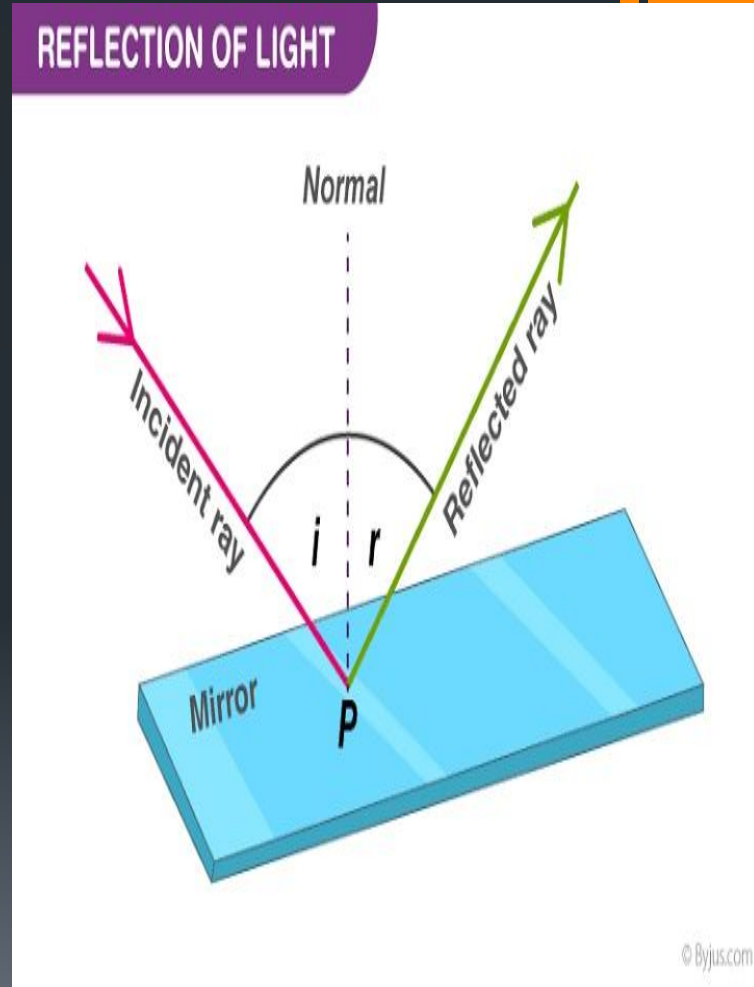
Reflection is the phenomenon of bouncing back of light in the same medium on striking the surface of any object.

REFLECTION OF LIGHT



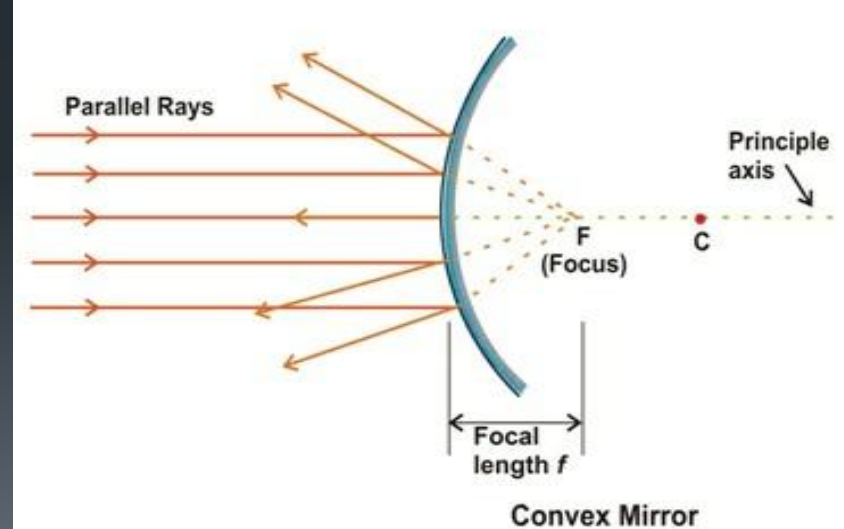
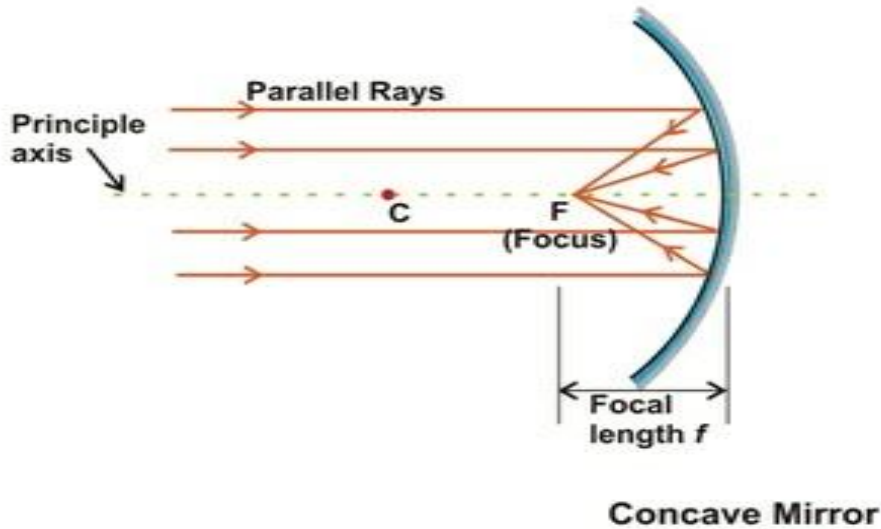
Two laws of reflection are:

- The incident ray, the normal to the mirror at the point of incidence and the reflected ray, all lie in the same plane as shown in the figure. →
- The angle of incidence is equal to the angle of reflection i.e $\angle i = \angle r$



Spherical Mirrors

Types



Ray diagram : Rules

- [Four rules to draw ray diagram of a mirror. Click here](#)

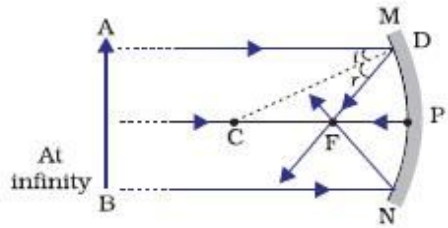
4 - Rules of *Shreem Ganesh*
Image formation
By spherical
Mirrors

Image formation by a mirror

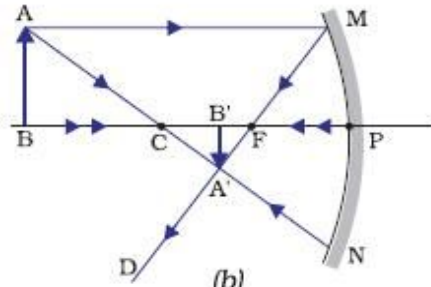
- [Click here to know the type of images form by a mirror](#)



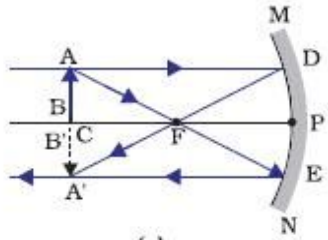
Image formed by a concave mirror



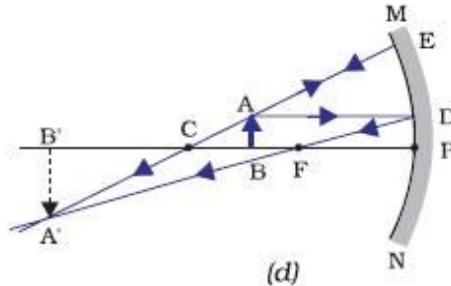
(a)



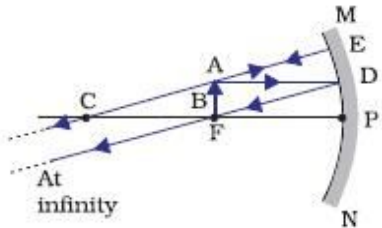
(b)



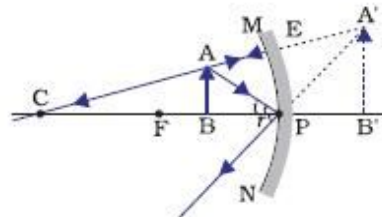
(c)



(d)



(e)



(f)

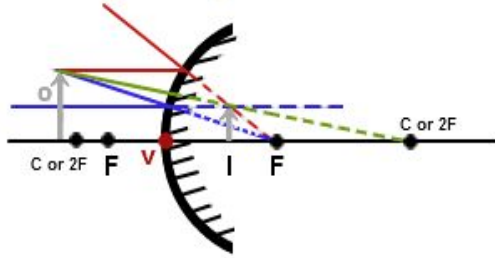
WORKSHEET-1

From the figure, identify and write down the

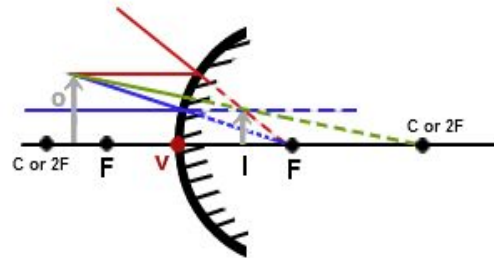
- i) Position of the object
- ii) Position of the image
- ii) Size of the image
- iv) Nature of the image

Image formed by a convex mirror

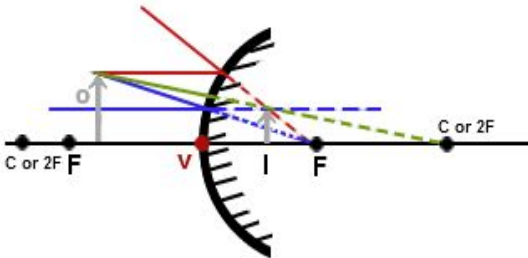
1. Object beyond C



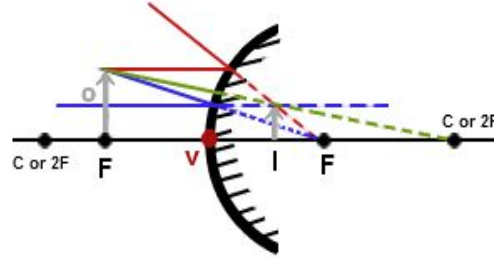
2. Object between C and F



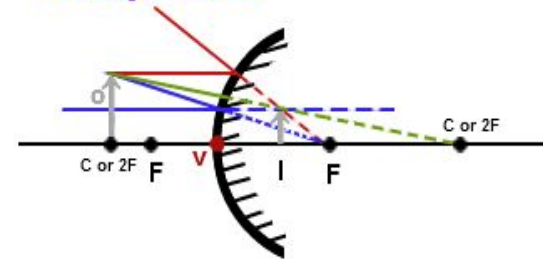
3. Object between F and V



4. Object at F



5. Object at C

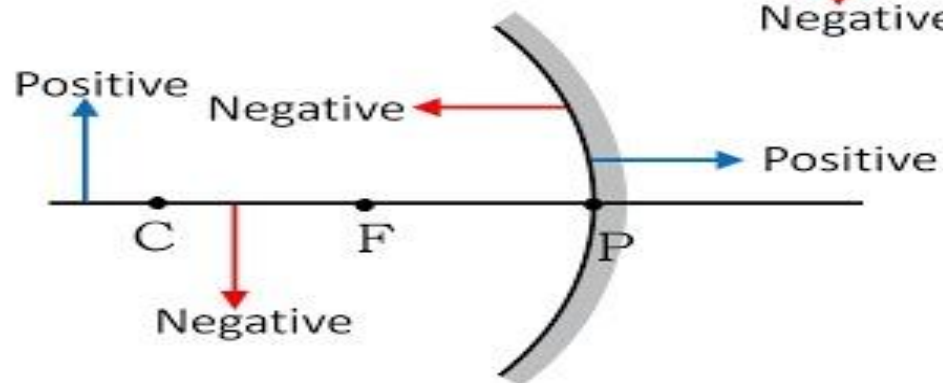


WORKSHEET-2

From the figure, identify and write down the

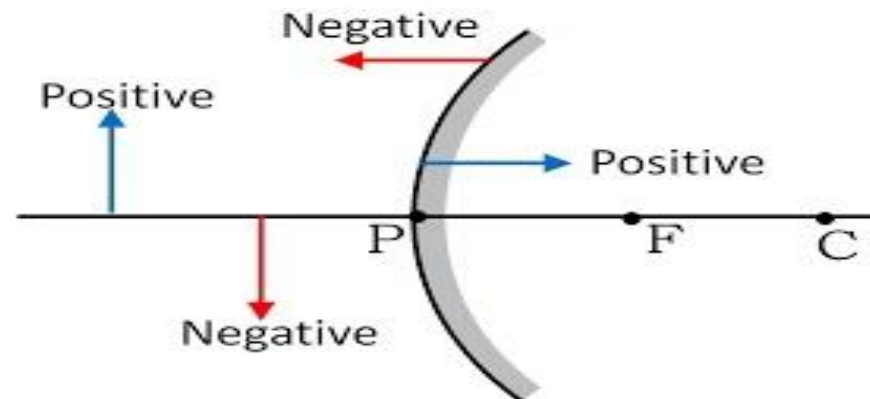
- i) Position of the object
- ii) Position of the image
- ii) Size of the image
- iv) Nature of the image

Sign convention for Mirrors



Concave Mirror

*Focal length of concave mirror is always **Negative***



Convex Mirror

*Focal length of convex mirror is always **Positive***

Mirror Formula

$$+\frac{1}{v} = \frac{1}{u} - \frac{1}{f}$$

Its magnification is given by ,

$$m = \frac{h'}{h} = \frac{v}{u}$$

Refraction of light

- [Watch the video by Clicking here and write down the answers for the questions in the next page.](#)



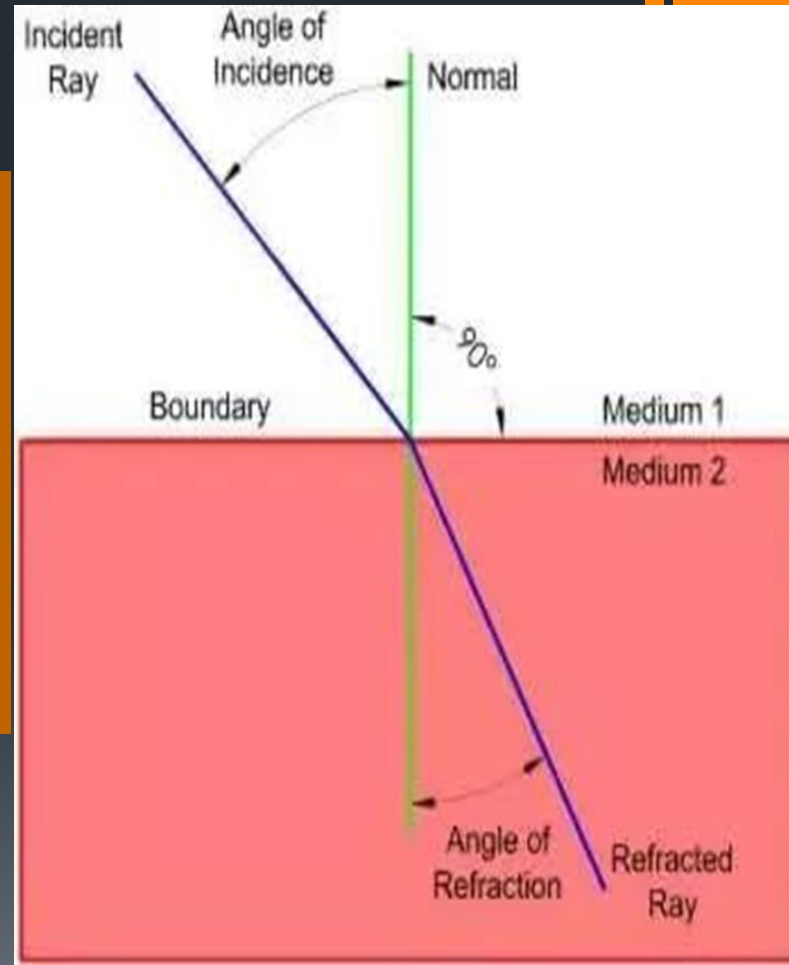
Refraction of light

Worksheet-3

- How does the speed of light changes when it passes from optically
 - (i) rarer medium to denser medium
 - (ii) denser medium to rarer medium.
- When light travels from water to air, in which direction does light bend?
- What is the cause of refraction.
- Does a lemon kept in a glass tumbler appear bigger than its actual when viewed normally? Explain.

Laws of refraction

- The incident ray, the refracted ray and the normal to the interface at the point of incidence all lie in the same plane as shown in the figure.

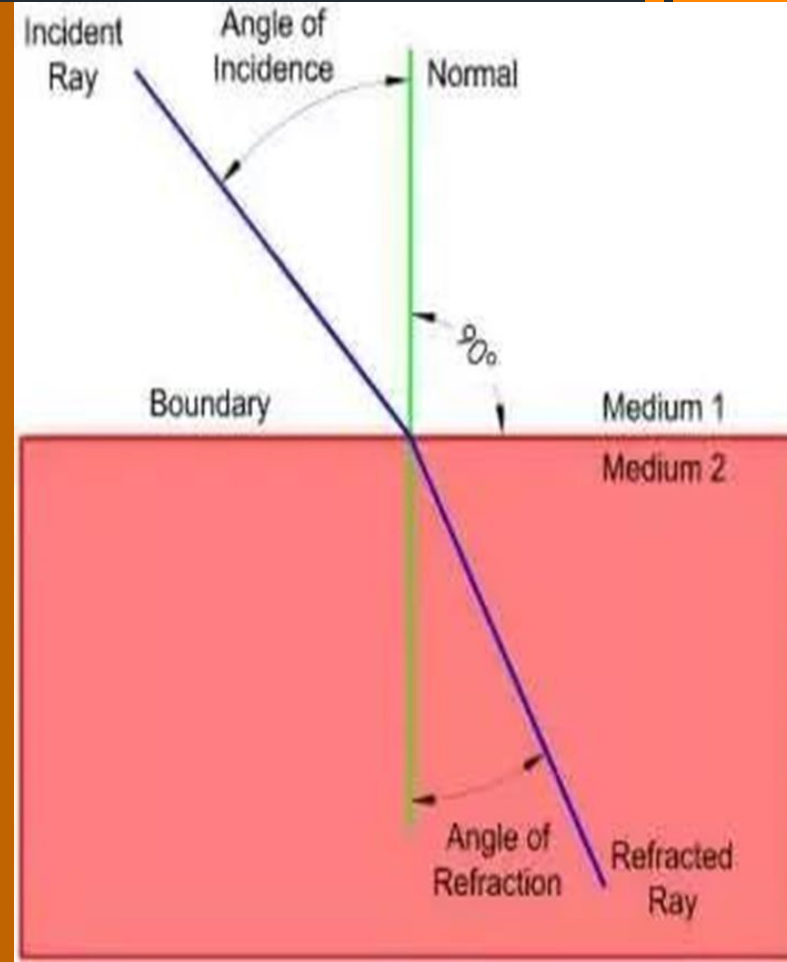


Laws of refraction

- The ratio of sine of angle of incidence to the sine of angle of refraction is constant for a given pair of media, which is also known as Snell's law i.e

$$\frac{\sin i}{\sin r} = \text{a constant}$$

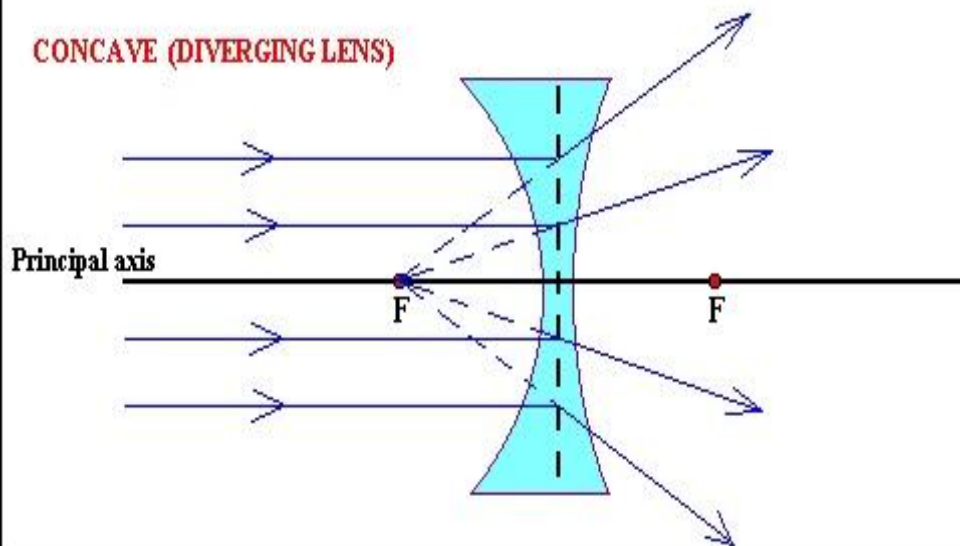
= n_{12} (refractive index of medium 2 w.r.t medium 1)



Spherical Lens

Types

CONCAVE (DIVERGING LENS)



CONVEX (CONVERGING LENS)

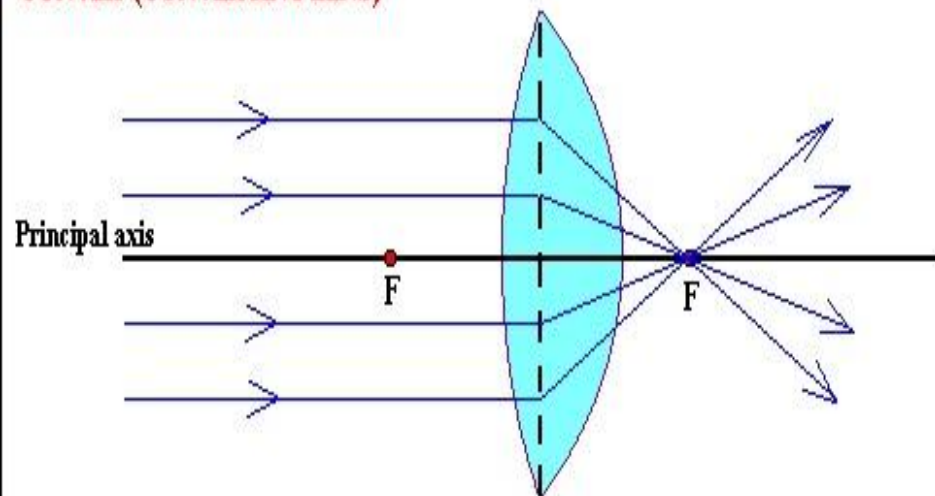
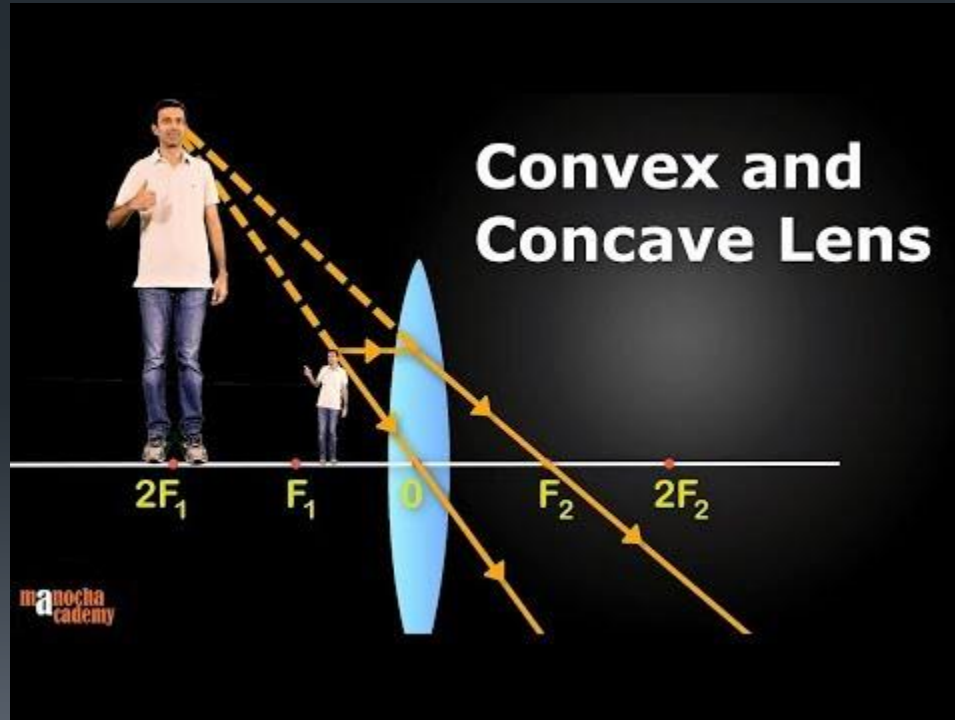
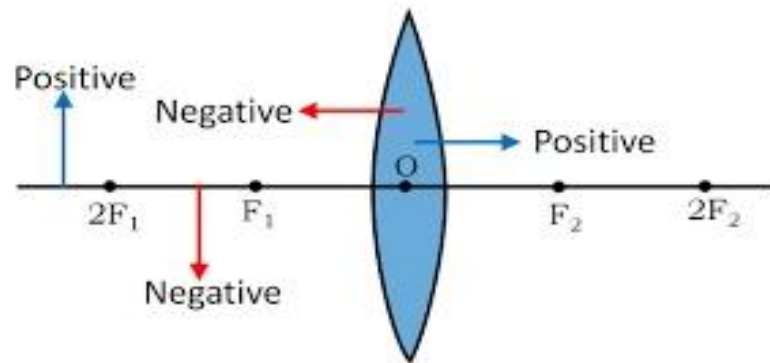
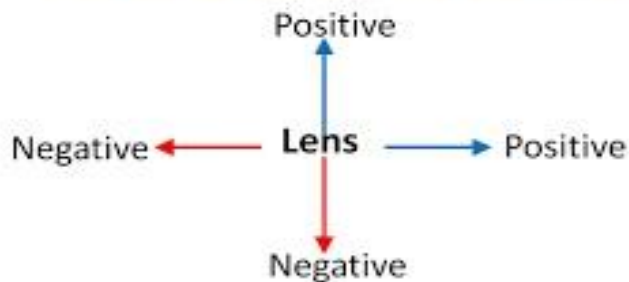


Image formation by lens using ray diagram rules

- [Image formation by concave & convex lens. Click here](#)

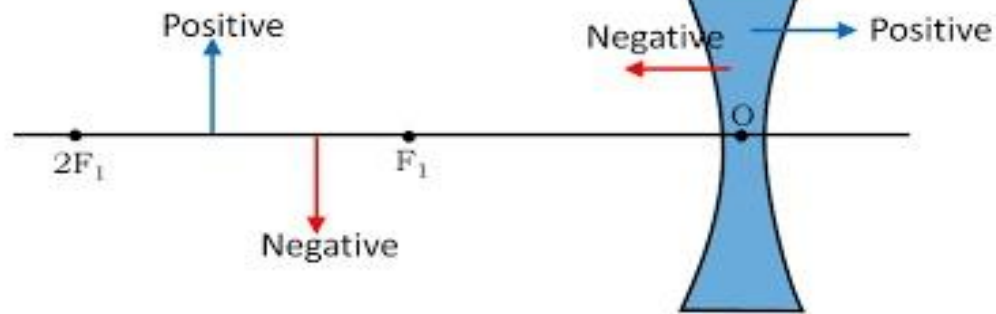


Sign convention for Lens



Convex Lens

Focal length of convex lens is always **Positive**



Concave Lens

Focal length of concave lens is always **Negative**

Lens Formula

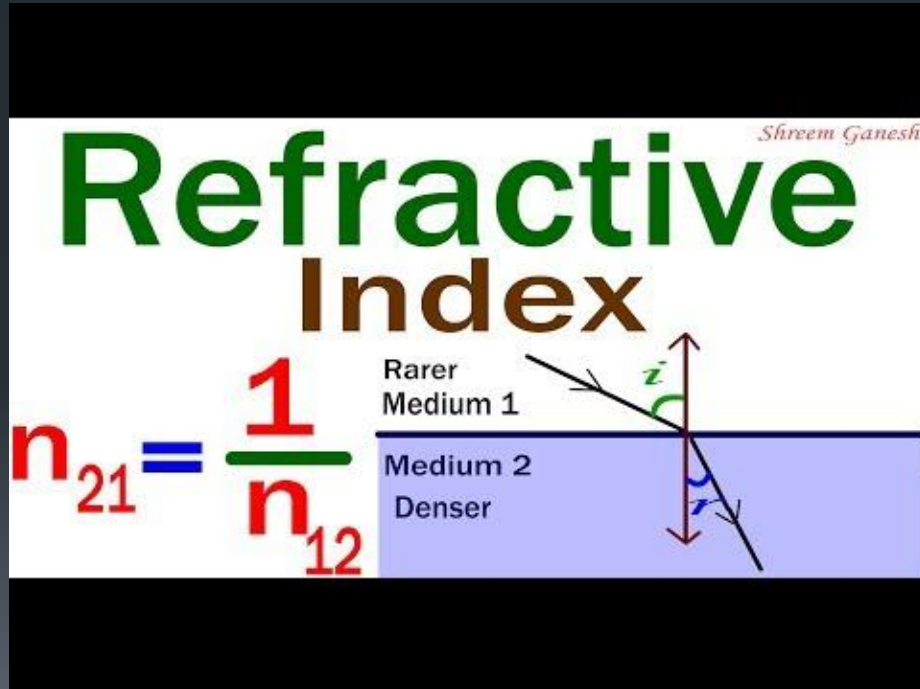
$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

Its magnification is given by,

$$m = \frac{h'}{h} = \frac{v}{u}$$

Refractive Index

- [Refractive index video.Click here](#)



Worksheet-4

i) Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is 3×10^8 m/s

Power of a lens

Power of a lens is the reciprocal of focal length of a lens measured in metre i.e

$$P = \frac{1}{f(m)}$$

Its S.I unit is Diopetre (D)

For convex lens, $P = +$

For concave lens, $P = -$

If two lenses are in contact,

$$\text{i) } \frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\text{ii) } P = P_1 + P_2$$

Problem Solving



- Follow the steps given below

- 1, Read the question carefully and write down the given values.
- 2, Apply new cartesian sign convention for a given mirror / lens in the given values.
- 3, Write the formula for a given mirror / lens.
- 4, Substitute the values with sign convention in the formula and find the answers.

Worksheet-3

1. Write the uses of a concave mirror.
2. Write the uses of a convex mirror.
3. Write 3 uses of a convex lens.
4. Write 3 uses of a concave lens.
5. Define refraction.
6. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18cm. At what distance from the mirror should a screen be placed, so that a sharp focused image can be obtained? Find the size and the nature of the image.

Worksheet-5

7. An object is placed at a distance of 20cm from a convex mirror of focal length 25cm. Find the position and nature of the image.
8. An object of 5cm in length is held 25cm away from a convex lens of focal length 10cm. Draw the ray diagram and find the position, size and the nature of the image formed.
9. Find the focal length of a lens of power -2.0D. What type of lens is this?
10. A doctor prescribed a corrective lens of power +1.5D. Find the focal length of the lens. Is the prescribed lens diverging or converging?
