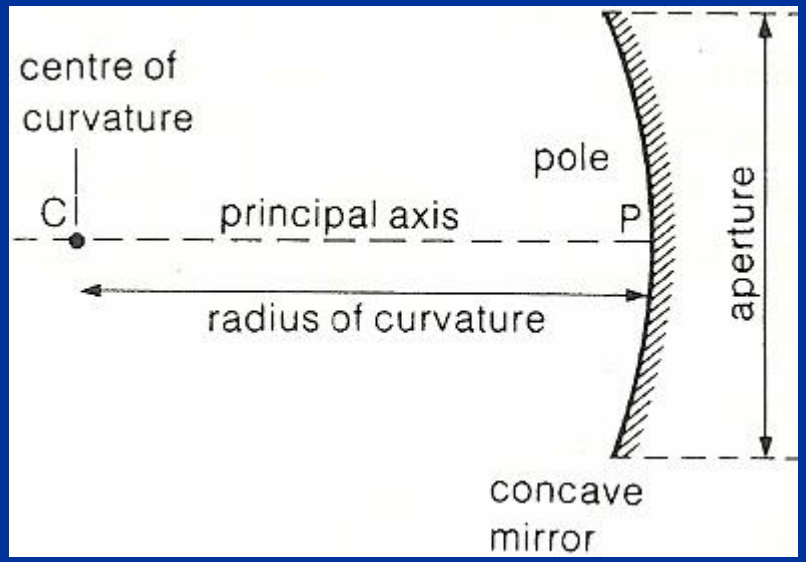
Curved mirrors

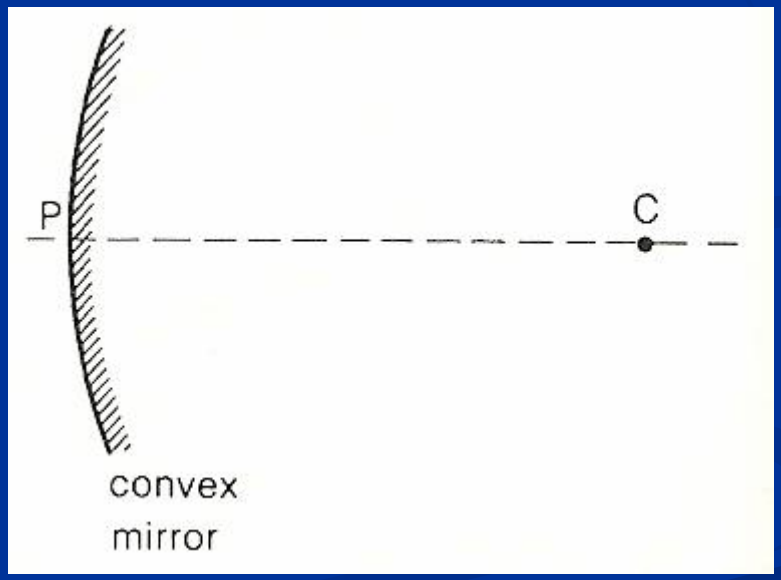
Curved mirrors:

•Concave mirror – caves inwards

•Convex mirror – bulges outwards

The centre of curvature marks the centre of the sphere of which the mirror forms the part, the pole, the principal axis, the aperture, and the radius of curvature of a mirror are illustrated in the figure.





Principal focus

The rays of light reflected from the concave mirror converge on a single point F (focus).

The rays of light reflected from the convex mirror diverge as if travelling outwards from a single point F (focus).

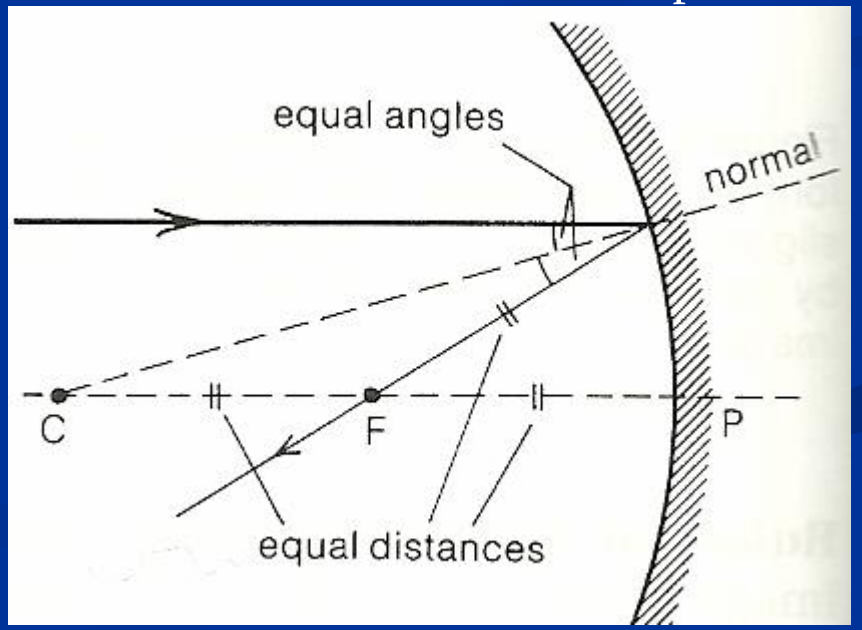
F – the principal focus

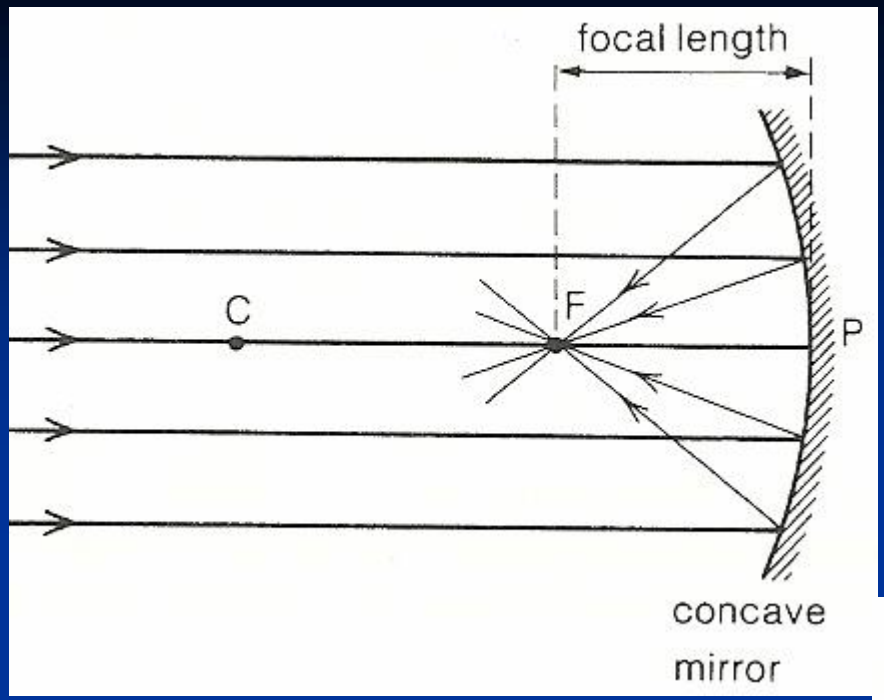
FP distance – focal length

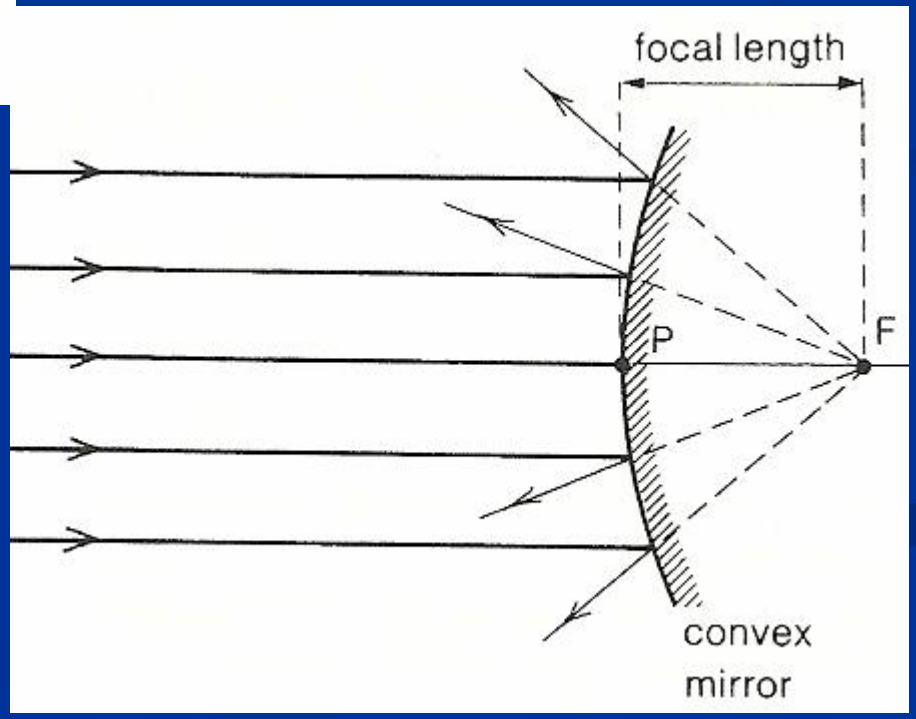
Focus is exactly middway between the centre of curvature of the mirror and its pole:

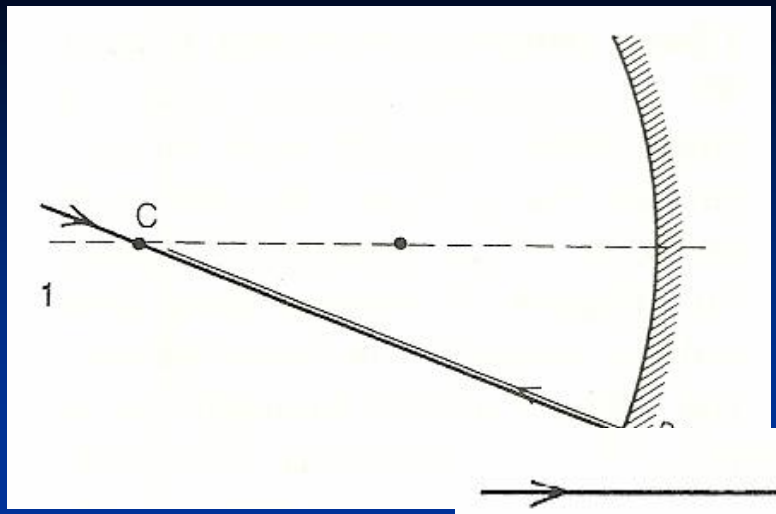
focal length = ½ radius of curvature

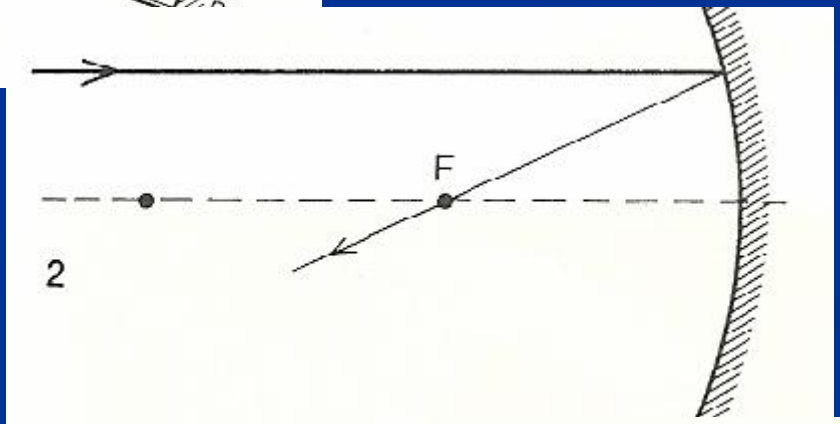
$f = \frac{1}{2} r$

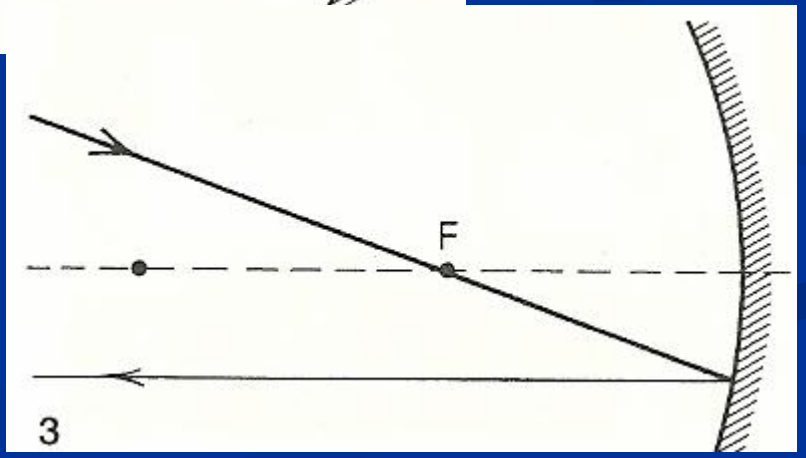



focal length
C
F
P
concave
mirror


focal length
P
F
convex
mirror


C
1

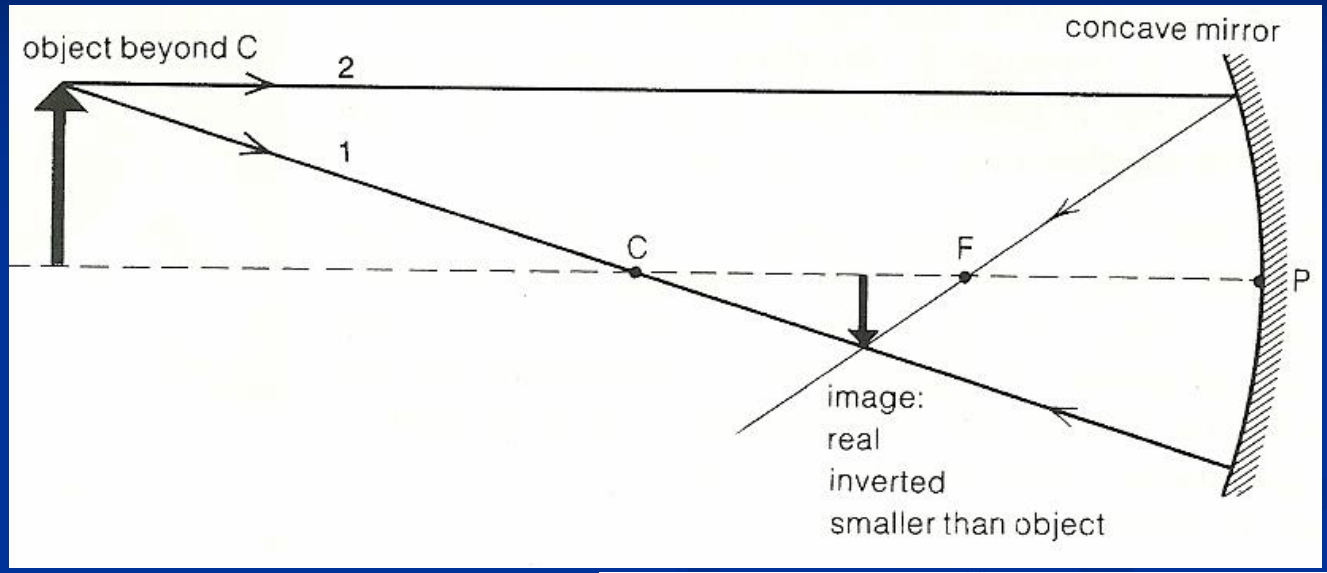

F
2


F
3

Images formed by concave mirrors

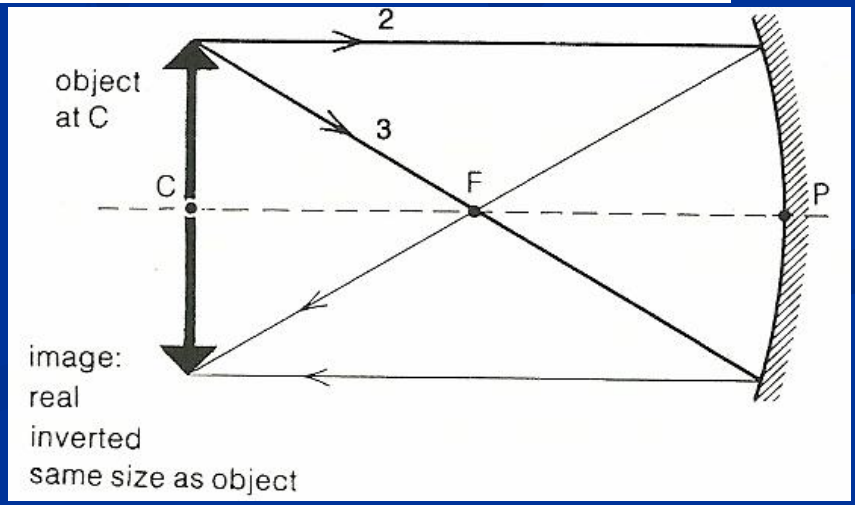
•Distant object (beyond C):

Image – real, inverted, smaller than object



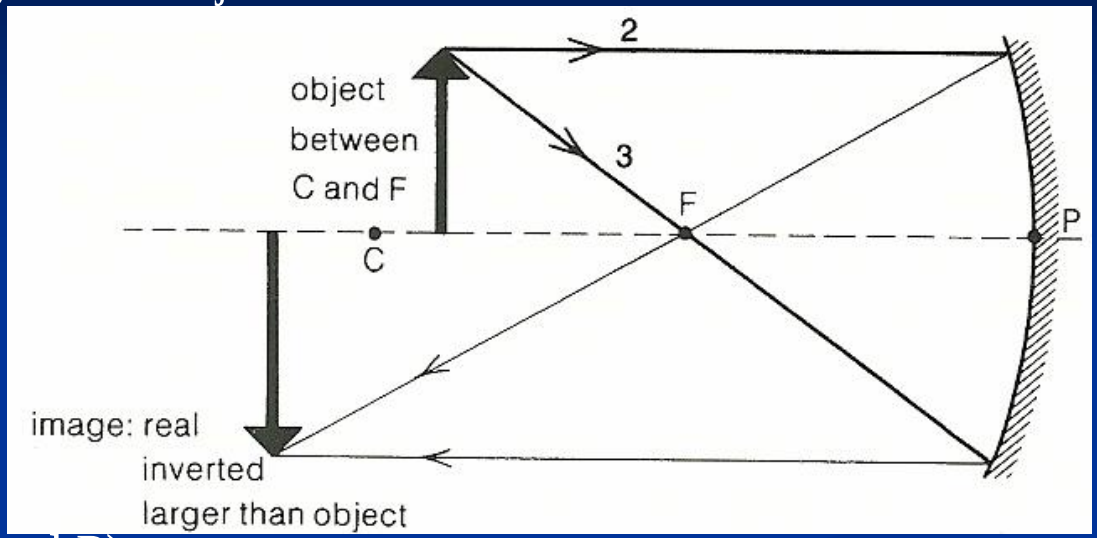
•Object at C:

Image – real, inverted, same size as object



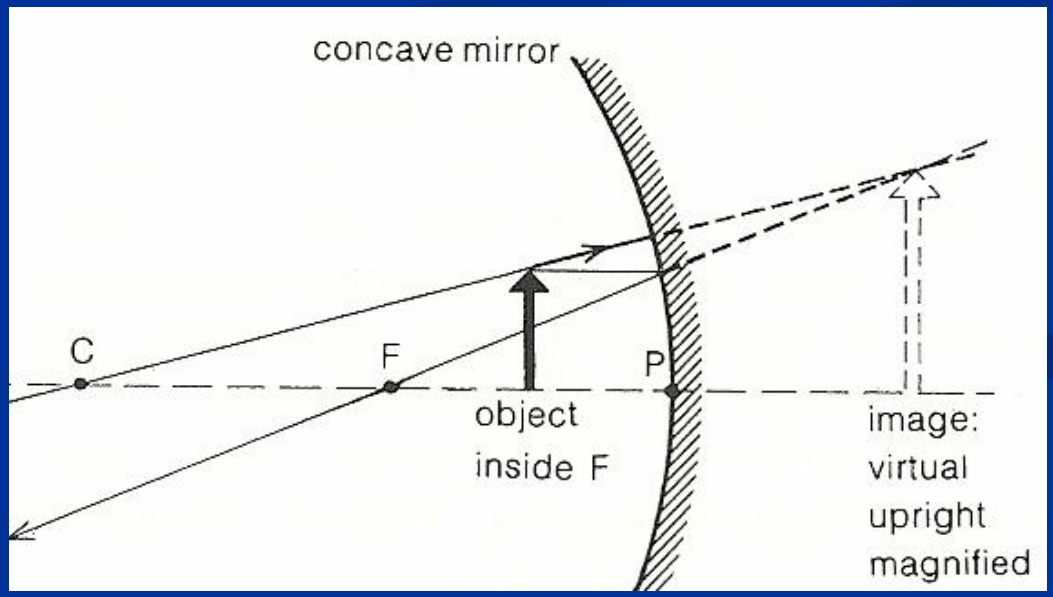
•Object between C and F:

Image – real, inverted, larger than object



•Close object (between F and P):

Image – virtual, upright, magnified



Images formed by convex mirror

A convex mirror forms an upright, virtual image of any object placed in front of it.

The image is always smaller than th eobject and closer to the mirror. Changing the position of the object changes the position and size of the image.

$$1/a + 1/a' = 2/r = 1/f$$

a – distance of the object from the mirror

a´ - distance of the imaget from the mirror

r – radius of curvature

f – focal length

y´, y – heigth of the image and of the object

$$Z = y'/y = - a'/a = - (a' - f) / f = - f/ (a - f)$$

Z - linear magnification

An object 2 cm high is plaaced 12 cm away from a curved mirror. Radius of curvature is 16 cm. Calculate the position of the image and describe it in both of cases of convex and concave mirror.

Uses of curved mirrors

•Convex mirror gives a wider angle of view than a plane mirror

•Shaving and make-up mirrors are often concave in shape because of the magnification they give close up.

•Car headlight – concave reflector – to produce a parallel beam of light from a small bulb placed at the principal focus of the reflector.

•The satellite tracking dish – to bring microwave signals from satellites to a focus.