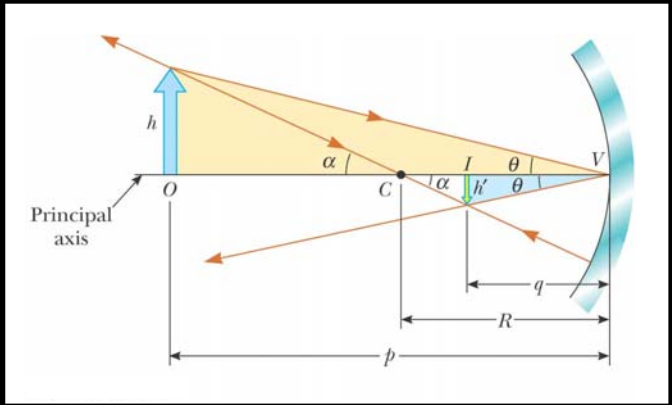
36.2 Images formed by spherical mirrors

- Concave (converging) & Convex (diverging) mirrors.

A) Concave mirror :



- Mirror equation : $1/p + 1/q = 1/f$
- Magnification : $M = -q/p$

- Sign convention for mirrors :

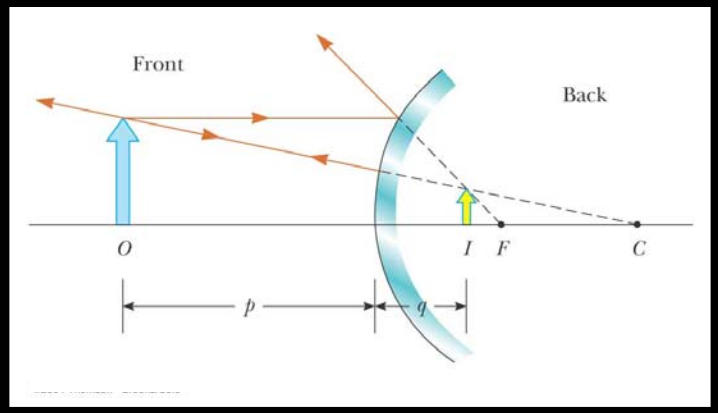
Quantity	Positive When	Negative When
Object location (p)	Object is in front of mirror (real object)	Object is in back of mirror (virtual object)
Image location (q)	Image is in front of mirror (real image)	Image is in back of mirror (virtual image)
Image height (h')	Image is upright	Image is inverted
Focal length (f) and radius (R)	Mirror is concave	Mirror is convex
Magnification (M)	Image is upright	Image is inverted

	p	q	f, R	M (= –q/p)
+	real object	real image	concave	upright
–	virtual object	virtual image	convex	inverted

36.2 Images formed by spherical mirrors

- Concave (converging) & Convex (diverging) mirrors.

B) Convex mirror :



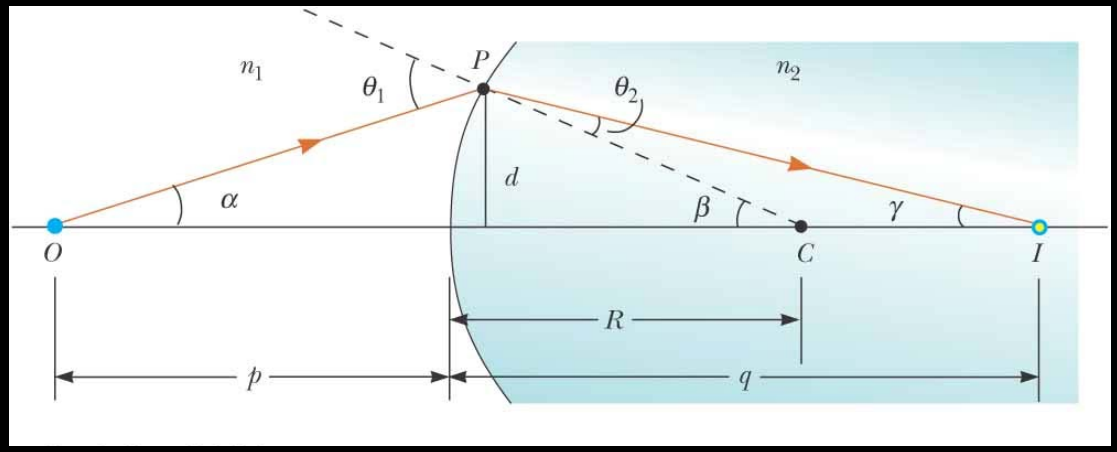
- Mirror equation : $1/p + 1/q = 1/f$
- Magnification : $M = -q/p$

- Sign convention for mirrors :

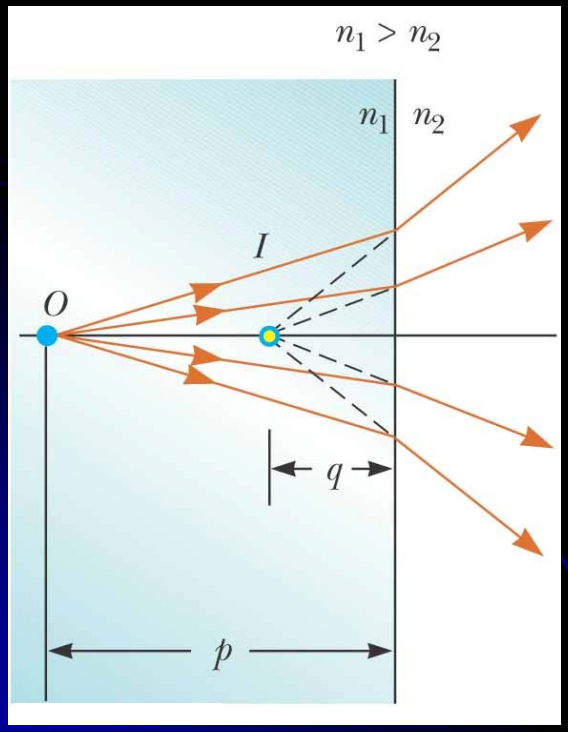
Quantity	Positive When	Negative When
Object location (p)	Object is in front of mirror (real object)	Object is in back of mirror (virtual object)
Image location (q)	Image is in front of mirror (real image)	Image is in back of mirror (virtual image)
Image height (h')	Image is upright	Image is inverted
Focal length (f) and radius (R)	Mirror is concave	Mirror is convex
Magnification (M)	Image is upright	Image is inverted

	p	q	f, R	M (= –q/p)
+	real object	real image	concave	upright
–	virtual object	virtual image	convex	inverted

36.3 Images formed by refraction



$$\frac{n_1}{p} + \frac{n_2}{q} = \frac{(n_2 - n_1)}{R}$$



Quantity	Positive When	Negative When
Object location (p)	Object is in front of surface (real object)	Object is in back of surface (virtual object)
Image location (q)	Image is in back of surface (real image)	Image is in front of surface (virtual image)
Image height (h')	Image is upright	Image is inverted
Radius (R)	Center of curvature is in back of surface	Center of curvature is in front of surface

- Flat refracting surfaces :

For $R \to \infty$ $\quad q = -(n_2 / n_1)\, p$