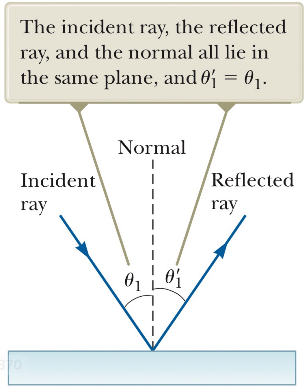


$\theta_1 = \theta_2$ LAW OF REFLECTION

ANGLES MEASURED W.R.T. THE NORMAL

INDEX OF REFRACTION: $N = \dfrac{c}{v} = \dfrac{3 \cdot 10^8 \, m/s}{v}$ $\boxed{N \geq 1}$

v OF LIGTH IN THAT ELEMENT

SNELL'S LAW: $N_1 \, SEN \, \theta_1 = N_2 \, SEN \, \theta_2$ ANGLE MEASURED W.R.T. TO THE NORMAL

$$\Downarrow$$

$$\frac{SEN \, \theta_1}{SEN \, \theta_2} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

SPEED OF LIGTH IN MEDIUM 1

SPEED OF LIGTH IN MEDIUM 2

$\boxed{v = \lambda f}$

f DO <u>NOT</u> CHANGE

- IF v DECREASE WHILE ENTERING MEDIUM 2, THE ANGLE FROM THE NORMAL DECREASE
- IF v INCREASE WHILE ENTERING MEDIUM 2, THE ANGLE FROM THE NORMAL INCREASE

TOTAL INTERNAL REFRACTION: $\theta_2 = 90° \Rightarrow N_1 \, SEN \, \theta_1 = N_2$ $\boxed{N_1 > N_2}$

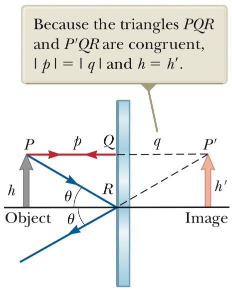
IMAGE FORMATION

p: OBJECT DISTANCE

q: IMAGE DISTANCE

REAL IMAGE
IT APPEARS FROM THE "FRONT" CONNECTION OF THE RAY

VIRTUAL IMAGE
IT APPEARS FROM THE "BACK" CONNECTION OF THE RAY



THE IMAGE FROM A FLAT MIRROR IS ALWAYS VIRTUAL

(LATERAL) MAGNIFICATION:

IMAGE HEIGHT

$$M = \frac{h'}{h} = \frac{-n_1 q}{n_2 p}$$

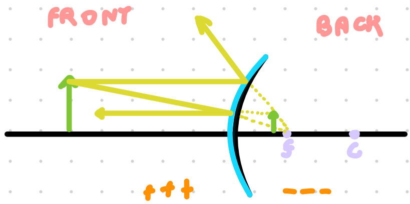
OBJECT HEIGHT

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f} \qquad f = \frac{R}{2} \qquad \Rightarrow \frac{1}{p} + \frac{1}{q} = \frac{2}{R}$$

FOCAL LENGTH

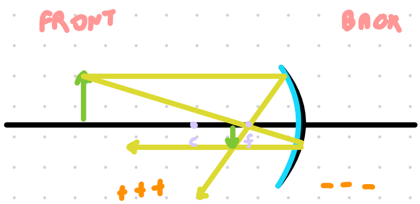
$$L = q + p$$

CONVEX MIRROR

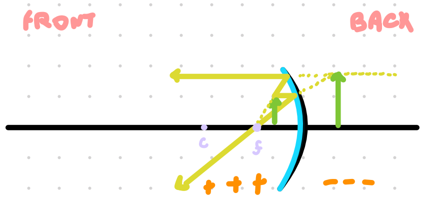


THE IMAGE IS ALWAYS VIRTUAL, UPRIGTH AND SMALLER THAN THE OBJECT

CONCAVE MIRROR



THE IMAGE IS REAL, INVERTED AND SMALLER THAN THE OBJECT



THE IMAGE IS VIRTUAL, UPRIGTH AND BIGGER THAN THE OBJECT

SIGN CONVENTION

TABLE 35.1 Sign Conventions 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.

TABLE 35.2 Sign Conventions for Refracting Surfaces

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.

$$\frac{N_1}{p} + \frac{N2}{q} = \frac{N_2 - N_1}{R}$$

INDEX OF RIFRACTION OF THE LENT

LEN'S MARHER EQUATION: $\frac{1}{f} = \left(\frac{N_L}{N_M} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

INDEX OF RIFRACTION OF THE MEDIUM

AMOUNT OF REFLECTED LIGTH: $R = \left(\frac{N_2 - N_1}{N_2 + N_1}\right)^2$

DIOPTIC POWER: $P = \frac{1}{f} = \frac{1}{p} + \frac{1}{q}$