The Practise Ground

Class 10-12 Physics

Ray Optics Formulas

Mirrors and lenses with the Cartesian sign convention

1

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

Mirror formula

Focal length f = R/2 (R = radius of curvature)

2

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

Lens formula

Thin lens, same sign convention

3

$$m = -\frac{v}{u}$$

Magnification (mirror)

For a lens, m = v / u. Negative m means a real, inverted image

4

$$P = \frac{1}{f}$$

Power of a lens

f in metres gives power in dioptre (D)

u	v	f	m	P
object distance	**image distance**	**focal length**	**magnification**	**power**
cm or m	cm or m	cm or m	no unit	dioptre (D)

Sign convention

Measure distances from the pole or optical centre. Distances against the incident light are negative.

Concave mirror: f is negative. Convex lens: f is positive.

Quick example

Concave mirror, f = −10 cm, u = −30 cm

1/v = 1/f − 1/u = −1/10 + 1/30

v = −15 cm and m = −0.5: real, inverted, smaller

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