

Formulas for Optics

The law of refraction

$$n_a \sin \theta_a = n_b \sin \theta_b$$

Gauss' formula for thin lenses and mirrors

$$\frac{1}{f} = \frac{1}{s} + \frac{1}{s'}$$

Newton's formulas for thin lenses and mirrors

$$s = \frac{s'f}{s' - f} \quad \text{and} \quad s' = \frac{sf}{s - f}$$

Lateral magnification in thin lenses and mirrors

$$m = \frac{y'}{y} = -\frac{s'}{s}$$

Spherical refracting surface

$$\frac{n_a}{s} + \frac{n_b}{s'} = \frac{n_b - n_a}{R}$$

Lensmaker's formula

$$\frac{1}{f} = (n - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

Angular magnification of a telescope

$$M = -\frac{f_1}{f_2}$$

Angular magnification of a microscope

$$M = -\frac{L\sigma}{f_1 f_2} = m_1 M_2$$

L is the distance between focal points and σ is the distance to the near point (25 cm)