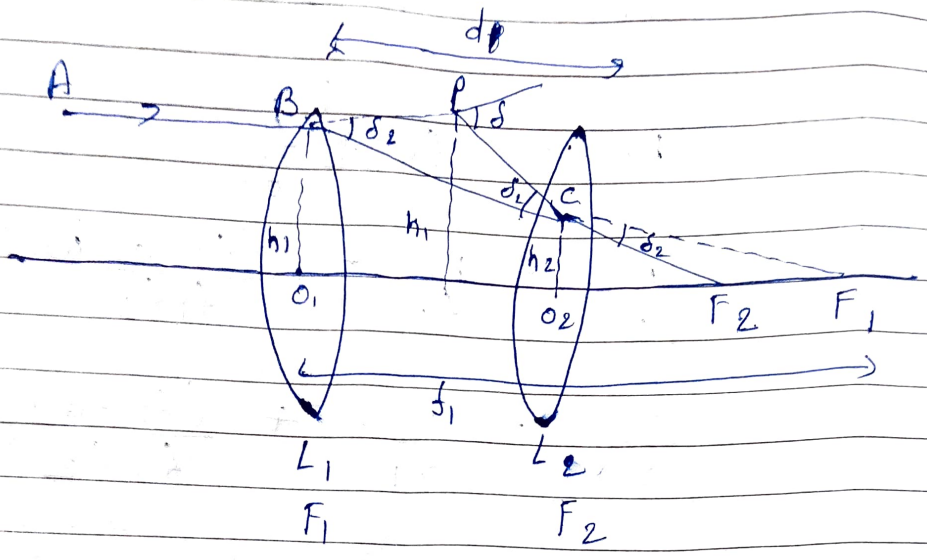


Equivalent focal length of combination of two thin lenses

Separated by a finite distance.



Let two thin lens L_1 and L_2 having focal lengths f_1 and f_2 separated by a distance d .

From $\triangle PBC$

Exterior angle = Interior angle

$$\delta = \delta_1 + \delta_2 \quad \left[\delta = \frac{h}{f} \right]$$

$$\delta = \frac{h_1}{f_1} + \frac{h_2}{f_2} \quad \text{--- (i)}$$

From figure

$$\delta = \frac{h_1}{f} \quad \text{--- (ii)}$$

$$\frac{h_1}{f} = \frac{h_1}{f_1} + \frac{h_2}{f_2} \quad \text{--- (iii)}$$

In ΔBO_1F_1 and ΔCO_2F_1

$$\frac{h_1}{f_1} = \frac{h_2}{(f_1 - d)}$$

$$h_2 = (f_1 - d) \frac{h_1}{f_1}$$

$$\frac{h_1}{f} = \frac{h_1}{f_1} + \frac{(f_1 - d) h_1}{f_1 f_2}$$

$$\frac{1}{f} = \frac{1}{f_1} + \frac{(f_1 - d)}{f_1 f_2}$$

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$$

— x —