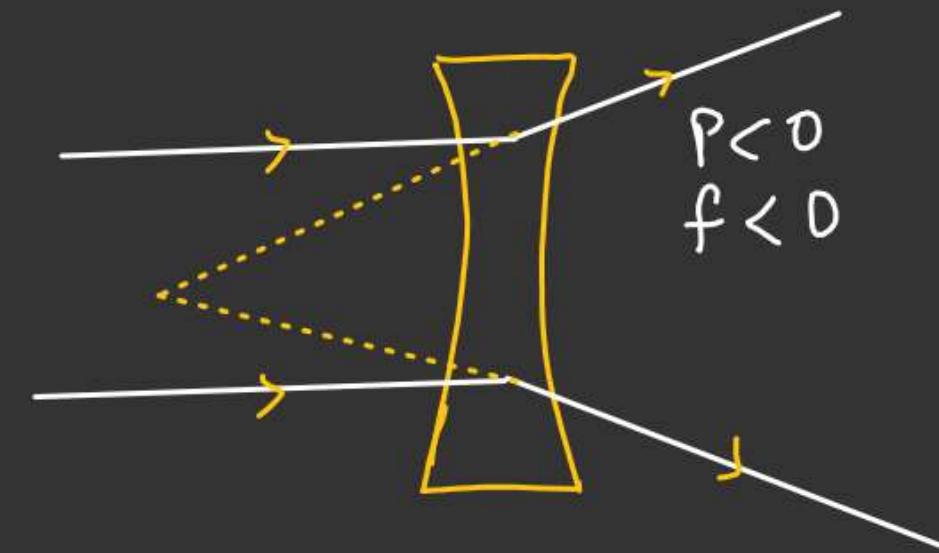
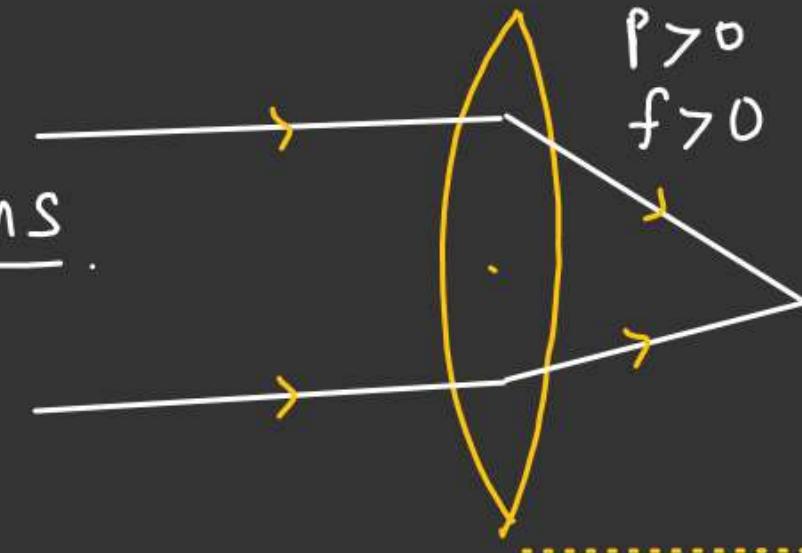




Power

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

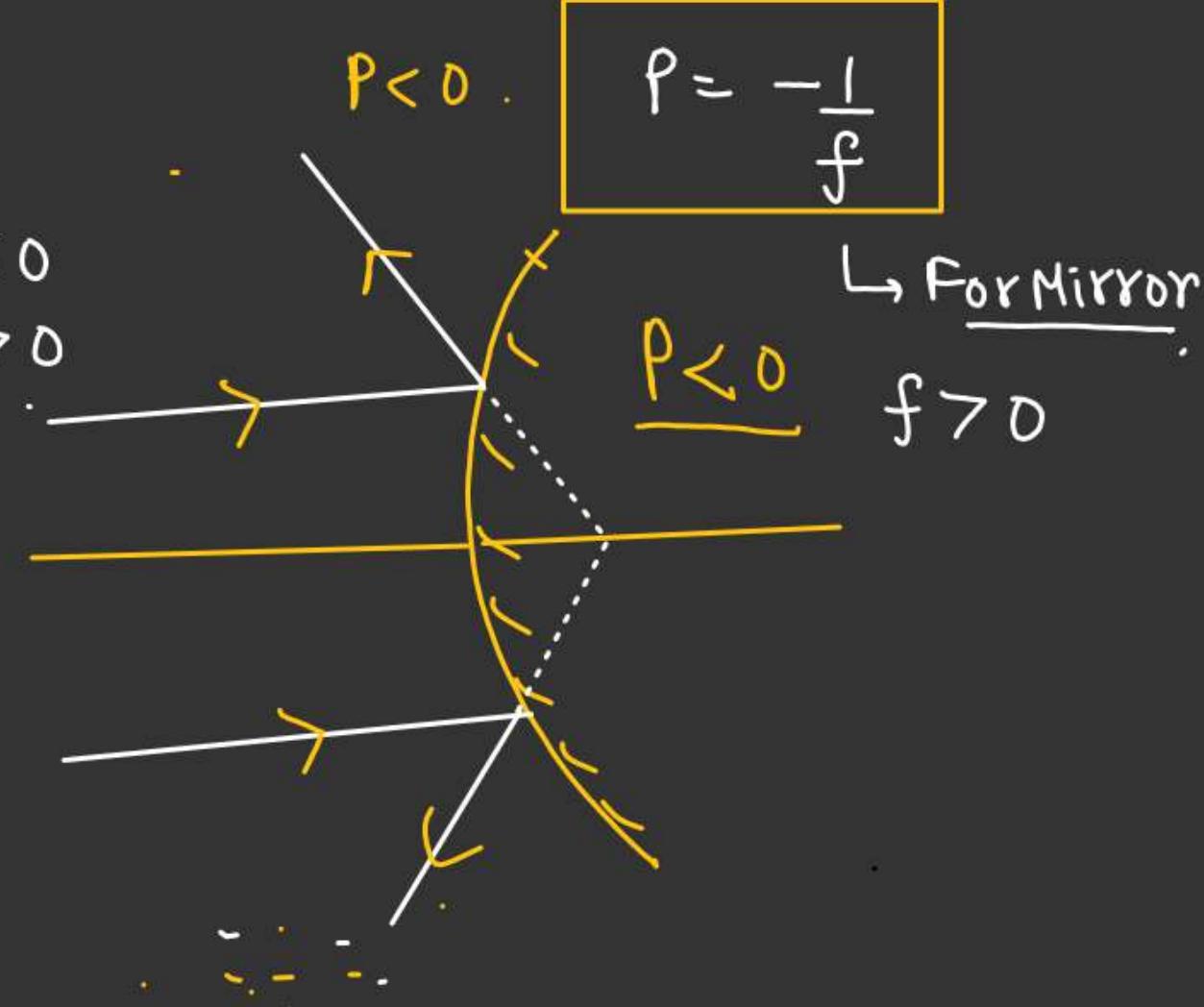
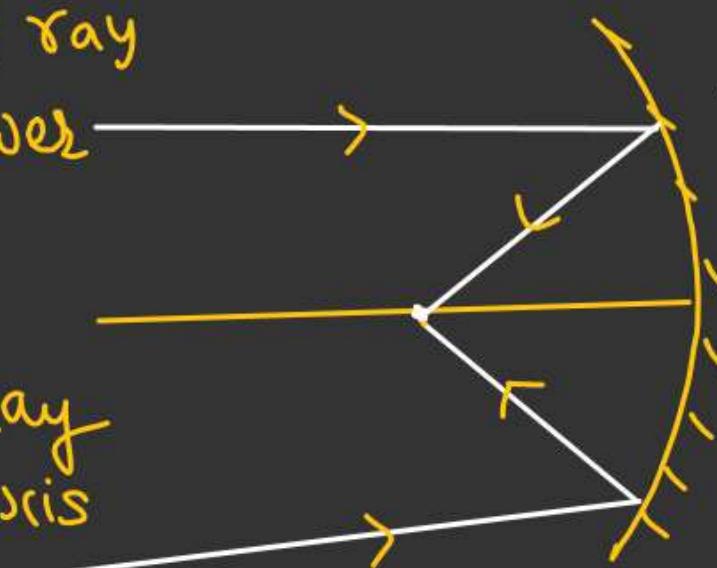
→ For lens



"Dioptre" → Unit of power.

Ability of optical instrument to deviate the incident ray is called of the power of optical instrument.

If optical instrument converge the incident ray parallel to principal axis its power is +ve & if it diverge then power is -ve



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

↳ For Mirror

$$P_{\text{net}} = P_1 + P_2 + \dots + P_n$$

$$\frac{1}{F_{\text{eq}}} = \frac{1}{f_1} + \frac{1}{f_2} + \dots + \frac{1}{f_n}$$

Distance b/w C_1 & C_2
negligible (Thin lens)

Lens formula for lens - ①

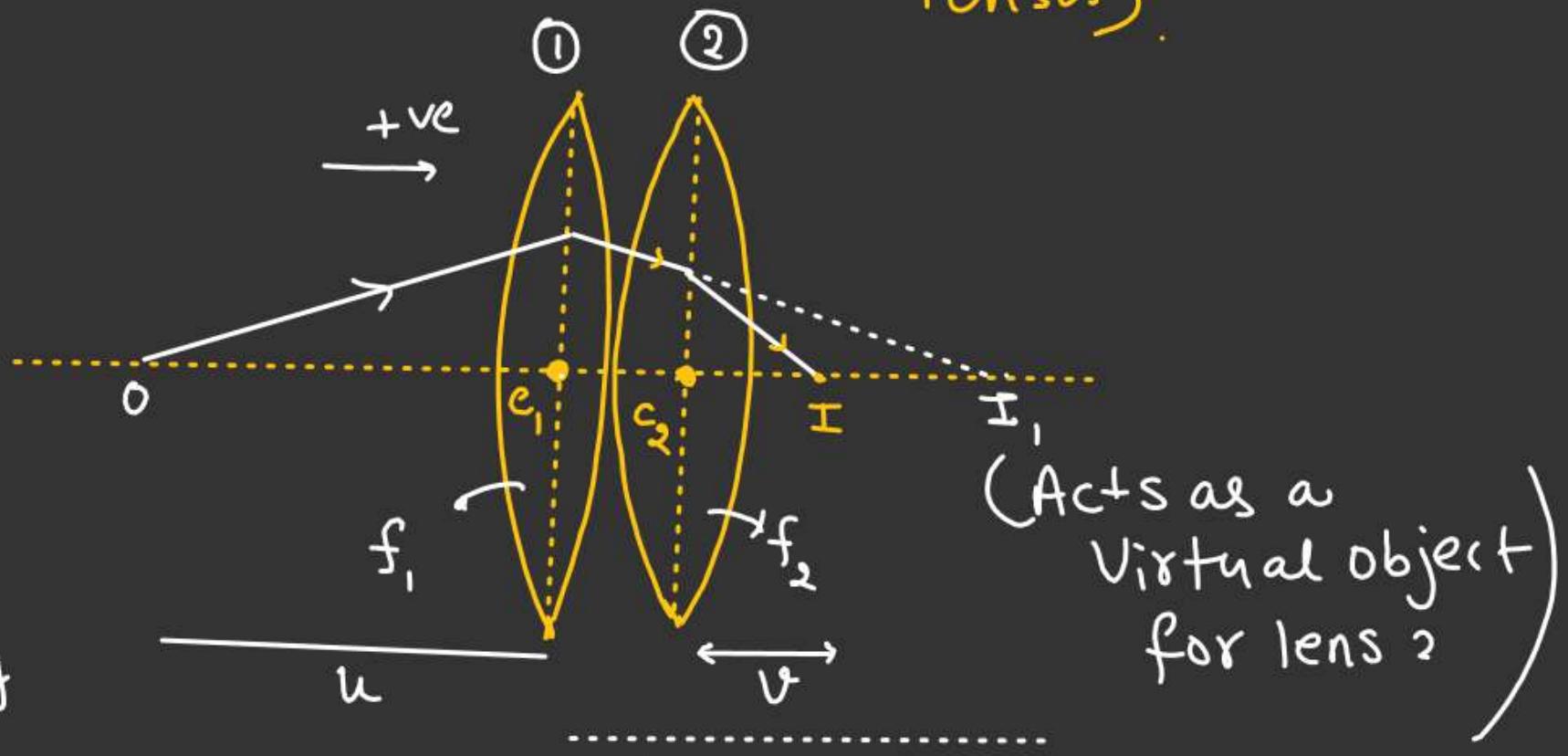
$$\frac{1}{v_1} - \frac{1}{u} = \frac{1}{f_1}$$

Adding

For lens - 2

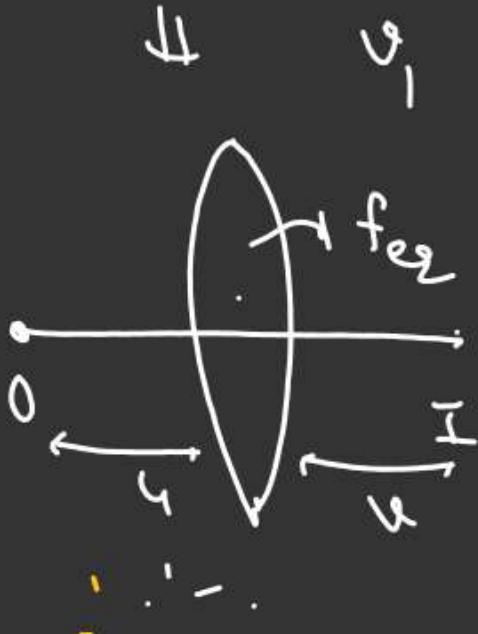
$$\frac{1}{v} - \frac{1}{v_1} = \frac{1}{f_2}$$

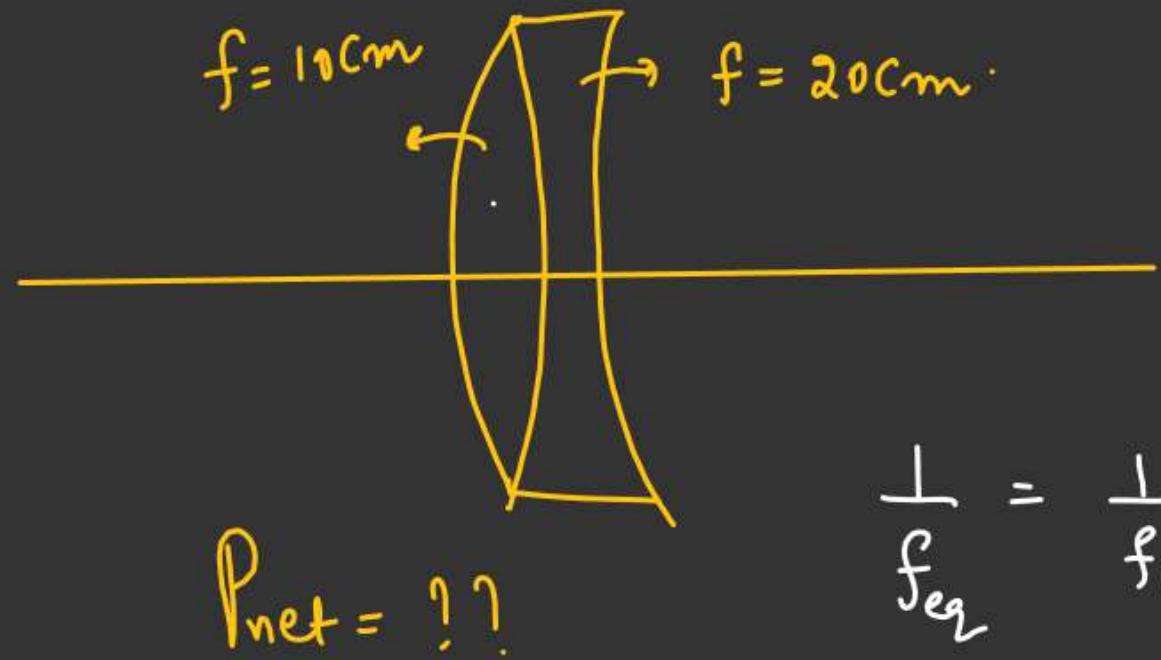
Equivalent focal length
of two lenses (separation
negligible b/w two
lenses).



$$\frac{1}{v} - \frac{1}{v_1} = \frac{1}{f_1} + \frac{1}{f_2}$$

$\frac{1}{f_{\text{eq}}} = \frac{1}{f_1} + \frac{1}{f_2}$





$$P_{\text{net}} = ??$$

$$\begin{aligned}f_2 &= -20 \\f_1 &= +10\end{aligned}$$

$$P = \frac{1}{f} \times 10^{-2}$$

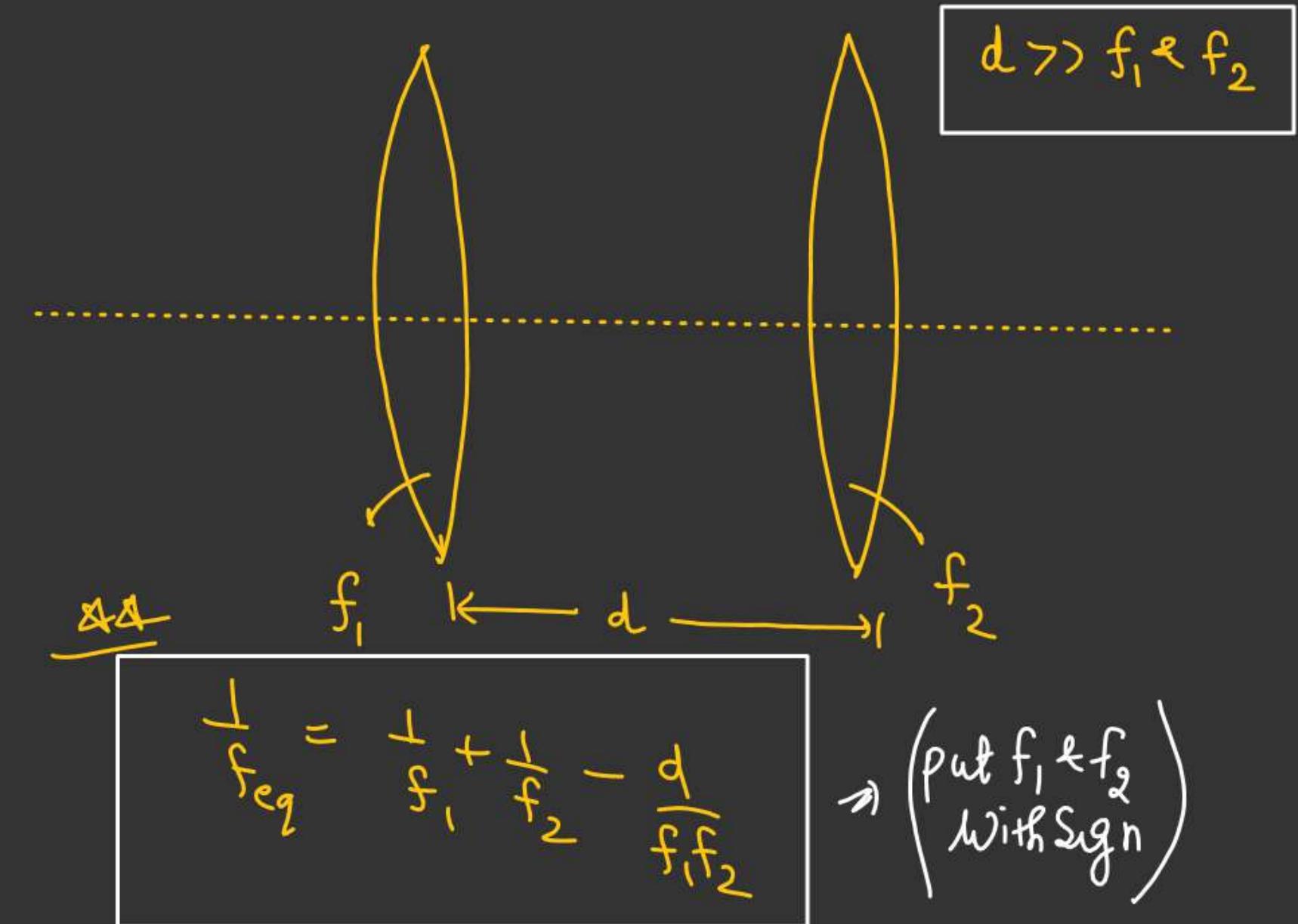
$P = \frac{100}{f}$
cm

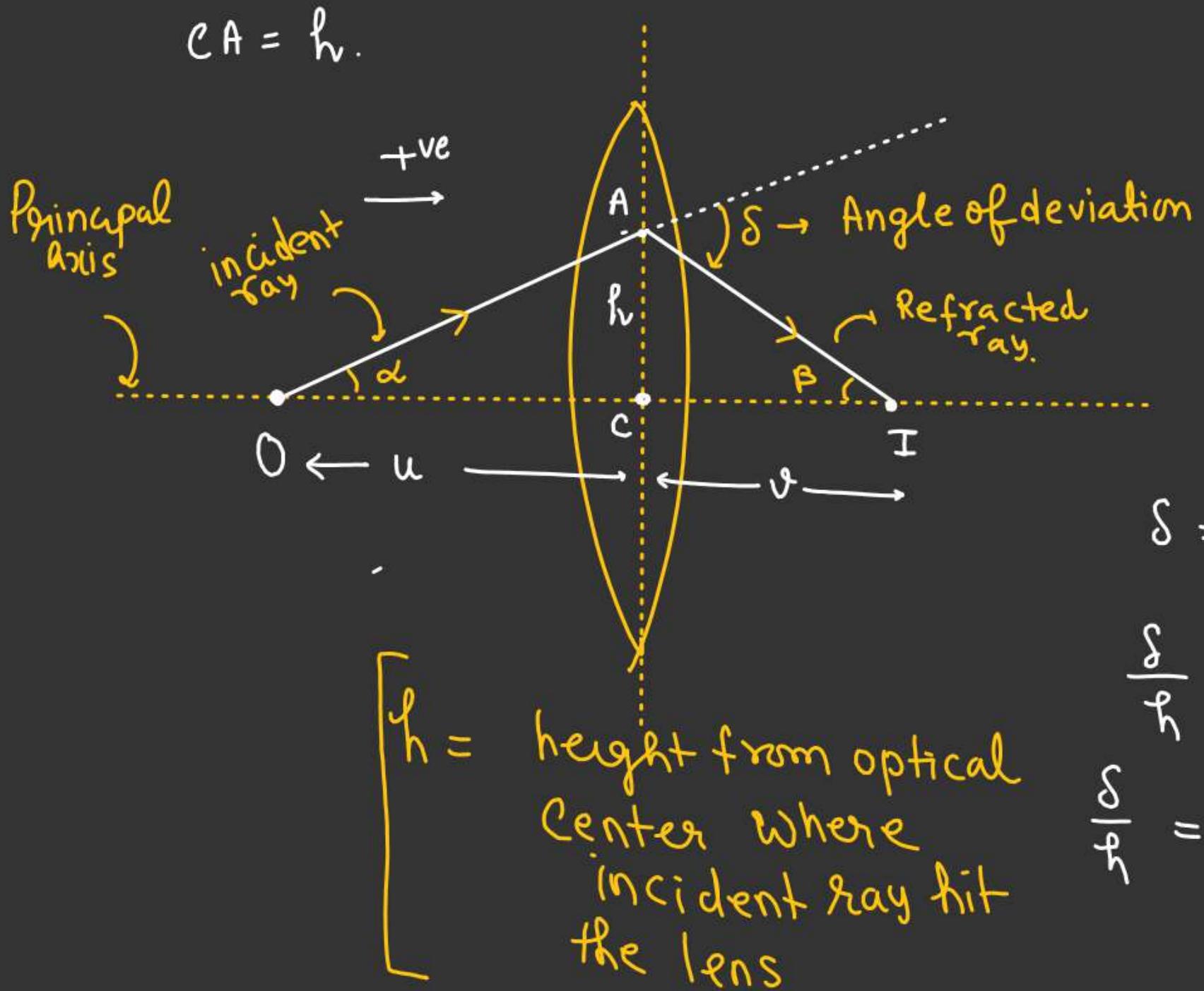
$$\frac{1}{f_{\text{eq}}} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\frac{1}{f_{\text{eq}}} = \frac{1}{10} - \frac{1}{20}$$

$$\begin{aligned}P &= \left(\frac{100}{20} \right) \quad \frac{1}{f_{\text{eq}}} = \frac{2-1}{20} = \left(\frac{1}{20} \right) \\&\approx 5 \text{ dioptre} \quad f_{\text{eq}} = 20 \text{ cm.}\end{aligned}$$

Ques: If two lenses at a separation d .



A &Angle of deviation in case of lensIn $\triangle OAI$.

$$\delta = \alpha + \beta.$$

$$\tan \alpha \approx \alpha = \left(\frac{h}{-u} \right)$$

$$\tan \beta \approx \beta = \left(\frac{h}{v} \right)$$

$$\delta = \frac{h}{-u} + \frac{h}{v}$$

$$\frac{\delta}{h} = \left(\frac{1}{v} - \frac{1}{u} \right)$$

$$\frac{\delta}{h} = \frac{1}{f}$$

$$\boxed{\delta = \frac{h}{f}}$$

In $\triangle ABC$.

$$\delta_{\text{net}} = \delta_1 + \delta_2$$

$$\frac{h_1}{f_{\text{eq}}} = \frac{h_1}{f_1} + \frac{h_2}{f_2} \quad (1)$$

In $\triangle CBC$

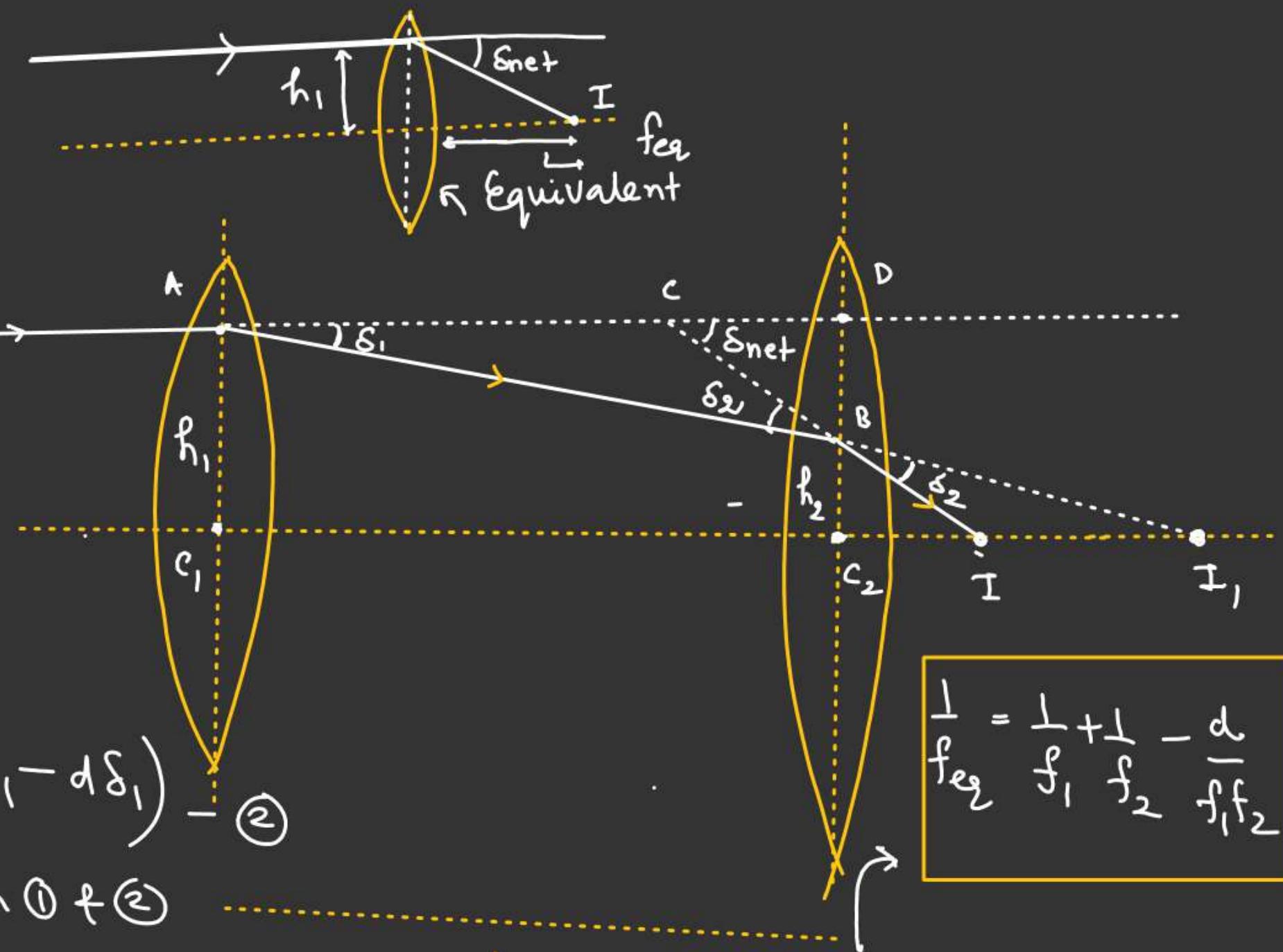
$$BD = (h_1 - h_2) \checkmark$$

In $\triangle ABD$

$$\tan \delta_1 = \frac{BD}{AD} \Rightarrow h_2 = (h_1 - d \delta_1) \quad (2)$$

$$\delta_1 = \left(\frac{h_1 - h_2}{d} \right)$$

$$d \delta_1 = h_1 - h_2$$



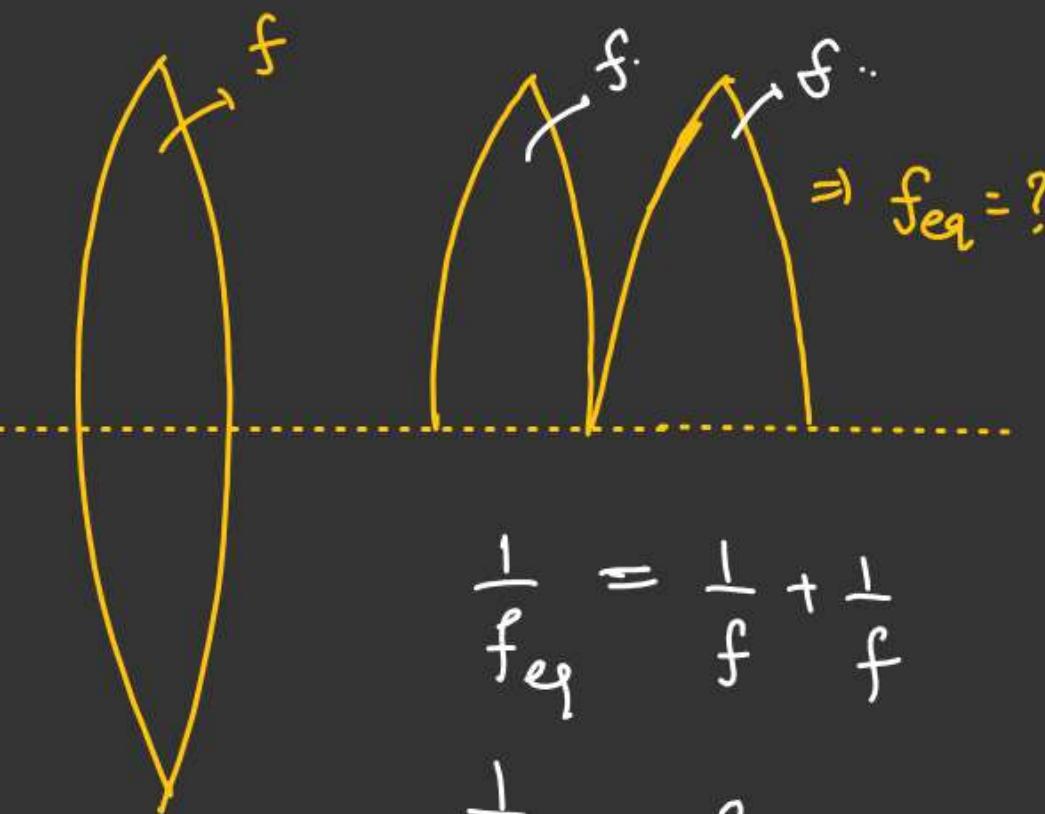
$$\frac{1}{f_{\text{eq}}} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$$

From (1) & (2)

$$\frac{h_1}{f_{\text{eq}}} = \frac{h_1}{f_1} + \frac{h_1 - d \delta_1}{f_2} \Rightarrow \frac{h_1}{f_{\text{eq}}} = \frac{h_1}{f_1} + \frac{h_1}{f_2} - \frac{d}{f_2} \left(\frac{h_1}{f_1} \right)$$

~~2f~~

along Cut
Principal ↓
axis.

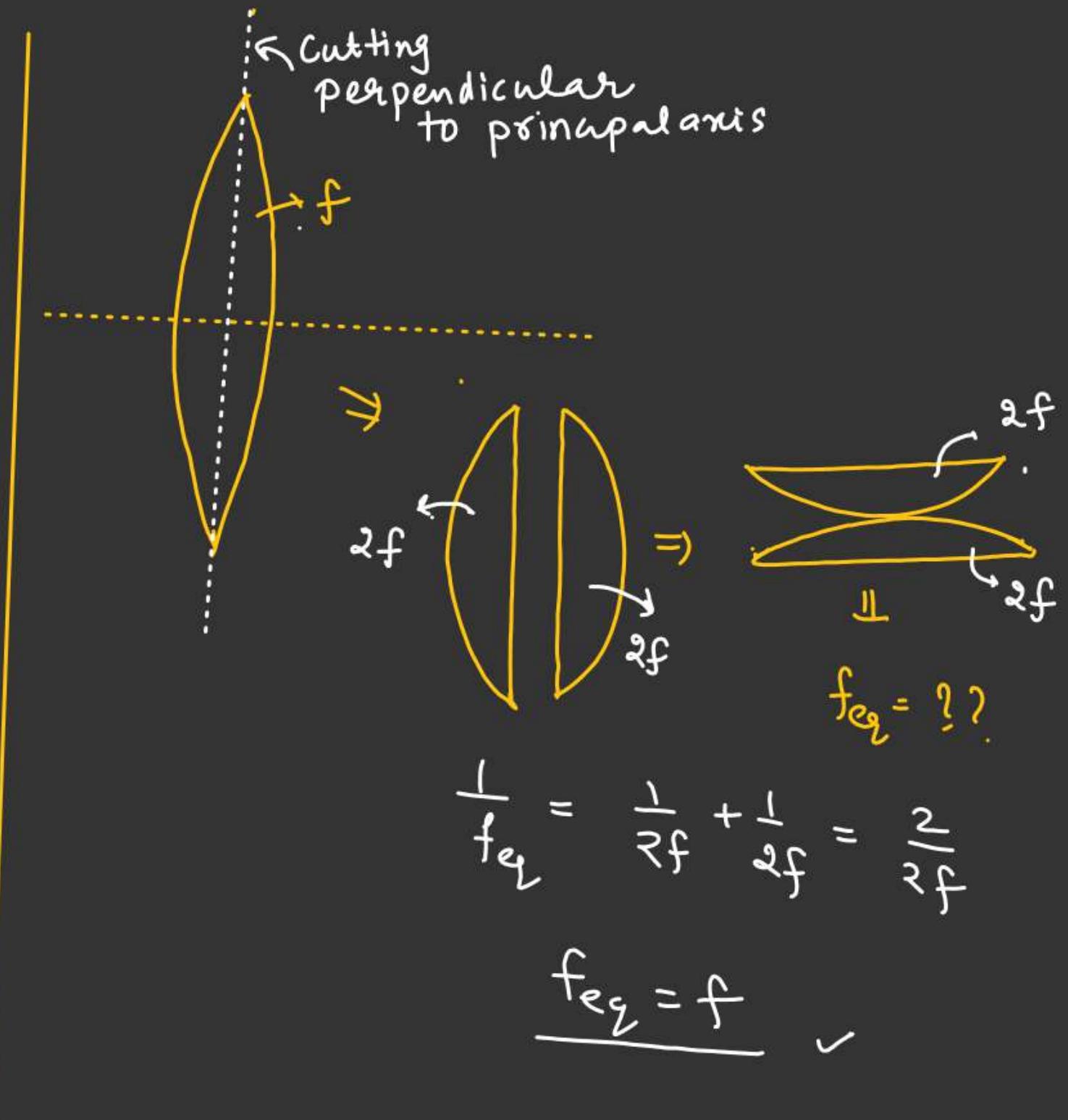


$$\frac{1}{f_{eq}} = \frac{1}{f} + \frac{1}{f}$$

$$\frac{1}{f_{eq}} = \frac{2}{f}$$

$$f_{eq} = f/2$$

$$\Rightarrow f_{eq} = ??$$





Equivalent focal length of a lens when its one side is Silvered

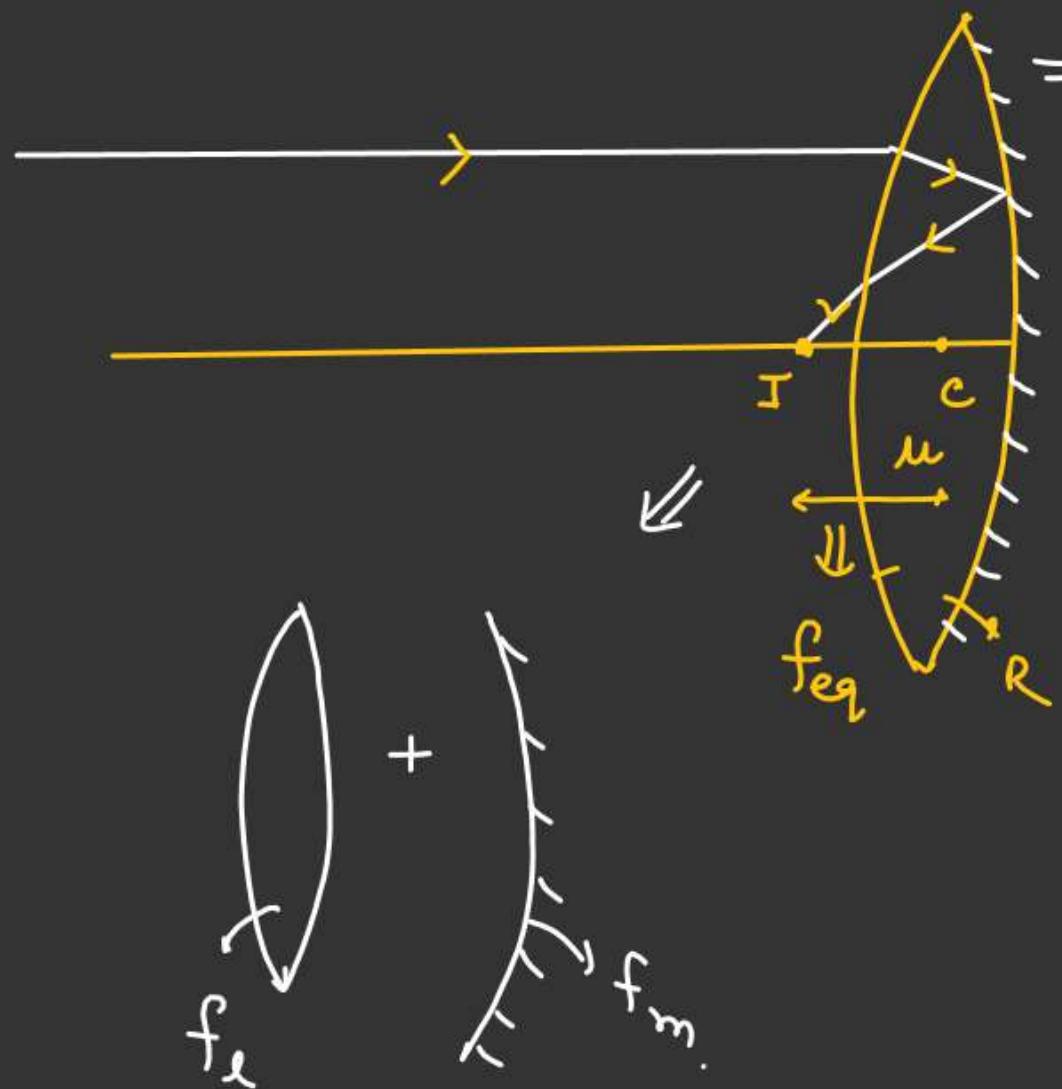
$$\frac{1}{f_{eq}} = - \left[\frac{n}{f_l} - \frac{m}{f_m} \right]$$

n = No of refraction

m = No of reflection.

f_l = focal length of lens

f_m = focal length of mirror



overall
whole
System behave
as Mirror.

if $f_{eq} = -ve$
then behaves as
Concave mirror

if $f_{eq} = +ve$
then behaves as
Convex mirror



$$\frac{1}{f_{eq}} = - \left[\frac{2}{f_e} - \frac{1}{f_m} \right]$$

$$\frac{1}{f_{eq}} = - \left[2 \left(\frac{(\mu-1)^2}{R} \right) - \left(\frac{-2}{R} \right) \right]$$

$$\frac{1}{f_e} = ??$$

+ve

$$\frac{1}{f_e} = (\mu-1) \left[\frac{1}{R} - \frac{1}{(-R)} \right]$$

$$\frac{1}{f_e} = (\mu-1) \frac{2}{R}$$



ar

$$\frac{1}{f_m} = ??$$

+ve

$$f_m = \left(-\frac{R}{2} \right)$$



$$\frac{1}{f_{eq}} = - \frac{2}{R} [2\mu - 2 + 1]$$

$$\frac{1}{f_{eq}} = - \frac{2}{R} [2\mu - 1]$$

$$\frac{1}{f_{eq}} = - \frac{2(2\mu - 1)}{R}$$

$$f_{eq} = \frac{-R}{2(2\mu - 1)}$$

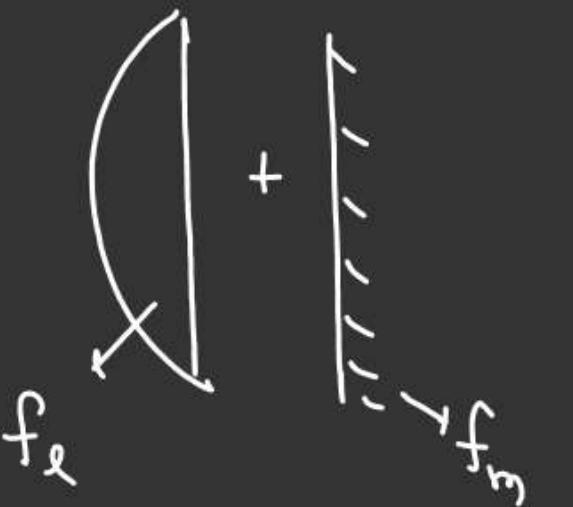
~~Δ &~~ ✓
~~H.W~~ ✓

Find

$$\frac{f_1}{f_2} = ??$$

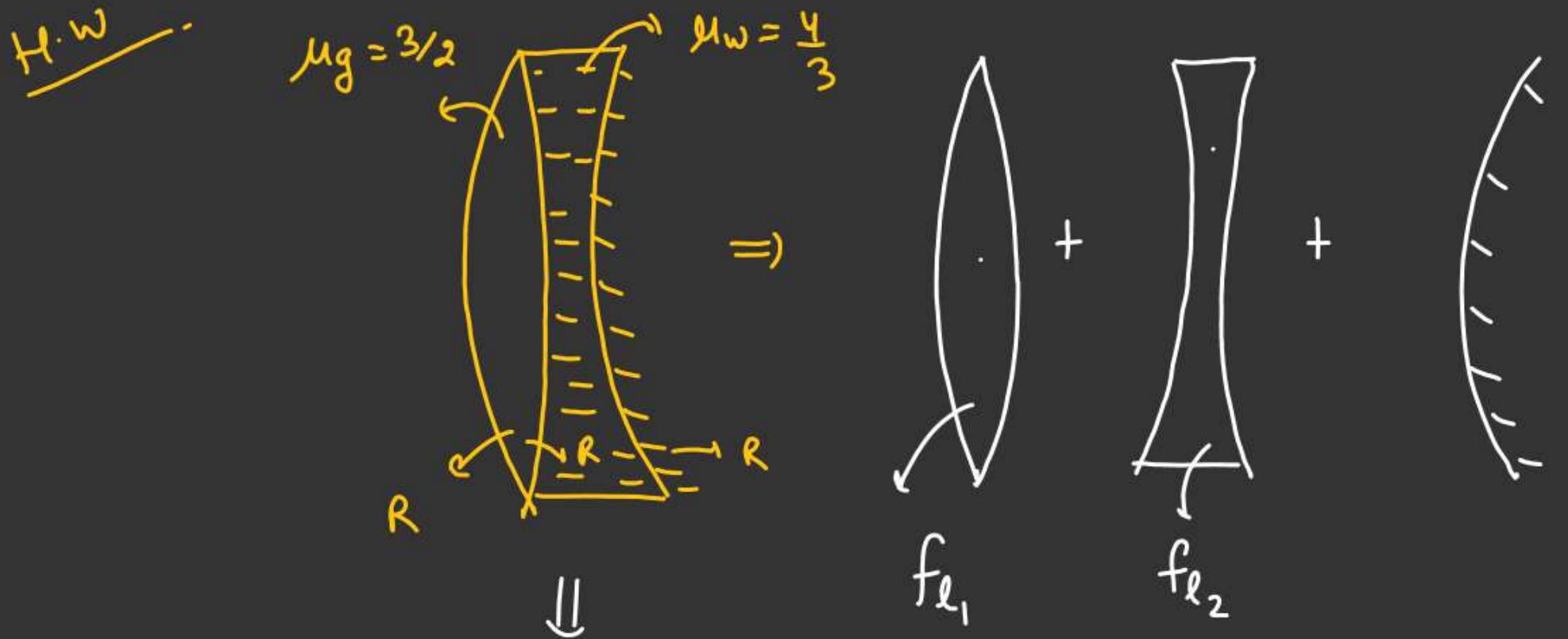


f_1



⇒





$$\frac{1}{f_{\ell_1}} = \left(\frac{1}{f_{\ell_1}} + \frac{1}{f_{\ell_2}} \right)$$

put n = 2

for $\left(\frac{1}{f_{\ell}} \right)$.