

$$n_1 \sin(\theta_1) = n_2 \sin(\theta_2)$$

$$\theta_2 = \sin^{-1} \left( \frac{n_1 \sin(\theta_1)}{n_2} \right)$$

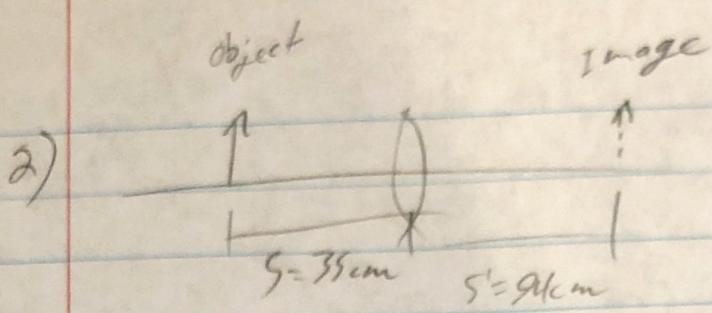
$$= \sin^{-1} \left( \frac{1.0}{1.15} \sin(45^\circ) \right)$$

$$\theta_2 = 37.9^\circ$$

$$\theta_3 = \sin^{-1} \left( \frac{n_2 \sin(\theta_2)}{n_3} \right)$$

$$= \sin^{-1} \left( \frac{1.15 \sin(37.9^\circ)}{1.33} \right)$$

$$\theta_3 = 32$$

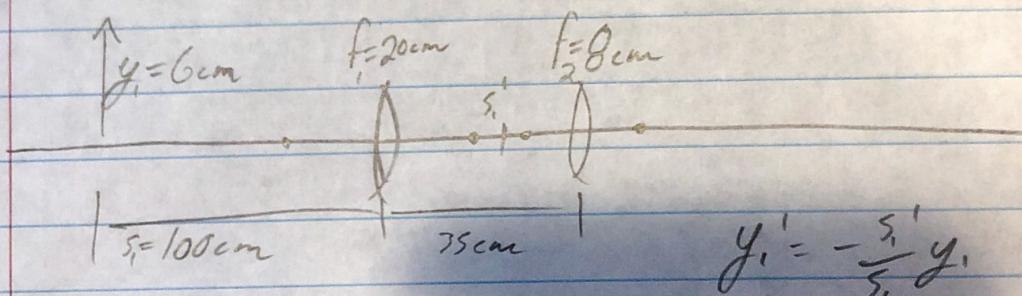


$$\frac{1}{f} = \frac{1}{s} + \frac{1}{s'}$$

$$\frac{1}{f} = \frac{1}{35} + \frac{1}{91}$$

$f = 25.5\text{cm}$

3)



$$s_1' = \frac{1}{f_1} - \frac{1}{s_1}$$

$$= \frac{1}{20} - \frac{1}{100}$$

$$s_2' = \frac{1}{f_2} - \frac{1}{s_2}$$

$$= \frac{1}{8} - \frac{1}{10}$$

$$= -\frac{10}{100} 6$$

$$y_1' = -0.6\text{cm}$$

$$y_2 = y_1'$$

$$s_1' = 25\text{cm}$$

$$s_2 = 35 - 25$$

$$s_2 = 10\text{cm}$$

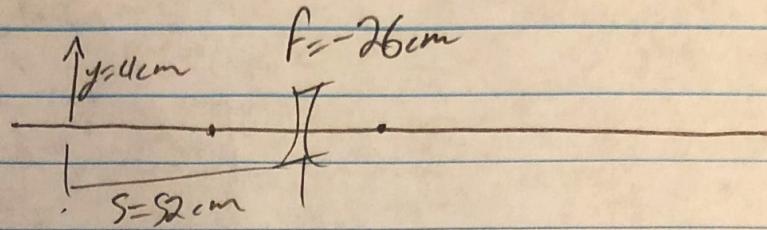
$$s_2' = 40\text{cm}$$

$$y_2' = -\frac{s_2'}{s_2} y_2$$

$$= -\frac{40}{10} (-0.6)$$

$y_2' = 2.4\text{cm}$

4)

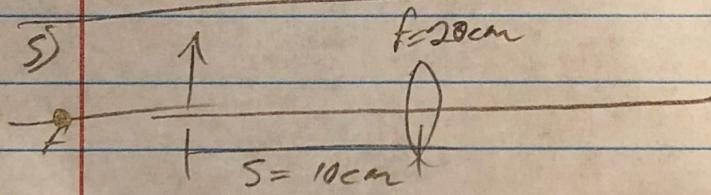


$$s' = \frac{1}{\frac{1}{f} - \frac{1}{s}}$$

$$= \frac{1}{\frac{1}{-26} - \frac{1}{52}}$$

$$s' = -17.3\text{cm}$$

sameside as object



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

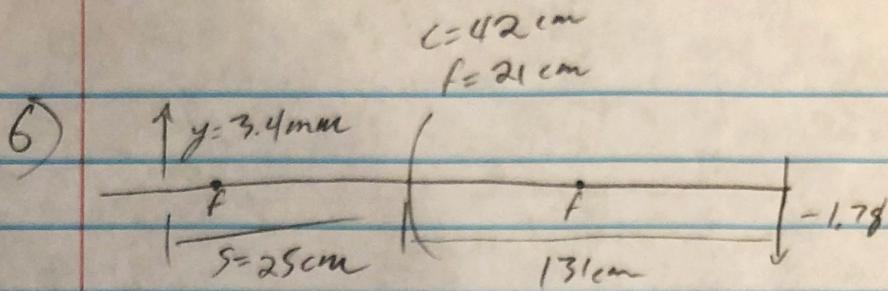
$$M = -\frac{s'}{s}$$

$$s' = \frac{1}{\frac{1}{20} - \frac{1}{10}}$$

$$= \frac{-(-20)}{10}$$

$$s' = -20\text{cm}$$

$$(M = 2)$$



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

$$= \frac{1}{\frac{1}{21} - \frac{1}{25}}$$

$$\textcircled{s'} = 131 \text{ cm}$$

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

$$= -\frac{131}{25} 0.34$$

$$\textcircled{y'} = -1.78 \text{ cm}$$