

#1

$p = ?$   
 $q = -23 \text{ cm}$   
 $f = -46 \text{ cm}$   
 $M = ?$   
 $h_i = 1.7 \text{ cm}$   
 $h_o = ?$

$$\frac{1}{p} = \frac{1}{f} - \frac{1}{q}$$

$$\frac{1}{p} = \frac{1}{-46 \text{ cm}} - \frac{1}{-23}$$

$$\frac{1}{p} = 0.0217$$

$$p = 46 \text{ cm}$$

$$M = -\frac{q}{p}$$

$$M = -\left(\frac{-23}{46}\right)$$

$$M = 0.5$$

upright,  
Virtual,  
smaller

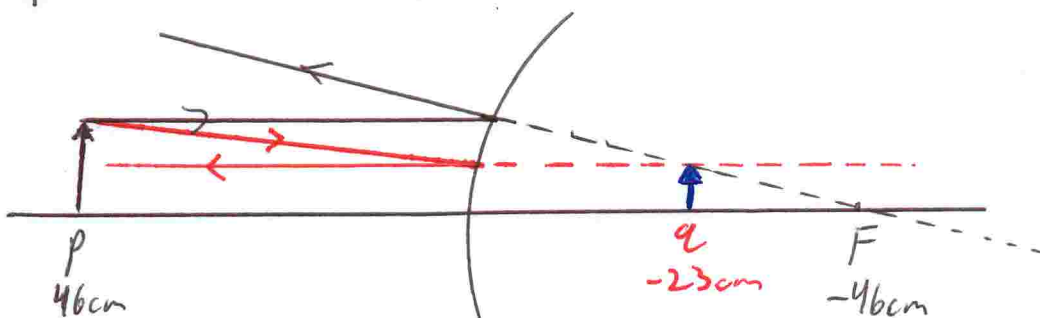
$$m = \frac{h_i}{h_o}$$

$$0.5 = \frac{1.7 \text{ cm}}{h_o}$$

$$h_o = \frac{1.7 \text{ cm}}{0.5}$$

$$h_o = 3.4 \text{ cm}$$

← Crayon height



#2.

$p = ?$   
 $q = -0.24 \text{ m}$   
 $f = -0.25 \text{ m}$   
 $M = ?$   
 $h_i = 0.080 \text{ m}$   
 $h_o = ?$

$$\frac{1}{p} = \frac{1}{f} - \frac{1}{q}$$

$$\frac{1}{p} = \left(\frac{1}{-0.25 \text{ m}}\right) - \left(\frac{1}{-0.24 \text{ m}}\right)$$

$$\frac{1}{p} = 0.166$$

$$p = 6 \text{ m}$$

$$M = -\frac{q}{p}$$

$$M = -\left(\frac{-0.24 \text{ m}}{6 \text{ m}}\right)$$

$$M = 0.04$$

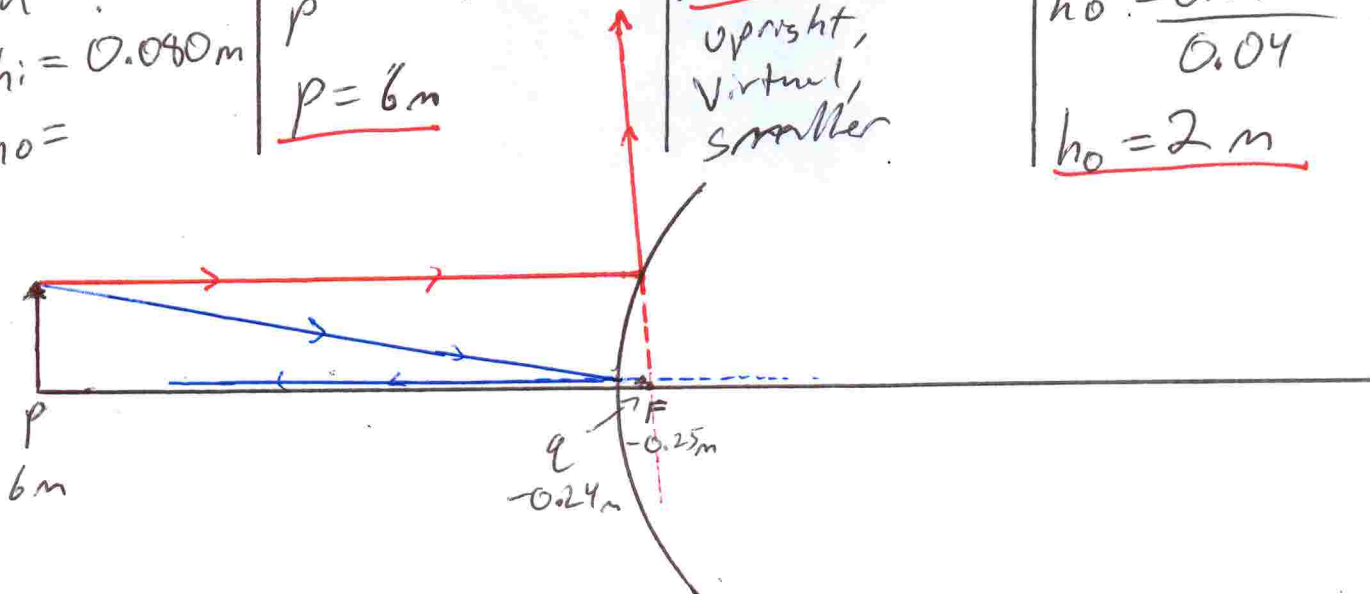
upright,  
Virtual,  
smaller

$$m = \frac{h_i}{h_o}$$

$$0.04 = \frac{0.080 \text{ m}}{h_o}$$

$$h_o = \frac{0.080 \text{ m}}{0.04}$$

$$h_o = 2 \text{ m}$$



#3.

$p = ?$   
 $q = -19 \text{ cm}$   
 $-33 \text{ cm}$   
 ~~$f = ?$~~   
 $m = ?$   
 $h_i = 7 \text{ cm}$   
 $h_o = ?$

$$\frac{1}{p} = \frac{1}{f} - \frac{1}{q}$$

$$\frac{1}{p} = \frac{1}{-33} - \left(-\frac{1}{-19}\right)$$

$$\frac{1}{p} = 0.0223$$

$$p = 44.8 \text{ cm}$$

$$m = -\frac{q}{p}$$

$$m = -\left(\frac{-19}{44.8}\right)$$
 ~~$m = 0$~~ 

$$m = 0.42$$

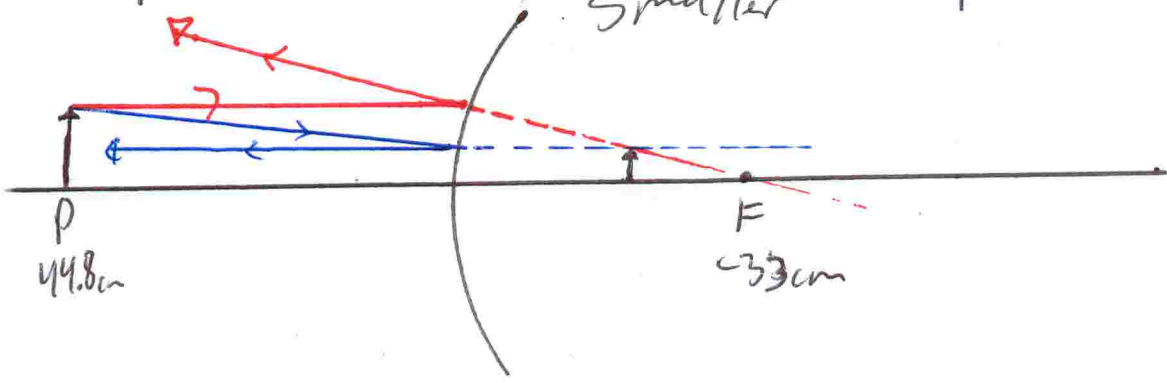
Upright, Virtual  
Smaller

$$m = \frac{h_i}{h_o}$$

$$0.42 = \frac{7 \text{ cm}}{h_o}$$

$$h_o = \frac{7 \text{ cm}}{0.42}$$

$$h_o = 16.66 \text{ cm}$$



#4.

$p = 3.1 \text{ m}$   
 $q = ?$   
 ~~$f = 2.75 \text{ m}$~~   
 $m = ?$   
 $h_i = \text{N/A}$   
 $h_o = \text{N/A}$   
 $c = 0.550 \text{ m}$

$c = 2 \cdot f$   
 $0.55 \text{ m} = 2 \cdot f$   
 $f = 0.275 \text{ m}$

$$\frac{1}{q} = \frac{1}{f} - \frac{1}{p}$$

$$\frac{1}{q} = \left(\frac{1}{0.275}\right) - \left(\frac{1}{3.1 \text{ m}}\right)$$

$$\frac{1}{q} = -3.9589$$

$$q = 0.2526$$

$$m = -\frac{q}{p}$$

$$m = -\left(\frac{-0.2526 \text{ m}}{3.1 \text{ m}}\right)$$

$$m = 0.081$$

Upright, Virtual, smaller