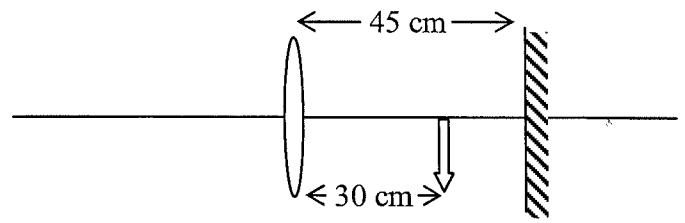


Name: _____

Solutions

A +15 cm focal length lens and a flat mirror are located as shown. (A flat mirror can be treated mathematically as a concave mirror with an infinite focal length.)



The arrow shown is the intermediate image, not the final image, formed by an object on the LEFT of the lens. Its height is -2 mm.

(a) Find the height and location of the original object. Put your answer in the box. (5 points)

Solution 1

$$\frac{1}{d_o} + \frac{1}{30} = \frac{1}{15}$$

$$d_o = \boxed{30 \text{ cm (to left) of lens}}$$

$$m = -\frac{30}{30} = -1$$

$$h_o = \boxed{+2 \text{ mm}}$$

Solution 2

The image shown could be reflected off the mirror first.

$$\frac{1}{d_o} + \frac{1}{60} = \frac{1}{15}$$

$$d_o = \boxed{20 \text{ cm (to left of lens)}}$$

$$m = \left(-\frac{60}{20}\right) \times \left(\frac{15}{15}\right) = -3$$

$$h_o = \boxed{\frac{2}{3} \text{ mm}}$$

(b) Find the location of the FINAL image produced by the object you found in (a), as seen by an observer on the left. Put your answer in the box. (5 points)

Continuing Soln 1
off mirror

$$\frac{1}{15} + \frac{1}{d_i'} = \frac{1}{\infty} \Rightarrow d_i' = \overset{\text{sign!}}{\downarrow} 15$$

next, through lens

$$\frac{1}{60} + \frac{1}{d_i''} = \frac{1}{15}$$

$$d_i'' = \boxed{20 \text{ cm to left of lens}}$$

Continuing Soln 2

it's coming off the mirror, ^{already} so can now pass through the lens.

$$\frac{1}{30} + \frac{1}{d_i'} = \frac{1}{15}$$

$$d_i' = \boxed{30 \text{ cm to left of lens}}$$

Note: Solutions 1 and 2
Swap the source and final image positions