

An object is 16.0 cm to the left of a thin lens. The lens forms an image 36.0 cm to the right of the lens.

- What is the focal length of the lens? Is the lens converging or diverging?
- If the object is 8.00 mm tall, how tall is the image? Is it erect or inverted?
- Draw a principal-ray diagram.

You are given the thin lens formula $\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$. You can use $m = -\frac{s'}{s}$ to find the size and orientation of the image. The sign of f determines whether the lens is converging or diverging.
 $s = 16.0 \text{ cm}$. $s' = +36.0 \text{ cm}$.

(a) $f = \frac{ss'}{s + s'} = \frac{(16.0 \text{ cm})(36.0 \text{ cm})}{16.0 \text{ cm} + 36.0 \text{ cm}} = 11.1 \text{ cm}$. $f > 0$ and the lens is converging.

(b) $m = -\frac{s'}{s} = -\frac{36.0 \text{ cm}}{16.0 \text{ cm}} = -2.25$. $|y'| = |m|y = (2.25)(8.00 \text{ mm}) = 18.0 \text{ mm}$.
 $m < 0$, so the image is inverted.

- (c) The image is real so the lens must be converging.

