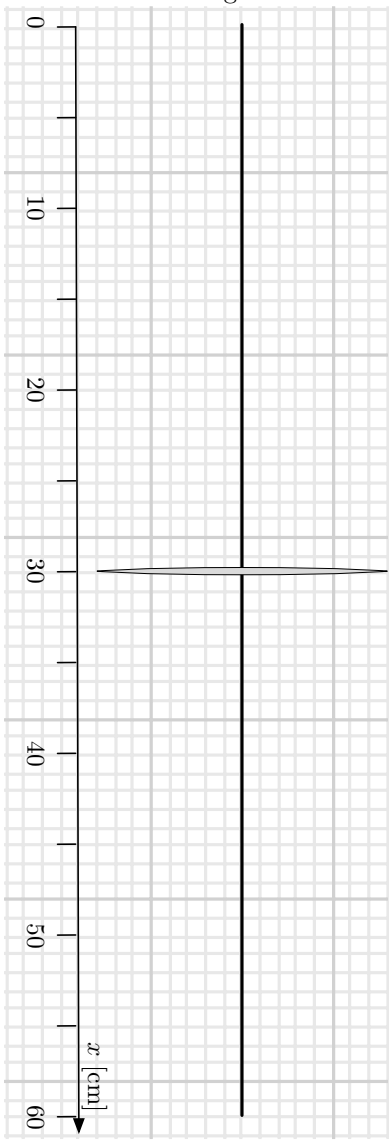
There is an object that is 4cm tall at the position $x = 24$cm and a lens at the position $x = 30$cm. The lens has a focal length of 18cm.
(a) Construct the image in the diagram below.
(b) Use the thin lens equation and the magnification equation to find the location of the image.



Physics 11 - Quiz 18 5/1/2020

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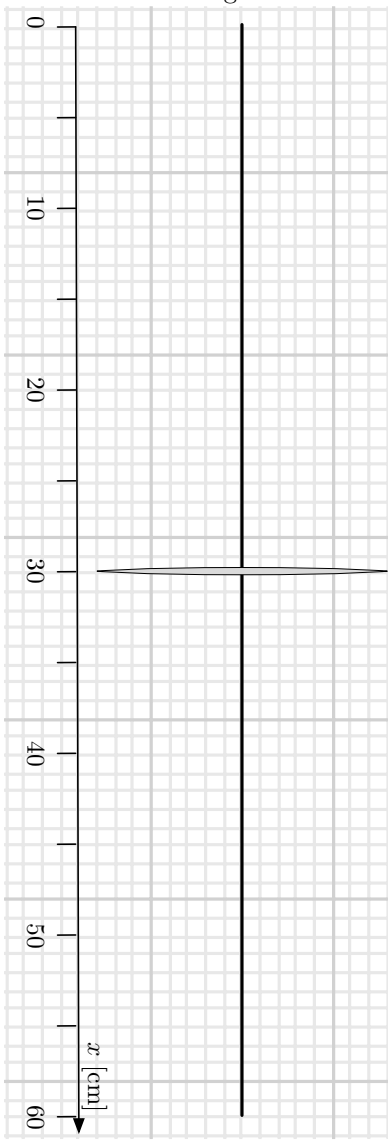

Solution:

$$\begin{aligned} d_o &= x_{\text{lens}} - x_{\text{object}} \\ &= 30\text{cm} - 24\text{cm} = 6\text{cm} \end{aligned}$$

so we can compute

$$\begin{aligned} \frac{1}{d_i} &= \frac{1}{f} - \frac{1}{d_o} \\ &= \frac{1}{18\text{cm}} - \frac{1}{6\text{cm}} \\ &= \frac{-2}{18\text{cm}} \\ &= \frac{-1}{9\text{cm}} \\ \longrightarrow\ d_i &= -9\text{cm} \end{aligned}$$

and

$$\begin{aligned} d_i &= x_{\text{image}} - x_{\text{lens}} \\ \longrightarrow\ x_{\text{image}} &= d_i + x_{\text{lens}} \\ &= -9\text{cm} + 30\text{cm} = 21\text{cm} \end{aligned}$$

and

$$\begin{aligned} \frac{h_i}{h_0} &= -\frac{d_i}{d_o} \\ \longrightarrow\ h_i &= -h_o \frac{d_i}{d_o} \\ &= -(4\text{cm})\frac{-9\text{cm}}{6\text{cm}} = 6\text{cm} \end{aligned}$$