Given the lens system shown. The object is 60 cm to the left of lens A.
(a) Find the position of the final image, measured in cm to the right or left 
(state clearly) of lens B.
(b) Characterize the final image as erect or inverted; real or virtual.
(c) If the original object is 1.75 cm high, what is the height of the final image?

I use object & image space: object distances will be positive 
if the object is to the left of a lens and image distances 
will be positive if the image is to the right of a lens.

a) First lens: \( \frac{1}{f_A} + \frac{1}{f_B} = \frac{1}{s_A} \Rightarrow \frac{s_A}{f_A} = \frac{P_A f_A}{P_A - f_A} = \frac{(+60)(+40)}{(+60)-(+40)} \) cm

\[ s_A = +120 \text{ cm or } 20 \text{ cm right of lens B} \]

Use the image from lens A as the object for B:
\( s_B = \frac{f_B P_B}{P_B - f_B} = \frac{(-20)(-40)}{(-20)-(-40)} \) (\( f_B \) is negative since it's right of B)

\[ s_B = +40 \text{ cm} \]

The final image is 40 cm to the right of lens B.

+6 pts \[ s_B = +40 \text{ cm} \]  
+3 pts You must specifically state this to receive full credit.
b) The magnification is given by

\[ M_{\text{final}} = M_A M_B = \left( \frac{-q_A}{p_A} \right) \left( \frac{-q_B}{p_B} \right) = \left( \frac{-\left(\frac{120}{+60}\right)}{-\left(\frac{+40}{-20}\right)} \right) \]

\[ M_{\text{final}} = -4 \]

+3 pts

Since the magnification is negative, the final image is inverted +1 pt

and since the final image is positive, (that is, to the right of lens B), the final image is real +1 pt

c) The height of the final image is the height of the original object multiplied by the magnification:

\[ h_{\text{final}} = |M| h_{\text{object}} = (4)(1.75 \text{ cm}) \]

\[ h_{\text{final}} = \pm 7.00 \text{ cm} \]

+5 pts

Other grading: -1 for units or sig. fig. abuse each time
-2 for first distance sign error, or first right/left or real/virtual error

Most common error by far was sig. fig. abuse! (\sim 90\% of)