A lens is made of glass having an index of refraction of 1.5. Both sides of the lens are convex with a radius of curvature 30 cm.

a. What is the focal length of the lens? (3 points)

b. If an object is placed 60 cm in front of the lens, where is the image (specify front or back of lens and distance from lens)? (3 points)

c. Is the image erect or inverted? (2 points)

d. If the object is 10 cm high, what size is the image? (2 points)

\[
a) \quad \frac{1}{f} = (N-1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right) \\
\quad = \left( 1 \frac{1}{2} - 1 \right) \left( \frac{1}{30} - \frac{1}{-30} \right) \\
\quad = \frac{1}{2} \left( \frac{2}{30} \right) \\
\quad f = 30 \text{ cm}
\]

\[
b) \quad \frac{1}{p} + \frac{1}{i} = \frac{1}{f} \\
\quad \frac{1}{60} + \frac{1}{i} = \frac{1}{30} \\
\quad i = 60 \text{ cm} \quad (+) \text{ means behind lens}
\]

\[
c) \quad M = -\frac{i}{p} = -\frac{60}{60} = -1 \quad (-) \text{ means inverted}
\]

\[
d) \quad |m| = 1 \quad \text{same size as object} \quad \Rightarrow \quad 10 \text{ cm}
\]