87. ***REASONING*** The angular magnification M of a magnifying glass is given by Equation 26.10 as

$$M = \frac{\theta'}{\theta} \approx \left(\frac{1}{f} - \frac{1}{d_i} \right) N$$

where $\theta' = 0.0380$ rad is the angular size of the final image produced by the magnifying glass, $\theta = 0.0150$ rad is the reference angular size of the object seen at the near point without the magnifying glass, and N is the near point of the eye. The largest possible angular magnification occurs when the image is at the near point of the eye, or $d_i = -N$, where the minus sign denotes that the image lies on the left side of the lens (the same side as the object). This equation can be solved to find the focal length of the magnifying glass.

SOLUTION Letting $d_i = -N$, and solving Equation 26.10 for the focal length f gives

$$f = \frac{N}{\frac{\theta'}{\theta} - 1} = \frac{21.0 \text{ cm}}{\frac{0.0380 \text{ rad}}{0.0150 \text{ rad}} - 1} = \boxed{13.7 \text{ cm}}$$