23.56. **Model:** Use the ray model of light.
Visualize: Please refer to Figure P23.56.
Solve: **(a)** Using Snell's law at the air-glass boundary, with ϕ being the angle of refraction inside the prism,

$$n_{\text{air}} \sin\beta = n\sin\phi \Rightarrow \sin\beta = n\sin\phi$$

Considering the triangle made by the apex angle and the refracted ray,

$$(90^\circ - \phi) + (90^\circ - \phi) + \alpha = 180^\circ \Rightarrow \phi = \tfrac{1}{2}\alpha$$

Thus

$$\sin\beta = n\sin(\tfrac{1}{2}\alpha) \Rightarrow \beta = \sin^{-1}\left(n\sin(\tfrac{1}{2})\alpha\right)$$

(b) Using the above expression, we obtain

$$n = \frac{\sin\beta}{\sin(\frac{1}{2}\alpha)} = \frac{\sin 52.2^\circ}{\sin 30^\circ} = 1.58$$