

### Answer on Question #71182, Physics / Optics

**Question.** The critical angle for the material of a prism is  $45^\circ$  and its refracting angle is  $30^\circ$ . A monochromatic ray goes out perpendicular to the surface of emergence from the prism. Then the angle of incidence on the prism will be

**Given.**  $\alpha = 30^\circ$ ;  $\theta_c = 45^\circ$ .

**Find.**  $\beta$ .

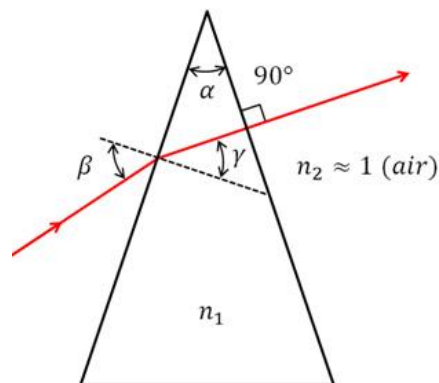
**Solution.**

Using the equation for the critical angle

$$\theta_c = \arcsin\left(\frac{n_2}{n_1}\right)$$

we get

$$45^\circ = \arcsin\left(\frac{1}{n_1}\right) \rightarrow n_1 = \frac{1}{\sin 45^\circ} = \sqrt{2}.$$



From the figure

$$\gamma = \alpha.$$

So

$$\frac{\sin \beta}{\sin \gamma} = \frac{n_1}{n_2} \rightarrow \sin \beta = \frac{n_1 \cdot \sin \gamma}{n_2} \rightarrow$$

$$\beta = \arcsin\left(\frac{n_1 \cdot \sin \gamma}{n_2}\right) = \arcsin\left(\frac{\sqrt{2} \cdot \sin 30^\circ}{1}\right) = \arcsin\left(\frac{\sqrt{2}}{2}\right) \rightarrow$$

$$\beta = 45^\circ$$

**Answer.**  $\beta = 45^\circ$ .