

SIXTH MIDTERM

3

Name: Solution

Student ID #: _____

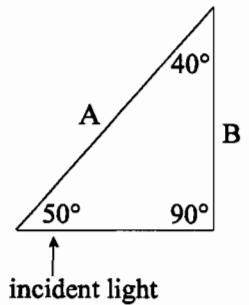
Discussion Instructor (circle): Barcikowski El-Gendy Johnson Rodriguez

SHOW ALL WORK!!!!

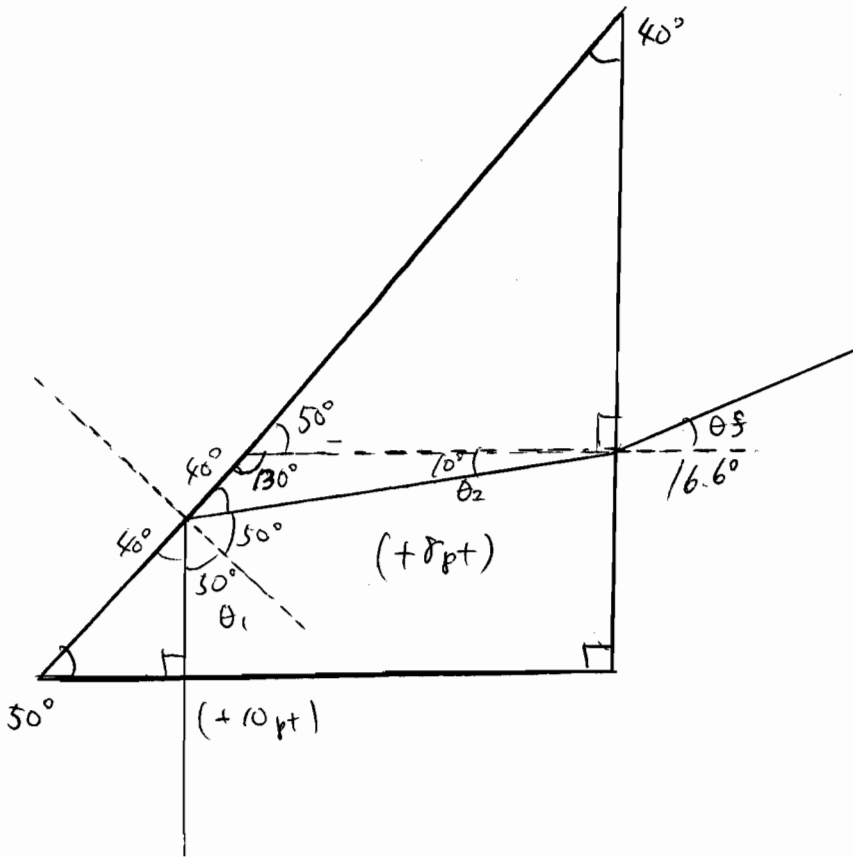
REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!

Use the conversion constants and data given on the front page.

Given a 40°-50°-90° prism as shown with an index of refraction of $1.65 = n$. Light is incident from air perpendicular to the base. Calculate from which face, A or B, the light leaves the prism, and show on a clear drawing its direction, with a numerical value for the angle.



Critical angle $\theta_c = \sin^{-1}\left(\frac{1}{1.65}\right)$
 $= 37.3^\circ$ (+2pt)



$$\theta_1 = 50^\circ$$

$$\theta_2 = 180^\circ - [180^\circ - 50^\circ + 40^\circ]$$

$$= 10^\circ$$

$$n_{\text{air}} \sin \theta_f = n \sin \theta_2 \quad (+5pt)$$

$$\theta_f = \sin^{-1}\left(\frac{n}{n_{\text{air}}} \sin \theta_2\right)$$

($n_{\text{air}} = 1$)

$$= \sin^{-1}\left(\frac{1.65}{1} \sin \theta_2\right)$$

$$= 16.6^\circ$$

$$\theta_f = 16.6^\circ$$