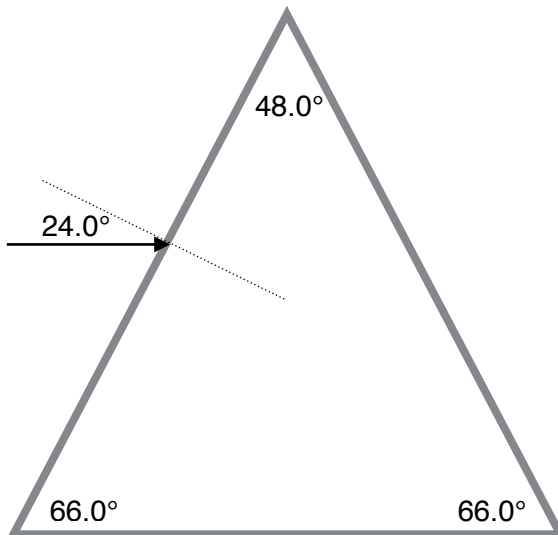


## **Physics 10164 - Exam 4B**

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (25 points) White light is incident on the left edge of a triangular prism at an angle of  $24.0^\circ$  with respect to the normal. The index of refraction for blue light is 1.54, and the index for red light is 1.50. The prism is surrounded by air on all sides.
  - a) What is the angle of refraction for blue light exiting the prism on the right side?
  - b) What is the angular dispersion of light exiting the right side of the prism?



2. (25 pts) A person standing 1.80 m in front of a curved mirror produces an inverted image 24 cm in front of the mirror. How close to the mirror should the person stand in order to form an upright image that is twice as large as the person?

3. (25 pts) A 440-nm thick anti-reflective coating ( $n = 1.53$ ) is applied to a glass surface ( $n = 1.40$ ). What wavelengths of light in the visible region of the spectrum (400nm - 700nm) experience destructive interference upon reflecting from this surface? Be sure to show all steps in solving this problem.

4. (25 pts) A vehicle with headlights separated by 2.00 meters approaches an observer holding a detector sensitive to light of wavelength 650 nm.

a) What aperture diameter is required in the detector if the headlights are to be resolved at a distance of 10.0 km?

b) If the vehicle is further away than 10.0 km, the headlights can be resolved by changing the wavelength at which the detector is sensitive. Should you change to a shorter wavelength or longer wavelength detector, given the same aperture? Explain.