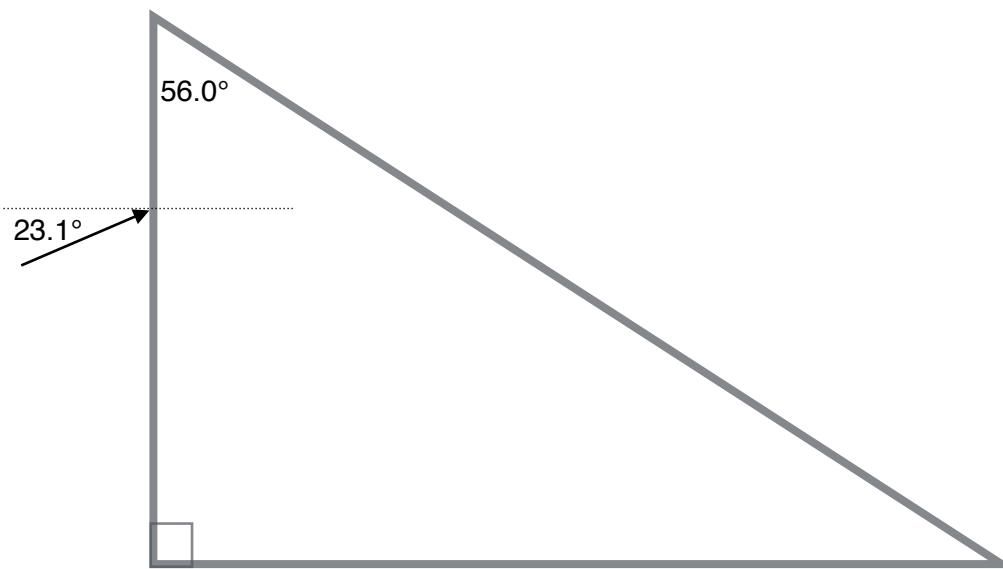


## **Physics 10164 - Exam 4D**

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) Light is incident on the left edge of a triangular prism as shown below. The prism is surrounded by air and made from a substance with  $n = 1.68$ . Where does the light exit the prism and with what exit angle of refraction?



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) White light is incident on a diffraction grating with 320 lines/mm. The wavelength range of visible light is 400 nm (blue) - 700 nm (red)

- a) What is the angular size of the 2nd order spectrum (the angular separation between the blue and red light)?
- b) How many complete orders can be seen in reflection from this grating? Justify your answer mathematically.

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.