# AP 2 Optics: Refraction WS 1
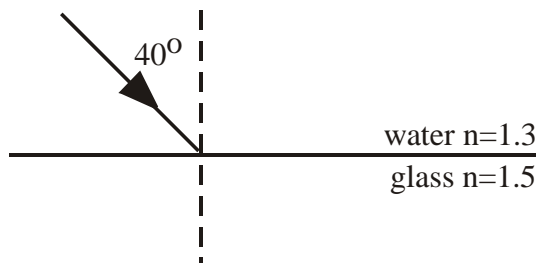
1. Quantitatively determine the direction of the refracted ray.



$36^o$    air n=1.0
           glass n=1.5
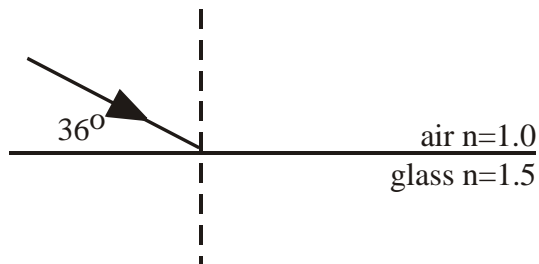
2. Find and draw the angle at which light will leave the 45-45-90 triangular glass block submerged in water. ($n_{glass} = 1.5$    $n_{water} = 1.3$)
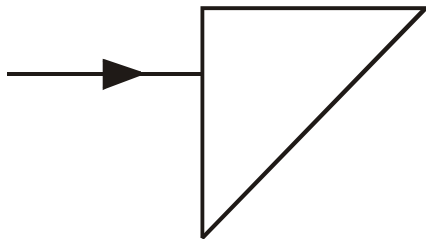


3. Quantitatively determine the direction of the refracted ray.



$40^o$    water n=1.3
           glass n=1.5

4. In a lab experiment where light passes from air into a plastic block, the incident angle is measured to be 25° and the refracted angle is 21°. Find the index of refraction for the block.

5. An optical fiber uses flint glass clad with crown glass. What is the critical angle?

6. Suppose you are using total internal reflection to make an efficient corner reflector. If there is air outside and the incident angle is 45.0º, what must be the minimum index of refraction of the material from which the reflector is made?

7. You can determine the index of refraction of a substance by determining its critical angle. (a) What is the index of refraction of a substance that has a critical angle of 68.4º when submerged in water? (What is the substance?)

(b) What would the critical angle be for this substance in air?

8. A ray of light travels from air into a liquid. The ray is incident upon the liquid at an angle of 30 degrees. The angle of refraction is 22 degrees. a) What is the index of refraction of the liquid?

b) What is the speed of light in the liquid?