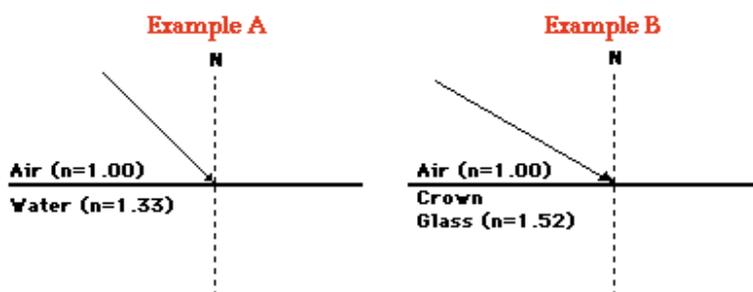


Word Problems With Refraction of Light

Recall that Snell's Law is $n_i \sin(\theta_i) = n_r \sin(\theta_r)$ or $\frac{\sin(\theta_i)}{\sin(\theta_r)} = \frac{n_r}{n_i}$ or $\frac{n_r}{n_i} = \frac{v_i}{v_r}$

Example Problems

In the following two examples, use Snell's law, the sine button on your calculator, a protractor, and the index of refraction values to complete the following diagrams. Measure θ_i , calculate θ_r and draw in the refracted ray with the calculated angle of refraction.



Example Problem A

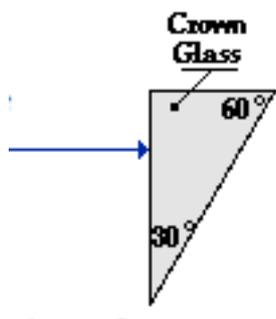
A ray of light in air is approaching the boundary with water at an angle of 52 degrees. Determine the angle of refraction of the light ray.

Example Problem B

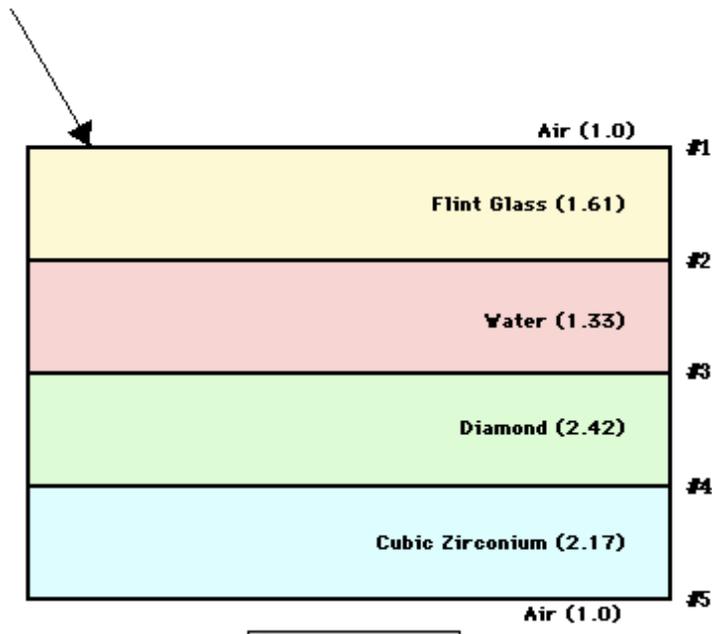
A ray of light in air is approaching the boundary with a layer of crown glass at an angle of 42.0 degrees. Determine the angle of refraction of the light ray upon entering the crown glass and upon leaving the crown glass.

Example Problem C

A ray of light in air is approaches a triangular piece of crown glass at an angle of 0.00 degrees (as shown in the diagram at the right). Perform the necessary calculations in order to trace the path of the light ray as it enters and exits the crown glass.

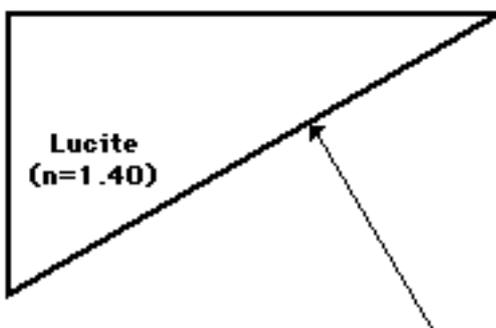


2. Perform the necessary calculations at each boundary in order to trace the path of the light ray through the following series of layers. Use a protractor and a ruler and show all your work.



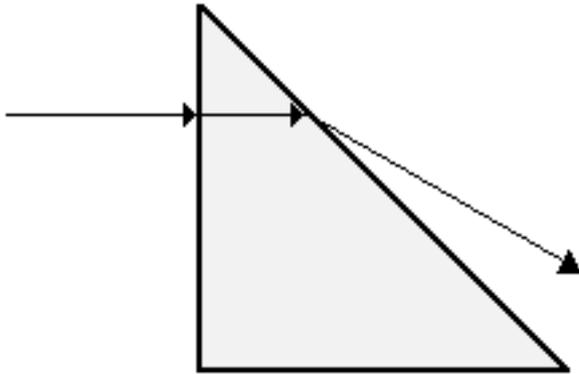
3. A ray of light in crown glass exits into air at an angle of 25.0 degrees. Determine the angle at which the light approached the glass-air boundary.

4. A ray of light is traveling through air ($n = 1.00$) towards a lucite block ($n = 1.40$) in the shape of a 30-60-90 triangle. Trace the path of the light ray through the lucite block shown in the diagram below.



Check Your Understanding

1. Cal Culator is performing an experiment to determine the index of refraction of an unknown material (in the shape of a 45-45-90 triangle). Cal determines that the light follows the path as shown on the diagram below. Use this path, a protractor, a calculator and Snell's Law to determine the index of refraction of the unknown material.



4. Light traveling through air ($n = 1.00$) is incident upon a 60-60-60 triangular block (the triangle is equilateral; the sides make 60-degree angles with each other) made of an unknown material. The path of the light through the material is shown in the diagram below. Using a protractor and a calculator, determine the index of refraction of the unknown material.

