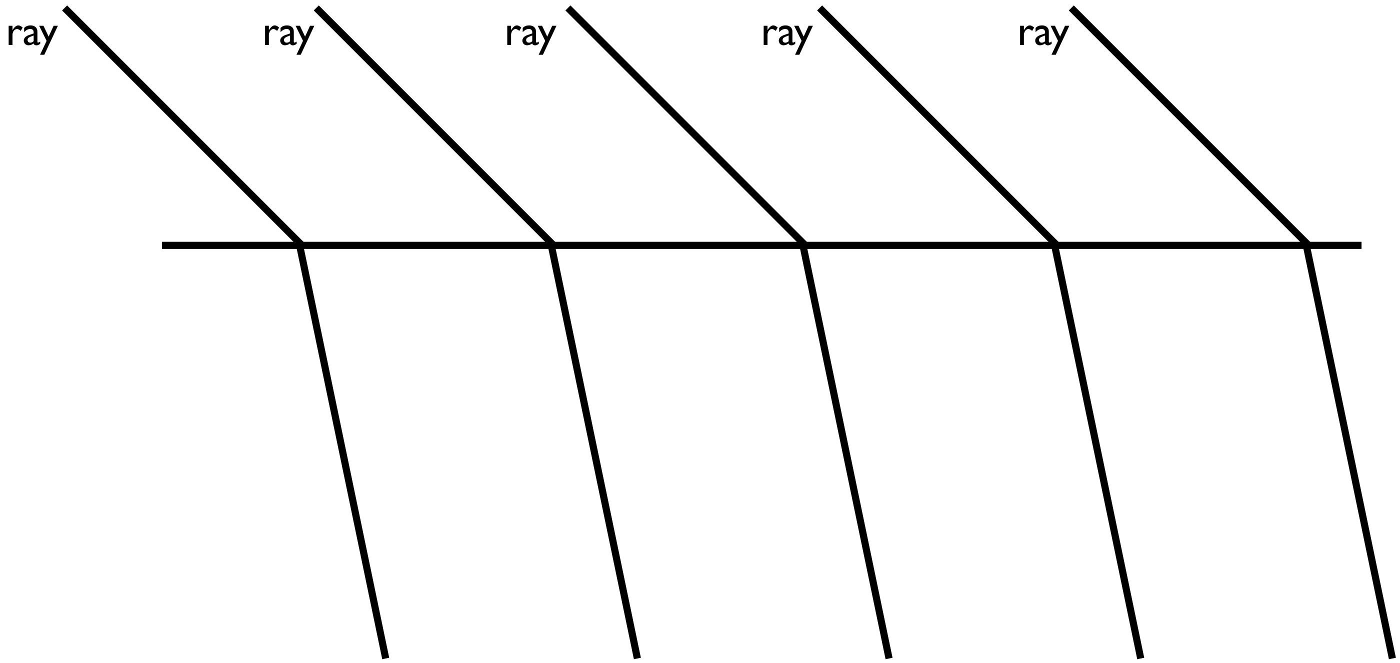
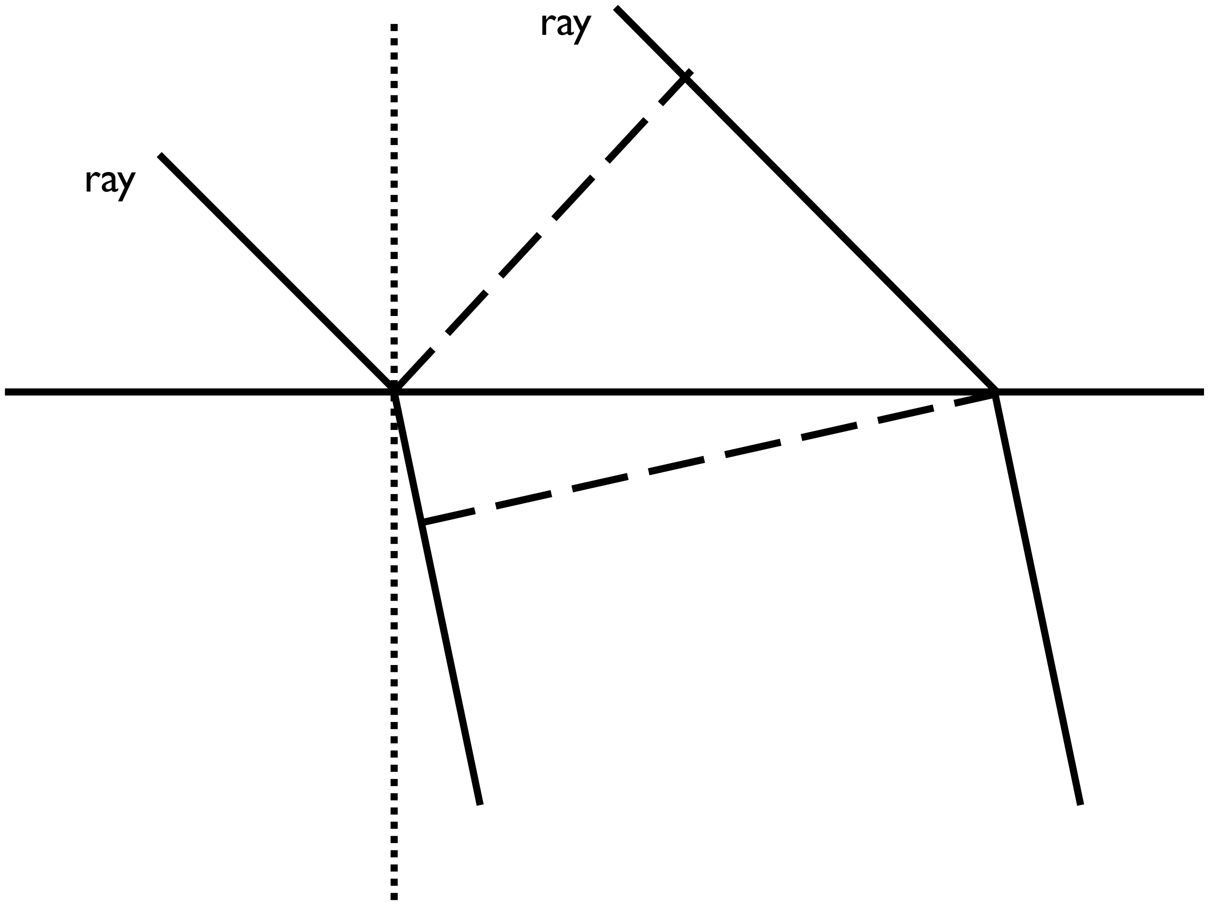
REFRACTION

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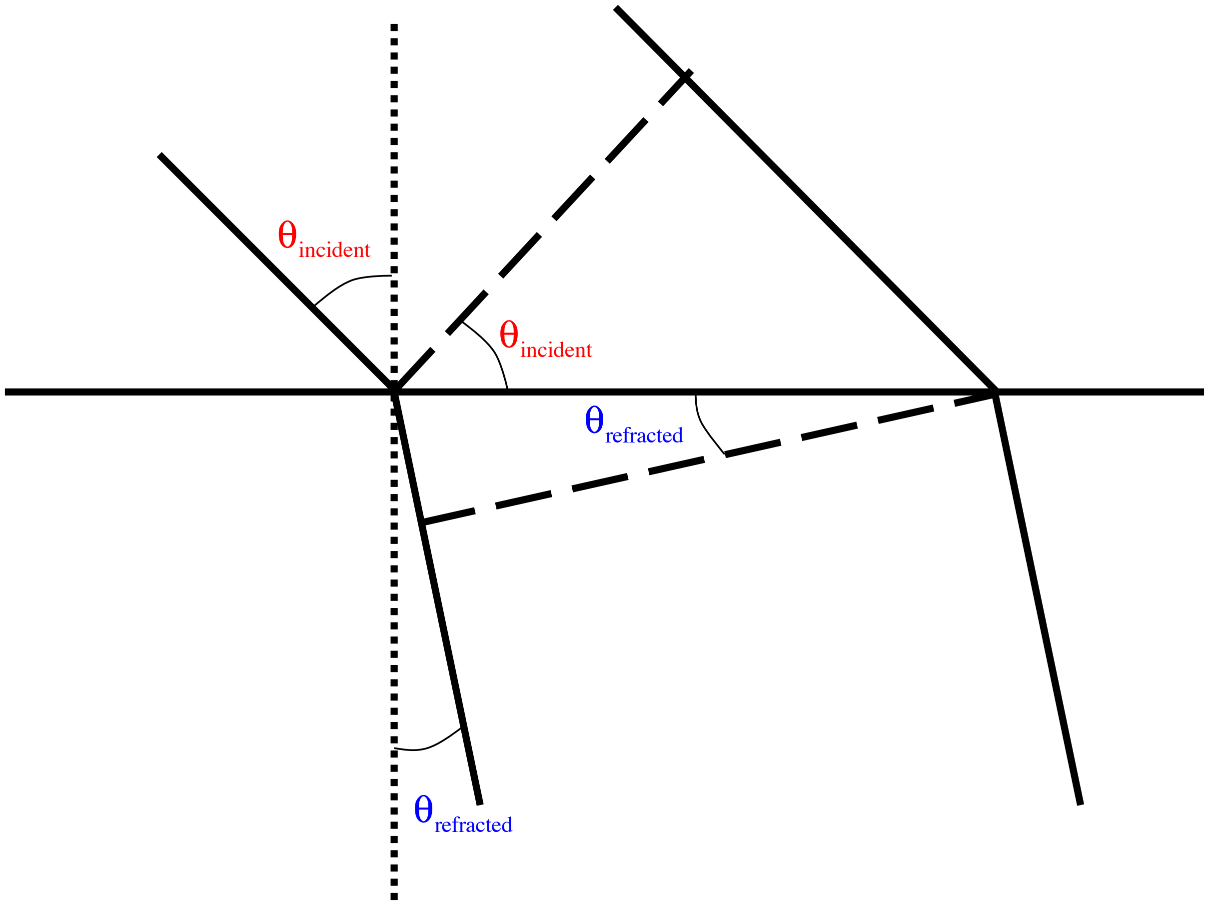
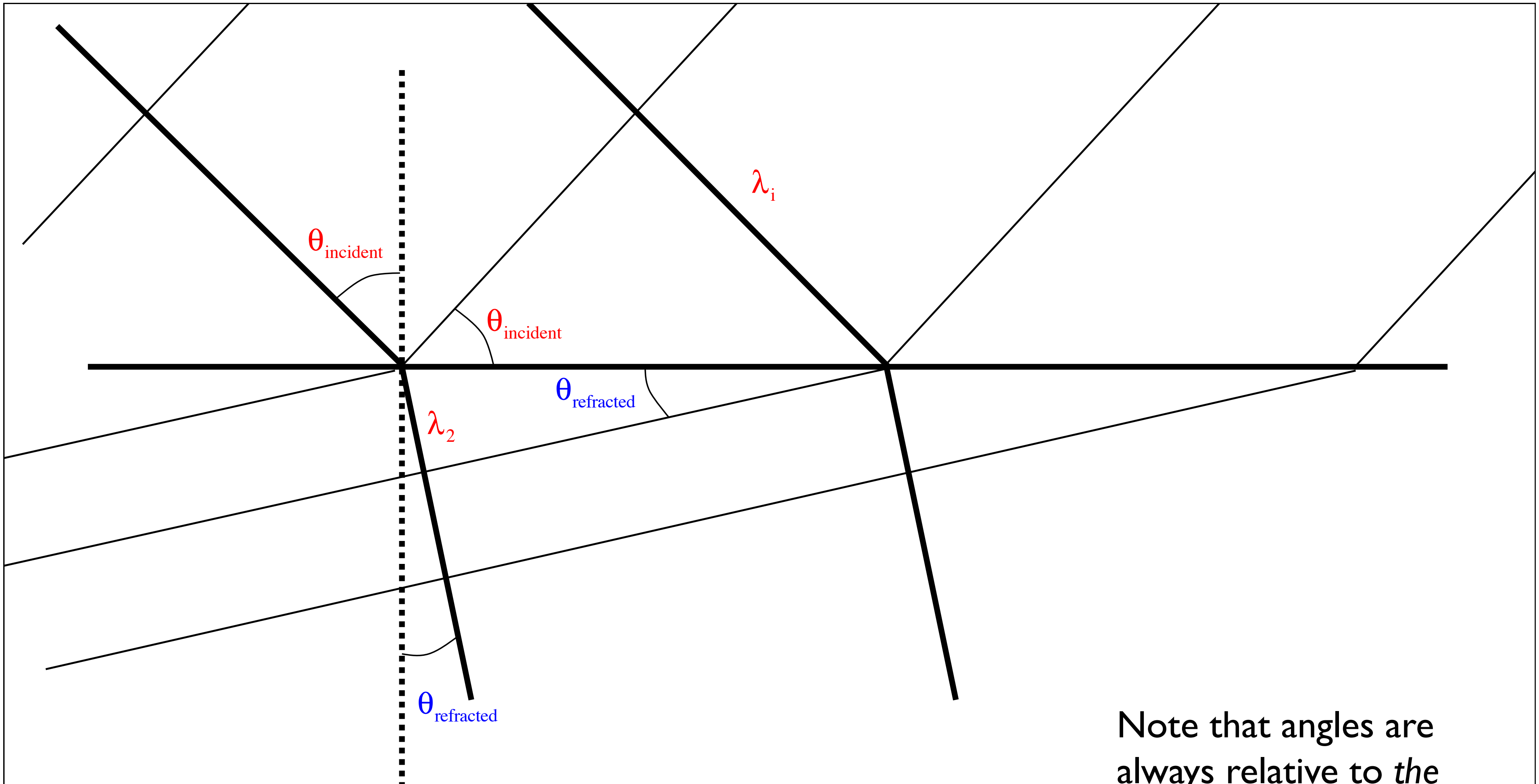


Note that angles are always relative to *the normal.*



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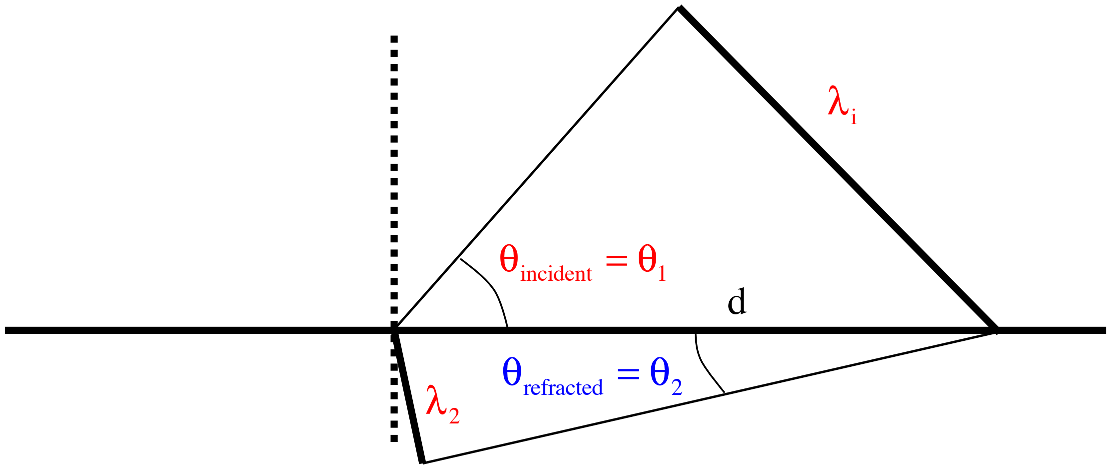


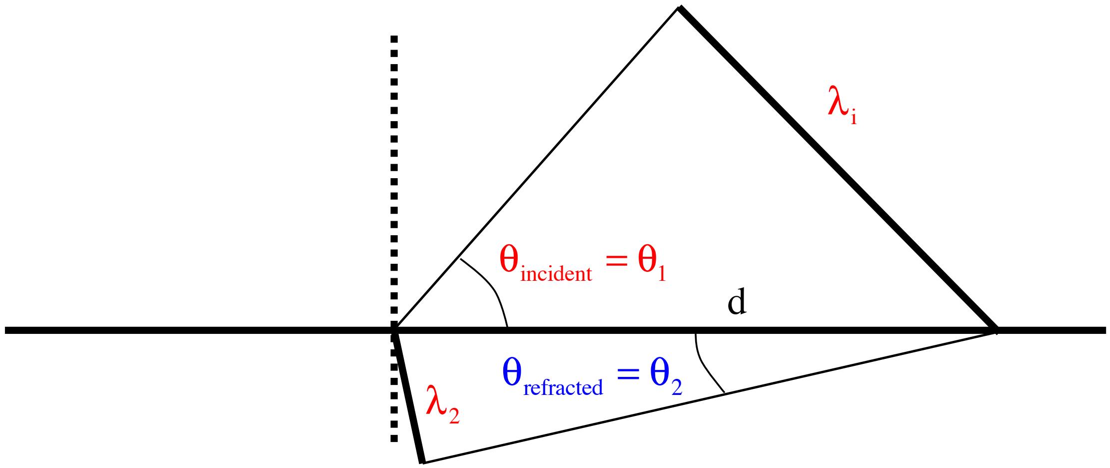
Using trig and the fact that the two triangles have a common side, we can write:

$$d = \frac{\lambda_1}{\sin\theta_1} = \frac{\lambda_2}{\sin\theta_2}$$

Noting that the relationship between frequency, wavelength and wave speed is:

$$v = \lambda\nu \quad \Rightarrow \quad \lambda = \frac{v}{\nu}$$

Additionally:

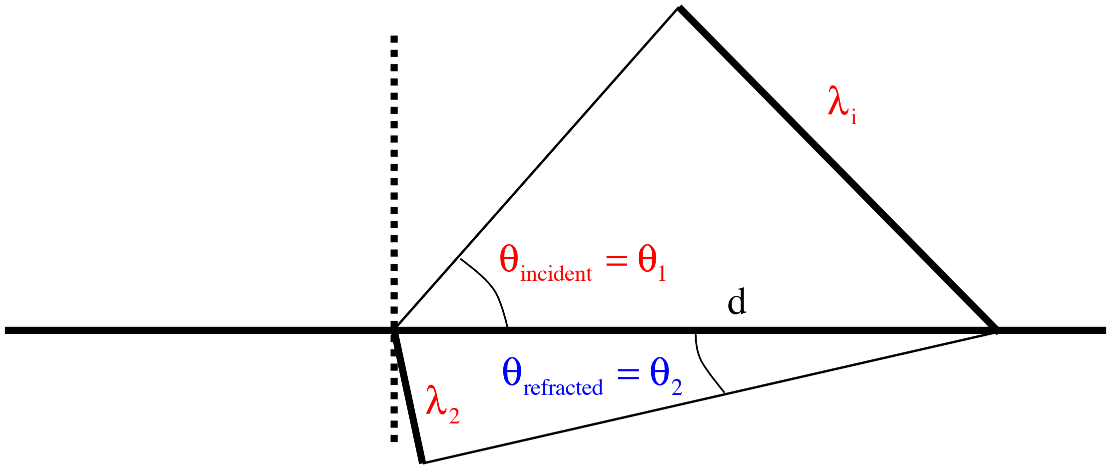


Noting that the frequency is the same no matter where the wave is, and remembering that the velocity is different in each medium, we can rewrite this "d" relationship as:

$$d = \frac{v_1/\nu}{\sin\theta_1} = \frac{v_2/\nu}{\sin\theta_2}$$

Canceling the frequency terms, then defining the *index of refraction* η as the ratio of the *speed of light* "c" to the effective *speed of the wave* in the material "v", or:

$$\eta_1 = \frac{c}{v_1} \quad \Rightarrow \quad v_1 = \frac{c}{\eta_1}$$



We can write:

$$\frac{c/\eta_1}{\sin\theta_1} = \frac{c/\eta_2}{\sin\theta_2}$$

Canceling the "c" terms and rearranging, we get Snell's Law, or:

$$\eta_1 \sin\theta_1 = \eta_2 \sin\theta_2$$