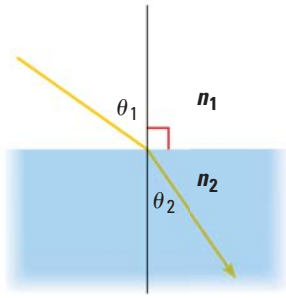
44. **TAKS REASONING** When light traveling in a medium (such as air) strikes the surface of a second medium (such as water) at an angle θ_1, the light begins to travel at a different angle θ_2. This change of direction is defined by Snell's law, $n_1 \sin \theta_1 = n_2 \sin \theta_2$, where n_1 and n_2 are the *indices of refraction* for the two mediums. Snell's law can be derived from the equation:



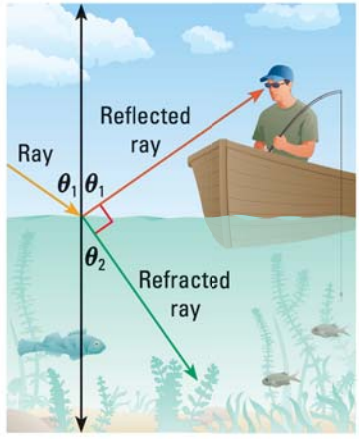
$$\frac{n_1}{\sqrt{\cot^2 \theta_1 + 1}} = \frac{n_2}{\sqrt{\cot^2 \theta_2 + 1}}$$

a. **Derive** Simplify the equation to derive Snell's law: $n_1 \sin \theta_1 = n_2 \sin \theta_2$.

b. **Solve** If $\theta_1 = 55°$, $\theta_2 = 35°$, and $n_2 = 2$, what is the value of n_1?

c. **Interpret** If $\theta_1 = \theta_2$, what must be true about the values of n_1 and n_2? *Explain* when this situation would occur.

45. **CHALLENGE** Brewster's angle is the angle θ_1, at which light reflected off water is completely polarized, so that glare is minimized when you look at the water with polarized sunglasses. Brewster's angle can be found using Snell's law (see Exercise 44).



a. Let $\sin^2 \theta_2 = \left(\frac{n_1}{n_2} \sin \theta_1\right)^2$ and $\cos^2 \theta_2 = \left(\frac{n_2}{n_1} \cos \theta_1\right)^2$.

Add the two equations to show that

$$\frac{n_1^2}{n_2^2} \sin^2 \theta_1 + \frac{n_2^2}{n_1^2} \cos^2 \theta_1 = 1.$$

b. Show that the equation from part (a) can be simplified to $\frac{n_2^2 - n_1^2}{n_2^2} \sin^2 \theta_1 = \frac{n_2^2 - n_1^2}{n_1^2} \cos^2 \theta_1$.

c. Solve the equation from part (b) to find Brewster's angle:

$$\theta_1 = \tan^{-1}\left(\frac{n_2}{n_1}\right)$$

MIXED REVIEW FOR TAKS

TAKS PRACTICE at classzone.com

REVIEW
Lesson 4.1; TAKS Workbook

46. **TAKS PRACTICE** Which equation will produce the widest parabola when graphed? *TAKS Obj. 5*

Ⓐ $y = -3x^2$ Ⓑ $y = -\frac{2}{5}x^2$ Ⓒ $y = 1.5x^2$ Ⓓ $y = \frac{5}{2}x^2$

REVIEW
Skills Review Handbook p. 988; TAKS Workbook

47. **TAKS PRACTICE** Reflect $\triangle RST$ in the line $x = -1$. In which quadrant will the image of point R appear? *TAKS Obj. 7*

Ⓕ Quadrant I Ⓖ Quadrant II

Ⓗ Quadrant III Ⓙ Quadrant IV