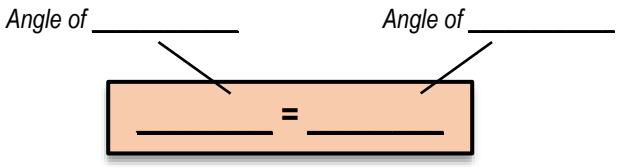
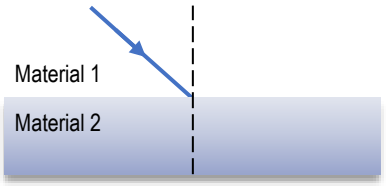
CONCEPT: LIGHT REFRACTION & SNELL'S LAW

- Refraction: Whenever light enters a new material at an *angle*, it changes _____ ***and*** _____.
  - When light hits the boundary between 2 materials, *some* of it reflects and *some* of it refracts into the new material.



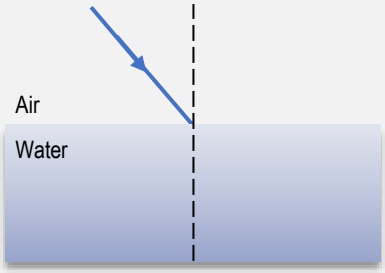
(Snell's Law of Refraction)



- *Always* make sure to use ____ & ____ for incident light!

Entering material with HIGHER n ($n_2 > n_1$)

EXAMPLE 1: A ray of light enters water at a 30° incident angle. Find the angle of refraction.



Light bends **[TOWARD | AWAY FROM]** normal, θ_2 θ_1

Entering material with LOWER n ($n_2 < n_1$)

EXAMPLE 2: A ray of light exits glass into air at a 30° incident angle. Find the angle of refraction.

Light bends **[TOWARD | AWAY FROM]** normal, θ_2 θ_1

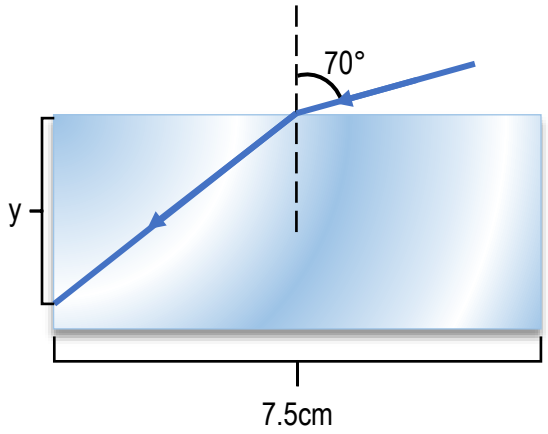
n FOR COMMON MATERIALS	
Air	1.00029 ≈ 1
Water	1.33
Glass	1.46

PROBLEM: A laser pointer emits a ray which enters a quartz crystal at an angle 50° with the normal to the surface of the crystal. The ray bends inside the crystal, making an angle of 30° with the normal. Find the index of refraction of quartz.

INDEX OF REFRACTION FOR COMMON MATERIALS	
Vacuum/Air	1
Water	1.33
Glass	1.46

OPTICS EQUATIONS
$n_1 sin\theta_1 = n_2 sin\theta_2$

PROBLEM: A ray of light is incident on a block of glass with an angle of 70° in the middle of the block (length = 7.5cm). What is the distance (in cm) below the top of the block at which the light ray exits?



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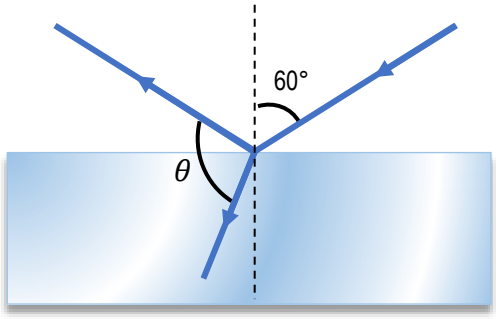
PROBLEM: A ray of light is incident on a glass pane with an angle of 60°. The light partially reflects and partially refracts. What is the angle θ between the reflected and refracted rays?



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OPTICS EQUATIONS
$\theta_1 = \theta_1'$
$n_1 sin\theta_1 = n_2 sin\theta_2$