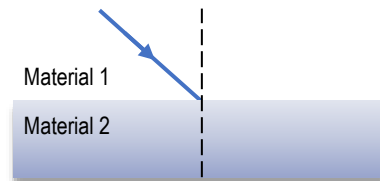
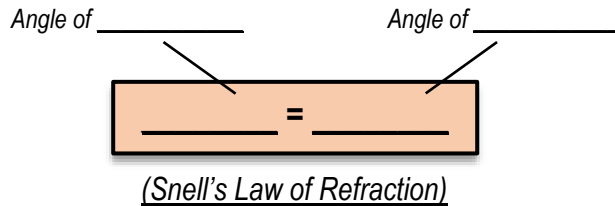


CONCEPT: LIGHT REFRACTION & SNELL'S LAW

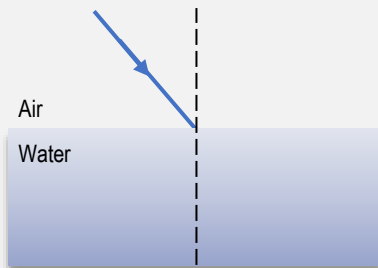
- **Refraction**: Whenever light enters a new material at an *angle*, it changes _____ **and** _____.
- When light hits the boundary between 2 materials, *some* of it **reflects** and *some* of it **refracts** into the new material.



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

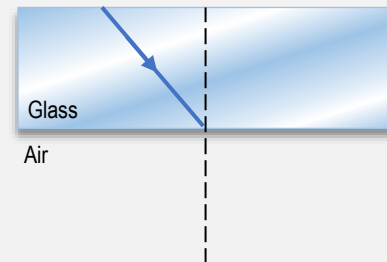
Entering material with HIGHER n ($n_2 > n_1$)

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



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.



n FOR COMMON MATERIALS	
Air	$1.00029 \approx 1$
Water	1.33
Glass	1.46

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

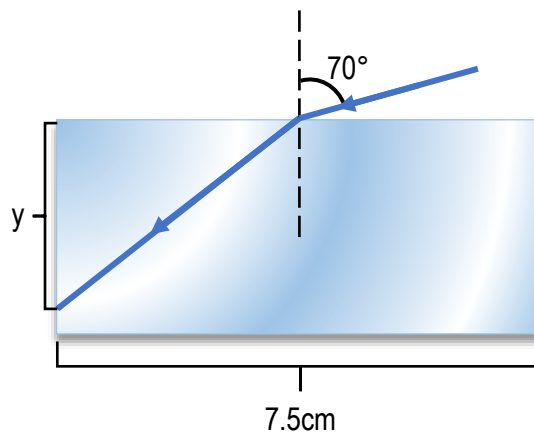
Light bends **[TOWARD | AWAY FROM]** normal, θ_2 θ_1

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

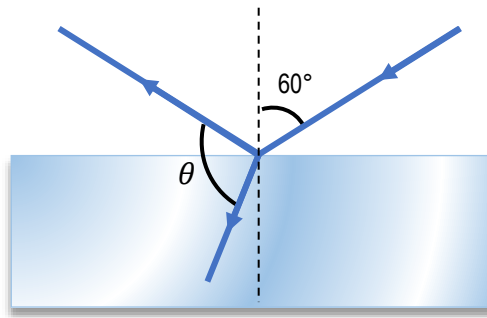
PROBLEM: A ray of light is incident on a block of glass with an angle of 70° in the middle of the block (length = 7.5cm). What is the distance (in cm) below the top of the block at which the light ray exits?



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 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?



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

OPTICS EQUATIONS	
$\theta_1 = \theta'_1$	
$n_1 \sin \theta_1 = n_2 \sin \theta_2$	