CONCEPT: THE INDEX OF REFRACTION

● Remember, c = speed of light in a *vacuum*. In all other materials, light travels _____.

CONSTANTS
c = 3.0×10^8 m/s

- The index of refraction n of a material is the ratio of c to the speed of light in that material (v).

___ = ___ = _____

- Because light always travels **[SLOWER | FASTER]** in any material, n is always **[LESS | GREATER]** than 1.
- Whenever light travels through air, use ___ for the index of refraction.

EXAMPLE: When light enters water, it slows to a speed of approximately 2.25×10^8 m/s. What is water's index of refraction?

INDEX OF REFRACTION FOR COMMON MATERIALS	
Vacuum	1
Air	1.00029
Water	
Glass	1.46

● Whenever light travels through air, use ___ for the index of refraction.

PROBLEM: Diamond has a refractive index of 2.42. How fast would a light ray travel through a diamond?

INDEX OF REFRACTION FOR COMMON MATERIALS	
Vacuum/Air	1
Water	1.33
Glass	1.46
Diamond	2.42

OPTICS EQUATIONS
$n = \frac{c}{v}$
CONSTANTS
$c = 3.0\times10^{8}\ \frac{m}{s}$

PROBLEM: You turn on one laser in air and shine a second laser through a glass block. How much farther does the light travel in air compared to light traveling in the glass over a period of 2 nanoseconds?

INDEX OF REFRACTION FOR COMMON MATERIALS	
Vacuum/Air	1
Water	1.33
Glass	1.46
Diamond	2.42

OPTICS EQUATIONS	
$n = \frac{c}{v}$	$v = \frac{\Delta x}{\Delta t}$
CONSTANTS	
$c = 3.0\times10^{8}\ \frac{m}{s}$	

PROBLEM: A light ray travels vertically down a frozen lake. The light passes through a layer of ice 1.5m thick, then through 2m of water before hitting the lakebed. How long does it take for light to travel from the ice surface to the lakebed?

INDEX OF REFRACTION FOR COMMON MATERIALS	
Vacuum/Air	1
Ice	1.31
Water	1.33
Glass	1.46
Diamond	2.42

OPTICS EQUATIONS	
$n = \frac{c}{v}$	$v = \frac{\Delta x}{\Delta t}$
CONSTANTS	
$c = 3.0\times10^{8}\ \frac{m}{s}$	