

12.4 Refraction Math

We discovered that $\frac{L \sin i}{L \sin R} = n$

for plexiglass was approx. 1.5

→ is a unique physical property.

Material scientists have carefully studied other transparent materials

"n" = refractive index

$$n_{\text{air}} =$$

$$1.0 = \frac{L \sin i}{L \sin R}$$

"no bending"
"no slowing"

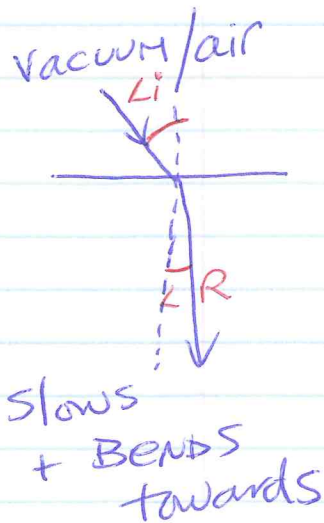
$$n_{\text{ice}} = 1.31$$

$$n_{\text{water}} = 1.33$$

$$n_{\text{olive oil}} = 1.48$$

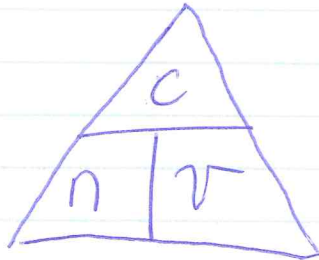
$$n_{\text{glass}} = 1.52$$

$$n_{\text{diamond}} = 2.42$$



light slows more + bends more

OR $n = \frac{c}{v}$



where

n = refractive index
 c = 3.0×10^8 m/s (vacuum/air)
 v = speed m/s
in other medium
(not vacuum/air)

Example light travels through salt crystals at 1.96×10^8 m/s.



Calculate the refractive index of salt. GRASP.

G: Givens $v = 1.96 \times 10^8$ m/s

$c = 3.0 \times 10^8$ m/s.

R: Required $n = ?$

A: Analysis (formula) $n = \frac{c}{v}$

S: Solve $n = \frac{3.0 \times 10^8 \text{ m/s}}{1.96 \times 10^8 \text{ m/s}}$

$$\left(\frac{300 \cancel{\times}}{196 \cancel{\times}} \right)$$

$$n = 1.53$$

P: paraphrase \Rightarrow sentence with answer
The 'n' value is 1.53

* Type in 1.96×10^8 into calculator.

* Button

says $\times 10$ - You type in "8"

Calculate the speed of light in olive oil.

G: $c = 3.0 \times 10^8 \text{ m/s}$ $n = 1.48$

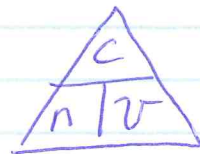
R: $v_{\text{olive oil}} = ?$

A: $v = \frac{c}{n}$

S: $v = \frac{3.0 \times 10^8 \text{ m/s}}{1.48}$

~~Ans~~ $v = \frac{2.03}{3.0} \times 10^8 \text{ m/s}$

P: light travels ~~at~~ $2.03 \times 10^8 \text{ m/s}$ in olive oil



* chart in text p 524

$$n = \frac{c}{v} = \frac{3.0 \times 10^8 \text{ m/s}}{\text{some number} \times 10^8 \text{ m/s}}$$

∴ "n" is a ratio with no units