=EQUALS=

A Club of Investigation and Discovery

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SOME QUESTIONS

If I shout “Knock Knock” in outer space, what would you answer with?

What happens to the speed of sound as the temperature decreases?

What happens to the speed of sound as the altitude increases?

The speed of sound is about 343 meters / second. What is this in miles / second?

Light travels at about 186,000 miles / second. I see a lightning bolt, and count five seconds. How far away did the lightning strike?

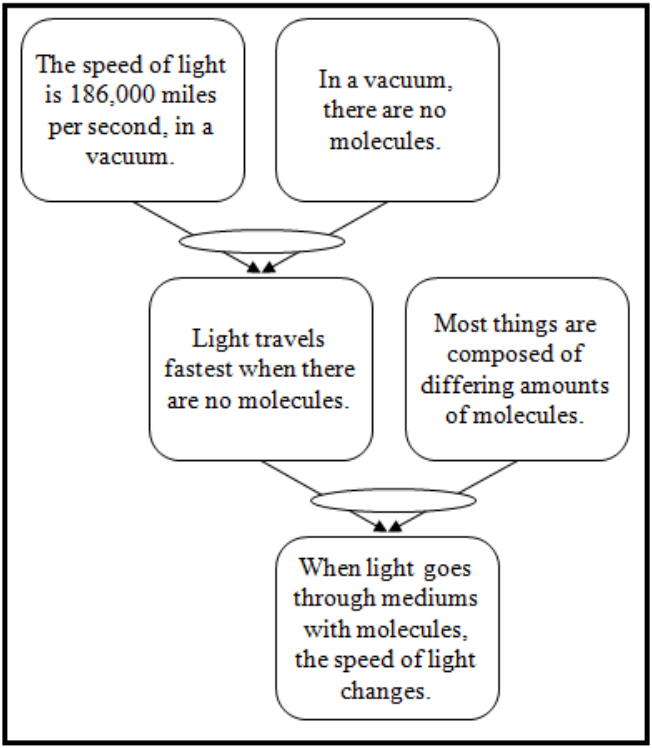
USING THE SPREADSHEET

complete the table below:

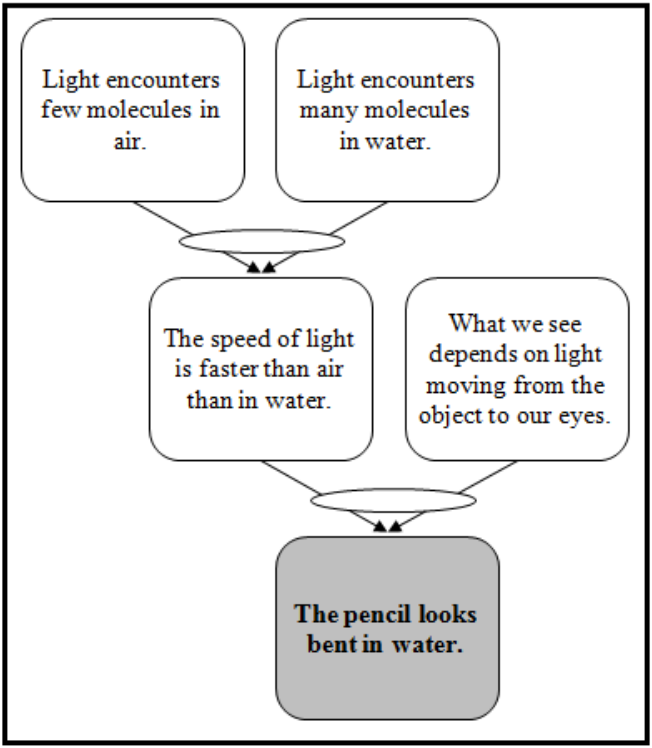
From	at this Angle of Incidence	Through	with this Angle of Refraction
Vacuum	45	Air	
Air	30	Water	
Air		Diamond	18
Water	20		17
	40	Diamond	24

Material	Speed of Light (relative to vacuum)	Speed of Sound (meters / second)
Vacuum	1.000000	0
Air	1.000277	343
Ice	1.310000	3,152
Water	1.333333	1,482
Glass	1.550000	5,640
Diamond	2.417000	12,000

The Speed of Light

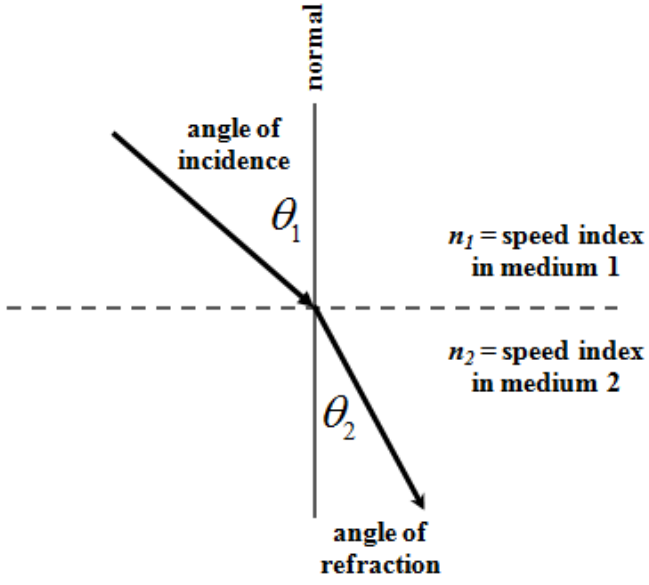


The Bent Pencil

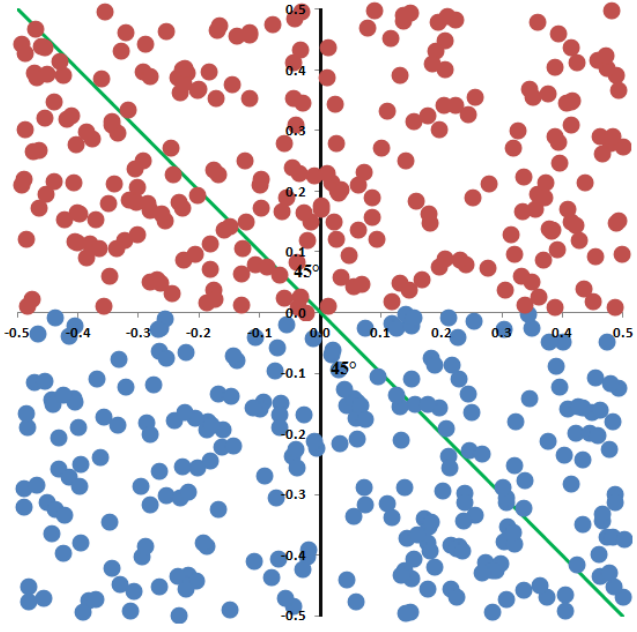


SNELL'S LAW

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

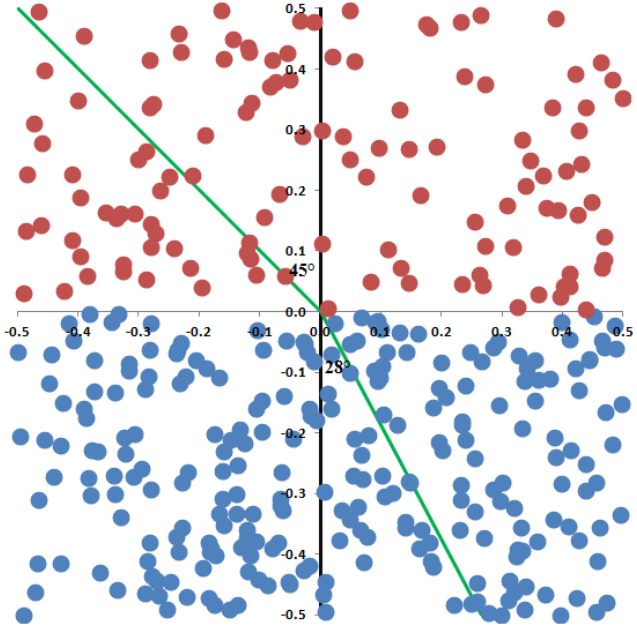


Light traveling from air through more air, at an angle of incidence of 45°,



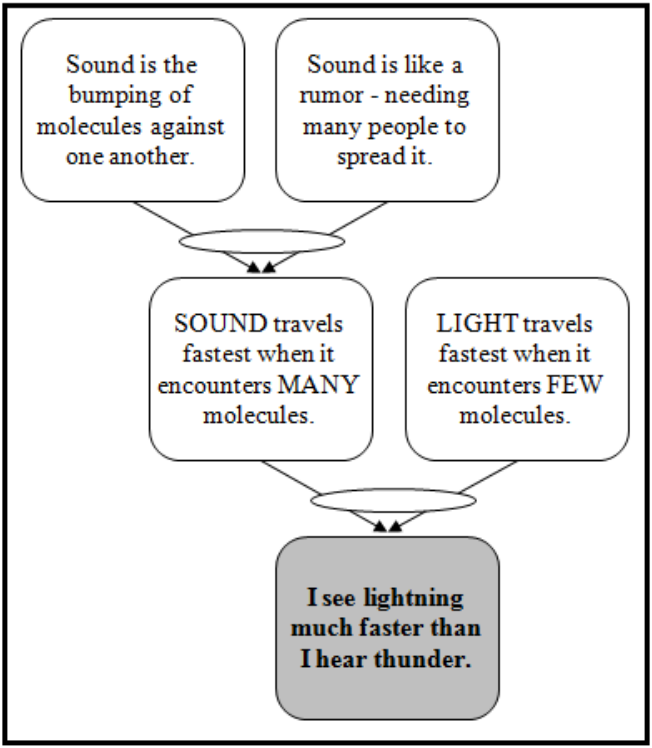
continues in a straight line …

Light traveling from air through water, at an angle of incidence of 45°,



bends towards the normal line

Thunder and Lightning



Solving for the Angle of Refraction (θ_2), Given Everything Else

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

$$\downarrow$$

$$\frac{n_1}{n_2}\sin\theta_1 = \sin\theta_2$$

$$\downarrow$$

$$\sin^{-1}\left[\frac{n_1}{n_2}\sin\theta_1\right] = \theta_2$$