MiSP Light and Sound Worksheet #3, L2

Name _____ Date_____

COMPARING THE SPEED OF SOUND AND THE SPEED OF LIGHT IN AIR AND WATER

You have learned that there are a number of differences between electromagnetic waves (such as light waves and radio frequency waves) and sound waves. One of these differences involves the ability to travel in a vacuum.

1. Can light travel in a vacuum? _____ Explain why or why not.

_____

_____

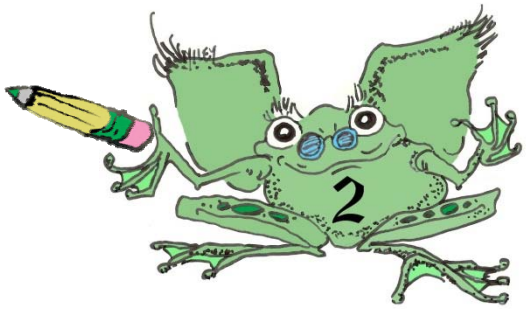
2. Can sound travel in a vacuum? _____ Explain why or why not.

_____

_____

There is also a difference in what happens to light and sound waves when they travel through different media. Complete the table below and then graph the data to see the difference.

Time traveled	**Distance (m) traveled**			
	Sound in air	**Sound in water**	**Light in air**	**Light in water**
0 seconds	0	0	0	0
1 second	343	1482	300,000,000	225,500,000
2 seconds				
3 seconds				

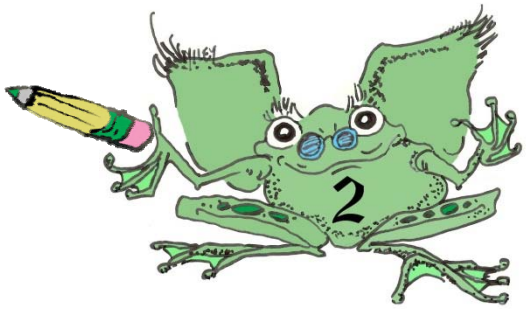


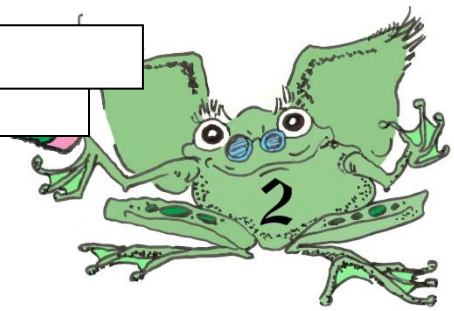
3. Convert the distance data for the distance traveled by light into millions of meters rather than meters. Place the new data in the table below.

Time traveled	**Distance (m) traveled**		**Distance (million m) traveled**	
	Sound in air	**Sound in water**	**Light in air**	**Light in water**
0 seconds	0	0	0	0
1 second	343	1482		
2 seconds				
3 seconds				

4. Graph the data. Make one graph for sound and one for light. Plot distance on the *y*-axis and time on the *x*-axis. You will have two lines on each graph. Use different symbols or colors to show the data points for distance traveled in air and the data points for distance traveled in water.

5. Draw separate lines connecting the data points for air and for water on both of your graphs. Make a legend for your graphs.

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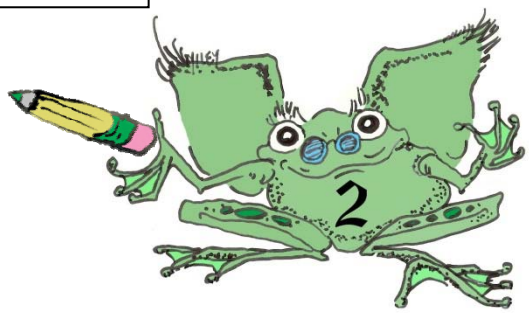
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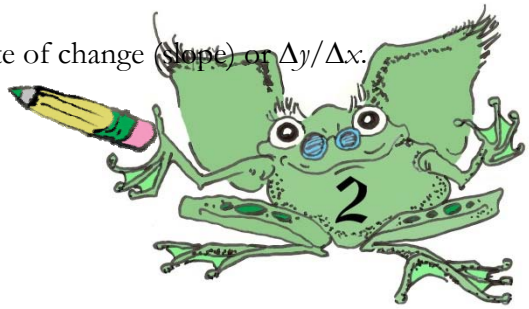
Analysis:

1. For each of the lines on your sound and light graphs, pick an ordered pair and calculate the unit rate of change.

   Unit rate of change = $\frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{\Delta \text{ distance}}{\Delta \text{ time}}$

SOUND			
Ordered Pair (x_1, y_1) (x_2, y_2)	Change in distance (meters)	Change in time (sec)	$\frac{\text{Change in distance}}{\text{Change in time}}$
Sound in air			
Sound in water			
LIGHT			
Ordered Pair (x_1, y_1) (x_2, y_2)	Change in distance (millions of meters)	Change in time (sec)	$\frac{\text{Change in distance}}{\text{Change in time}}$
Light in air			
Light in water			

2. Speed = Δ distance ÷ Δ time. On your graph, this is the unit rate of change (slope) or $\Delta y/\Delta x$. What is the



a. Speed of sound in air: _____

b. Speed of sound in water: _____

c. Speed of light in air:_____

d. Speed of light in water: _____