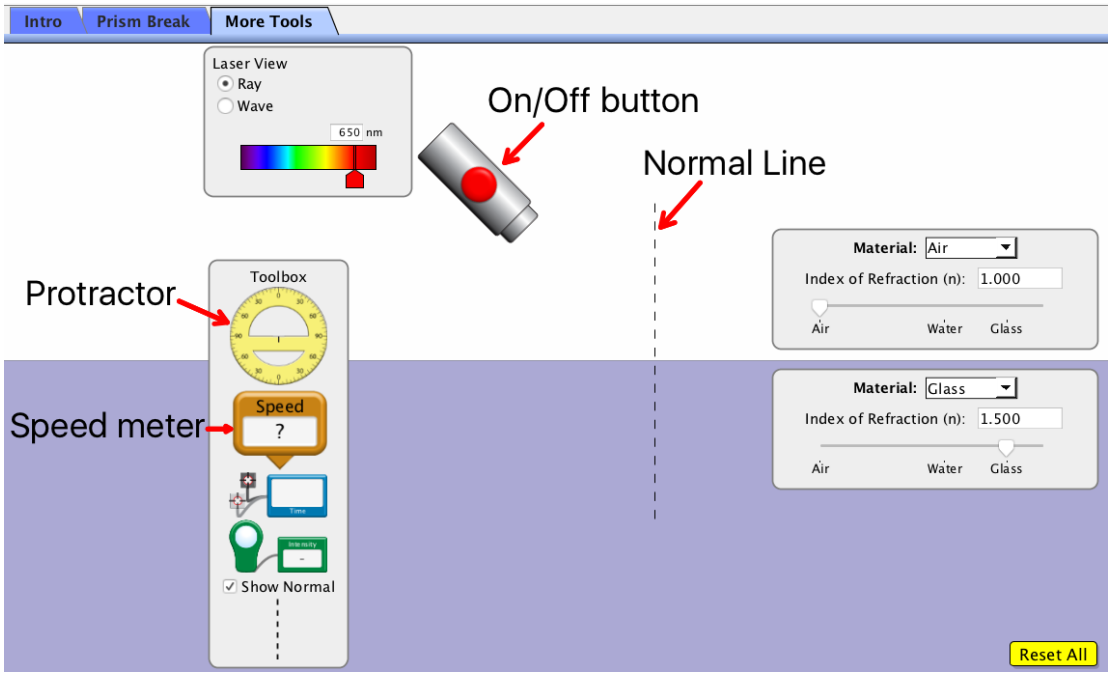
ACTIVITY NO. 2: Reflection and Refraction of light

I. Objective: To verify laws of reflection and refraction of light.

II. Materials:
- PhET Simulation on Resonance
- Laptop
- Activity sheet
- Pen

III. Procedure:
1. Open the PhET Simulation on "Bending Light" distributed last week.
2. Click the tab "More Tools". Explore the sim and play around with its functionalities.



3. Activity proper:

PART I. ***Definitions***

A. Turn on the light source. Refer to Figure 1 below and identify the rays based on the definitions below:
   1. Incident ray – is the light ray coming directly from the source.
   2. Reflected ray – is the light ray that bounces back to the 1st material once it hits the boundary of the 2nd material.
   3. Refracted ray – is the light ray that passes through and bends towards the Normal line as it hits the 2nd material.

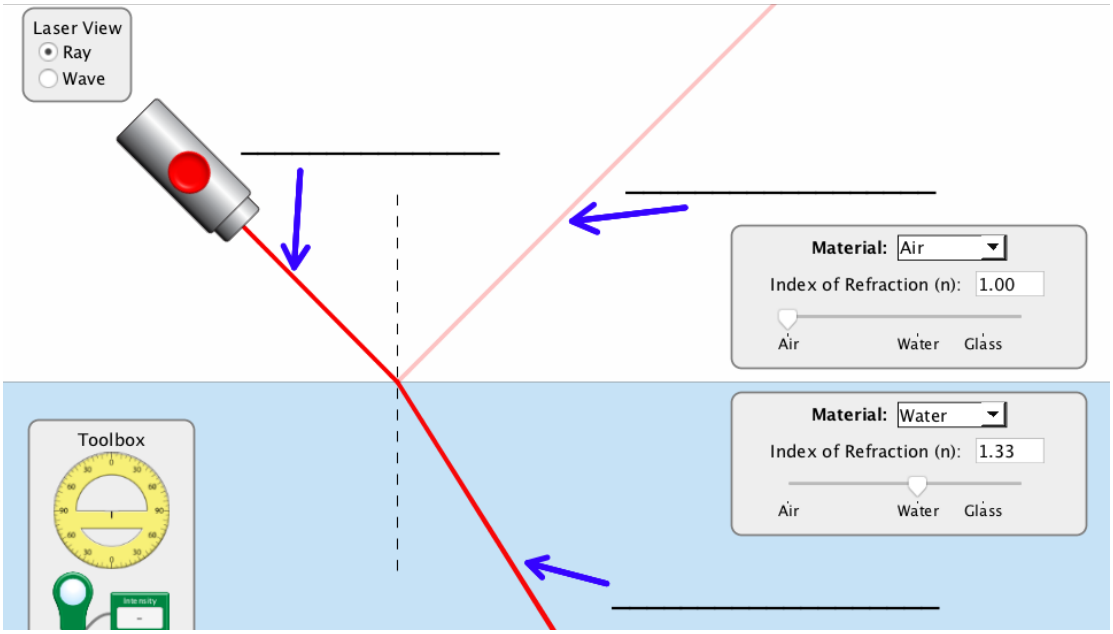


Figure 1. Light rays

PART II. ***Law of Reflection***

A. Place the center of the protractor at the intersection of the Normal line and boundary of the two materials.
B. Set material #1 as air and material #2 as water. Record the index of refraction of the two (2) materials below.

Table 1. Index of Refraction of different materials

Material	Name	Index of refraction (n)
1		
2		

C. Turn on the light source and move it so that the incident ray will have a reading of 30^0 from the Normal line.
D. Identify the angle of *reflected ray* from the Normal line and record it in Table #2.
E. Now, move the light source to change the angle of incidence of your own choice. Record the angle of incident ray and reflected ray in Table #2 along reading #2.

Table 2. Angle of reflected ray

Readings	Angle of incident ray	Angle of reflected ray
1	30^0	
2		

F. *Guide Question:* From Table #2, what do you notice about the angle of incident ray and angle of reflected ray from the two (2) readings?_____.
G. *Guided conclusion:* The Law of Reflection states that the angle of incident ray is _____ to the angle of the _____.

PART III. ***Law of Refraction (Snell's Law)***

A. Place the center of the protractor at the intersection of the Normal line and boundary of the two materials.
B. Set material #1 as air and material #2 as water. Record the index of refraction of the two (2) materials below.

Table 3. Index of refraction of different materials

Material	Name	Index of refraction (n)
1		n_A =_____
2		n_B =_____

C. Turn on the light source and move it so that the incident ray will have a reading of 30^0 from the Normal line.
D. Identify the angle of *refracted ray* from the Normal line and record it in Table #4.
E. Now, move the light source to change the angle of incidence of your own choice. Record the angle of incident ray and refracted ray in Table #4 along reading #2.

Table 4. Angle of refracted ray

Readings	Angle of incident ray	Angle of refracted ray
1	$\theta_A = 30^0$	θ_B =
2	θ_B =	θ_B =

F. From your results in Table 3, compute the inverse ratio of the indexes of refraction and record it on Table #5 below.
G. From your results in Table #4, compute the ratio of the sines of the angles θ_A and θ_B and record it on Table #5 below.

Table 5. Ratio of indexes of refraction and sines of the angles θ_A and θ_B.

Readings	$\frac{n_B}{n_A}$	$\frac{sin\theta_A}{sin\theta_B}$
1		
2		

H. *Guide Question:* From your results in Table 5, what do you notice about inverse ratio of the indexes of refraction and ratio of the sines of the angles θ_A *and* θ_B? _____.

I. *Guided Conclusion:* Snell's Law states that inverse ratio of the indexes of refraction is _____ to the ratio of the sines of the angles θ_A *and* θ_B.