# Measuring the Index of Refraction

I. Glass/Plastic/Acrylic <u>Rectangle</u> and/or <u>Triangle</u>

1. Place the rectangle/triangle on the center of your paper. Trace around it.
2. Place one pin on either side of the object, snugly up against the sides.
   <u>Rectangle</u>: They should not be directly across from one another.
   <u>Triangle</u>: They should be directly across from one another.
   (Pins A and B in diagrams)
3. Look through the objects until these two pins line up in your eyesight.
4. Place another pin (C) between your eye and the two pins that are lined up in sight. Now all three pins (A, B, and C) should seem to be lined up.
5. Place a fourth pin (D) on the other side of the object in line with the other three. You should see all four pins lined up when you look through the object.
6. Remove the object and pins.
7. Connect the pin holes to show the path of light traveling through the rectangle/triangle.
8. With your ruler, carefully draw a dotted line "normal" to the object's surface where the light ray enters the object. Draw another one where the light ray leaves the object.
9. Measure the angles of incidence and refraction where the light enters and where the light leaves the object.
10. Use **<u>Snell's Law</u>** to calculate the index of refraction of your material. You will make this calculation for each set of angles.
11. Average the two values together. This is the material's index of refraction.
12. Use the definition of the index of refraction to calculate the speed of light through the material.
13. Show all calculations on your ray diagram.
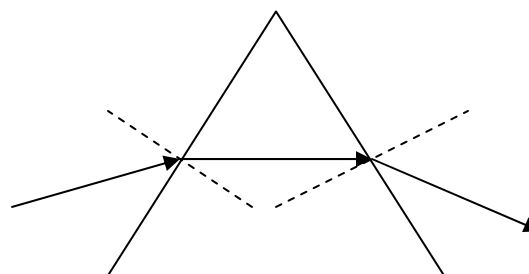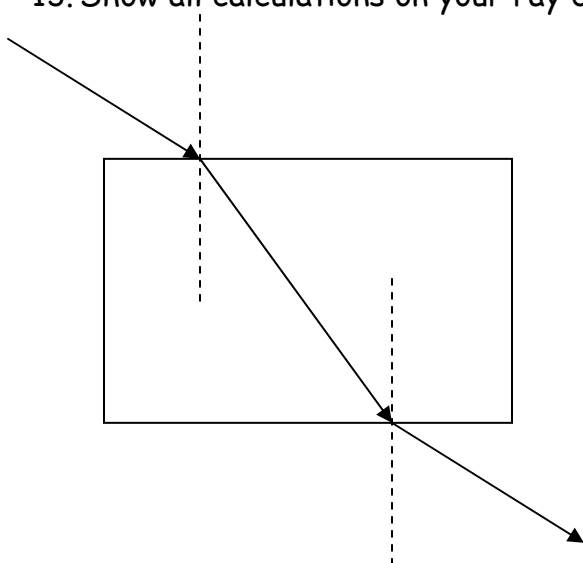
II. Circular Water Dish

1. Place the circular water dish on the center of your paper. Trace around it. Carefully fill to near the top with water.
2. Place two pins on one side of the dish, one snugly against the side slightly off the center of the dish and the other directly in line with it. (Pins A and B in diagram)
3. Look through the dish until these two pins line up in your eyesight. Place another pin on the other side of the dish snugly against the side so that all three pins that are lined up in sight. (Pin C in diagram)
4. Place a fourth pin (Pin D) behind the dish in line with the other three. You should see all four pins lined up when you look through the dish.
5. Remove the water dish and pins.
6. Connect the pin holes to show the path of light traveling through the dish.
7. With your ruler, carefully draw a dotted line "normal" to the circular surface where the light ray enters the dish. Draw another one where the light ray leaves the dish. The normal will be a line through the center of the circular dish.
8. Measure the angles of incidence and refraction where the light enters and where the light leaves the dish.
9. Use **Snell's Law** to calculate the index of refraction of the water. You will make this calculation for each set of angles.
10. Average the two values together. This is the water's index of refraction.
11. Use the definition of the index of refraction to calculate the speed of light through the water.
12. Show all calculations on your ray diagram.