07-04 Intensity Versus Distance Lab **Name:** _____

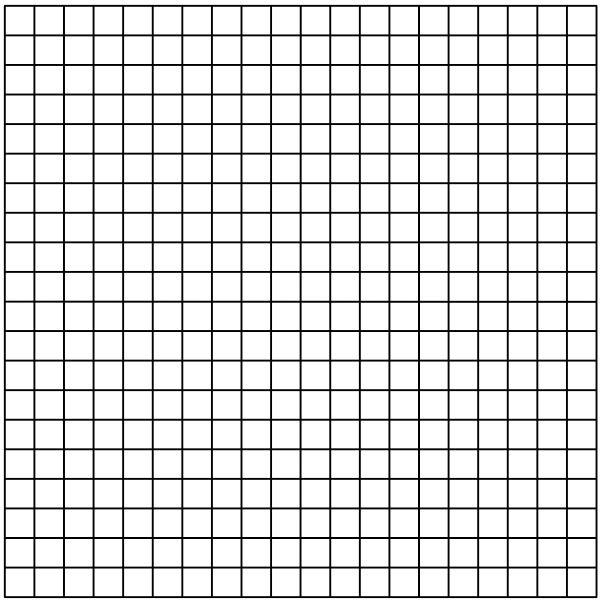
Adapted from Take-Home Physics by Michael Horton

Objective

- Find the relationship between intensity of a wave and the distance away from the source of the wave.

Materials

- Flashlight
- Pipe with paper with square opening on end
- Ruler/Meter stick
- Bare flat surface

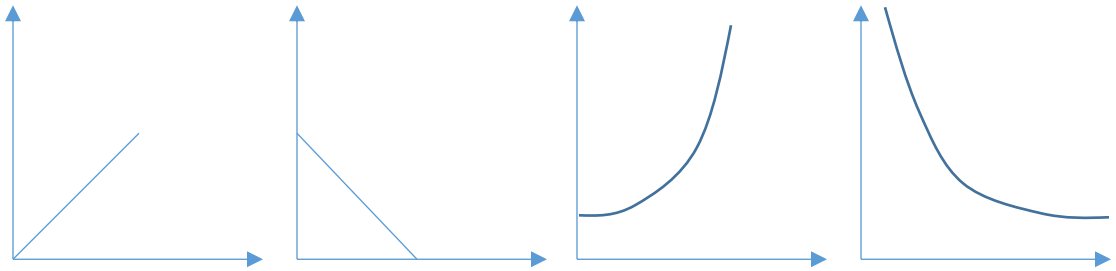


Procedure

1. Set the pipe on the end of the flashlight so that the paper with the square hole is farthest from the light bulb.
2. You will be shining the light through the pipe and square hole onto a flat surface from various distances. The amount of light coming out of the flashlight is constant, but the size of the square that you see on the surface changes with distance. The size of the square of light on the surface then can be used as a measure of intensity.
3. Place square hole the given distance from the bare surface. Measure the width of the square of light. (You will calculate the intensity later.)

Distance from surface	**0 cm**	**10 cm**	**20 cm**	**30 cm**	**40 cm**	**50 cm**
Width of square						
Intensity						

4. What would be the width of the square of light if the hole was 0 cm (touching) the surface? Add that to your table.
5. Call the light coming out of your flashlight 1,000 light units. Calculate the intensity for each distance by $I = \frac{light}{area}$ and put it in the table.
6. Draw a graph with the distance from the surface on the *x*-axis and the intensity on the *y*-axis.
7. The shape of the graph represents a _____ (direct, inverse, square, inverse square) relationship between the distance and intensity.



8. How far away would you have to be to get four times the intensity as at 30 cm? _____
9. When you were at 40 cm, was the intensity half the intensity as at 20 cm? _____, If not, what fraction was it? _____
10. When you were at 30 cm, was the intensity one-third the intensity as at 10 cm? _____, If not, what fraction was it? _____
11. Would the graph have been different if you used a circle instead of a square?