

Range Vs. Launch Speed Lab

Name _____ Date _____ Period ___ Group ___

Problem: What effect does the speed a marble is launched at, have on the distance (range) it ends up going ? (Assume a constant launch angle is used)

Hypothesis : _____

Variables: By the time you finish this experiment , you will need to identify the different types of variables present in this investigation. Consult your notes for definitions of the types of variables.

Independent Variables: _____

Dependent Variables: _____

Controlled Variables: _____

Objective:

The speed of the marble also affects how far it goes. The different settings for the spring will allow you to get five different launch speeds. The photogate timer will provide accurate speed measurement so you can find the relation between speed and range. The objective of this activity is to find the relationship between range and launch speed by experiment.

Procedures:

Setting Up

1-Just as in the last experiment, you will need to make a tape mark on the floor and use a tape measure to measure the range of the marble.

2-Use the timer in interval mode with just one clamp connected. If you put the clamp on correctly the center of the marble crosses the light beam. The speed of the marble is then calculated by dividing the diameter (1.9 cm) by the time that the beam is broken (Time from clamp A)

To Do the Experiment:

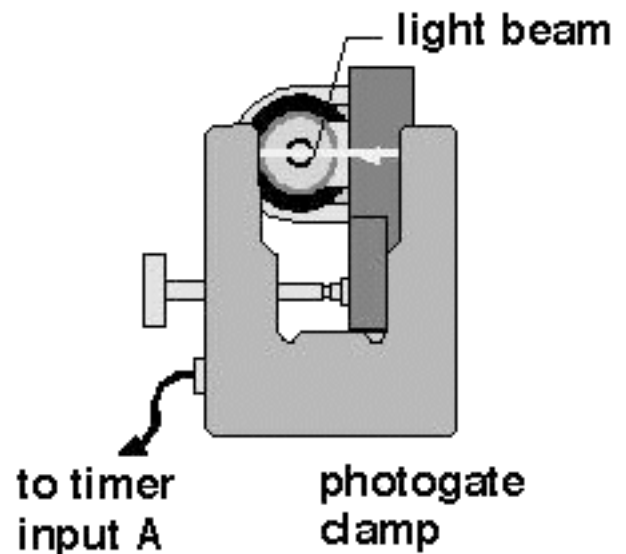
3-Remember to follow a few safety rules when using the Marble Launcher. Do not shoot anything out of the Launcher except the black plastic marbles provided. Do not shoot the Launcher at other people and wear safety glasses.

4-A minimum of two people are needed per Launcher. One person launches the marbles and the other records the distance the marble has traveled (range). The best way to record the range is to station an observer to the side of where the marble will land. It usually takes a couple of tries to get the distance right.

5-Use a fixed launch angle (an angle near 45 degrees works best) and shoot the marble at least three times at each spring setting. Record the range, time from clamp A, and calculate the speed for each shot.

6-Use the table on the next page to record your data. The double lined columns are for results that you have to calculate from the measurements. Take three good measurements of the range and time for each spring setting.

Use the average of the three times to calculate the average speed of the marble for each spring setting



Spring Setting	Launch Angle (degrees)	Time From Clamp A (show entire reading from timer in seconds)			Average Time (seconds)	Average Speed (1.9 ÷ Average time) in cm/sec	Range (centimeters)			Average Range (cm)
1	35									
2	35									
3	35									
4	35									
5	35									
1	45									
2	45									
3	45									

Question 1. What happens to the range as launch speed increases? At spring setting 3, which launch angle makes the marble go further, 35° or 45° ? (Answer both parts of the question)

Use the graph paper on the next page to make a graph showing the **range of the marble** plotted against the **launch speed**. Answer the questions below **ONLY AFTER THE GRAPH IS CONSTRUCTED!**

Label the x-axis with your independent variable and the y-axis with your dependent variable. Include the proper units for each. Construct an appropriate scale for each axis that uses most of the graph.

Make a key below the graph, that shows which symbols will be used for launch angles of 35° and which symbols will be used for launch angles of 45°.

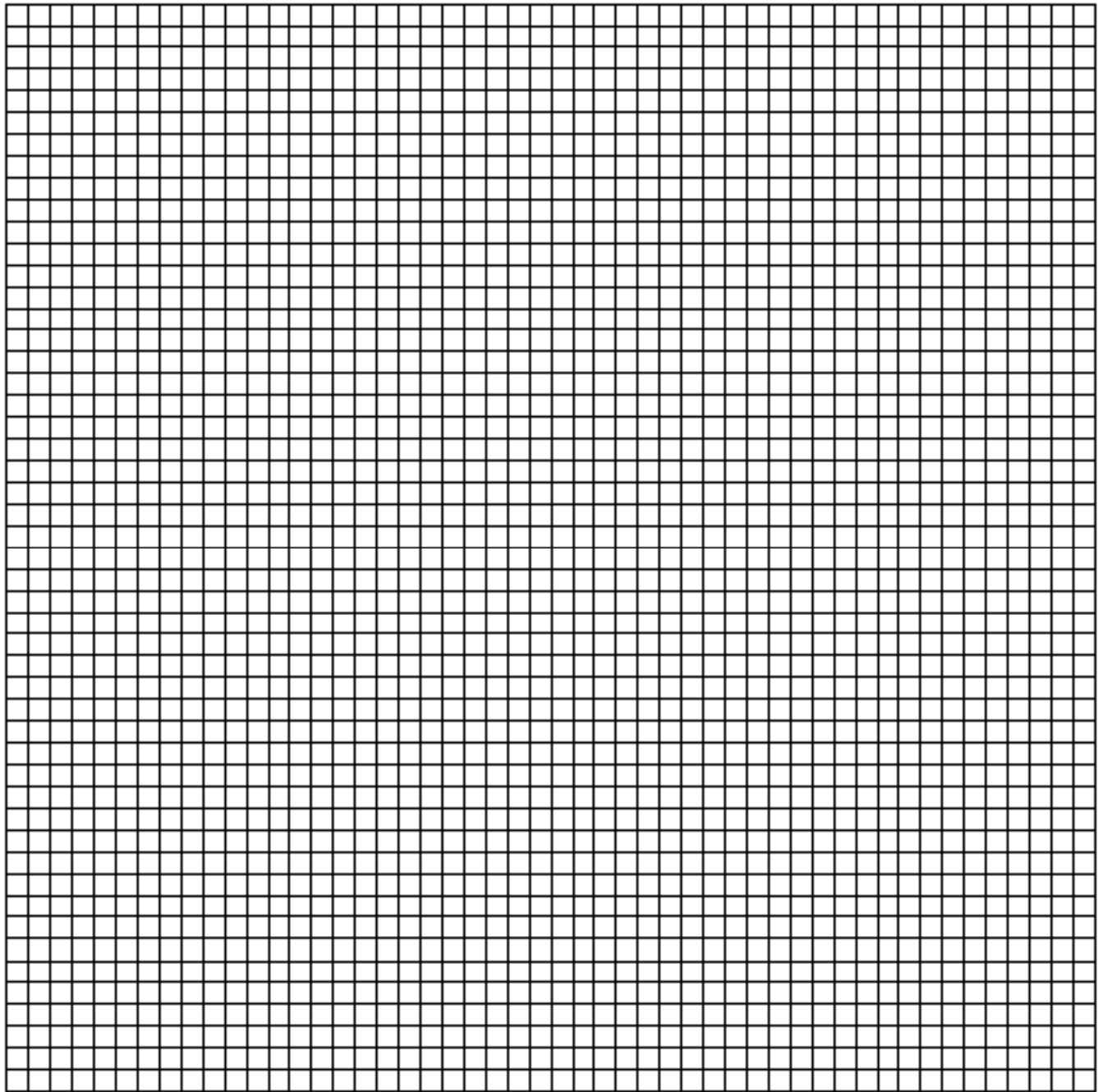
After plotting all of the points for launch angle 35°, construct a best-fit line .

After plotting all of the points for launch angle 45°, construct a second best-fit line .

Question 2. How does the **shape** of the graph in **this activity**, **differ** from the **shape** of the graph in the **previous lab** , "Range versus Launch Angle" ? Be **specific** in **describing each shape**.



Question 3. What would the range be if the speed of the marble was raised to 800 cm/sec for a launch angle of 45° ? Give the estimated range from your graph. (Extrapolation skill)

Title _____



On the y-axis place tic marks every 5 lines going up– (Dependent Variable)

On the x-axis place tic marks every 5 lines going across– (Independent Variable)

Key: 35° 
 45° 

Consult your notes about how to come up with a title

