



The Hobby Shop: Catapult Module

Balloon Blast Graphing

Instructor MASTER

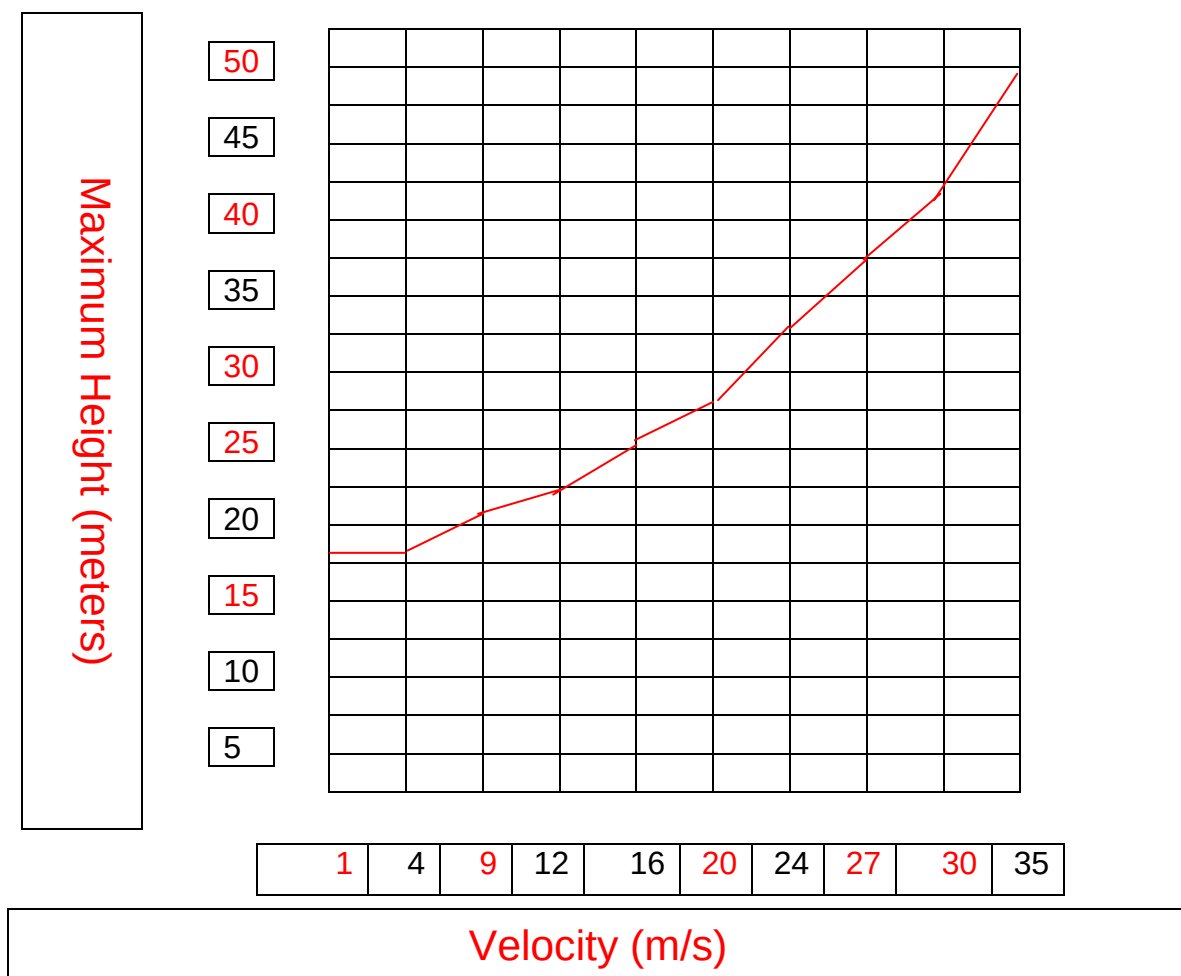
Name _____ Date _____ Period _____

Maximum Height vs. Velocity – PART 1, **Directions:**

1. Go to Hobby Shop and play Balloon Blast. Set your angle to remain at 45 degrees. Change the velocity to the numbers provided in the table below to find the maximum height of each trebuchet launch. Complete the table with your findings.

Angle (degrees)	45	45	45	45	45	45	45	45	45	45
Velocity (meters/second)	1	4	9	12	16	20	24	27	30	35
Range (meters)	1	6	17	25	37	54	72	89	107	141
Max. Height (meters)	16	16	18	20	23	26	31	35	39	47
Time (seconds)	1.95	2.2	2.65	2.95	3.25	3.8	4.25	4.65	5.05	5.7

2. Fill in the missing numbers on the axes in the graph by writing the numbers in the empty boxes. (.5 pt each)
3. Determine what measure goes on each axis, and write the type of measurement and unit in the blanks. (.5 pt each)
4. Plot the points from your set of data and connect the points to make your graph. (6.5 points)
5. Answer the questions about your graph. (5 points each)



Maximum Height vs. Velocity - PART 1, Questions:

1. In this situation, what factor is the variable and which is the constant?
The variable factor is velocity and the constant is the angle.
2. What happens to the balloon's max height as the velocity increases?
The max height increases as the velocity increases.
3. How, if at all, does the velocity of the balloon affect its time-of-flight and/or range?
As the velocity increases or decreases, the time-of-flight and range also increase or decrease accordingly.

Angle vs. Range - PART 1, Directions:

1. Go to Hobby Shop and play Balloon Blast. Set your velocity to a constant of 35 meters per second. Change the angle to the numbers provided in the table below to find the range, maximum height, and flight time of each trebuchet launch. Complete the table with your findings.

Velocity (meters/second)	35	35	35	35	35	35	35
Angle (degrees)	10	15	30	45	60	75	90
Range (meters)	83	96	126	141	117	67	0
Maximum Height (meters)	18	20	32	47	63	74	78
Time (seconds)	2.40	2.85	4.15	5.7	6.7	7.4	7.6

Angle vs. Range - PART 1, Questions:

1. What happens to the range as the angle increases?

As the angle increases, the range increases up to 45 degrees and then begins to decrease as the angle continues to increase.

2. What happens to the maximum height as the angle increases?

The maximum height increases as the angle increases.

3. How, if at all, will the launch angle of a balloon affect its time-of-flight?

As the angle of a balloon increases the time-of-flight also increases accordingly.

4. What happens to the range when the angle is set to 90 degrees? Why?

The balloon doesn't travel horizontally at all, resulting in a range of 0 meters. This is because it is fired straight up into the air.

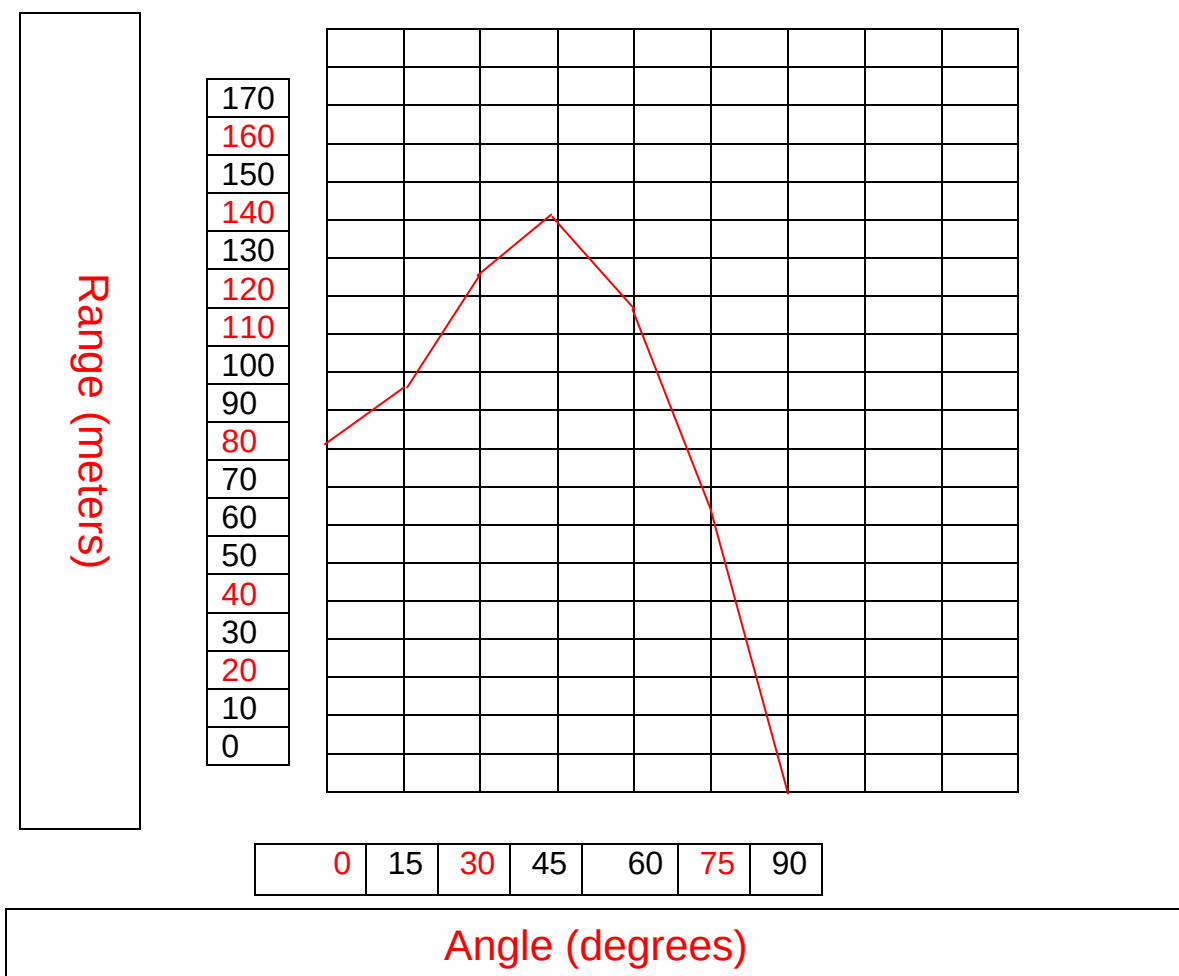
Angle vs. Range - PART 2, Directions:

1. Fill in the missing numbers on the axes in the graph by writing the numbers in the empty boxes. (.5 pt each)

2. Determine what measure goes on each axis, and write the type of measurement and unit in the blanks. (.5 pt each)

3. Plot the points from your set of data and connect the points to make your graph. (6.5 points)

4. Answer the questions about your graph. (5 points each)



Angle vs. Range - PART 2, Questions:

- Of the ones you have plotted on the graph above, what angle causes the balloon to travel the farthest? **The angle of 45 degrees causes the balloon to travel the farthest**
- What force is acting on the vertical velocity of a projectile in flight?
Gravity
- Using the words **angle, velocity, maximum height, gravity, and range**, describe the motion of a balloon fired from the catapult. Use complete sentences.
When a balloon is fired from the catapult, the angle and velocity at which it is fired determine the maximum height and range that the balloon will reach. Because the force of gravity acts upon the vertical velocity, once the balloon reaches its maximum height, the balloon seems to travel in an arc.
- Without any air-resistance and again, not dependent upon angle of the toss, the time for the balloon to go up compared to the time for the balloon to come back down is:
 - dependent upon the angle of launch
 - greater on the way up
 - greater on the way down
 - the same