Names: _____

Candy Catapult Lab

Materials:

candy catapult, stopwatch, meter stick, piece of candy

Overview:

You will use a catapult to launch a piece of candy into the air, and you will collect the distance and time traveled. This data will be used to develop a model for the flight of the candy. Afterwards, the catapult will be moved on top of a desk, and you will use your equation to estimate how far the projectile will travel.

Pre-lab questions:

1. What will the sign of the leading coefficient for the equation of this trajectory be positive or negative? Why? _____

_____

Procedure:

1. Find a buddy.
2. Get a materials basket.

   **Designate one buddy as a "launcher" who will fire the catapult and spot where the candy lands and the other buddy as a "measurer" who will measure the exact distance and time traveled.
3. Place the catapult on the floor.

   **Be careful that it does not change position during trials!
4. Put the piece of candy in the basket.
5. Aim the catapult away from others.
6. Fire!!

   ** Make sure to pull the catapult back the same distance each time so the shots are as consistent as possible!
7. Record the distance and time traveled (from launching to landing) on the table below.
8. Repeat the trial two more times.
9. Average the distance and time traveled (to the nearest tenth).

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trial	Time (to the nearest tenth of a second)	Distance (to the nearest tenth of a centimeter)
1		
2		
3		
average		

Find the vertex.

A. Divide your average time by 2 (to obtain freefall time).
   Round the nearest hundredth of a second.

freefall time _____

The equation for freefall of an object is $d = \frac{1}{2}gt^2$
where ***d*** is the vertical distance traveled and ***g*** is the effect of gravity.

B. Plug in gravity (980 cm/s^2) and the freefall time.
C. Solve for ***d*** (*y*-value of vertex).
   Round the nearest hundredth of a centimeter.

vertical distance (*d*) _____

D. Divide your average distance by 2 (*x*-value of vertex).
   Round the nearest hundredth of a centimeter.

forward distance _____

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Vertex (_____ , _____)

Write the equation

A. Use the vertex and a start point of (0,0) to find the value for ***a.***

Round the nearest thousandth.

vertex form: $y = a(x - h)^2 + k$

$0 = a\,(0 - _____)^2 + _____$

B. Write the final equation for the flight of your candy.

$\boldsymbol{y = _____(x - _____)^2 + _____}$

Translate your equation

A. Measure from the floor to the top of a desk (to the nearest tenth of centimeter).

Height of desk _____

B. Vertically translate your equation by the height of the desk.

$\boldsymbol{y = _____(x - _____)^2 + _____}$

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C. Predict the distance the candy will travel.

Round the nearest hundredth of a centimeter.

0 = _____(x - _____)^2 + _____

D. Place the catapult on the desk and test your hypothesis.

Test your equation

1. Record the distance traveled (from launching to landing) on the table below.

distance traveled _____

Were you correct? _____

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