"Launching Pumpkins"
Activity Sheet

N ________________
D __________ P ___

Learning Goals:

- Describe differences between quadratic and linear functions using real-world applications.
- Solve quadratic functions for a specific variable.

First, **RESET** the Sim by selecting the orange button in the lower-right corner. 

Modify ***ONLY*** the Cannon's ***Height*** and ***Degree*** to launch the Pumpkin onto the ground target.

1) One way to hit the ground target 

, would be to set the Cannon's height at ____ meters and the Cannon's degrees from the ground at ____^{0}.

2) A different setting of the Cannon to hit the ground target is ____ meters and ____ degrees.

3) Find a classmate who has another different Cannon setting than your two that hit the target.

Classmate's Name _______________ Cannon's height = ____ m and ____^{0}.

4) Describe one or two things you noticed about the line of trajectory of the pumpkins shot out of the cannon.

5) Why might it be impossible to have a situation where the pumpkin is shot out of the cannon and follows a linear line of trajectory? Under what circumstances could the line be linear?

6) Describe a situation where the pumpkin will travel the farthest distance.

7) **Describe** what you think the pumpkin's line of trajectory might look like for the following functions. What aspect of their **graphs** make them nonlinear**?** What aspects of their **equations** make them nonlinear**?** $y = -0.05x^2 + 2x + 0$ $y = 0.25x^2 + 3x + 0$

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8) Change the **Cannon's Height to <u>0 meters</u>** for the following three launches of pumpkins.

A) Change the Cannon's Degree to $\mathbf{40^0}$ for the following launch.

a) Complete the input-output table using the 

tool. Make sure to include the ***vertex*** in the table.

x (range in meters)	0			
y (height in meters)				0

b) This 40^0 launch created the function $\mathbf{y = -0.04(x - 10)^2 + 4}$.
Solve the function so that **x** is isolated.

B) Change the Cannon's Degree to $\mathbf{80^0}$ for the following launch.

a) Complete the input-output table. Include the ***vertex*** in the table.

x (range in meters)	0			
y (height in meters)				0

b) This 80^0 launch created the function $\mathbf{y = -0.75(x^2 - 8x)}$.
Solve this function so that **x** is isolated.

C) Change the Cannon's Degree to $\mathbf{70^0}$ for the following launch.

a) Complete the input-output table. Include the ***vertex*** in the table.

x (range in meters)	0			
y (height in meters)				0

b) This 70^0 launch created the function $\mathbf{y = -0.9x(.2x - 3)}$.
Solve this function so that **x** is isolated.