Nerf Launcher Lab Activities   Name _____

Part I: Find the speed with which the dart leaves the launcher

Method 1:

- Launch the dart horizontally from a known height.
- Measure the distance the horizontal distance to where the dart hits the ground

Height: _____

Horizontal Distance: _____

Solve for the initial velocity of the dart: (Use projectile motion equations)

Method 2:

- Open the Vernier Graphical Analysis software
- Connect to the Photogate and launch darts through it to measure the speed.
- Do a few trials and use the fastest recorded speed.

Speed: _____ m/s

Assuming that this measured speed is the actual speed, find the percent error for the value you found with Method 1.

Part II: Find the Spring Constant of your Launcher

Use the dart speed to find the spring constant of the launcher.

Mass of the dart: _____kg

Part III: Predict the max height the dart would reach if fired straight up

Use energy methods to predict the maximum height of the dart based on the measurements you've taken in the first parts. Show your work:
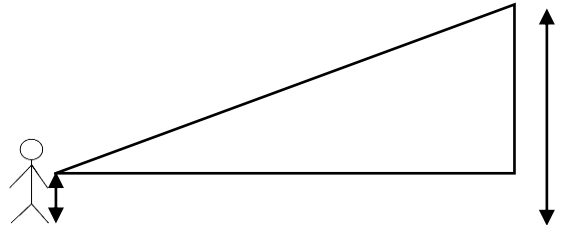
Part IV: Estimate the Actual Height

Go to the courtyard and measure launch the Nerf dart straight up in the air. Measure the angle between the horizontal and your line of sight to the maximum height from a known horizontal distance away from the launch position.   Use your measurements to find the maximum height.

Angle _____

Horizontal Distance _____ m

Initial Height _____ m

Part V: Estimate the average force of air resistance

Solve for the force of air resistance using work and energy, and then using kinematics and dynamics. (Find what the average acceleration was).