Name _____

Marble Launch Lab

Day 1: Find the initial velocity

Purpose: to calculate the initial velocity of a marble launched from a CPO the marble launcher at two different settings.

Procedures:

1) Materials: eye protection, CPO marble launcher, marble, measuring tape.
2) WEAR EYE PROTECTION
3) Set up your marble launcher by attaching it to a stand and setting the angle to 0°.
4) Measure the height of the launcher from the ground to the center of the launching tube.
5) Choose which two settings you will be measuring. The setting closest to the nozzle is considered setting 1. The setting closest to the back is considered setting 5.
6) At each setting launch the marble at least 4 times and measure the horizontal displacement of each trial.

Data:

Height: _____

Setting 1: _____	displacement
Trial 1	
Trial 2	
Trial 3	
Trial 4	
Average displacement	

Setting 2: _____	displacement
Trial 1	
Trial 2	
Trial 3	
Trial 4	
Average displacement	

Calculations:

1) Prove that $v_0 = \dfrac{\Delta x}{\sqrt{\dfrac{2h}{4.9}}}$

2) Find the initial velocity of the marble at each setting.

Results:

The initial velocity at setting _____ is _____.

The initial velocity at setting _____ is _____.

Day 2: Make Predictions

Purpose: To use what we know about projectile motion to predict where the marble is going to land when it is launched at two different angles.

Procedures:

1) Decide what two angles you are going to launch your marble at.
2) Calculate the displacement of the marble at each of the 4 setting combinations. You will have 4 different calculations to make: setting 1-angle 1, setting 1-angle 2, setting 2-angle 1, setting 2-angle 2.
3) Split the initial velocity into it's components using $v_x = v_i \cos\theta$ and $v_y = v_i \sin\theta$
4) Calculate the time it will take to fall in y using $\Delta y = v_y t + \frac{1}{2} a t^2$ and the quadratic equation.
5) Use that time to calculate the displacement in x using $\Delta x = v_x t$

Calculations:

Setting ____, Angle _____ v_i= h= t= Δx=

V_y= V_x=

Setting ____, Angle _____ v_i= h= t= Δx=

V_y= V_x=

Setting ____, Angle _____ v_i= h= t= Δx=

V_y= V_x=

Setting ____, Angle _____ v_i= h= t= Δx=

V_y= V_x=

Results:

Setting ____, Angle _____ will hit the ground _____ from the launch point.

Setting ____, Angle _____ will hit the ground _____ from the launch point.

Setting ____, Angle _____ will hit the ground _____ from the launch point.

Setting ____, Angle _____ will hit the ground _____ from the launch point.

Day 3: Test your Predictions

Purpose: To test our predictions and catch the marbles in small cups

Procedures:

1) Materials: eye protection, CPO marble launcher, marble, measuring tape, small Dixie cup, tape.
2) Set up your marble launcher at setting 1- angle 1
3) Measure the predicted displacement for this arrangement and tape the Dixie cup to the floor where you think the marble will land.
4) Launch your marble 4 times. If after these 4 trials you haven't hit your cup, adjust the cups placement and try again.
5) If you had to move your cup measure its location.

Results:

Setting ____, Angle _____:

Was your prediction accurate?

If not how much did you have to adjust your cup placement?

Setting ____, Angle _____:

Was your prediction accurate?

If not how much did you have to adjust your cup placement?

Setting ____, Angle _____:

Was your prediction accurate?

If not how much did you have to adjust your cup placement?

Setting ____, Angle _____:

Was your prediction accurate?

If not how much did you have to adjust your cup placement?

Conclusion: On a separate sheet of paper write a conclusion for this lab. Be sure to discuss error.