Name: _____ Date:_____
Dr. Croom's Physics Lab 04-6

Projectile Motion Lab [NOTEBOOK LAB]

Purpose
Verify symmetrical and nonsymmetrical projectile motion equations truly explain real world scenarios

Materials

- Computer
- Interface
- photogate
- Projectile launcher
- C-Clamp
- Plum Bob
- Tape Measure
- Vernier Caliper
- Micrometer
- Time of Flight Pads
- Carbon paper
- Projectiles
- Monkey

Set-Up and Calibration
Setup the projectile launcher, time of flight pad, and photogate as shown by your teacher. Make sure to test the photogate and time of flight pad with your hand before you start. If it is not working correctly, please ask for assistance from your teacher. Next you will need to find the initial velocity of the ball coming out of your plunger. To do this, we will use the photogate.

Your teacher will explain to you how many clicks to set your projectile launcher. Us this setting for the rest of the lab unless instructed to change the launch speed. Measure the velocity of the ball 3 times. If there is a range of velocities greater than 0.5 m/s please ask for assistance from your teacher. Record the trials and average of the trials in a data table in your notebook.

$V_{trial\ 1}$=_____ **m/s** $V_{trial\ 2}$=_____ **m/s**

$V_{trial\ 3}$=_____ **m/s** $\overline{vo}$ **= _____ m/s**

Part 1 – Target Practice

The goal of this part of the lab is to accurately predict where your projectile will land on the floor when it is launched *perfectly horizontally*. No cheating by actually firing it!! This will result in loosing points! Fill in the data for this situation below, *with proper units:*

θ = _____

v_{iy} = _____

v_{ix} = _____

Δ y = _____

Now, solve for the time it would take for your projectile to hit the floor.

Now, solve below for the horizontal distance the ball will travel.

Range = _____

When you have a value, let your teacher know that that he will see how accurate you are. **Comment on your results:**

Name: _____ Date:_____
Dr. Croom's Physics Lab 04-6

Part 2 – Hit the Target (Symmetrical Projectile Motion Target Practice)

Now that you have a feeling for your launcher, it is time to shoot at a designated location. Calculate the horizontal and vertical distance to the target. Then aim your launcher and make it hit the target. You know the initial velocity and the distance. Determine the angle to make it hit the target.

You have one shot!

- Write down all givens – measure the horizontal distance between your launcher and Bill.
- **Solve for the angle your launcher has to be at to hit the target.**
- Show work below.
- All groups will shoot at the end – one after the other. You get one shot.

v_o = _____

θ = _____

Δ x = range = _____

Total Time = _____

Part 3 – The Revenge of the Monkey.

The Monkey is back for some more torture. Now, he is hanging from the ceiling. Again, your job is to shoot him.

Record below the position of the monkey.

Δ y = _____

You have one shot!

- Show work below, and solve for the necessary information for your launcher to hit the Monkey.
- All groups will shoot at the end – one after the other. You get one shot.

v_i = _____

θ = _____

v_{ox} = _____

v_{oy} = _____

v_{fy} = _____

t = _____

Δ x = _____

Name: _____ Date:_____
Dr. Croom's Physics Lab 04-6

Questions/Things you need to do individually:

Purpose (5pt)

Include

Data (15pt)

Include the data neatly for each section

Calculations (15pt)

Show calculations for each section

Results (15pt)

Explain your qualitative observations for each experiment. Remember that you should have in each section under 5% between theoretical and experimental results. Some of this error is because of air resistance. Other error is because the angle is not measured precisely. More error could be because the launcher velocity is not constant. For time remember you have 0.2 second of error in your thumb. Being off by 0.05 seconds is an extremely small error. If you have more than 5% error redo the experiment.

Conclusions (5pt)

A normal conclusion.