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Projectile Motion Lab

One of the major uses for the two dimensional motion calculations we have been doing are for artillery (cannons, catapults etc.). It has always been important to aim your weapon right the first time, not take shots and adjust after missing. The shells/cannon balls/rocks are always expensive so you don’t want to waste them, and in battle you only get a few shots, whoever hits first wins. You will be firing your launcher from a known height and must determine where it will land. You will place a cup where it should land and must make it in the cup in **ONE** shot to receive full credit for this lab. If you miss you will continue until you make it in the cup with point deductions each time. Normally artillery weapons fire at an angle upward. This is so you can move the weapon to hit any target instead of moving the target so the weapon will hit it. We will do our experiment firing horizontally to make our calculations a little easier. Although, with a little more practice you would easily be able to do the calculations at an angle as well.

*Instructions for using the launcher*.

Place a metal ball inside the launcher, using the plastic plunger or a pencil push the metal ball until you hear a click. The plunger has three settings (one click, two clicks and three clicks). Make sure nothing is directly in the path of the launcher. Pull the string to launch. Be careful not to hit yourself, especially in the eye.

Determination of the initial velocity of the launcher.

Before you do your calculations you must first calculate the initial velocity of the launcher. You must always use the same setting on your launcher. I would recommend using the first setting (one click).

1. From a lab table or some other flat horizontal surface launch the ball horizontally mark where the ball hits the ground using a post it note. Launch several times to ensure you are getting the same result.
2. Measure the height the launcher is above the ground (y direction). You can use this to determine the time the ball will be in there air.
3. Measure the x displacement the ball travels (how far forward). You can use this and the time previously calculated to determine the initial velocity of the launcher.
4. Show all work for the calculations of the initial velocity of the launcher.

Calculations for initial velocity Launch

Final launch

I will be at the final launch station (it will altering the height of the launcher throughout the lab). I must be present for your launch, there will be NO practice launches from the required height. You must calculate where to place the cup to catch the ball. Again to receive full credit you must catch the ball in ONE launch. You will continue to launch until you catch the ball however you will lose points each time you miss. Make sure to measure from the launcher to the top of the cup, NOT the ground.

You must turn all calculations showing full work for this.