

Goals

1. To experiment with range.
2. To predict the range of a dart gun.

Equipment:

Notebook (draw diagrams directly inside), dart gun, dart, targets, protractor, penny.

In this lab, we will analyze the motion of a projectile. In an attempt to have a consistent initial velocity, we use a firing device (a dart gun). This initial velocity is found experimentally and used to calculate the range of the projectile. For a given range, we calculate the firing angle needed and test this calculation by firing the dart gun.

1. Prepare gun. Since later we will need to know the angle with which we are firing, we must find a way to measure that angle. We use a protractor taped to the side of the gun, with a plumb bob to measure the angle. First, construct a plumb bob attached to the protractor. Cut a piece of fishing line and run it through the hole in the straight part of the protractor. Make a knot to attach it, and be certain it lies straight. Tape a weight (like a penny) to the end of the wire and be certain this plumb bob is measuring the angle correctly as the protractor is tilted. Now, tape the protractor to the gun. If the person to fire the gun is right-handed, tape the protractor to the left side of the gun; for left-handers, tape to the right. Make sure the protractor is lined up with the direction the gun fires and that it does not block the trigger.
2. Find initial velocity. Take the gun outside and fire it straight up. Describe your method of measuring Δy and note your measurement. Be sure to repeat the measurement and take the average. Plug this measurement into the equation derived in the beginning of class to determine the velocity of your gun.
3. Find the firing angle. You now want your projectile to land a certain horizontal distance from where you fire (Δx). At what angle do you fire it?
 - a. Ask your instructor for your value of Δx .
 - b. Using the formula from the previous lab, calculate the firing angle.
 - c. Test your calculation by firing your dart gun at that angle. Place a target at the location you want the projectile to land. Do this several times. How close can you get to the target (don't count the bouncing of the dart)? Why can't you get any closer?