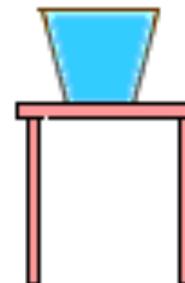


Projectile Motion



A projectile launching device will be provided. The angle of launch will be set to a value that will be specified during the lab session. Protractors, meter sticks, carbon paper, tape, plumb bobs, and levels are also provided. You may ask the instructor for other devices if desired.

Determining the Muzzle Velocity

All groups will be given some time to design an experiment to measure the "muzzle" velocity of the projectile launching device. This is the speed with which the ball leaves the launcher. You should take into consideration the limited space in the laboratory and the accuracy of your method. The simpler the method, the better. Each group will describe their method and there will be a discussion of the pros and cons of each method before we begin.

Whatever method you choose, it is advised that you make numerous measurements, in order to both ascertain the variability in velocity that is inherent in the launcher and to obtain a reliable average value. Keep a complete record of your data and subsequent calculations.

Where to Put the Bucket

A launch angle (roughly between 30 degrees and 50 degrees) will be specified after all groups have completed muzzle velocity measurements. The launcher and a bucket will be placed on the floor and/or tables and pedestals. All groups will have the opportunity to measure all the heights involved.

Using the equations of motion for projectiles, determine the horizontal displacement between the launcher and bucket such that the projectile will land directly in the bucket. Keep complete and clear records of all calculations.

When ready, you will position the launcher and the bucket. You may not make any test trials. Two attempts will be allowed.

The Report

Describe the method used for determining the muzzle velocity and estimate the error in the average value of the muzzle velocity. Completely describe all measurements and calculations you made for determining range for the launch. Include diagrams clearly labeling distances, heights and angles. Determine the error in your calculated range from the error in the muzzle velocity, the error in the angle, and the errors in length and height measurements. Compare the error in the range to the width of the bucket.