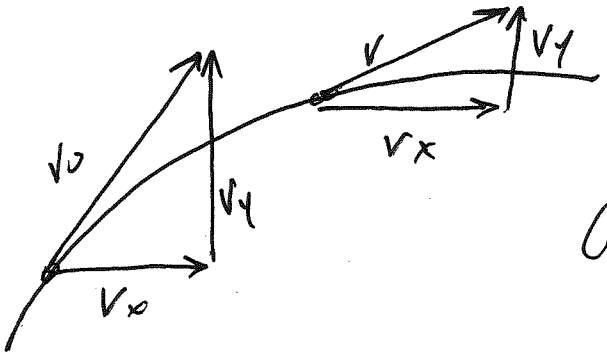
Honors Physics _____ **Instructor: Barton Clark**
Archie Williams High School **names of team members here please** **Fall 2022**

Parabolic trajectories and introduction to vectors.

As described in class, once an object is thrown into the air, the force of gravity only acts on the 'y' component of the velocity vector.



$a_g = \downarrow = \frac{\Delta V_y}{\Delta t}$

In this lab, students will first 'pace off' a known distance (big steps are fine). Then students will throw a tennis ball to a 'receiver', propelling the ball into a classic 'parabolic trajectory'. While this is happening, a third students will use their cell-phone stop watch to 'time' how long the ball is physically 'in the air' and a fourth student will simultaneously video tape 'the throw' itself, to capture the angle of the launch trajectory with respect to the ground.

Distance of throw (meters)_____ total time in the air (sec.)_____

Using this information, perform the following calculations on the back of this sheet (and attached papers if required).

1. Determine the X component of the initial velocity vector (total, horizontal distance divided by total time in the air).
2. Determine what the Y component must be (based on the idea that ½ of the total time in the air was basically 'falling' from the peak height).
3. Use those two components to a) determine the magnitude of the original launch and b) what the 'max height' of the throw must have been, and c) what the launch angle must be.
4. Use the video footage to estimate what the launch angle was (use a protractor from class to measure).
5. Determine the percent error of your determination of launch angle (compared to the measured angle)
6. Determine the 'uncertainty' in your determination of launch angle and determine whether or not the measured angle of launch fell within the uncertainty of the predicted launch angle.