

## Lab: Projectile Motion

In this experiment, you will observe the projectile motion of a ball launched from a spring-loaded cannon. The ball will travel in front of a board with a Cartesian grid, and a camera will take 10 pictures per second as it goes through the air.

From your pictures, you can establish the position (both  $x$ - and  $y$ -position) of the ball in each picture. A couple of pointers;

For the  $y$  position, you might consider measuring the top of the ball, the middle of the ball, or the bottom of the ball. One of these is a bad idea because it is difficult to be precise. Similarly for the  $x$ - position, you could always measure the right side, middle, or left side, but again one of these is not a good choice.

At the bottom of the grid are two finer (1 cm divisions) scales. If you use *Paint*, you can clip and drag these scales to where the ball is in order to make a more precise measurement.

Once you have your position data, it would be nice to see what is happening to each of the  $x$  and  $y$  positions with respect to time. One of these graphs (either the  $x$  or  $y$ ) will tell you everything you need to know about the motion in that direction. For the motion in the other direction, you will want to make another graph, since there is something besides position that is changing, so it would be nice to see how that changes with time.

One final tip: for an object with constant acceleration, the average velocity over a period of time is the same as the instantaneous velocity at the centre of that time interval. If, for example, you were to calculate the velocity from  $t = 0$  to  $t = 0.2$  s, that average velocity is also the velocity it had at the moment  $t = \underline{\hspace{1cm}} \text{ s}$