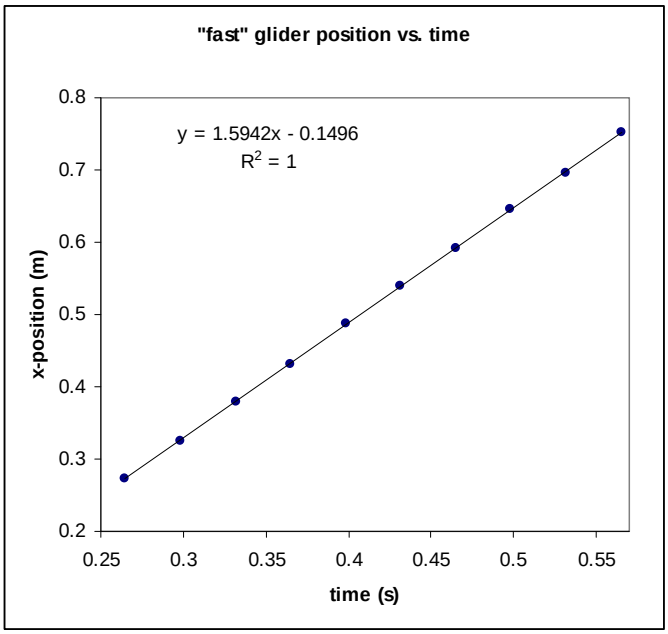
Corresponding Learning Goals for Week 4 Physicists Workshop:

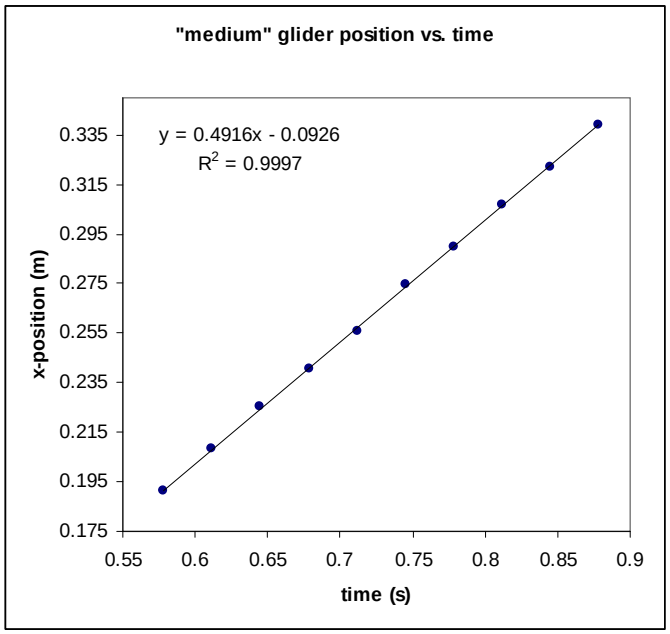
- Use video analysis software and graphing programs to make motion diagrams and position vs. time graphs
- Compare and contrast uniform motion and uniformly accelerated motion

There were lots of ways that students pursued this week's work. I found that a series of graphs with little to no narrative did demonstrate that you could make motion diagrams and/or position vs. time graphs. However, without a narrative, it was difficult to know what you understood the key features of uniform motion and uniformly accelerated motion were, and how it was demonstrated on the graphs you produced.

Gliders demonstrate uniform motion (constant speed motion) in the horizontal direction.

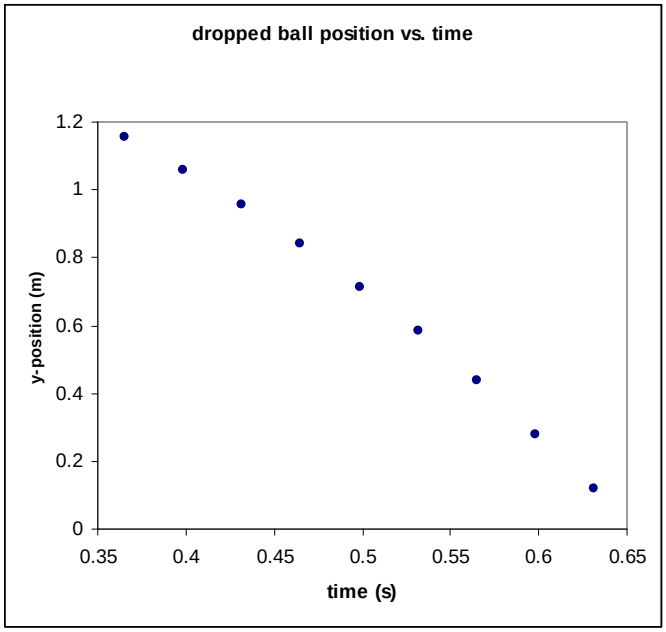
Here, I just provide the position vs. time graphs for the "fast" glider and the "medium" glider. The position is the horizontal position of the glider, which only moves in that direction. Note that the graphs are straight lines, which indicates uniform motion (constant velocity). The fast glider has a slope of about 1.6 m/s and the medium glider has a slope of about 0.5 m/s. The slope of a one-dimensional position vs. time graph allows you to figure out the speed in that direction. The R^2 values so close to 1 indicates that a straight line models the experimental data quite well. We expected constant velocity in this case since it was horizontal motion on a low friction air track.





Dropped ball demonstrated uniformly accelerated motion in the vertical direction.

For the dropped ball, we expect uniformly accelerated motion, assuming air resistance is negligible. The position vs. time graph is shown below. Here, the position is the vertical position.



It is difficult to tell just from the data if it is a straight line or if it is quadratic. We'd expect a straight line if it were uniform motion (constant velocity) and we'd expect a quadratic if it were uniformly accelerated.

The two graphs below show different trend-lines: one is a linear trend-line and the other is a quadratic trend-line. We can make a judgment based both on visual inspection and comparing the R^2 values.

We can see both from visual inspection and the R^2 values that the quadratic fit models the data better than the linear fit. So we can conclude that the dropped ball's motion is consistent with uniformly accelerated motion.