

Laboratory #1  
**Motion in one direction**

This is a very simple experiment. However, as the first experiment in the semester it will give everyone practice both in graphing and also in writing their lab reports.

As a group we use the air track to measure the position of a freely sliding mass as a function of time. Arrange yourselves in smaller groups of three or four to discuss what is going on and to aid in writing the laboratory report.

First we give a glider a slow push and put a marker down at its location every second. Then measure the position at each second (putting the data in a table showing position and time—include units always!). Plot the data as a graph of the position as a function of the time. Put the “position” on the vertical axis and the “time” on the horizontal. And make the graph plenty *big*. Also use a ruler or other straight edge to make straight lines when appropriate. We need to find the slope of this graph.

$$\text{slope} = \Delta d / \Delta t.$$

To find the slope we need to put a straight line as close to the points as possible. The point (0,0) is also a point on this graph and should be treated on an equal basis to the other points - that is, it does not have to go through it but it must go near it. When we take the slope of the graph, we mean take the slope of the line you have drawn. To do this draw a big, right angle triangle, with the long side of the triangle being part of the line. the slope is then the length of the vertical side divided by the horizontal side. Make the triangle big as this minimizes errors.

The average speed of the glider is just this slope. So what is the average speed? Is the speed constant? What is your evidence (look at the graph)?