THE SIMPLE PENDULUM

We will use, in this experiment, perhaps the oldest form of simple harmonic motion known to man: a simple pendulum. The motion of a mass hanging on a string as it swings back and forth about its equilibrium position (string is vertical) is nearly simple harmonic.

Procedure

Since our main interest is understanding of the scientific method, we will only take enough data to sort out what factor(s) effect the period (T) of a pendulum. There are really only four things to measure about a pendulum that could possibly affect the period: the mass m of the pendulum bob, the length L of the string, the thickness of the string and the amplitude A of the motion. Our first job is then to sort out the effects of these four parameters. The best way to attack this problem is to hold three of the parameters fixed while the fourth is varied. In this way, the effect of the fourth parameter can be separated from the other three.
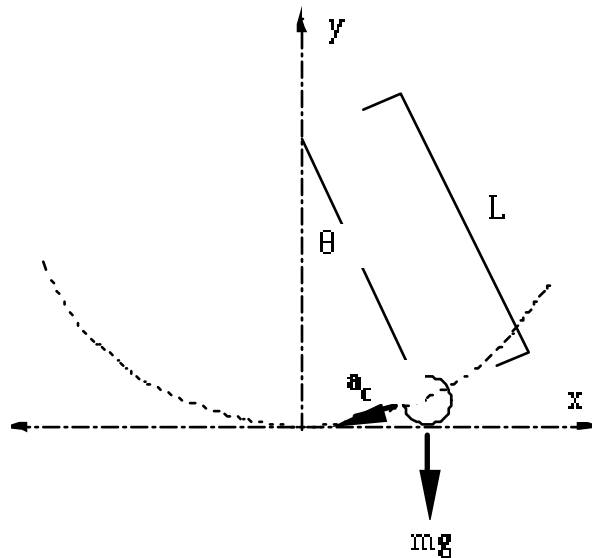

Figure 1.

1) Pick three of the factors that you believe will affect the period of the pendulum. Write an introduction identifying which factors you believe will affect the period of the pendulum. Be specific as to how you think the factor will affect it (as mass increases the period will decrease). Identify which graphical relationship the data will make for each factor. Summarize how you are going to test it.

2) Devise a plan of action to test each of the factors independently. Make sure you **time more than 1 period** to avoid timing errors. Make sure you have more than 3 data points.

3) Build a data chart for each of your experiments. Make sure it is neat.

4) Graph the results of your tests with the single period that you measured as the dependent variable. Add a best fit line/curve for the relationship. If your graph does not appear to be linear, try to find a way to graph the relationship in such a way to achieve a linear relationship. This will help in determining the equation of the period of the pendulum. Use Calc on your netbook to create the graphs. Here is a link to how to do this. Make sure that you calculate the slope for all of your linear graphs.

5) Based on the information on your graphs write a conclusion about what factors affect the period and how each affects it.. Give specific information as to how you came to these conclusions (i.e, include the slopes you found for the graphs to support your conclusion.) Based on your data try to determine the equation for the period of a pendulum.