Experiment 1

The Simple Pendulum and Computer Data Analysis

We will be looking at what effects the period of a pendulum.

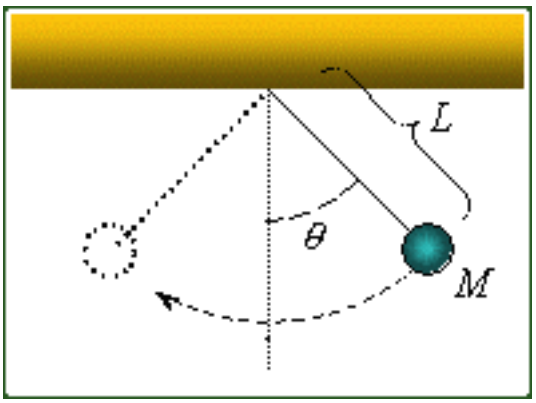

Figure 1. A Simple Pendulum

A simple pendulum is a mass *M* swinging on the end of a string of length *L* whose other end is fixed, as shown in Figure 1. What do we know about the period, T (amount of time to swing back and forth?) of a pendulum? How should it depend on L? M? amplitude (θ_{max})? acceleration of gravity, g?

We would like to explore these parameters and use a pendulum to measure g, the gravitational acceleration in San Luis Obispo. In this process you will also create a graph that nicely demonstrates the relationship between L and T.

Here are some things to remember:
1) Whenever possible, the data you graph should be linear – that is fall on a straight line. Why do we want to do that? What do we do if the relationship *isn't* linear? we find a way to *make* it linear!
2) Axis should be labeled and include units.
3) Should we connect the data points with a line? Why not? What should we do?
4) Use your graph to find the acceleration of gravity.
5) What can you do to increase the precision of your measurement of the period?
6) If you're going to vary something in order to find a relationship, should you vary it a little or a lot? How many data points should you take?

Procedure

1) Devise a procedure to discover and/or verify the relationship between L and T.
2) Figure out how you are going to measure and express your data graphically.
3) On your graph, what is the meaning of the slope and of the y and x intercepts (or what should they be?)
4) Execute your experiment while being very conscious of how accurately you can record your measurements, collect data, and display your data.
5) Calculate g from your experiment.
6) If you have time, conduct an experiment to see the dependence of T on amplitude (θ_{max}).

Questions (Answer clearly and completely).

1. Does your pendulum behave according to your theory / expectations?
2. How did you determine g from your data/graph?
3. How did you minimize your uncertainty in measuring the period?
4. What value do you determine for the acceleration due to gravity? What is the percent difference from the accepted value of 9.8 m/s^2?