Laboratory 2: Period of a Pendulum as a Function of Length

Last week, we saw that while mass and amplitude did not affect the period of a pendulum, longer pendula took more time to complete a cycle.
This week, we will map out the dependence of period on length.

Period is the time for one complete cycle.

A. Our Reference Clock

At the back of the room, we have set up a mass on a spring, and will let its oscillation be our time standard. We will call one complete cycle a **boing (bg)**.

B. Matching a Pendulum

For all pendulum cases today, let m = 100 g and A = 20°.
Adjust the length of your pendulum until you get its period to equal 1.0 bg.

We will ask everyone to share the lengths that they find for a 1.0 bg pendulum, and then we will discuss the results.

C. Pendulum Period as a Function of Length

Now, sequentially set up 6 pendula of different lengths, covering distances from 0.30 m to 1.50 m. Record the time for 10 cycles and find the periods (Period = total time/10).

D. Analyzing the Data, Building an Explanatory Model

We will talk you through the graphical analysis of these data, with an eye toward developing a mathematical model of how the period of a pendulum depends on length.

E. Using the Mode to Predict a New Result

We will advise you on how to make a prediction from that model, and apply it to the very long pendulum that is hanging in the Hegeman stairwell.

We will be working up to this analysis by steps:

- A graph of period *vs.* length for your pendulum,
- Discussion of the curve, an argument to consider a particular power law,
- Re-graphing the data according to that power law,
- Finding the slope of the "best fit line" for the resulting graph,
- Making a prediction for a new pendulum based on your line slope.