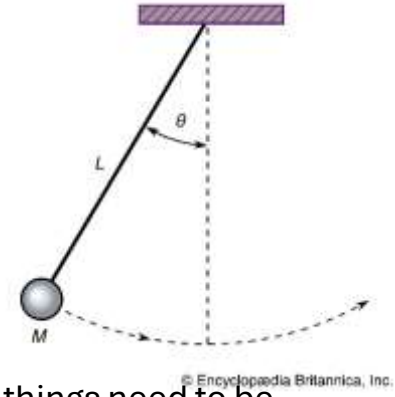
Manual to Lab 2: PHY2048C.

Florida State University – Republic of Panama

Measuring g



About labs in this class

The labs in this class will have general instructions, and many things need to be figured out by the students. I will be answering any specific questions the students may have without completely giving away the key to the puzzle. **Answer the questions and record your measurements in your lab notebook and then submit the notebook at the end of the activity.**

About this lab

In this lab, you measure the gravitational acceleration at sea level, in Panama City. Always report your measured values with error bars. You are provided with the tools required to build the experimental setup. You will also need to use the stopwatch on your phone and the Phyphox app. Describe the setup in your notebook. Perform the following experiments:

Activity 1. Explore the relationship between mass, length and period. When releasing the pendulum, make sure that $\theta < 15°$ always to respect the small angle approximation done in class. When reporting the length *you must measure from the pivot to the center of mass of the weight.*

Question 1. How does the period depend on the mass? How does it depend on the length? Show your data.

Activity 2. Compute g with less than 10 percent error bar.

Activity 3. Compare to the theoretical value of g and compute the fractional discrepancy between your value and the theoretical value. This is given by:

$$\Delta = \frac{Theory - Data}{Theory}$$

Question 2. What sources of measurement and standard deviation error do you detect in this experiment?

Activity 4. Use The app on your phone Phyphox to measure g. For this, you will need to use your phone as the pendulum by constructing a swing for your phone using the provided rope. Open the "pendulum" experiment, go to the g tab, and press play (▶) before you swing your phone. Compare this value to the theoretical value.

Question 3. Does being at sea-level 9° from the equator change the value of g is a way that this experiment can detect? Imagine performing this experiment on Volcan Barú or in the Arctic polar circle, how would that change g?