

## Force-Mass Lab

The purpose of this lab is to determine the relationship between the force exerted and the amount of mass an object has.

**Procedure (Your teacher will demonstrate how to do this):**



1. Plug in the **USB link** and **Force sensor** into your computer.
2. Open "**PASCOCapstone**" from the dock. The icon looks like this ----->
3. Select "Two Large Digits."
4. In the upper left corner click "**Select Measurement**" and then select "**Force (N).**"
5. Connect the the force sensor vertically to a ring stand and press the "**zero**" button on the sensor.
6. Attach the mass to the force sensor
7. Record the force in the data table.
8. Measure the mass of the object using the triple-beam balance.
9. Convert the mass from grams to kilograms.

**Data:**

Object	Mass (g)	Mass(kg)	Force (N)

**Evaluation of Data:**

Graph your data using **Logger Pro** refer to the "**How to Use Logger Pro**" handout to see how to do this. Put "Mass" (kg) on the x-axis and "Force" (N) on the y-axis. Once your graph has been approved, print a copy for each person in your group. Refer to "How to Calculate the Slope of a Line" document and following it's directions calculate the slope of the line on your graph. Show all the work on your graph as is illustrated in the instructions in the "How to Calculate the Slope of a Line" document.

Record the slope you calculated (be sure to include units): \_\_\_\_\_

Record the slope the computer calculated (be sure to include units): \_\_\_\_\_

Record the y-intercept the computer calculated (be sure to include units): \_\_\_\_\_

1. Develop a mathematical model for the relationship between force and mass. Follow the format on the “How to Make a Mathematical Model” worksheet, Step One (i.e. clearly show all 5 steps) . Be sure to include units.

2. Use the 5% Rule to determine if the y-intercept is significant to this relationship. Follow format on the “How to Make a Mathematical Model” worksheet, Step Two. Begin with the equation, then fill in the numbers into the equation, and calculate the answer. Explain why you should include or eliminate the y-intercept.

3. Write out your final mathematical model, after taking into consideration the 5% rule. Box the final mathematical model.

### **Practice Problems**

**Once you have discovered a mathematical relationship between force and mass you can calculate any mass if you know the force or you can calculate any force if you know the mass. Let’s give it a try. . .**

4. Use your Mathematical Model to calculate the amount of force a 75 kg person exerts. Show your work.

5. Your lab partner forgot to measure the mass of an object, but they recorded the amount of force as  $-3.8\text{ N}$ . Use your Mathematical Model to calculate the mass of the object. Show your work.

**Conclusion (Claim, Evidence, Reasoning)**

a. What **claim** can you make involving force and mass now that you have finished the lab?

b. What **evidence** did you gather that supports this **claim**?

c. Use **reasoning** to link the **evidence** to the **claim**.