Laboratory Investigation Name _____

Physical Science@Frisch: Form L1.3A Date _____ Period _____

Interpreting the Y-Intercept

Problem

What is the meaning of the Y-intercept?

Introduction

Many relationships, when they are graphed, pass directly through the origin of the graph at (0,0). For example, an hourly employee who does not work any hours during the pay period does not earn any money. A graph showing earnings versus hours worked would pass through (0,0). Not all relationships pass through (0,0), however. Often, when the X-value of a graph is zero, the Y-value is not. The Y-value of a graph at X equal to zero (0,Y) is known as the Y-intercept. It is the point where the relationship passes through the Y-axis. In this laboratory exercise, you will examine a relationship with a nonzero Y-intercept.

Materials (*per group*)

Balance; graduated cylinder; water

Procedure

1. Using a balance, measure the mass of an empty graduated cylinder. Record the mass in your data table.

2. Put some water into the graduated cylinder. Measure and record the volume of the water. Then, using a balance, measure the mass of the water plus the graduated cylinder. Record the result.

3. Repeat step 2 until you have measured ten different volumes and masses.

4. Calculate the mass of the water for each volume by subtracting the mass of the empty graduated cylinder from the mass of the water plus the graduated cylinder.

5. Prepare a suitable graphing space for two graphs with the proper axes, origin and intervals. Remember, if a graph has a Y-intercept other than zero, it may be best to have an origin other than (0,0), and/or the graph may not pass through the origin.
   (a) On the first graph, plot the points with Volume on the X-axis and Mass of the Water plus the Graduated Cylinder on the Y-axis.
   (b) On the second graph, plot the points with Volume on the X-axis and Mass of the Water on the Y-axis.

6. For each of the two graphs, draw the best straight line through the points. The best straight line will have points scattered above and below it because of random errors of measurement.

7. In each case, find the density of the water by finding the slope (m) of the line. Pick two points on the line. The difference between the Y-values of the points is the change in Y (ΔY). The difference between the X values of the points is the change in X (ΔX). The slope is the change in Y divided by the change in X ($m = \Delta Y/\Delta X$).

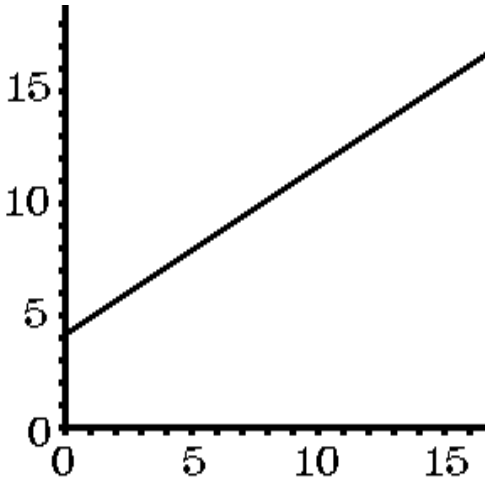

Figure 1. The intercept of this graph is 4, and the line does not pass through the origin.

OBSERVATIONS

Mass of Empty Graduated Cylinder . . . . . _____

Trial Number	Volume	MASS	
		Water plus Graduated Cylinder	Water
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Density of Water (Slope): First Graph _____ Second Graph _____

CONCLUSIONS

1. Why is the slope of the line the density of the water in each case? (*HINT:* Slope is $\Delta Y/\Delta X$. Which variables are on the *Y*-axis and on the *X*-axis?) _____

_____

2. How does the density of water as determined by the slopes of the two graphs compare? _____

_____

3. Does the graduated cylinder effect the density of water? How do you know? _____

_____

4. What is the *Y*-intercept of the first graph? _____

5. Why isn't the *Y*-intercept of the first graph zero? What is the meaning of the *Y*-intercept in the first graph? _____

_____

6. What part of the equation for the line formed by the relationship between the volume and the mass of water is effected by the mass of the graduated cylinder? _____