Lab 3: Representing Data With Graphs

1. Record the mass of a 100 mL graduated cylinder. Place 20 mL of water in the graduated cylinder. Measure the mass of the graduated cylinder with the 20 mL of water you just added and use subtraction to determine the mass of the water. Add another 20 mL of water and repeat the process to fill out the following table.

   Mass of 100 mL graduated cylinder: ______________

Volume of liquid (mL)	Mass of liquid and graduated cylinder (gram)	Mass of liquid (gram)
0		
20		
40		
60		
80		
100		

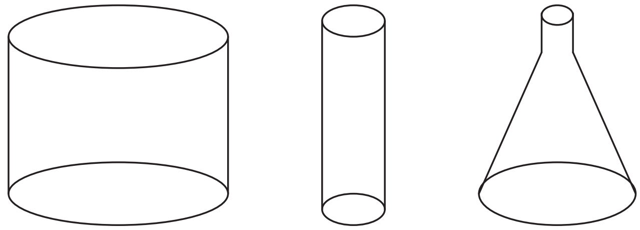
2. Plot your data on the graph paper provided. Be sure to label your axes with the name and units of the variable that it represents, and scale your axes so it takes up about half of the page.

   (a) What are the independent and dependent variables in this experiment? Explain.

   (b) Do your data points follow any particular pattern?

   (c) Your data should look like a straight line. Does it? If not check your measurements and the scales of your axes. What is the slope of your line? Show on your graph how you found the slope.

   (d) What are the units of the slope? What does the slope tell you about water?



3. Consider the three containers shown. Imagine you filled each of them with water in the same way you did above. On a separate sheet of paper, sketch a graph showing the height of the water above the table on the vertical axis and the volume of water in the container on the horizontal axis for each container (use the same graph for all of them). This doesn't need to be perfect, just a rough approximation of what you think it will look like.

   (a) Explain your thinking for each of the graphs.

   (b) How is your sketch for container (a) different from your sketch for container (b)? How is your sketch for container (c) different than the other two?

4. Your group has one of the three types of containers. Add water in 10 mL increments for the graduated cylinders and 25 mL increments for the conical flask (called an Erlenmeyer flask) and measure the height of the water above the table. Record your data in the following table. You won't use all of the rows if you have the smaller graduated cylinder.

Type of container: Select One

Total volume of water in container (mL)	Height of water above table top (cm)
0	

5. Plot the data you obtained on the graph paper provided, scaling your axes to take up the other half of the page you used for your previous graph. Your instructor will have one group for each type of container draw their results on the whiteboard.
   (a) How do these graphs compare to what you predicted? Explain.

   (b) Look closely at the Erlenmeyer flask. Are the volume marks on it equally spaced? (If you did not use the Erlenmeyer flask, find a group that did and ask to examine it.) Explain why you think they are spaced the way they are.

6. On your lab table you should have five cylinders of different sizes. Using these cylinders, *measure* the circumference and diameter of the circular face of each as accurately as you can. The best way to measure the circumference is to wrap a piece of string around the circular part of the cylinder and mark it so that you can unwrap it and use a ruler to measure the length of the string. Record your data in the table below.

Object	Circumference (C) (cm)	Diameter (d) (cm)	Ratio (C/d)

7. Plot your data on the graph paper provided, taking up about half of the page. Use a ruler to draw a smooth line through the middle of your data (we call this a *trendline* or *best fit line*).
   (a) Does it appear from the table that C and d are proportional? How can you tell?

   (b) The "best fit" to your data should be a straight line. Is it? If not, check your measurements and the scales of your axes.

(c) Besides looking like a straight line when graphed, what other property do direct proportions have that distinguish them from other straight lines?

(d) Does your graph of Circumference vs Diameter indicate that they are proportional? Explain.

(e) Find the slope of your best-fit line and use it to write a mathematical equation relating C and d.

(f) Compare the slope you just found to the last column in your table of circumferences and diameters. Are they similar? Do these numbers look like another number commonly associated with circles? If so, which one?

(g) If you take a circle and increase its diameter by 1 centimeter, how much will the circumference increase?