



Marble Experiment

Student Activity

Name _____

Class _____

Camilla's math class was performing an experiment to see if they could come up with a relationship connecting the number of marbles dropped in a clear glass cylinder and the height of the water after each drop.

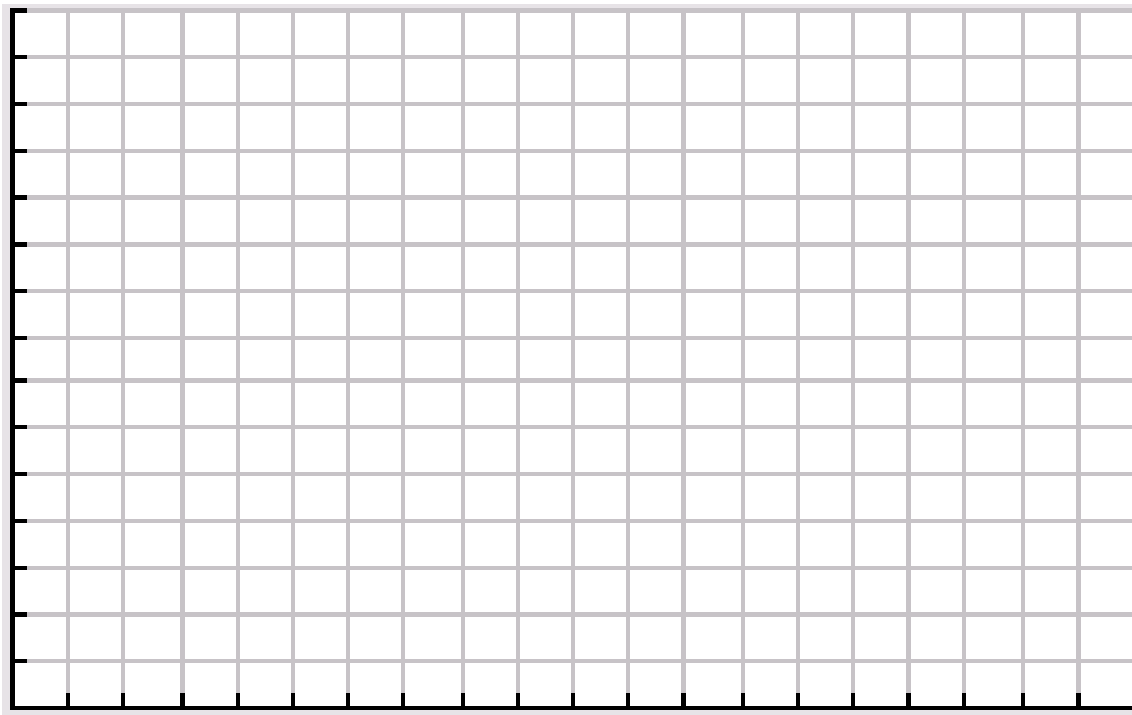
Camilla's group started with a 14-inch tall cylinder filled with 3 inches of water. As one member dropped a marble in, another measured the height of the water, and another recorded it in a table. Their data table is shown to the right.

Answer the following questions based on their data.

1. What kind of mathematical model would best fit the data in this table?

2. Plot the data below. Label the axes and provide the scale. Confirm by plotting the data on your graphing calculator with a similar viewing window. Draw and write an equation that best fits the data. How did you determine this equation?

Number of Marbles	Height of Water (in inches)
0	3
1	$3\frac{5}{8}$
2	4.25
3	5
4	5.5
5	6.25
6	$6\frac{7}{8}$
7	7.5
8	$8\frac{1}{4}$
9	$8\frac{7}{8}$
10	9.5





Tech Tip: To plot the data on your TI-84, first enter the data in L1 and L2 by pressing **[STAT]** **[ENTER]**. Input mixed fractions by pressing **[ALPHA]** **[F1]**. Then press **[2nd]** **[Y=]** for **[STAT PLOT]** and turn on Plot1. Choose the Xlist to be L1 (**[2nd]** **[1]**) and Ylist to be L2. Press **[WINDOW]** and set the domain and range based on the data. Press **[GRAPH]** to see the plotted data.

To use the TI-84 to calculate the line of best fit, select the linear regression by pressing **[STAT]**, move the cursor to the **CALC** menu, and select **LinReg(ax+b)**. Again, enter L1 as the Xlist and L2 as the Ylist. Store the regression equation in **Y1** using **[ALPHA]** **[F4]**. Press **[ENTER]** to calculate. Then press **[GRAPH]** to see the regression line graphed.

3. If an eleventh marble is placed in the cylinder and the water's height is measured, use your equation to predict the height of the water.
4. How many marbles can be dropped into the cylinder so that the cylinder is as full as possible without overflowing?
5. From the line of best fit equation explain what the rate of change is and what it means in the context of this experiment. Be sure to use correct units in your description.
6. What is the y-intercept of the graph and what does it represent?
7. If the initial water level were 5 inches, how would the graph be different? In what ways would the graph be the same?