

The Water Drinking Experiment

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This lab has been adapted from the March 2000 issue of "The Mathematics Teacher".

Self evaluation: (to be completed at the end of the experiment)

How, if at all, this helped in your understanding of working with slope?

Yes because it broke down the equation into each step to see how the equation comes together.

The Water Drinking Experiment

As you drink water from a glass, the height of the water remaining in the glass decreases. This lab is to try and determine a mathematical model that relates the height of the water removed from the glass as you drink.

Choose a member from your group of three persons to be the "sipper". Each "sipper" will drink from a glass of water using a straw until the glass is empty. Another person from the group records the number of sips and the third person of the group measures the height of the water remaining in the glass. You will use a ruler for the measurements. It is important that the glass remains level during the experiment. The "sipper" must try to be consistent in sipping from the glass.

Fill the glass with water. Determine what the independent variable and dependent variable are for the problem. Record the height of the water. How many sips have occurred so far? Now have the sipper remove some water from the glass. How many sips have occurred so far? Record the new height. Repeat the process until the glass is empty. Plot your data on graph paper.

Fill in the data collection sheet for your group in order to help you determine the equation that the data models. Each group should work through the worksheet. One copy from your group will be handed in.

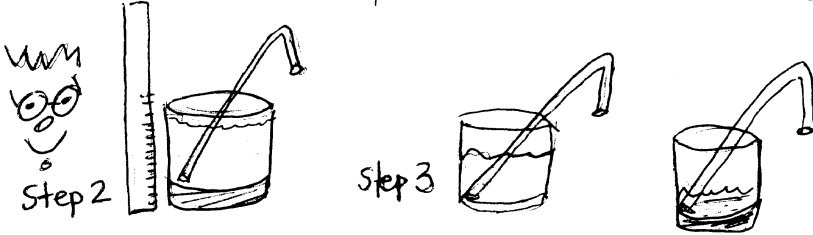
PART I

DATA COLLECTION

Describe the procedure for the experiment. You may wish to include a diagram of the experiment.

STEPS:

1. Fill cup with H_2O
2. Measure level of H_2O before sipping
3. After each sip, measure the level of H_2O , record



Identify the independent variable number of sips Units 0 Sips

Identify the dependent variable level of water Units CM

Perform the lab as indicated on the introductory sheet and record your data.

DATA:

Independent variable	Dependent variable	
0	7.1	C
1	7.3	D
2	7.0	A
3	6.1	E
4	5.8	F
5	5.3	B
6	4.7	G
7	3.9	H
8	3.4	I
9	2.5	J
10	2.2 (base of cup)	K

PART II

DETERMINING THE MODEL FOR THE DATA

Graph the data on graph paper. Draw the "best fit" line. Identify two points on this line.

- Points: (2, 7.0) and (5, 5.3)

Use these points to write the equation of the line that you identified. Show your calculations and identify the slope and y intercept.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{5.3 - 7}{5 - 2}$$

$$m = \frac{-1.7}{3} \quad m = -.57$$

- FOUND SLOPE -

$$y = mx + b$$

$$8.13 = b$$

$$7 = -.57(2) + b$$

$$7 = -1.13 + b$$
$$1.13 + 1.13$$

- Equation: $y = -.57x + 8.13$
- Slope: $-.57$
- Intercept: 8.13

Rewrite the equation using the names of the variables rather than using the letters x and y.

- Equation: level of water = $-.57(\text{\# of sips}) + 8.13$

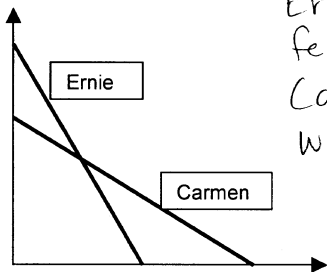
PART III

DATA INTERPRETATION

Use your equation to answer each question. Show your work as necessary.

- Equation that models your data: level of $H_2O = -.57(\# \text{ of sips}) + 8.13$

- How high was the liquid after 3 sips? 6.42 cm
- How many sips were needed to bring the level of the liquid to 6 cm? 3.74 sips
- How many sips were needed to lower the level of the water by 4 cm? 7.77 sips
- Using the graphs of Ernie and Carmen, describe the conditions of their experiment.



Ernie started with a higher level of water and took fewer sips to empty the glass. Carmen started with a lower level of water and took more sips to empty the glass.

- If Vin's equation was $y = -3.1x + 11$ and Carol's equation was $y = -9x + 14$:

- Who took larger sips? ~~Vin~~

- Justify your answer.

When Vin took a sip the level of water reduced by 3.1, when Carol took a sip the level of water reduced by .9. Vin's sips were larger.

- If identical glasses were used, which person had more water to drink?

Carol

GROUP
H2O
H2

$$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1}$$

