

Stacking Cups

Student Materials

1. Get a stack of Styrofoam cups.
 - a. Find the height of 1 cup. Find the height of a stack of 2 cups. Find the height of a stack of 3, 4, and 5 cups. Make a table of values of the number of cups versus the height of the stack. Using your table, plot points on a graph where the x -coordinate is the number of cups and the y -coordinate is the height of the stack.
 - b. Develop an equation for the height of x cups using your work from part a.
 - c. What is the slope of this line and what is its physical significance?
 - d. What height does the formula give when there are zero cups? What is the physical significance of the vertical intercept?
 - e. Determine whether a stack of 100 cups will fit under the table you are working on. Write a few sentences describing how you determined this.
 - f. Determine the maximum number of cups that can be put in a stack under your table. Write a few sentences describing how you determined this.
 - g. If you have 10 stacks of cups, each stack about 3 feet long, about how many cups do you have?



Homework to follow Stacking Cups

1. Find an equation for the length, y , of x grocery carts at a local grocery store. Write a paragraph telling everything you did to get information needed for writing this equation. (If going to the grocery store is inconvenient for you, then find an equation for the height of a stack of stackable chairs. In your paragraph, include information about where the chairs are whose equation you developed.)

2. When this material was being written, one of the authors was in the Netherlands. At that time, the exchange rate between Dutch guilders and the US dollar was 1.6 guilders per dollar.
 - a. How many guilders could this author get for 100 dollars in traveler checks? \$200? \$300?

 - b. Let g represent the number of guilders the author could get for d dollars. Is the relationship between g and d a linear relationship? How do you know?

 - c. Write a relationship for guilders g in terms of dollars d . What is the slope and how does it relate to the problem?

 - d. Write an equation for dollars d in terms of guilders g . What did the slope of this line tell the author about the value of his guilders? Use this equation to determine how many dollars the author received when he returned to the United States and exchanged 500 guilders for dollars.

3. When the author was planning his trip to the Netherlands, he had to wire money, both to his European bank account and to a landlord for rent on his apartment. The cost of the wire was \$25, with the remaining money being converted to guilders at the rate of 1.6 guilders per dollar.
- a. How many guilders could the author send for \$100? \$101? \$102?
 - b. How many more guilders can be sent for each additional dollar that is added to the wire?
 - c. Write a formula for the number of guilders that could be wired in terms of the number of dollars.
 - d. What is the slope of this equation and what does the slope mean?
 - e. For what dollar values does this formula make sense?
 - f. The author needed to wire 2500 guilders to his landlord. How many dollars will this cost?
 - g. Write a formula for the number of dollars it will cost to wire some number of guilders.
 - h. Graph the lines found in problem 2c. and 3c. on the same coordinate plane. What is the relationship between the graphs of the two lines and why does this relationship occur?

4. You have a car that averages 25 miles per gallon of gas. The gas tank holds 15 gallons of gas.
- Make a table of the number of miles you can drive on 1, 2, \dots , 5 gallons of gas.
 - Develop an equation for the number of miles m you can drive on g gallons of gas. What is the slope of this line and what is its physical significance? What numbers does it make sense to use for the number of gallons g in your formula?
 - Develop an equation for the number of gallons of gas that are used to go m miles. What is the slope of this equation and what is its physical significance? What numbers does it make sense to use for the number of miles?
 - Develop a function for the amount of gasoline left in your car if the tank was full when you started to drive and you have gone m miles. What is the slope of this equation and what is its physical significance? What numbers does it make sense to use for the number of miles you have gone?