1.1.2 How can I use my graphing calculator?

Using a Graphing Calculator to Explore a Function

In Algebra 1 you learned that multiple representations such as situations, tables, graphs, and equations and their interconnections are useful for learning about functions. A graphing calculator can be a very useful tool for generating different representations quickly. Today, you will use this tool to explore a function. You will describe your function completely to the class.

1-10. Your team will use graphing calculators to learn about one of the following functions.

i. $y = 2\sqrt{9-x} - 4$

ii. $y = \sqrt{100-x^2}$

iii. $y = 3\sqrt{x+4} - 6$

iv. $y = 3\sqrt{4-x} - 3$

v. $y = -2\sqrt{25-x^2} + 8$

vi. $y = -3\sqrt{x+9} + 4$

vii. $y = 2\sqrt{25-x^2} - 1$

viii. $y = \sqrt{4-x} - 1$

Your Task: Describe your team's function in as much detail as possible. Use your graphing calculator to help you generate a table and a complete graph of your function. Remember that drawing a complete graph means:

- Use graph paper.
- Scale your axes appropriately.
- Label key points.
- Plot points accurately.

As you work, keep your graphing calculators in the middle of your workspace, so that you can compare your

screens and all team members can see and discuss your results. Be sure to record what you learn as you explore your function. As a team, you will be preparing a report about your function for the class. Consider the "Discussion Points" below as you work.

Discussion Points

What are the key points on the graph? Where are they exactly?

Can we identify at least five integer inputs that give integer values as outputs?

Are there values of x or y that do not make sense?

How high or low does the graph go?

Did the graphing calculator show an accurate graph?

How can we be sure the graph is complete?

1-11. When your team has completed a table and drawn a complete graph, prepare a report for the whole class.

The class will get most out of your presentation if you focus on what was particularly interesting about your function or what you learned. Rather than saying, "*We plugged in a 2 and got a 5,*"consider using statements such as, *"We decided to try an input of 2 because we wanted to know what happened to the left of* $x = 3$*."*

The following sentence starters can help you make a meaningful and interesting presentation.

"At first we were confused by..."

"This makes sense because..."

"We weren't sure about..., so we tried..."

"Something interesting that we noticed about our graph is..."

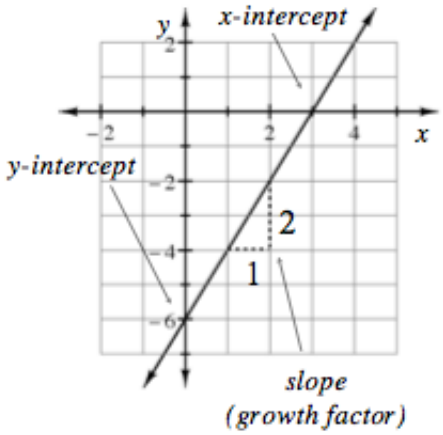
As you prepare your presentation, your teacher will provide you with an overhead transparency or poster paper. Reread the task statement of problem 1-10 (labeled "Your task") and be sure to include all relevant information and ideas in your presentation.

METHODS AND MEANINGS

MATH NOTES

Linear Equations

A **linear equation** is an equation that forms a line when it is graphed. This type of equation may be written in several different forms. Although these forms look different, they are equivalent; that is, their graphs are all the same line.



Standard Form: An equation in $ax + by = c$ form, such as $-6x + 3y = -18$.

Slope-Intercept Form: An equation in $y = mx + b$ form, such as $y = 2x - 6$.

You can find the **slope** (also known as the **growth factor**) and the ***y*-intercept** of a line in $y = mx + b$ form quickly. For the equation $y = 2x - 6$, the slope is 2, while the y −intercept is $(0, -6)$.

$y = 2x - 6$ ← *y-intercept*

slope

1-12. Junior is saving money in his piggy bank. He starts with 10 cents and adds two pennies each day. Create an $x \rightarrow y$ table and a graph for the function for which x represents the number of days since Junior started saving money and y represents the total money he has saved. Help (Html5) ⇔ Help (Java)

1-13. Use the Zero Product Property and factoring, when necessary, to solve for x. The Math Notes box for Lesson 1.1.4 may be useful, if you need help. Help (Htm5) ⇔ Help (Java)

a. $(x + 13)(x - 7) = 0$

b. $(2x + 3)(3x - 7) = 0$

c. $x(x - 3) = 0$

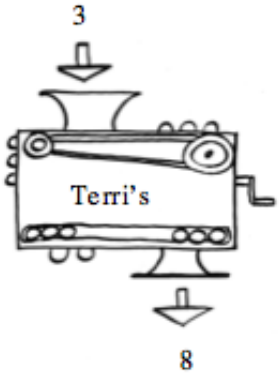
d. $x^2 - 5x = 0$

e. $x^2 - 2x - 35 = 0$

f. $3x^2 + 14x - 5 = 0$

1-14. Terri's project for the Math Fair was a magnificent black box that she called a function machine. If you put 3 into her machine, the output would be 8. If you put in 10, the output would be 29; and if you put in 20, it

would be 59. Help (Html5)⇔Hep (Java)



a. What would her machine do to the input 5? What about −1? What about x? Making an input → output table may help.

b. Write an equation for Terri's machine.

1-15. Nafeesa graphed a line with a slope of 5 and a y −intercept of (0, −2). Help (Html5)⇔Help (Java)

a. Find an equation for her line.

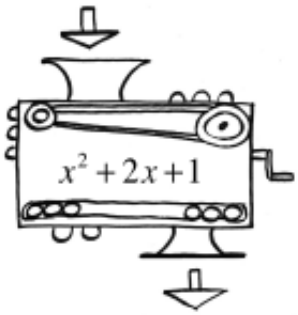
b. Find the value of x when $y = 0$.

1-16. In each of the following equations, what is y when $x = 2$? When $x = 0$? Where would the graph of each equation cross the y−axis? Help (Html5)⇔Help (Java)

a. $y = 3x + 15$

b. $y = 3 - 3x$

1-17. Carmichael made a function machine. The inner workings of the machine are visible in the diagram below. What will the output be in each of the following cases? Help (Html5)⇔Help (Java)



a. If 3 is dropped in?

b. If − 4 is dropped in?

c. If −22.872 is dropped in?

1-18. Does the temperature outside depend on the time of day, or does the time of day depend on the temperature outside? This may seem like a silly question, but to sketch a graph that represents this relationship, you first need to decide which axis will represent which quantity. Help (Html5)⇔Help (Java)

a. When you graph an equation such as $y = 3x - 5$, which variable (the x or the y)*depends* on the other? Which is not dependent? (That is, which is*in*dependent?) Explain.

b. Which variable is *dependent*: temperature or time of day? Which variable is*independent*?

c. Sketch a graph (with appropriately named axes) that shows the relationship between temperature outside

and time of day.

1-19. Jill needs to cut a piece off of a 30-foot length of lumber. Create multiple representations ($x \rightarrow y$ table, graph, and equation) for the function with x -values that are the length of the piece Jill cuts off and y -values that are the length of the piece that is left over. Which representation best portrays the situation? Why? Explain. Help (Html5)⇔Help (Java)

1-20. Make a table and graph the function $f(x) = \frac{1}{2}x^2$. Describe all of the possible input and output values. Help (Html5)⇔Help (Java)

1-21. Given $f(x) = -\frac{2}{3}x + 3$ and $g(x) = 2x^2 - 5$, complete parts (a) through (f) below. Help (Html5)⇔Help (Java)

a. Calculate $f(3)$.

b. Solve $f(x) = -5$.

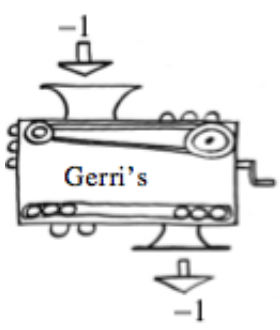
c. Calculate $g(-3)$.

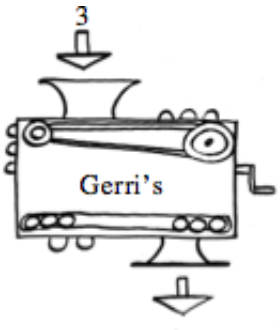
d. Solve $g(x) = -7$.

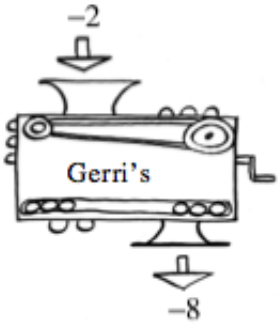
e. Solve $g(x) = 8$.

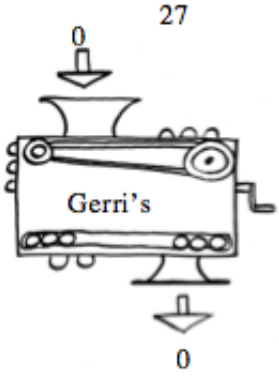
f. Solve $g(x) = 9$.

1-22. Gerri made a function machine. Below are four pictures of her machine. (Note that these are all pictures of the same function machine.) Find the rule for Gerri's function machine. Help (Html5)⇔Help (Java)





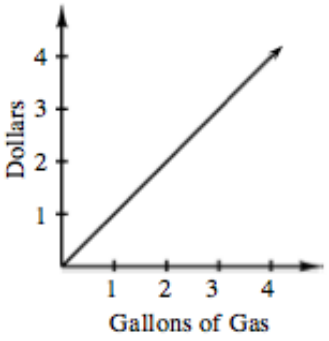




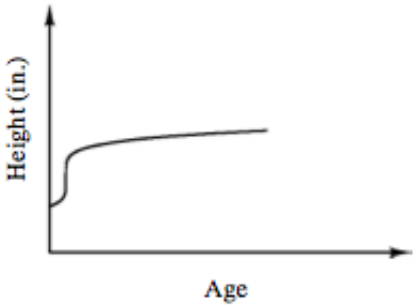
1-23. Examine each graph below. Based on the shape of the graph and the labels of the axes, write a sentence to

describe the relationship that each graph represents. Then state which axis represents the independent variable and which one represents the dependent variable. Help (Html5)⇔Help (Java)

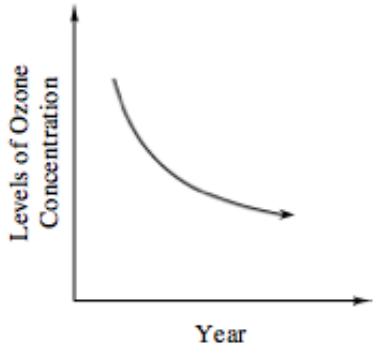
a.



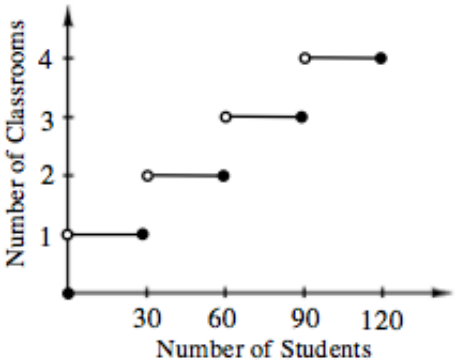
b.



c.

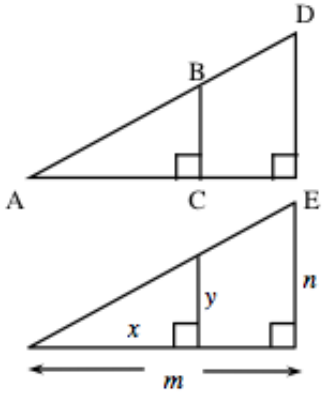


d.



e. What are all of the possible inputs of the graph in part (d)? What are all of the possible outputs?

1-24. Consider triangles ABC and ADE at right. Give a convincing argument why $\Delta ABC \sim \Delta ADE$. Then use what you know about similar triangles to complete each of the following ratios for the triangles. Help (Html5)⇔Help (Java)



a. $\frac{y}{x} = \frac{?}{?}$

b. $\frac{n}{y} = \frac{?}{?}$

1-25. Note: The stoplight icon to the right of a problem indicates that there is an error in the problem.

Find the error in the solution below. Explain what the error is and solve the equation correctly. Show how to check your solution to be sure that it is correct. Help (Html5)⇔Help (Java)

$3(x - 2) - 2(x + 7) = 2x + 17$
$3x - 6 - 2x + 14 = 2x + 17$
$x + 8 = 2x + 17$
$-9 = x$