

## 2.6 Form Follows Function

### *A Practice Understanding Task*

In our work so far, we have worked with linear and exponential equations in many forms. Some of the forms of equations and their names are:



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Linear Functions	
Equation	Name
$y = \frac{1}{2}x + 1$	Slope Intercept Form $y = mx + b$ , where $m$ is the slope and $b$ is the $y$ -intercept
$y = \frac{1}{2}(x - 4) + 3$	Point Slope Form $y = m(x - x_1) + y_1$ , where $m$ is the slope and $(x_1, y_1)$ the coordinates of a point on the line
$f(0) = 1, f(n) = f(n - 1) + \frac{1}{2}$	Recursion Formula $f(n) = f(n - 1) + D$ , Given an initial value $f(a)$ $D$ = constant difference in consecutive terms (used only for discrete functions)

Exponential Functions	
Equation	Name
$y = 10(3)^x$	Explicit Form $y = a(b)^x$
$f(0) = 10, f(n + 1) = 3f(n)$	Recursion Formula $f(n + 1) = Rf(n)$ Given an initial value $f(a)$ $R$ = constant ratio between consecutive terms (used only for discrete functions)

Knowing a number of different forms for writing and graphing equations is like having a mathematical toolbox. You can select the tool you need for the job, or in this case, the form of the equation that makes the job easier. Any master builder will tell you that the more tools you have the better. In this task, we'll work with our mathematical tools to be sure that we know how to use them all efficiently. As you model the situations in the following problems, think about the important information in the problem and the conclusions that can be drawn from it. Is the function linear or exponential? Does the problem give you the slope, a point, a ratio, a y-intercept? Is the function discrete or continuous? This information helps you to identify the best tools and get to work!

1. In his job selling vacuums, Joe makes \$500 each month plus \$20 for each vacuum he sells. Write the equation that describes Joe's monthly income  $I$  as a function of the  $n$ , the number of vacuums sold.

Name the form of the equation you wrote and why you chose to use that form.

This function is:    linear                    exponential                    neither                    (choose one)

This function is:    continuous                    discrete                    neither                    (choose one)

2. Write the equation of the line with a slope of -1 through the point  $(-2, 5)$

Name the form of the equation you wrote and why you chose to use that form.

This function is:    linear                    exponential                    neither                    (choose one)

This function is:    continuous                    discrete                    neither                    (choose one)

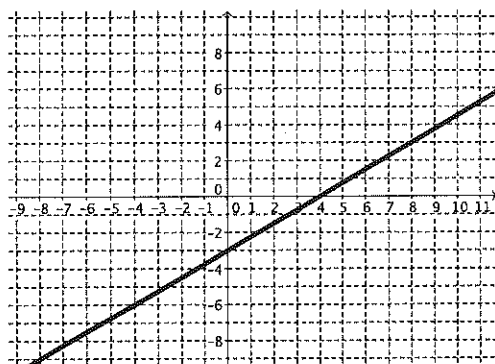
3. Write the equation of the geometric sequence with a constant ratio of 5 and a first term of -3.

Name the form of the equation you wrote and why you chose to use that form.

This function is:      linear              exponential              neither              (choose one)

This function is:      continuous      discrete              neither              (choose one)

3. Write the equation of the function graphed below:



Name the form of the equation you wrote and why you chose to use that form.

This function is:      linear              exponential              neither              (choose one)

This function is:      continuous      discrete              neither              (choose one)

4. The population of the resort town of Java Hot Springs in 2003 was estimated to be 35,000 people with an annual rate of increase of about 2.4%. Write the equation that models the number of people in Java Hot Springs, with  $t$  = the number of years from 2003?

Name the form of the equation you wrote and why you chose to use that form.

This function is:      linear              exponential              neither              (choose one)

This function is:      continuous      discrete              neither              (choose one)

5. Yessica's science fair project involved growing some seeds to see what fertilizer made the seeds grow fastest. One idea she had was to use an energy drink to fertilize the plant. (She thought that if they make people perky, they might have the same effect on plants.) This is the data that shows the growth of the seed each week of the project.

Week	1	2	3	4	5
Height (cm)	1.7	2.9	4.1	5.3	6.5

Write the equation that models the growth of the plant over time.

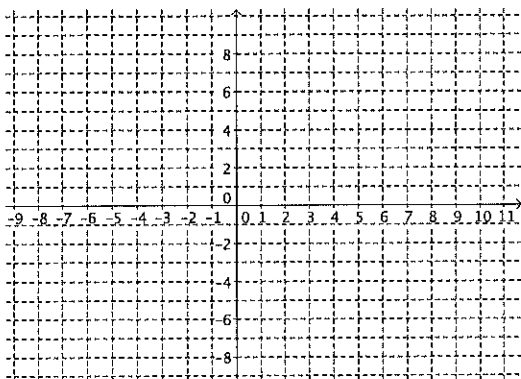
Name the form of the equation you wrote and why you chose to use that form.

This function is:      linear              exponential              neither              (choose one)

This function is:      continuous      discrete              neither              (choose one)

An equation gives us information that we can use to graph the function. Pick out the important information given in each of the following equations and use the information to graph the function.

6.  $y = \frac{1}{2}x - 5$

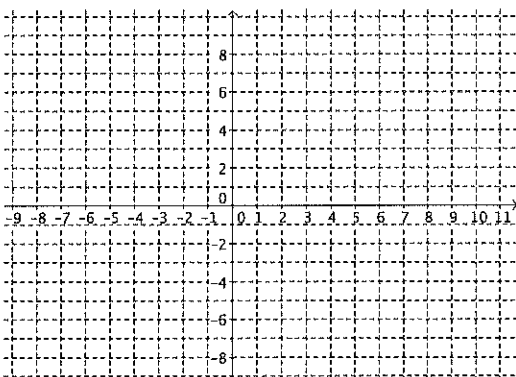


What do you know from the equation that helps you to graph the function?

## SECONDARY MATH 1 // MODULE 2

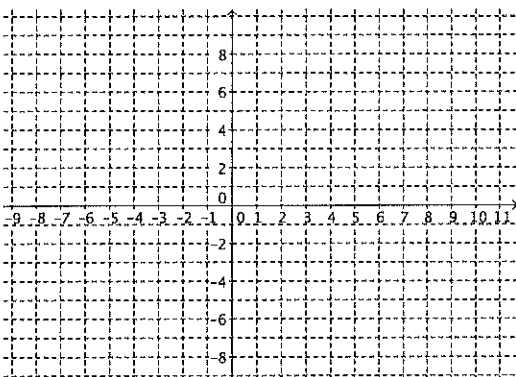
## LINEAR &amp; EXPONENTIAL FUNCTIONS - 2.6

7.  $y = 2^n$



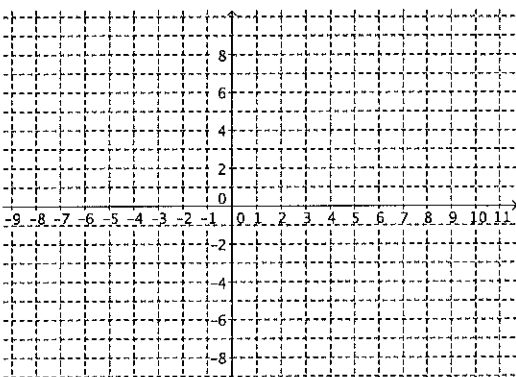
What do you know from the equation that helps you to graph the function?

8.  $y = -2(x + 6) + 8$



What do you know from the equation that helps you to graph the function?

9.  $f(1) = -5, f(n) = f(n - 1) + 1$



What do you know from the equation that helps you to graph the function?

**READY, SET, GO!**

Name \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_

**READY**

Topic: Comparing linear and exponential models.

**Comparing different characteristics of each type of function by filling in the cells of each table as completely as possible.**

	$y = 4 + 3x$	$y = 4(3^x)$																																												
1. Type of growth																																														
2. What kind of sequence corresponds to each model?																																														
3. Make a table of values	<table border="1" style="margin: auto;"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	x	y																					<table border="1" style="margin: auto;"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	x	y																				
x	y																																													
x	y																																													
4. Find the rate of change																																														
5. Graph each equation. Compare the graphs. What is the same? What is different?																																														
6. Find the y-intercept for each function.																																														

7. Find the y-intercepts for the following equations

a)  $y = 3x$

b)  $y = 3^x$

8. Explain how you can find the y-intercept of a linear equation and how that is different from finding the y-intercept of a geometric equation.

### SET

Topic: Efficiency with different forms of linear and exponential functions.

**For each exercise or problem below use the given information to determine which of the forms would be the most efficient to use for what is needed. (See task 2.6, Linear: slope-intercept, point-slope form, recursive, Exponential: explicit and recursive forms)**

9. Jasmine has been working to save money and wants to have an equation to model the amount of money in her bank account. She has been depositing \$175 a month consistently, she doesn't remember how much money she deposited initially, however on her last statement she saw that her account has been open for 10 months and currently has \$2475 in it. Create an equation for Jasmine.

**Which equation form do you chose?**

**Write the equation.**

10.

The table below shows the number of rectangles created every time there is a fold made through the center of a paper. Use this table for each question.

Folds	Rectangles
1	2
2	4
3	8
4	16

A. Find the number of rectangles created with 5 folds.

**Which equation form do you chose?      Write the equation.**

B. Find the number of rectangles created with 14 folds.

**Which equation form do you chose?      Write the equation.**

11. Using a new app that I just downloaded I want to cut back on my calorie intake so that I can lose weight. I currently weigh 90 kilograms, my plan is to lose 1.2 kilograms a week until I reach my goal. How can I make an equation to model my weight loss for the next several weeks.

**Which equation form do you chose?**

**Write the equation.**

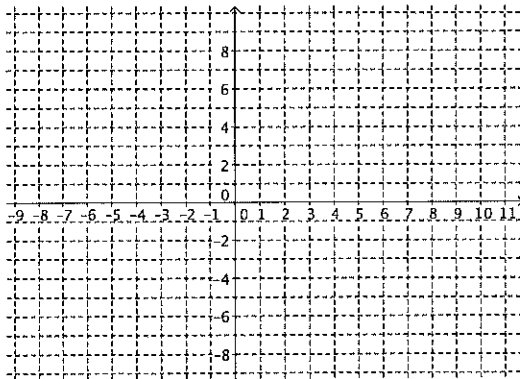
12. Since Scott started doing his work out plan Janet has been inspired to set her self a goal to do more exercise and walk a little more each day. She has decided to walk 10 meters more every day. On the day 20 she walked 800 meters. How many meters will she walk on day 21? On day 60?

**Which equation form do you chose?**

**Write the equation.**

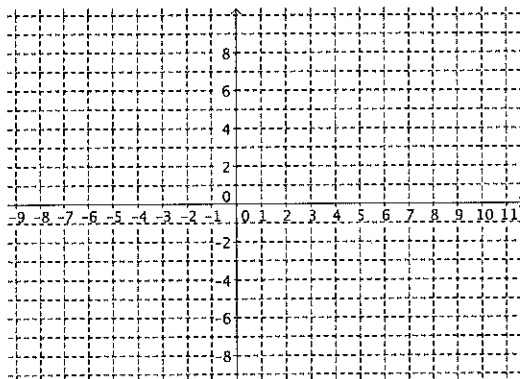
**For each equation provided state what information you see in the equation that will help you graph it, then graph it. Also, use the equation to fill in any four coordinates on the table.**

13.  $y = \left(\frac{1}{2}\right)^n 8$



What do you know from the equation that helps you to graph the function?

14.  $y = 5(x - 2) - 6$



What do you know from the equation that helps you to graph the function?



**GO**

Topic: Solving one-step equations with justification.

Recall the two properties that help us solve equations.

The Additive property of equality states:

You can add any number to both sides of an equation and the equation will still be true.

The Multiplicative **property of equality** states:

You can multiply any number to both sides of an equation and the equation will still be true.

Solve each equation. Justify your answer by identifying the property(s) you used to get it.

Example 1: $x - 13 = 7$ $+13 \quad +13$ $x + 0 = 20$ $x = 20$		<u>Justification</u> additive property of equality addition additive identity (You added 0 and got x.)	
Example 2: $5x = 35$ $\frac{5}{5}x = \frac{35}{5}$ $1x = 7$		<u>Justification</u> multiplicative property of equality (multiplied by $\frac{1}{5}$ ) multiplicative identity (A number multiplied by its reciprocal = 1)	
15. $3x = 15$	<u>Justification</u>	16. $x - 10 = 2$	<u>Justification</u>
17. $-16 = x + 11$	<u>Justification</u>	18. $6 + x = 10$	<u>Justification</u>
19. $6x = 18$	<u>Justification</u>	20. $-3x = 2$	<u>Justification</u>