Name: _____ Date: _____

NON-PROPORTIONAL LINEAR RELATIONSHIPS
COMMON CORE ALGEBRA I

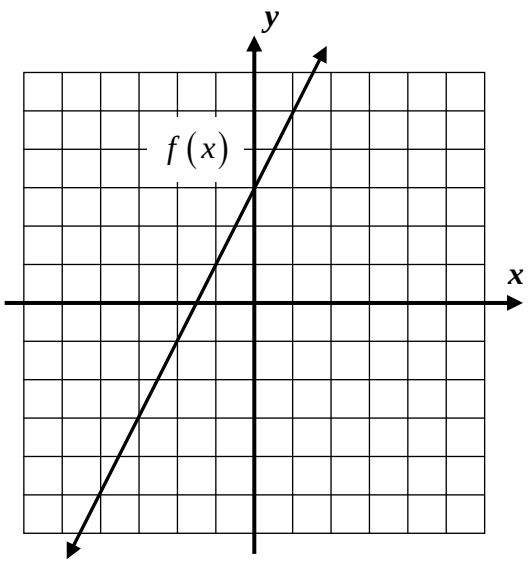
In this unit's first lesson, we saw the simplest type of linear relationship, one where the two variables are **proportional to one another**. In that case, recall:

PROPORTIONAL RELATIONSHIPS

The variables *x* and *y* are proportional if: $\frac{y}{x} = k$ or $y = kx$. In other words, one variable is always a constant multiple of the other.

But, there are lots of linear relationships (ones that when graphed would form a line) that are not proportional. How can we relate them with an equation?

***Exercise* #1:** Consider the linear function $f(x)$ shown below.



(a) Evaluate $f(-2)$ and $f(1)$. What two coordinate points do these function values correspond to?

(b) Calculate the average rate of change of *f* from $x = -2$ to $x = 1$. This is also known as what quantity for this line?

(c) Is there a proportional relationship between *x* and *y*? How can you check?

(d) Based on your 8th grade coursework, what relationship does exist between the two variables? Write this equation and check it for the points from (a).

In general, what is always proportional on a linear function is the **change in *y*** to the **change in *x***, also known as the **line's slope**. This gives rise to what is known as the **slope-intercept** form of a line.

THE SLOPE-INTERCEPT FORM OF A LINEAR FUNCTION

Given a linear function, $f(x)$, it can be expressed in equation form by:

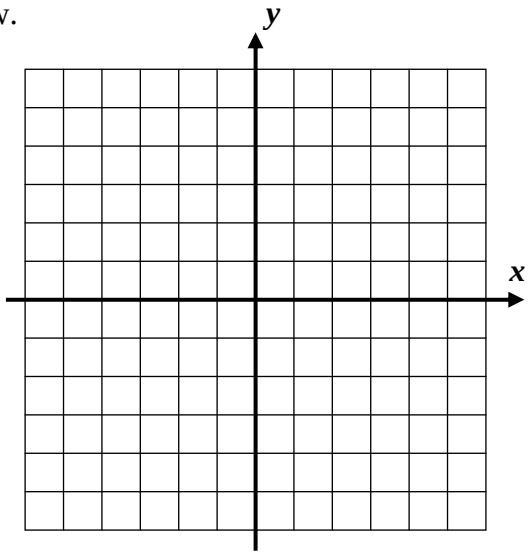
$$f(x) = y = mx + b$$

where m = average rate of change = slope = $\dfrac{\Delta y}{\Delta x}$ and $b = y$-intercept of the line

***Exercise* #2:** Given the linear function $g(x) = \dfrac{1}{2}x + 1$ do the following.

(a) Create a limited table of values to help graph the function.

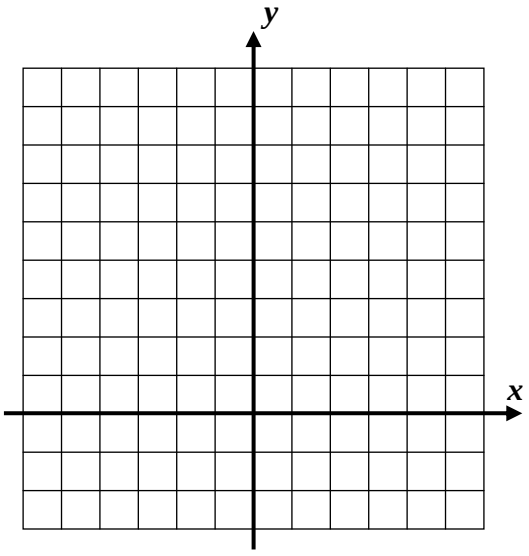
(b) Create a graph of the function on the axes below.



(c) Illustrate the slope of the function graphically.

(d) Circle the graph's *y*-intercept.

***Exercise* #3:** Use information about the slope and *y*-intercept to graph $y = -\dfrac{3}{5}x + 4$ on the grid. Pick two points off the graph and calculate the average rate of change and verify that it is equal to the slope.



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NONPROPORTIONAL LINEAR RELATIONSHIPS
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. For the linear function $g(x) = 7x - 2$, which of the following is true?

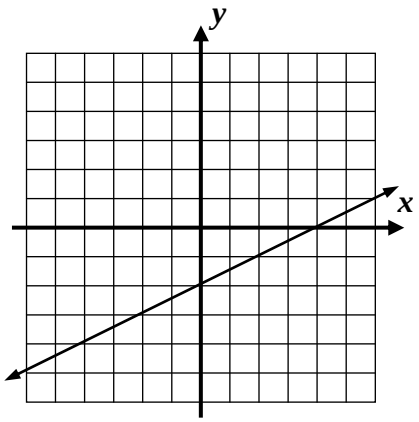
   (1) It has a slope of 7 and a *y*-intercept of -2.
   (2) It has a slope of -2 and a *y*-intercept of 7.
   (3) It has a slope of $7x$ and a *y*-intercept of -2.
   (4) It has a slope of -2 and a *y*-intercept of $7x$.

2. Which of the following represents the average rate of change of the function $g(x) = \frac{3}{2}x + 1$ over the interval $-2 \le x \le 8$?

   (1) $\frac{9}{7}$ (3) $\frac{2}{3}$

   (2) $\frac{5}{4}$ (4) $\frac{3}{2}$

3. What is the equation of the line shown in the graph below?



   (1) $y = 2x + 4$ (3) $y = \frac{1}{2}x - 2$

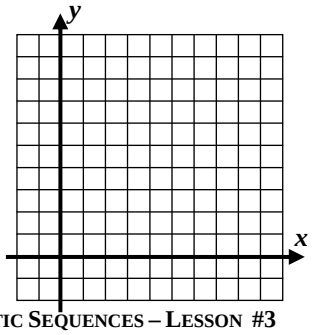
   (2) $y = 2x - 2$ (4) $y = \frac{1}{2}x + 4$

4. Which of the following is the equation of a line whose slope is 3 and which passes through the point $(2, 7)$?

   (1) $y = 3x + 7$ (3) $y = 3x + 1$

   (2) $y = 7x + 3$ (4) $y = 7x - 7$

5. Which of the following is the equation of a line that passes through the points $(0, 8)$ and $(6, 4)$? Use of grid is optional.



   (1) $y = -\frac{2}{3}x + 8$ (3) $y = -\frac{4}{5}x + 4$

   (2) $y = \frac{3}{2}x + 6$ (4) $y = \frac{1}{2}x + 8$

6. Graph each of the following linear functions on the grid provided and label with their equations. For each, create a table **without** the use of your calculator to maintain **fluency** with operation facts. Show your table. In the first problem, the *x*-values are given. In others, you will have to choose them. Always include $x = 0$.

(a) $f(x) = 2x + 3$

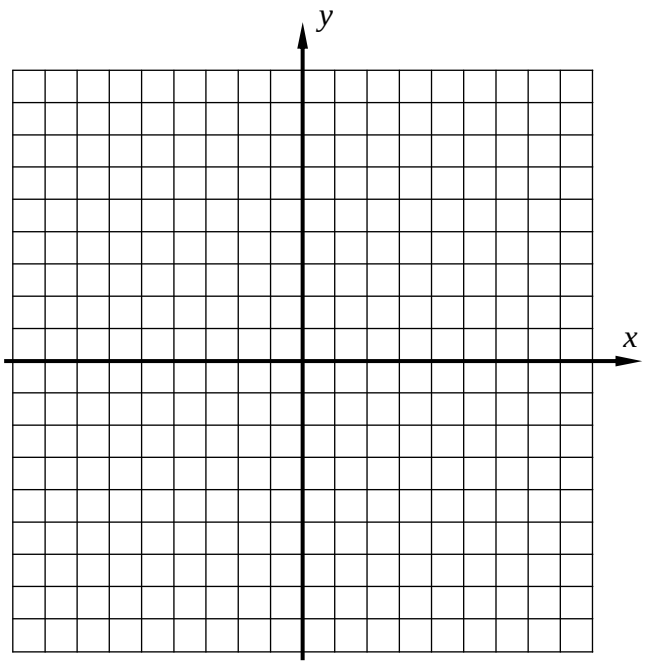
x	–5	–2	0	2	5
$f(x)$					

(b) $g(x) = -\frac{1}{2}x - 1$

x			0		
$g(x)$					

(c) $h(x) = 5 - x$

x			0		
$h(x)$					



7. State the values of the slope and the *y*-intercept for each of the following linear functions. Then, use this information to create graphs of the functions on the grid below. Label each with its equation.

(a) $y = \frac{2}{3}x - 4$

Slope: _____ *y*-intercept: _____

(b) $y = -\frac{5}{2}x + 7$

Slope: _____ *y*-intercept: _____

(c) $y = 3x - 2$

Slope: _____ *y*-intercept: _____

(d) $y = -x + 3$

Slope: _____ *y*-intercept: _____