APPLICATIONS

1. How many centimeters are there in 1 yard if there are 2.54 centimeters per inch? Show your work and express your answer without rounding.

$$\frac{2.54\,cm}{1\,\cancel{inch}} \cdot \frac{36\,\cancel{in}}{1\,yd} = 91.44\,cm/yd$$

2. How close are a meter and a yard? Convert 1 meter into yards by using the fact that there are 100 centimeters in a meter, 2.54 centimeters in an inch, 12 inches in a foot, and 3 feet in a yard. Round your answer to the nearest tenth of a yard.

$$\frac{91.44\,\cancel{cm}}{1\,yd} \cdot \frac{1\,m}{100\,\cancel{cm}} \quad 0.9144\,m/yd$$

3. If there are 1000 grams in a kilogram and 454 grams in a pound, how many pounds are there per kilogram? Round to the nearest tenth of a pound.

$$\frac{1000\,\cancel{g}}{1\,kg}\cdot\frac{1\,lb.}{454\,\cancel{g}} = 2.2\,lb./kg$$

4. Water is flowing out of an artesian spring at a rate of 8 cubic feet per minute. How many minutes will it take for the water to fill up a 300 gallon tank. There are 7.5 gallons of water per cubic foot. Show or explain how you arrive at your answer.

~~8~~, 7.5, ~~300~~

7 

$300_g = 60t$

$$\frac{8\,\cancel{ft^3}}{1\,min}\cdot\frac{7.5\,gal}{1\,\cancel{ft^3}} = 60\,gal/min$$

5 minutes

$$\frac{300g}{60g/m} = \frac{300\,\cancel{g}}{60}\cdot\frac{m}{\cancel{g}}$$

5. A high school track athlete sprints 100 yards in 15 seconds.

(a) Determine the number of feet per second the runner is traveling at. Show your work.

$$\frac{100\ \cancel{yd}}{15\ sec} \cdot \frac{3\ ft.}{1\ \cancel{yd}} = \frac{300\ ft}{15\ s}$$

20 ft./sec.

(b) If there are 5280 feet in a mile and 3600 seconds in an hour, determine the runner's speed in miles per hour. Round to the nearest tenth.

$$\frac{100\ \cancel{yd}}{15\ sec} \cdot \frac{3\ \cancel{ft}}{1\ \cancel{yd}} \cdot \frac{1\ m}{5280\ \cancel{ft}}$$

$$\frac{1\ mile}{1} \cdot \frac{3600\ \cancel{sec}}{1\ hr}$$

450

$$\frac{150\ m}{11\ hr} = 13.6\ m/hr$$

6. A cafeteria is trying to scale a small pancake recipe up in order to feed a group of tourists. The recipe feeds 6 people and the cafeteria is trying to feed 75. The recipe calls for 4 cups of flour and $1\frac{1}{2}$ cups of milk and ½ cup of sugar (as well as some other minor ingredients such as baking powder).

(a) One 10 pound bag of flour contains 38 cups of flour. Will it be enough for this recipe? Justify.

$\frac{75}{6} = 12.5$

$12.5 \times 4 = 50$

NO.

(b) If one 10 pound bag of flour contains 38 cups of flour, how many pounds of flour will be needed for this recipe? Round to the nearest tenth of a pound.

$\frac{38}{10} = 3.8$ $\frac{10}{38} = \cancel{0.263157}$

13.2 lbs

(c) If there are 4 cups in a quart and 4 quarts in a gallon, will we need more or less than a gallon of milk for this recipe?

4.4 = 16 cups/g

$12.5 \times 1.5 = 18\ldots$

MORE

(d) The cafeteria has a 1.5 kilogram bag of sugar. If a cup of sugar weighs 0.5 pounds and there are 2.2 pounds per kilogram, does the cafeteria have enough sugar to make this recipe?

(e) If the original recipe made 14 pancakes and the cafeteria plans to charge \$.50 per pancake, how much money will they make if they sell all of the pancakes made for the 75 people?

Mindfulness:

Choose Your Breath:

Initial (monitor/keep rhythm)

Heart/Belly

Calming (2 in, 4 out)

Energizing (4 in, 2 out)

$\frac{f(b)-f(a)}{b-a}$

Bell Ringer:

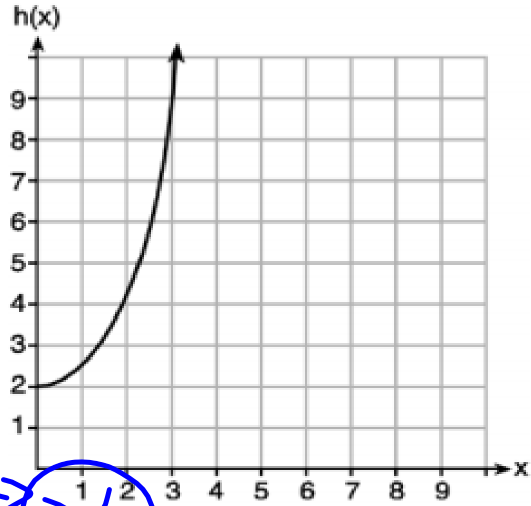
Given the functions g(x), f(x), and h(x) shown below:

$\frac{7-1}{3-0} = \frac{6}{3}$

2

$g(x) = x^2 - 2x$

x	f(x)
0	1
1	2
2	5
3	7



(0,2)
(3,9)

$\frac{9-2}{3-0} = \frac{7}{3} \to 2\frac{1}{3}$

The correct list of functions ordered from greatest to least by average rate of change over the interval $0 \le x \le 3$ is

~~1) f(x), g(x), h(x)~~
2) h(x), g(x), f(x)
~~3) g(x), f(x), h(x)~~
4) h(x), f(x), g(x)

$0^2 - 2(0) = 0$

$3^2 - 2(3) = 3$

$\frac{3-0}{3-0} = \frac{3}{3} = 1$

$2\frac{1}{3}$ 2 1

h(x), f(x), g(x)

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:

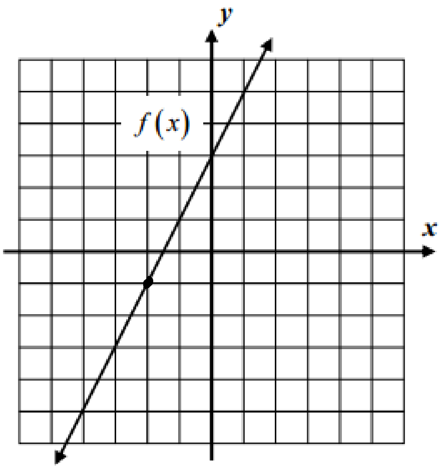
> **PROPORTIONAL RELATIONSHIPS**
>
> The variables x and y are proportional if: $\frac{y}{x}=k$ or $y=kx$. In other words, one variable is always a constant multiple of the other.

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?

(-2,-1)
(1,5)



(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?

$$\frac{5+1}{1+2}=\frac{6}{3}=2$$

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

$\frac{-1}{-2} = \frac{1}{2} \neq 2 \quad \frac{5}{1} = 5 \neq 2$

(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:

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

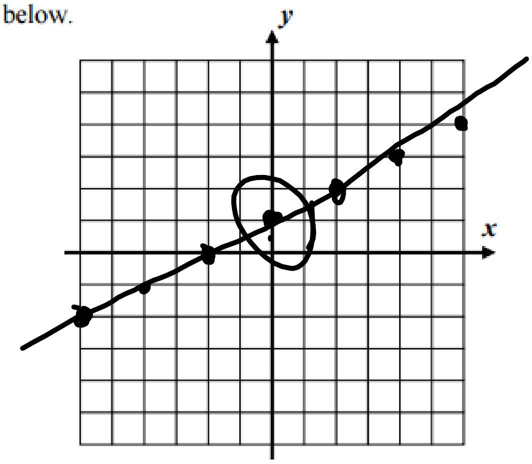
where m = average rate of change = slope = $\frac{\Delta y}{\Delta x}$ and $b = y$-intercept of the line

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

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

-2	0
-1	0.5
0	1
1	1.5
2	2

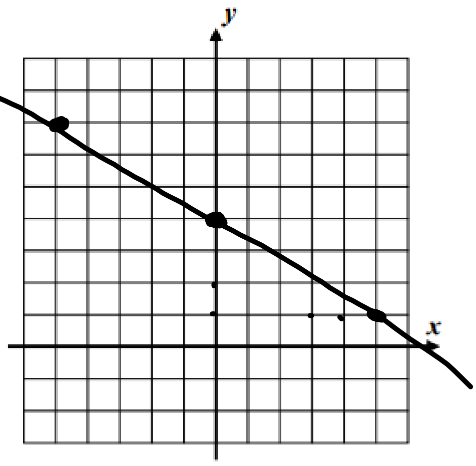
(b) Create a graph of the function on the axes below.



(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 $y=-\frac{3}{5}x+4$ 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.



(-5, 7)
(0, 4)
(5, 1)

$$\frac{4-7}{0+5}=\frac{-3}{5}$$