Name: ______________________________ Date: ______________

NEW UNIT! AND THAT MEANS…PROPORTIONAL RELATIONSHIPS!

Do Now: At a local farm stand, six apples can be bought for four dollars. Determine how much it would cost to buy the following amounts of apples. Round to the nearest cent, when necessary.

(a) a dozen apples

$\boxed{\$8}$

$$\frac{6 \text{ apples}}{\$4} = \frac{12 \text{ apples}}{\$x}$$

(b) 20 apples

$$\frac{6 \text{ apples}}{\$4} = \frac{20 \text{ apples}}{\$x}$$

$$\frac{6x}{6} = \frac{80}{6} \quad x = \$13.33$$

PROPORTIONAL RELATIONSHIPS

Two variables have a **proportional relationship** if their respective values are always in the same ratio (they have the same relative size to one another). This value is also called the proportionality constant. In equation form, if the two variables are x and y then:

$$\text{constant} = \frac{y}{x}$$

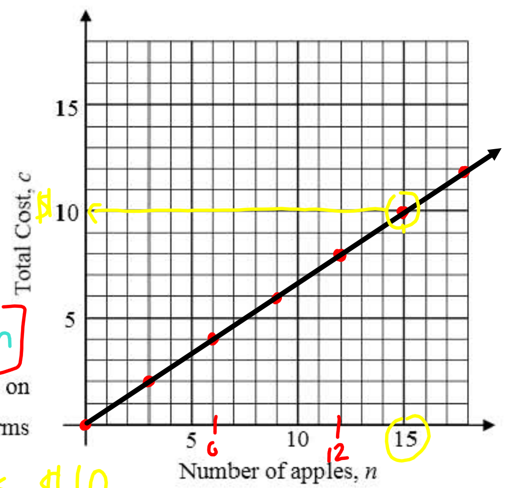
(c) If c is the total cost of apples and n is the number of apples bought, write a proportional relationship between c and n. Solve this equation for the variable c.

$$\frac{6 \text{ apples}}{\$4} = \frac{n \text{ apples}}{\$c}$$

$$\frac{4n}{6} = \frac{\cancel{6}c}{\cancel{6}} \implies c = \frac{4}{6}n = \boxed{\frac{2}{3}n}$$

(d) Graph the relationship below.

SLOPE = $\frac{\text{RISE}}{\text{RUN}}$



(e) According to the graph, $c(15) = 10$. Illustrate this on your graph. How do you interpret $c(15) = 10$ in terms of apples and money spent?

15 apples costs $10.

***Exercise* #2:** If Jenny can run 5 meters in 2 seconds, then which of the following gives the distance, d, she can run over a span of t-seconds going at the same constant rate? Show the work that leads to your answer.

(1) $d = \frac{2}{5}t$

(2) $d = 5t + 2$

(3) $d = 2t + 5$

(4) $\boxed{d = \frac{5}{2}t}$

$$\frac{5 \text{ meters}}{2 \text{ seconds}} = \frac{d \text{ meters}}{t \text{ seconds}}$$

$$\frac{\cancel{2}d}{\cancel{2}} = \frac{5t}{2} \qquad \boxed{d = \frac{5}{2}t}$$

Exercise #2 illustrates one of the most important proportional relationships, that of distance traveled compared to time traveled at a constant rate. Let's work some more with this.

***Exercise* #3:** Erika is driving at a constant rate. She travels 120 miles in the span of 2 hours.

(a) If Erika travels at the same **rate**, how far will she travel in 3 hours?

$$\frac{120 \text{ miles}}{2 \text{ hours}} = \frac{x \text{ miles}}{3 \text{ hours}}$$

$$\frac{2x}{2} = \frac{360}{2} \qquad x = 180 \text{ miles}$$

(b) Write a proportional relationship between the distance D that Erika will drive over the time t that she travels, assuming she continues at this same rate. $\boxed{\text{Solve the proportion for } D}$ as a function of t.

$$\frac{120 \text{ miles}}{2 \text{ hours}} = \frac{D \text{ miles}}{t \text{ hours}}$$

$$\frac{120t}{2} = \frac{2D}{2} \Rightarrow D = \frac{120}{2}t$$

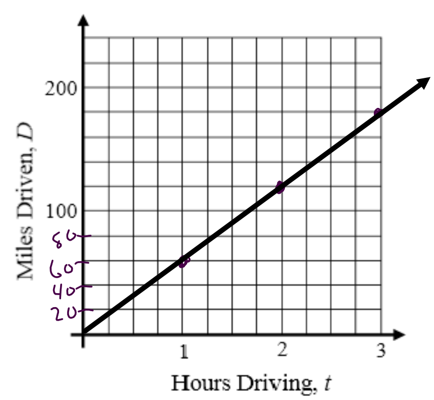
$$= \frac{60}{1}t$$

(c) What is the value of the **proportionality constant**? What are its units?

(d) How much time will it take for Erika to travel 150 miles.

(e) Graph D as a function of t on the axes at the right.

(f) What does the constant of proportionality, from (c) represent about this graph? Explain your thinking.



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Proportional Relationships HW…!

HW

Applications

1. A nutrition company is marketing a low-calorie snack brownie. A serving size of the snack is 3 brownies and has a total of 50 calories.

(a) Determine how many calories 6 brownies would have.

(b) Determine how many calories 21 brownies would have.

(c) Determine how many calories 14 brownies would have. Round to the nearest calorie.

(d) If c represents the number of calories and b represents the number of brownies, write a proportional relationship involving c and b and solve it for c.

(e) Graph the proportional relationship you found in part (d) on the grid shown.

(f) Using the graph, what is the smallest whole number of brownies a person would need to eat in order to consume 125 calories? Illustrate on your graph.

(g) Algebraically determine the number of brownies a person would need to eat in order to consume 300 calories.