

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**MORE WORK WITH PROPORTIONAL RELATIONSHIPS**  
**N-GEN MATH<sup>®</sup> 8**



We know that when two variables, say  $x$  and  $y$ , are proportionally related the following is true:

**PROPORTIONAL RELATIONSHIPS**

$$\frac{y}{x} = \text{a constant} = k \quad \text{or} \quad \text{equivalently } y = k \cdot x$$

The parameter  $k$  is known as the **constant of proportionality** and is the **unit rate** that  $y$  is changing compared to  $x$ .

**Exercise #1:** The weight of water is proportional to its volume. It is known that 50 gallons of water weigh 417 pounds. Let  $v$  be the volume of water in gallons and  $w$  be the weight of the water in pounds.

- (a) Find the ratio of the weight of water to its volume as a unit rate. Write first as a fraction, then simplify to a decimal. Include proper units.
- (b) Using (a), write an equation that relates  $v$  and  $w$ .

**Exercise #2:** The weight of olive oil is given in the table below as a function of its volume in gallons.

Volume (gallons)	0	5	10	15	20
Weight (pounds)	0	38	76	114	152

- (a) Is the ratio of weight to volume greater for olive oil or less for olive oil than water? Justify.
- (b) How much would 50 gallons of olive oil weigh? Show how you found your answer.



One of the most important proportional relationships is that of distance and time when an object moves at a **constant speed**.

### SPEED

The ratio of the distance an object travels to the time it has been traveling is known as the **speed** of the object. If  $d$  is the distance the object travels and  $t$  is the time it has been traveling, then:

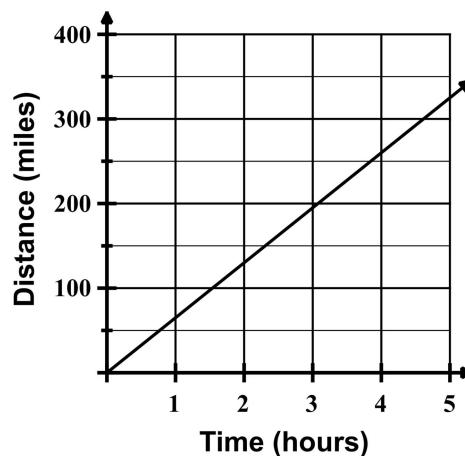
$$\text{speed} = \frac{d}{t} \quad \text{or} \quad d = \text{speed} \times t$$

**Exercise #3:** A car moving at a constant speed has a distance given by the equation  $d = 54t$ , where  $t$  is the time the car has traveled in hours and  $d$  is the distance it has traveled in miles.

- (a) How far will the car travel in 3 hours?                      (b) What is the car's speed?

**Exercise #4:** Another car is moving such that the relationship between its distance and time is shown on the graph.

- (a) Give an estimate for the speed of the car.
- (b) Is the car moving faster or slower than the one from *Exercise #3*.



**Exercise #5:** Trinity runs 147 meters in 35 seconds. Assuming her speed is constant:

- (a) Write an equation for Trinity's distance,  $d$ , in terms of the time she has been running,  $t$ .                      (b) Set up and solve an equation for how long it will take Trinity to run a kilometer. Round to the nearest second.



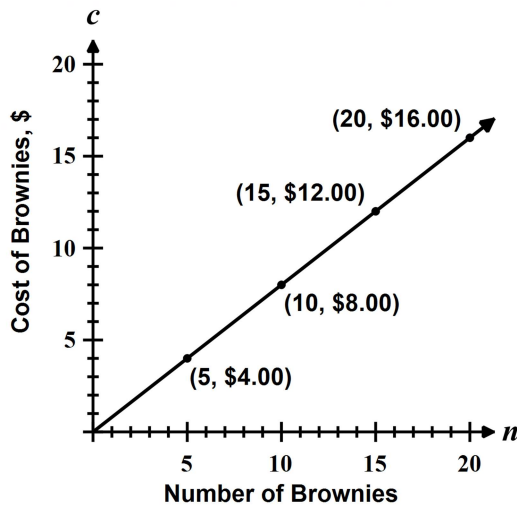
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**MORE WORK WITH PROPORTIONAL RELATIONSHIPS**  
**N-GEN MATH<sup>®</sup> 8 HOMEWORK**

**USING YOUR MATH**

1. Two friends, Caleb and Ynez are both selling brownies for a class fundraiser. They decide to advertise how much buying a certain number of brownies will cost in two different ways, as shown below.



**Caleb's Pricing**

Number of Brownies	Cost of Brownies (\$)
0	0
4	3
8	6
12	9
16	12

**Ynez's Pricing**

- (a) Create an equation for the cost,  $c$ , of  $n$ -brownies for both Caleb and Ynez's pricing.

Caleb:

Ynez:

- (b) Which of the two friends has the higher unit cost per brownie? Explain.

- (c) How much more would it cost to purchase 50 of the more expensive brownies than the less expensive ones?



2. A company is growing a type of wheat that gains height at a constant rate. They know that its height,  $h$ , can be found using the equation  $h = 4.6w$ , where  $w$  is the number of weeks it has been growing and the height is in centimeters.

They experiment by adding nutrients to a field to see if it will change the above equation. The data below shows their results every four weeks.

- (a) Create an equation for the height,  $h$ , of the wheat that has been grown with the nutrient added. Show your work.

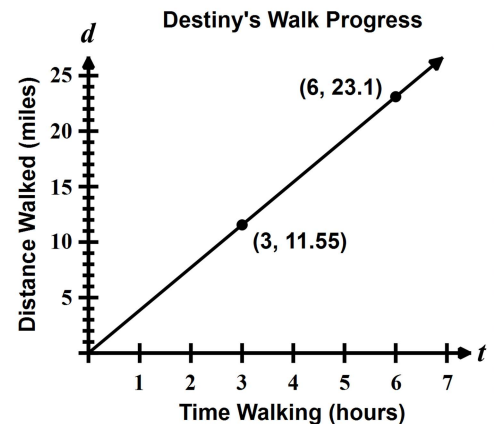
Weeks, $w$	0	4	8	12	16
Height, $h$ , cm	0	23.2	46.4	69.6	92.8

**Growth with Nutrient Added**

- (b) Did adding the nutrient increase the rate at which the wheat grew? Explain.

3. Javier and Destiny are participating in a marathon walk for charity. They both walk at a consistent speed, with Javier covering 6.5 miles in his first two hours of walking. Destiny keeps track of her progress on an app that gives her the graph below.

- (a) Who is walking faster, Javier or Destiny? Justify.



- (b) Create equations that give Javier and Destiny's distance,  $d$ , if you know the time,  $t$ , they have been walking in hours.

- (c) The walk is 25 miles long. Use algebra to determine the number of hours, to the nearest tenth, that both Javier and Destiny will spend walking.

