Unit 2, Lesson 3: More about Constant of Proportionality

Let's solve more problems involving proportional relationships using tables.

3.1: Equal Measures

Use the numbers and units from the list to find as many equivalent measurements as you can. For example, you might write "30 minutes is $\frac{1}{2}$ hour."

You can use the numbers and units more than once.

1	$\frac{1}{2}$	0.3	centimeter
12	40	24	meter
0.4	0.01	$\frac{1}{5}$	hour
60	$3\frac{1}{3}$	6	feet
50	30	2	minute
			inch

3.2: Centimeters and Millimeters

There is a proportional relationship between any length measured in centimeters and the same length measured in millimeters.

centimeters
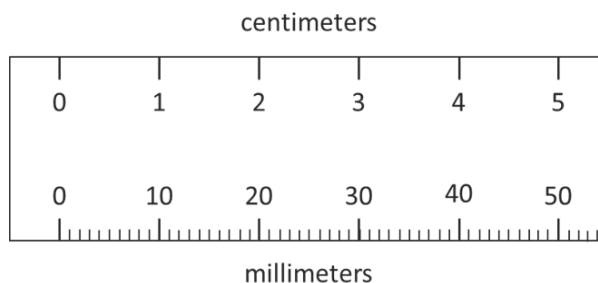
millimeters

NAME   DATE   PERIOD

There are two ways of thinking about this proportional relationship.

1. If you know the length of something in centimeters, you can calculate its length in millimeters.

    a. Complete the table.

    b. What is the constant of proportionality?

length (cm)	length (mm)
9	
12.5	
50	
88.49	

2. If you know the length of something in millimeters, you can calculate its length in centimeters.

    a. Complete the table.

    b. What is the constant of proportionality?

length (mm)	length (cm)
70	
245	
4	
699.1	

3. How are these two constants of proportionality related to each other?

4. Complete each sentence:

    a. To convert from centimeters to millimeters, you can multiply by _____.

    b. To convert from millimeters to centimeters, you can divide by _____ *or* multiply by _____.

NAME   DATE   PERIOD
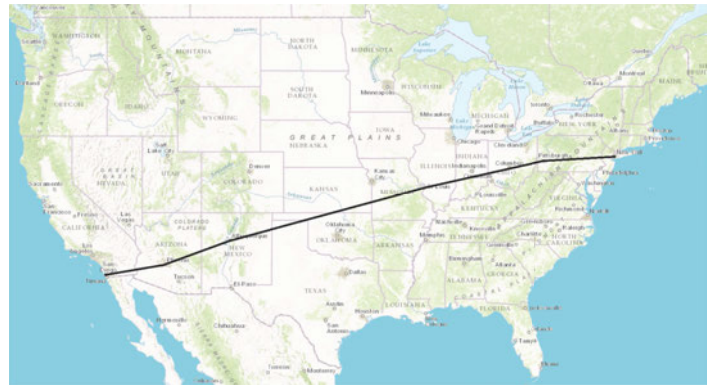
Are you ready for more?

1. How many square millimeters are there in a square centimeter?

2. How do you convert square centimeters to square millimeters? How do you convert the other way?

3.3: Pittsburgh to Phoenix

On its way from New York to San Diego, a plane flew over Pittsburgh, Saint Louis, Albuquerque, and Phoenix traveling at a constant speed.

Complete the table as you answer the questions. Be prepared to explain your reasoning.

segment	time	distance	speed
Pittsburgh to Saint Louis	1 hour	550 miles	
Saint Louis to Albuquerque	1 hour 42 minutes		
Albuquerque to Phoenix		330 miles	

1. What is the distance between Saint Louis and Albuquerque?

2. How many minutes did it take to fly between Albuquerque and Phoenix?

3. What is the proportional relationship represented by this table?

4. Diego says the constant of proportionality is 550. Andre says the constant of proportionality is $9\frac{1}{6}$. Do you agree with either of them? Explain your reasoning.

Lesson 3 Summary

When something is traveling at a constant speed, there is a proportional relationship between the time it takes and the distance traveled. The table shows the distance traveled and elapsed time for a bug crawling on a sidewalk.

distance traveled (cm)	elapsed time (sec)
$\frac{3}{2}$	1
1	$\frac{2}{3}$
3	2
10	$\frac{20}{3}$

$\cdot \frac{2}{3}$

We can multiply any number in the first column by $\frac{2}{3}$ to get the corresponding number in the second column. We can say that the elapsed time is proportional to the distance traveled, and the constant of proportionality is $\frac{2}{3}$. This means that the bug's *pace* is $\frac{2}{3}$ seconds per centimeter.

This table represents the same situation, except the columns are switched.

elapsed time (sec)	distance traveled (cm)
1	$\frac{3}{2}$
$\frac{2}{3}$	1
2	3
$\frac{20}{3}$	10

$\cdot \frac{3}{2}$

We can multiply any number in the first column by $\frac{3}{2}$ to get the corresponding number in the second column. We can say that the distanced traveled is proportional to the elapsed time, and the constant of proportionality is $\frac{3}{2}$. This means that the bug's *speed* is $\frac{3}{2}$ centimeters per second.

Notice that $\frac{3}{2}$ is the reciprocal of $\frac{2}{3}$. When two quantities are in a proportional relationship, there are two constants of proportionality, and they are always reciprocals of each other. When we represent a proportional relationship with a table, we say the quantity in the second column is proportional to the quantity in the first column, and the corresponding constant of proportionality is the number we multiply values in the first column to get the values in the second.

NAME   DATE   PERIOD

Unit 2, Lesson 3: More about Constant of Proportionality

1. Noah is running a portion of a marathon at a constant speed of 6 miles per hour.

Complete the table to predict how long it would take him to run different distances at that speed, and how far he would run in different time intervals.

time in hours	miles traveled at 6 miles per hour
1	
$\frac{1}{2}$	
$1\frac{1}{3}$	
	$1\frac{1}{2}$
	9
	$4\frac{1}{2}$

2. One kilometer is 1000 meters.

a. Complete the tables. What is the interpretation of the constant of proportionality in each case?

meters	kilometers
1,000	1
250	
12	
1	

kilometers	meters
1	1,000
5	
20	
0.3	

The constant of proportionality tells us that: The constant of proportionality tells us that:

b. What is the relationship between the two constants of proportionality?

3. Jada and Lin are comparing inches and feet. Jada says that the constant of proportionality is 12. Lin says it is $\frac{1}{12}$. Do you agree with either of them? Explain your reasoning.

4. The area of the Mojave desert is 25,000 square miles. A scale drawing of the Mojave desert has an area of 10 square inches. What is the scale of the map?
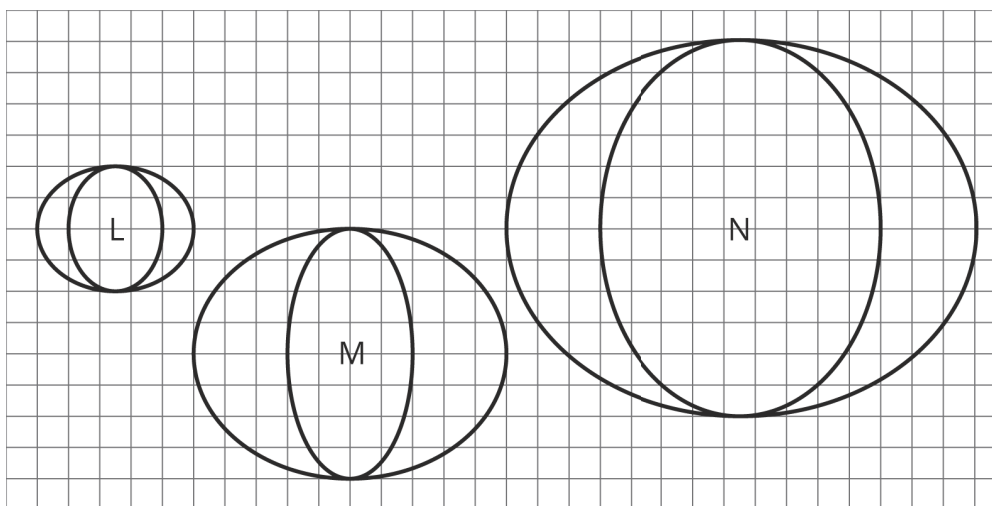
(from Unit 1, Lesson 12)

5. Which of these scales is equivalent to the scale 1 cm to 5 km? Select **all** that apply.

   A. 3 cm to 15 km
   B. 1 mm to 150 km
   C. 5 cm to 1 km
   D. 5 mm to 2.5 km
   E. 1 mm to 500 m

(from Unit 1, Lesson 11)

6. Which one of these pictures is not like the others? Explain what makes it different using ratios.

(from Unit 2, Lesson 1)