Unit 5, Lesson 2

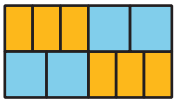
Two Equations for Each Relationship

Let’s investigate equations that represent proportional relationships.

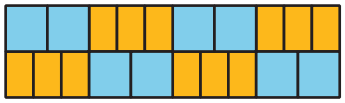
2.1 Which Three Go Together: Tiles

Which three go together? Why do they go together?

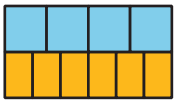
A



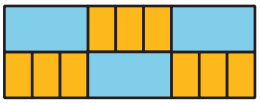
B



C



D



 CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

2.2 Meters and Centimeters

There are 100 centimeters (cm) in every meter (m).

length (m)	length (cm)
1	100
0.94	
1.67	
57.24	
x	

length (cm)	length (m)
100	1
250	
78.2	
123.9	
y	

1. Complete the tables.
2. For each table, find the constant of proportionality.
3. Describe the relationship between these two constants of proportionality.
4. For each table, write an equation for the proportional relationship. Let x represent a length measured in meters and y represent the same length measured in centimeters.

Are you ready for more?

1. How many cubic centimeters are there in 1 cubic meter?
2. How do you convert cubic centimeters to cubic meters?
3. How do you convert the other way?

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

2.3 Filling a Water Cooler

It took Priya 5 minutes to fill a cooler with 8 gallons of water from a faucet that was flowing at a steady rate. Let w be the number of gallons of water in the cooler after t minutes.

1. Which of the following equations represent the relationship between w and t? Select **all** that apply.

   A. $w = 1.6t$

   B. $w = 0.625t$

   C. $t = 1.6w$

   D. $t = 0.625w$

2. What does 1.6 tell you about the situation?

3. What does 0.625 tell you about the situation?

4. Priya changed the rate at which water flowed through the faucet. Write an equation that represents the relationship of w and t when it takes 3 minutes to fill the cooler with 1 gallon of water.

5. Was the cooler filling faster before or after Priya changed the rate of water flow? Explain how you know.

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

2.4 Feeding Shrimp

At an aquarium, a shrimp is fed $\frac{1}{5}$ gram of food each feeding and is fed 3 times each day.

1. How much food does a shrimp get fed in 1 day?

2. Complete the table to show how many grams of food the shrimp is fed over different numbers of days.

number of days	grams of food
1	
7	
30	

3. What is the constant of proportionality? What does it tell us about the situation?

4. If the columns in the table were switched, what would be the constant of proportionality? Explain your reasoning

5. Use d for number of days and f for amount of food in grams that a shrimp is fed to write *two* equations that represent the relationship between d and f.

6. At this rate, how much food does a shrimp get fed in 75 days?

7. At this rate, how many days would 75 grams of shrimp food last? Explain or show your reasoning.

 CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

Lesson 2 Summary

If Kiran rode his bike at a constant 10 miles per hour, his distance in miles, d, is proportional to the number of hours, t, that he rode. We can write the equation

$$d = 10t$$

to represent the proportional relationship. With this equation, it is easy to find the distance Kiran rode when we know how long it took, because we can just multiply the time by 10.

We can rewrite the equation:

$$\begin{aligned} d &= 10t \\ \left(\frac{1}{10}\right) d &= t \\ t &= \left(\frac{1}{10}\right) d \end{aligned}$$

This version of the equation tells us that the amount of time Kiran rode is proportional to the distance he traveled, and the constant of proportionality is $\frac{1}{10}$. That form of the equation is easier to use when we know his distance and want to find how long it took, because we can just multiply the distance by $\frac{1}{10}$.

When two quantities x and y are in a proportional relationship, we can write the equation

$$y = kx$$

and say, "y is proportional to x." In this case, the number k is the corresponding constant of proportionality. We can also write the equation

$$x = \frac{1}{k} y$$

and say, "x is proportional to y." In this case, the number $\frac{1}{k}$ is the corresponding constant of proportionality. Each equation can be useful, depending on the information we have and the quantity we are trying to figure out.

 CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.