Lesson 2: Proportional Relationships

Classwork

Example 1: Pay by the Ounce Frozen Yogurt

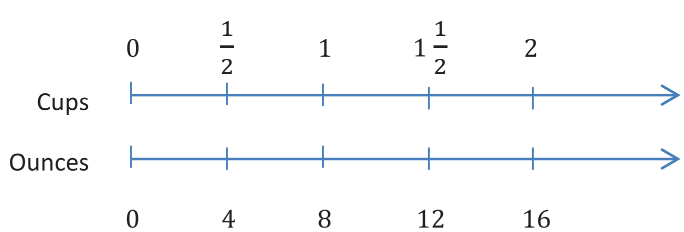
A new self-serve frozen yogurt store opened this summer that sells its yogurt at a price based upon the total weight of the yogurt and its toppings in a dish. Each member of Isabelle's family weighed his dish, and this is what they found. Determine if the cost is proportional to the weight.

Weight (ounces)	12.5	10	5	8
Cost ($)	5	4	2	3.20

The cost ____ the weight.

Example 2: A Cooking Cheat Sheet

In the back of a recipe book, a diagram provides easy conversions to use while cooking.

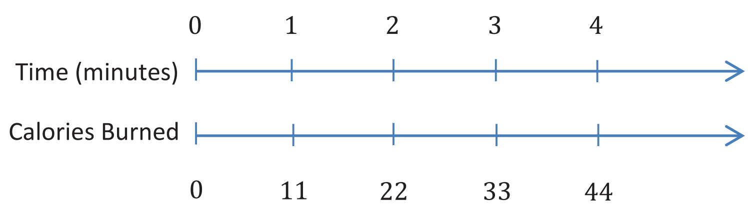


The ounces ____the cups.

Exercise 1

During Jose's physical education class today, students visited activity stations. Next to each station was a chart depicting how many calories (on average) would be burned by completing the activity.

Calories Burned While Jumping Rope



a. Is the number of calories burned proportional to time? How do you know?

b. If Jose jumped rope for 6.5 minutes, how many calories would he expect to burn?

Example 3: Summer Job

Alex spent the summer helping out at his family's business. He was hoping to earn enough money to buy a new $\$220$ gaming system by the end of the summer. Halfway through the summer, after working for 4 weeks, he had earned $\$112$. Alex wonders, "If I continue to work and earn money at this rate, will I have enough money to buy the gaming system by the end of the summer?"

To determine if he will earn enough money, he decided to make a table. He entered his total money earned at the end of Week 1 and his total money earned at the end of Week 4.

Week	0	1	2	3	4	5	6	7	8
Total Earnings		$\$28$			$\$112$				

a. Work with a partner to answer Alex's question.

b. Are Alex's total earnings proportional to the number of weeks he worked? How do you know?

Lesson Summary

Measures of one type of quantity are *proportional to* measures of a second type of quantity if there is a number k so that for every measure x of a quantity of the first type, the corresponding measure y of a quantity of the second type is given by kx; that is, $y = kx$. The number k is called the *constant of proportionality*.

A *proportional relationship* is a correspondence between two types of quantities such that the measures of quantities of the first type are proportional to the measures of quantities of the second type.

Note that proportional relationships and ratio relationships describe the same set of ordered pairs but in two different ways. Ratio relationships are used in the context of working with equivalent ratios, while proportional relationships are used in the context of rates.

In the example given below, the distance is *proportional to* time since each measure of distance, y, can be calculated by multiplying each corresponding time, t, by the same value, 10. This table illustrates a *proportional relationship* between time, t, and distance, y.

Time (h), t	0	1	2	3
Distance (km), y	0	10	20	30

Problem Set

1. A cran-apple juice blend is mixed in a ratio of cranberry to apple of 3 to 5.
   a. Complete the table to show different amounts that are proportional.

Amount of Cranberry			
Amount of Apple			

   b. Why are these quantities proportional?

2. John is filling a bathtub that is 18 inches deep. He notices that it takes two minutes to fill the tub with three inches of water. He estimates it will take 10 more minutes for the water to reach the top of the tub if it continues at the same rate. Is he correct? Explain.