

Understand Unit Rate



Think It Through

How are ratios, rates, and unit rates related?

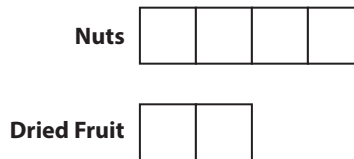


Ratios, rates, and unit rates are all comparisons. They compare one quantity to another quantity.

A **ratio** compares any two quantities.

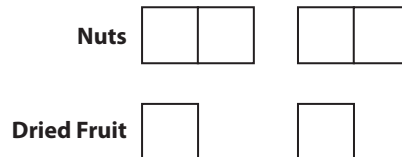
Yolanda uses 4 cups of nuts and 2 cups of dried fruit to make trail mix.

You can use a tape diagram to show this comparison.



The ratio is 4 cups to 2 cups or 4:2. Notice that the quantity of nuts is double the quantity of dried fruit.

Think Every ratio has a related rate.



A related **rate** is an equivalent ratio that compares the first quantity in a ratio to only one of the second quantity. In this example, you know that the amount of nuts is double the amount of dried fruit. So, what if you want the same kind of mix but you only have 1 cup of dried fruit? How many cups of nuts would you use?

Think: 4:2 is the same as ____:1.

The rate is 2 cups of nuts to 1 cup of dried fruit. You can also say the rate is 2 cups of nuts per cup of fruit.

Think Every rate has a related unit rate.

The **unit rate** is the number in a rate that is being compared to 1. In the previous problem, the unit rate of nuts to fruit is 2. Let's look at another example.

Marco earned \$85 for 10 hours of work.

Ratio of dollars to hours: 85 to 10

Rate of dollars to 1 hour: Marco earned \$85 in 10 hours, so he earned $\$85 \div 10$ in 1 hour. He earned \$8.50 for each 1 hour, or \$8.50 per 1 hour.

Unit Rate: The part of the rate that is compared to 1 is \$8.50.

Marco earned \$8.50 for each hour that he worked.



Talking about rates in different ways helps me understand them. I can say "\$8.50 for every hour," "\$8.50 for each hour," or "\$8.50 per hour."

► Reflect

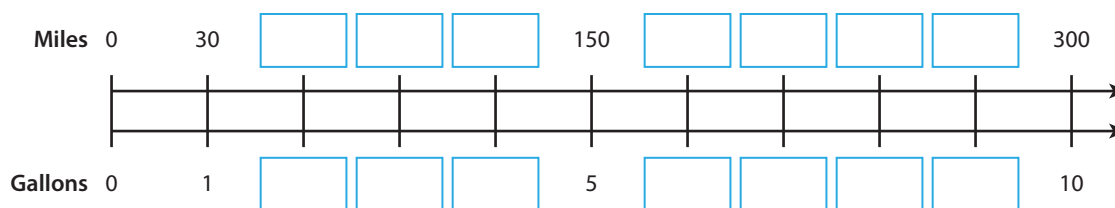
1 What is the difference between a ratio and its related rate and unit rate?

Think About Finding Unit Rates

Let's Explore the Idea A double number line can be used to find rate and unit rate.



A car can travel 300 miles on 10 gallons of gas. The ratio is 300 miles to 10 gallons.



- 2 What do the 300 and 10 in the double number line represent?

- 3 Fill in the remaining numbers on both number lines.
- 4 Look at the corresponding pairs of numbers on the bottom and top number lines. Write a multiplication sentence to show how 10 gallons and 300 miles are related. How are 5 gallons and 150 miles related? How are 1 gallon and 30 miles related?

- 5 Use words to describe the relationship between the number of miles and each corresponding number of gallons.

- 6 What is the rate of miles per gallon for this car?

- 7 What is the unit rate of miles to gallons? _____



Let's Talk About It

Solve the problems below as a group.



- 8 Look at the model on the previous page. What pattern do you see in the numbers of miles?

What pattern do you see in the numbers of gallons?

- 9 Now look at all of the corresponding numbers of miles and gallons. Describe the pattern.

- 10 Write the ratio given in the problem. _____

Use division to find the related rate. Explain how you know your answer is correct.

- 11 Look at your answer to Problem 10. How can you find the related rate for a ratio?

► Try It Another Way Work with your group to use equivalent fractions to find the rate and unit rate.

- 12 A 10-pound box of apples costs \$12.50. Write the ratio of cost to number of pounds as a fraction. Then find an equivalent fraction with a denominator of 1. Write the rate and unit rate to describe the cost of the apples.

- 13 A driver traveled 260 miles on the highway for 4 hours, driving at the same speed for the whole trip. Write the ratio of miles to hours. Then use what you know about equivalent fractions to write a related rate and unit rate.

Talk through these problems as a class. Then write your answers below.

14 Identify Write the letter of the rate that matches each ratio.

\$7.50 : 3 pounds

\$3.75 to 5 pounds

\$6.00 : 4 pounds

\$13.50 to 6 pounds

a. \$0.75 for every 1 pound

b. \$2.25 for each 1 pound

c. \$2.50 for every 1 pound

d. \$1.50 per 1 pound

15 Analyze Use the information on this nutrition label to write the unit rates described below. Show your work.

There are _____ calories in 1 cracker.

One cracker has a mass of _____ grams.

There are _____ fat calories in 1 cracker.

Nutrition Facts

Serving Size: 2 Crackers (14 grams)
Servings Per Container: About 20

Amount Per Serving

Calories 50 Calories From Fat 15

16 Compare Dawn earned \$97.50 for 10 hours of work. Amy earned \$120 for 12 hours of work. How much did each person earn per hour? How can you use this information to compare their earnings?

 Apply Finding Unit Rates

17 Put It Together A recipe uses 3 cups of flour and 2 cups of sugar.

Part A Write the ratio of flour to sugar. Then write the related rate and unit rate. Be sure to label your answers.

Part B Now write the ratio of sugar to flour. Then write the related rate and unit rate. Be sure to label your answers.

Part C Imagine that the recipe is doubled and that 4 cups of sugar are used. Use the unit rate in A to find how much flour is needed. Show your work.

Part D Imagine that 6 cups of flour are used to make the recipe. Use the unit rate in B to find how much sugar is needed.

Part E Compare your answers to C and D and explain how the two unit rates are related.
