

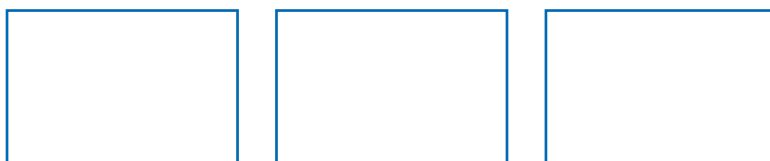
# Understanding Unit Rates

**UNDERSTAND** A **rate** is a ratio that compares two quantities with different units of measure. A **unit rate** is a rate in which the second measurement or amount is 1 unit.

Three full vans, all with the same number of seats, hold a total of 36 people. The unit rate is the number of people per 1 van. What is the unit rate?

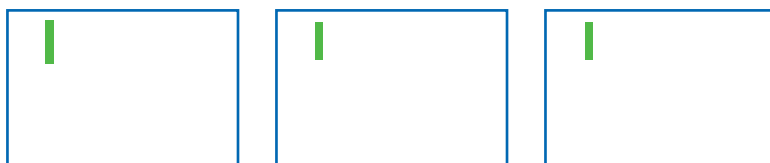
1

To find the unit rate, find the number of people needed to fill one van. Use drawings to find the unit rate. Draw 3 boxes to represent the 3 vans.



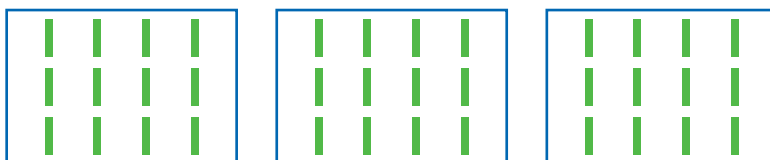
2

Draw bars in each box to represent the people. Draw one bar in each box to represent one person per van.



3

Draw another bar in each box. Then continue to draw one bar in each box until you have drawn 36 bars.



4

Count the number of bars in each box to find the unit rate. Each box has 12 bars.

▶ The unit rate is  $\frac{12 \text{ people}}{1 \text{ van}}$ , or 12 people per van.

## Connect

Three full vans hold 36 people. The number of people per van is the unit rate. What is the number of people per van?

1

Write a ratio to compare the number of people to the number of vans.

number of people : number of vans  
36:3

2

Write the ratio in fraction form.

$\frac{\text{people}}{\text{vans}} \rightarrow \frac{36}{3}$

3

Write the fraction as division.

The fraction bar means division.  
Divide the numerator by the denominator.

$36 \div 3$

4

Divide.

$36 \div 3 = 12$

5

Write the unit rate.

$\frac{36}{3} = \frac{12}{1}$

► The unit rate is  $\frac{12 \text{ people}}{1 \text{ van}}$ , or 12 people per van.

DISCUSS

How could you find the unit rate if 4 full vans hold 36 people?

**EXAMPLE A** A recipe calls for 24 eggs to 4 cups of milk. The unit rate is the number of eggs per cup of milk. What is the number of eggs per cup of milk? How many eggs are needed if 2 cups of milk are used?

1

Write a ratio to compare the number of eggs to the number of cups of milk.

Write the ratio in fraction form.

$$\frac{\text{eggs}}{\text{cups of milk}} \rightarrow \frac{24}{4}$$

2

Write the fraction as division.

Divide the numerator by the denominator.

$$24 \div 4$$

3

Divide.

$$24 \div 4 = 6$$

4

Write the unit rate.

$$\frac{24}{4} = \frac{6}{1}$$

► The unit rate is  $\frac{6 \text{ eggs}}{1 \text{ cup milk}}$  or 6 eggs per 1 cup of milk.

5

Use the unit rate to find the number of eggs needed for 2 cups of milk.

Multiply to find the rate for 2 cups of milk.

$$\frac{6 \text{ eggs}}{1 \text{ cup milk}} \times \frac{2}{2} = \frac{12 \text{ eggs}}{2 \text{ cups milk}}$$

► 12 eggs are needed if 2 cups of milk are used.

**TRY**

A recipe has a ratio of 3 cups of milk to 12 eggs. How many eggs are needed if 12 cups of milk are used?

**EXAMPLE B** A recipe for one loaf of bread calls for  $\frac{3}{4}$  cup of white flour for each cup of whole wheat flour. Rose wants to make 4 loaves of bread. How much whole wheat flour will she need? How much white flour will she need?

1

Identify the unit rate.

The unit rate is  $\frac{3}{4}$  cup of white flour per 1 cup of whole wheat flour,  $\frac{3}{4}$  to 1, or  $\frac{3}{4}:1$ .

2

Think about the information you need.

The recipe for one loaf of bread calls for 1 cup of whole wheat flour. Rose wants to make 4 loaves of bread. So, she must multiply each ingredient by 4 to find how much flour she will need.

3

Multiply to find the amount of whole wheat flour Rose will need.

The recipe calls for 1 cup of whole wheat flour.

$$1 \times 4 = 4$$

► Rose will need 4 cups of whole wheat flour to make 4 loaves of bread.

4

Multiply to find the amount of white flour Rose will need.

The recipe calls for  $\frac{3}{4}$  cup of white flour.

$$\frac{3}{4} \times 4 = \frac{3 \times 4}{4} = \frac{12}{4} = 3$$

► Rose will need 3 cups of white flour to make 4 loaves of bread.

**MODEL**

In a recipe for punch,  $\frac{1}{4}$  cup of pineapple juice is used for each cup of orange juice. Draw a diagram to model how many cups of pineapple juice are used with 4 cups of orange juice.

# Practice

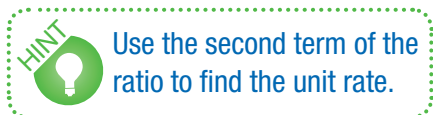
Write a ratio for each rate. Then find the unit rate.

1. 120 miles in 5 hours

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2. 96 words in 3 minutes

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3. 208 people in 4 buses

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4. 136 points in 8 games

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5. \$2.70 for 3 goldfish

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6. \$14 for 7 comic books

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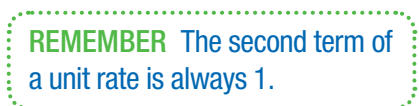
Find each unit rate.

7. 48 grams of protein in 4 servings

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8. 1,068 miles in 3 hours

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9. 140 students to 5 teachers

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10. \$3.60 for 12 eggs

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11. 72 strikeouts in 12 games

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12. 190 feet in 5 seconds

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13. 32 students to 4 parents

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14. 640 miles per 20 gallons

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**Find each unit rate. Then write which is the better buy.**

15. \$0.90 for 2 pens or \$1.75 for 5 pens

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16. \$2.25 for 3 tennis balls or \$6.24 for 8 tennis balls

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17. \$1.92 for 4 apples or \$4.20 for 10 apples

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18. \$24 for 6 pounds of cereal or \$45 for 9 pounds of cereal

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**Choose the best answer.**

19. A chef uses 1 cup of cheese per 2 cups of milk in a casserole. How many cups of cheese are needed if the chef uses 6 cups of milk?

- A. 2 cups
- B. 3 cups
- C. 5 cups
- D. 6 cups

20. Javier scored 30 goals in 15 soccer games. Using the unit rate, how many goals will he score in 20 games?

- A. 35 goals
- B. 40 goals
- C. 45 goals
- D. 60 goals

**Solve.**

21. The coach pays \$72 for 18 hamburgers. What is the cost per hamburger?

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22. Ayesha's puppy gained 36 pounds in 9 weeks. Using the unit rate, how many pounds did the puppy gain in 5 weeks?

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23. **ANALYSIS** Compare and contrast rates and ratios.

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