



Applications

1. Guests at a pizza party are seated at three tables. The small table has 5 seats and 2 pizzas. The medium table has 7 seats and 3 pizzas. The large table has 12 seats and 5 pizzas. The pizzas at each table are shared equally. At which table does a guest get the most pizza?

2. Suppose a news story about the Super Bowl claims “Men outnumbered women in the stadium by a ratio of 9 to 5.” Haru thinks that this means there were 14 people in the stadium—9 men and 5 women. Do you agree with Haru? Why or why not?

3. **Multiple Choice** Which of the following is a correct interpretation of the statement “Men outnumbered women by a ratio of 9 to 5?”
 - A. There were four more men than women.
 - B. The number of men was 1.8 times the number of women.
 - C. The number of men divided by the number of women was equal to the quotient of $5 \div 9$.
 - D. In the stadium, five out of nine fans were women.

4. Each business day, news reports tell the number of stocks that gained (went up in price) and the number that declined (went down in price). For each of the following pairs of reports, determine which report is better news for investors.

a. Gains outnumber declines by a ratio of 5 to 3.	OR	Gains outnumber declines by a ratio of 7 to 5.
b. Gains outnumber declines by a ratio of 9 to 5.	OR	Gains outnumber declines by a ratio of 6 to 3.
c. Gains outnumber declines by a ratio of 10 to 7.	OR	Gains outnumber declines by a ratio of 6 to 4.

Note on Notation Mathematicians use ellipses to indicate the continuation of a pattern. For example, you can refer to the list of numbers between 1 and 10 by writing 1, 2, 3, . . . , and 10, rather than listing each number. You can do this for other intervals as well. For example, 6, 9, 12, . . . , and 30 refers to the list of every multiple of 3 from 6 to 30.

For Exercises 5–11, use correct measurement units in the rates you compute.

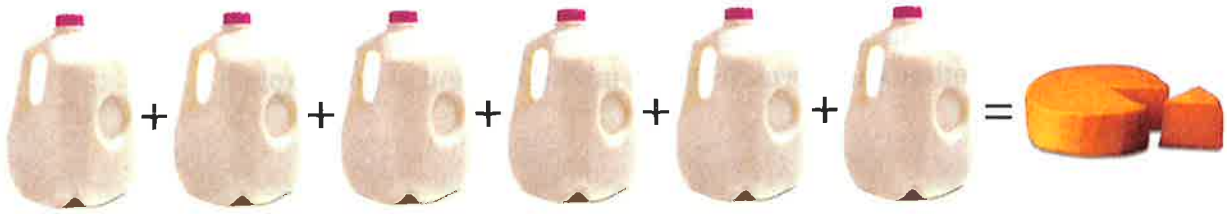
5. Maralah can drive her car 580 miles at a steady speed using 20 gallons of gasoline. Make a rate table to show the number of miles she can drive her car for 1, 2, 3, . . . , and 10 gallons of gas.
6. Joel can drive his car 450 miles at a steady speed using 15 gallons of gasoline. Make a rate table showing the number of miles he can drive his car for 1, 2, 3, . . . , and 10 gallons of gas.
7. Franky's Trail Mix Factory gives customers the information in the table below. Use the pattern in the table to answer the questions.

**Caloric Content
of Franky's Trail Mix**

Grams of Trail Mix	Calories
50	150
150	450
300	900
500	1,500

- a. Fiona eats 75 grams of trail mix. How many Calories does she eat?
 - b. Rico eats trail mix containing 1,000 Calories. How many grams of trail mix does he eat?
 - c. Write an equation to represent the number of Calories in any number of grams of trail mix.
 - d. Write an equation to represent the number of grams of trail mix that will provide any given number of Calories.
8. At camp, Miriam uses a pottery wheel to make 3 bowls in 2 hours. Duane makes 5 bowls in 3 hours.
 - a. Who makes bowls faster, Miriam or Duane?
 - b. How long will it take Miriam to make a set of 12 bowls?
 - c. How long will it take Duane to make a set of 12 bowls?

9. The dairy uses 50 pounds of milk to make 5 pounds of cheddar cheese.



- Make a rate table showing the amount of milk needed to make 5, 10, 15, 20, . . . , and 50 pounds of cheddar cheese.
 - Graph the relationship between pounds of milk and pounds of cheddar cheese. First, decide which variable should go on each axis.
 - Write an equation relating pounds of milk m to pounds of cheddar cheese c .
 - What is the constant of proportionality in your equation from part (c)?
 - Explain one advantage of each method (the graph, the table, and the equation) to express the relationship between milk and cheddar cheese production.
10.
 - Keeley buys songs from a music website. She buys 35 songs for \$26.25. What is the price per song?
 - Regina gets a \$50 gift card for the music site. She tries to estimate how many songs she can buy with the gift card. Which estimate is the most reasonable? Explain.
 - between 30 and 50 songs
 - around 70 songs, but less than 70
 - around 70 songs, but more than 70
 - at least 90 songs
 - Copy and complete the table below.

Prices of Songs

Number of Songs, n	35	■	50	1	70	■
Cost, C	\$26.25	\$3	■	■	■	\$15

- Lucius and Javier discuss how to write an equation relating price and number of songs. Lucius writes the equation $n = 0.75C$. Javier writes the equation $C = 0.75n$. Do you agree with Lucius or with Javier? Use the information from parts (a)–(c) to explain.

11. a. Several students wonder which is a better buy, a 40-pack of pencil-top erasers for \$2.82 or a 2-pack of pencil-top erasers for \$.12. They use different methods to arrive at an answer. Which of these methods are correct? Which method do you prefer? Explain.

Courtney

Compare the two unit rates to determine which unit rate is cheaper.

$$\frac{2.82}{40} = \frac{x}{1} \quad x = 0.0705 = \$.07 \text{ per eraser}$$

$$\frac{0.12}{2} = \frac{x}{1} \quad x = 0.06 = \$.06 \text{ per eraser}$$

The 2-packs have a cheaper per-eraser price.

Elliot

If I buy 40 of the 2-packs of erasers, the total cost will be

$$40 \times 0.12 = 4.8 = \$ 4.80$$

That is more expensive than spending \$ 2.82 for a 40-pack of erasers. The 40-pack is the better deal.

Julio

If a 2-pack costs \$.12, then twenty 2-packs would have the same number of erasers as the 40-pack. Twenty 2-packs cost

$$20 \times 0.12 = 2.4 = \$ 2.40$$

Since a 40-pack costs \$ 2.82, the price per eraser of the 2-packs is cheaper.

Kimi

If a 40-pack costs \$2.82, then half of the pack (20 erasers) should cost \$1.41.

Ten 2-packs (also 20 erasers) should cost \$1.20. This is cheaper.

The price per eraser is cheaper using the 2-packs.

- b. Describe another method you can use to determine which is the better buy.

- 12.** For each situation, find a unit rate and write an equation relating the two quantities.
- 3 dozen apples for \$4.50
 - 30 bottles of water for \$4.80
 - 24 ounces of mozzarella cheese for \$2.88
- 13.** Which of these items is the better buy?
- an 8-pack of glue sticks for \$3.99 or 1 glue stick for \$.54
 - a 12-pack of tape for \$2.50 or 1 roll of tape for \$.19
 - a 100-pack of pencils for \$4.88 or 1 pencil for \$.05
 - a 50-pack of paper clips for \$.89 or a 25-pack of paper clips for \$.45

Connections

- 14.** Find values that make each sentence correct.

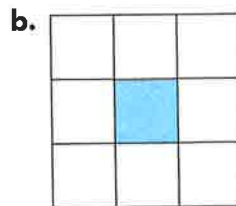
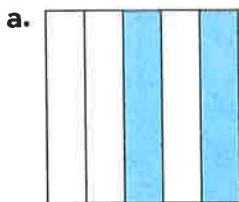
a. $\frac{6}{14} = \frac{\square}{21} = \frac{\square}{28}$

b. $\frac{\square}{27} = \frac{8}{36} = \frac{\square}{63}$

c. $\frac{\square}{20} = \frac{\square}{25} = \frac{6}{30}$

d. $\frac{\square}{8} = \frac{15}{\square} = \frac{24}{32}$

- 15.** For each diagram, write three statements comparing the areas of the shaded and unshaded regions. In one statement, use fractions to express the comparison. In the second, use percentages. In the third, use ratios.



16. **Multiple Choice** Choose the value that makes $\frac{18}{30} = \frac{\square}{15}$ correct.

F. 7

G. 8

H. 9

J. 10

17. **Multiple Choice** Choose the value that makes $\frac{\square}{15} \leq \frac{3}{5}$ correct.

A. 9

B. 10

C. 11

D. 12

For Exercises 18–21, rewrite each equation. Replace the variable with a number that makes a true statement.

18. $\frac{4}{9} \times n = 1\frac{1}{3}$

19. $n \times 2.25 = 90$

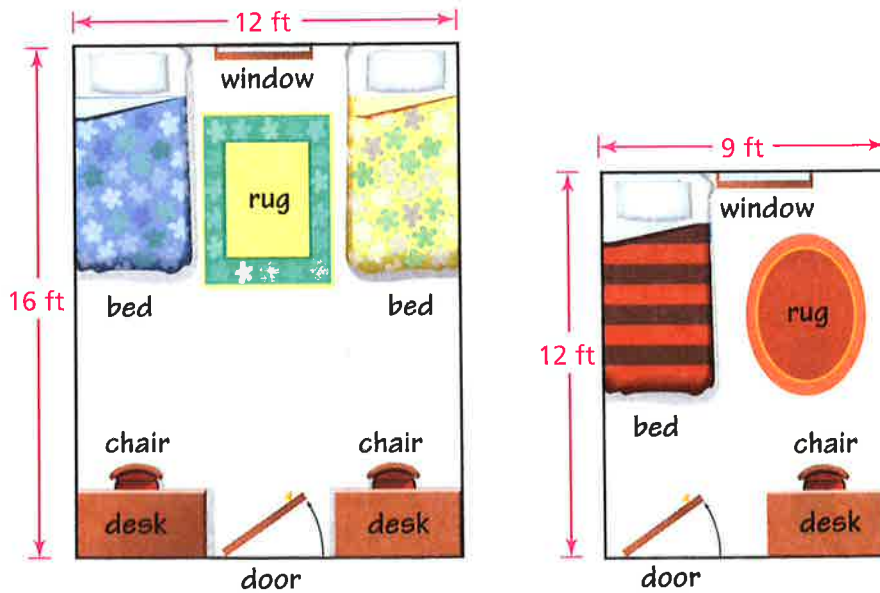
20. $n \div 15 = 120$

21. $180 \div n = 15$

22. Find two fractions with a product between 10 and 11.

23. Find two decimals with a product between 1 and 2.

24. These diagrams show floor plans for two different dorm rooms. One room is for two students. The other is for one student.

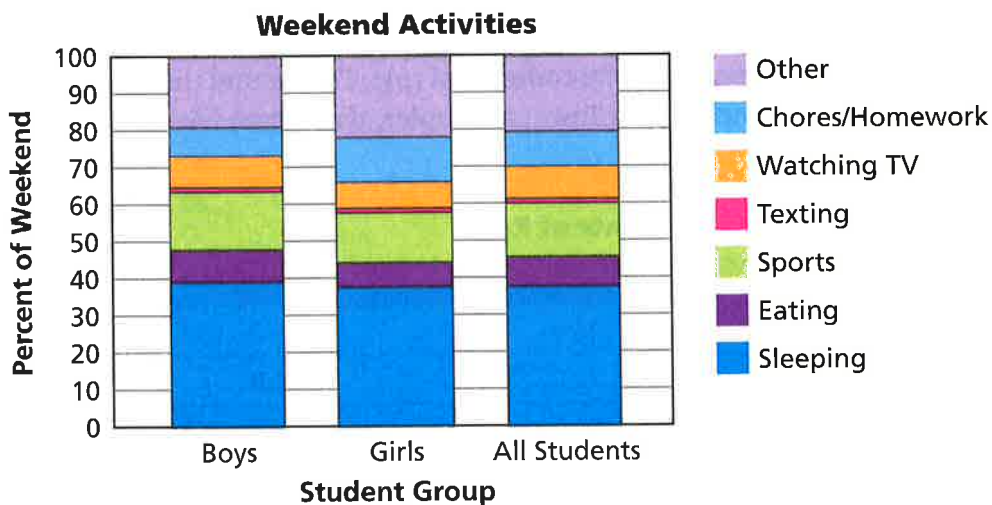


- Are the walls of the floor plans similar rectangles? If so, what is the scale factor? If not, why not?
- What is the ratio of the floor areas of the two rooms (including the space under the beds and desks)?
- Which room gives more space per student?

For Exercises 25 and 26, use both the table and the graph below. The table shows the mean times that students in one seventh-grade class spend on several activities during a weekend. The data are also displayed in the stacked bar graph.

Weekend Activities (hours)

Category	Boys	Girls	All Students
Sleeping	18.8	18.2	18.4
Eating	4.0	2.7	3.1
Sports	7.8	6.9	7.2
Texting	0.5	0.7	0.6
Watching TV	4.2	3.0	3.4
Chores and Homework	3.6	5.8	5.1
Other	9.1	10.7	10.2



25. The stacked bar graph was made using the data from the table. Explain how it was constructed.
26. Suppose you are writing a report summarizing the class's data. You have space for either the table or the graph, but not both. What is one advantage of including the table? What is one advantage of including the bar graph?

Extensions

27. A cranberry bog owner has pressed 240 liters of cranberry juice. He has many sizes of containers in which to package the juice.
- a. The owner wants to package all the cranberry juice in identical containers. Copy and complete the table to show the number of containers of each size the owner would need to package the juice.

Containers Needed by Volume

Volume of Container (liters)	10	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$
Number of Containers Needed	■	■	■	■	■	■	■

- b. Write an equation that relates the volume V of a container and the number of containers n needed to hold 240 liters of cranberry juice.
28. Chemistry students analyzed the contents of rust. They found that it is made up of iron and oxygen. Tests on samples of rust gave the data in the table below.

Contents of Rust

Amount of Rust (g)	Amount of Iron (g)	Amount of Oxygen (g)
50	35.0	15.0
100	70.0	30.0
135	94.5	40.5
150	105.0	45.0

- a. Is the ratio of iron to oxygen the same in each sample? Explain.
- b. Is the ratio of iron to total rust the same in each sample? Explain.
- c. The students analyze 400 grams of rust. How much iron and how much oxygen should they find?



29. Mammals vary in the length of their pregnancies, or gestations. Gestation is the time from conception to birth. Use the table to answer the questions below.

**Gestation Times and Life Spans
of Selected Mammals**

Animal	Gestation (days)	Life Span (years)
Chipmunk	31	6
Cat	63	12
Fox	52	7
Lion	100	15
Black Bear	219	18
Gorilla	258	20
Moose	240	12
Giraffe	425	10
Elephant (African)	660	35

SOURCE: *The World Almanac and Book of Facts*

- For each mammal listed in the table, compare life span to gestation.
- Which animal has the greatest ratio of life span to gestation time? Which has the least ratio?
- Plot the data on a coordinate graph using (gestation, life span) as data points. Describe any patterns that you see. Is there a relationship between the two variables? Explain.
- What pattern would you expect to see in a graph if each statement were true?
 - Longer gestation time implies longer life span.
 - Longer gestation time implies shorter life span.