

Margin Exercise Answers

1. $\frac{6}{5}$ 2. a. $\frac{2}{7}$ b. $\frac{4}{1}$ 3. $\frac{12}{7}$ 4. a. $\frac{5}{24}$ b. $\frac{7}{40}$ 5. a. $\frac{5}{3}$ b. $\frac{3}{5}$ 6. $\frac{7}{3}$
7. $\frac{55 \text{ students}}{2 \text{ sections}}$ 8. We can expect the player to get 1 hit for every 5 times at bat. 9. 24 laps/hr
10. 49 cupcakes/hour 11. 42 pgs/min 12. 3-liter bottle for \$1.49 13. 24-ounce box for \$2.00;
16¢/oz (12.5-ounce box); 18.8¢/oz (16-ounce box); 14.6¢/oz (24-ounce box)

4.1 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

- When two quantities are compared by division, the comparison is called a/an _____.
- The ratio $\frac{3}{8}$ is read “the ratio of _____ to _____.”
- Ratios can be _____ to lowest terms.
- When numbers in a ratio have different units, the ratio is said to be a/an _____.
- A unit rate is a rate with denominator _____.
- To find a unit price (or price per unit), divide the _____ by the number of units.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

- The units in the numerator and denominator of a ratio must be the same, or need to be able to be converted to the same units.
- The order of the numbers in a ratio or a rate is irrelevant as long as the numbers are reduced.
- The ratio 8:2 can be reduced to the ratio 4.
- To make a unit rate, divide the numerator by the denominator.

Practice

Write each ratio as a fraction in lowest terms. See Examples 1 through 3.

- 18 to 28
- 25 to 30
- 3.2 to 2.4
- 2.1 to 3.5
- $\frac{2}{3}$ to $\frac{5}{6}$
- $\frac{10}{9}$ to $\frac{5}{12}$
- \$5.50 to \$8.00
- \$12.75 to \$18.50

9. $3\frac{1}{2}$ donuts to 12 donuts

10. 3 months to $9\frac{1}{2}$ months

For each ratio, change to common units in the numerator and denominator and then write each ratio as a fraction in lowest terms. See Example 6.

11. 1 dime to 4 nickels

16. 4 hours to 30 minutes

12. 5 nickels to 3 quarters

17. 18 inches to 2 feet

13. 5 dollars to 5 quarters

18. 36 inches to 2 feet

14. 6 dollars to 50 dimes

19. 8 days to 2 weeks

15. 5 minutes to 200 seconds

20. 21 days to 4 weeks

Write each rate as a fraction in lowest terms. See Example 7.

21. \$200 in profit to \$500 invested

26. 125 hits to 500 times at bat

22. \$200 in profit to \$1000 invested

27. 1500 children to 450 families

23. 2 teachers to 24 students

28. 900 children to 480 families

24. 3 teachers to 54 students

29. 25 scholarships to 210 students

25. 100 hits to 500 times at bat

30. 12 scholarships to 160 students

Write each rate as a unit rate. See Examples 9 through 11.

31. 270 miles to 4.5 hours

36. 840 words to 15 minutes

32. 245 miles to 3.5 hours

37. 2250 gallons of water to 25 people

33. 50 miles to 2 gallons of gas

38. 3600 gallons of water to 16 people

34. 60 miles to 5 gallons of gas

39. \$612 to 48 hours

35. 1260 words to 30 minutes

40. \$399 to 28 hours

Find the unit price (to the nearest tenth of a cent) of each set of items and tell which one is the better (or best) purchase. See Examples 12 and 13.

41. **Coffee beans:** 1.75 oz at \$1.99, 12 oz at \$7.99

45. **Sliced ham:** 12 oz at \$3.99, 8 oz at \$2.89

42. **Coffee:** 11.5 oz at \$3.99, 39 oz at \$8.99

46. **Frozen orange juice:** 16 fl oz at \$2.99, 12 fl oz at \$2.19

43. **Socks:** 5 pairs for \$12.50, 3 pairs for \$8.25

47. **Mayonnaise:** 8 oz at \$1.59, 16 oz at \$2.69, 32 oz at \$3.89, 64 oz at \$6.79

44. **Tennis balls:** 3-pack for \$2.99, 12-pack for \$10.98

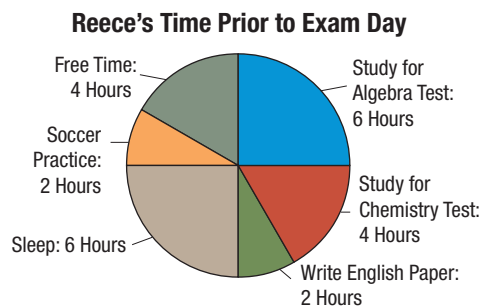
48. **Aluminum foil:** 200 sq ft at \$7.39, 75 sq ft at \$3.69, 50 sq ft at \$3.19, 25 sq ft at \$1.49

Applications

Solve.

49. A serving of three home-baked chocolate chip cookies weighs 40 grams and contains 12 grams of fat. What is the rate, in lowest terms, of fat grams to total grams?
50. In recent years, 18 out of every 100 students taking the SAT (Scholastic Aptitude Test) at a local school have scored 600 or above on the mathematics portion of the test. Write the ratio, in lowest terms, of the number of scores 600 or above to the number of scores below 600.
51. In a recent year, Albany, NY reported a total of 60 clear days, the rest being cloudy or partly cloudy. For a 365-day year, write the rate, in lowest terms, of clear days to cloudy or partly cloudy days.
52. Different sellers for an online book broker sell the same book title for a wide variety of prices. For a certain title, the highest selling price (mint condition) is \$35, while the lowest selling price is \$10. What is the ratio of the highest price to the lowest?
53. One truck can carry 9.2 tons of cargo, while a second truck can haul 11.5 tons. What is the ratio of their capacities? (**Hint:** Multiply both the numerator and denominator by 10 to remove the decimal point.)
54. If the CEO of a major corporation makes \$4,000,000 a year, and the average annual salary of the workers is \$30,000 a year, what is the ratio of the CEO's salary to that of the regular workers?
55. John has collected 7 quarters, while Walt has collected 25 dimes. How much money does Walt have compared with John's accumulation? (**Hint:** When converting the coin collections to monetary values, express them in cents.)
56. A recipe calls for 6 cups of milk and 4 cups of bread crumbs. What is the ratio of milk to bread crumbs?
57. A farmer has a long narrow rectangular piece of land. If the length is 9504 feet and the width is 1320 feet, what is the ratio of the length to the width?
58. Lemonade can be made by mixing lemon juice, sugar, and water in the ratio 1:1:6. Find the amount of each ingredient in 12 quarts of lemonade.

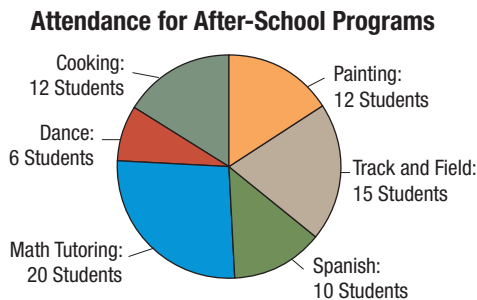
The circle graph shown here illustrates how Reece spent his time the day before his final exams. Use the information from the graph to answer the following questions.



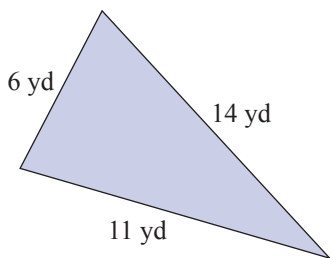
59. What is the ratio of time Reece spent studying for his algebra exam to time spent studying for his chemistry exam?

- 60. What is the ratio of time Reece spent at soccer practice to time spent sleeping?
- 61. What is the ratio of time Reece spent writing his English paper to the total number of hours in the day?
- 62. What is the ratio of time Reece spent in free time to the total number of hours in the day?

Iliana is organizing an after school program for kids in her school. The circle graph shown here illustrates the number of kids that have signed up for each session. Use the information from the graph to answer the following questions.

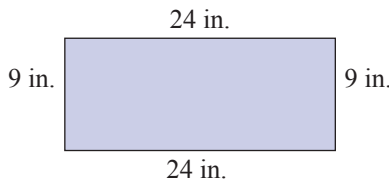


- 63. What is the ratio of children in Cooking to children in Track and Field?
- 64. What is the ratio of children in Dance to children in Spanish?
- 65. What is the ratio of children in Math Tutoring to total children in the program?
- 66. What is the ratio of children in Painting to total children in the program?



Solve.

- 67. The lengths of the sides of a triangle are 6 yd, 11 yd, and 14 yd.
 - a. Find the ratio of the length of the longest side to the length of the shortest side.
 - b. Find the ratio of the length of the shortest side to the length of the longest side.
- 68. The length of a rectangle is 24 in. and its width is 9 in.
 - a. Find the ratio of the length to the width.



- b. Find the ratio of the width to the length.
- 69. If a car consumes 9 gallons of gasoline while being driven 225 miles, what is the unit rate of the distance driven to the gasoline consumed?
- 70. A certain selective college has 18,400 applicants for 400 openings. What is the unit rate of applicants to openings?
- 71. An employer who has 6 job openings is overwhelmed with 444 applicants. What is the rate of applicants per job opening?

72. In the new office building he is designing, Steve is including 216 electrical outlets in the offices. If the building will have 36 similar sized offices, what is the unit rate of outlets to offices?
73. A benefactor donated new iPads to his local elementary school. If he gave the school 210 ipads and the school has 42 classrooms, what is the unit rate of ipads per classroom?
74. An automobile manufacturer produces 6000 cars in a week. Find their production rate of cars per day. (Assume a 5 day workweek.)
75. An office entered a local contest for best Christmas decorations and won. If the grand prize was \$1500 and the money was split evenly between all 24 employees, what were the dollar per person winnings?
76. A restaurant charges a flat fee of \$6.50 to fill up a salad bowl with whatever you want from their salad bar. If the salad Marianita made weighed 12.5 ounces, what was its cost per ounce?
77. Suppose a baseball player has a batting average of .300. What does this indicate?
78. Suppose a baseball player has a batting average of .280. What does this indicate?
79. A store sells 42-gallon trash bags in two different amounts. If you can buy a box of 50 trash bags for \$25.98 or a box of 24 trash bags for \$14.98, which option is the better deal per trash bag?
80. A landscaping company needs to purchase grass seed to plant a new lawn. Brand A sells 225 square feet worth of seed for \$29.97. Brand B sells 400 square feet worth of seed for \$55.97. Which option should they go with?
81. A shopper paid \$2.12 for 4 pounds of bananas. What was the price per pound of bananas?
82. A carton of 18 free-range organic eggs costs \$5.94. What is the cost per egg?
83. A 24-pack of 12-ounce cans of cola costs \$6.00. What is the price per can?
84. A 24-pack of 16.9-ounce bottles of water is sold for \$3.84. What is the price per bottle of water?
85. A shopper buys a 14-ounce bag of candy for \$5.99 and uses a coupon for \$1 off. What is the price per ounce after the discount?
86. A shopper buys a 24-pack of 3-ounce cans of cat food for \$16.18 and uses a coupon for \$3.25 off. What is the price per can after the discount?
87. A car travels 441 miles and uses 14 gallons of gas. The fuel efficiency rating for the car is advertised to be 33 miles per gallon.
- Find the rate of miles per gallon for the car.
 - Does the car's mileage per gallon match the advertised mileage per gallon? If not, is it higher or lower?
88. A receptionist at a luxury spa sold 32 memberships during her 5-day work week. She is required to sell an average of 6 memberships per work day.
- Find the rate of memberships per day that the receptionist sold.
 - Does the average number of membership sales by the receptionist match her daily quota? If not, is it higher or lower?



Highest Batting Average

As of 2019, Ty Cobb holds the record for the highest batting average in Major League Baseball, at .366 or .367, depending on the source. He achieved this over 11,434 total career at bats.

89. A motorist drives along an interstate highway for 3 hours and travels a total of 189 miles. The posted speed limit is 65 miles per hour. Does the motorist's average speed (in miles per hour) match the posted speed limit? If not, is it higher or lower?
90. A nurse sets up a 750 milliliter bag of intravenous solution. The bag empties in 5 hours. The patient's doctor prescribed the solution to be administered at a rate of 150 milliliters per hour. Does the rate that the nurse set the bag at match the prescribed rate? If not, is it higher or lower?

Writing & Thinking

91. Demonstrate three different ways the ratio comparing 5 apples to 3 apples can be written. Choose one form and explain why it is the preferred form when using ratios in a math course.
92. Give an example of when the use of ratios or rates might be relevant in a real life situation.
93. In your own words, define each of the following terms.
- Rate
 - Unit rate
 - Price per unit
94. When finding price per unit, will monetary units be located in the numerator or the denominator of the rate?