

2.5 Exercises

Concept Check

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

1. When two quantities are compared by division, the comparison is called a _____.
2. A unit rate is a rate with denominator _____.
3. To find a unit price (or price per unit), divide the _____ by the number of units.
4. A proportion is true if the _____ are equal
5. To solve a word problem using a proportion, the first step is to _____ the unknown quantity.
6. When setting up a proportion to solve a word problem, the same _____ should be compared in the same order.

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.)

7. 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.
8. To make a unit rate, divide the numerator by the denominator.
9. A proportion is a statement that two ratios are being multiplied.
10. When using proportions to solve a word problem, there is only one correct way to set up the proportion.

Practice

Write each ratio as a fraction in lowest terms. See Example 1.

- | | |
|-------------------------------------|---------------------------------------|
| 1. 18 to 28 | 5. \$5.50 to \$8.00 |
| 2. 2.1 to 3.5 | 6. \$12.75 to \$18.50 |
| 3. $\frac{2}{3}$ to $\frac{5}{6}$ | 7. $3\frac{1}{2}$ donuts to 12 donuts |
| 4. $\frac{10}{9}$ to $\frac{5}{12}$ | 8. 3 months to $9\frac{1}{2}$ months |

Write each rate as a fraction in lowest terms. See Example 4.

- | | |
|--|-------------------------------|
| 9. \$200 in profit to \$500 invested | 11. 2 teachers to 24 students |
| 10. \$200 in profit to \$1000 invested | 12. 3 teachers to 54 students |

13. 1500 children to 450 families

15. 25 scholarships to 210 students

14. 900 children to 480 families

16. 12 scholarships to 160 students

Write each rate as a unit rate. See Example 5.

17. 270 miles to 4.5 hours

21. 1260 words to 30 minutes

18. 245 miles to 3.5 hours

22. 840 words to 15 minutes

19. 50 miles to 2 gallons of gas

23. \$612 to 48 hours

20. 60 miles to 5 gallons of gas

24. \$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 buy. See Example 6.

25. **Coffee beans:** 1.75 oz at \$1.99, 12 oz at \$7.9929. **Sliced ham:** 12 oz at \$3.99, 8 oz at \$2.8926. **Coffee:** 11.5 oz at \$3.99, 39 oz at \$8.9930. **Frozen orange juice:** 16 fl oz at \$2.99, 12 fl oz at \$2.1927. **Socks:** 5 pairs for \$12.50, 3 pairs for \$8.2531. **Mayonnaise:** 8 oz at \$1.59, 16 oz at \$2.69, 32 oz at \$3.89, 64 oz at \$6.7928. **Tennis balls:** 3-pack for \$2.99, 12-pack for \$10.9832. **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

Determine whether each proportion is true or false. See Example 7.

33. $\frac{3}{6} = \frac{4}{8}$

39. $\frac{12}{18} = \frac{14}{21}$

34. $\frac{9}{8} = \frac{7}{6}$

40. $\frac{11}{22} = \frac{17}{34}$

35. $\frac{2}{5} = \frac{4}{10}$

41. $\frac{7}{16} = \frac{3\frac{1}{2}}{8}$

36. $\frac{3}{5} = \frac{6}{10}$

42. $\frac{10}{17} = \frac{5}{8\frac{1}{2}}$

37. $\frac{2}{3} = \frac{66}{100}$

43. $\frac{6}{1.56} = \frac{2}{0.52}$

38. $\frac{1}{3} = \frac{33}{100}$

44. $\frac{8.5}{6.5} = \frac{4.5}{3.5}$

Solve each proportion. See Example 8.

$$45. \frac{5}{4} = \frac{x}{8}$$

$$46. \frac{3}{6} = \frac{6}{x}$$

$$47. \frac{1}{2} = \frac{x}{100}$$

$$48. \frac{3}{5} = \frac{R}{100}$$

$$49. \frac{3}{5} = \frac{60}{D}$$

$$50. \frac{8}{B} = \frac{6}{30}$$

$$51. \frac{x}{1} = \frac{1\frac{1}{4}}{5}$$

$$52. \frac{1}{5} = \frac{x}{7\frac{1}{2}}$$

$$53. \frac{150}{300} = \frac{R}{100}$$

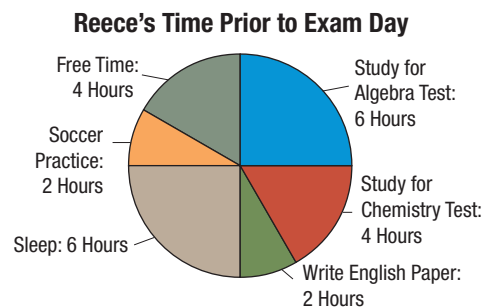
$$54. \frac{98}{100} = \frac{B}{35}$$

$$55. \frac{3}{2} = \frac{B}{4.5}$$

$$56. \frac{7}{x} = \frac{2}{6.5}$$

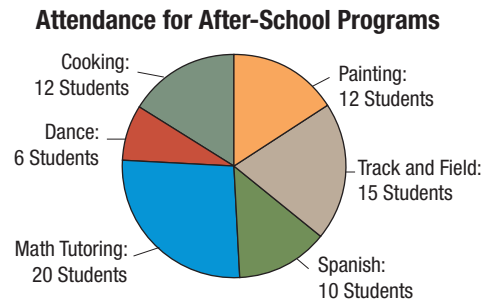
Applications

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.



57. What is the ratio of time Reece spent studying for his algebra exam to time spent studying for his chemistry exam?
58. What is the ratio of time Reece spent at soccer practice to time spent sleeping?
59. What is the ratio of time Reece spent writing his English paper to the total number of hours in the day?
60. What is the ratio of time Reece spent in free time to the total number of hours in the day?

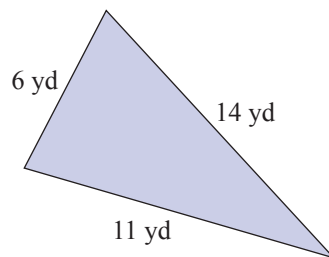
Iliana is organizing an after school program for kids in her school. The circle graph shown here illustrates the number of kids that have signed up for each session. Use the information from the graph to answer the following questions.



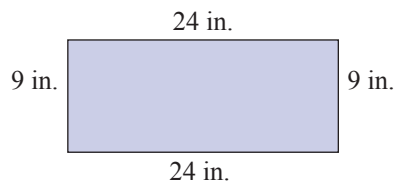
61. What is the ratio of children in Cooking to children in Track and Field?
62. What is the ratio of children in Dance to children in Spanish?
63. What is the ratio of children in Math Tutoring to total children in the program?
64. What is the ratio of children in Painting to total children in the program?

Solve.

65. 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.



66. 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.
67. If a car consumes 9 gallons of gasoline after being driven 225 miles, what is the unit rate of the distance driven to the gasoline consumed?
68. A certain selective college has 18,400 applicants for 400 openings. What is the unit rate of applicants to openings?

69. A store sells 42-gallon trash bags in two different sizes. 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?
70. 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?
71. A carton of 18 free-range organic eggs costs \$5.94. What is the cost per egg?
72. A 24-pack of 16.9-ounce bottles of water is sold for \$3.84. What is the price per bottle of water?
73. 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?
74. 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?
75. 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?
76. One propane heater will operate for $2\frac{2}{5}$ hours on $4\frac{2}{3}$ pounds of propane, while a second heater will operate for $4\frac{4}{5}$ hours on $9\frac{1}{3}$ pounds of propane. Determine if they operate at the same efficiency.
77. One olive press will extract 3.2 cups of oil from 15.6 pounds of olives, while the second press will extract 9.5 cups of oil from 48.8 pounds of olives. Assuming that the olives came from the same batch, determine if the two presses operate at the same efficiency.
78. When making a small "Energizing" scented candle, 5 drops of pepper scent and 3 drops of lemongrass scent are added to the wax. When making a large "Energizing" scented candle 35 drops of peppermint scent and 21 drops of lemongrass scent are added to the wax. Determine if the ratio of peppermint scent to lemongrass scent is the same for each size candle.
79. While competing in a speed run to complete the first level of a video game, Alex scores a total of 2352 points in 98 seconds. Shannon scored a total of 2314 points in 89 seconds. Determine if the ratio of points per second is the same for Alex and Shannon.

80. An English teacher must read and grade 27 essays. If the teacher takes 20 minutes to read and grade 3 essays, how much time will he need to grade all 27 essays?
81. A salesman figured he drove 560 miles every two weeks. How far would he drive in three months (12 weeks)?
82. Two units of a certain gas weigh 175 grams. What is the weight of 5 units of this gas?
83. A typist can type 8 pages of a manuscript in 56 minutes. How long will this typist take to type 300 pages?
84. Sales tax is figured at 6¢ for every \$1.00 of merchandise purchased. What is the purchase price on an item that had sales tax of \$2.04?
85. A sales woman makes \$8 for every \$100 worth of product that she sells. What will she make if she sells \$5000 worth of product?
86. If you can drive 286 miles in $5\frac{1}{2}$ hours, how long will it take you to drive 468 miles at the same rate of speed?
87. An architect drew plans for a city park using a scale of $\frac{1}{4}$ inch to represent 25 feet. How many feet would 2 inches represent?
88. One bag of dichondra lawn food contains 20 pounds of fertilizer and its recommended coverage is 4000 square feet. If you want to cover a lawn that is in the shape of a rectangle 120 feet by 160 feet, how many pounds of lawn food do you need?

Writing & Thinking

89. When finding price per unit, will monetary units be located in the numerator or the denominator of the rate?
90. A problem states:
- “On a map from Detroit to Chicago, the distance is 4 inches. The actual distance is 300 miles. What is the distance on the map for an actual distance of 750 miles?”
 - When Traci set up this problem, her proportion was:
$$\frac{4 \text{ inches}}{300 \text{ miles}} = \frac{750 \text{ miles}}{x \text{ inches}}$$
 Explain and correct the problem/s with Traci’s proportion.