Completion Example Answers

2. $\frac{91}{4}, \frac{91}{4}$; equal, true **7.** $3 \cdot 6$; 18; 18; $\frac{36}{5}$ **11.** 3, 2; $\frac{15}{2} = \frac{x \cdot 2}{2}$; $\frac{15}{2}$; $\frac{15}{2}$

12. 2.5, 6; $\frac{2.5 \cdot x}{2.5} = \frac{1800}{2.5}$; 720; 720

Margin Exercise Answers

1. a. False **b.** False **c.** True **2.** False **3.** $x = 20$ **4.** $y = 49$ **5.** $y = 16$ **6.** $x = 60$ **7.** $z = \frac{3}{8}$

8. 12 pounds **9.** 126 voted in Precinct 2 **10.** \$64 **11.** 26 hours **12.** 14 students **13.** 10 hr

3.11 Exercises

Concept Check

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

1. A proportion is true if the _____ _____ are equal.

2. When two fractions are equal to each other, a/an _____ is created.

3. The cross products of $\frac{r}{k} = \frac{t}{f}$ are _____ and _____.

4. To solve a word problem using a proportion, the first step is to _____ the unknown quantity.

5. 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.)

6. A proportion is a statement that two ratios are being multiplied.

7. Cross canceling is used to determine if a proportion is true.

8. In order to solve the proportion $\frac{16}{32} = \frac{x}{18}$ we construct the equation $32x = 288$.

9. When using proportions to solve a word problem, there is only one correct way to set up the proportion.

10. The proportions $\frac{36 \text{ tickets}}{\$540} = \frac{x \text{ tickets}}{\$75}$ and $\frac{x \text{ tickets}}{36 \text{ tickets}} = \frac{\$75}{\$540}$ will yield the same answer.

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Practice

Determine whether each proportion is true or false. See Examples 1 and 2.

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

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

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

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

5. $\frac{12}{15}=\frac{20}{25}$

6. $\frac{19}{16}=\frac{20}{17}$

7. $\frac{1}{4}=\frac{25}{100}$

8. $\frac{7}{8}=\frac{875}{1000}$

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

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

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

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

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

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

15. $\frac{3\frac{1}{5}}{\frac{2}{5}}=\frac{3\frac{3}{5}}{\frac{3}{5}}$

16. $\frac{1\frac{1}{4}}{1\frac{1}{2}}=\frac{\frac{1}{4}}{\frac{1}{2}}$

17. $\frac{6}{57}=\frac{2}{19}$

18. $\frac{15}{12}=\frac{30}{24}$

19. $\frac{85}{65}=\frac{45}{35}$

20. $\frac{12}{17}=\frac{36}{51}$

Solve each proportion. See Examples 3 through 7.

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

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

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

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

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

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

27. $\frac{A}{3}=\frac{7}{2}$

28. $\frac{6}{x}=\frac{5}{7}$

29. $\frac{\frac{1}{2}}{x}=\frac{5}{10}$

30. $\frac{\frac{1}{3}}{x}=\frac{3}{9}$

31. $\frac{1}{4}=\frac{1\frac{1}{2}}{y}$

32. $\frac{1}{12}=\frac{1\frac{2}{3}}{x}$

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

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

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

36. $\frac{A}{450}=\frac{30}{100}$

37. $\frac{A}{42}=\frac{65}{100}$

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

39. $\frac{3}{2}=\frac{B}{4\frac{1}{2}}$

40. $\frac{7}{x}=\frac{2}{6\frac{1}{10}}$

41. $\frac{3\frac{1}{2}}{2\frac{3}{5}}=\frac{10\frac{1}{2}}{B}$

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42. $\dfrac{7\frac{1}{5}}{y} = \dfrac{4\frac{4}{5}}{14\frac{2}{5}}$

43. $\dfrac{7\frac{4}{5}}{1\frac{3}{10}} = \dfrac{x}{\frac{1}{4}}$

44. $\dfrac{4\frac{1}{10}}{3\frac{1}{5}} = \dfrac{x}{6\frac{2}{5}}$

45. $\dfrac{13\frac{1}{2}}{B} = \dfrac{15}{100}$

46. $\dfrac{19\frac{1}{5}}{96} = \dfrac{R}{100}$

47. 120 mL : 2 hr :: 1500 mL : x hr

48. x mL : 3 hr :: 1800 mL : 12 hr

49. 3 grams : x ounces :: 12 grams : 80 ounces

50. $2\frac{1}{2}$ .grams : 18 ounces :: x grams : 54 ounces

51. 50 mg : 30 min :: 225 mg : x min

52. x mg : 45 min :: 240 mg : 120 min

Applications

Solve.

53. The quality of concrete is based on the ratio of bags of cement to cubic yards of gravel. One batch of concrete consists of 27 bags of cement mixed into 9 cubic yards of gravel, while a second has 15 bags of cement mixed with 5 cubic yards of gravel. Determine whether the ratio of cement to gravel is the same for both batches.

54. Two children were selling lemonade at different stands. At the first stand the child mixed 2 cups of lemon juice with 8 cups of water, while at the second stand 3 cups of lemon juice were mixed with 13 cups of water. Determine if the two lemonades are of the same strength.

55. 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.

56. One olive press will extract 3 cups of oil from 16 pounds of olives, while the second press will extract 10 cups of oil from 50 pounds of olives. Assuming that the olives came from the same batch, determine if the two presses operate at the same efficiency.

57. A florist sells a bouquet of 12 red roses for $46 and a bouquet of 18 red roses for $62. Determine if the cost per rose is the same for each bouquet.

58. To color 1 cup of frosting the color of a granny smith apple, 10 drops of green and 25 drops of yellow food coloring are used. To color a larger amount of frosting, 28 drops of green and 65 drops of yellow food coloring are used. Determine if the ratio of green to yellow food coloring is the same for each batch of frosting.

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59. When making a small "Energizing" scented candle, 5 drops of peppermint 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.

60. 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.

61. If the odds on a horse are that a $1 bet wins $5 if the horse wins, how much can be won with a $5 bet?

62. If a cat normally catches 3 mice in a day, how many would you expect it to catch in a week?

63. 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?

64. A salesman determined that he drove 560 miles every two weeks. How far would he drive in three months (12 weeks)?

65. If one dozen (12) eggs cost $2, what would three dozen eggs cost?

66. If 1 inch represents 35 miles on a map, how many miles do $4\frac{2}{5}$ inches represent?

67. If 2 cups of flour are needed to make 12 biscuits, how much flour is needed to make 9 of the same kind of biscuits?

68. A baseball team bought 8 bats for $96. What would they pay for 10 bats?

69. A baseball player gets 22 hits in 4 weeks. How many hits would you expect him to get in 6 weeks?

70. If property taxes are figured at $15 for every $1000 in evaluation, what taxes will be paid on a home valued at $85,000?

71. Two units of a certain gas weigh 180 grams. What is the weight of 5 units of this gas?

72. A typist can type 8 pages of a manuscript in 56 minutes. How long will this typist take to type 300 pages?

73. The price of a certain fabric is $3 per yard. How many yards can be bought with $60 (not including tax)?

74. A store receives 6 returns for every 100 sales made during a week. If the store receives 204 returns, how many sales were made?

75. 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?

76. An investor made $144 in one year on a $1000 investment. What would she have earned if her investment had been $4500?

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77. 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?

78. 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?

79. One bag of Weed Killer & Fertilizer contains 18 pounds of fertilizer and weed treatment with a recommended coverage of 2700 square feet. If your lawn is in the shape of a rectangle 150 feet by 220 feet, how many pounds of Weed Killer & Fertilizer do you need to cover the lawn?

80. 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?

81. A condominium owner pays property taxes of $1920 per year. If taxes are figured at a rate of $12 for every $1000 in value, what is the value of the condominium?

82. You can buy 3 quarts of blueberries at a farmers market for $21. What would be the cost of 9 quarts of blueberries?

83. If a 4-year-old laughs 300 times per day on average, how many times does the child laugh in a year (assuming 365 days in a year)?

84. An electric fan makes 180 revolutions per minute. How many revolutions will the fan make if it runs for 24 hours?

Writing & Thinking

85. In your own words, clarify how you can know that a proportion is set up correctly or not.

86. List the steps to solve a word problem using a proportion.

87. 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.

88. Give an example when the use of proportions would be helpful (outside of a class).

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