3.2 Exercises

Concept Check

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

1. Any integer can be written in fraction form with denominator _____.
2. Finding a fraction "of" a number requires _____.
3. To reduce a fraction to lowest terms, divide out any common _____.
4. If all the factors in the numerator or denominator are divided out, then _____ must be used as a factor.
5. To multiply and reduce at the same time, divide numerators and denominators by _____ factors.
6. Finding _____ factorizations may help in multiplying and reducing at the same time.

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. Multiplication can be used to find $\frac{1}{2}$ of $\frac{2}{9}$.
8. $-\frac{3}{4}\cdot\frac{9}{10}=-\frac{27}{40}$
9. The statement $\frac{1}{3}\cdot\frac{2}{5}=\frac{2}{5}\cdot\frac{1}{3}$ is an example of the associative property of multiplication.
10. The number 1 is always a factor of the numerator and the denominator.

Practice

Multiply. See Examples 1 and 2.

1. $\frac{1}{2}\cdot\frac{3}{4}$
2. $\frac{3}{5}\cdot\frac{1}{2}$
3. $-\frac{2}{5}\cdot\frac{2}{5}$
4. $-\frac{3}{7}\cdot\frac{3}{7}$
5. $\frac{0}{3}\cdot\frac{5}{7}$
6. $\frac{0}{4}\cdot\frac{7}{6}$
7. $\frac{4}{1}\cdot\frac{3}{1}$
8. $\frac{2}{1}\cdot\frac{5}{1}$
9. $\frac{3}{5}\left(-\frac{4}{7}\right)$
10. $\frac{2}{3}\left(-\frac{5}{11}\right)$
11. $\left(-\frac{5}{8}\right)\left(-\frac{3}{4}\right)$
12. $\left(-\frac{7}{6}\right)\left(-\frac{5}{2}\right)$
13. $\frac{15}{1}\cdot\frac{3}{2}$
14. $\frac{6}{5}\cdot\frac{7}{1}$
15. $-\frac{1}{2}\cdot\frac{3}{7}\cdot\frac{9}{2}$
16. $-\frac{7}{3}\cdot\frac{2}{5}\cdot\frac{1}{9}$
17. $\left(-\frac{7}{8}\right)\left(\frac{7}{9}\right)\left(-\frac{7}{3}\right)$
18. $\left(\frac{8}{5}\right)\left(-\frac{4}{3}\right)\left(-\frac{7}{1}\right)$

19. Find $\frac{1}{4}$ of $\frac{1}{2}$.

20. Find $\frac{1}{7}$ of $\frac{1}{2}$.

21. Find $\frac{2}{3}$ of $-\frac{2}{15}$.

22. Find $\frac{4}{7}$ of $-\frac{3}{5}$.

23. Find $\frac{1}{3}$ of $\frac{2}{3}$.

24. Find $\frac{1}{4}$ of $\frac{3}{4}$.

Reduce each fraction to lowest terms. If it is already in lowest terms, simply rewrite the fraction. See Examples 5 through 8.

25. $\frac{3}{9}$

26. $\frac{2}{8}$

27. $-\frac{9}{12}$

28. $-\frac{6}{20}$

29. $\frac{5}{11}$

30. $\frac{7}{13}$

31. $\frac{0}{25}$

32. $\frac{0}{16}$

33. $\frac{16}{-40}$

34. $\frac{14}{-36}$

35. $\frac{16}{32}$

36. $\frac{25}{50}$

37. $\frac{42}{63}$

38. $\frac{64}{96}$

39. $\frac{-25}{76}$

40. $\frac{-12}{35}$

41. $\frac{48}{12}$

42. $\frac{72}{36}$

43. $-\frac{75}{100}$

44. $-\frac{50}{75}$

45. $\frac{-150}{-135}$

46. $\frac{-140}{-112}$

47. $\frac{390}{260}$

48. $\frac{560}{420}$

49. $\frac{-7n}{28n}$

50. $\frac{-5q}{20q}$

51. $\frac{34x}{-51x^2}$

52. $\frac{-30x}{45x^2}$

53. $\frac{-54a^2}{-9ab}$

54. $\frac{48y}{-8xy^2}$

55. $\frac{-14xyz}{-63xz}$

56. $\frac{-18r^2st^3}{-40r^2st}$

Multiply and reduce to lowest terms. See Examples 10 through 14. (**Hint:** Factor before multiplying.)

57. $\frac{1}{3}\cdot\frac{3}{4}$

58. $\frac{3}{7}\cdot\frac{5}{3}$

59. $\left(-\frac{1}{5}\right)\left(-\frac{4}{7}\right)$

60. $\left(-\frac{3}{5}\right)\left(-\frac{2}{7}\right)$

61. $\frac{7}{8}\cdot\frac{9}{14}$

62. $\frac{6}{7}\cdot\frac{5}{12}$

63. $\frac{10}{18}\cdot\frac{9}{5}$

64. $\frac{8}{10}\cdot\frac{5}{4}$

65. $-\frac{2}{21}\cdot\frac{15}{22}$

66. $-\frac{3}{16}\cdot\frac{20}{21}$

67. $\left(-\frac{15}{27}\right)\left(\frac{9}{30}\right)$

68. $\left(-\frac{25}{9}\right)\left(\frac{3}{100}\right)$

69. $8\cdot\frac{5}{12}$

70. $9\cdot\frac{7}{24}$

71. $\left(\frac{32}{20}\right)\left(\frac{13}{9}\right)\left(-\frac{7}{26}\right)$

72. $\left(\frac{20}{32}\right)\left(-\frac{9}{13}\right)\left(\frac{26}{7}\right)$

73. $\left(-\frac{17}{100}\right)\cdot\frac{27}{34}\cdot\frac{25}{9}\cdot(-6)$

74. $\frac{13}{28}\cdot\left(-\frac{7}{9}\right)\cdot\left(-\frac{45}{39}\right)\cdot 4$

75. $\dfrac{5xy}{16x^2y^2} \cdot \dfrac{16x^2y}{15y}$

76. $\dfrac{14a^2b^3}{9a^2b} \cdot \dfrac{3a^2}{14ab^2}$

77. $\dfrac{35a^2b^3c}{20ab^2c^2} \cdot \dfrac{36ac^3}{14a^2bc^2}$

78. $\dfrac{15r^3s^2t}{85r^2s^4t^2} \cdot \dfrac{34rs^3t}{9r^2s}$

79. $\dfrac{-9a}{10b} \cdot \dfrac{35a}{40} \cdot \dfrac{25b}{15a}$

80. $\dfrac{5x}{12xy} \cdot \dfrac{-56}{42x} \cdot \dfrac{90}{54}$

Applications

Solve.

81. A pizza is to be cut into fourths. Each of these fourths is to be cut into thirds. What fraction of the pizza is each of the final pieces?

82. One of Maria's birthday presents was a box of candy. Half of the candy was chocolate covered and one-fourth of the chocolate-covered candy had cherries inside. What fraction of the candy were chocolate-covered cherries?

83. A recipe calls for $\frac{3}{4}$ cups of flour. How much flour should be used if only half of the recipe is to be made?

84. In a box of ink cartridges for a printer, $\frac{5}{6}$ of the cartridges are not black ink. Of these nonblack ink cartridges, $\frac{1}{2}$ are magenta. What fraction of the cartridges are magenta?

85. Of the books in a personal library, $\frac{3}{4}$ are fiction. Of these fiction books, $\frac{3}{5}$ are paperback. What fraction of the books in the library are fiction and paperbacks?

86. While shopping for a new smartphone, Jasmine found that $\frac{2}{3}$ of the smartphones within her budget have the ability to record high-definition videos. Of these smartphones, $\frac{2}{5}$ have 64 GB of memory. What fraction of the smartphones within her budget can take high-definition video and have 64 GB of memory?

87. A glass is 8 inches tall. If the glass is $\frac{3}{4}$ full of water, what is the height of the water in the glass?

88. A study showed that $\frac{3}{5}$ of the students in an elementary school were left-handed. If the school had an enrollment of 600 students, how many were left-handed?

89. A hexagonal dance floor has a total area of 720 square feet. If the floor separates into 6 triangles, each of which is $\frac{1}{6}$ the total area, find the area of one of the triangles.

90. If you go on a bicycle trip of 75 miles in the mountains and $\frac{1}{5}$ of the trip is downhill, what fraction of the trip is not downhill? How many miles are not downhill?

91. Suppose that a ball is dropped from a height of 40 feet, and that each time the ball bounces, it bounces back to $\frac{1}{2}$ the height it dropped. How high will the ball bounce on its third bounce?

92. You have a wire that is 40 cm long. If you take $\frac{3}{4}$ of the wire and bend it into a square, find the length of one side of the square. You may want to draw a figure to help solve the problem. (**Hint:** $s = \frac{P}{4}$ where s is the side length of one side of the square and P is the perimeter of the square.)

93. The student senate has 75 members, and $\frac{7}{15}$ of them are women. A change in the senate constitution is being considered, and at the present time (before debating has begun), a survey shows that $\frac{3}{5}$ of the women and $\frac{4}{5}$ of the men are in favor of this change.

a. How many women are on the student senate?

b. How many women on the senate are in favor of the change?

c. If the change requires $\frac{2}{3}$ majority vote in favor to pass, would the change pass if the vote were taken today?

d. By how many votes would the change pass or fail?

94. There are 3000 students at Mountain High School, and $\frac{1}{4}$ of these students are seniors. If $\frac{3}{5}$ of the seniors are in favor of the school forming a debating team and $\frac{7}{10}$ of the remaining students (not seniors) are also in favor of forming a debating team, how many students do not favor this idea?

95. There are 4000 registered voters in Roseville and $\frac{3}{8}$ of these voters are registered Democrats. A survey indicates that $\frac{2}{3}$ of the registered Democrats are in favor of Bond Measure A and $\frac{3}{5}$ of the other registered voters are in favor of this measure.

a. How many of the voters are registered Democrats?

b. How many of the voters are not registered Democrats?

c. How many of the registered Democrats favor Measure A?

d. How many of the registered voters favor Measure A?

96. A man can read $\frac{1}{5}$ of a book in 3 hours. If the book contains 450 pages, how many pages can he read in 3 hours?

Writing &Thinking

97. If two fractions are between 0 and 1, can their product be more than 1? Explain.

98. List the steps you would use in using prime factorization to reduce a fraction.

99. Explain the process of multiplying two fractions. Give an example of a product that cannot be reduced.