15. Simplify the expression:

$$-\frac{3}{4}-\frac{1}{2y}$$

Example 15 Subtracting Fractions Containing Variables

Subtract: $\frac{1}{6y}-\frac{5}{18}$

Solution

Step 1: The LCD is $18y$.

Step 2: Steps 2, 3, and 4 can be written in one step.

$$\frac{1}{6y}-\frac{5}{18}=\frac{1}{6y}\cdot\frac{\mathbf{3}}{\mathbf{3}}-\frac{5}{18}\cdot\frac{\boldsymbol{y}}{\boldsymbol{y}}=\frac{3}{18y}-\frac{5y}{18y}=\frac{3-5y}{18y}$$

Notice that this fraction cannot be reduced because there are no common factors in the numerator and denominator.

Now work margin exercise 15.

Margin Exercise Answers

1. a. $\frac{4}{7}$ **b.** $-\frac{2}{3}$ **2.** 18 **3.** $-\frac{3}{20}$ **4.** $\frac{5}{12}$ **5.** $\frac{27}{20}$ or $1\frac{7}{20}$ **6.** $\frac{13}{30}$, \$13,000 **7.** $\frac{1}{5}$ **8.** $\frac{2}{55}$ **9.** $\frac{9}{20}$ **10.** $\frac{31}{12}$ or $2\frac{7}{12}$ **11.** $\frac{1}{15}$ of their losses were by exactly 5 runs **12.** $\frac{8}{c}$ **13.** $\frac{10+3x}{5x}$ **14.** $\frac{7x+2}{28}$ **15.** $\frac{-3y-2}{4y}$

3.6 Exercises

Concept Check

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

1. When adding fractions, it is important that the _____ are the same before adding.

2. LCD stands for _____ _____ _____.

3. The LCD is the least common multiple of the _____.

4. When subtracting fractions with the same denominator, _____ the numerators and keep the _____ _____.

5. In subtraction with fractions with different denominators, each fraction is changed to a/an _____ fraction with the LCD as its denominator.

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. The final step in adding fractions is to reduce, if possible.

7. The process for finding the LCD is the same as the process for finding the LCM.

8. LCD represents the Least Common Digit.

9. When subtracting fractions, simply subtract the numerators and the denominators.

10. Subtraction of fractions requires that the fractions have the same denominators.

Practice

Add and reduce to lowest terms. See Examples 1 through 5.

1. $\frac{3}{4}+\frac{3}{4}$

2. $\frac{7}{9}+\frac{8}{9}$

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

4. $-\frac{9}{10}+\left(-\frac{1}{10}\right)$

5. $\frac{1}{20}+\frac{3}{20}$

6. $\frac{3}{25}+\frac{12}{25}$

7. $\frac{4}{12}+\left(-\frac{5}{12}\right)$

8. $\frac{6}{13}+\left(-\frac{9}{13}\right)$

9. $\frac{1}{8}+\frac{3}{8}+\frac{2}{8}$

10. $\frac{5}{14}+\frac{4}{14}+\frac{1}{14}$

11. $\frac{5}{8}+\frac{3}{4}$

12. $\frac{5}{6}+\frac{2}{3}$

13. $-\frac{7}{15}+\frac{3}{5}$

14. $-\frac{15}{16}+\frac{1}{4}$

15. $\frac{7}{9}+\frac{3}{5}$

16. $\frac{5}{6}+\frac{2}{7}$

17. $\frac{1}{4}+\frac{5}{6}$

18. $\frac{2}{9}+\frac{5}{6}$

19. $-\frac{2}{5}+\left(-\frac{7}{20}\right)$

20. $-\frac{3}{4}+\left(-\frac{1}{12}\right)$

21. $\frac{1}{12}+\frac{2}{3}+\frac{1}{4}$

22. $\frac{5}{18}+\frac{1}{2}+\frac{4}{9}$

23. $\frac{2}{5}+\frac{3}{10}+\frac{3}{20}$

24. $\frac{2}{7}+\frac{4}{21}+\frac{1}{3}$

25. $\frac{1}{4}+\left(-\frac{1}{20}\right)+\frac{8}{15}$

26. $-\frac{1}{5}+\frac{2}{15}+\frac{1}{6}$

27. $-\frac{2}{5}+\left(-\frac{3}{10}\right)+\frac{3}{20}$

28. $-\frac{1}{3}+\frac{5}{36}+\left(-\frac{7}{18}\right)$

29. $\frac{3}{10}+\frac{1}{100}+\frac{7}{1000}$

30. $\frac{7}{10}+\frac{5}{100}+\frac{3}{1000}$

31. $5+\frac{1}{10}+\frac{3}{100}+\frac{4}{1000}$

32. $8+\frac{1}{10}+\frac{9}{100}+\frac{1}{1000}$

Subtract and reduce to lowest terms. See Examples 7 through 10.

33. $\frac{9}{10}-\frac{3}{10}$

34. $\frac{7}{8}-\frac{5}{8}$

35. $\frac{1}{12}-\frac{7}{12}$

36. $\frac{1}{15}-\frac{4}{15}$

37. $-\frac{5}{9}-\frac{1}{9}$

38. $-\frac{4}{11}-\frac{6}{11}$

39. $\frac{5}{6}-\frac{1}{3}$

40. $\frac{5}{6}-\frac{1}{2}$

41. $\frac{1}{16}-\frac{3}{8}$

42. $\frac{2}{3}-\frac{7}{6}$

43. $\frac{5}{4}-\frac{3}{5}$

44. $\frac{2}{3}-\frac{2}{7}$

45. $-\frac{5}{12}-\left(-\frac{1}{6}\right)$

46. $-\frac{31}{40}-\left(-\frac{5}{8}\right)$

47. $1-\frac{9}{10}$

48. $1-\frac{1}{16}$

49. $2-\frac{9}{16}$

50. $6-\frac{2}{3}$

51. $\frac{14}{35}-\frac{12}{30}$

52. $\frac{20}{35}-\frac{24}{42}$

53. $\frac{9}{10}-\frac{3}{100}$

54. $\frac{6}{10}-\frac{17}{100}$

55. $\frac{76}{100}-\frac{7}{10}$

56. $\frac{54}{100}-\frac{5}{10}$

57. $-\frac{5}{14}-\frac{5}{7}$

58. $-\frac{1}{3}-\frac{2}{15}$

59. $\frac{5}{7}-\left(-\frac{11}{14}\right)$

60. $\frac{9}{10}-\left(-\frac{4}{15}\right)$

Find each sum or difference. See Examples 12 through 15.

61. $\frac{3}{5x}+\frac{7}{5x}$

62. $\frac{5}{3n}+\frac{10}{3n}$

63. $\frac{8}{x}+\frac{1}{9}$

64. $\frac{3}{11}+\frac{6}{y}$

65. $\frac{5}{12}+\frac{y}{18}$

66. $\frac{x}{7}+\frac{5}{14}$

67. $\frac{2}{5}-\frac{7}{15x}$

68. $\frac{5}{6}-\frac{4}{5y}$

69. $-\frac{1}{2}+\frac{5}{4y}-\frac{1}{6}$

70. $\frac{2}{3}-\frac{4}{5}-\frac{7}{15y}$

71. $-\frac{1}{6}+\frac{5x}{8}-\frac{11}{12}$

72. $-\frac{x}{3}-\frac{7}{18}+\frac{5}{6}$

Applications

Solve.

73. Three pieces of mail weigh $\frac{1}{2}$ ounce, $\frac{1}{5}$ ounce, and $\frac{3}{10}$ ounce. What is the total weight of the letters?

74. Using a microscope, a scientist measures the diameters of three hairs to be $\frac{1}{1000}$ inch, $\frac{3}{1000}$ inch, and $\frac{1}{100}$ inch. What is the total of these three diameters?

75. A machinist drills four holes in a straight line. Each hole has a diameter of $\frac{1}{10}$ inch and there is $\frac{1}{4}$ inch between the holes. What is the distance between the outer edges of the first and last holes?

76. A notebook contains a piece of cardboard as a back cover that is $\frac{1}{16}$ inch thick. It has a front cover that is $\frac{1}{4}$ inch thick. All together, the sheets of paper between the front and back are $\frac{3}{10}$ inch thick. What is the total thickness of the notebook?

77. A carpenter is installing baseboard and toe molding. If the baseboard is $\frac{3}{8}$ inch thick and the toe molding (to be put in front of the baseboard) is $\frac{1}{4}$ inch thick, what is the total thickness of the two trim pieces?

78. A recipe calls for the following spices: $\frac{1}{2}$ teaspoon of turmeric, $\frac{1}{4}$ teaspoon of ginger, and $\frac{1}{8}$ teaspoon of cumin. What is the total quantity of these three spices?

79. Alyssa's investment strategy is to put $\frac{1}{6}$ of her paycheck into a savings account and another $\frac{1}{9}$ into a retirement account.

a. What fraction of her salary does Alyssa invest each month?

b. If she maintains this strategy for 24 paychecks and receives $900 per paycheck, how much money will she have saved?

80. Bryce has a monthly income of $3000. Of this amount, $\frac{1}{10}$ of it goes to college savings, $\frac{2}{15}$ to general savings, and $\frac{1}{12}$ to retirement.

a. What fraction of Bryce's income is being saved?

b. How much money is being saved each month?

c. What is the total amount saved in a 12-month year?

81. A $\frac{7}{8}$ inch pipe is to be shortened to $\frac{7}{12}$ inch. How much must be removed?

82. Near the end of the snow season, the road salt supply for a small college had dwindled down to $\frac{7}{10}$ ton. When the next snow storm came, $\frac{1}{2}$ ton of salt was used for the roads. How much road salt was left?

83. Xavier has driven to a national park with no gas stations and he wants to drive around some before leaving the park. He knows he can safely make it to the nearest gas station on $\frac{1}{4}$ of a tank of gas. If the tank is currently $\frac{5}{9}$ full. What fraction of a tank of gasoline does he have to use for touring the park?

84. About $\frac{1}{2}$ of all incoming solar radiation is absorbed by the earth, $\frac{1}{5}$ is absorbed by the atmosphere, and $\frac{1}{20}$ is scattered by the atmosphere. The rest is reflected by the earth and clouds.

a. What fraction of solar radiation is absorbed or scattered?

b. What fraction of solar radiation is reflected by the earth and clouds?

85. Karina has $\frac{3}{4}$ of an apple pie left over from a party last night. Her roommates found it and cut themselves three unequal sized pieces in the following amounts: $\frac{1}{3}$ of a pie, $\frac{1}{4}$ of a pie, and $\frac{1}{6}$ of a pie.

a. What fraction of a full pie did Karina's roommates take?

b. What fraction of the pie is left over?

86. A moving truck has to make stops at three different apartments to collect items for three different moves. The first apartment takes up $\frac{3}{7}$ of the truck and the second apartment takes up $\frac{3}{14}$ of the truck. What fraction of the space in the moving truck is left to fit in the items from the last apartment?

87. Jayden has a large homework assignment to do this weekend. He is able to get $\frac{4}{15}$ of the assignment done Friday after class. If he doesn't want to leave more than $\frac{2}{9}$ of the assignment to do for Sunday, what fraction of the assignment must he complete on Saturday?

88. A pentagon (a five-sided figure) has 4 sides of length $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}$, and $\frac{1}{6}$ inches. If the perimeter of the pentagon is 1 inch, find the length of the fifth side.

Writing & Thinking

89. Explain how finding the LCM relates to LCDs.

90. Explain the steps to follow when adding or subtracting fractions with unlike denominators

91. Give an example of a situation where you might add or subtract fractions (other than in class).

92. Pick one problem in this section that gave you some difficulty. Explain briefly why you had difficulty and why you think that you can better solve problems of this type in the future.