4.2 Exercises

Concept Check

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

1. The first step in solving linear equations that simplify to the form $ax + b = c$ is to combine _____ terms on both sides of the equation.
2. When solving a linear equation that has been simplified to the form $ax + b = c$, use the _____ principle of equality and add the _____ of the constant b to both sides of the equation.
3. Once you have a variable term on one side of the equation and a constant term on the other, use the _____ principle of equality and multiply both sides of the equation by the reciprocal of the coefficient of the variable.
4. When you multiply both sides of the equation by the reciprocal of the coefficient of the variable, the coefficient of the variable will become _____.
5. Check your answer by _____ it in for the variable in the original equation.

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. If an equation of the form $ax + b = c$ uses decimal or fractional coefficients, the addition and multiplication principles of equality cannot be used.
7. The first step in solving $2x + 3 = 9$ is to add 3 to both sides.
8. To solve an equation that has been simplified to $4x = 12$, you need to multiply both sides by $\frac{1}{4}$, or divide both sides by 4.
9. When solving a linear equation with decimal coefficients, one approach is to multiply both sides in such a way to give integer coefficients before solving.

Practice

Solve each equation. See Examples 1 through 7.

1. $3x + 11 = 2$
2. $3x + 10 = -5$
3. $5x - 4 = 6$
4. $4y - 8 = -12$
5. $6x + 10 = 22$
6. $3n + 7 = 19$
7. $9x - 5 = 13$
8. $2x - 4 = 12$
9. $1 - 3y = 4$
10. $5 - 2x = 9$
11. $14 + 9t = 5$
12. $5 + 2x = -7$
13. $-5x + 2.9 = 3.5$
14. $3x + 2.7 = -2.7$
15. $10 + 3x - 4 = 18$
16. $5 + 5x - 6 = 9$

17. $15 = 7x + 7 + 8$

18. $14 = 9x + 5 + 8$

19. $5y - 3y + 2 = 2$

20. $6y + 8y - 7 = -7$

21. $x - 4x + 25 = 31$

22. $3y + 9y - 13 = 11$

23. $-20 = 7y - 3y + 4$

24. $-20 = 5y + y + 16$

25. $4n - 10n + 35 = 1 - 2$

26. $-5n - 3n + 2 = 34$

27. $3n - 15 - n = 1$

28. $2n + 12 + n = 0$

29. $5.4x - 0.2x = 0$

30. $0 = 5.1x + 0.3x$

31. $\frac{1}{2}x + 7 = \frac{7}{2}$

32. $\frac{3}{5}x + 4 = \frac{9}{5}$

33. $\frac{1}{2} - \frac{8}{3}x = \frac{5}{6}$

34. $\frac{2}{5} - \frac{1}{2}x = \frac{7}{4}$

35. $\frac{3}{2} = \frac{1}{3}x + \frac{11}{3}$

36. $\frac{11}{8} = \frac{1}{5}x + \frac{4}{5}$

37. $\frac{7}{2} - 5 - \frac{5}{2}x = 9$

38. $\frac{8}{3} + 2 - \frac{7}{3}x = 6$

39. $\frac{5}{8}x - \frac{1}{4}x + \frac{1}{2} = \frac{3}{10}$

40. $\frac{1}{2}x + \frac{3}{4}x - \frac{5}{3} = \frac{5}{6}$

41. $\frac{y}{2} + \frac{1}{5} = 3$

42. $\frac{y}{3} - \frac{2}{3} = 7$

43. $\frac{7}{8} = \frac{3}{4}x - \frac{5}{8}$

44. $\frac{1}{10} = \frac{4}{5}x + \frac{3}{10}$

45. $\frac{y}{7} + \frac{y}{28} + \frac{1}{2} = \frac{3}{4}$

46. $\frac{5y}{6} - \frac{7y}{8} - \frac{1}{12} = \frac{1}{3}$

47. $x + 1.2x + 6.9 = -3.0$

48. $3x - 0.75x - 1.72 = 3.23$

49. $10 = x - 0.5x + 32$

50. $33 = y + 3 - 0.4y$

51. $2.5x + 0.5x - 3.5 = 2.5$

52. $4.7 - 0.5x - 0.3x = -0.1$

53. $6.4 + 1.2x + 0.3x = 0.4$

54. $5.2 - 1.3x - 1.5x = -0.4$

55. $-12.13 = 2.42y + 0.6y - 13.64$

56. $-7.01 = 1.75x + 3.05x - 8.45$

57. $-0.4x + x + 17.2 = 18.1$

58. $y - 0.75y + 13.76 = 14.66$

59. $0 = 17.3x - 15.02x - 0.456$

60. $0 = 20.5x - 16.35x + 0.1245$

Use a calculator to help solve the following equations.

61. $0.15x + 5.23x - 17.815 = 15.003$

62. $15.97y - 12.34y + 16.95 = 8.601$

63. $13.45x - 20x - 17.36 = -24.696$

64. $26.75y - 30y + 23.28 = 4.4625$

Applications

Solve.

65. The tickets for a concert featuring the new hit band, Flying Sailor, sold out in 2.5 hours. If there were 35,000 tickets sold, solve the equation $35,000 - 2.5x = 0$ to find the number of tickets sold per hour.

66. Katie's nutritionist recommends that she follows a diet of 2000 calories per day. Katie eats 4 times a day, eating the same number of calories at each sitting. However, every morning she stops at the local coffee shop and treats herself to a large flavored coffee that contains 240 calories. Solve the equation $4x + 240 = 2000$ to determine how many calories Katie should eat at each sitting.

67. Salim is a student in a course on the modern British novel. He is given an assignment to read a 350 page novel in 7 days. He reads the first 38 pages of the novel on the day he receives his assignment and decides to finish the novel by reading the same amount of pages of each day until the assignment is due. Solve the equation $6x + 38 = 350$ to determine how many pages Salim should read each day.

68. All snacks (candy, popcorn, and soda) cost \$3.50 each at the local movie theater. Admission tickets cost \$7.50 each. After a long week, Carlos treats himself to a night at the movies. His movie night budget is \$25 and he spends all his movie money. Solve the equation $\$3.50x + \$7.50 = \$25.00$ to determine how many snacks Carlos can buy.

69. The Political Science Club at Homestate University is planning to host an election night party for members and guests. The club plans to serve cookies and estimates it will need a total of 1500 cookies in 6 varieties for the party. The club orders 300 chocolate chip cookies and an equal number of cookies in each of the remaining 5 varieties. Solve the equation $5x + 300 = 1500$ to determine how many cookies of each remaining variety will be ordered.

70. All courses in the Homestate University graduate school are worth 3 credits. To earn a master's degree, a student must earn a total of 36 credits. The student's thesis work counts as 6 credits. Solve the equation $3x + 6 = 36$ to determine how many courses a student must take to earn a master's degree.

71. A rectangular-shaped parking lot is to have a perimeter of 450 yards. If the width must be 90 yards because of a building code, solve the equation $2l + 2(90) = 450$ to determine the length of the parking lot.

72. Jeff, who lives in England, is reading a letter from his pen pal in the United States. His pen pal says that the temperature was 97.7 degrees Fahrenheit that day, making it too hot to play soccer outside. Jeff doesn't know how hot this is, because he is used to temperatures in Celsius. Help Jeff solve the equation, $1.8C + 32 = 97.7$ to determine the temperature in degrees Celsius.

73. The tallest man-made structure in the world is the Burj Khalifa in Dubai, which stands at 2717 feet tall. The tallest tree in the world is a redwood tree in California. If 7 of these trees were stacked on top of each other, they would still be 59.1 feet shorter than the Burj Khalifa. Solve the equation, $7x + 59.1 = 2717$ to determine the height of the tree.

74. A bakery sells cake pops individually and in packages of 4. At the beginning of the day, the bakery had 114 cake pops in stock. They sold 34 individual cake pops and several packages of cake pops. At the end of the day, there were 8 cake pops left. This situation can be modeled by the equation $114 - 34 - 4x = 8$, where x is the number of packages of cake pops sold.

a. Explain what each term in the equation $114 - 34 - 4x = 8$ represents in the situation.

b. Solve the equation to determine the value of x.

c. What does the answer to part b. mean? Write a complete sentence.

75. The lowest temperature of the night was reported to be 24 °F. The weather report mentioned that the temperature has steadily risen 1.5 degrees per hour since the lowest temperature of the day and it is currently 30 °F. This situation can be modeled by the equation $24 + 1.5x = 30$, where x is the time in hours since the lowest temperature was recorded.

a. Explain what each term in the equation $24 + 1.5x = 30$ represents in the situation.

b. Solve the equation to determine the value of x.

c. What does the answer to part b. mean? Write a complete sentence.

76. While taking inventory, a nurse records that there are $\frac{3}{5}$ of a box of syringes in one closet, two boxes that are $\frac{1}{8}$ full in another closet, and 24 syringes in the supply cart. He calculates the total to be 194 syringes. The staff member who reorders supplies is new and doesn't know how many syringes are in the boxes that the clinic uses, so she sets up the equation $\frac{3}{5}x + 2\left(\frac{1}{8}x\right) + 24 = 194$, where x is the number of syringes in a box.

a. Solve the equation to determine the value of x.

b. What does the answer to part a. mean? Write a complete sentence.

Writing & Thinking

77. Find the error(s) made in solving each equation and give the correct solution.

a.
$$\frac{1}{3}x + 4 = 9$$
$$3 \cdot \frac{1}{3}x + 4 = 3 \cdot 9$$
$$x + 4 = 27$$
$$x + 4 - 4 = 27 - 4$$
$$x = 23$$

b.
$$5x + 3 = 11$$
$$(5x - 3) + (3 - 3) = 11 - 3$$
$$2x + 0 = 8$$
$$\frac{2x}{2} = \frac{8}{2}$$
$$x = 4$$