Preface

This manual contains detailed solutions to all of the exercises of the text *Beginning Algebra*, tenth edition, by Karr, Massey, and Gustafson.

Many of the exercises in the text may be solved using more than one method, but it is not feasible to list all possible solutions in this manual. Also, some of the exercises may have been solved in this manual using a method that differs slightly from that presented in the text. There are a few exercises in the text whose solutions may vary from person to person. Some of these solutions may not have been included in this manual. For the solution to an exercise like this, the notation "answers may vary" has been included.

If you are a student using this manual, please remember that only reading a solution does not teach you how to solve a problem. To repeat a commonly used phrase, mathematics is not a spectator sport. You MUST make an honest attempt to solve each exercise in the text without using this manual first. This manual should be viewed more or less as a last resort. Above all, DO NOT simply copy the solution from this manual onto your own paper. Doing so will not help you learn how to do the exercise, nor will it help you to do better on quizzes or tests.

I would like to thank Lauren Crosby of Brooks/Cole Publishing for her help and guidance.

This book is dedicated to the Reverend Ben Loyd, the Reverend Jack Swanson, and the Reverend Pam Gregory for their friendship and inspiration throughout my life.

May your study of this material be successful and rewarding.

Michael G. Welden

Contents

Exercises 1.1 (page 11)

1-10. Answers may vary. **11.** $-|-7| = -(+7) = -7$ **12.** $|-12| = +12 = 12$

13. set **14.** natural, positive integers **15.** whole **16.** ellipses

17. integers **18.** negative numbers **19.** subset **20.** the set of all x such that x is a whole number

21. rational **22.** irrational **23.** real **24.** prime

25. natural, prime **26.** even **27.** odd **28.** is not equal to

29. $<$ **30.** is greater than or equal to **31.** variables **32.** number, origin

33. 7 **34.** intervals **35.** parenthesis, open **36.** bracket, closed

37. distance, 6 **38.** sum, difference, product, quotient

39. natural: $1, 2, 6, 9$ **40.** whole: $0, 1, 2, 6, 9$

41. positive integers: $1, 2, 6, 9$ **42.** negative integers: $-3, -1$

43. integers: $-3, -1, 0, 1, 2, 6, 9$ **44.** rational: $-3, -\frac{1}{2}, -1, 0, 1, 2, \frac{5}{3}, 3.25, 6, 9$

45. real: $-3, -\frac{1}{2}, -1, 0, 1, 2, \frac{5}{3}, \sqrt{7}, 3.25, 6, 9$ **46.** irrational: $\sqrt{7}$

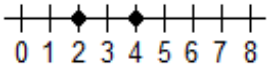
47. odd integers: $-3, -1, 1, 9$ **48.** even integers: $0, 2, 6$

49. composite: $6, 9$ **50.** prime: 2

51. $7 \boxed{<} 10$ **52.** $3 \boxed{} 2+1$, $3 \boxed{=} 3$ **53.** $9 \boxed{} 2+5$, $9 \boxed{>} 7$ **54.** $-5 \boxed{<} -4$

55. $-6 \boxed{>} -8$ **56.** $2+3 \boxed{} 17$, $5 \boxed{<} 17$ **57.** $5+7 \boxed{} 10$, $12 \boxed{>} 10$ **58.** $3+3 \boxed{} 9-3$, $6 \boxed{=} 6$

59.



4 is greater than 2. 4 is to the right of 2.

60.

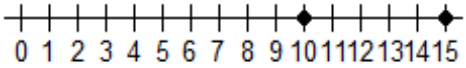
9 is greater than 5. 9 is to the right of 5.

SECTION 1.1

61.

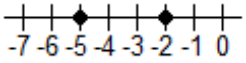
11 is greater than 6. 11 is to the right of 6.

62.



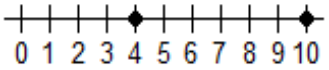
15 is greater than 10. 15 is to the right of 10.

63.



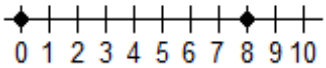
-2 is greater than -5.
-2 is to the right of -5.

64.



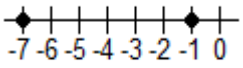
10 is greater than 4. 10 is to the right of 4.

65.



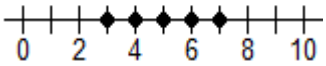
8 is greater than 0. 8 is to the right of 0.

66.



-1 is greater than -7. -1 is to the right of -7.

67.



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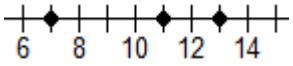

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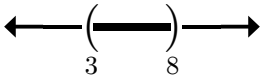
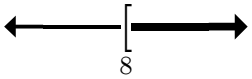


70.

71.



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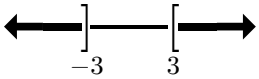

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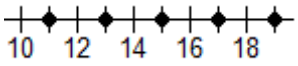
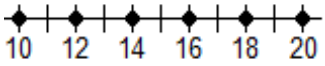


74.



75. $|36| = 36$

76. $|-17| = 17$

77. $|0| = 0$

78. $|120| = 120$

79. $-|-23| = -(+23) = -23$

80. $|18 - 12| = |6| = 6$

81. $|12 - 4| = |8| = 8$

82. $|100 - 100| = |0| = 0$

83. $6 + 3 = 9$
9: natural, odd, composite, whole

84. $7 - 2 = 5$
5: natural, odd, prime, whole

85. $15 - 15 = 0$
0: even, whole

86. $13 - 6 = 7$
7: natural, odd, prime, whole

87. $3 \cdot 8 = 24$
24: natural, even, composite, whole

88. $6 \cdot 12 = 72$
72: natural, even, composite, whole

SECTION 1.1

89. $24 \div 8 = 3$
3: natural, odd, prime, whole

90. $7 \div 7 = 1$
1: natural, odd, whole

91. $5 + 6 \boxed{} 13 - 1$
$11 \boxed{<} 12$

92. $19 - 3 \boxed{} 8 + 6$
$16 \boxed{>} 14$

93. $4 \cdot 3 \boxed{} 3 \cdot 4$
$12 \boxed{=} 12$

94. $7 \cdot 9 \boxed{} 9 \cdot 6$
$63 \boxed{>} 54$

95. $0 \div 6 \boxed{} 1$
$0 \boxed{<} 1$

96. $2 + 7 \boxed{} 7 + 2$
$9 \boxed{=} 9$

97. $45 \div 9 \boxed{} 36 \div 12$
$5 \boxed{>} 3$

98. $5 \cdot 12 \boxed{} 300 \div 5$
$60 \boxed{=} 60$

99. $3 + 2 + 5 \boxed{} 5 + 2 + 3$
$10 \boxed{=} 10$

100. $8 + 5 + 2 \boxed{} 5 + 2 + 8$
$15 \boxed{=} 15$

101. $9 > 4$

102. $5 < 32$

103. $8 \leq 8$

104. $25 \neq 23$

105. $3 + 4 = 7$

106. $37 > 3 \cdot 4$

107. $\sqrt{2} \approx 1.41$

108. $x \geq 5$

109. $3 \leq 7 \Rightarrow \boxed{7 \geq 3}$

110. $5 > 2 \Rightarrow \boxed{2 < 5}$

111. $6 > 0 \Rightarrow \boxed{0 < 6}$

112. $34 \leq 40 \Rightarrow \boxed{40 \geq 34}$

113. $3 + 8 > 8 \Rightarrow \boxed{8 < 3 + 8}$

114. $8 - 3 < 8 \Rightarrow \boxed{8 > 8 - 3}$

115. $6 - 2 < 10 - 4 \Rightarrow \boxed{10 - 4 > 6 - 2}$

116. $8 \cdot 2 \geq 8 \cdot 1 \Rightarrow \boxed{8 \cdot 1 \leq 8 \cdot 2}$

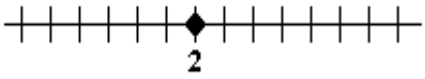
117. $2 \cdot 3 < 3 \cdot 4 \Rightarrow \boxed{3 \cdot 4 > 2 \cdot 3}$

118. $8 \div 2 \geq 9 \div 3 \Rightarrow \boxed{9 \div 3 \leq 8 \div 2}$

119. $\frac{12}{4} < \frac{24}{6} \Rightarrow \boxed{\frac{24}{6} > \frac{12}{4}}$

120. $\frac{2}{3} \leq \frac{3}{4} \Rightarrow \boxed{\frac{3}{4} \geq \frac{2}{3}}$

121.



122.

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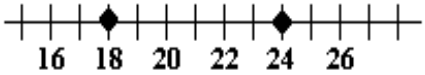

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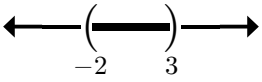

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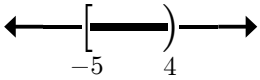

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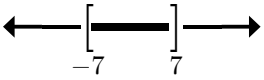


127. $|21 - 19| = |2| = 2$

128. $|25 - 21| = |4| = 4$

129. If you think you have the greatest natural number, just add 1 to it to get a greater natural number.

130. 2 is prime because it has two factors, 1 and itself. Any even number greater than 2 has at least three factors: 1, itself, and 2, so it is not prime.

131. The absolute value of a positive number (or 0) is equal to the positive number (or 0). The absolute value of a negative number is equal to the opposite of the negative number.

132. 0 is even because it can be evenly divided by 2: $0 \div 2 = 0$, with no remainder.

133. Answers may vary.

134. Answers may vary.

Exercises 1.2 (page 25)

1. $3 = 1 \cdot 3, 6 = 2 \cdot 3$
largest common factor: 3

2. $5 = 1 \cdot 5, 10 = 2 \cdot 5$
largest common factor: 5

3. $12 = 2 \cdot 6, 18 = 3 \cdot 6$
largest common factor: 6

4. $15 = 5 \cdot 3, 27 = 9 \cdot 3$
largest common factor: 3

5. $\frac{3}{4} \cdot \frac{1}{2} = \frac{3 \cdot 1}{4 \cdot 2} = \frac{3}{8}$

6. $\frac{5}{6} \cdot \frac{5}{7} = \frac{5 \cdot 5}{6 \cdot 7} = \frac{25}{42}$

7. $\frac{3}{4} \div \frac{4}{3} = \frac{3}{4} \cdot \frac{3}{4} = \frac{3 \cdot 3}{4 \cdot 4} = \frac{9}{16}$

8. $\frac{3}{5} \div \frac{5}{2} = \frac{3}{5} \cdot \frac{2}{5} = \frac{3 \cdot 2}{5 \cdot 5} = \frac{6}{25}$

9. $\frac{4}{9} + \frac{7}{9} = \frac{4+7}{9} = \frac{11}{9}$

10. $\frac{10}{11} - \frac{2}{11} = \frac{10-2}{11} = \frac{8}{11}$

11. $\frac{2}{3} - \frac{1}{2} = \frac{2 \cdot \mathbf{2}}{3 \cdot \mathbf{2}} - \frac{1 \cdot \mathbf{3}}{2 \cdot \mathbf{3}} = \frac{4}{6} - \frac{3}{6} = \frac{4-3}{6} = \frac{1}{6}$

12. $\frac{3}{4} + \frac{1}{2} = \frac{3}{4} + \frac{1 \cdot \mathbf{2}}{2 \cdot \mathbf{2}} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4}$

13.
$$\begin{array}{r} 5.1 \\ +\ 0.62 \\ \hline 5.72 \end{array}$$

14.
$$\begin{array}{r} 3.45 \\ -\ 2.21 \\ \hline 1.24 \end{array}$$

15.
$$\begin{array}{r} 0.2 \\ \times\ 2.5 \\ \hline 10 \\ 40 \\ \hline 50 \end{array}$$
Put two digits to the right of the decimal point. Answer: 0.5

16.
$$\begin{array}{r} 0.4 \\ \times\ 16. \\ \hline 24 \\ 40 \\ \hline 64 \end{array}$$
Put one digit to the right of the decimal point. Answer: 6.4

SECTION 1.2

17. The digit in the 2nd decimal place is 6. The next digit to the right is 5. Since this digit is 5 or more, round up. Change the 6 in the 2nd decimal place to 7, and delete all digits to the right. 5.17

18. The digit in the 2nd decimal place is 6. The next digit to the right is 4. Since this digit is less than 5, round down. Leave the 6 in the 2nd decimal place, and delete all digits to the right. 5.16

19. true

20. false; Fractions are not natural numbers.

21. false; 21 has factors of 3 and 7.

22. false; 2 is an even prime number.

23. false; -5 is to the left of -2.

24. true; -3 is to the left of -2.

25. true; $|-9| = 9$, so $9 \leq |-9|$.

26. true; $|-11| = 11$, so $|-11| \geq 10$.

27. $3 + 7 \boxed{=} 10$

28. $\frac{3}{7} \boxed{-} \frac{2}{7} = \frac{1}{7}$

29. $|-2| = 2$, so $|-2| \boxed{=} 2$

30. $4 + 8 = 12$, so $4 + 8 \boxed{>} 11$

31. numerator

32. denominator

33. undefined

34. simplify

35. prime

36. proper

37. improper

38. lowest terms

39. 1

40. $\frac{a}{b}$

41. multiply

42. reciprocal

43. numerators, denominator

44. denominator

45. least common denominator, equivalent

46. plus, mixed

47. terminating, 2

48. repeating

49. divisor, dividend, quotient

50. percent

51. $24 = 4 \cdot 6$
$= 2 \cdot 2 \cdot 2 \cdot 3$

52. $105 = 5 \cdot 21$
$= 5 \cdot 3 \cdot 7$
$= 3 \cdot 5 \cdot 7$

53. $48 = 8 \cdot 6$
$= 2 \cdot 4 \cdot 2 \cdot 3$
$= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$

54. $315 = 9 \cdot 35$
$= 3 \cdot 3 \cdot 5 \cdot 7$

55. $\frac{6}{12} = \frac{1 \cdot \cancel{6}^{1}}{2 \cdot \underset{1}{\cancel{6}}} = \frac{1}{2}$

56. $\frac{3}{9} = \frac{1 \cdot \cancel{3}^{1}}{3 \cdot \underset{1}{\cancel{3}}} = \frac{1}{3}$

57. $\frac{15}{20} = \frac{3 \cdot \cancel{5}^{1}}{4 \cdot \underset{1}{\cancel{5}}} = \frac{3}{4}$

58. $\frac{33}{55} = \frac{3 \cdot \cancel{11}^{1}}{5 \cdot \underset{1}{\cancel{11}}} = \frac{3}{5}$

59. $\frac{27}{18} = \frac{3 \cdot \cancel{9}^{1}}{2 \cdot \underset{1}{\cancel{9}}} = \frac{3}{2}$

60. $\frac{35}{14} = \frac{5 \cdot \cancel{7}^{1}}{2 \cdot \underset{1}{\cancel{7}}} = \frac{5}{2}$

61. $\frac{72}{64} = \frac{9 \cdot \cancel{8}^{1}}{8 \cdot \underset{1}{\cancel{8}}} = \frac{9}{8}$

62. $\frac{26}{21} = \frac{2 \cdot 13}{3 \cdot 7} = \frac{26}{21}$ in lowest terms

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

64. $\frac{3}{4} \cdot \frac{5}{7} = \frac{3 \cdot 5}{4 \cdot 7} = \frac{15}{28}$

SECTION 1.2

65. $\frac{4}{3} \cdot \frac{6}{5} = \frac{4 \cdot 6}{3 \cdot 5} = \frac{4 \cdot 2 \cdot \cancel{3}^{1}}{\underset{1}{\cancel{3}} \cdot 5} = \frac{8}{5}$

66. $\frac{7}{8} \cdot \frac{6}{15} = \frac{7 \cdot 6}{8 \cdot 15} = \frac{7 \cdot \cancel{2}^{1} \cdot \cancel{3}^{1}}{4 \cdot \underset{1}{\cancel{2}} \cdot 5 \cdot \underset{1}{\cancel{3}}} = \frac{7}{20}$

67. $12 \cdot \frac{5}{6} = \frac{12}{1} \cdot \frac{5}{6} = \frac{12 \cdot 5}{1 \cdot 6} = \frac{2 \cdot \cancel{6}^{1} \cdot 5}{1 \cdot \underset{1}{\cancel{6}}} = \frac{10}{1} = 10$

68. $10 \cdot \frac{5}{12} = \frac{10}{1} \cdot \frac{5}{12} = \frac{10 \cdot 5}{1 \cdot 12} = \frac{\cancel{2}^{1} \cdot 5 \cdot 5}{1 \cdot \underset{1}{\cancel{2}} \cdot 6} = \frac{25}{6}$

69. $\frac{10}{21} \cdot 14 = \frac{10}{21} \cdot \frac{14}{1} = \frac{10 \cdot 14}{21 \cdot 1} = \frac{10 \cdot 2 \cdot \cancel{7}^{1}}{3 \cdot \underset{1}{\cancel{7}}} = \frac{20}{3}$

70. $\frac{5}{24} \cdot 16 = \frac{5}{24} \cdot \frac{16}{1} = \frac{5 \cdot 16}{24 \cdot 1} = \frac{5 \cdot 2 \cdot \cancel{8}^{1}}{3 \cdot \underset{1}{\cancel{8}}} = \frac{10}{3}$

71. $\frac{2}{5} \div \frac{3}{2} = \frac{2}{5} \cdot \frac{2}{3} = \frac{2 \cdot 2}{5 \cdot 3} = \frac{4}{15}$

72. $\frac{4}{5} \div \frac{3}{7} = \frac{4}{5} \cdot \frac{7}{3} = \frac{4 \cdot 7}{5 \cdot 3} = \frac{28}{15}$

73. $\frac{3}{4} \div \frac{6}{5} = \frac{3}{4} \cdot \frac{5}{6} = \frac{3 \cdot 5}{4 \cdot 6} = \frac{\cancel{3}^{1} \cdot 5}{4 \cdot 2 \cdot \underset{1}{\cancel{3}}} = \frac{5}{8}$

74. $\frac{3}{8} \div \frac{15}{28} = \frac{3}{8} \cdot \frac{28}{15} = \frac{3 \cdot 28}{8 \cdot 15} = \frac{\cancel{3}^{1} \cdot 7 \cdot \cancel{4}^{1}}{2 \cdot \underset{1}{\cancel{4}} \cdot 5 \cdot \underset{1}{\cancel{3}}} = \frac{7}{10}$

75. $9 \div \frac{3}{8} = \frac{9}{1} \div \frac{3}{8} = \frac{9}{1} \cdot \frac{8}{3} = \frac{9 \cdot 8}{1 \cdot 3} = \frac{3 \cdot \cancel{3}^{1} \cdot 8}{1 \cdot \underset{1}{\cancel{3}}} = \frac{24}{1} = 24$

76. $23 \div \frac{46}{5} = \frac{23}{1} \div \frac{46}{5} = \frac{23}{1} \cdot \frac{5}{46} = \frac{23 \cdot 5}{1 \cdot 46} = \frac{\cancel{2}^{1}\cancel{3} \cdot 5}{1 \cdot 2 \cdot \underset{1}{\cancel{2}}\cancel{3}} = \frac{5}{2}$

77. $\frac{54}{20} \div 3 = \frac{54}{20} \div \frac{3}{1} = \frac{54}{20} \cdot \frac{1}{3} = \frac{54 \cdot 1}{20 \cdot 3} = \frac{\cancel{2}^{1} \cdot \cancel{3}^{1} \cdot 9}{10 \cdot \underset{1}{\cancel{2}} \cdot \underset{1}{\cancel{3}}} = \frac{9}{10}$

78. $\frac{39}{27} \div 13 = \frac{39}{27} \div \frac{13}{1} = \frac{39}{27} \cdot \frac{1}{13} = \frac{39 \cdot 1}{27 \cdot 13} = \frac{\cancel{3}^{1} \cdot 1\cancel{3}^{1} \cdot 1}{9 \cdot \underset{1}{\cancel{3}} \cdot 1\underset{1}{\cancel{3}}} = \frac{1}{9}$

79. $\frac{3}{5} + \frac{3}{5} = \frac{3+3}{5} = \frac{6}{5}$

80. $\frac{4}{7} - \frac{2}{7} = \frac{4-2}{7} = \frac{2}{7}$

81. $\frac{5}{17} - \frac{3}{17} = \frac{5-3}{17} = \frac{2}{17}$

82. $\frac{2}{11} + \frac{9}{11} = \frac{2+9}{11} = \frac{11}{11} = \frac{\cancel{1}^{1}\cancel{1}}{\underset{1}{\cancel{1}}\cancel{1}} = 1$

SECTION 1.2

83. $\dfrac{1}{42}+\dfrac{1}{6}=\dfrac{1}{42}+\dfrac{1\cdot\mathbf{7}}{6\cdot\mathbf{7}}=\dfrac{1}{42}+\dfrac{7}{42}=\dfrac{1+7}{42}=\dfrac{8}{42}=\dfrac{4\cdot\overset{1}{\cancel{2}}}{21\cdot\underset{1}{\cancel{2}}}=\dfrac{4}{21}$

84. $\dfrac{17}{25}-\dfrac{2}{5}=\dfrac{17}{25}-\dfrac{2\cdot\mathbf{5}}{5\cdot\mathbf{5}}=\dfrac{17}{25}-\dfrac{10}{25}=\dfrac{17-10}{25}=\dfrac{7}{25}$

85. $\dfrac{7}{10}-\dfrac{1}{14}=\dfrac{7\cdot\mathbf{7}}{10\cdot\mathbf{7}}-\dfrac{1\cdot\mathbf{5}}{14\cdot\mathbf{5}}=\dfrac{49}{70}-\dfrac{5}{70}=\dfrac{49-5}{70}=\dfrac{44}{70}=\dfrac{22\cdot\overset{1}{\cancel{2}}}{35\cdot\underset{1}{\cancel{2}}}=\dfrac{22}{35}$

86. $\dfrac{8}{25}+\dfrac{1}{10}=\dfrac{8\cdot\mathbf{2}}{25\cdot\mathbf{2}}+\dfrac{1\cdot\mathbf{5}}{10\cdot\mathbf{5}}=\dfrac{16}{50}+\dfrac{5}{50}=\dfrac{16+5}{50}=\dfrac{21}{50}$

87. $4\dfrac{3}{5}+\dfrac{3}{5}=\left(4+\dfrac{3}{5}\right)+\dfrac{3}{5}=\left(\dfrac{20}{5}+\dfrac{3}{5}\right)+\dfrac{3}{5}=\dfrac{23}{5}+\dfrac{3}{5}=\dfrac{26}{5}=5\dfrac{1}{5}$

88. $2\dfrac{1}{8}+\dfrac{3}{8}=\left(2+\dfrac{1}{8}\right)+\dfrac{3}{8}=\left(\dfrac{16}{8}+\dfrac{1}{8}\right)+\dfrac{3}{8}=\dfrac{17}{8}+\dfrac{3}{8}=\dfrac{20}{8}=\dfrac{5}{2}=2\dfrac{1}{2}$

89. $3\dfrac{1}{3}-1\dfrac{2}{3}=\left(3+\dfrac{1}{3}\right)-\left(1+\dfrac{2}{3}\right)=\left(\dfrac{9}{3}+\dfrac{1}{3}\right)-\left(\dfrac{3}{3}+\dfrac{2}{3}\right)=\dfrac{10}{3}-\dfrac{5}{3}=\dfrac{5}{3}=1\dfrac{2}{3}$

90. $6\dfrac{1}{5}-4\dfrac{2}{5}=\left(6+\dfrac{1}{5}\right)-\left(4+\dfrac{2}{5}\right)=\left(\dfrac{30}{5}+\dfrac{1}{5}\right)-\left(\dfrac{20}{5}+\dfrac{2}{5}\right)=\dfrac{31}{5}-\dfrac{22}{5}=\dfrac{9}{5}=1\dfrac{4}{5}$

91. $3\dfrac{3}{4}-2\dfrac{1}{2}=\left(3+\dfrac{3}{4}\right)-\left(2+\dfrac{1}{2}\right)=\left(\dfrac{12}{4}+\dfrac{3}{4}\right)-\left(\dfrac{8}{4}+\dfrac{2}{4}\right)=\dfrac{15}{4}-\dfrac{10}{4}=\dfrac{5}{4}=1\dfrac{1}{4}$

92. $15\dfrac{5}{6}+11\dfrac{5}{8}=\left(15+\dfrac{5}{6}\right)+\left(11+\dfrac{5}{8}\right)=\left(\dfrac{360}{24}+\dfrac{20}{24}\right)+\left(\dfrac{264}{24}+\dfrac{15}{24}\right)=\dfrac{380}{24}+\dfrac{279}{24}$
$=\dfrac{659}{24}=27\dfrac{11}{24}$

93. $8\dfrac{2}{9}-7\dfrac{2}{3}=\left(8+\dfrac{2}{9}\right)-\left(7+\dfrac{2}{3}\right)=\left(\dfrac{72}{9}+\dfrac{2}{9}\right)-\left(\dfrac{63}{9}+\dfrac{6}{9}\right)=\dfrac{74}{9}-\dfrac{69}{9}=\dfrac{5}{9}$

94. $3\dfrac{4}{5}-3\dfrac{1}{10}=\left(3+\dfrac{4}{5}\right)-\left(3+\dfrac{1}{10}\right)=\left(\dfrac{30}{10}+\dfrac{8}{10}\right)-\left(\dfrac{30}{10}+\dfrac{1}{10}\right)=\dfrac{38}{10}-\dfrac{31}{10}=\dfrac{7}{10}$

95.
$$\begin{array}{r|l} & 0.\ 6 \\ \hline 5 & 3.\ 0 \\ & \underline{3\ 0} \\ & 0 \end{array}$$
$\dfrac{3}{5}=0.6$, terminating

96.
$$\begin{array}{r|l} & 0.\ 5\ 5\ 5 \\ \hline 9 & 5.\ 0\ 0\ 0 \\ & \underline{4\ 5} \\ & \quad 5\ 0 \\ & \quad \underline{4\ 5} \\ & \quad\ \ 4\ 5 \end{array}$$
$\dfrac{5}{9}=0.\overline{5}$, repeating

SECTION 1.2

97.
$$\begin{array}{r} 0.409 \\ 22\overline{)\,9.000} \\ 88 \\ \hline 20 \\ 0 \\ \hline 200 \\ 198 \\ \hline 2 \end{array}$$
$\frac{9}{22} = 0.4\overline{09}$ repeating

98.
$$\begin{array}{r} 1.6 \\ 5\overline{)\,8.0} \\ 5 \\ \hline 30 \\ 30 \\ \hline 0 \end{array}$$
$\frac{8}{5} = 1.6$, terminating

99.
$$\begin{array}{r} {\scriptstyle 1} \\ 43.54 \\ +\ 315.7 \\ \hline 359.24 \end{array}$$

100.
$$\begin{array}{r} {\scriptstyle 3\ \not{1}^{14}\ \ \not{1}^{11}\ 11} \\ 3\not{4}\not{5}.\not{2}\not{1}3 \\ -\ \ 27.35 \\ \hline 317.863 \end{array}$$

101.
$$\begin{array}{r} {\scriptstyle 6\ \ \not{1}^{11}\ 13} \\ 6\not{7}.\not{2}\not{3}5 \\ -\ 22.45 \\ \hline 44.785 \end{array}$$

102.
$$\begin{array}{r} {\scriptstyle 1} \\ 21.36 \\ +\ \ 4.573 \\ \hline 25.933 \end{array}$$

103.
$$\begin{array}{r} 7.2 \\ \times\ \ 15.6 \\ \hline 432 \\ 360 \\ 72 \\ \hline 112.32 \end{array}$$
Put two digits to the right of the decimal point. Answer: 112.32

104.
$$\begin{array}{r} 4.21 \\ \times\ \ 2.73 \\ \hline 1263 \\ 2947 \\ 842 \\ \hline 11.4933 \end{array}$$
Put four digits to the right of the decimal point. Answer: 11.4933

105. $23\overline{)\,1.0465}$

Move decimal points 2 places right.
$$\begin{array}{r} 4.55 \\ 23.\overline{)\,104.65} \\ 92 \\ \hline 126 \\ 115 \\ \hline 115 \\ 115 \\ \hline 0 \end{array}$$

106. $47\overline{)\,10.857}$

Move decimal points 1 place right.
$$\begin{array}{r} 2.31 \\ 47.\overline{)\,108.57} \\ 94 \\ \hline 145 \\ 141 \\ \hline 47 \\ 47 \\ \hline 0 \end{array}$$

107. The digit in the 2nd decimal place is 5. The next digit to the right is 8. Since this digit is 5 or more, round up. Change the 5 in the 2nd decimal place to 6, and delete all digits to the right. 496.26

The digit in the 3rd decimal place is 8. The next digit to the right is 3. Since this digit is less than 5, round down. Leave the 8 in the 3rd decimal place, and delete all digits to the right. 496.258

108. The digit in the 2nd decimal place is 5. The next digit to the right is 4. Since this digit is less than 5, round down. Leave the 5 in the 2nd decimal place, and delete all digits to the right. 13.05

The digit in the 3rd decimal place is 4. The next digit to the right is 7. Since this digit is 5 or more, round up. Change the 4 in the 3rd decimal place to 5, and delete all digits to the right. 13.055

109. The digit in the 2nd decimal place is 9. The next digit to the right is 8. Since this digit is 5 or more, round up. Change the 9 in the 2nd decimal place to 0, increase the digit in the 1st decimal place from 3 to 4, and delete all digits to the right. 6,025.40

The digit in the 3rd decimal place is 8. The next digit to the right is 2. Since this digit is less than 5, round down. Leave the 8 in the 3rd decimal place, and delete all digits to the right. 6,025.398

110. The digit in the 2nd decimal place is 0. The next digit to the right is 4. Since this digit is less than 5, round down. Leave the 0 in the 2nd decimal place, and delete all digits to the right. 1.60

The digit in the 3rd decimal place is 4. The next digit to the right is 8. Since this digit is 5 or more, round up. Change the 4 in the 3rd decimal place to 5, and delete all digits to the right. 1.605

111. $\dfrac{5}{12} \cdot \dfrac{18}{5} = \dfrac{5 \cdot 18}{12 \cdot 5} = \dfrac{\overset{1}{\cancel{5}} \cdot 3 \cdot \overset{1}{\cancel{6}}}{2 \cdot \underset{1}{\cancel{6}} \cdot \underset{1}{\cancel{5}}} = \dfrac{3}{2}$

112. $\dfrac{5}{4} \cdot \dfrac{12}{10} = \dfrac{5 \cdot 12}{4 \cdot 10} = \dfrac{\overset{1}{\cancel{5}} \cdot 3 \cdot \overset{1}{\cancel{4}}}{\underset{1}{\cancel{4}} \cdot 2 \cdot \underset{1}{\cancel{5}}} = \dfrac{3}{2}$

113. $\dfrac{17}{34} \cdot \dfrac{3}{6} = \dfrac{17 \cdot 3}{34 \cdot 6} = \dfrac{\overset{1}{\cancel{17}} \cdot \overset{1}{\cancel{3}}}{2 \cdot \underset{1}{\cancel{17}} \cdot 2 \cdot \underset{1}{\cancel{3}}} = \dfrac{1}{4}$

114. $\dfrac{21}{14} \cdot \dfrac{3}{6} = \dfrac{21 \cdot 3}{14 \cdot 6} = \dfrac{3 \cdot \overset{1}{\cancel{7}} \cdot \overset{1}{\cancel{3}}}{2 \cdot \underset{1}{\cancel{7}} \cdot 2 \cdot \underset{1}{\cancel{3}}} = \dfrac{3}{4}$

115. $\dfrac{2}{13} \div \dfrac{8}{13} = \dfrac{2}{13} \cdot \dfrac{13}{8} = \dfrac{2 \cdot 13}{13 \cdot 8} = \dfrac{\overset{1}{\cancel{2}} \cdot \overset{1}{\cancel{13}}}{\underset{1}{\cancel{13}} \cdot 4 \cdot \underset{1}{\cancel{2}}} = \dfrac{1}{4}$

116. $\dfrac{4}{7} \div \dfrac{20}{21} = \dfrac{4}{7} \cdot \dfrac{21}{20} = \dfrac{4 \cdot 21}{7 \cdot 20} = \dfrac{\overset{1}{\cancel{4}} \cdot 3 \cdot \overset{1}{\cancel{7}}}{\underset{1}{\cancel{7}} \cdot 5 \cdot \underset{1}{\cancel{4}}} = \dfrac{3}{5}$

117. $\dfrac{21}{35} \div \dfrac{3}{14} = \dfrac{21}{35} \cdot \dfrac{14}{3} = \dfrac{21 \cdot 14}{35 \cdot 3} = \dfrac{\overset{1}{\cancel{7}} \cdot \overset{1}{\cancel{3}} \cdot 14}{5 \cdot \underset{1}{\cancel{7}} \cdot \underset{1}{\cancel{3}}} = \dfrac{14}{5}$

118. $\dfrac{23}{25} \div \dfrac{46}{5} = \dfrac{23}{25} \cdot \dfrac{5}{46} = \dfrac{23 \cdot 5}{25 \cdot 46} = \dfrac{\overset{1}{\cancel{23}} \cdot \overset{1}{\cancel{5}}}{5 \cdot \underset{1}{\cancel{5}} \cdot 2 \cdot \underset{1}{\cancel{23}}} = \dfrac{1}{10}$

SECTION 1.2

119. $\dfrac{3}{5}+\dfrac{2}{3}=\dfrac{3\cdot\mathbf{3}}{5\cdot\mathbf{3}}+\dfrac{2\cdot\mathbf{5}}{3\cdot\mathbf{5}}=\dfrac{9}{15}+\dfrac{10}{15}=\dfrac{9+10}{15}=\dfrac{19}{15}$

120. $\dfrac{4}{3}+\dfrac{7}{2}=\dfrac{4\cdot\mathbf{2}}{3\cdot\mathbf{2}}+\dfrac{7\cdot\mathbf{3}}{2\cdot\mathbf{3}}=\dfrac{8}{6}+\dfrac{21}{6}=\dfrac{8+21}{6}=\dfrac{29}{6}$

121. $\dfrac{9}{4}-\dfrac{5}{6}=\dfrac{9\cdot\mathbf{3}}{4\cdot\mathbf{3}}-\dfrac{5\cdot\mathbf{2}}{6\cdot\mathbf{2}}=\dfrac{27}{12}-\dfrac{10}{12}=\dfrac{27-10}{12}=\dfrac{17}{12}$

122. $\dfrac{2}{15}+\dfrac{7}{9}=\dfrac{2\cdot\mathbf{3}}{15\cdot\mathbf{3}}+\dfrac{7\cdot\mathbf{5}}{9\cdot\mathbf{5}}=\dfrac{6}{45}+\dfrac{35}{45}=\dfrac{6+35}{45}=\dfrac{41}{45}$

123. $3-\dfrac{3}{4}=\dfrac{3}{1}-\dfrac{3}{4}=\dfrac{3\cdot\mathbf{4}}{1\cdot\mathbf{4}}-\dfrac{3}{4}=\dfrac{12}{4}-\dfrac{3}{4}=\dfrac{12-3}{4}=\dfrac{9}{4}$

124. $5+\dfrac{21}{5}=\dfrac{5}{1}+\dfrac{21}{5}=\dfrac{5\cdot\mathbf{5}}{1\cdot\mathbf{5}}+\dfrac{21}{5}=\dfrac{25}{5}+\dfrac{21}{5}=\dfrac{25+21}{5}=\dfrac{46}{5}$

125. $\dfrac{17}{3}+4=\dfrac{17}{3}+\dfrac{4}{1}=\dfrac{17}{3}+\dfrac{4\cdot\mathbf{3}}{1\cdot\mathbf{3}}=\dfrac{17}{3}+\dfrac{12}{3}=\dfrac{17+12}{3}=\dfrac{29}{3}$

126. $\dfrac{13}{9}-1=\dfrac{13}{9}-\dfrac{1}{1}=\dfrac{13}{9}-\dfrac{1\cdot\mathbf{9}}{1\cdot\mathbf{9}}=\dfrac{13}{9}-\dfrac{9}{9}=\dfrac{13-9}{9}=\dfrac{4}{9}$

Problems 127-134 are to be solved using a calculator. The keystrokes needed to solve each problem using a TI-84 graphing calculator appear in each solution. There may be other solutions. Keystrokes for other calculators may be slightly different.

127. [4] [7] [4] [.] [8] [1] [+] [2] [3] [.] [4] [5] [3] [2] [ENTER] $\{498.2632\} \Rightarrow 498.26$

128. [8] [4] [3] [.] [4] [5] [2] [1] [3] [−] [7] [1] [2] [.] [7] [6] [5] [ENTER]
$\{130.68713\} \Rightarrow 130.69$

129. [2] [5] [.] [2] [5] [×] [1] [3] [2] [.] [1] [7] [9] [ENTER] $\{3337.51975\} \Rightarrow 3{,}337.52$

130. [2] [3] [4] [.] [8] [7] [4] [×] [2] [4] [2] [.] [4] [6] [4] [7] [3] [ENTER]
$\{56948.66099\} \Rightarrow 56{,}948.66$

131. [4] [.] [5] [6] [9] [4] [3] [2] [3] [÷] [.] [4] [5] [6] [ENTER] $\{10.02068487\} \Rightarrow 10.02$

132. [3] [2] [.] [4] [6] [5] [7] [4] [8] [÷] [4] [3] [.] [2] [2] [5] [ENTER]
$\{0.751087287\} \Rightarrow 0.75$

133. [5] [5] [.] [7] [7] [4] [4] [3] [−] [.] [5] [6] [8] [2] [4] [5] [ENTER]
$\{55.206185\} \Rightarrow 55.21$

134. [.] [6] [2] [3] [1] [7] [+] [1] [.] [3] [3] [1] [6] [ENTER] $\{1.95477\} \Rightarrow 1.95$

135. $43\dfrac{1}{2}-12\dfrac{1}{3}=43+\dfrac{1}{2}-12-\dfrac{1}{3}=\dfrac{258}{6}+\dfrac{3}{6}-\dfrac{72}{6}-\dfrac{2}{6}=\dfrac{187}{6}=31\dfrac{1}{6}$ acres

136. $7\frac{2}{3}+15\frac{1}{4}+19\frac{1}{2}+10\frac{3}{4}=7+15+19+10+\frac{2}{3}+\frac{1}{4}+\frac{1}{2}+\frac{3}{4}$
$=51+\frac{8}{12}+\frac{3}{12}+\frac{6}{12}+\frac{9}{12}=51+\frac{26}{12}=51+2\frac{2}{12}=53\frac{1}{6}$ ft

137. $15\cdot 4\frac{1}{3}=\frac{15}{1}\cdot\frac{13}{3}=\frac{15\cdot 13}{1\cdot 3}=\frac{5\cdot \cancel{3}^{1}\cdot 13}{1\cdot \cancel{3}_{1}}=\frac{65}{1}=65$ yd

138. $26\div\frac{1}{4}=\frac{26}{1}\cdot\frac{4}{1}=\frac{104}{1}=104$ laps

139. $187.75-46.8-72.5=\$68.45$ million

140. $0.265(12{,}419{,}000)=3{,}291{,}035$ citizens

141. 34% of $36{,}000=0.34(36{,}000)$
$=\$12{,}240$

142. 24% of $52{,}000=0.24(52{,}000)$
$=\$12{,}480$

143. $0.23(17{,}500)=4{,}025$ defective $\Rightarrow 17{,}500-4025=13{,}475$ acceptable units

144. $0.36(750)=270$ lb of water is removed.

145. $0.12(18{,}700{,}000)=2{,}244{,}000$ increase $\Rightarrow$ sales $=18{,}700{,}000+2{,}244{,}000=\$20{,}944{,}000$

146. $\frac{44.47+43.24+42.77+42.05}{4}=\frac{172.53}{4}=43.1325\approx 43.13$ seconds

147. # gallons $=16{,}275.3\div 25.5=638.24705882\Rightarrow$ cost $=638.24705882(3.45)\approx\$2{,}201.95$

148. 15% of 1st \$23,000 $=0.15(23{,}000)=3{,}450$; other income $=48{,}712.32-23{,}000=25{,}712.32$
other income tax $=0.28(25{,}712.32)\approx 7{,}199.45$; social security $=0.154(48{,}712.32)\approx 7{,}501.70$
total tax $=3{,}450+7{,}199.45+7{,}501.70=\$18{,}151.15$

149. Area = length $\cdot$ width $=(253.5\text{ ft})(178.5\text{ ft})=45{,}249.75\text{ ft}^2$
Drums of sealer $=45{,}249.75\div 4{,}000\approx 11.3\Rightarrow$ needs 12 drums; Cost $=12(97.50)=\$1{,}170$

150. $37(\$3.25)=\$120.25$ per day; $21(\$120.25)=\$2{,}525.25$ for 21 days (3 weeks)

151. Standard $=37.50(2{,}530)=\$94{,}875$; High-capacity $=57.35(1{,}670)=\$95{,}774.50$
The high-capacity order will produce the greater profit.

152. Holstein $=0.035(7{,}600)=266$ lb of butterfat; Guernsey $=0.05(6{,}500)=325$ lb of butterfat
The Guernsey cow will produce more butterfat.

153. Silage per cow $=0.57(12{,}000)=6840$ pounds; $30(6{,}840)=205{,}200$ lb of silage

154. 2nd cost $=4{,}500+150(27.50)=4{,}500+4{,}125=8{,}625\Rightarrow$ 2nd is lower

155. Regular $= 1{,}730 + 36(107.75) = 1{,}730 + 3{,}879 = 5{,}609$
High $= 4{,}170 + 36(57.50) = 4{,}170 + 2{,}070 = 6{,}240$
The high-efficiency furnace will be more expensive after 3 years.

156. Regular $= 1{,}730 + 60(107.75) = 1{,}730 + 6{,}465 = 8{,}195$
High $= 4{,}170 + 60(57.50) = 4{,}170 + 3{,}450 = 7{,}620$
The regular furnace will be more expensive after 5 years.

157-162. Answers may vary.

163. No. Each proper fraction is less than 1. When a number is multiplied by a number less than 1, the result is smaller than the original number.

164. The result will be a number between the two fractions.

Exercises 1.3 (page 36)

1. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$

2. $3 \cdot 3 \cdot 3 \cdot 3 = 81$

3. $4 \cdot 4 \cdot 4 = 64$

4. $5 \cdot 5 \cdot 5 = 125$

5. $\frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} = \frac{8}{27}$

6. $\frac{4}{5} \cdot \frac{4}{5} = \frac{16}{25}$

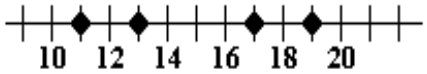
7. base: y

8. base: $2x$

9. base: $4x$

10. base: y

11.



12. $7 \le 12 \Rightarrow 12 \ge 7$

13. 17 is a prime number.

14. $\frac{3}{5} - \frac{1}{2} = \frac{3 \cdot \mathbf{2}}{5 \cdot \mathbf{2}} - \frac{1 \cdot \mathbf{5}}{2 \cdot \mathbf{5}} = \frac{6}{10} - \frac{5}{10} = \frac{6-5}{10} = \frac{1}{10}$

15. exponent

16. base, exponent

17. grouping

18. diameter, radius

19. perimeter, circumference

20. area, square, volume, cubic

21. $P = 4s$, units

22. $A = s^2$, square units

23. $P = 2l + 2w$, units

24. $A = lw$, square units

25. $P = a + b + c$, units

26. $A = \frac{1}{2}bh$, square units

27. $P = a + b + c + d$, units

28. $A = \frac{1}{2}h(b + d)$, square units

29. $C = \pi D$, or $C = 2\pi r$, units

30. $A = \pi r^2$, square units

31. $V = lwh$, cubic units

32. $V = Bh$, cubic units

33. $V = \frac{1}{3}Bh$, cubic units

SECTION 1.3

34. $V = \frac{1}{3}Bh$, cubic units **35.** $V = \frac{4}{3}\pi r^3$, cubic units **36.** area

37. $6^2 = 6 \cdot 6 = 36$ **38.** $9^2 = 9 \cdot 9 = 81$

39. $\left(-\frac{1}{5}\right)^4 = \left(-\frac{1}{5}\right)\left(-\frac{1}{5}\right)\left(-\frac{1}{5}\right)\left(-\frac{1}{5}\right) = \frac{1}{625}$ **40.** $\left(\frac{1}{2}\right)^6 = \frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2} = \frac{1}{64}$

41. $x^3 = x \cdot x \cdot x$ **42.** $y^4 = y \cdot y \cdot y \cdot y$ **43.** $8z^4 = 8 \cdot z \cdot z \cdot z \cdot z$

44. $5t^2 = 5 \cdot t \cdot t$ **45.** $(4x)^3 = 4x \cdot 4x \cdot 4x$ **46.** $(3z)^4 = 3z \cdot 3z \cdot 3z \cdot 3z$

47. $3(6y)^2 = 3 \cdot 6y \cdot 6y$ **48.** $2(4t)^3 = 2 \cdot 4t \cdot 4t \cdot 4t$ **49.** $4(3^2) = 4 \cdot 9 = 36$

50. $4(2^3) = 4 \cdot 8 = 32$ **51.** $(2 \cdot 5)^4 = 10^4 = 10{,}000$ **52.** $(2 \cdot 2)^3 = 4^3 = 64$

53. $5(4)^2 = 5 \cdot 16 = 80$ **54.** $4(5)^2 = 4 \cdot 25 = 100$ **55.** $(3 \cdot 2)^3 = 6^3 = 216$

56. $(2 \cdot 3)^2 = 6^2 = 36$ **57.** $3 \cdot 5 - 4 = 15 - 4 = 11$ **58.** $3 + 6 \cdot 4 = 3 + 24 = 27$

59. $3(5 - 4) = 3(1) = 3$ **60.** $3(5 + 8) = 3(13) = 39$

61. $2 + 3 \cdot 5 - 4 = 2 + 15 - 4 = 17 - 4 = 13$ **62.** $10 + 2 \cdot 4 + 3 = 10 + 8 + 3 = 18 + 3 = 21$

63. $48 \div (4 + 2) = 48 \div 6 = 8$ **64.** $16 \div (5 + 3) = 16 \div 8 = 2$

65. $3^2 + 2(1 + 4) - 2 = 9 + 2(5) - 2 = 9 + 10 - 2 = 19 - 2 = 17$

66. $4 \cdot 3 + 2(5 - 2) - 2^3 = 12 + 2(3) - 8 = 12 + 6 - 8 = 18 - 8 = 10$

67. $\frac{3}{5}\cdot\frac{10}{3} + \frac{1}{2}\cdot 12 = \frac{3}{5}\cdot\frac{10}{3} + \frac{1}{2}\cdot\frac{12}{1} = \frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{5}}}\cdot\frac{2\cdot\overset{1}{\cancel{5}}}{\underset{1}{\cancel{3}}} + \frac{1}{\underset{1}{\cancel{2}}}\cdot\frac{6\cdot\overset{1}{\cancel{2}}}{1} = \frac{2}{1} + \frac{6}{1} = 2 + 6 = 8$

68. $\frac{15}{4}\left(1 + \frac{3}{5}\right) = \frac{15}{4}\left(\frac{5}{5} + \frac{3}{5}\right) = \frac{15}{4}\cdot\frac{8}{5} = \frac{3\cdot\overset{1}{\cancel{5}}}{\underset{1}{\cancel{4}}}\cdot\frac{2\cdot\overset{1}{\cancel{4}}}{\underset{1}{\cancel{5}}} = \frac{6}{1} = 6$

69. $\left[\frac{1}{3} - \left(\frac{1}{2}\right)^2\right]^2 = \left[\frac{1}{3} - \frac{1}{4}\right]^2 = \left[\frac{1\cdot\mathbf{4}}{3\cdot\mathbf{4}} - \frac{1\cdot\mathbf{3}}{4\cdot\mathbf{3}}\right]^2 = \left[\frac{4}{12} - \frac{3}{12}\right]^2 = \left[\frac{1}{12}\right]^2 = \frac{1}{144}$

70. $\left[\left(\frac{2}{3}\right)^2 - \frac{1}{3}\right]^2 = \left[\frac{4}{9} - \frac{1}{3}\right]^2 = \left[\frac{4}{9} - \frac{1\cdot\mathbf{3}}{3\cdot\mathbf{3}}\right]^2 = \left[\frac{4}{9} - \frac{3}{9}\right]^2 = \left[\frac{1}{9}\right]^2 = \frac{1}{81}$

SECTION 1.3

71. $\dfrac{(3+5)^2+2}{2(8-5)} = \dfrac{8^2+2}{2(3)} = \dfrac{64+2}{6} = \dfrac{66}{6} = 11$

72. $\dfrac{25-(2\cdot 3-1)}{2\cdot 9-8} = \dfrac{25-(6-1)}{18-8} = \dfrac{25-5}{10} = \dfrac{20}{10} = 2$

73. $\dfrac{(5-3)^2+2}{4^2-(8+2)} = \dfrac{2^2+2}{16-10} = \dfrac{4+2}{6} = \dfrac{6}{6} = 1$

74. $\dfrac{(4^2-2)+7}{5(2+4)-3^2} = \dfrac{(16-2)+7}{5(6)-9} = \dfrac{14+7}{30-9} = \dfrac{21}{21} = 1$

75. $\dfrac{3\cdot 7-5(3\cdot 4-11)}{4(3+2)-3^2+5} = \dfrac{3\cdot 7-5(12-11)}{4(5)-3^2+5} = \dfrac{3\cdot 7-5(1)}{4(5)-9+5} = \dfrac{21-5}{20-9+5} = \dfrac{16}{16} = 1$

76. $\dfrac{2\cdot 5^2-2^2+3}{2(5-2)^2-11} = \dfrac{2\cdot 25-4+3}{2(3)^2-11} = \dfrac{50-4+3}{2(9)-11} = \dfrac{49}{18-11} = \dfrac{49}{7} = 7$

77. $P = 4s = 4(5 \text{ in.}) = 20 \text{ in.}$

78. $P = 2l + 2w = 2(10 \text{ cm}) + 2(3 \text{ cm}) = 20 \text{ cm} + 6 \text{ cm} = 26 \text{ cm}$

79. $P = a + b + c = 3 \text{ m} + 5 \text{ m} + 7 \text{ m} = 15 \text{ m}$

80. $P = a + b + c + d = 7 \text{ cm} + 6 \text{ cm} + 9 \text{ cm} + 14 \text{ cm} = 36 \text{ cm}$

81. $A = s^2 = (6 \text{ m})^2 = 36 \text{ m}^2$

82. $A = \frac{1}{2}bh = \frac{1}{2}(8 \text{ cm})(4 \text{ cm}) = \frac{1}{2}(32 \text{ cm}^2) = 16 \text{ cm}^2$

83. $A = bh = (5 \text{ ft})(11 \text{ ft}) = 55 \text{ ft}^2$

84. $A = \frac{1}{2}h(b+d) = \frac{1}{2}(12 \text{ cm})(16 \text{ cm} + 22 \text{ cm}) = \frac{1}{2}(12 \text{ cm})(38 \text{ cm}) = (6 \text{ cm})(38 \text{ cm}) = 228 \text{ cm}^2$

85. $C = 2\pi r \approx 2\left(\dfrac{22}{7}\right)(14 \text{ m}) = \dfrac{2}{1}\cdot\dfrac{22}{7}\cdot\dfrac{14}{1} \text{ m} = \dfrac{2\cdot 22\cdot 2\cdot \overset{1}{\cancel{7}}}{\underset{1}{\cancel{7}}} \text{ m} = 88 \text{ m}$

86. $C = \pi D \approx \dfrac{22}{7}(21 \text{ cm}) = \dfrac{22}{7}\cdot\dfrac{21}{1} \text{ cm} = \dfrac{22}{\underset{1}{\cancel{7}}}\cdot\dfrac{3\cdot \overset{1}{\cancel{7}}}{1} \text{ cm} = 66 \text{ cm}$

87. $A = \pi r^2 \approx \dfrac{22}{7}(21 \text{ ft})^2 = \dfrac{22}{7}\left(441 \text{ ft}^2\right) = \dfrac{22}{7}\cdot\dfrac{441}{1} \text{ ft}^2 = \dfrac{22}{\underset{1}{\cancel{7}}}\cdot\dfrac{63\cdot \overset{1}{\cancel{7}}}{1} \text{ ft}^2 = 1{,}386 \text{ ft}^2$

88. $A = \pi r^2 \approx \dfrac{22}{7}(7 \text{ m})^2 = \dfrac{22}{7}\left(49 \text{ m}^2\right) = \dfrac{22}{7}\cdot\dfrac{49}{1} \text{ m}^2 = \dfrac{22}{\underset{1}{\cancel{7}}}\cdot\dfrac{7\cdot \overset{1}{\cancel{7}}}{1} \text{ m}^2 = 154 \text{ m}^2$

89. $V = \frac{1}{3}Bh = \frac{1}{3}(3 \text{ cm})^2(2 \text{ cm}) = \frac{1}{3}(9 \text{ cm}^2)(2 \text{ cm}) = (3 \text{ cm}^2)(2 \text{ cm}) = 6 \text{ cm}^3$

SECTION 1.3

90. $V = lwh = (6 \text{ ft})(3 \text{ ft})(2 \text{ ft}) = (18 \text{ ft}^2)(2 \text{ ft}) = 36 \text{ ft}^3$

91. $V = \frac{4}{3}\pi r^3 \approx \frac{4}{3} \cdot \frac{22}{7}(6 \text{ m})^3 = \frac{88}{21}\left(216 \text{ m}^3\right) = \frac{88}{21} \cdot \frac{216}{1} \text{ m}^3 \approx 905 \text{ m}^3$

92. $V = \frac{1}{3}Bh = \frac{1}{3}\pi(6 \text{ in.})^2(14 \text{ in.}) \approx \frac{1}{3} \cdot \frac{22}{7} \cdot \frac{36}{1} \text{ in.}^2 \cdot \frac{14}{1} \text{ in.} = \frac{22 \cdot 12 \cdot \overset{1}{\cancel{3}} \cdot 2 \cdot \overset{1}{\cancel{7}}}{\underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{7}} \cdot 1 \cdot 1} \text{in.}^3 = 528 \text{ in.}^3$

93. Cylinder: $V = Bh = \pi(4 \text{ cm})^2(14 \text{ cm}) \approx \frac{22}{7} \cdot \frac{16}{1} \text{ cm}^2 \cdot \frac{14}{1} \text{ cm} = \frac{22 \cdot 16 \cdot 2 \cdot \overset{1}{\cancel{7}}}{\underset{1}{\cancel{7}} \cdot 1 \cdot 1} \text{ cm}^3 = 704 \text{ cm}^3$

Cone: $V = \frac{1}{3}Bh = \frac{1}{3}\pi(4 \text{ cm})^2(21 \text{ cm}) \approx \frac{1}{3} \cdot \frac{22}{7} \cdot \frac{16}{1} \text{ cm}^2 \cdot \frac{21}{1} \text{ cm} = \frac{22 \cdot 16 \cdot \overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{7}}}{\underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{7}} \cdot 1 \cdot 1} \text{ cm}^3 = 352 \text{ cm}^3$

Total $= 704 \text{ cm}^3 + 352 \text{ cm}^3 = 1{,}056 \text{ cm}^3$

94. Rect. solid: $V = lwh = (6 \text{ in.})(3 \text{ in.})(4 \text{ in.}) = 72 \text{ in.}^3$
Pyramid: $V = \frac{1}{3}Bh = \frac{1}{3}(6 \text{ in.})(3 \text{ in.}) \cdot (4 \text{ in.}) = \frac{1}{3}(72 \text{ in.}^3) = 24 \text{ in.}^3$
Total $= 72 \text{ in.}^3 + 24 \text{ in.}^3 = 96 \text{ in.}^3$

95. $6^2 = 6 \cdot 6 = 36$

96. $7^3 = 7 \cdot 7 \cdot 7 = 343$

97. $2 + 4^2 = 2 + 16 = 18$

98. $4^2 - 2^2 = 16 - 4 = 12$

99. $(2 + 4)^2 = (6)^2 = 36$

100. $(7 - 3)^3 = (4)^3 = 64$

101. $(7 + 9) \div (2 \cdot 4) = 16 \div 8 = 2$

102. $(7 + 9) \div 2 \cdot 4 = 16 \div 2 \cdot 4 = 8 \cdot 4 = 32$

103. $(5 + 7) \div 3 \cdot 4 = 12 \div 3 \cdot 4 = 4 \cdot 4 = 16$

104. $(5 + 7) \div (3 \cdot 4) = 12 \div 12 = 1$

105. $24 \div 4 \cdot 3 + 3 = 6 \cdot 3 + 3 = 18 + 3 = 21$

106. $36 \div 9 \cdot 4 - 2 = 4 \cdot 4 - 2 = 16 - 2 = 14$

107. $6^2 - (8 - 3)^2 = 6^2 - 5^2 = 36 - 25 = 11$

108. $3^3 + (3 - 1)^3 = 3^3 + 2^3 = 27 + 8 = 35$

109. $(2 \cdot 3 - 4)^3 = (6 - 4)^3 = 2^3 = 8$

110. $(3 \cdot 5 - 2 \cdot 6)^2 = (15 - 12)^2 = 3^2 = 9$

111. $\frac{2[4 + 2(3 - 1)]}{3[3(2 \cdot 3 - 4)]} = \frac{2[4 + 2(2)]}{3[3(6 - 4)]} = \frac{2[4 + 4]}{3[3(2)]} = \frac{2[8]}{3[6]} = \frac{16}{18} = \frac{8}{9}$

112. $\frac{3[9 - 2(7 - 3)]}{(8 - 5)(9 - 7)} = \frac{3[9 - 2(4)]}{(3)(2)} = \frac{3[9 - 8]}{6} = \frac{3[1]}{6} = \frac{3}{6} = \frac{1}{2}$

Problems 113-116 are to be solved using a calculator. The keystrokes needed to solve each problem using a TI-84 graphing calculator appear in each solution. There may be other solutions. Keystrokes for other calculators may be slightly different.

113. [7] [.] [9] [^] [3] [ENTER]
{493.039}

114. [.] [4] [5] [^] [4] [ENTER]
{0.04100625}

115. [2][5][.][3][^][2][ENTER]
$\{640.09\}$

116. [7][.][5][6][7][^][3][ENTER]
$\{433.2825533\}$

117. $39 = (3 \cdot 8) + (5 \cdot 3)$

118. $117 = 3 \cdot (8 + 5) \cdot 3$

119. $87 = (3 \cdot 8 + 5) \cdot 3$

120. $69 = 3 \cdot (8 + 5 \cdot 3)$

121. $V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(21.35 \text{ ft})^3 \approx 40{,}764.51 \text{ ft}^3$

122. Rectangular: $V = lwh = (12 \text{ in.})(9.5 \text{ in.})(7.3 \text{ in.}) = 832.2 \text{ in.}^3$
Cylinder: $V = Bh = \pi r^2 h = \pi(3.75 \text{ in.})^2(18 \text{ in.}) = 795.22 \text{ in.}^3$
Left over $= 832.2 \text{ in.}^3 - 795.22 \text{ in.}^3 = 36.98 \text{ in.}^3$

123. $P = 4s = 4\left(30\frac{2}{5} \text{ m}\right) = 4\left(30 + \frac{2}{5} \text{ m}\right) = 4\left(\frac{150}{5} + \frac{2}{5} \text{ m}\right) = \frac{4}{1}\left(\frac{152}{5} \text{ m}\right)$
$= \frac{608}{5} \text{ m} = 121\frac{3}{5} \text{ m}$

124. Area = length $\cdot$ width + length $\cdot$ width $= (23)(17.5) + (17.5)(14) = 402.5 + 245 = 647.5 \text{ ft}^2$
Square yards $= 647.5 \div 9 = 71.94444444$; Cost $= 71.94444444(29.79) \approx \$2{,}143.23$

125. $V = lwh = (40 \text{ ft})(40 \text{ ft})(9 \text{ ft}) = 14{,}400 \text{ ft}^3$; Per student $= 14{,}400 \text{ ft}^3 \div 30 = 480 \text{ ft}^3$ per student

126. $A = 2(lw) = 2(17.3 \text{ ft})(8.5 \text{ ft}) = 294.1 \text{ ft}^2$; # rolls $= 294.1 \text{ ft}^2 \div 33 = 8.91$
Cost of 9 rolls $= 9(\$27.50) = \$247.50$

127. $f = \dfrac{rs}{(r+s)(n-1)} = \dfrac{(8)(12)}{(8+12)(1.6-1)} = \dfrac{96}{(20)(0.6)} = \dfrac{96}{12} = 8$

128. $R = \dfrac{rs}{r+s} = \dfrac{(170)(255)}{170+255} = \dfrac{43{,}350}{425} = 102$

129. Answers may vary.

130. Answers may vary.

131. Increasing powers produce larger numbers.

132. Increasing powers produce smaller numbers.

Exercises 1.4 (page 45)

1. $2 + 3 = +(2 + 3) = 5$

2. $2 + (-5) = -(5 - 2) = -3$

3. $-4 + 7 = +(7 - 4) = 3$

4. $-5 + (-6) = -(5 + 6) = -11$

5. $6 - 2 = 4$

6. $-8 - 4 = -8 + (-4) = -(8 + 4) = -12$

7. $-5 - (-7) = -5 + (+7) = +(7 - 5) = 2$

8. $12 - (-4) = 12 + (+4) = +(12 + 4) = 16$

SECTION 1.4

9. $5 + 3(7 - 2) = 5 + 3(5) = 5 + 15 = 20$

10. $(5 + 3)(7 - 2) = (8)(5) = 40$

11. $5 + 3(7) - 2 = 5 + 21 - 2 = 26 - 2 = 24$

12. $(5 + 3)7 - 2 = 8(7) - 2 = 56 - 2 = 54$

13. arrows

14. like

15. unlike

16. add, keep

17. subtract, greater

18. $a + (-b)$

19. add, opposite

20. $-a$, a

21. $5 + 9 = +(5 + 9) = 14$

22. $(-6) + (-4) = -(6 + 4) = -10$

23. $(-7) + (-2) = -(7 + 2) = -9$

24. $(+4) + 11 = +(4 + 11) = 15$

25. $\frac{1}{5} + \left(+\frac{1}{7}\right) = \frac{7}{35} + \left(+\frac{5}{35}\right) = +\left(\frac{7}{35} + \frac{5}{35}\right) = \frac{12}{35}$

26. $-\frac{3}{4} + \left(-\frac{1}{4}\right) = -\left(\frac{3}{4} + \frac{1}{4}\right) = -\frac{4}{4} = -1$

27. $44.902 + 33.098 = +(44.902 + 33.098) = 78$

28. $-421.377 + (-122.043) = -(421.377 + 122.043) = -543.42$

29. $7 + (-3) = +(7 - 3) = 4$

30. $8 + (-5) = +(8 - 5) = 3$

31. $(-0.4) + 0.9 = +(0.9 - 0.4) = 0.5$

32. $(-1.2) + (-5.3) = -(1.2 + 5.3) = -6.5$

33. $\frac{2}{3} + \left(-\frac{1}{4}\right) = \frac{8}{12} + \left(-\frac{3}{12}\right) = +\left(\frac{8}{12} - \frac{3}{12}\right) = +\frac{5}{12}$

34. $-\frac{1}{2} + \frac{1}{3} = -\frac{3}{6} + \frac{2}{6} = -\left(\frac{3}{6} - \frac{2}{6}\right) = -\frac{1}{6}$

35. $73.82 + (-108.4) = -(108.4 - 73.82) = -34.58$

36. $-721.964 + (38.291) = -(721.964 - 38.291) = -683.673$

37. $5 + [4 + (-2)] = 5 + [2] = 7$

38. $-2 + [(-5) + 3] = -2 + [-2] = -4$

39. $-2 + (-4 + 5) = -2 + 1 = -1$

40. $5 + [-4 + (-6)] = 5 + [-10] = -5$

41. $(-7 + 5) + 2 = -2 + 2 = 0$

42. $-12 + (-2 + 10) = -12 + 8 = -4$

43. $-9 + [-6 + (-4)] = -9 + [-10] = -19$

44. $-27 + [-12 + (-13)] = -27 + [-25] = -52$

45.
$$\begin{array}{r} 5 \\ +\ -4 \\ \hline 1 \end{array}$$

46.
$$\begin{array}{r} -18 \\ +\ -11 \\ \hline -29 \end{array}$$

47.
$$\begin{array}{r} -1.3 \\ +\ 3.5 \\ \hline 2.2 \end{array}$$

48.
$$\begin{array}{r} 1.3 \\ +\ -2.5 \\ \hline -1.2 \end{array}$$

SECTION 1.4

49. $8 - 4 = 8 + (-4) = 4$

50. $-8 - 4 = -8 + (-4) = -12$

51. $8 - (-4) = 8 + (+4) = 12$

52. $-8 - (-4) = -8 + (+4) = -4$

53. $0 - (-5) = 0 + (+5) = 5$

54. $0 - 75 = 0 + (-75) = -75$

55. $\dfrac{5}{3} - \dfrac{7}{6} = \dfrac{10}{6} - \dfrac{7}{6} = \dfrac{10}{6} + \left(-\dfrac{7}{6}\right) = \dfrac{3}{6} = \dfrac{1}{2}$

56. $-\dfrac{5}{9} - \dfrac{5}{3} = -\dfrac{5}{9} - \dfrac{15}{9} = -\dfrac{5}{9} + \left(-\dfrac{15}{9}\right) = -\dfrac{20}{9}$

57.
$$\begin{array}{r} 8 \\ -\ \underline{4} \end{array} \quad \Rightarrow \quad \begin{array}{r} 8 \\ +\ \underline{-4} \\ 4 \end{array}$$

58.
$$\begin{array}{r} 8 \\ -\ \underline{-3} \end{array} \quad \Rightarrow \quad \begin{array}{r} 8 \\ +\ \underline{3} \\ 11 \end{array}$$

59.
$$\begin{array}{r} -10 \\ -\ \underline{-3} \end{array} \quad \Rightarrow \quad \begin{array}{r} -10 \\ +\ \underline{3} \\ -7 \end{array}$$

60.
$$\begin{array}{r} -13 \\ -\ \underline{5} \end{array} \quad \Rightarrow \quad \begin{array}{r} -13 \\ +\ \underline{-5} \\ -18 \end{array}$$

61. $5 - [(-2) - 4] = 5 - [(-2) + (-4)] = 5 - [-6] = 5 + [+6] = 11$

62. $-3 - [5 - (-4)] = -3 - [5 + (+4)] = -3 - [9] = -3 + (-9) = -12$

63. $4 - [(-3) - 5] = 4 - [(-3) + (-5)] = 4 - [-8] = 4 + [+8] = 12$

64. $(3 - 5) - [5 - (-3)] = [3 + (-5)] - [5 + (+3)] = [-2] - [8] = [-2] + [-8] = -10$

65. $\dfrac{5 - (-4)}{3 - (-6)} = \dfrac{5 + (+4)}{3 + (+6)} = \dfrac{9}{9} = 1$

66. $\dfrac{2 + (-3)}{-3 - (-4)} = \dfrac{-1}{-3 + (+4)} = \dfrac{-1}{1} = -1$

67. $\dfrac{-6 - (-3)}{5 + (-8)} = \dfrac{-6 + (+3)}{-3} = \dfrac{-6 + 3}{-3} = \dfrac{-3}{-3} = 1$

68. $\dfrac{2 + (-3)}{-3 - (-5)} + \dfrac{-4 + 1}{8 + (-6)} = \dfrac{-1}{-3 + (+5)} + \dfrac{-3}{2} = \dfrac{-1}{2} + \dfrac{-3}{2} = \dfrac{-1 + (-3)}{2} = \dfrac{-4}{2} = -2$

Problems 69-72 are to be solved using a calculator. The keystrokes needed to solve each problem using a TI-84 graphing calculator appear in each solution. There may be other solutions. Keystrokes for other calculators may be slightly different.

69. [4] [.] [2] [6] [−] [6] [.] [3] [4] [+] [.] [5] [6] [ENTER]

$\{-1.52\} \Rightarrow -1.52$

70. [6] [.] [3] [4] [−] [.] [5] [6] [−] [4] [.] [2] [6] [ENTER]

$\{1.52\} \Rightarrow 1.52$

71. [2] [.] [3] [4] [x^2] [−] [3] [.] [4] [7] [x^2] [−] [.] [7] [2] [x^2] [ENTER]
$\{-7.0837\} \Rightarrow -7.08$

72. [.] [7] [2] [x^2] [−] [2] [.] [3] [4] [x^2] [+] [3] [.] [4] [7] [^] [3] [ENTER]
$\{36.824723\} \Rightarrow 36.82$

73. $\left(\frac{5}{2}-3\right)-\left(\frac{3}{2}-5\right)=\left(\frac{5}{2}-\frac{6}{2}\right)-\left(\frac{3}{2}-\frac{10}{2}\right)=\left(-\frac{1}{2}\right)-\left(-\frac{7}{2}\right)=\left(-\frac{1}{2}\right)+\left(+\frac{7}{2}\right)$
$=\frac{6}{2}=3$

74. $\left(\frac{7}{3}-\frac{5}{6}\right)-\left[\frac{5}{6}-\left(-\frac{7}{3}\right)\right]=\left(\frac{14}{6}-\frac{5}{6}\right)-\left[\frac{5}{6}+\left(+\frac{7}{3}\right)\right]=\left(\frac{9}{6}\right)-\left[\frac{5}{6}+\frac{14}{6}\right]=\frac{9}{6}-\left[\frac{19}{6}\right]$
$=\frac{9}{6}+\left[-\frac{19}{6}\right]$
$=-\frac{10}{6}=-\frac{5}{3}$

75. $(5.2-2.5)-(5.25-5)=[5.2+(-2.5)]-[5.25+(-5)]=2.7-[0.25]=2.7+(-0.25)$
$=2.45$

76. $(3.7-8.25)-(3.75+2.5)=[3.7+(-8.25)]-(6.25)=(-4.55)-(6.25)=-(4.55+6.25)$
$=-10.8$

77. $4+(-12)=-(12-4)=-8$

78. $11+(-15)=-(15-11)=-4$

79. $[-4+(-3)]+[2+(-2)]=[-7]+[0]$
$=-7$

80. $[3+(-1)]+[-2+(-3)]=[2]+[-5]$
$=-3$

81. $-4+(-3+2)+(-3)=-4+(-1)+(-3)=-5+(-3)=-8$

82. $5+[2+(-5)]+(-2)=5+[-3]+(-2)=2+(-2)=0$

83. $-|8+(-4)|+7=-|4|+7=-4+7=3$

84. $\left|\frac{3}{5}+\left(-\frac{4}{5}\right)\right|=\left|-\frac{1}{5}\right|=\frac{1}{5}$

85. $-5.2+|-2.5+(-4)|=-5.2+|-6.5|$
$=-5.2+6.5=1.3$

86. $6.8+|8.6+(-1.1)|=6.8+|7.5|$
$=6.8+7.5=14.3$

87. $-3\frac{1}{2}-5\frac{1}{4}=-\frac{7}{2}-\frac{21}{4}=-\frac{14}{4}-\frac{21}{4}=-\frac{14}{4}+\left(-\frac{21}{4}\right)=-\frac{35}{4}=-8\frac{3}{4}$

88. $2\frac{1}{2}-\left(-3\frac{1}{2}\right)=\frac{5}{2}-\left(-\frac{7}{2}\right)=\frac{5}{2}+\left(+\frac{7}{2}\right)=\frac{12}{2}=6$

SECTION 1.4

89. $-6.7-(-2.5)=-6.7+(+2.5)=-4.2$

90. $25.3-17.5=25.3+(-17.5)=7.8$

91. $\dfrac{-4-2}{-[2+(-3)]}=\dfrac{-4+(-2)}{-[-1]}=\dfrac{-6}{+1}=-6$

92. $\dfrac{-3+(-2)}{2-(-1)}-\dfrac{1-7}{-4-(-7)}=\dfrac{-5}{2+(+1)}-\dfrac{1+(-7)}{-4+(+7)}=\dfrac{-5}{3}-\dfrac{-6}{3}=\dfrac{-5-(-6)}{3}$
$=\dfrac{-5+(+6)}{3}=\dfrac{1}{3}$

93. $\left(\dfrac{3}{4}-\dfrac{4}{5}\right)-\left(\dfrac{2}{3}+\dfrac{1}{4}\right)=\left(\dfrac{15}{20}-\dfrac{16}{20}\right)-\left(\dfrac{8}{12}+\dfrac{3}{12}\right)=\left(-\dfrac{1}{20}\right)-\left(\dfrac{11}{12}\right)=\left(-\dfrac{3}{60}\right)-\left(\dfrac{55}{60}\right)$
$=-\left(\dfrac{3}{60}+\dfrac{55}{60}\right)$
$=-\dfrac{58}{60}=-\dfrac{29}{30}$

94. $\left(3\dfrac{1}{2}-2\dfrac{1}{2}\right)-\left[5\dfrac{1}{3}-\left(-5\dfrac{2}{3}\right)\right]=\left(\dfrac{7}{2}-\dfrac{5}{2}\right)-\left[5\dfrac{1}{3}+\left(+5\dfrac{2}{3}\right)\right]=\left(\dfrac{2}{2}\right)-\left[\dfrac{16}{3}+\dfrac{17}{3}\right]$
$=1-\dfrac{33}{3}=1-11=-10$

95. $(-735)+(+500)=-235$
She still owes \$235.

96. $(+212)+(-24)=+188$
He weighs 188 pounds.

97. $(+13)+(-4)=+9$

98. $(+2{,}347)+(-597)=+1{,}750$ ft

99. $(-14)+10=-4°$

100. $1897+54-19=1932$

101. $1700-(-300)=2000$ years

102. $415-176+212=\$451$

103. $(-2{,}300)+(1{,}750)+(1{,}875)=+1{,}325$ m

104. $5+(+7)+(-5)+(+1)+(-2)+(-6)=0$ yd

105. $32{,}000-28{,}000=4{,}000$ ft

106. $37.125-31.625=5.5$

107. $+32-(+27)=5°$

108. $-3-(-21)=18°$

109. $12{,}153-23+57=12{,}187$

110. $11{,}917+29+12-53-27-27=11{,}851$

111. $500\cdot 2-300=1000-300=700$ shares

112. $2{,}532-633=\$1{,}899$

113. $437.45+25.17+37.93+45.26-17.13-83.44-22.58=\$422.66$

114. $97{,}345.32-37{,}675.66-7{,}537.45-3{,}723.41-5{,}767.99=\$42{,}640.81$

115. $115{,}000 - 78 - 446 - 216 - 7{,}612.32 - 23{,}445.11 + 223 = \$83{,}425.57$

116. $\frac{1}{20}(500{,}000) - 7{,}645.12 - 10{,}000 + 0.02(7{,}645.12) - 0.28\left(\frac{1}{20} \cdot 500{,}000\right)$
$= 25{,}000 - 7{,}645.12 - 10{,}000 + 152.90 - 7{,}000 = \$507.78$

117. Answers may vary.

118. Answers may vary.

119. The answers agree if the two numbers have the same sign. The answers do not agree if the numbers have opposite signs.

120. Answers may vary.

Exercises 1.5 (page 52)

1. $1(3) = 3$

2. $2(5) = 10$

3. $2(3)(4) = 6(4) = 24$

4. $5(3)(2) = 15(2) = 30$

5. $\frac{12}{6} = 2$

6. $\frac{10}{2} = 5$

7. $\frac{3(6)}{2} = \frac{18}{2} = 9$

8. $\frac{2 \cdot 3}{6} = \frac{6}{6} = 1$

9. $12 \div 4(3) = 3(3) = 9$

10. $16 \div 2(4) = 8(4) = 32$

11. $30 \cdot 37\frac{1}{2} = \frac{30}{1} \cdot \frac{75}{2} = \frac{15 \cdot \cancel{2}^{1} \cdot 75}{1 \cdot \cancel{2}_{1}} = 1{,}125$ lb

12. $500(1.3) = 650$ lb

13. $3^3 - 8(3)^2 = 27 - 8(9) = 27 - 72 = -45$

14.
$$\begin{aligned} -2(-3+4) &\ \square\ -3[3-(-4)] \\ -2(+1) &\ \square\ -3[+7] \\ -2 &\ \boxed{>}\ -21 \end{aligned}$$

15. positive

16. positive

17. positive

18. negative

19. positive

20. 0

21. a

22. undefined

23. 0

24. 1

25. $(+4)(+9) = 36$

26. $(-5)(-6) = 30$

27. $(-8)(-7) = 56$

28. $(9)(-6) = -54$

29. $(-10)(+9) = -90$

30. $(-3)(11) = -33$

31. $(-32)(-14) = 448$

32. $(-27)(14) = -378$

33. $(-2)(3)(4) = (-6)(4) = -24$

34. $(5)(0)(-3) = (0)(-3) = 0$

35. $(-5)^2 = (-5)(-5) = 25$

36. $(-2)^3 = (-2)(-2)(-2) = (+4)(-2) = -8$

SECTION 1.5

37. $(-4)^3 = (-4)(-4)(-4) = (+16)(-4) = -64$

38. $(-6)^2 = (-6)(-6) = 36$

39. $(-3)(5)(-6) = (-15)(-6) = 90$

40. $(-1)(-3)(-6) = (+3)(-6) = -18$

41. $2 + (-1)(-3) = 2 + 3 = 5$

42. $-3 - (-1)(2) = -3 - (-2) = -3 + 2 = -1$

43. $(-1 + 2)(-3) = 1(-3) = -3$

44. $3[-2 - (-4)] = 3(-2 + 4) = 3(2) = 6$

45. $[-1 - (-3)][-1 + (-3)] = [-1 + 3][-4] = [2][-4] = -8$

46. $[2 + (-3)][-1 - (-3)] = [-1][-1 + 3] = [-1][2] = -2$

47. $2(-1)^2 - 3(-2)^2 = 2(1) - 3(4) = 2 - 12 = -10$

48. $(-1)^2(3) + (-3)(2) = (1)(3) + (-6) = 3 + (-6) = -3$

49. $\left(\frac{2}{3}\right)(-36) = -\frac{2}{3} \cdot \frac{36}{1} = -\frac{72}{3} = -24$

50. $\left(-\frac{3}{4}\right)(12) = -\frac{3}{4} \cdot \frac{12}{1} = -\frac{36}{4} = -9$

51. $\left(-\frac{20}{3}\right)\left(-\frac{3}{5}\right) = +\frac{20}{3} \cdot \frac{3}{5} = \frac{60}{15} = 4$

52. $\left(-\frac{2}{5}\right)\left(\frac{15}{2}\right) = -\frac{2}{5} \cdot \frac{15}{2} = -\frac{30}{10} = -3$

53. $\frac{80}{-20} = -4$

54. $\frac{-66}{33} = -2$

55. $\frac{-110}{-55} = 2$

56. $\frac{200}{40} = 5$

57. $\frac{-120}{30} = -4$

58. $\frac{-250}{-25} = 10$

59. $\frac{320}{-16} = -20$

60. $\frac{180}{-36} = -5$

61. $\frac{-3(6)}{-(-2)} = \frac{-18}{2} = -9$

62. $\frac{4(-3)^2}{-2} = \frac{4(9)}{-2} = \frac{36}{-2} = -18$

63. $\frac{(-2)^3(10)}{-(-5)} = \frac{(-8)(10)}{5} = \frac{-80}{5} = -16$

64. $\frac{-18}{-2(3)} = \frac{-18}{-6} = 3$

65. $\frac{18 - 20}{-2} = \frac{-2}{-2} = 1$

66. $\frac{16 - 2}{2 - 9} = \frac{14}{-7} = -2$

67. $\frac{-3(-2)(-4)}{-4 - 2(-5)} = \frac{6(-4)}{-4 + 10} = \frac{-24}{6} = -4$

68. $\frac{2(15)^2 - 2}{-2^3 + 1} = \frac{2(225) - 2}{-8 + 1} = \frac{450 - 2}{-7} = \frac{448}{-7} = -64$

69. $\frac{6 - 3(2)^2}{-1(7 - 4)} = \frac{6 - 3(4)}{-1(3)} = \frac{6 - 12}{-3} = \frac{-6}{-3} = 2$

70. $\frac{2(-25)(10) + 4(5)(-5)}{5(125 - 25)} = \frac{-50(10) + 20(-5)}{5(100)} = \frac{-500 + (-100)}{500} = \frac{-600}{500} = -\frac{6}{5}$

SECTION 1.5

71. $\dfrac{-4(5)(2)+2(-10)(3)}{-2(-4)-8}=\dfrac{-20(2)+(-20)(3)}{8-8}=\dfrac{-40+(-60)}{0}\Rightarrow$ undefined

72. $\dfrac{-5(-2)+4}{-4(2)+8}=\dfrac{10+4}{-8+8}=\dfrac{14}{0}\Rightarrow$ undefined

Problems 73-76 are to be solved using a calculator. The keystrokes needed to solve each problem using a TI-84 graphing calculator appear in each solution. There may be other solutions. Keystrokes for other calculators may be slightly different.

73. ((–) 6 + 4 × (–) 3) ÷ (4 – 6) ENTER $\{9\}$

74. (4 – 2 × 4 × (–) 3 + (–) 3) ÷ (4 – (–) 6 – 3) ENTER $\{3.5714\}$ $\left[\text{or } \frac{25}{7}\right]$

75. (4 × ((–) 6) x^2 × (–) 3 + 4 x^2 × (–) 6) ÷ (2 × (–) 6 – 2 × (–) 3) ENTER $\{88\}$

76. ((4 x^2 – 2 × (–) 6) × ((–) 3) x^2) ÷ ((–) 4 × (–) 3) ENTER $\{21\}$

77. $(-4)\left(\dfrac{-3}{4}\right)=+\dfrac{4}{1}\cdot\dfrac{3}{4}=\dfrac{12}{4}=3$

78. $(5)\left(-\dfrac{2}{5}\right)=-\dfrac{5}{1}\cdot\dfrac{2}{5}=-\dfrac{10}{5}=-2$

79. $(-1)(2^3)=(-1)(8)=-8$

80. $[2(-3)]^2=[-6]^2=(-6)(-6)=36$

81. $(-2)(-2)(-2)(-3)(-4)=(+4)(-2)(-3)(-4)=(-8)(-3)(-4)=(+24)(-4)=-96$

82. $(-5)(4)(3)(-2)(-1)=(-20)(3)(-2)(-1)=(-60)(-2)(-1)=(+120)(-1)=-120$

83. $(2)(-5)(-6)(-7)=(-10)(-6)(-7)$
$=(+60)(-7)=-420$

84. $(-3)(-5)(-5)(-2)=(+15)(-5)(-2)$
$=(-75)(-2)=150$

85. $(-7)^2=(-7)(-7)=49$

86. $(-2)^3=(-2)(-2)(-2)=(+4)(-2)=-8$

87. $-(-3)^2=-(-3)(-3)=-(+9)=-9$

88. $-(-1)(-3)^2=-(-1)(-3)(-3)=-(+3)(-3)=-(-9)=9$

89. $(-1)^2[2-(-3)]=(-1)(-1)[2+(+3)]$
$=1[5]=5$

90. $2^2[(-1)-(-3)]=4[-1+(+3)]$
$=4[2]=8$

91. $(-3)(-1)-(-3)(2)=3-(-6)=3+6$
$=9$

92. $(-1)(2)(-3)+6=(-2)(-3)+6=6+6$
$=12$

93. $(-1)^3(-2)^2 + (-3)^2 = (-1)(-1)(-1)(-2)(-2) + (-3)(-3) = -4 + 9 = 5$

94. $(-2)^3[3 - (-5)] = (-2)(-2)(-2)[3 + 5] = (-8)[8] = -64$

95. $\dfrac{4 + (-12)}{(-2)^2 - 4} = \dfrac{-8}{4 - 4} = \dfrac{-8}{0} \Rightarrow$ undefined

96. $\dfrac{-2(3)(4)}{3 - 1} = \dfrac{-24}{2} = -12$

97. $\dfrac{(-2)(5)(4)}{-3 + 1} = \dfrac{-40}{-2} = 20$

98. $\dfrac{-3 + 2 - (-10)}{4(-3) + 2(6)} = \dfrac{-1 + (+10)}{-12 + 12} = \dfrac{9}{0}$
$\Rightarrow$ undefined

99. $\dfrac{1}{2} - \dfrac{2}{3} - \dfrac{3}{4} = \dfrac{6}{12} + \left(-\dfrac{8}{12}\right) + \left(-\dfrac{9}{12}\right) = -\dfrac{11}{12}$

100. $-\dfrac{2}{3} + \dfrac{1}{2} + \dfrac{3}{4} = -\dfrac{8}{12} + \dfrac{6}{12} + \dfrac{9}{12} = \dfrac{7}{12}$

101. $\dfrac{1}{2} - \dfrac{2}{3} = \dfrac{3}{6} + \left(-\dfrac{4}{6}\right) = -\dfrac{1}{6}$

102. $-\dfrac{2}{3} - \dfrac{3}{4} = -\dfrac{8}{12} + \left(-\dfrac{9}{12}\right) = -\dfrac{17}{12}$

103. $\left(\dfrac{1}{2} - \dfrac{2}{3}\right)\left(\dfrac{1}{2} + \dfrac{2}{3}\right) = \left(\dfrac{3}{6} - \dfrac{4}{6}\right)\left(\dfrac{3}{6} + \dfrac{4}{6}\right) = \left(-\dfrac{1}{6}\right)\left(\dfrac{7}{6}\right) = -\dfrac{7}{36}$

104. $\left(\dfrac{1}{2} + \dfrac{3}{4}\right)\left(\dfrac{1}{2} - \dfrac{3}{4}\right) = \left(\dfrac{4}{8} + \dfrac{6}{8}\right)\left(\dfrac{4}{8} - \dfrac{6}{8}\right) = \left(\dfrac{10}{8}\right)\left(-\dfrac{2}{8}\right) = -\dfrac{5}{16}$

105. $\left(\dfrac{1}{4} - \dfrac{2}{3}\right)\left(\dfrac{3}{4} - \dfrac{1}{3}\right) = \left(\dfrac{3}{12} - \dfrac{8}{12}\right)\left(\dfrac{9}{12} - \dfrac{4}{12}\right) = \left(-\dfrac{5}{12}\right)\left(\dfrac{5}{12}\right) = -\dfrac{25}{144}$

106. $\left(\dfrac{2}{5} - \dfrac{1}{4}\right)\left(\dfrac{1}{5} - \dfrac{3}{4}\right) = \left(\dfrac{8}{20} - \dfrac{5}{20}\right)\left(\dfrac{4}{20} - \dfrac{15}{20}\right) = \left(\dfrac{3}{20}\right)\left(-\dfrac{11}{20}\right) = -\dfrac{33}{400}$

107. $(+425)(-12) = -\$5{,}100$

108. $94 - (8)(8) = 94 - 64 = \$30$

109. $\dfrac{-18}{-3} = +6$

110. $\dfrac{-37.5}{-2.5} = 15$ weeks

111. **a.** $75(-32) = -\$2400$ **b.** $57(-17) = -\$969$ **c.** $87(-12) = -\$1044$
d. $(-2400) + (-969) + (-1044) = -\$4413$

112 **a.** $\dfrac{-60}{-12} = \$5$ **b.** $\dfrac{-49}{-7} = \$7$ **c.** $\dfrac{-39}{-13} = \$3$

113. $\dfrac{(+26) + (+35) + (+17) + (-25) + (-31) + (-12) + (-24)}{7} = \dfrac{-14}{7} = -2$ per day

114. $\dfrac{67{,}000{,}000}{186{,}000} \approx 360$ seconds

115. $613.50(18) = \$11{,}043 \Rightarrow$ enough \$

116. $\dfrac{(+19)+(+15)+(+12)+(-11)+(-39)}{5} = \dfrac{-4}{5} = -0.8$ million dollars, or $-\$800{,}000$ per year.

117. Answers may vary.

118. Answers may vary.

119. If the quotient is undefined, then the denominator must equal 0, and the product of the two numbers is 0.

120. If the product of the five numbers is negative, then either 1, 3 or 5 of the numbers must be negative.

121. If x^5 is negative, then x must be negative.

122. If x^6 is positive, then x may be either positive or negative.

Exercises 1.6 (page 59)

1. sum **2.** product **3.** product **4.** difference

5. quotient **6.** quotient **7.** difference **8.** sum

9. $0.14 \cdot 3{,}800 = 532$

10. $\frac{3}{5}(4{,}765) = 2{,}859$

11. $\dfrac{-4+(7-9)}{(-9-7)+4} = \dfrac{-4+(-2)}{-16+4} = \dfrac{-6}{-12} = \dfrac{1}{2}$

12. $\dfrac{5}{4}\left(1-\dfrac{3}{5}\right) = \dfrac{5}{4}\left(\dfrac{5}{5}-\dfrac{3}{5}\right) = \dfrac{5}{4}\cdot\dfrac{2}{5} = \dfrac{2}{4} = \dfrac{1}{2}$

13. sum **14.** subtraction **15.** multiplication **16.** quotient

17. algebraic **18.** evaluate **19.** term, coefficient **20.** constants

21. $x+y$ **22.** $2x+2y$ **23.** $x-3$ **24.** $y-2x$

25. $(2x)y$ **26.** $x(2y)$ **27.** $3xy$ **28.** $3(2z)$

29. $\dfrac{y}{x}$ **30.** $\dfrac{x+y}{y}$ **31.** $\dfrac{3z}{4x}$ **32.** $\dfrac{x+y}{y+z}$

33. $x+y=(-2)+5=3$

34. $x-z=(-2)-(-3)=-2+3=1$

35. $4xyz = 4(-2)(5)(-3) = -8(5)(-3) = -40(-3) = 120$

36. $2x^2z = 2(-2)^2(-3) = 2(4)(-3) = 8(-3) = -24$

37. $\dfrac{x^2y}{z-1} = \dfrac{(-2)^2(5)}{-3-1} = \dfrac{4(5)}{-4} = \dfrac{20}{-4} = -5$

38. $\dfrac{xy-2}{z} = \dfrac{(-2)(5)-2}{-3} = \dfrac{-10-2}{-3} = \dfrac{-12}{-3} = 4$

39. $\dfrac{4z^2y}{3(x-z)} = \dfrac{4(-3)^2(5)}{3[-2-(-3)]} = \dfrac{4(9)(5)}{3[1]} = \dfrac{36(5)}{3} = \dfrac{180}{3} = 60$

SECTION 1.6

40. $\dfrac{x+y+z}{4y^2x} = \dfrac{-2+5+(-3)}{4(5)^2(-2)} = \dfrac{3+(-3)}{4(25)(-2)} = \dfrac{0}{100(-2)} = 0$

41. $\dfrac{x(y+z)-25}{(x+z)^2-y^2} = \dfrac{-2[5+(-3)]-25}{[-2+(-3)]^2-5^2} = \dfrac{-2[2]-25}{[-5]^2-25} = \dfrac{-4-25}{25-25} = \dfrac{-29}{0} \Rightarrow$ undefined

42. $\dfrac{(x+y)(y+z)}{x+z+y} = \dfrac{(-2+5)[5+(-3)]}{-2+(-3)+5} = \dfrac{(3)[2]}{-5+5} = \dfrac{6}{0} \Rightarrow$ undefined

43. $\dfrac{3(x+z^2)+4}{y(x-z)} = \dfrac{3\left[(-2)+(-3)^2\right]+4}{5[(-2)-(-3)]} = \dfrac{3(-2+9)+4}{5(1)} = \dfrac{3(7)+4}{5} = \dfrac{21+4}{5} = \dfrac{25}{5} = 5$

44. $\dfrac{x(y^2-2z)-1}{z(y-x^2)} = \dfrac{-2[5^2-2(-3)]-1}{-3\left[5-(-2)^2\right]} = \dfrac{-2(25+6)-1}{-3(5-4)} = \dfrac{-2(31)-1}{-3(1)} = \dfrac{-62-1}{-3} = \dfrac{-63}{-3} = 21$

45. $-7c$: 1 term; coef. $= -7$

46. $4c-9d$: 2 terms; coef. $= 4$

47. $-xy-5z+8$: 3 terms; coef. $= -1$

48. cd: 1 term; coef. $= 1$

49. $-3xy+yz-zw+5$: 4 terms; coef. $= -3$

50. $-2xyz+cde-14$: 3 terms; coef. $= -2$

51. $9abc-5ab-c$: 3 terms; coef. $= 9$

52. $5uvw-4uv+8uw$: 3 terms; coef. $= 5$

53. $5x-4y+3z+2$: 4 terms; coef. $= 5$

54. $7abc-9ab+2bc+a-1$: 5 terms; coef. $= 7$

55. $z+\dfrac{x}{y}$

56. $z-3$

57. $z-xy$

58. $xy-z$

59. $\dfrac{xy}{x+z}$

60. $xy+\dfrac{y}{z}$

61. $\dfrac{x-4}{3y}$

62. $\dfrac{2z-5y}{x+3y}$

Several answers are possible for problems 63-74. Only one possible answer is listed for each problem.

63. the sum of y and 4

64. 5 less than x

65. the product of x, y and the sum of x and y

66. the product obtained when the sum of x, y and z is multiplied by their product

67. the quotient obtained when the sum of x and 2 is divided by z

68. the sum of 5 and the quotient obtained when y is divided by z

69. the quotient obtained when y is divided by z

70. the product of x and y

71. the product of 2, x and y

72. the quotient obtained when the sum of x and y is divided by 2

73. the quotient obtained when 5 is divided by the sum of x and y

74. the quotient obtained when the product of 3 and x is divided by the sum of y and z

75. $x + z = 8 + 2 = 10$

76. $xyz = (8)(4)(2) = 64$

77. $y - z = 4 - 2 = 2$

78. $\dfrac{y}{z} = \dfrac{4}{2} = 2$

79. $yz - 3 = (4)(2) - 3 = 5$

80. $(x + y) - 7 = (8 + 4) - 7 = 5$

81. $\dfrac{xy}{z} = \dfrac{(8)(4)}{2} = 16$

82. $\dfrac{x + 10}{z} = \dfrac{8 + 10}{2} = 9$

83. 3rd term: $19x$; factors: 19, x

84. 2nd term: $23xy$; factors: 23, x, y

85. x is common to the 1st and 3rd terms.

86. x is common to all three terms.

87. 1st term: $3xyz$; factors: 3, x, y, z

88. 2nd term: $5xy$; factors: 5, x, y

89. 3rd term: $17xz$; factors: 17, x, z

90. x is common to all three terms.

91. coefficients: 5, 1 and 8

92. y is common to all three terms.

93. x and y are common to the 1st and 3rd terms.

94. y and t are common to the 2nd and 3rd terms.

95. coefficients: 3, 1 and 25; $3 \cdot 1 \cdot 25 = 75$

96. coefficients: 3, 1 and 25; $3 + 1 + 25 = 29$

97. x and y are common to the 1st and 3rd terms.

98. y is common to all three terms.

99. $c + 6$

100. $m + 25{,}000$

101. **a.** $(h - 20)$ ft **b.** $(c + 20)$ ft

102. $\$9{,}987t$

103. $\$35{,}000n$

104. $\dfrac{x}{5}$ ft

105. $(500 - x)$ in.

106. $\dfrac{12}{x}$ ft

107. $\$(3d + 5)$

108. $(2x - 2)$ shares

109. $\dfrac{N(N-1)}{2} = \dfrac{10{,}000(10{,}000-1)}{2} = \dfrac{10{,}000(9{,}999)}{2} = \dfrac{99{,}990{,}000}{2} = 49{,}995{,}000$ comparisons

110. $\dfrac{N(N-1)}{2} = \dfrac{50{,}000(50{,}000-1)}{2} = \dfrac{50{,}000(49{,}999)}{2} = \dfrac{2{,}499{,}950{,}000}{2}$
$= 1{,}249{,}975{,}000$ comparisons

111-114. Answers may vary.

115. $37x \Rightarrow 37(2x)$
$37(2x) = 2(37x)$
$37x$ is doubled.

116. $5xy^2 \Rightarrow 5(2x)(2y)^2$
$5(2x)(2y)^2 = 8\left(5xy^2\right)$
$5xy^2$ is multiplied by 8.

Exercises 1.7 (page 67)

Several answers are possible for problems 1-6. Only one possible answer is listed for each problem.

1. $2(xy) = (2x)y$

2. $a + 0 = a$

3. $2(x + y) = 2x + 2y$

4. $x \cdot \frac{1}{x} = 1$

5. $5 - 3 = 2$
$3 - 5 = -2$

6. $24 \div (4 \div 2) = 24 \div 2 = 12$
$(24 \div 4) \div 2 = 6 \div 2 = 3$

7. $x + y^2 \geq z$

8. the product of 3 and the sum of x and z

9. $|x| \boxed{\geq} 0$

10. $x - y = x + \boxed{-y}$

11. positive

12. negative

13. real

14. $b \neq 0$

15. $a + b = b + \underline{\ a\ }$

16. $a \cdot b = \underline{\ b\ } \cdot a$

17. $(a + b) + c = a + \underline{(b + c)}$

18. $(ab)c = \underline{\ a\ } \cdot (bc)$

19. $a(b + c) = ab + \underline{\ ac\ }$

20. $0 + a = \underline{\ a\ }$

21. $a \cdot 1 = \underline{\ a\ }$

22. identity, addition

23. element, multiplication

24. additive

25. a, $\frac{1}{a}$, multiplicative

26. $a(b + c + d) = ab + \underline{ac + ad}$

27. $x + y = 12 + (-2) = 10$

28. $y - x = -2 - 12 = -14$

29. $xy = 12(-2) = -24$

30. $\frac{x}{y} = \frac{12}{-2} = -6$

31. $x^2 = 12^2 = 144$

32. $y^2 = (-2)^2 = 4$

33. $\frac{x}{y^2} = \frac{12}{(-2)^2} = \frac{12}{4} = 3$

34. $\frac{2x}{3y} = \frac{2(12)}{3(-2)} = \frac{24}{-6} = -4$

35. $x + y = 5 + 7 = 12$
$y + x = 7 + 5 = 12$

36. $xy = 5(7) = 35$
$yx = 7(5) = 35$

37. $3x + 2y = 3(5) + 2(7) = 15 + 14 = 29$
$2y + 3x = 2(7) + 3(5) = 14 + 15 = 29$

38. $3xy = 3(5)(7) = 15(7) = 105$
$3yx = 3(7)(5) = 21(5) = 105$

39. $x(x + y) = 5(5 + 7) = 5(12) = 60$
$(x + y)x = (5 + 7)5 = (12)5 = 60$

40. $xy + y^2 = (5)(7) + 7^2 = 35 + 49 = 84$
$y^2 + xy = 7^2 + (5)(7) = 49 + 35 = 84$

SECTION 1.7

41. $x^2(yz^2) = 5^2\left[7(-1)^2\right] = 25[7(1)] = 25[7] = 175$
$(x^2y)z^2 = \left[5^2(7)\right](-1)^2 = [25(7)](1) = [175](1) = 175$

42. $x(y^2z^3) = 5\left[(7)^2(-1)^3\right] = 5[49(-1)] = 5[-49] = -245$
$(xy^2)z^3 = \left[5(7)^2\right](-1)^3 = [5(49)](-1) = [245](-1) = -245$

43. $3(x+5) = 3x + 15$

44. $7(y+2) = 7y + 14$

45. $5(z-4) = 5z - 20$

46. $4(a-3) = 4a - 12$

47. $-2(3x+y) = -6x - 2y$

48. $-3(4a+b) = -12a - 3b$

49. $x(x+3) = x \cdot x + x \cdot 3 = x^2 + 3x$

50. $y(y+z) = y \cdot y + y \cdot z = y^2 + yz$

51. $-x(a+b) = (-x)a + (-x)b = -ax - bx$

52. $-a(x+y) = (-a)x + (-a)y = -ax - ay$

53. $-4(x^2+x+2) = (-4)x^2 + (-4)x + (-4)2 = -4x^2 - 4x - 8$

54. $-2(a^2-a+3) = (-2)a^2 + (-2)(-a) + (-2)(3) = -2a^2 + 2a - 6$

55. additive inverse: -5
multiplicative inverse: $\frac{1}{5}$

56. additive inverse: -3
multiplicative inverse: $\frac{1}{3}$

57. additive inverse: $-\frac{1}{3}$
multiplicative inverse: 3

58. additive inverse: $\frac{1}{3}$
multiplicative inverse: -3

59. additive inverse: 0
multiplicative inverse: none

60. additive inverse: 4
multiplicative inverse: $-\frac{1}{4}$

61. additive inverse: $\frac{2}{3}$
multiplicative inverse: $-\frac{3}{2}$

62. additive inverse: -0.5
multiplicative inverse: 2

63. additive inverse: 0.2
multiplicative inverse: -5

64. additive inverse: -0.75
multiplicative inverse: $\frac{4}{3}$

65. additive inverse: $-\frac{5}{4}$
multiplicative inverse: $\frac{4}{5}$

66. additive inverse: 1.25
multiplicative inverse: $-\frac{4}{5}$

67. $8(x+2) = 8x + 8(2) = 8x + 16$

68. $a + b = b + a$

69. $xy^3 = y^3x$

70. $2 + (5+3) = (2+5) + 3$

71. $(x+y)z = (y+x)z$

72. $7(x+2) = 7x + 7(2) = 7x + 14$

73. $(xy)z = x(yz)$

74. $1x = x$

75. $(x+y) + z = [2+(-3)] + 1 = -1 + 1 = \boxed{0}$; $x + (y+z) = 2 + (-3+1) = 2 + (-2) = \boxed{0}$

76. $(xy)z = [2(-3)](1) = [-6](1) = \boxed{-6}$; $x(yz) = 2[-3(1)] = 2[-3] = \boxed{-6}$

77. $(xz)y = [2(1)](-3) = [2](-3) = \boxed{-6}$; $x(yz) = 2[-3(1)] = 2[-3] = \boxed{-6}$

78. $(x + y) + z = [2 + (-3)] + 1 = -1 + 1 = \boxed{0}$; $y + (x + z) = -3 + (2 + 1) = -3 + 3 = \boxed{0}$

79. $-6(a + 4) = -6a + (-6)(4) = -6a - 24$

80. $2x(a - x) = 2xa - 2x \cdot x = 2ax - 2x^2$

81. $-3x(x - a) = -3x \cdot x + (-3x)(-a)$
$= -3x^2 + 3ax$

82. $-a(a + b) = -a(a) + (-a)b = -a^2 - ab$

83. commutative property of addition

84. associative property of addition

85. commutative property of multiplication

86. commutative property of multiplication

87. distributive property

88. commutative property of multiplication

89. commutative property of addition

90. distributive property

91. multiplication identity property

92. addition identity property

93. additive inverse property

94. multiplicative inverse property

95. addition identity property

96. multiplicative inverse property

97. **Answers may vary.**

98. **Answers may vary.**

99. Closure for addition would not be true (odd number plus odd number equals even number).
Closure for multiplication would be true (odd number times odd number equals odd number).
There would be no additive identity (0 is an even number).
There would be a multiplicative identity, 1 (1 is an odd number).

100. Closure for addition would be true (even number plus even number equals even number).
Closure for multiplication would be true (even number times even number equals even number).
There would be an additive identity (0 is an even number).
There would not be a multiplicative identity (1 is an odd number).

Chapter 1 Review (page 71)

1. natural: $1, 2, 3, 4, 5$

2. prime: $2, 3, 5$

3. odd, natural: $1, 3, 5$

4. composite: 4

5. integers: $-6, 0, 5$

6. rational: $-6, -\frac{2}{3}, 0, 2.6, 5$

7. prime: 5

8. real: $-6, -\frac{2}{3}, 0, \sqrt{2}, 2.6, \pi, 5$

9. even integers: $-6, 0$

10. odd integers: 5

11. irrational: $\sqrt{2}, \pi$

12. negative numbers: $-6, -\frac{2}{3}$

13. $-3 \boxed{\phantom{<}} 5-5$
$-3 \boxed{<} 0$

14. $\frac{12}{4} \boxed{\phantom{<}} 7$
$3 \boxed{<} 7$

15. $\frac{36}{4} \boxed{\phantom{<}} -2$
$9 \boxed{>} -2$

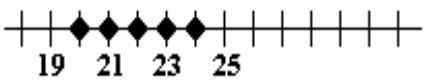
16. $2-2 \boxed{\phantom{<}} 8-\frac{24}{3}$
$0 \boxed{\phantom{<}} 8-8$
$0 \boxed{=} 0$

17. $-(-9) = +9$

18. $-(12-4) = -(8) = -8$

19.

20.



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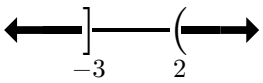
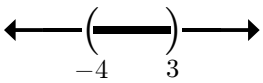


22.



23. $|29-24| = |5| = 5$

24. $|-25| = 25$

25. $\frac{45}{27} = \frac{5 \cdot \overset{1}{\cancel{9}}}{3 \cdot \underset{1}{\cancel{9}}} = \frac{5}{3}$

26. $\frac{48}{18} = \frac{8 \cdot \overset{1}{\cancel{6}}}{3 \cdot \underset{1}{\cancel{6}}} = \frac{8}{3}$

27. $\frac{31}{15} \cdot \frac{10}{62} = \frac{\overset{1}{\cancel{31}} \cdot \overset{1}{\cancel{2}} \cdot \overset{1}{\cancel{5}}}{3 \cdot \underset{1}{\cancel{5}} \cdot \underset{1}{\cancel{2}} \cdot \underset{1}{\cancel{31}}} = \frac{1}{3}$

28. $\frac{25}{36} \cdot \frac{12}{15} \cdot \frac{3}{5} = \frac{\overset{1}{\cancel{5}} \cdot \overset{1}{\cancel{5}} \cdot \overset{1}{\cancel{12}} \cdot \overset{1}{\cancel{3}}}{\underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{12}} \cdot 3 \cdot \underset{1}{\cancel{5}} \cdot \underset{1}{\cancel{5}}} = \frac{1}{3}$

29. $\frac{18}{21} \div \frac{6}{7} = \frac{18}{21} \cdot \frac{7}{6} = \frac{\overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{6}} \cdot \overset{1}{\cancel{7}}}{\underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{7}} \cdot \underset{1}{\cancel{6}}} = \frac{1}{1} = 1$

30. $\frac{14}{24} \div \frac{7}{12} \div \frac{2}{5} = \frac{14}{24} \cdot \frac{12}{7} \cdot \frac{5}{2}$
$= \frac{\overset{1}{\cancel{2}} \cdot \overset{1}{\cancel{7}} \cdot \overset{1}{\cancel{12}} \cdot 5}{\underset{1}{\cancel{2}} \cdot \underset{1}{\cancel{12}} \cdot \underset{1}{\cancel{7}} \cdot 2} = \frac{5}{2}$

31. $\frac{7}{12} + \frac{9}{12} = \frac{7+9}{12} = \frac{16}{12} = \frac{4 \cdot \overset{1}{\cancel{4}}}{3 \cdot \underset{1}{\cancel{4}}} = \frac{4}{3}$

32. $\frac{13}{24} - \frac{5}{24} = \frac{13-5}{24} = \frac{8}{24} = \frac{\overset{1}{\cancel{8}}}{3 \cdot \underset{1}{\cancel{8}}} = \frac{1}{3}$

33. $\frac{1}{5} + \frac{1}{4} = \frac{1 \cdot \mathbf{4}}{5 \cdot \mathbf{4}} + \frac{1 \cdot \mathbf{5}}{4 \cdot \mathbf{5}} = \frac{4}{20} + \frac{5}{20} = \frac{9}{20}$

34. $\frac{5}{7} + \frac{4}{9} = \frac{5 \cdot \mathbf{9}}{7 \cdot \mathbf{9}} + \frac{4 \cdot \mathbf{7}}{9 \cdot \mathbf{7}} = \frac{45}{63} + \frac{28}{63}$
$= \frac{45+28}{63} = \frac{73}{63}$

35. $\dfrac{2}{3}-\dfrac{1}{7}=\dfrac{2\cdot\mathbf{7}}{3\cdot\mathbf{7}}-\dfrac{1\cdot\mathbf{3}}{7\cdot\mathbf{3}}=\dfrac{14}{21}-\dfrac{3}{21}=\dfrac{14-3}{21}=\dfrac{11}{21}$

36. $\dfrac{4}{5}-\dfrac{2}{3}=\dfrac{4\cdot\mathbf{3}}{5\cdot\mathbf{3}}-\dfrac{2\cdot\mathbf{5}}{3\cdot\mathbf{5}}=\dfrac{12}{15}-\dfrac{10}{15}=\dfrac{12-10}{15}=\dfrac{2}{15}$

37. $3\dfrac{2}{3}+5\dfrac{1}{4}=\dfrac{11}{3}+\dfrac{21}{4}=\dfrac{11\cdot\mathbf{4}}{3\cdot\mathbf{4}}+\dfrac{21\cdot\mathbf{3}}{4\cdot\mathbf{3}}=\dfrac{44}{12}+\dfrac{63}{12}=\dfrac{44+63}{12}=\dfrac{107}{12}=8\dfrac{11}{12}$

38. $7\dfrac{5}{12}-4\dfrac{1}{2}=\dfrac{89}{12}-\dfrac{9}{2}=\dfrac{89}{12}-\dfrac{9\cdot\mathbf{6}}{2\cdot\mathbf{6}}=\dfrac{89}{12}-\dfrac{54}{12}=\dfrac{89-54}{12}=\dfrac{35}{12}=2\dfrac{11}{12}$

39. $48.29+31.9=80.19$

40. $36.85-15.86=20.99$

41. $4.32\cdot 1.5=6.48$

42. $21.83\div 5.9=3.7$

43. $2.7(4.92-3.18)=2.7(1.74)\approx 4.70$

44. $\dfrac{3.3+2.5}{0.22}=\dfrac{5.8}{0.22}\approx 26.36$

45. $\dfrac{12.5}{14.7-11.2}=\dfrac{12.5}{3.5}\approx 3.57$

46. $(3-0.7)(3.63-2)=(2.3)(1.63)\approx 3.75$

47. $17\dfrac{1}{2}+15\dfrac{3}{4}=17+\dfrac{2}{4}+15+\dfrac{3}{4}=32+\dfrac{5}{4}=32+1\dfrac{1}{4}=33\dfrac{1}{4}$

$100-33\dfrac{1}{4}=100-33-\dfrac{1}{4}=67-\dfrac{1}{4}=66\dfrac{3}{4}$ acres left

48. avg. $=\dfrac{5.2+4.7+9.5+8}{4}=\dfrac{27.4}{4}=6.85$ hours

49. $0.20(425)=85$

50. Front/Back: $2(2.7+2.7+4.2)=2(9.6)=19.2$ ft
Top/Bottom: $2(1.2+1.2+4.2)=2(6.6)=13.2$ ft
Sides: $2(1.2+2.7)=2(3.9)=7.8$ ft
TOTAL $=19.2+13.2+7.8=40.2$ ft

51. $3^4=3\cdot 3\cdot 3\cdot 3=81$

52. $\left(\dfrac{2}{3}\right)^2=\dfrac{2}{3}\cdot\dfrac{2}{3}=\dfrac{4}{9}$

53. $(0.5)^2=(0.5)(0.5)=0.25$

54. $5^2+2^3=5\cdot 5+2\cdot 2\cdot 2=25+8=33$

55. $3^2+4^2=9+16=25$

56. $(3+4)^2=7^2=49$

57. $A=\dfrac{1}{2}bh=\dfrac{1}{2}\left(6\dfrac{1}{2}\text{ ft}\right)(7\text{ ft})=\dfrac{1}{2}\cdot\dfrac{13}{2}\cdot\dfrac{7}{1}\text{ ft}^2=\dfrac{91}{4}\text{ ft}^2=22\dfrac{3}{4}\text{ ft}^2$

58. $V=Bh=\pi r^2h=\pi\left(\dfrac{32.1}{2}\text{ ft}\right)^2(18.7\text{ ft})=\pi\left(257.6025\text{ ft}^2\right)(18.7\text{ ft})\approx 15{,}133.6\text{ ft}^3$

CHAPTER 1 REVIEW

59. $7 + 3^3 = 7 + 27 = 34$

60. $6 + 2 \cdot 4 = 6 + 8 = 14$

61. $5 + 6 \div 2 = 5 + 3 = 8$

62. $(8 + 6) \div 2 = 14 \div 2 = 7$

63. $5^3 - \dfrac{81}{3} = 125 - 27 = 98$

64. $(5-2)^2 + 5^2 + 2^2 = 3^2 + 5^2 + 2^2 = 9 + 25 + 4 = 38$

65. $\dfrac{4 \cdot 3 + 3^4}{31} = \dfrac{12 + 81}{31} = \dfrac{93}{31} = 3$

66. $\dfrac{4}{3} \cdot \dfrac{9}{2} + \dfrac{1}{2} \cdot 18 = \dfrac{2 \cdot \cancel{2}^{\,1} \cdot 3 \cdot \cancel{3}^{\,1}}{\underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{2}}} + \dfrac{1 \cdot 9 \cdot \cancel{2}^{\,1}}{\underset{1}{\cancel{2}} \cdot 1} = \dfrac{6}{1} + \dfrac{9}{1} = 15$

67. $8^2 - 6 = 64 - 6 = 58$

68. $(8-6)^2 = 2^2 = 4$

69. $\dfrac{10 + 2}{10 - 6} = \dfrac{12}{4} = 3$

70. $\dfrac{6(8) - 12}{4 + 8} = \dfrac{48 - 12}{12} = \dfrac{36}{12} = 3$

71. $2^2 + 2(3)^2 = 4 + 2(9) = 4 + 18 = 22$

72. $\dfrac{2^2 + 3}{2^3 - 1} = \dfrac{4 + 3}{8 - 1} = \dfrac{7}{7} = 1$

73. $(+15) + (+9) = +(15 + 9) = 24$

74. $(-17) + (-16) = -(17 + 16) = -33$

75. $(-2.7) + (-3.8) = -(2.7 + 3.8) = -6.5$

76. $\dfrac{1}{2} + \left(-\dfrac{1}{6}\right) = \dfrac{3}{6} + \left(-\dfrac{1}{6}\right) = +\left(\dfrac{3}{6} - \dfrac{1}{6}\right) = \dfrac{2}{6} = \dfrac{1}{3}$

77. $(+12) + (-24) = -(24 - 12) = -12$

78. $(-44) + (+60) = +(60 - 44) = 16$

79. $3.7 + (-2.5) = +(3.7 - 2.5) = 1.2$

80. $-5.6 + (+2.06) = -(5.6 - 2.06) = -3.54$

81. $15 - (-4) = 15 + (+4) = 19$

82. $-8 - (-15) = -8 + (+15) = 7$

83. $[-5 + (-5)] - (-5) = [-10] + (+5) = -5$

84. $1 - [5 - (-3)] = 1 - [5 + (+3)] = 1 - [8] = -7$

85. $-\dfrac{7}{10} - \left(-\dfrac{2}{5}\right) = -\dfrac{7}{10} + \dfrac{2}{5} = -\dfrac{7}{10} + \dfrac{4}{10} = -\dfrac{3}{10}$

86. $\dfrac{2}{3} - \left(\dfrac{1}{3} - \dfrac{2}{3}\right) = \dfrac{2}{3} - \left(-\dfrac{1}{3}\right) = \dfrac{2}{3} + \dfrac{1}{3} = \dfrac{3}{3} = 1$

87. $\left|\dfrac{3}{7} - \left(-\dfrac{4}{7}\right)\right| = \left|\dfrac{3}{7} + \dfrac{4}{7}\right| = \left|\dfrac{7}{7}\right| = |1| = 1$

88. $\frac{3}{7} - \left|-\frac{4}{7}\right| = \frac{3}{7} - \left(+\frac{4}{7}\right) = \frac{3}{7} + \left(-\frac{4}{7}\right) = -\frac{1}{7}$

89. $(+5)(+8) = 40$

90. $(-5)(-12) = 60$

91. $\left(-\frac{3}{14}\right)\left(-\frac{7}{6}\right) = +\frac{3}{14} \cdot \frac{7}{6} = \frac{\overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{7}}}{2 \cdot \underset{1}{\cancel{7}} \cdot 2 \cdot \underset{1}{\cancel{3}}} = \frac{1}{4}$

92. $(3.75)(0.37) = 1.3875$

93. $5(-7) = -35$

94. $(-15)(7) = -105$

95. $\left(-\frac{1}{2}\right)\left(\frac{4}{3}\right) = -\frac{1}{2} \cdot \frac{4}{3} = -\frac{1 \cdot 2 \cdot \overset{1}{\cancel{2}}}{\underset{1}{\cancel{2}} \cdot 3} = -\frac{2}{3}$

96. $(2.1)(-8.2) = -17.22$

97. $\frac{+36}{+12} = 3$

98. $\frac{-14}{-2} = 7$

99. $\frac{(-2)(-7)}{4} = \frac{+14}{4} = +\frac{7 \cdot \overset{1}{\cancel{2}}}{2 \cdot \underset{1}{\cancel{2}}} = \frac{7}{2}$

100. $\frac{-22.5}{-3.75} = 6$

101. $\frac{(-2)(-9)}{-3} = \frac{+18}{-3} = -6$

102. $\frac{(-6)(12)}{-4} = \frac{-72}{-4} = 18$

103. $\left(\frac{-10}{2}\right)^2 - (-1)^3 = (-5)^2 - (-1)^3$
$= 25 - (-1)$
$= 25 + 1 = 26$

104. $\frac{[-3 + (-4)]^2}{10 + (-3)} = \frac{[-7]^2}{7} = \frac{49}{7} = 7$

105. $\left(\frac{-3 + (-3)}{3}\right)\left(\frac{-15}{5}\right) = \left(\frac{-6}{3}\right)\left(\frac{-15}{5}\right)$
$= (-2)(-3) = 6$

106. $\frac{-2 - (-8)}{5 + (-1)} = \frac{-2 + (+8)}{4} = \frac{6}{4} = \frac{3}{2}$

107. xz

108. $x + 2y$

109. $2(x + y)$

110. $x - yz$

111. the product of 5, x and z

112. 5 decreased by the product of y and z

113. 4 less than the product of x and y

114. the quotient obtained when the sum of x, y and z is divided by twice their product

115. $x + z = 2 + (-1) = 1$

116. $x + y + z = 2 + (-3) + (-1) = -1 + (-1)$
$= -2$

117. $5x + (y - z) = 5(2) + [-3 - (-1)]$
$= 10 + [-3 + 1]$
$= 10 + (-2) = 8$

118. $z^2 - y = (-1)^2 - (-3) = 1 - (-3)$
$= 1 + 3 = 4$

119. $x - (y - z) = 2 - [-3 - (-1)]$
$= 2 - [-3 + (+1)]$
$= 2 - [-2] = 2 + (+2) = 4$

120. $(x - y) - z = [2 - (-3)] - (-1)$
$= [2 + (+3)] + (+1)$
$= 5 + 1 = 6$

121. $yz = (-3)(-1) = 3$

122. $xyz = (2)(-3)(-1) = -6(-1) = 6$

123. $(x + y)(y + z) = [2 + (-3)][-3 + (-1)]$
$= [-1][-4] = 4$

124. $\dfrac{3(x - y)}{x + (y - z)} = \dfrac{3[2 - (-3)]}{2 + [-3 - (-1)]}$
$= \dfrac{3[5]}{2 + [-2]} = \dfrac{15}{0}$: undefined

125. $y^2z + x = (-3)^2(-1) + 2$
$= 9(-1) + 2 = -9 + 2 = -7$

126. $yz^3 + (xy)^2 = (-3)(-1)^3 + [2(-3)]^2$
$= (-3)(-1) + [-6]^2$
$= 3 + 36 = 39$

127. $\dfrac{2y^2}{3x - 6} = \dfrac{2(-3)^2}{3(2) - 6} = \dfrac{2(9)}{6 - 6} = \dfrac{18}{0}$
undefined

128. $\dfrac{|xy|}{3z} = \dfrac{|2(-3)|}{3(-1)} = \dfrac{|-6|}{-3} = \dfrac{6}{-3} = -2$

129. three terms

130. 7

131. 1

132. $2 + 4 + 3 = 9$

133. closure property of addition

134. commutative property of multiplication

135. associative property of addition

136. distributive property

137. commutative property of addition

138. associative property of multiplication

139. commutative property of addition

140. multiplicative identity property

141. additive inverse property

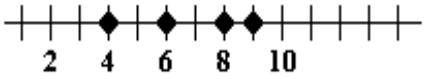
142. additive identity property

Chapter 1 Test (page 77)

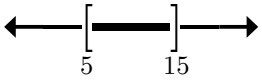
1. $31, 37, 41, 43, 47$

2. 2

3.



4.



CHAPTER 1 TEST

5. $-|-17| = -(+17) = -17$

6. $-|9| + |-9| = -(+9) + (+9) = -9 + 9 = 0$

7. $3(4-2) \boxed{\quad} -2(2-5)$
$3(2) \boxed{\quad} -2(-3)$
$6 \boxed{=} 6$

8. $1 + 4 \cdot 3 \boxed{\quad} -2(-7)$
$1 + 12 \boxed{\quad} +14$
$13 \boxed{<} 14$

9. 25% of 136 $\boxed{\quad}$ $\frac{1}{2}$ of 66
$0.25(136) \boxed{\quad} \frac{1}{2}(66)$
$34 \boxed{>} 33$

10. $-8.5 \boxed{\quad} -|-8.5|$
$-8.5 \boxed{\quad} -(+8.5)$
$-8.5 \boxed{=} -8.5$

11. $\dfrac{26}{40} = \dfrac{13 \cdot \overset{1}{\cancel{2}}}{20 \cdot \underset{1}{\cancel{2}}} = \dfrac{13}{20}$

12. $\dfrac{9}{11} \cdot \dfrac{44}{45} = \dfrac{\overset{1}{\cancel{9}} \cdot 4 \cdot \overset{1}{\cancel{11}}}{\underset{1}{\cancel{11}} \cdot \underset{1}{\cancel{9}} \cdot 5} = \dfrac{4}{5}$

13. $\dfrac{14}{21} \div \dfrac{28}{9} = \dfrac{14}{21} \cdot \dfrac{9}{28} = \dfrac{\overset{1}{\cancel{14}} \cdot \overset{1}{\cancel{3}} \cdot 3}{\underset{1}{\cancel{3}} \cdot 7 \cdot 2 \cdot \underset{1}{\cancel{14}}} = \dfrac{3}{14}$

14. $\dfrac{24}{16} + 3 = \dfrac{3 \cdot \overset{1}{\cancel{8}}}{2 \cdot \underset{1}{\cancel{8}}} + \dfrac{3}{1} = \dfrac{3}{2} + \dfrac{3 \cdot \mathbf{2}}{1 \cdot \mathbf{2}} = \dfrac{3}{2} + \dfrac{6}{2} = \dfrac{3+6}{2} = \dfrac{9}{2} \left(\text{or } 4\dfrac{1}{2}\right)$

15. $\dfrac{17-5}{36} - \dfrac{2(13-5)}{12} = \dfrac{12}{36} - \dfrac{2(8)}{12} = \dfrac{12}{36} - \dfrac{16}{12} = \dfrac{\overset{1}{\cancel{12}}}{3 \cdot \underset{1}{\cancel{12}}} - \dfrac{4 \cdot \overset{1}{\cancel{4}}}{3 \cdot \underset{1}{\cancel{4}}} = \dfrac{1}{3} - \dfrac{4}{3} = \dfrac{1-4}{3} = \dfrac{-3}{3} = -1$

16. $\dfrac{|-7-(-6)|}{-7-|-6|} = \dfrac{|-7+(+6)|}{-7-(+6)} = \dfrac{|-1|}{-7+(-6)} = \dfrac{1}{-13} = -\dfrac{1}{13}$

17. $0.13(256) = 33.28 \approx 33.3$

18. $A = lw = (18.9 \text{ ft})(21.25 \text{ ft}) = 401.625 \text{ ft}^2$
$\approx 401.63 \text{ ft}^2$

19. $A = \frac{1}{2}bh = \frac{1}{2}(16 \text{ cm})(8 \text{ cm}) = \frac{1}{2}(128 \text{ cm}^2)$
$= 64 \text{ cm}^2$

20. $V = Bh = \pi r^2 h = \pi(7 \text{ in.})^2(10 \text{ in.})$
$= \pi\big(49 \text{ in.}^2\big)(10 \text{ in.})$
$= \pi\big(490 \text{ in.}^3\big) \approx 1{,}539 \text{ in.}^3$

21. $xy + z = (-2)(3) + 4 = -6 + 4 = -2$

22. $x(y+z) = -2(3+4) = -2(7) = -14$

23. $\dfrac{z+4y}{2x} = \dfrac{4+4(3)}{2(-2)} = \dfrac{4+12}{-4} = \dfrac{16}{-4} = -4$

24. $\big|x^3 - z\big| = \big|(-2)^3 - 4\big| = |-8-4| = |-12|$
$= 12$

25. $x^3 + y^2 + z = (-2)^3 + (3)^2 + 4$
$= -8 + 9 + 4 = 5$

26. $|x| - 3|y| - 4|z| = |-2| - 3|3| - 4|4|$
$= 2 - 3(3) - 4(4)$
$= 2 - 9 - 16 = -23$

27. $\dfrac{xy}{x+y}$

28. $5y-(x+y)$

29. $x(12+12)+y(7+7)=24x+14y$

30. $\$(12a+8b)$

31. 3

32. 4 terms

33. $3(x+2)=3x+6$

34. $-p(r-t)=(-p)r+(-p)(-t)=-pr+pt$

35. 0

36. 5

37. commutative property of multiplication

38. distributive property

39. commutative property of addition

40. multiplicative inverse property

Exercises 2.1 (page 91)

1. $x-5=15$
addition

2. $x-3=13$
addition

3. $w+5=7$
subtraction

4. $x+32=36$
subtraction

5. $-8x=-24$
division

6. $-7x=14$
division

7. $\dfrac{x}{5}=2$
multiplication

8. $\dfrac{x}{2}=-10$
multiplication

9. $\dfrac{4}{5}+\dfrac{2}{3}=\dfrac{4\cdot 3}{5\cdot 3}+\dfrac{2\cdot 5}{3\cdot 5}=\dfrac{12}{15}+\dfrac{10}{15}=\dfrac{22}{15}$

10. $\dfrac{5}{6}\cdot\dfrac{12}{25}=\dfrac{\cancel{5}^{\,1}}{\cancel{6}_{\,1}}\cdot\dfrac{2\cdot\cancel{6}^{\,1}}{5\cdot\cancel{5}_{\,1}}=\dfrac{2}{5}$

11. $\dfrac{5}{9}\div\dfrac{3}{5}=\dfrac{5}{9}\cdot\dfrac{5}{3}=\dfrac{25}{27}$

12. $\dfrac{15}{7}-\dfrac{10}{3}=\dfrac{15\cdot 3}{7\cdot 3}-\dfrac{10\cdot 7}{3\cdot 7}=\dfrac{45}{21}-\dfrac{70}{21}=-\dfrac{25}{21}$

13. $3+5\cdot 6=3+30=33$

14. $3\cdot 4^2=3\cdot 16=48$

15. $3+4^3(-5)=3+64(-5)=3+(-320)=-317$

16. $\dfrac{5(-4)-3(-2)}{10-(-4)}=\dfrac{-20-(-6)}{10+4}=\dfrac{-20+6}{14}=\dfrac{-14}{14}=-1$

17. equation, expression

18. solution, root

19. equivalent

20. variable

21. equal

22. equal

23. equal

24. linear

25. regular price

26. markup

27. 100

28. base