

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

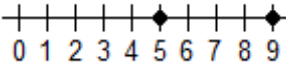
INSTRUCTOR USE ONLY

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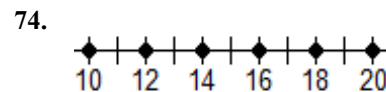
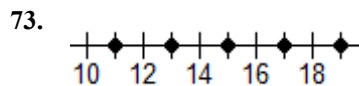
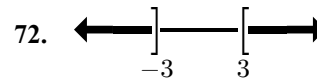
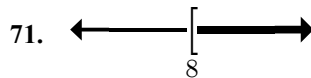
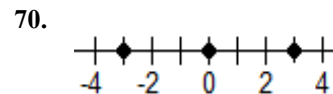
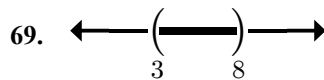
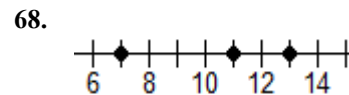
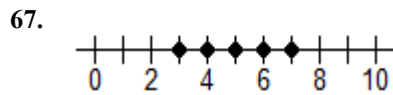
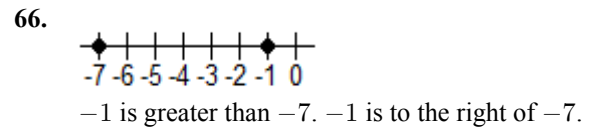
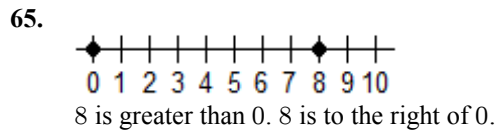
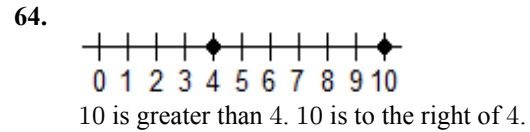
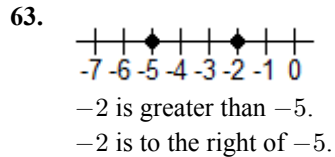
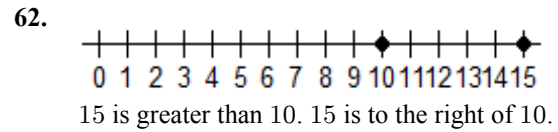
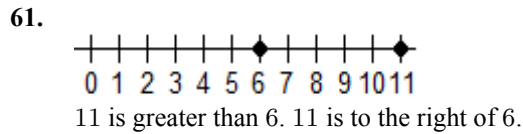
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SECTION 1.1

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. $7 < 10$ 52. $3 \square 2 + 1$
 $3 = 3$ 53. $9 \square 2 + 5$ 54. $-5 < -4$
 $9 > 7$
55. $-6 > -8$ 56. $2 + 3 \square 17$
 $5 < 17$ 57. $5 + 7 \square 10$ 58. $3 + 3 \square 9 - 3$
 $12 > 10$ $6 = 6$
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



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

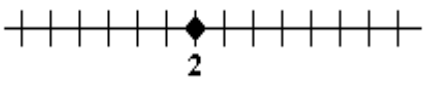
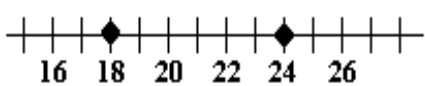
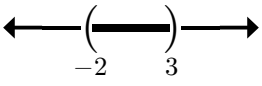
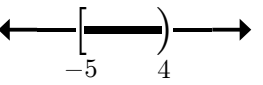
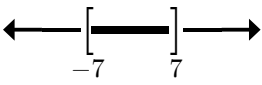
87. $3 \cdot 8 = 24$

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. $5 + 6 \begin{matrix} \square \\ 11 \end{matrix} 13 - 1$ 92. $19 - 3 \begin{matrix} \square \\ 16 \end{matrix} 8 + 6$ 93. $4 \cdot 3 \begin{matrix} \square \\ 12 \end{matrix} 3 \cdot 4$ 94. $7 \cdot 9 \begin{matrix} \square \\ 63 \end{matrix} 9 \cdot 6$
 $11 \begin{matrix} \square \\ < \end{matrix} 12$ $16 \begin{matrix} \square \\ > \end{matrix} 14$ $12 \begin{matrix} \square \\ = \end{matrix} 12$ $5 \begin{matrix} \square \\ > \end{matrix} 3$
95. $0 \div 6 \begin{matrix} \square \\ 0 \end{matrix} 1$ 96. $2 + 7 \begin{matrix} \square \\ 9 \end{matrix} 7 + 2$ 97. $45 \div 9 \begin{matrix} \square \\ 5 \end{matrix} 36 \div 12$
 $0 \begin{matrix} \square \\ < \end{matrix} 1$ $9 \begin{matrix} \square \\ = \end{matrix} 9$ $5 \begin{matrix} \square \\ > \end{matrix} 3$
98. $5 \cdot 12 \begin{matrix} \square \\ 60 \end{matrix} 300 \div 5$ 99. $3 + 2 + 5 \begin{matrix} \square \\ 10 \end{matrix} 5 + 2 + 3$ 100. $8 + 5 + 2 \begin{matrix} \square \\ 15 \end{matrix} 5 + 2 + 8$
 $60 \begin{matrix} \square \\ = \end{matrix} 60$ $10 \begin{matrix} \square \\ = \end{matrix} 10$ $15 \begin{matrix} \square \\ = \end{matrix} 15$
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. 
123. 
124. 
125. 
126. 
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.

SECTION 1.1

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

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

13.
$$\begin{array}{r} 5 \quad . \quad 1 \\ + \quad 0 \quad . \quad 6 \quad 2 \\ \hline 5 \quad . \quad 7 \quad 2 \end{array}$$

14.
$$\begin{array}{r} 3 \quad . \quad 4 \quad 5 \\ - \quad 2 \quad . \quad 2 \quad 1 \\ \hline 1 \quad . \quad 2 \quad 4 \end{array}$$

15.
$$\begin{array}{r} 0. \quad 2 \\ \times \quad 2. \quad 5 \\ \hline 1 \quad 0 \\ 4 \quad 0 \\ \hline 5 \quad 0 \end{array}$$

Put two digits to the right of the decimal point. Answer: 0.5

16.
$$\begin{array}{r} 0. \quad 4 \\ \times \quad 1 \quad 6. \\ \hline 2 \quad 4 \\ 4 \quad 0 \\ \hline 6 \quad 4 \end{array}$$

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. $\frac{6}{12} = \frac{1 \cdot \cancel{6}}{2 \cdot \cancel{6}} = \frac{1}{2}$
56. $\frac{3}{9} = \frac{1 \cdot \cancel{3}}{3 \cdot \cancel{3}} = \frac{1}{3}$
57. $\frac{15}{20} = \frac{3 \cdot \cancel{5}}{4 \cdot \cancel{5}} = \frac{3}{4}$
58. $\frac{33}{55} = \frac{3 \cdot \cancel{11}}{5 \cdot \cancel{11}} = \frac{3}{5}$
59. $\frac{27}{18} = \frac{3 \cdot \cancel{9}}{2 \cdot \cancel{9}} = \frac{3}{2}$
60. $\frac{35}{14} = \frac{5 \cdot \cancel{7}}{2 \cdot \cancel{7}} = \frac{5}{2}$
61. $\frac{72}{64} = \frac{9 \cdot \cancel{8}}{8 \cdot \cancel{8}} = \frac{9}{8}$
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

$$65. \quad \frac{4}{3} \cdot \frac{6}{5} = \frac{4 \cdot 6}{3 \cdot 5} = \frac{4 \cdot 2 \cdot \cancel{3}^1}{\cancel{3}_1 \cdot 5} = \frac{8}{5}$$

$$66. \quad \frac{7}{8} \cdot \frac{6}{15} = \frac{7 \cdot 6}{8 \cdot 15} = \frac{7 \cdot \cancel{2}^1 \cdot \cancel{3}^1}{4 \cdot \cancel{2}_1 \cdot 5 \cdot \cancel{3}_1} = \frac{7}{20}$$

$$67. \quad 12 \cdot \frac{5}{6} = \frac{12}{1} \cdot \frac{5}{6} = \frac{12 \cdot 5}{1 \cdot 6} = \frac{2 \cdot \cancel{6}^1 \cdot 5}{1 \cdot \cancel{6}_1} = \frac{10}{1} = 10$$

$$68. \quad 10 \cdot \frac{5}{12} = \frac{10}{1} \cdot \frac{5}{12} = \frac{10 \cdot 5}{1 \cdot 12} = \frac{\cancel{2}^1 \cdot 5 \cdot 5}{1 \cdot \cancel{2}_1 \cdot 6} = \frac{25}{6}$$

$$69. \quad \frac{10}{21} \cdot 14 = \frac{10}{21} \cdot \frac{14}{1} = \frac{10 \cdot 14}{21 \cdot 1} = \frac{10 \cdot 2 \cdot \cancel{7}^1}{3 \cdot \cancel{7}_1} = \frac{20}{3}$$

$$70. \quad \frac{5}{24} \cdot 16 = \frac{5}{24} \cdot \frac{16}{1} = \frac{5 \cdot 16}{24 \cdot 1} = \frac{5 \cdot 2 \cdot \cancel{8}^1}{3 \cdot \cancel{8}_1} = \frac{10}{3}$$

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

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

$$73. \quad \frac{3}{4} \div \frac{6}{5} = \frac{3}{4} \cdot \frac{5}{6} = \frac{3 \cdot 5}{4 \cdot 6} = \frac{\cancel{3}^1 \cdot 5}{4 \cdot 2 \cdot \cancel{3}_1} = \frac{5}{8}$$

$$74. \quad \frac{3}{8} \div \frac{15}{28} = \frac{3}{8} \cdot \frac{28}{15} = \frac{3 \cdot 28}{8 \cdot 15} = \frac{\cancel{3}^1 \cdot 7 \cdot \cancel{4}^1}{2 \cdot \cancel{4}_1 \cdot 5 \cdot \cancel{3}_1} = \frac{7}{10}$$

$$75. \quad 9 \div \frac{3}{8} = \frac{9}{1} \div \frac{3}{8} = \frac{9}{1} \cdot \frac{8}{3} = \frac{9 \cdot 8}{1 \cdot 3} = \frac{3 \cdot \cancel{3}^1 \cdot 8}{1 \cdot \cancel{3}_1} = \frac{24}{1} = 24$$

$$76. \quad 23 \div \frac{46}{5} = \frac{23}{1} \div \frac{46}{5} = \frac{23}{1} \cdot \frac{5}{46} = \frac{23 \cdot 5}{1 \cdot 46} = \frac{\cancel{23}^1 \cdot 5}{1 \cdot 2 \cdot \cancel{23}_1} = \frac{5}{2}$$

$$77. \quad \frac{54}{20} \div 3 = \frac{54}{20} \div \frac{3}{1} = \frac{54}{20} \cdot \frac{1}{3} = \frac{54 \cdot 1}{20 \cdot 3} = \frac{\cancel{2}^1 \cdot \cancel{3}^1 \cdot 9}{10 \cdot \cancel{2}_1 \cdot \cancel{3}_1} = \frac{9}{10}$$

$$78. \quad \frac{39}{27} \div 13 = \frac{39}{27} \div \frac{13}{1} = \frac{39}{27} \cdot \frac{1}{13} = \frac{39 \cdot 1}{27 \cdot 13} = \frac{\cancel{3}^1 \cdot \cancel{13}^1 \cdot 1}{9 \cdot \cancel{3}_1 \cdot \cancel{13}_1} = \frac{1}{9}$$

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

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

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

$$82. \quad \frac{2}{11} + \frac{9}{11} = \frac{2+9}{11} = \frac{11}{11} = \frac{\cancel{11}^1}{\cancel{11}_1} = 1$$

SECTION 1.2

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

$$84. \quad \frac{17}{25} - \frac{2}{5} = \frac{17}{25} - \frac{2 \cdot 5}{5 \cdot 5} = \frac{17}{25} - \frac{10}{25} = \frac{17-10}{25} = \frac{7}{25}$$

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

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

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

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

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

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

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

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

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

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

$$95. \quad \begin{array}{r} 0. \ 6 \\ 5 \overline{) 3. \ 0} \\ \underline{3 \ 0} \\ 0 \end{array} \quad \frac{3}{5} = 0.6, \text{ terminating}$$

$$96. \quad \begin{array}{r} 0. \ 5 \ 5 \ 5 \\ 9 \overline{) 5. \ 0 \ 0 \ 0} \\ \underline{4 \ 5} \\ 5 \ 0 \\ \underline{4 \ 5} \\ 5 \end{array} \quad \frac{5}{9} = 0.\overline{5}, \text{ repeating}$$

SECTION 1.2

97. $\frac{9}{22} = 0.\overline{409}$
repeating

$$\begin{array}{r}
 22 \overline{) 9.000000} \\
 \underline{8 } \\
 2 \\
 \underline{0 } \\
 2 0 \\
 \underline{1 9 8} \\
 2 0 \\
 \underline{0 0} \\
 2 0 0 \\
 \underline{1 9 8} \\
 2
 \end{array}$$

98. $\frac{8}{5} = 1.6$, terminating

$$\begin{array}{r} 1.6 \\ 5 \overline{) 8.0} \\ \underline{5} \\ 3 \\ \underline{3} \\ 0 \end{array}$$

99.

$$\begin{array}{r} \\ \\ \\ + \\ \hline \end{array}$$

100.

			14		11		
		3	4		1	11	
	3	4	5	.	2	1	3
-		2	7	.	3	5	
	<u>3</u>	<u>1</u>	<u>7</u>	<u>.</u>	<u>8</u>	<u>6</u>	<u>3</u>

101.

				11		
	6			<u>1</u>	13	
	6	7	.	2	3	5
-	2	2	.	4	5	
	<u>4</u>	<u>4</u>	.	<u>7</u>	<u>8</u>	<u>5</u>

102.

$$\begin{array}{r} \\ 2 \\ + 4 5 7 \\ \hline 2 5 9 3 \end{array}$$

103.

$$\begin{array}{r} 7.2 \\ \times 15.6 \\ \hline 432 \\ 360 \\ 72 \\ \hline 1123.2 \end{array}$$

Put two digits to the right of the decimal point. Answer: 112.32

104.

$$\begin{array}{r} 4. 2 1 \\ 2. 7 3 \\ \hline 1 2 6 3 \\ 2 9 4 7 \\ 8 4 2 \\ \hline 1 1 4 9 3 3 \end{array}$$

Put four digits to the right of the decimal point. Answer: 11.4933

105. 0. 2 3 $\overline{1. 0 4 6 5}$

Move decimal points 2 places right.

$$\begin{array}{r} 4. 5 5 \\ 2 3. \overline{1 0 4. 6 5} \\ 9 2 \\ \hline 1 2 6 \\ 1 1 5 \\ \hline 1 1 5 \\ 1 1 5 \\ \hline 0 \end{array}$$

106. 4. 7 $\overline{) 1 \ 0. \ 8 \ 5 \ 7}$

Move decimal points 1 place right.

$$\begin{array}{r} 2. 3 1 \\ 4 \ 7. \overline{) 1 \ 0 \ 8. \ 5 \ 7} \\ \underline{ 9 4} \\ 1 4 5 \\ 1 4 1 \\ \hline 4 7 \\ 4 7 \\ \hline 0 \end{array}$$

SECTION 1.2

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

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

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

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

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

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

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

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

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

SECTION 1.2

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

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

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

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

$$123. \quad 3 - \frac{3}{4} = \frac{3}{1} - \frac{3}{4} = \frac{3 \cdot 4}{1 \cdot 4} - \frac{3}{4} = \frac{12}{4} - \frac{3}{4} = \frac{12-3}{4} = \frac{9}{4}$$

$$124. \quad 5 + \frac{21}{5} = \frac{5}{1} + \frac{21}{5} = \frac{5 \cdot 5}{1 \cdot 5} + \frac{21}{5} = \frac{25}{5} + \frac{21}{5} = \frac{25+21}{5} = \frac{46}{5}$$

$$125. \quad \frac{17}{3} + 4 = \frac{17}{3} + \frac{4}{1} = \frac{17}{3} + \frac{4 \cdot 3}{1 \cdot 3} = \frac{17}{3} + \frac{12}{3} = \frac{17+12}{3} = \frac{29}{3}$$

$$126. \quad \frac{13}{9} - 1 = \frac{13}{9} - \frac{1}{1} = \frac{13}{9} - \frac{1 \cdot 9}{1 \cdot 9} = \frac{13}{9} - \frac{9}{9} = \frac{13-9}{9} = \frac{4}{9}$$

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.

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

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

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

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

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

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

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

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

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

SECTION 1.2

- 136.** $7\frac{2}{3} + 15\frac{1}{4} + 19\frac{1}{2} + 10\frac{3}{4} = 7 + 15 + 19 + 10 + \frac{2}{3} + \frac{1}{4} + \frac{1}{2} + \frac{3}{4}$
 $= 51 + \frac{8}{12} + \frac{3}{12} + \frac{6}{12} + \frac{9}{12} = 51 + \frac{26}{12} = 51 + 2\frac{2}{12} = 53\frac{1}{6} \text{ ft}$
- 137.** $15 \cdot 4\frac{1}{3} = \frac{15}{1} \cdot \frac{13}{3} = \frac{15 \cdot 13}{1 \cdot 3} = \frac{5 \cdot \cancel{3} \cdot 13}{1 \cdot \cancel{3}} = \frac{65}{1} = 65 \text{ yd}$
- 138.** $26 \div \frac{1}{4} = \frac{26}{1} \cdot \frac{4}{1} = \frac{104}{1} = 104 \text{ laps}$ **139.** $187.75 - 46.8 - 72.5 = \$68.45 \text{ million}$
- 140.** $0.265(12,419,000) = 3,291,035 \text{ citizens}$
- 141.** $34\% \text{ of } 36,000 = 0.34(36,000) = \$12,240$ **142.** $24\% \text{ of } 52,000 = 0.24(52,000) = \$12,480$
- 143.** $0.23(17,500) = 4,025 \text{ defective} \Rightarrow 17,500 - 4,025 = 13,475 \text{ acceptable units}$
- 144.** $0.36(750) = 270 \text{ lb of water is removed.}$
- 145.** $0.12(18,700,000) = 2,244,000 \text{ increase} \Rightarrow \text{sales} = 18,700,000 + 2,244,000 = \$20,944,000$
- 146.** $\frac{44.47 + 43.24 + 42.77 + 42.05}{4} = \frac{172.53}{4} = 43.1325 \approx 43.13 \text{ seconds}$
- 147.** $\# \text{ gallons} = 16,275.3 \div 25.5 = 638.24705882 \Rightarrow \text{cost} = 638.24705882(3.45) \approx \$2,201.95$
- 148.** $15\% \text{ of } 1\text{st } \$23,000 = 0.15(23,000) = 3,450$; 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 = $45,249.75 \div 4,000 \approx 11.3 \Rightarrow \text{needs } 12 \text{ drums; Cost} = 12(97.50) = \$1,170$
- 150.** $37(\$3.25) = \$120.25 \text{ per day; } 21(\$120.25) = \$2,525.25 \text{ for } 21 \text{ days (3 weeks)}$
- 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 = $0.035(7,600) = 266 \text{ lb of butterfat}$; Guernsey = $0.05(6,500) = 325 \text{ lb of butterfat}$
 The Guernsey cow will produce more butterfat.
- 153.** Silage per cow = $0.57(12,000) = 6,840 \text{ pounds; } 30(6,840) = 205,200 \text{ lb of silage}$
- 154.** 2nd cost = $4,500 + 150(27.50) = 4,500 + 4,125 = 8,625 \Rightarrow 2\text{nd is lower}$

SECTION 1.2

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

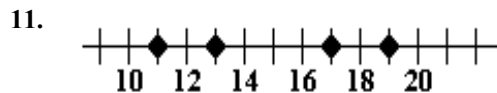
6. $\frac{4}{5} \cdot \frac{4}{5} = \frac{16}{25}$

7. base: y

8. base: $2x$

9. base: $4x$

10. base: y



12. $7 \leq 12 \Rightarrow 12 \geq 7$

13. 17 is a prime number.

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

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

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

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

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

SECTION 1.3

$$71. \frac{(3+5)^2+2}{2(8-5)} = \frac{8^2+2}{2(3)} = \frac{64+2}{6} = \frac{66}{6} = 11 \qquad 72. \frac{25-(2 \cdot 3-1)}{2 \cdot 9-8} = \frac{25-(6-1)}{18-8} = \frac{25-5}{10} = \frac{20}{10} = 2$$

$$73. \frac{(5-3)^2+2}{4^2-(8+2)} = \frac{2^2+2}{16-10} = \frac{4+2}{6} = \frac{6}{6} = 1 \qquad 74. \frac{(4^2-2)+7}{5(2+4)-3^2} = \frac{(16-2)+7}{5(6)-9} = \frac{14+7}{30-9} = \frac{21}{21} = 1$$

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

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

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

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

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

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

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

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

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

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

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

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

$$87. A = \pi r^2 \approx \frac{22}{7}(21 \text{ ft})^2 = \frac{22}{7}(441 \text{ ft}^2) = \frac{22}{7} \cdot \frac{441}{1} \text{ ft}^2 = \frac{22}{7} \cdot \frac{63 \cdot \frac{1}{7}}{1} \text{ ft}^2 = 1,386 \text{ ft}^2$$

$$88. A = \pi r^2 \approx \frac{22}{7}(7 \text{ m})^2 = \frac{22}{7}(49 \text{ m}^2) = \frac{22}{7} \cdot \frac{49}{1} \text{ m}^2 = \frac{22}{7} \cdot \frac{7 \cdot \frac{1}{7}}{1} \text{ m}^2 = 154 \text{ m}^2$$

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

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

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

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

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

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}

SECTION 1.3

115. $\boxed{2}\boxed{5}\boxed{.}\boxed{3}\boxed{^{\wedge}}\boxed{2}\boxed{\text{ENTER}}$
 $\{640.09\}$

116. $\boxed{7}\boxed{.}\boxed{5}\boxed{6}\boxed{7}\boxed{^{\wedge}}\boxed{3}\boxed{\text{ENTER}}$
 $\{433.2825533\}$

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 · width + length · 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. $f = \frac{rs}{(r+s)(n-1)} = \frac{(8)(12)}{(8+12)(1.6-1)} = \frac{96}{(20)(0.6)} = \frac{96}{12} = 8$

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

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.
$$\begin{array}{r} 5 \\ + \quad -4 \\ \hline 1 \end{array}$$
 46.
$$\begin{array}{r} -18 \\ + \quad -11 \\ \hline -29 \end{array}$$
 47.
$$\begin{array}{r} -1.3 \\ + \quad 3.5 \\ \hline 2.2 \end{array}$$
 48.
$$\begin{array}{r} 1.3 \\ + \quad -2.5 \\ \hline -1.2 \end{array}$$

SECTION 1.4

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

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

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

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

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

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

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

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

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

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

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

$$60. \quad \begin{array}{r} -13 \\ 5 \\ \hline \end{array} \Rightarrow \begin{array}{r} -13 \\ -5 \\ \hline \end{array}$$

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

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

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

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

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

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

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

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

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.

$$69. \quad \boxed{4} \boxed{.} \boxed{2} \boxed{6} \boxed{-} \boxed{6} \boxed{.} \boxed{3} \boxed{4} \boxed{+} \boxed{.} \boxed{5} \boxed{6} \boxed{\text{ENTER}} \\ \{-1.52\} \Rightarrow -1.52$$

$$70. \quad \boxed{6} \boxed{.} \boxed{3} \boxed{4} \boxed{-} \boxed{.} \boxed{5} \boxed{6} \boxed{-} \boxed{4} \boxed{.} \boxed{2} \boxed{6} \boxed{\text{ENTER}} \\ \{1.52\} \Rightarrow 1.52$$

SECTION 1.4

71. $\boxed{2} \boxed{.} \boxed{3} \boxed{4} \boxed{x^2} \boxed{-} \boxed{3} \boxed{.} \boxed{4} \boxed{7} \boxed{x^2} \boxed{-} \boxed{.} \boxed{7} \boxed{2} \boxed{x^2} \boxed{\text{ENTER}}$
 $\{-7.0837\} \Rightarrow -7.08$

72. $\boxed{.} \boxed{7} \boxed{2} \boxed{x^2} \boxed{-} \boxed{2} \boxed{.} \boxed{3} \boxed{4} \boxed{x^2} \boxed{+} \boxed{3} \boxed{.} \boxed{4} \boxed{7} \boxed{\wedge} \boxed{3} \boxed{\text{ENTER}}$
 $\{36.824723\} \Rightarrow 36.82$

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. $-3\frac{1}{2} - 5\frac{1}{4} = -\frac{7}{2} - \frac{21}{4} = -\frac{14}{4} - \frac{21}{4} = -\frac{35}{4} = -8\frac{3}{4}$

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

$$89. -6.7 - (-2.5) = -6.7 + (+2.5) = -4.2 \quad 90. 25.3 - 17.5 = 25.3 + (-17.5) = 7.8$$

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

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

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

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

$$95. (-735) + (+500) = -235$$

She still owes \$235.

$$96. (+212) + (-24) = +188$$

He weighs 188 pounds.

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

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

$$99. (-14) + 10 = -4^\circ$$

$$100. 1897 + 54 - 19 = 1932$$

$$101. 1700 - (-300) = 2000 \text{ years}$$

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

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

$$104. 5 + (+7) + (-5) + (+1) + (-2) + (-6) = 0 \text{ yd}$$

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

$$106. 37.125 - 31.625 = 5.5$$

$$107. +32 - (+27) = 5^\circ$$

$$108. -3 - (-21) = 18^\circ$$

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

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

$$111. 500 \cdot 2 - 300 = 1000 - 300 = 700 \text{ shares} \quad 112. 2,532 - 633 = \$1,899$$

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

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

SECTION 1.4

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. $30 \cdot 37\frac{1}{2} = \frac{30}{1} \cdot \frac{75}{2} = \frac{15 \cdot \overset{1}{\cancel{2}} \cdot 75}{1 \cdot \underset{1}{\cancel{2}}} = 1,125 \text{ lb}$

12. $500(1.3) = 650 \text{ lb}$

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

14. $-2(-3 + 4) \begin{array}{|c|} \hline \\ \hline \end{array} -3[3 - (-4)]$
 $-2(+1) \begin{array}{|c|} \hline \\ \hline \end{array} -3[+7]$
 $-2 \begin{array}{|c|} \hline > \\ \hline \end{array} -21$

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

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

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

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

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.

$$73. \boxed{(} \boxed{(-)} \boxed{6} \boxed{+} \boxed{4} \boxed{\times} \boxed{(-)} \boxed{3} \boxed{)} \boxed{\div} \boxed{(} \boxed{4} \boxed{-} \boxed{6} \boxed{)} \boxed{\text{ENTER}} \{9\}$$

$$74. \boxed{(} \boxed{4} \boxed{-} \boxed{2} \boxed{\times} \boxed{4} \boxed{\times} \boxed{(-)} \boxed{3} \boxed{+} \boxed{(-)} \boxed{3} \boxed{)} \boxed{\div} \boxed{(} \boxed{4} \boxed{-} \boxed{(-)} \boxed{6} \boxed{-} \boxed{3} \boxed{)} \boxed{\text{ENTER}} \{3.5714\} \text{ [or } \frac{25}{7} \text{]}$$

$$75. \boxed{(} \boxed{4} \boxed{\times} \boxed{(} \boxed{(-)} \boxed{6} \boxed{)} \boxed{x^2} \boxed{\times} \boxed{(-)} \boxed{3} \boxed{+} \boxed{4} \boxed{x^2} \boxed{\times} \boxed{(-)} \boxed{6} \boxed{)} \boxed{\div} \boxed{(} \boxed{2} \boxed{\times} \boxed{(-)} \boxed{6} \boxed{-} \boxed{2} \boxed{\times} \boxed{(-)} \boxed{3} \boxed{)} \boxed{\text{ENTER}} \{88\}$$

$$76. \boxed{(} \boxed{(} \boxed{4} \boxed{x^2} \boxed{-} \boxed{2} \boxed{\times} \boxed{(-)} \boxed{6} \boxed{)} \boxed{\times} \boxed{(} \boxed{(-)} \boxed{3} \boxed{)} \boxed{x^2} \boxed{)} \boxed{\div} \boxed{(} \boxed{(-)} \boxed{4} \boxed{\times} \boxed{(-)} \boxed{3} \boxed{)} \boxed{\text{ENTER}} \{21\}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 1.5

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

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

$$95. \frac{4 + (-12)}{(-2)^2 - 4} = \frac{-8}{4 - 4} = \frac{-8}{0} \Rightarrow \text{undefined} \quad 96. \frac{-2(3)(4)}{3 - 1} = \frac{-24}{2} = -12$$

$$97. \frac{(-2)(5)(4)}{-3 + 1} = \frac{-40}{-2} = 20 \quad 98. \frac{-3 + 2 - (-10)}{4(-3) + 2(6)} = \frac{-1 + (+10)}{-12 + 12} = \frac{9}{0} \Rightarrow \text{undefined}$$

$$99. \frac{1}{2} - \frac{2}{3} - \frac{3}{4} = \frac{6}{12} + \left(-\frac{8}{12}\right) + \left(-\frac{9}{12}\right) = -\frac{11}{12} \quad 100. -\frac{2}{3} + \frac{1}{2} + \frac{3}{4} = -\frac{8}{12} + \frac{6}{12} + \frac{9}{12} = \frac{7}{12}$$

$$101. \frac{1}{2} - \frac{2}{3} = \frac{3}{6} + \left(-\frac{4}{6}\right) = -\frac{1}{6} \quad 102. -\frac{2}{3} - \frac{3}{4} = -\frac{8}{12} + \left(-\frac{9}{12}\right) = -\frac{17}{12}$$

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

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

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

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

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

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

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

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

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

$$112. \text{ a. } \frac{-60}{-12} = \$5 \quad \text{ b. } \frac{-49}{-7} = \$7 \quad \text{ c. } \frac{-39}{-13} = \$3$$

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

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

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

SECTION 1.5

116. $\frac{(+19) + (+15) + (+12) + (-11) + (-39)}{5} = \frac{-4}{5} = -0.8$ 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. $\frac{-4 + (7 - 9)}{(-9 - 7) + 4} = \frac{-4 + (-2)}{-16 + 4} = \frac{-6}{-12} = \frac{1}{2}$

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

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. $\frac{y}{x}$

30. $\frac{x + y}{y}$

31. $\frac{3z}{4x}$

32. $\frac{x + y}{y + z}$

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

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

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

SECTION 1.6

40. $\frac{x+y+z}{4y^2x} = \frac{-2+5+(-3)}{4(5)^2(-2)} = \frac{3+(-3)}{4(25)(-2)} = \frac{0}{100(-2)} = 0$
41. $\frac{x(y+z)-25}{(x+z)^2-y^2} = \frac{-2[5+(-3)]-25}{[-2+(-3)]^2-5^2} = \frac{-2[2]-25}{[-5]^2-25} = \frac{-4-25}{25-25} = \frac{-29}{0} \Rightarrow \text{undefined}$
42. $\frac{(x+y)(y+z)}{x+z+y} = \frac{(-2+5)[5+(-3)]}{-2+(-3)+5} = \frac{(3)[2]}{-5+5} = \frac{6}{0} \Rightarrow \text{undefined}$
43. $\frac{3(x+z^2)+4}{y(x-z)} = \frac{3[(-2)+(-3)^2]+4}{5[(-2)-(-3)]} = \frac{3(-2+9)+4}{5(1)} = \frac{3(7)+4}{5} = \frac{21+4}{5} = \frac{25}{5} = 5$
44. $\frac{x(y^2-2z)-1}{z(y-x^2)} = \frac{-2[5^2-2(-3)]-1}{-3[5-(-2)^2]} = \frac{-2(25+6)-1}{-3(5-4)} = \frac{-2(31)-1}{-3(1)} = \frac{-62-1}{-3} = \frac{-63}{-3} = 21$
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. $z + \frac{x}{y}$
56. $z - 3$
57. $z - xy$
58. $xy - z$
59. $\frac{xy}{x+z}$
60. $xy + \frac{y}{z}$
61. $\frac{x-4}{3y}$
62. $\frac{2z-5y}{x+3y}$

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

SECTION 1.6

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. $\frac{y}{z} = \frac{4}{2} = 2$
79. $yz - 3 = (4)(2) - 3 = 5$
80. $(x + y) - 7 = (8 + 4) - 7 = 5$
81. $\frac{xy}{z} = \frac{(8)(4)}{2} = 16$
82. $\frac{x + 10}{z} = \frac{8 + 10}{2} = 9$
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. $\frac{x}{5}$ ft
105. $(500 - x)$ in.
106. $\frac{12}{x}$ ft
107. $\$(3d + 5)$
108. $(2x - 2)$ shares
109. $\frac{N(N - 1)}{2} = \frac{10,000(10,000 - 1)}{2} = \frac{10,000(9,999)}{2} = \frac{99,990,000}{2} = 49,995,000$ comparisons
110. $\frac{N(N - 1)}{2} = \frac{50,000(50,000 - 1)}{2} = \frac{50,000(49,999)}{2} = \frac{2,499,950,000}{2} = 1,249,975,000$ comparisons
- 111-114. Answers may vary.
115. $37x \Rightarrow 37(2x)$
 $37(2x) = 2(37x)$
 $37x$ is doubled.
116. $5xy^2 \Rightarrow 5(2x)(2y)^2$
 $5(2x)(2y)^2 = 8(5xy^2)$
 $5xy^2$ is multiplied by 8.

SECTION 1.7

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. $x^2(yz^2) = 5^2[7(-1)^2] = 25[7(1)] = 25[7] = 175$
 $(x^2y)z^2 = [5^2(7)](-1)^2 = [25(7)](1) = [175](1) = 175$
42. $x(y^2z^3) = 5[(7)^2(-1)^3] = 5[49(-1)] = 5[-49] = -245$
 $(xy^2)z^3 = [5(7)^2](-1)^3 = [5(49)](-1) = [245](-1) = -245$
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. $(xy)z = [2(-3)](1) = [-6](1) = \boxed{-6}$; $x(yz) = 2[-3(1)] = 2[-3] = \boxed{-6}$

SECTION 1.7

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

CHAPTER 1 REVIEW

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

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

13. $-3 \begin{matrix} \square \\ \square \end{matrix} 5 - 5$
 $-3 \begin{matrix} \square \\ \square \end{matrix} 0$

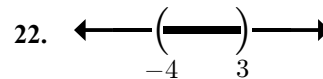
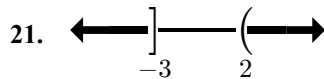
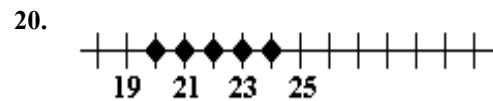
14. $\frac{12}{4} \begin{matrix} \square \\ \square \end{matrix} 7$
 $3 \begin{matrix} \square \\ \square \end{matrix} 7$

15. $\frac{36}{4} \begin{matrix} \square \\ \square \end{matrix} -2$
 $9 \begin{matrix} \square \\ \square \end{matrix} -2$

16. $2 - 2 \begin{matrix} \square \\ \square \\ \square \end{matrix} 8 - \frac{24}{3}$
 $0 \begin{matrix} \square \\ \square \end{matrix} 8 - 8$
 $0 \begin{matrix} \square \\ \square \end{matrix} 0$

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

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



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

24. $|-25| = 25$

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

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

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

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

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

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

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

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

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

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

CHAPTER 1 REVIEW

35. $\frac{2}{3} - \frac{1}{7} = \frac{2 \cdot 7}{3 \cdot 7} - \frac{1 \cdot 3}{7 \cdot 3} = \frac{14}{21} - \frac{3}{21}$
 $= \frac{14-3}{21} = \frac{11}{21}$
36. $\frac{4}{5} - \frac{2}{3} = \frac{4 \cdot 3}{5 \cdot 3} - \frac{2 \cdot 5}{3 \cdot 5} = \frac{12}{15} - \frac{10}{15}$
 $= \frac{12-10}{15} = \frac{2}{15}$
37. $3\frac{2}{3} + 5\frac{1}{4} = \frac{11}{3} + \frac{21}{4} = \frac{11 \cdot 4}{3 \cdot 4} + \frac{21 \cdot 3}{4 \cdot 3} = \frac{44}{12} + \frac{63}{12} = \frac{44+63}{12} = \frac{107}{12} = 8\frac{11}{12}$
38. $7\frac{5}{12} - 4\frac{1}{2} = \frac{89}{12} - \frac{9}{2} = \frac{89}{12} - \frac{9 \cdot 6}{2 \cdot 6} = \frac{89}{12} - \frac{54}{12} = \frac{89-54}{12} = \frac{35}{12} = 2\frac{11}{12}$
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. $\frac{3.3 + 2.5}{0.22} = \frac{5.8}{0.22} \approx 26.36$
45. $\frac{12.5}{14.7 - 11.2} = \frac{12.5}{3.5} \approx 3.57$
46. $(3 - 0.7)(3.63 - 2) = (2.3)(1.63) \approx 3.75$
47. $17\frac{1}{2} + 15\frac{3}{4} = 17 + \frac{2}{4} + 15 + \frac{3}{4} = 32 + \frac{5}{4} = 32 + 1\frac{1}{4} = 33\frac{1}{4}$
 $100 - 33\frac{1}{4} = 100 - 33 - \frac{1}{4} = 67 - \frac{1}{4} = 66\frac{3}{4}$ acres left
48. $\text{avg.} = \frac{5.2 + 4.7 + 9.5 + 8}{4} = \frac{27.4}{4}$
 $= 6.85$ hours
49. $0.20(425) = 85$
50. Front/Back: $2(2.7 + 2.7 + 4.2) = 2(9.6) = 19.2$ ft TOTAL = $19.2 + 13.2 + 7.8 = 40.2$ 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
51. $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$
52. $\left(\frac{2}{3}\right)^2 = \frac{2}{3} \cdot \frac{2}{3} = \frac{4}{9}$
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. $A = \frac{1}{2}bh = \frac{1}{2}\left(6\frac{1}{2} \text{ ft}\right)(7 \text{ ft}) = \frac{1}{2} \cdot \frac{13}{2} \cdot \frac{7}{1} \text{ ft}^2 = \frac{91}{4} \text{ ft}^2 = 22\frac{3}{4} \text{ ft}^2$
58. $V = Bh = \pi r^2 h = \pi\left(\frac{32.1}{2} \text{ ft}\right)^2 (18.7 \text{ ft}) = \pi(257.6025 \text{ ft}^2)(18.7 \text{ ft}) \approx 15,133.6 \text{ ft}^3$

CHAPTER 1 REVIEW

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

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

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

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

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

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

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

$$66. \quad \frac{4}{3} \cdot \frac{9}{2} + \frac{1}{2} \cdot 18 = \frac{2 \cdot \frac{1}{2} \cdot 3 \cdot \frac{1}{3}}{\frac{3 \cdot 2}{1}} + \frac{1 \cdot 9 \cdot \frac{1}{2}}{\frac{2 \cdot 1}{1}} \\ = \frac{6}{1} + \frac{9}{1} = 15$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CHAPTER 1 REVIEW

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$107. \quad xz$$

$$108. \quad x + 2y$$

$$109. \quad 2(x + y)$$

$$110. \quad x - yz$$

$$111. \quad \text{the product of } 5, x \text{ and } z$$

$$112. \quad 5 \text{ decreased by the product of } y \text{ and } z$$

$$113. \quad 4 \text{ less than the product of } x \text{ and } y$$

$$114. \quad \text{the quotient obtained when the sum of } x, \\ y \text{ and } z \text{ is divided by twice their product}$$

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

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

CHAPTER 1 REVIEW

$$\begin{aligned} 117. \quad 5x + (y - z) &= 5(2) + [-3 - (-1)] \\ &= 10 + [-3 + 1] \\ &= 10 + (-2) = 8 \end{aligned}$$

$$\begin{aligned} 119. \quad x - (y - z) &= 2 - [-3 - (-1)] \\ &= 2 - [-3 + (+1)] \\ &= 2 - [-2] = 2 + (+2) = 4 \end{aligned}$$

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

$$\begin{aligned} 123. \quad (x + y)(y + z) &= [2 + (-3)][-3 + (-1)] \\ &= [-1][-4] = 4 \end{aligned}$$

$$\begin{aligned} 125. \quad y^2z + x &= (-3)^2(-1) + 2 \\ &= 9(-1) + 2 = -9 + 2 = -7 \end{aligned}$$

$$\begin{aligned} 127. \quad \frac{2y^2}{3x - 6} &= \frac{2(-3)^2}{3(2) - 6} = \frac{2(9)}{6 - 6} = \frac{18}{0} \\ &\text{undefined} \end{aligned}$$

129. three terms

131. 1

133. closure property of addition

135. associative property of addition

137. commutative property of addition

139. commutative property of addition

141. additive inverse property

$$\begin{aligned} 118. \quad z^2 - y &= (-1)^2 - (-3) = 1 - (-3) \\ &= 1 + 3 = 4 \end{aligned}$$

$$\begin{aligned} 120. \quad (x - y) - z &= [2 - (-3)] - (-1) \\ &= [2 + (+3)] + (+1) \\ &= 5 + 1 = 6 \end{aligned}$$

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

$$\begin{aligned} 124. \quad \frac{3(x - y)}{x + (y - z)} &= \frac{3[2 - (-3)]}{2 + [-3 - (-1)]} \\ &= \frac{3[5]}{2 + [-2]} = \frac{15}{0} : \text{undefined} \end{aligned}$$

$$\begin{aligned} 126. \quad yz^3 + (xy)^2 &= (-3)(-1)^3 + [2(-3)]^2 \\ &= (-3)(-1) + [-6]^2 \\ &= 3 + 36 = 39 \end{aligned}$$

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

130. 7

132. $2 + 4 + 3 = 9$

134. commutative property of multiplication

136. distributive property

138. associative property of multiplication

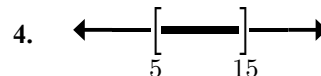
140. multiplicative identity property

142. additive identity property

Chapter 1 Test (page 77)

1. 31, 37, 41, 43, 47

2. 2



CHAPTER 1 TEST

5. $-|-17| = -(+17) = -17$
6. $-|9| + |-9| = -(+9) + (+9) = -9 + 9 = 0$
7. $3(4 - 2) \boxed{} - 2(2 - 5)$
 $3(2) \boxed{} - 2(-3)$
 $6 \boxed{=} 6$
8. $1 + 4 \cdot 3 \boxed{} - 2(-7)$
 $1 + 12 \boxed{} + 14$
 $13 \boxed{<} 14$
9. 25% of 136 $\boxed{}$ $\frac{1}{2}$ of 66
 $0.25(136) \boxed{} \frac{1}{2}(66)$
 $34 \boxed{>} 33$
10. $-8.5 \boxed{} -|-8.5|$
 $-8.5 \boxed{} -(+8.5)$
 $-8.5 \boxed{=} -8.5$
11. $\frac{26}{40} = \frac{13 \cdot \frac{1}{2}}{20 \cdot \frac{2}{1}} = \frac{13}{20}$
12. $\frac{9}{11} \cdot \frac{44}{45} = \frac{\frac{1}{9} \cdot 4 \cdot \frac{1}{1}}{\frac{1}{1} \cdot \frac{9}{1} \cdot \frac{1}{5}} = \frac{4}{5}$
13. $\frac{14}{21} \div \frac{28}{9} = \frac{14}{21} \cdot \frac{9}{28} = \frac{\frac{1}{4} \cdot \frac{1}{3} \cdot 3}{\frac{3}{1} \cdot 7 \cdot 2 \cdot \frac{1}{4}} = \frac{3}{14}$
14. $\frac{24}{16} + 3 = \frac{3 \cdot \frac{1}{8}}{2 \cdot \frac{8}{1}} + \frac{3}{1} = \frac{3}{2} + \frac{3 \cdot 2}{1 \cdot 2} = \frac{3}{2} + \frac{6}{2} = \frac{3+6}{2} = \frac{9}{2} \left(\text{or } 4\frac{1}{2} \right)$
15. $\frac{17-5}{36} - \frac{2(13-5)}{12} = \frac{12}{36} - \frac{2(8)}{12} = \frac{12}{36} - \frac{16}{12} = \frac{\frac{1}{2}}{3 \cdot \frac{1}{2}} - \frac{4 \cdot \frac{1}{4}}{3 \cdot \frac{4}{1}} = \frac{1}{3} - \frac{4}{3} = \frac{1-4}{3} = \frac{-3}{3} = -1$
16. $\frac{|-7 - (-6)|}{-7 - |-6|} = \frac{|-7 + (+6)|}{-7 - (+6)} = \frac{|-1|}{-7 + (-6)} = \frac{1}{-13} = -\frac{1}{13}$
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. $V = Bh = \pi r^2 h = \pi(7 \text{ in.})^2(10 \text{ in.})$
 $= \pi(49 \text{ in.}^2)(10 \text{ in.})$
 $= \pi(490 \text{ in.}^3) \approx 1,539 \text{ in.}^3$
21. $xy + z = (-2)(3) + 4 = -6 + 4 = -2$
22. $x(y + z) = -2(3 + 4) = -2(7) = -14$
23. $\frac{z + 4y}{2x} = \frac{4 + 4(3)}{2(-2)} = \frac{4 + 12}{-4} = \frac{16}{-4} = -4$
24. $|x^3 - z| = |(-2)^3 - 4| = |-8 - 4| = |-12|$
 $= 12$
25. $x^3 + y^2 + z = (-2)^3 + (3)^2 + 4$
 $= -8 + 9 + 4 = 5$
26. $|x| - 3|y| - 4|z| = |-2| - 3|3| - 4|4|$
 $= 2 - 3(3) - 4(4)$
 $= 2 - 9 - 16 = -23$

SECTION 2.1

- | | |
|--|---|
| 27. $\frac{xy}{x+y}$ | 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. $\frac{x}{5} = 2$
multiplication | 8. $\frac{x}{2} = -10$
multiplication |
| 9. $\frac{4}{5} + \frac{2}{3} = \frac{4 \cdot 3}{5 \cdot 3} + \frac{2 \cdot 5}{3 \cdot 5} = \frac{12}{15} + \frac{10}{15} = \frac{22}{15}$ | 10. $\frac{5}{6} \cdot \frac{12}{25} = \frac{\frac{1}{\cancel{5}}}{\cancel{6}} \cdot \frac{2 \cdot \cancel{6}}{\cancel{5} \cdot \frac{1}{\cancel{5}}} = \frac{2}{5}$ | 11. $\frac{5}{9} \div \frac{3}{5} = \frac{5}{9} \cdot \frac{5}{3} = \frac{25}{27}$ | 12. $\frac{15}{7} - \frac{10}{3} = \frac{15 \cdot 3}{7 \cdot 3} - \frac{10 \cdot 7}{3 \cdot 7} = \frac{45}{21} - \frac{70}{21} = -\frac{25}{21}$ |
| 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. $\frac{5(-4) - 3(-2)}{10 - (-4)} = \frac{-20 - (-6)}{10 + 4} = \frac{-20 + 6}{14} = \frac{-14}{14} = -1$ |
| 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 |