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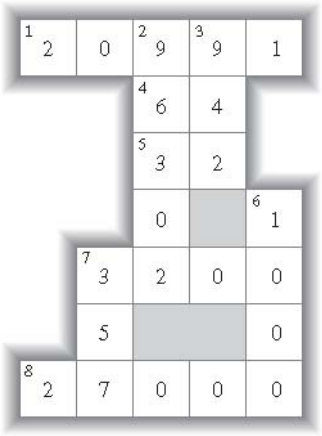
Chapter 1 Whole Numbers

Review Your Skills



Section 1.1 Study Tips

Group Activity: Becoming a Successful Student

1. Answers will vary.

2. Answers will vary.

3. Answers will vary.

4. Answers will vary.

5. Answers will vary.

6. Answers will vary.

7. Answers will vary.

8. Answers will vary.

9. Answers will vary.

10. Answers will vary.

11. **(1) e**. answers to odd exercises
(2) g. Avoiding Mistakes
(3) b. Connect Math
(4) f. Chapter Summary
(5) d. Problem Recognition Exercises
(6) a. Tips
(7) c. Skill Practice exercises

Section 1.2 Introduction to Whole Numbers

Section 1.2 Practice Exercises

1. **(a)** periods
(b) hundreds
(c) thousands

2. 36,791
1: ones
9: tens
7: hundreds
6: thousands
3: ten-thousands

3. 8, 213,457
7: ones
5: tens
4: hundreds
3: thousands
1: ten-thousands
2: hundred-thousands
8: millions

4. 103,596
6: ones
9: tens
5: hundreds
3: thousands
0: ten-thousands
1: hundred-thousands

5. 321 tens

6. 689 tens

7. 214 ones

8. 738 ones

9. 8710 hundreds

10. 2293 hundreds

11. 1430 thousands

12. 3101 thousands

13. 452,723 hundred-thousands

14. 655,878 hundred thousands

15. 1,023,676,207 billions

16. 3,111,901,211 billions

17. 22,422 ten-thousands

18. 58,106 ten-thousands

19. 51,033,201 millions

20. 93,971,224 millions

21. 10,677,881 ten-millions

22. 31,820 mi^2 thousands

23. 7,653,468,440 billions

24. 31,000 ft ten-thousands

25. 5 tens + 8 ones; $5\times10+8\times1$

26. 7 tens + 1 one; $7\times10+1\times1$

27. 5 hundreds + 3 tens + 9 ones
$5\times100+3\times10+9\times1$

28. 3 hundreds + 8 tens + 2 ones
$3\times100+8\times10+2\times1$

29. 5 thousands + 2 hundreds + 3 ones
$5\times1,000+2\times100+3\times1$

30. 7 thousands + 8 tens + 9 ones
$7\times1,000+8\times10+9\times1$

31. 1 ten-thousand + 2 hundreds + 4 tens + 1 one
$1\times10,000+2\times100+4\times10+1\times1$

32. 2 ten-thousands + 8 hundreds + 7 tens + 3 ones
$2\times10,000+8\times100+7\times10+3\times1$

33. 524

34. 318

35. 150

36. 620

37. 1,906

38. 4,201

39. 85,007

40. 26,002

41. ones, thousands, millions, billions

42. ones, tens, hundreds, thousands

43. Two hundred forty-one

44. Three hundred twenty-seven

45. Six hundred three

46. One hundred eight

47. Thirty-one thousand, five hundred thirty

48. Fifty-two thousand, one hundred sixty

49. One hundred thousand, two hundred thirty-four

50. Four hundred thousand, one hundred ninety-nine

51. Nine thousand, five hundred thirty-five

52. One thousand, three hundred seventy-seven

53. Twenty thousand, three hundred twenty

54. One thousand, eight hundred

55. Five hundred ninety thousand, seven hundred twelve

56. Sixty million

57. 6005

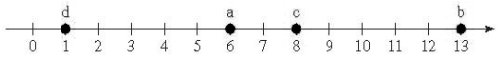
58. 4004

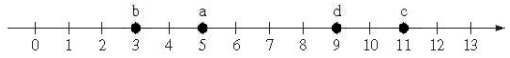
59. 672,000

60. 248,000

61. 1,484,250

62. 2,647,520

63. 

64. 

65. Counting on a number line, 10 is 4 units to the right of 6.

66. Counting on a number line, 3 is 8 units to the left of 11.

67. Counting on a number line, 4 is 3 units to the left of 7.

68. Counting on a number line, 5 is 5 units to the right of 0.

69. $8 > 2$
8 is greater than 2, or 2 is less than 8.

70. $6 < 11$
6 is less than 11, or 11 is greater than 6.

71. $3 < 7$
3 is less than 7, or 7 is greater than 3.

72. $14 > 12$
14 is greater than 12, or 12 is less than 14.

73. $6 < 11$

74. $14 > 13$

75. $21 > 18$

76. $5 < 7$

77. $3 < 7$

78. $14 < 24$

79. $95 > 89$

80. $28 < 30$

81. $0 < 3$

82. $8 > 0$

83. $90 < 91$

84. $48 > 47$

85. False; 12 is made up of the digits 1 and 2.

86. False; 26 is made up of the digits 2 and 6.

87. 99

88. 999

89. There is no greatest whole number.

90. 0 is the least whole number.

91. 10,000,000 7 zeros

92. 100,000,000,000 11 zeros

93. 964

94. 840

Section 1.3 Addition and Subtraction of Whole Numbers and Perimeter

Section 1.3 Practice Exercises

1. **(a)** addends

(b) sum

(c) variable

(d) commutative

(e) a; a

(f) $a + (b + c)$

(g) minuend; subtrahend; difference

(h) polygon

(i) perimeter

2. 5 thousands + 2 tens + 4 ones

3. 3 hundreds + 5 tens + 1 one

4. 2004

5. 4012

6. 6206

7. Fill in the table. Use the number line if necessary.

+	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10	11
3	3	4	5	6	7	8	9	10	11	12
4	4	5	6	7	8	9	10	11	12	13
5	5	6	7	8	9	10	11	12	13	14
6	6	7	8	9	10	11	12	13	14	15
7	7	8	9	10	11	12	13	14	15	16
8	8	9	10	11	12	13	14	15	16	17
9	9	10	11	12	13	14	15	16	17	18

8. $11 + 10 = 21$
Addends: 11, 10
Sum: 21

9. $1 + 13 + 4 = 18$
Addends: 1, 13, 4
Sum: 18

10. $5 + 8 + 2 = 15$
Addends: 5, 8, 2
Sum: 15

11.
$$\begin{array}{r} 42 = 4 \text{ tens} + 2 \text{ ones} \\ +\ 33 = 3 \text{ tens} + 3 \text{ ones} \\ \hline 75 = 7 \text{ tens} + 5 \text{ ones} \end{array}$$

12.
$$\begin{array}{r} 21 = 2 \text{ tens} + 1 \text{ one} \\ +\ 53 = 5 \text{ tens} + 3 \text{ ones} \\ \hline 74 = 7 \text{ tens} + 4 \text{ ones} \end{array}$$

13.
$$\begin{array}{r} 12 = 1 \text{ ten} + 2 \text{ ones} \\ 15 = 1 \text{ ten} + 5 \text{ ones} \\ +\ 32 = 3 \text{ tens} + 2 \text{ ones} \\ \hline 59 = 5 \text{ tens} + 9 \text{ ones} \end{array}$$

14. $10 = 1 \text{ ten} + 0 \text{ ones}$
$8 = 0 \text{ tens} + 8 \text{ ones}$
$30 = 3 \text{ tens} + 0 \text{ ones}$
$48 = 4 \text{ tens} + 8 \text{ ones}$

15.
$$\begin{array}{r} 890 \\ +\,107 \\ \hline 997 \end{array}$$

16.
$$\begin{array}{r} 444 \\ +\,354 \\ \hline 798 \end{array}$$

17.
$$\begin{array}{r} 4 \\ 13 \\ +\,102 \\ \hline 119 \end{array}$$

18.
$$\begin{array}{r} 11 \\ 221 \\ +\;\;5 \\ \hline 237 \end{array}$$

19.
$$\begin{array}{r} {\scriptstyle 1} \\ 76 \\ +\,45 \\ \hline 121 \end{array}$$

20.
$$\begin{array}{r} {\scriptstyle 1} \\ 25 \\ +\,59 \\ \hline 84 \end{array}$$

21.
$$\begin{array}{r} {\scriptstyle 1} \\ 87 \\ +\,24 \\ \hline 111 \end{array}$$

22.
$$\begin{array}{r} {\scriptstyle 1} \\ 38 \\ +\,77 \\ \hline 115 \end{array}$$

23.
$$\begin{array}{r} 658 \\ +\,231 \\ \hline 889 \end{array}$$

24.
$$\begin{array}{r} {\scriptstyle 1} \\ 642 \\ +\,295 \\ \hline 937 \end{array}$$

25.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 152 \\ +\,549 \\ \hline 701 \end{array}$$

26.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 462 \\ +\,388 \\ \hline 850 \end{array}$$

27.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 79 \\ 112 \\ +\,12 \\ \hline 203 \end{array}$$

28.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 62 \\ 907 \\ +\,34 \\ \hline 1003 \end{array}$$

29.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 4980 \\ +\,10223 \\ \hline 15,203 \end{array}$$

30.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 23112 \\ 892 \\ \hline 24,004 \end{array}$$

31.
$$\begin{array}{r} {\scriptstyle 11\;1\acute{Z}} \\ 10\,223 \\ 25\,782 \\ 4\,980 \\ \hline 40,985 \end{array}$$

32.
$$\begin{array}{r} {\scriptstyle 11\;\;11} \\ 92\,377 \\ 5\,622 \\ 34\,659 \\ \hline 132,658 \end{array}$$

33. $101 + 44 = 44 + 101$

34. $8 + 13 = 13 + 8$

35. $x + y = y + x$

36. $t + q = q + t$

37. $(23 + 9) + 10 = 23 + (9 + 10)$

38. $7 + (12 + 8) = (7 + 12) + 8$

39. $r + (s + t) = (r + s) + t$

40. $(c + d) + e = c + (d + e)$

41. The commutative property changes the order of the addends, and the associative property changes the grouping.

42. The sum of any number and 0 is that number.

(a) $423 + 0 = 423$

(b) $0 + 25 = 25$

(c) $67 + 0 = 67$

(d) $0 + x = x$

43. $12 - 8 = 4$
minuend: 12
subtrahend: 8
difference: 4

44.
$$\begin{array}{r} 9 \\ -\,6 \\ \hline 3 \end{array}$$
minuend: 9
subtrahend: 6
difference: 3

45. $27 - 9 = 18$ because $18 + 9 = 27$.

46. $20 - 8 = 12$ because $12 + 8 = 20$.

47. $102 - 75 = 27$ because $27 + 75 = 102$.

48. $211 - 45 = 166$ because $166 + 45 = 211$.

49. $8 - 3 = 5$ Check: $5 + 3 = 8$

50. $7 - 2 = 5$ Check: $5 + 2 = 7$

51. $4 - 1 = 3$ Check: $3 + 1 = 4$

52. $9 - 1 = 8$ Check: $8 + 1 = 9$

53.
$$\begin{array}{r} 1347 \\ -\,221 \\ \hline 1126 \end{array}$$
Check:
$$\begin{array}{r} 1126 \\ +\,221 \\ \hline 1347 \end{array}$$ ✓

54.
$$\begin{array}{r} 4865 \\ -\,713 \\ \hline 4152 \end{array}$$
Check:
$$\begin{array}{r} 4152 \\ +\,713 \\ \hline 4865 \end{array}$$ ✓

55.
$$\begin{array}{r} 14,356 \\ -\,13,253 \\ \hline 1,103 \end{array}$$
Check:
$$\begin{array}{r} 1\,103 \\ +\,13\,253 \\ \hline 14,356 \end{array}$$ ✓

56.
$$\begin{array}{r} 34,550 \\ -\,31,450 \\ \hline 3100 \end{array}$$
Check:
$$\begin{array}{r} 3\,100 \\ +\,31\,450 \\ \hline 34,550 \end{array}$$ ✓

57.
$$\begin{array}{r} {\scriptstyle 6\,16} \\ \cancel{7}\cancel{6} \\ -\,59 \\ \hline 17 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1} \\ 17 \\ +\,59 \\ \hline 76 \end{array}$$ ✓

58.
$$\begin{array}{r} {\scriptstyle 5\,14} \\ \cancel{6}\cancel{4} \\ -\,48 \\ \hline 16 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1} \\ 16 \\ +\,48 \\ \hline 64 \end{array}$$ ✓

59.
$$\begin{array}{r} {\scriptstyle 10} \\ {\scriptstyle 6\,\cancel{0}\,10} \\ \cancel{7}\,\cancel{1}\,\cancel{0} \\ -\,1\;8\;9 \\ \hline 5\;2\;1 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 521 \\ +\,189 \\ \hline 710 \end{array}$$ ✓

60.
$$\begin{array}{r} {\scriptstyle 4\,10} \\ 8\cancel{5}\,\cancel{0} \\ -\,30\,3 \\ \hline 547 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1} \\ 547 \\ +\,303 \\ \hline 850 \end{array}$$ ✓

61.
$$\begin{array}{r} {\scriptstyle 9\;\;9} \\ {\scriptstyle 5\,\cancel{1}\,\cancel{0}\,\cancel{1}\,12} \\ \cancel{6}\,\cancel{0}\,\cancel{0}\,\cancel{2} \\ -1\;2\;3\;8 \\ \hline 4\;7\;6\;4 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1\,1\,1} \\ 4764 \\ +\,1238 \\ \hline 6002 \end{array}$$ ✓

62.
$$\begin{array}{r} {\scriptstyle 9\;\;9} \\ {\scriptstyle 2\,\cancel{1}\,\cancel{0}\,10} \\ \cancel{3}\;0\;0\;0 \\ -\,2\;3\;5\;6 \\ \hline 6\;4\;4 \end{array}$$
Check:
$$\begin{array}{r} {\scriptstyle 1\,1\,1} \\ 644 \\ +\,2356 \\ \hline 3000 \end{array}$$ ✓

63.
$$\begin{array}{r} {\scriptstyle 0\,10} \\ \cancel{1}\cancel{0},425 \\ -\,9\;022 \\ \hline 1,403 \end{array}$$
Check:
$$\begin{array}{r} 1\;403 \\ +\,9\;022 \\ \hline 10,425 \end{array}$$ ✓

64. $\begin{array}{r} {\scriptstyle 1\ 13\ 8\ 10\ 11} \\ \cancel{2}\,\cancel{3},\cancel{9}\,\cancel{0}\,\cancel{1} \\ -\ 8\ 0\ 6\ 4 \\ \hline 15,8\ 3\ 7 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 1\quad 11} \\ 15\,837 \\ +\ 8\,064 \\ \hline 23{,}901 \end{array}$ ✓

65. $\begin{array}{r} {\scriptstyle 11} \\ {\scriptstyle 5\ 1\ 10} \\ \cancel{6}\cancel{2}\,\cancel{0}88 \\ -\ 59\ 871 \\ \hline 2{,}217 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 11} \\ 2\,217 \\ +\ 59\,871 \\ \hline 62{,}088 \end{array}$ ✓

66. $\begin{array}{r} {\scriptstyle 11\,10\,10} \\ {\scriptstyle 2\ 1\ \ 0\ \ 0\ 12} \\ \cancel{3}\cancel{2},\cancel{1}\,\cancel{1}\,\cancel{2} \\ -\ 28,\ 3\ 3\ 4 \\ \hline 3\ 7\ 7\ 8 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 1\ 11} \\ 13\,778 \\ +\ 28\,334 \\ \hline 32{,}112 \end{array}$ ✓

67. $\begin{array}{r} {\scriptstyle 16\ 9} \\ {\scriptstyle 2\ \cancel{6}\ \cancel{10}\ 10} \\ \cancel{3}\cancel{7}\,\cancel{0}\,0 \\ -\ 29\ 8\ 7 \\ \hline 7\ 1\ 3 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 713 \\ +\ 2987 \\ \hline 3700 \end{array}$ ✓

68. $\begin{array}{r} {\scriptstyle 9\ \ 9} \\ {\scriptstyle 7\ \cancel{10}\ \cancel{10}\ 10} \\ \cancel{8}\,\cancel{0}\,\cancel{0}\,\cancel{0} \\ -\ 3\ 7\ 8\ 8 \\ \hline 4\ 2\ 1\ 2 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 4212 \\ +\ 3788 \\ \hline 8000 \end{array}$ ✓

69. $\begin{array}{r} {\scriptstyle 13} \\ {\scriptstyle 1\ \ \cancel{3}\ 13} \\ 3\cancel{2},\cancel{4}\,\cancel{3}9 \\ -\ 1\ \ 4\ 98 \\ \hline 30\,,9\,41 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 1\ \ 1} \\ 30\ 941 \\ +\ 1\ 498 \\ \hline 32{,}439 \end{array}$ ✓

70. $\begin{array}{r} {\scriptstyle 1\ 11} \\ \cancel{2}\cancel{1}\,335 \\ -\ 4\ 123 \\ \hline 17{,}212 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 1} \\ 17\,212 \\ +\ 4\ 123 \\ \hline 21{,}335 \end{array}$ ✓

71. $\begin{array}{r} {\scriptstyle 9} \\ {\scriptstyle 7\ \cancel{10}10\quad 2\ 14} \\ \cancel{8},\cancel{0}\,\cancel{0}7,2\cancel{3}\,\cancel{4} \\ -\ 2,3\ 45,11\ 5 \\ \hline 5,\ 6\ 62,11\ 9 \end{array}$ Check:

$\begin{array}{r} {\scriptstyle 1\ 1\quad\ 1} \\ 5\,662\ 119 \\ +\ 2\,345\ 115 \\ \hline 8{,}007{,}234 \end{array}$ ✓

72. $\begin{array}{r} {\scriptstyle 9} \\ {\scriptstyle 2\ \cancel{10}14\quad 4\ 16} \\ \cancel{3}\,\cancel{0}\,\cancel{4}5\ \cancel{5}\,\cancel{6}7 \\ -\ 1\ 8\ 71\ 4\ 95 \\ \hline 1,\ 1\ 74,0\ 72 \end{array}$ Check: $\begin{array}{r} {\scriptstyle 1\quad\ 1} \\ 1\,174\ 072 \\ +\ 1\,871\ 495 \\ \hline 3{,}045{,}567 \end{array}$ ✓

73. The expression $7 - 4$ means 7 minus 4, yielding a difference of 3. The expression $4 - 7$ means 4 minus 7 which results in a difference of -3.

74. Subtraction is not associative. For example, $10 - (6 - 2) = 10 - 4 = 6$, and $(10 - 6) - 2 = 4 - 2 = 2$. Therefore $10 - (6 - 2)$ does not equal $(10 - 6) - 2$.

75. $13 + 7$ $\begin{array}{r} {\scriptstyle 1} \\ 13 \\ +\ 7 \\ \hline 20 \end{array}$

76. $100 + 42$ $\begin{array}{r} 100 \\ +\ 42 \\ \hline 142 \end{array}$

77. $7 + 45$ $\begin{array}{r} {\scriptstyle 1} \\ 7 \\ +\ 45 \\ \hline 52 \end{array}$

78. $23 + 81$ $\begin{array}{r} 23 \\ +\ 81 \\ \hline 104 \end{array}$

79. $18 + 5$ $\begin{array}{r} {\scriptstyle 1} \\ 18 \\ +\ 5 \\ \hline 23 \end{array}$

80. $76 + 2$

$$\begin{array}{r} 76 \\ +\ 2 \\ \hline 78 \end{array}$$

81. $1523 + 90$

$$\begin{array}{r} {\scriptstyle 1} \\ 1523 \\ +\ \ 90 \\ \hline 1613 \end{array}$$

82. $1320 + 448$

$$\begin{array}{r} 1320 \\ +\ 448 \\ \hline 1768 \end{array}$$

83. $5 + 39 + 81$

$$\begin{array}{r} {\scriptstyle 1} \\ 5 \\ 39 \\ +\ 81 \\ \hline 125 \end{array}$$

84.

$$\begin{array}{r} 78 \\ -\ 6 \\ \hline 72 \end{array}$$

85.

$$\begin{array}{r} 422 \\ -\ 100 \\ \hline 322 \end{array}$$

86.

$$\begin{array}{r} 89 \\ -\ 42 \\ \hline 47 \end{array}$$

87.

$$\begin{array}{r} {\scriptstyle 8\ 10} \\ 10\cancel{9}\ \cancel{0} \\ -\ 7\ 2 \\ \hline 101\ 8 \end{array}$$

88.

$$\begin{array}{r} {\scriptstyle 0\ 11} \\ 3\cancel{1}\cancel{1}1 \\ -\ 60 \\ \hline 3051 \end{array}$$

89.

$$\begin{array}{r} {\scriptstyle 4\ 10} \\ \cancel{5}\ \cancel{0} \\ -\ 1\ 3 \\ \hline 3\ 7 \end{array}$$

90.

$$\begin{array}{r} 405 \\ -\ 103 \\ \hline 302 \end{array}$$

91.

$$\begin{array}{r} {\scriptstyle 9\ 13} \\ \cancel{1}\cancel{0}\ \cancel{3} \\ -\ 3\ 5 \\ \hline 6\ 8 \end{array}$$

92.

$$\begin{array}{r} {\scriptstyle 8\ 11} \\ \cancel{9}\ \cancel{1} \\ -\ 1\ 4 \\ \hline 7\ 7 \end{array}$$

93.

$$\begin{array}{r} {\scriptstyle 1\quad 2} \\ 21{,}209{,}000 \\ 20{,}836{,}000 \\ +\ 16{,}448{,}000 \\ \hline 58{,}493{,}000 \end{array}$$

The shows had a total of 58,493,000 viewers.

94.

$$\begin{array}{r} {\scriptstyle 3\ 3} \\ 38 \\ 54 \\ 44 \\ 61 \\ 97 \\ 103 \\ +\ 124 \\ \hline 521 \end{array}$$

521 deliveries were made.

95.

$$\begin{array}{r} {\scriptstyle 1} \\ \$60 \\ 82 \\ +\ \ 58 \\ \hline \$200 \end{array}$$

The total amount is $200.

96.

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 115 \\ 104 \\ 93 \\ +\ 111 \\ \hline 423 \end{array}$$

423 desks were delivered.

97.

$$\begin{array}{r} {\scriptstyle 1\ 10\ 2\ 1\ 10} \\ 2\cancel{0},\cancel{3}\cancel{2}0 \text{ ft} \\ -\ 14,\ 246 \text{ ft} \\ \hline 6,\ 074 \text{ ft} \end{array}$$

Denali is 6074 ft higher than White Mountain Peak.

98.
$$\begin{array}{r} {\scriptstyle 4\ 15} \\ \cancel{5}\ \cancel{5} \\ -\ 3\ 9 \\ \hline 1\ 6 \end{array}$$
16 DVDs are left.

99.
$$\begin{array}{r} {\scriptstyle \quad 9\ \ 9} \\ {\scriptstyle 7\cancel{0}\,\cancel{0}10} \\ 2\ 39\cancel{8}\ 0\ 0\ 0 \\ -\ 2\ 390\ 2\ 5\ 2 \\ \hline 7\ 7\ 4\ 8 \end{array}$$
The difference is 7748 marriages.

100.
$$\begin{array}{r} 2{,}398{,}000 \\ -\ 2{,}248{,}000 \\ \hline 150{,}000 \end{array}$$
The decrease is 150,000 marriages.

101.
$$\begin{array}{r} {\scriptstyle \quad 13} \\ {\scriptstyle 3\,\cancel{3}\,13} \\ 2\cancel{4}\,\cancel{4}\,\cancel{3}\ 489 \\ -\ 2\,248\ 000 \\ \hline 195{,}489 \end{array}$$
The difference is 195,489 marriages.

102.
$$\begin{array}{r} 2{,}398{,}000 \\ -\ 2{,}336{,}000 \\ \hline 62{,}000 \end{array}$$
The greatest increase occurred between Year 4 and Year 5; the increase was 62,000 marriages.

103.
$$\begin{array}{r} {\scriptstyle 111\ 11} \\ 100{,}052 \\ 675{,}038 \\ +\ 45{,}934 \\ \hline 821{,}024 \end{array}$$
There are 821,024 nonteachers.

104.
$$\begin{array}{r} {\scriptstyle \quad 1\ 11} \\ \$7\ 329 \\ 9\ 560 \\ 1\ 248 \\ +\ 3\ 500 \\ \hline \$21{,}637 \end{array}$$
The total cost is $21,637.

105.
$$\begin{array}{r} 6288 \\ -\ 2032 \\ \hline 4256 \end{array}$$
Mt. Washington is 4256 ft higher than the Pinkham Notch Visitor Center.

106.
$$\begin{array}{r} {\scriptstyle \quad 10} \\ {\scriptstyle 4\ \cancel{0}14} \\ \cancel{5}\ \cancel{1}\ \cancel{4}9 \\ -\ 2\ 6\ 7\ 0 \\ \hline 2\ 4\ 7\ 9 \end{array}$$
The Lion King had been performed 2479 more times.

107.
$$\begin{array}{r} {\scriptstyle \quad 1} \\ 26{,}960 \\ +\ 2\ 600 \\ \hline 29{,}560 \end{array}$$
Jeannette will pay $29,560 for 1 year.

108.
$$\begin{array}{r} {\scriptstyle \quad 11} \\ 138 \\ +\ 96 \\ \hline 234 \end{array}$$
They are 234 miles apart.

109.
$$\begin{array}{r} {\scriptstyle \quad 1} \\ 35\text{ cm} \\ 35\text{ cm} \\ +\ 34\text{ cm} \\ \hline 104\text{ cm} \end{array}$$

110.
$$\begin{array}{r} {\scriptstyle \quad 1} \\ 27\text{ in.} \\ 13\text{ in.} \\ +\ 20\text{ in.} \\ \hline 60\text{ in.} \end{array}$$

111.
$$\begin{array}{r} {\scriptstyle \quad 2} \\ 6\text{ yd} \\ 10\text{ yd} \\ 11\text{ yd} \\ 3\text{ yd} \\ 5\text{ yd} \\ +\ 7\text{ yd} \\ \hline 42\text{ yd} \end{array}$$

112.
$$\begin{array}{r} {\scriptstyle 2\,3}\\ 200 \text{ yd}\\ 136 \text{ yd}\\ 142 \text{ yd}\\ 98 \text{ yd}\\ 58 \text{ yd}\\ +\ 38 \text{ yd}\\ \hline 672 \text{ yd}\end{array}$$

113.
$$\begin{array}{r} 94 \text{ ft}\\ 94 \text{ ft}\\ 50 \text{ ft}\\ +\ 50 \text{ ft}\\ \hline 288 \text{ ft}\end{array}$$

114.
$$\begin{array}{r} 90 \text{ ft}\\ 90 \text{ ft}\\ 90 \text{ ft}\\ +\ 90 \text{ ft}\\ \hline 360 \text{ ft}\end{array}$$

115.
$$\begin{array}{r} 14 \text{ m}\\ +\ 12 \text{ m}\\ \hline 26 \text{ m}\end{array} \qquad \begin{array}{r} 39 \text{ m}\\ -\ 26 \text{ m}\\ \hline 13 \text{ m}\end{array}$$

The missing length is 13 m.

116.
$$\begin{array}{r} {\scriptstyle 1\,1}\\ 139 \text{ cm}\\ 87 \text{ cm}\\ +\ 201 \text{ cm}\\ \hline 427 \text{ cm}\end{array} \qquad \begin{array}{r} 547 \text{ cm}\\ -\ 427 \text{ cm}\\ \hline 120 \text{ cm}\end{array}$$

The missing length is 120 cm.

117.
$$\begin{array}{r} 45{,}418\\ 81{,}990\\ 9\,063\\ +\ 56{,}309\\ \hline 192{,}780\end{array}$$

118.
$$\begin{array}{r} 9{,}300{,}050\\ 7{,}803{,}513\\ 3{,}480{,}009\\ +\ 907{,}822\\ \hline 21{,}491{,}394\end{array}$$

119.
$$\begin{array}{r} 3{,}421{,}019\\ 822{,}761\\ 1{,}003{,}721\\ +\ 9{,}678\\ \hline 5{,}257{,}179\end{array}$$

120.
$$\begin{array}{r} 4{,}905{,}620\\ -\ 458{,}318\\ \hline 4{,}447{,}302\end{array}$$

121.
$$\begin{array}{r} 953{,}400{,}415\\ -\ 56{,}341{,}902\\ \hline 897{,}058{,}513\end{array}$$

122.
$$\begin{array}{r} 82{,}025{,}160\\ -\ 79{,}118{,}705\\ \hline 2{,}906{,}455\end{array}$$

123.
$$\begin{array}{r} 103{,}718 \text{ mi}^2\\ -\ 54{,}310 \text{ mi}^2\\ \hline 49{,}408 \text{ mi}^2\end{array}$$

The difference in land area between Colorado and Wisconsin is $49{,}408 \text{ mi}^2$.

124.
$$\begin{array}{r} 41{,}217 \text{ mi}^2\\ -\ 24{,}078 \text{ mi}^2\\ \hline 17{,}139 \text{ mi}^2\end{array}$$

Tennessee has $17{,}139 \text{ mi}^2$ more than West Virginia.

125.
$$\begin{array}{r} {\scriptstyle 1\,0\,4\,5}\\ 41{,}217 \text{ mi}^2\\ +\ 54{,}310 \text{ mi}^2\\ \hline 96{,}572 \text{ mi}^2\end{array}$$

The combined land area of Rhode Island, Tennessee, and Wisconsin is $96{,}572 \text{ mi}^2$.

126.
$$\begin{array}{r} 1\,045 \text{ mi}^2\\ 41{,}217 \text{ mi}^2\\ 24{,}078 \text{ mi}^2\\ 54{,}310 \text{ mi}^2\\ +\ 103{,}718 \text{ mi}^2\\ \hline 224{,}368 \text{ mi}^2\end{array}$$

The combined land area of the five states is $224{,}368 \text{ mi}^2$.

Section 1.4 Rounding and Estimating

Section 1.4 Practice Exercises

1. rounding

2.
$$\begin{array}{r} {\scriptstyle 1} \\ 13 \\ 12 \\ +\ 5 \\ \hline 30 \end{array}$$
The perimeter is 30 ft.

3.
$$\begin{array}{r} 59 \\ -\ 33 \\ \hline 26 \end{array}$$

4.
$$\begin{array}{r} {\scriptstyle 0\,12\,10} \\ \not{1}\not{3}\not{0} \\ -\ 9\,8 \\ \hline 3\,2 \end{array}$$

5.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 4009 \\ +\ 998 \\ \hline 5007 \end{array}$$

6.
$$\begin{array}{r} 12{,}033 \\ +\ 23{,}441 \\ \hline 35{,}474 \end{array}$$

7. Ten-thousands

8. Hundreds

9. If the digit in the tens place is 0, 1, 2, 3, or 4, then change the tens and ones digits to 0. If the digit in the tens place is 5, 6, 7, 8, or 9, increase the digit in the hundreds place by 1 and change the tens and ones digits to 0.

10. If the digit in the ones place is 0, 1, 2, 3, or 4, then change the ones digits to 0. If the digit in the ones place is 5, 6, 7, 8, or 9, increase the digit in the tens place by 1 and change the ones digit to 0.

11. $342 \approx 340$

12. $834 \approx 830$

13. $725 \approx 730$

14. $445 \approx 450$

15. $9384 \approx 9400$

16. $8363 \approx 8400$

17. $8539 \approx 8500$

18. $9817 \approx 9800$

19. $34{,}992 \approx 35{,}000$

20. $76{,}831 \approx 77{,}000$

21. $2578 \approx 3000$

22. $3511 \approx 4000$

23. $9982 \approx 10{,}000$

24. $7974 \approx 8000$

25. $109{,}337 \approx 109{,}000$

26. $437{,}208 \approx 437{,}000$

27. $489{,}090 \approx 490{,}000$

28. $388{,}725 \approx 390{,}000$

29. $\$77{,}025{,}481 \approx \$77{,}000{,}000$

30. $\$33{,}050 \approx \$33{,}000$

31. $238{,}863 \text{ mi} \approx 239{,}000 \text{ mi}$

32. $492{,}000 \text{ m}^2 \approx 500{,}000 \text{ m}^2$

33.
$$\begin{array}{rcr} 57 & \rightarrow & 60 \\ 82 & \rightarrow & 80 \\ +\ 21 & \rightarrow & +\ 20 \\ \hline & & 160 \end{array}$$

34.
$$\begin{array}{rcr} 33 & \to & 30 \\ 78 & \to & 80 \\ +\ 41 & \to & +\ 40 \\ \hline & & 150 \end{array}$$

35.
$$\begin{array}{rcr} 639 & \to & 640 \\ -\ 422 & \to & -\ 420 \\ \hline & & 220 \end{array}$$

36.
$$\begin{array}{rcr} 851 & \to & 850 \\ -\ 399 & \to & -\ 400 \\ \hline & & 450 \end{array}$$

37.
$$\begin{array}{rcr} 892 & \to & 900 \\ +\ 129 & \to & +\ 100 \\ \hline & & 1000 \end{array}$$

38.
$$\begin{array}{rcr} 347 & \to & 300 \\ +\ 563 & \to & +\ 600 \\ \hline & & 900 \end{array}$$

39.
$$\begin{array}{rcr} 3412 & \to & 3400 \\ -\ 1252 & \to & -\ 1300 \\ \hline & & 2100 \end{array}$$

40.
$$\begin{array}{rcr} 9771 & \to & 9800 \\ -\ 4544 & \to & -\ 4500 \\ \hline & & 5300 \end{array}$$

41.
$$\begin{array}{rcr} & & {\scriptstyle 1} \\ 97,404,576 & \to & 97,000,000 \\ +\ 53,695,428 & \to & +\ 54,000,000 \\ \hline & & 151,000,000 \end{array}$$

$151,000,000 was brought in by Mars.

42.
$$\begin{array}{rcr} & & {\scriptstyle 1} \\ 81,296,784 & \to & 81,000,000 \\ 54,391,268 & \to & 54,000,000 \\ +\ 38,168,580 & \to & +\ 38,000,000 \\ \hline & & 173,000,000 \end{array}$$

$173,000,000 was brought in by Hershey.

43.
$$\begin{array}{rcr} 71,339,710 & \to & 71,000,000 \\ -\ 59,684,076 & \to & -\ 60,000,000 \\ \hline & & 11,000,000 \end{array}$$

Neil Diamond earned $11,000,000 more.

44.
$$\begin{array}{rcr} 63,640 & \to & 64,000 \\ -\ 43,130 & \to & -\ 43,000 \\ \hline & & 21,000 \end{array}$$

A teacher in California makes about $21,000 more than a teacher in Iowa.

45.
$$\begin{array}{rcr} & & {\scriptstyle 1} \\ \$3,316,897 & \to & \$3,300,000 \\ 3,272,028 & \to & 3,300,000 \\ +\ 3,360,289 & \to & +\ 3,400,000 \\ \hline & & \$10,000,000 \end{array}$$

46.
$$\begin{array}{rcr} \$3,470,295 & \to & \$3,500,000 \\ 3,173,050 & \to & 3,200,000 \\ +\ 1,970,380 & \to & +\ 2,000,000 \\ \hline & & \$8,700,000 \end{array}$$

47. **(a)** 2003; $3,470,295 → $3,500,000

(b) 2005; $1,970,380 → $2,000,000

48.
$$\begin{array}{r} \$3,500,000 \\ -\ 2,000,000 \\ \hline \$1,500,000 \end{array}$$

49. Massachusetts; 78,771 → 79,000 students

50. Vermont; 7456 → 7000 students

51.
$$\begin{array}{r} 79,000 \\ -\ 7\ 000 \\ \hline 72,000 \end{array}$$

The difference is 72,000 students.

52.
$$\begin{array}{rcr} & & {\scriptstyle 3} \\ & & 46,000 \\ 46,377 & \to & 12,000 \\ 11,726 & \to & 15,000 \\ 15,259 & \to & 79,000 \\ 78,771 & \to & 17,000 \\ 17,108 & \to & 13,000 \\ 13,137 & \to & +\ 7\ 000 \\ +\ 7,456 & \to & 189,000 \end{array}$$

The total is 189,000 students.

53.
$$\begin{array}{rcr} 3045 \text{ mm} & \to & 3000 \text{ mm} \\ 1892 \text{ mm} & \to & 2000 \text{ mm} \\ 3045 \text{ mm} & \to & 3000 \text{ mm} \\ +\ 1892 \text{ mm} & \to & +\ 2000 \text{ mm} \\ \hline & & 10,000 \text{ mm} \end{array}$$

54.
$$\begin{array}{rcr} 1851 \text{ cm} & \rightarrow & 2000 \text{ cm} \\ 1782 \text{ cm} & \rightarrow & 2000 \text{ cm} \\ 1851 \text{ cm} & \rightarrow & 2000 \text{ cm} \\ +\,1782 \text{ cm} & \rightarrow & +\,2000 \text{ cm} \\ \hline & & 8000 \text{ cm} \end{array}$$

55.
$$\begin{array}{rcr} & & {\scriptstyle 2} \\ 105 \text{ in.} & \rightarrow & 100 \text{ in.} \\ 57 \text{ in.} & \rightarrow & 60 \text{ in.} \\ 57 \text{ in.} & \rightarrow & 60 \text{ in.} \\ 105 \text{ in.} & \rightarrow & 100 \text{ in.} \\ 57 \text{ in.} & \rightarrow & 60 \text{ in.} \\ +\,57 \text{ in.} & \rightarrow & +\,60 \text{ in.} \\ \hline & & 440 \text{ in.} \end{array}$$

56.
$$\begin{array}{rcr} 182 \text{ ft} & \rightarrow & 200 \text{ ft} \\ 121 \text{ ft} & \rightarrow & 100 \text{ ft} \\ 182 \text{ ft} & \rightarrow & 200 \text{ ft} \\ 169 \text{ ft} & \rightarrow & 200 \text{ ft} \\ +\,169 \text{ ft} & \rightarrow & +\,200 \text{ ft} \\ \hline & & 900 \text{ ft} \end{array}$$

Section 1.5 Multiplication of Whole Numbers and Area

Section 1.5 Practice Exercises

1. **(a)** factors; product
(b) commutative
(c) associative; $a \cdot (b \cdot c)$
(d) 0; 0
(e) a; a
(f) distributive; $a \cdot b + a \cdot c$
(g) area
(h) $l \cdot w$

2.
$$\begin{array}{rcr} 5{,}981 & \rightarrow & 6{,}000 \\ +\,7{,}206 & \rightarrow & +\,7{,}000 \\ \hline & & 13{,}000 \end{array}$$

3.
$$\begin{array}{rcr} & & {\scriptstyle 1} \\ 869{,}240 & \rightarrow & 870{,}000 \\ 34{,}921 & \rightarrow & 30{,}000 \\ +\,108{,}332 & \rightarrow & +\,110{,}000 \\ \hline & & 1{,}010{,}000 \end{array}$$

4.
$$\begin{array}{rcr} 907{,}801 & \rightarrow & 900{,}000 \\ -\,413{,}560 & \rightarrow & -\,400{,}000 \\ \hline & & 500{,}000 \end{array}$$

5.
$$\begin{array}{rcr} 8821 & \rightarrow & 8800 \\ -\,3401 & \rightarrow & -\,3400 \\ \hline & & 5400 \end{array}$$

6.

$\times$	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

7. $5 + 5 + 5 + 5 + 5 + 5 = 6 \times 5 = 30$

8. $2+2+2+2+2+2+2+2+2 = 9\times 2$
$= 18$

9. $9 + 9 + 9 = 3 \times 9 = 27$

10. $7 + 7 + 7 + 7 = 4 \times 7 = 28$

11. $13 \times 42 = 546$
factors: 13, 42; product: 546

12. $26 \times 9 = 234$
factors: 26, 9; product: 234

13. $3 \cdot 5 \cdot 2 = 30$
factors: 3, 5, 2; product: 30

14. $4 \cdot 3 \cdot 8 = 96$
factors: 4, 3, 8; product: 96

15. For example: 5×12; $5 \cdot 12$; $5(12)$

16. For example: 23×14; $23 \cdot 14$; $23(14)$

17. d

18. a

19. e

20. b

21. c

22. a

23. $14 \bullet 8 = 8 \bullet 14$

24. $3 \bullet 9 = 9 \bullet 3$

25. $6 \bullet (2 \bullet 10) = (6 \bullet 2) \bullet 10$

26. $(4 \bullet 15) \bullet 5 = 4 \bullet (15 \bullet 5)$

27. $5(7 + 4) = (5 \bullet 7) + (5 \bullet 4)$

28. $3(2 + 6) = (3 \bullet 2) + (3 \bullet 6)$

29.
$$\begin{array}{r} 24 \\ \times\ 6 \\ \hline 24 \\ +\ 120 \\ \hline 144 \end{array}$$
Multiply 6×4.
Multiply 6×20.
Add.

30.
$$\begin{array}{r} 18 \\ \times\ 5 \\ \hline 40 \\ +\ 50 \\ \hline 90 \end{array}$$
Multiply 5×8.
Multiply 5×10.
Add.

31.
$$\begin{array}{r} 26 \\ \times\ 2 \\ \hline 12 \\ +\ 40 \\ \hline 52 \end{array}$$
Multiply 2×6.
Multiply 2×20.
Add.

32.
$$\begin{array}{r} 71 \\ \times\ 3 \\ \hline 3 \\ +\ 210 \\ \hline 213 \end{array}$$
Multiply 3×1.
Multiply 3×70.
Add.

33.
$$\begin{array}{r} 131 \\ \times\ 5 \\ \hline 5 \\ 150 \\ +\ 500 \\ \hline 655 \end{array}$$
Multiply 5×1.
Multiply 5×30.
Multiply 5×100.
Add.

34.
$$\begin{array}{r} 725 \\ \times\ 3 \\ \hline 15 \\ 60 \\ +\ 2100 \\ \hline 2175 \end{array}$$
Multiply 3×0.
Multiply 3×20.
Multiply 3×700.
Add.

35.
$$\begin{array}{r} 344 \\ \times\ 4 \\ \hline 16 \\ 160 \\ +\ 1200 \\ \hline 1376 \end{array}$$
Multiply 4×4.
Multiply 4×40.
Multiply 4×300.
Add.

36.
$$\begin{array}{r} 105 \\ \times\ 9 \\ \hline 45 \\ 00 \\ +\ 900 \\ \hline 945 \end{array}$$
Multiply 9×5.
Multiply 9×0.
Multiply 9×100.
Add.

37.
$$\begin{array}{r} {\scriptstyle 3} \\ 1410 \\ \times\ \ \ 8 \\ \hline 11,280 \end{array}$$

38.
$$\begin{array}{r} {\scriptstyle 3} \\ 2016 \\ \times\quad 6 \\ \hline 12{,}096 \end{array}$$

39.
$$\begin{array}{r} {\scriptstyle 2\ 1} \\ 3312 \\ \times\quad 7 \\ \hline 23{,}184 \end{array}$$

40.
$$\begin{array}{r} {\scriptstyle 4} \\ 4801 \\ \times\quad 5 \\ \hline 24{,}005 \end{array}$$

41.
$$\begin{array}{r} {\scriptstyle 1\quad 1\,3} \\ 42{,}014 \\ \times\quad 9 \\ \hline 378{,}126 \end{array}$$

42.
$$\begin{array}{r} {\scriptstyle 4} \\ 51{,}006 \\ \times\quad 8 \\ \hline 408{,}048 \end{array}$$

43.
$$\begin{array}{r} 32 \\ \times\ 14 \\ \hline 128 \\ +\,320 \\ \hline 448 \end{array}$$

44.
$$\begin{array}{r} 41 \\ \times\ 21 \\ \hline 41 \\ +\,820 \\ \hline 861 \end{array}$$

45.
$$\begin{array}{r} {\scriptstyle 1} \\ {\scriptstyle 3} \\ 68 \\ \times 24 \\ \hline {\scriptstyle 1} \\ 272 \\ +\,1360 \\ \hline 1632 \end{array}$$

46.
$$\begin{array}{r} {\scriptstyle 2} \\ 55 \\ \times 41 \\ \hline 55 \\ +\,2200 \\ \hline 2255 \end{array}$$

47.
$$\begin{array}{r} 72 \\ \times\ 12 \\ \hline 144 \\ +\,720 \\ \hline 864 \end{array}$$

48.
$$\begin{array}{r} {\scriptstyle 1} \\ {\scriptstyle 1} \\ 13 \\ \times\ 46 \\ \hline 78 \\ +\,520 \\ \hline 598 \end{array}$$

49.
$$\begin{array}{r} {\scriptstyle 3\,2} \\ 143 \\ \times\ 17 \\ \hline 1001 \\ +\,1430 \\ \hline 2431 \end{array}$$

50.
$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 722 \\ \times\quad 28 \\ \hline {\scriptstyle 1\ 1\ 1} \\ 5\,776 \\ +\,14\,440 \\ \hline 20{,}216 \end{array}$$

51.
$$\begin{array}{r} {\scriptstyle 4\,8} \\ 349 \\ \times\ 19 \\ \hline {\scriptstyle 1} \\ 3141 \\ +\,3490 \\ \hline 6631 \end{array}$$

52.
$$\begin{array}{r} 512 \\ \times\quad 31 \\ \hline 512 \\ +\,15\,360 \\ \hline 15{,}872 \end{array}$$

53.
$$\begin{array}{r} {\scriptstyle 1\ \ \ } \\ {\scriptstyle 3\ \ \ } \\ 151 \\ \times\ 127 \\ \hline 1\,057 \\ 3\,020 \\ +\,15\,100 \\ \hline 19{,}177 \end{array}$$

54.
$$\begin{array}{r} {\scriptstyle \ \ 1\ \ } \\ {\scriptstyle 1\ \ } \\ 703 \\ \times\ 146 \\ \hline {\scriptstyle 1}\,4\,218 \\ 28\,120 \\ +\,70\,300 \\ \hline 102{,}638 \end{array}$$

55.
$$\begin{array}{r} {\scriptstyle 1\,1\ } \\ 222 \\ \times 841 \\ \hline {\scriptstyle 1\ \ } \\ {\scriptstyle 1\,1}\ 222 \\ 8\,880 \\ +\,177\,600 \\ \hline 186{,}702 \end{array}$$

56.
$$\begin{array}{r} {\scriptstyle 4\,3\ } \\ {\scriptstyle 5\,4\ } \\ 387 \\ \times\ 506 \\ \hline 2\,322 \\ 0\,000 \\ +\,193\,500 \\ \hline 195{,}822 \end{array}$$

57.
$$\begin{array}{r} {\scriptstyle 3\,1\,1\ } \\ {\scriptstyle 2\,1\ } \\ 3532 \\ \times\ 6014 \\ \hline {\scriptstyle 1\,1\ } \\ 14\,128 \\ 35\,320 \\ 000\,000 \\ +\,21\,192\,000 \\ \hline 21{,}241{,}448 \end{array}$$

58.
$$\begin{array}{r} {\scriptstyle 2\ \ \ } \\ {\scriptstyle 7\ \ \ } \\ 2810 \\ \times\ 1039 \\ \hline {\scriptstyle 1}\,25\,290 \\ 84\,300 \\ 000\,000 \\ +\,2\,810\,000 \\ \hline 2{,}919{,}590 \end{array}$$

59.
$$\begin{array}{r} {\scriptstyle 1\,1\,1\ } \\ {\scriptstyle 1\,1\ } \\ 4122 \\ \times\ 982 \\ \hline 8\,244 \\ 329\,760 \\ +\,3\,709\,800 \\ \hline 4{,}047{,}804 \end{array}$$

60.
$$\begin{array}{r} {\scriptstyle 1\,3\ } \\ {\scriptstyle 1\ \ } \\ {\scriptstyle 2\,4\ } \\ 7026 \\ \times\ 528 \\ \hline 56\,208 \\ 140\,520 \\ +\,3513\,000 \\ \hline 3{,}709{,}728 \end{array}$$

61. $600 \rightarrow 6 \mid 00$, $\times 40 \rightarrow \times 4 \mid 0$, $24 \mid 000 = 24{,}000$

62. $900 \rightarrow 9 \mid 00$, $\times 50 \rightarrow \times 5 \mid 0$, $45 \mid 000 = 45{,}000$

63. $3000 \rightarrow 3 \mid 000$, $\times 700 \rightarrow \times 7 \mid 00$, $21 \mid 00000 = 2{,}100{,}000$

64. $4000 \rightarrow 4 \mid 000$, $\times 400 \rightarrow \times 4 \mid 00$, $16 \mid 00000 = 1{,}600{,}000$

65. $8000 \rightarrow 8 \mid 000$, $\times 9000 \rightarrow \times 9 \mid 000$, $72 \mid 000000 = 72{,}000{,}000$

66. $1000 \rightarrow 1 \mid 000$
$\times 2000 \rightarrow \times 2 \mid 000$
$2 \mid 000000 = 2{,}000{,}000$

67. $90{,}000 \rightarrow 9 \mid 0000$
$\times 400 \rightarrow \times 4 \mid 00$
$36 \mid 000000 = 36{,}000{,}000$

68. $50{,}000 \rightarrow 5 \mid 0000$
$\times 6{,}000 \rightarrow \times 6 \mid 000$
$30 \mid 0000000 = 300{,}000{,}000$

69. $11{,}784 \rightarrow 12{,}000$
$\times 5\ 201 \rightarrow \times 5{,}000$
$60{,}000{,}000$

70. $45{,}046 \rightarrow 45{,}000$
$\times 7\ 812 \rightarrow \times 8\ 000$
$360{,}000{,}000$

71. $82{,}941 \rightarrow 80{,}000$
$\times 29{,}740 \rightarrow \times 30{,}000$
$2{,}400{,}000{,}000$

72. $630{,}229 \rightarrow 630{,}000$
$\times 71{,}907 \rightarrow \times 70{,}000$
$44{,}100{,}000{,}000$

73. $\$189 \rightarrow \$200$
$\times 5 \quad \times 5$
$\$1000$

74. $\$129 \rightarrow \$130$
$\times 28 \rightarrow \times 30$
$\$3{,}900$

75. $10{,}256 \rightarrow 1 \mid 0000$
$\times \$137 \rightarrow \times 137 \mid$
$137 \mid 0000 =$

$\$1{,}370{,}000$

76. $48 \rightarrow 5 \mid 0$
$\times 12 \rightarrow \times 1 \mid 0$
$5 \mid 00$

500
$\times 7$
$\$3500$ per week

77. 1000
$\times 4$
4000
4000 minutes can be stored.

78. 700
$\times 15$
3500
$+ 7000$
$10{,}500$
15 CD's hold 10,500 MB of data

79. $^{1}_{3}$
$\$45$
$\times 37$
315
$+ 1\,350$
$\$1{,}665$

80. ^{1}
55
$\times 20$
00
$+ 1\,100$
1100
It can go 1100 miles on 20 gallons of gas.

81. 12
$\times 12$
24
$+ 120$
144
A case contains 144 fl oz.

82. ^{1}
16
$\times 3$
48
The class meets for 48 hours.

83. ^{2}
115
$\times 5$
575

$^{3\,2}$
$57\,5 \mid$
$\times \quad 5 \mid 00$
$287{,}5 \quad 00$

287,500 sheets of paper are delivered.

84. 14
$\times 2$
28

^{4}
28
$\times 6$
168

She gets 168 g of protein.

85.
$$\begin{array}{r} 31 \\ \times\ 12 \\ \hline 62 \\ +310 \\ \hline 372 \end{array}$$
He can travel 372 miles.

86.
$$\begin{array}{r} 23 \\ \times\ 32 \\ \hline {\scriptstyle 1} \\ 46 \\ +690 \\ \hline 736 \end{array}$$
Sherica schedules 736 hr.

87. $A = l \times w$
$A = (23 \text{ ft}) \times (12 \text{ ft})$
$$\begin{array}{r} 23 \\ \times\ 12 \\ \hline 46 \\ +230 \\ \hline 276 \end{array}$$
The area is 276 ft^2.

88. $A = l \times w$
$A = (31 \text{ m}) \times (2 \text{ m}) = 62 \text{ m}^2$

89. $A = l \times w$
$A = (73 \text{ cm}) \times (73 \text{ cm})$
$$\begin{array}{r} {\scriptstyle 2} \\ 73 \\ \times\ 73 \\ \hline 219 \\ +5110 \\ \hline 5329 \end{array}$$
The area is 5329 cm^2.

90. $A = l \times w$
$A = (41 \text{ yd}) \times (41 \text{ yd})$
$$\begin{array}{r} 41 \\ \times\ 41 \\ \hline 41 \\ +1640 \\ \hline 1681 \end{array}$$
The area is 1681 yd^2.

91. $A = l \times w$
$A = (390 \text{ mi}) \times (270 \text{ mi})$
$$\begin{array}{r} {\scriptstyle 1} \\ 6 \\ 390 \\ \times\ 270 \\ \hline 000 \\ 27300 \\ +78000 \\ \hline 105{,}300 \end{array}$$
The area is $105{,}300 \text{ mi}^2$.

92. $A = l \times w$
$A = (130 \text{ yd}) \times (150 \text{ yd})$
$$\begin{array}{r} {\scriptstyle 1} \\ 130 \\ \times\ 150 \\ \hline 000 \\ 6500 \\ +13000 \\ \hline 19{,}500 \end{array}$$
The area is $19{,}500 \text{ yd}^2$.

93. (a) $A = l \times w$
$A = (40 \text{ in.}) \times (60 \text{ in.})$
$$\begin{array}{r} 40 \\ \times\ 60 \\ \hline 00 \\ +2400 \\ \hline 2400 \end{array} \text{ in.}^2$$

(b)
$$\begin{array}{r} {\scriptstyle 1} \\ 14 \\ \times 3 \\ \hline 42 \end{array}$$
There are 42 windows.

(c)
$$\begin{array}{r} {\scriptstyle 1} \\ 2400 \\ \times\ 42 \\ \hline 4\,800 \\ +96\,000 \\ \hline 100{,}800 \end{array}$$
The total area is $100{,}800 \text{ in.}^2$

94. $A = l \times w$

$A = (50 \text{ ft.}) \times (30 \text{ ft.})$

$$\begin{array}{r} {\scriptstyle 8} \\ 50 \\ \times\ 30 \\ \hline 000 \\ +\ 1500 \\ \hline 1500 \end{array}$$

The area is 1500 ft^2.

95. $A = l \times w$

$A = (8 \text{ ft}) \times (16 \text{ ft})$

$$\begin{array}{r} {\scriptstyle 4} \\ 16 \\ \times\ 8 \\ \hline 128 \end{array}$$

The area is 128 ft^2.

96. $A = l \times w$

$A = (10 \text{ yd}) \times (15 \text{ yd}) = 150 \text{ yd}^2$.

Section 1.6 Division of Whole Numbers

Section 1.6 Practice Exercises

1. **(a)** dividend; divisor; quotient
(b) 1
(c) 5
(d) 0
(e) undefined
(f) remainder

2. **(a)** $5 + 2$
(b) $5 \bullet 2$
(c) $(3 + 10) + 2$
(d) $(3 \bullet 10) \bullet 2$

3.
$$\begin{array}{r} {\scriptstyle 1} \\ {\scriptstyle 2} \\ 103 \\ \times\ 48 \\ \hline 824 \\ +\ 4120 \\ \hline 4944 \end{array}$$

4.
$$\begin{array}{r} {\scriptstyle 5\,17} \\ \cancel{6}\cancel{7}8 \\ -\ 83 \\ \hline 595 \end{array}$$

5.
$$\begin{array}{r} {\scriptstyle 1} \\ 1008 \\ +\ 245 \\ \hline 1253 \end{array}$$

6.
$$\begin{array}{r} 220 \\ \times\ 14 \\ \hline {\scriptstyle 1}\,880 \\ 2200 \\ \hline 3080 \end{array}$$

7.
$$\begin{array}{r} {\scriptstyle 1\,2} \\ 5230 \\ \times\ 127 \\ \hline {\scriptstyle 1\,1} \\ 36\,610 \\ 104\,600 \\ +\ 523\,000 \\ \hline 664,210 \end{array}$$

8.
$$\begin{array}{r} {\scriptstyle 1\,1} \\ {\scriptstyle 4\,4} \\ 789 \\ \times\ 25 \\ \hline {\scriptstyle 1\,1} \\ 3\,945 \\ +\ 15\,780 \\ \hline 19,725 \end{array}$$

9.
$$\begin{array}{r} {\scriptstyle 3\,1\,8\,8\,10} \\ \cancel{4}\,\cancel{8}\cancel{9}\,\cancel{0} \\ -\ 3\,98\ \ 8 \\ \hline 90\ 2 \end{array}$$

10.
$$\begin{array}{r} {\scriptstyle 1} \\ 38\,002 \\ +\ 3\,902 \\ \hline 41,904 \end{array}$$

11. $72 \div 8 = 9$ because $9 \times 8 = 72$.
dividend: 72
divisor: 8
quotient: 9

12. $32 \div 4 = 8$ because $8 \times 4 = 32$.
dividend: 32
divisor: 4
quotient: 8

13. $8\overline{)64} = 8$ because $8 \times 8 = 64$.
dividend: 64
divisor: 8
quotient: 8

14. $5\overline{)35} = 7$ because $7 \times 5 = 35$.
dividend: 35
divisor: 5
quotient: 7

15. $\frac{45}{9} = 5$ because $5 \times 9 = 45$.
dividend: 45
divisor: 9
quotient: 5

16. $\frac{20}{5} = 4$ because $4 \times 5 = 20$.
dividend: 20
divisor: 5
quotient: 4

17. You cannot divide a number by zero (the quotient is undefined). If you divide zero by a number (other than zero), the quotient is always zero.

18. A number divided or multiplied by 1 remains unchanged.

19. $15 \div 1 = 15$ because $15 \times 1 = 15$.

20. $21\overline{)21} = 1$ because $1 \times 21 = 21$.

21. $0 \div 10 = 0$ because $0 \times 10 = 0$.

22. $\frac{0}{3} = 0$ because $0 \times 3 = 0$.

23. $0\overline{)9}$ is undefined because division by zero is undefined.

24. $4 \div 0$ is undefined because division by zero is undefined.

25. $\frac{20}{20} = 1$ because $1 \times 20 = 20$.

26. $1\overline{)9} = 9$ because $9 \times 1 = 9$.

27. $\frac{16}{0}$ is undefined because division by zero is undefined.

28. $\frac{5}{1} = 5$ because $5 \times 1 = 5$.

29. $8\overline{)0} = 0$ because $0 \times 8 = 0$.

30. $13 \div 13 = 1$ because $13 \times 1 = 13$.

31. $6 \div 3 = 2$ because $2 \times 3 = 6$.
$3 \div 6 \neq 2$ because $2 \times 6 \neq 3$.

32. $(36 \div 12) \div 3 = 3 \div 3 = 1$ but
$36 \div (12 \div 3) = 36 \div 4 = 9$.

33. To check a division problem without a remainder you should multiply the quotient and the divisor to get the dividend.

34. To check $0 \div 5 = 0$ we multiply $0 \times 5 = 0$ which is true. If we try to check $5 \div 0 = ?$ we need to find a number to multiply by 0 to get 5. Since no such number exists, the answer to $5 \div 0$ is undefined.

35.
$$\begin{array}{r} 13 \\ 6\overline{)\,78} \\ \underline{-6} \\ 18 \\ \underline{-18} \\ 0 \end{array}$$

$$\begin{array}{r} {\scriptstyle 1} \\ 13 \\ \times\, 6 \\ \hline 78 \end{array} \checkmark$$

36.
$$\begin{array}{r} 52 \\ 7\overline{)\,364} \\ \underline{-35} \\ 14 \\ \underline{-14} \\ 0 \end{array}$$

$$\begin{array}{r} {\scriptstyle 1} \\ 52 \\ \times\, 7 \\ \hline 364 \end{array} \checkmark$$

37.
$$\begin{array}{r} 41 \\ 5\overline{)\,205} \\ \underline{-20} \\ 05 \\ \underline{-5} \\ 0 \end{array}$$
$$\begin{array}{r} 41 \\ \times\ 5 \\ \hline 205 \end{array}\ \checkmark$$

38.
$$\begin{array}{r} 19 \\ 8\overline{)152} \\ \underline{-8} \\ 72 \\ \underline{-72} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 7} \\ 19 \\ \times\ 8 \\ \hline 152 \end{array}\ \checkmark$$

39.
$$\begin{array}{r} 486 \\ 2\overline{)\,972} \\ \underline{-8} \\ 17 \\ \underline{-16} \\ 12 \\ \underline{-12} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 486 \\ \times\ 2 \\ \hline 972 \end{array}\ \checkmark$$

40.
$$\begin{array}{r} 97 \\ 6\overline{)\,582} \\ \underline{-54} \\ 42 \\ \underline{-42} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 4} \\ 97 \\ \times\ 6 \\ \hline 582 \end{array}\ \checkmark$$

41.
$$\begin{array}{r} 409 \\ 3\overline{)\,1227} \\ \underline{-12} \\ 02 \\ \underline{-0} \\ 27 \\ \underline{-27} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 2} \\ 409 \\ \times\ \ 3 \\ \hline 1227 \end{array}\ \checkmark$$

42.
$$\begin{array}{r} 59 \\ 4\overline{)\,236} \\ \underline{-20} \\ 36 \\ \underline{-36} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 3} \\ 59 \\ \times\ 4 \\ \hline 236 \end{array}\ \checkmark$$

43.
$$\begin{array}{r} 203 \\ 5\overline{)\,1015} \\ \underline{-10} \\ 01 \\ \underline{-0} \\ 15 \\ \underline{-15} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 1} \\ 203 \\ \times\ \ 5 \\ \hline 1015 \end{array}\ \checkmark$$

44.
$$\begin{array}{r} 407 \\ 5\overline{)\,2035} \\ \underline{-20} \\ 03 \\ \underline{-0} \\ 35 \\ \underline{-35} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 3} \\ 407 \\ \times\ \ 5 \\ \hline 2035 \end{array}\ \checkmark$$

45.
$$\begin{array}{r} 822 \\ 6\overline{)\,4932} \\ \underline{-48} \\ 13 \\ \underline{-12} \\ 12 \\ \underline{-12} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 1\,1} \\ 822 \\ \times\ \ 6 \\ \hline 4932 \end{array}\ \checkmark$$

46.
$$\begin{array}{r} 517 \\ 7\overline{)\,3619} \\ \underline{-35} \\ 11 \\ \underline{-7} \\ 49 \\ \underline{-49} \\ 0 \end{array}$$
$$\begin{array}{r} {\scriptstyle 1\,4} \\ 517 \\ \times\ \ 7 \\ \hline 3619 \end{array}\ \checkmark$$

47.
$$\begin{array}{r} {\scriptstyle 2} \\ 56 \\ \times\ 4 \\ \hline 224 \end{array}$$ correct

48.
$$\begin{array}{r} {\scriptstyle 1} \\ 82 \\ \times\ 7 \\ \hline 574 \end{array}$$ correct

49.
$$\begin{array}{r} {\scriptstyle 1} \\ 253 \\ \times\ 3 \\ \hline 759 \end{array}$$
incorrect

$$3\overline{)\,761}\quad 253\text{ R }2$$
$$\begin{array}{r} -6 \\ \hline 16 \\ -15 \\ \hline 11 \\ -9 \\ \hline 2 \end{array}$$

50.
$$\begin{array}{r} {\scriptstyle 1} \\ 120 \\ \times\ 5 \\ \hline 600 \end{array}$$
incorrect

$$5\overline{)\,604}\quad 120\text{ R }4$$
$$\begin{array}{r} -5 \\ \hline 10 \\ -10 \\ \hline 04 \\ -0 \\ \hline 4 \end{array}$$

51.
$$\begin{array}{r} {\scriptstyle 1\,2} \\ 113 \\ \times\ 9 \\ \hline {\scriptstyle 1} \\ 1017 \\ +\ 4 \\ \hline 1021 \end{array}$$
Add the remainder.
Correct

52.
$$\begin{array}{r} {\scriptstyle 1\,4} \\ 218 \\ \times\ 6 \\ \hline 1308 \\ +\ 3 \\ \hline 1311 \end{array}$$
Add the remainder.
Correct

53.
$$\begin{array}{r} {\scriptstyle 4} \\ 25 \\ \times\ 8 \\ \hline 200 \\ +\ 6 \\ \hline 206 \end{array}$$
incorrect

$$8\overline{)\,203}\quad 25\text{ R }3$$
$$\begin{array}{r} -16 \\ \hline 43 \\ -40 \\ \hline 3 \end{array}$$

54.
$$\begin{array}{r} {\scriptstyle 1\,4} \\ 117 \\ \times\ 7 \\ \hline 819 \\ +\ 5 \\ \hline 824 \end{array}$$
incorrect

$$7\overline{)\,821}\quad 117\text{ R }2$$
$$\begin{array}{r} -7 \\ \hline 12 \\ -7 \\ \hline 51 \\ -49 \\ \hline 2 \end{array}$$

55.
$$8\overline{)\,61}\quad 7\text{ R }5$$
$$\begin{array}{r} -56 \\ \hline 5 \end{array}$$
$7 \times 8 + 5 = 56 + 5$
$= 61$ ✓

56.
$$3\overline{)\,89}\quad 29\text{ R }2$$
$$\begin{array}{r} -6 \\ \hline 29 \\ -27 \\ \hline 2 \end{array}$$
$29 \times 3 + 2 = 87 + 2$
$= 89$ ✓

57.
$$9\overline{)\,92}\quad 10\text{ R }2$$
$$\begin{array}{r} -9 \\ \hline 02 \end{array}$$
$10 \times 9 + 2 = 90 + 2$
$= 92$ ✓

58.
$$5\overline{)\,74}\quad 14\text{ R }4$$
$$\begin{array}{r} -5 \\ \hline 24 \\ -20 \\ \hline 4 \end{array}$$
$14 \times 5 + 4 = 70 + 4$
$= 74$ ✓

59.
$$2\overline{)\,55}\quad 27\text{ R }1$$
$$\begin{array}{r} -4 \\ \hline 15 \\ -14 \\ \hline 1 \end{array}$$
$27 \times 2 + 1 = 54 + 1$
$= 55$ ✓

60.
$$3\overline{)\,49}\quad 16\text{ R }1$$
$$\begin{array}{r} -3 \\ \hline 19 \\ -18 \\ \hline 1 \end{array}$$
$16 \times 3 + 1 = 48 + 1$
$= 49$ ✓

61.
$$3\overline{)\,593}\quad 197\text{ R }2$$
$$\begin{array}{r} -3 \\ \hline 29 \\ -27 \\ \hline 23 \\ -21 \\ \hline 2 \end{array}$$
$197 \times 3 + 2 = 591 + 2$
$= 593$ ✓

62.
$$\begin{array}{r} 200 \text{ R } 1 \\ 4\overline{)\,801} \\ \underline{-8} \\ 00 \\ \underline{-00} \\ 01 \\ \underline{-00} \\ 1 \end{array}$$
$200 \times 4 + 1 = 800 + 1$
$= 801$ ✓

63.
$$\begin{array}{r} 42 \text{ R } 4 \\ 9\overline{)\,382} \\ \underline{-36} \\ 22 \\ \underline{-18} \\ 4 \end{array}$$
$42 \times 9 + 4 = 378 + 4$
$= 382$ ✓

64.
$$\begin{array}{r} 53 \text{ R } 4 \\ 8\overline{)\,428} \\ \underline{-40} \\ 28 \\ \underline{-24} \\ 4 \end{array}$$
$53 \times 8 + 4 = 424 + 4$
$= 428$ ✓

65.
$$\begin{array}{r} 1557 \text{ R } 1 \\ 2\overline{)\,3115} \\ \underline{-2} \\ 11 \\ \underline{-10} \\ 11 \\ \underline{-10} \\ 15 \\ \underline{-14} \\ 1 \end{array}$$
$$\begin{array}{r} {\scriptstyle 111} \\ 1557 \\ \times\ \ 2 \\ \hline 3114 \\ +\ \ 1 \\ \hline 3115 \end{array}$$ ✓

66.
$$\begin{array}{r} 785 \text{ R } 5 \\ 6\overline{)\,4715} \\ \underline{-42} \\ 51 \\ \underline{-48} \\ 35 \\ \underline{-30} \\ 5 \end{array}$$
$$\begin{array}{r} {\scriptstyle 53} \\ 785 \\ \times\ \ 6 \\ \hline 4710 \\ +\ \ 5 \\ \hline 4715 \end{array}$$ ✓

67.
$$\begin{array}{r} 751 \text{ R } 6 \\ 8\overline{)\,6014} \\ \underline{-56} \\ 41 \\ \underline{-40} \\ 14 \\ \underline{-8} \\ 6 \end{array}$$
$$\begin{array}{r} {\scriptstyle 4} \\ 751 \\ \times\ \ 8 \\ \hline 6008 \\ +\ \ 6 \\ \hline 6014 \end{array}$$ ✓

68.
$$\begin{array}{r} 1287 \text{ R } 4 \\ 7\overline{)\,9013} \\ \underline{-7} \\ 20 \\ \underline{-14} \\ 61 \\ \underline{-56} \\ 53 \\ \underline{-49} \\ 4 \end{array}$$
$$\begin{array}{r} {\scriptstyle 264} \\ 1287 \\ \times\ \ 7 \\ \hline 9009 \\ +\ \ 4 \\ \hline 9013 \end{array}$$ ✓

69.
$$\begin{array}{r} 835 \text{ R } 2 \\ 6\overline{)\,5012} \\ \underline{-48} \\ 21 \\ \underline{-18} \\ 32 \\ \underline{-30} \\ 2 \end{array}$$
$$\begin{array}{r} {\scriptstyle 23} \\ 835 \\ \times\ \ 6 \\ \hline 5010 \\ +\ \ 2 \\ \hline 5012 \end{array}$$ ✓

70.
$$\begin{array}{r} 550 \text{ R } 1 \\ 2\overline{)\,1101} \\ \underline{-10} \\ 10 \\ \underline{-10} \\ 01 \\ \underline{00} \\ 1 \end{array}$$
$$\begin{array}{r} {\scriptstyle 1} \\ 550 \\ \times\ \ 2 \\ \hline 1100 \\ +\ \ 1 \\ \hline 1101 \end{array}$$ ✓

71.
$$\begin{array}{r} 479 \text{ R } 9 \\ 19\overline{)\,9110} \\ \underline{-76} \\ 151 \\ \underline{-133} \\ 180 \\ \underline{-171} \\ 9 \end{array}$$

72.
$$\begin{array}{r} 269 \text{ R } 8 \\ 13\overline{)\,3505} \\ \underline{-26} \\ 90 \\ \underline{-78} \\ 125 \\ \underline{-117} \\ 8 \end{array}$$

73.
$$\begin{array}{r} 43 \text{ R } 19 \\ 24\overline{)1051} \\ \underline{-96} \\ 91 \\ \underline{-72} \\ 19 \end{array}$$

74.
$$\begin{array}{r} 197 \text{ R } 27 \\ 41\overline{)\,8104} \\ \underline{-41} \\ 400 \\ \underline{-369} \\ 314 \\ \underline{-287} \\ 27 \end{array}$$

75.
$$\begin{array}{r} 308 \\ 26\overline{)\,8008} \\ \underline{-78} \\ 20 \\ \underline{-0} \\ 208 \\ \underline{-208} \\ 0 \end{array}$$

76.
$$\begin{array}{r} 612 \\ 15\overline{)\,9180} \\ \underline{-90} \\ 18 \\ \underline{-15} \\ 30 \\ \underline{-30} \\ 0 \end{array}$$

77.
$$\begin{array}{r} 1259 \text{ R } 26 \\ 54\overline{)\,68012} \\ \underline{-54} \\ 140 \\ \underline{-108} \\ 321 \\ \underline{-270} \\ 512 \\ \underline{-486} \\ 26 \end{array}$$

78.
$$\begin{array}{r} 2628 \text{ R } 33 \\ 35\overline{)\,92{,}013} \\ \underline{-70} \\ 220 \\ \underline{-210} \\ 101 \\ \underline{-70} \\ 313 \\ \underline{-280} \\ 33 \end{array}$$

79.
$$\begin{array}{r} 22 \\ 75\overline{)\,1650} \\ \underline{-150} \\ 150 \\ \underline{-150} \\ 0 \end{array}$$

80.
$$\begin{array}{r} 41 \\ 89\overline{)\,3649} \\ \underline{-356} \\ 89 \\ \underline{-89} \\ 0 \end{array}$$

81.
$$\begin{array}{r} 35 \text{ R } 1 \\ 520\overline{)\,18{,}201} \\ \underline{-1560} \\ 2601 \\ \underline{-2600} \\ 1 \end{array}$$

82.
$$\begin{array}{r} 21 \text{ R } 20 \\ 298\overline{)\,6278} \\ \underline{-596} \\ 318 \\ \underline{-298} \\ 20 \end{array}$$

83.
$$\begin{array}{r} 229 \text{ R } 96 \\ 304\overline{)\ 69712} \\ \underline{-608} \\ 891 \\ \underline{-608} \\ 2832 \\ \underline{-2736} \\ 96 \end{array}$$

84.
$$\begin{array}{r} 231 \text{ R } 56 \\ 221\overline{)\ 51107} \\ \underline{-442} \\ 690 \\ \underline{-663} \\ 277 \\ \underline{-221} \\ 56 \end{array}$$

85.
$$\begin{array}{r} 302 \\ 114\overline{)\ 34428} \\ \underline{-342} \\ 22 \\ \underline{-00} \\ 228 \\ \underline{-228} \\ 0 \end{array}$$

86.
$$\begin{array}{r} 209 \\ 421\overline{)\ 87989} \\ \underline{-842} \\ 378 \\ \underline{-000} \\ 3789 \\ \underline{-3789} \\ 0 \end{array}$$

87. $497 \div 71 = 7$

$$\begin{array}{r} 7 \\ 71\overline{)\ 497} \\ \underline{-497} \\ 0 \end{array}$$

88. $1890 \div 45 = 42$

$$\begin{array}{r} 42 \\ 45\overline{)\ 1890} \\ \underline{-180} \\ 90 \\ \underline{-90} \\ 0 \end{array}$$

89. $877 \div 14 = 62 \text{ R } 9$

$$\begin{array}{r} 62 \text{ R } 9 \\ 14\overline{)\ 877} \\ \underline{-84} \\ 37 \\ \underline{-28} \\ 9 \end{array}$$

90. $722 \div 53 = 13 \text{ R } 33$

$$\begin{array}{r} 13 \\ 53\overline{)\ 722} \\ \underline{-53} \\ 192 \\ \underline{-159} \\ 33 \end{array}$$

91. $42 \div 6 = 7$

92. $108 \div 9 = 12$

$$\begin{array}{r} 12 \\ 9\overline{)108} \\ \underline{-9} \\ 18 \\ \underline{-18} \\ 0 \end{array}$$

93.
$$\begin{array}{r} 14 \text{ classrooms} \\ 28\overline{)\ 392} \\ \underline{-28} \\ 112 \\ \underline{-112} \\ 0 \end{array}$$

94.
$$\begin{array}{r} 15 \text{ tables} \\ 8\overline{)120} \\ \underline{-8} \\ 40 \\ \underline{-40} \\ 0 \end{array}$$

95.
$$\begin{array}{r} 5 \text{ R } 8 \\ 32\overline{)\ 168} \\ \underline{-160} \\ 8 \end{array}$$

5 cases; 8 cans left over

96.
$$\begin{array}{r} 8 \text{ R } 9 \\ 52\overline{)\ 425} \\ \underline{-416} \\ 9 \end{array}$$

Yes; \$9 left over

97.
$$\begin{array}{r} 120 \\ 25\overline{)\ 3000} \\ \underline{-25} \\ 50 \\ \underline{-50} \\ 0 \\ \underline{-0} \\ 0 \end{array}$$

There will be 120 classes of Beginning Algebra.

98.
$$\begin{array}{r} 10560 \\ 8\overline{)\ 84480} \\ \underline{-8} \\ 4 \\ \underline{-0} \\ 44 \\ \underline{-40} \\ 48 \\ \underline{-48} \\ 0 \\ \underline{-0} \\ 0 \end{array}$$

Each person will receive \$10,560.

99.
$$\begin{array}{r} 9 \\ 45\overline{)\ 405} \\ \underline{-405} \\ 0 \end{array}$$

There will be 9 gallons used.

100.
$$\begin{array}{r} 26 \\ 52\overline{)\ 1352} \\ \underline{-104} \\ 312 \\ \underline{-312} \\ 0 \end{array}$$

The couple traveled for 26 hours.

101. $1200 \div 20 = 60$

$$\begin{array}{r} 60 \\ 20\overline{)\ 1200} \\ \underline{-120} \\ 00 \\ \underline{-0} \\ 0 \end{array}$$

Approximately 60 words per minute

102. $2800 \div 400$

$$\begin{array}{r} 7 \\ 400\overline{)\ 2800} \\ \underline{-2800} \\ 0 \end{array}$$

Approximately 7 tanks of gas

103.
$$\begin{array}{r} 25 \\ 18\overline{)\ 450} \\ \underline{-36} \\ 90 \\ \underline{-90} \\ 0 \end{array}$$

Yes, they can all attend if they sit in the second balcony.

104.
$$\begin{array}{r} 3\,000 \\ 12\overline{)\ 36{,}000} \\ \underline{-36} \\ 0 \end{array}$$

Teacher: \$3000

$$\begin{array}{r} 5\,000 \\ 12\overline{)\ 60{,}000} \\ \underline{-60} \\ 0 \end{array}$$

Professor: \$5,000

$$\begin{array}{r} 10{,}000 \\ 12\overline{)\ 120{,}000} \\ \underline{-12} \\ 0 \end{array}$$

CEO: \$10,000

$$\begin{array}{r} 4\,000 \\ 12\overline{)\ 48{,}000} \\ \underline{-48} \\ 0 \end{array}$$

Programmer: \$4,000

105.
$$\begin{array}{r} 21{,}000{,}000 \\ \times \quad 365 \\ \hline 7{,}665{,}000{,}000 \end{array} \text{ bbl}$$

106.
$$\begin{array}{r} 52 \\ \times \quad 5 \\ \hline 260 \\ \times \quad 50 \\ \hline 13{,}000 \end{array} \text{ min}$$

107. $13{,}360 \div 4 = 3340$
$3340 billion

108.
$$\begin{array}{r} 34{,}080 \\ -\ 9\,600 \\ \hline 24{,}480 \end{array}$$
$24{,}480 \div 96 = 255$
Each crate weighs 255 lb.

Problem Recognition Exercises: Operations on Whole Numbers

1. (a)
$$\begin{array}{r} {\scriptstyle 1} \\ 96 \\ +24 \\ \hline 120 \end{array}$$

(b)
$$\begin{array}{r} 96 \\ -24 \\ \hline 72 \end{array}$$

(c)
$$\begin{array}{r} {\scriptstyle 1} \\ {\scriptstyle 2} \\ 96 \\ \times\ 24 \\ \hline {\scriptstyle 11} \\ 384 \\ +1920 \\ \hline 2304 \end{array}$$

(d)
$$\begin{array}{r} \ 4 \\ 24\overline{)\ 96} \\ \underline{-96} \\ 0 \end{array}$$

2. (a)
$$\begin{array}{r} 550 \\ +25 \\ \hline 575 \end{array}$$

(b)
$$\begin{array}{r} {\scriptstyle 4\ 10} \\ 5\not{5}\not{0} \\ -\ 25 \\ \hline 525 \end{array}$$

(c)
$$\begin{array}{r} {\scriptstyle 1} \\ {\scriptstyle 2} \\ 550 \\ \times\ 25 \\ \hline 2750 \\ +11000 \\ \hline 13{,}750 \end{array}$$

(d)
$$\begin{array}{r} \ 22 \\ 25\overline{)\ 550} \\ \underline{-50} \\ 50 \\ \underline{50} \\ 0 \end{array}$$

3. (a)
$$\begin{array}{r} 612 \\ +334 \\ \hline 946 \end{array}$$

(b)
$$\begin{array}{r} 946 \\ -334 \\ \hline 612 \end{array}$$

4. (a)
$$\begin{array}{r} {\scriptstyle 5\ 10\ 12} \\ \not{6}\not{1}\not{2} \\ -\ 3\ 3\ 4 \\ \hline 2\ 7\ 8 \end{array}$$

(b)
$$\begin{array}{r} 278 \\ +334 \\ \hline 612 \end{array}$$

5. (a)
$$\begin{array}{r} {\scriptstyle 4\ \ 9\ 10} \\ 5\not{5}\not{0}\not{0} \\ -4\ 2\ 9\ 9 \\ \hline 1\ 2\ 0\ 1 \end{array}$$

(b)
$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 1201 \\ +\ 4299 \\ \hline 5500 \end{array}$$

6. (a)
$$\begin{array}{r} {\scriptstyle 1} \\ 22,718 \\ +\,12,137 \\ \hline 34,855 \end{array}$$

(b)
$$\begin{array}{r} {\scriptstyle 4\ 15} \\ 34,8\not{5}\not{5} \\ -\,12,13\ 7 \\ \hline 22,71\ 8 \end{array}$$

7. (a)
$$\begin{array}{r} 400 \\ \times\ \ 50 \\ \hline 000 \\ +\,20000 \\ \hline 20,000 \end{array}$$

(b)
$$\begin{array}{r} 400 \\ 50\overline{)\ 20000} \\ \underline{-200} \\ 00 \\ \underline{-0} \\ 00 \\ \underline{-0} \\ 0 \end{array}$$

8. (a)
$$\begin{array}{r} {\scriptstyle 24} \\ {\scriptstyle 12} \\ 548 \\ \times\ \ 63 \\ \hline 1644 \\ +\,32880 \\ \hline 34,524 \end{array}$$

(b)
$$\begin{array}{r} 548 \\ 63\overline{)\ 34524} \\ \underline{-315} \\ 302 \\ \underline{-252} \\ 504 \\ \underline{-504} \\ 0 \end{array}$$

9. (a)
$$\begin{array}{r} 230 \\ 22\overline{)\ 5060} \\ \underline{-44} \\ 66 \\ \underline{-66} \\ 00 \\ \underline{-0} \\ 0 \end{array}$$

(b)
$$\begin{array}{r} 230 \\ \times\ \ 22 \\ \hline 460 \\ +\,4600 \\ \hline 5060 \end{array}$$

10. (a)
$$\begin{array}{r} 15 \\ 125\overline{)\ 1875} \\ \underline{-125} \\ 625 \\ \underline{-625} \\ 0 \end{array}$$

(b)
$$\begin{array}{r} {\scriptstyle 12} \\ 125 \\ \times\ \ 15 \\ \hline 625 \\ +\,1250 \\ \hline 1875 \end{array}$$

11. (a)
$$\begin{array}{r} 328 \\ 4\overline{)\ 1312} \\ \underline{-12} \\ 11 \\ \underline{-8} \\ 32 \\ \underline{32} \\ 0 \end{array}$$

(b)
$$\begin{array}{r} 4 \\ 328\overline{)\ 1312} \\ \underline{-1312} \\ 0 \end{array}$$

12. (a)
$$\begin{array}{r} 8 \\ 547\overline{)\ 4376} \\ \underline{-4376} \\ 0 \end{array}$$

(b)
$$\begin{array}{r} 547 \\ 8\overline{)\ 4376} \\ \underline{-40} \\ 37 \\ \underline{-32} \\ 56 \\ \underline{56} \\ 0 \end{array}$$

13. **(a)** $418 \times 10 = 4180$

(b) $418 \times 100 = 41,800$

(c) $418 \times 1000 = 418,000$

(d) $418 \times 10,000 = 4,180,000$

14. **(a)** $350,000 \div 10 = 35,000$

(b) $350,000 \div 100 = 3500$

(c) $350,000 \div 1000 = 350$

(d) $350,000 \div 10,000 = 35$

15.
$$\begin{array}{r} {\scriptstyle 11} \\ 159 \\ 224 \\ +\,123 \\ \hline 506 \end{array}$$

16.
$$\begin{array}{r} 230\text{ R }4 \\ 22\overline{)\,5064} \\ \underline{-44} \\ 66 \\ \underline{-66} \\ 04 \\ \underline{-0} \\ 4 \end{array}$$

17.
$$\begin{array}{r} {\scriptstyle 3\,2} \\ 843 \\ \times\ \ 27 \\ \hline 5901 \\ +\,16860 \\ \hline 22,761 \end{array}$$

18.
$$\begin{array}{r} {\scriptstyle 9\ \ 9} \\ 6\ \cancel{10}\ \cancel{10}\ 10 \\ \cancel{7}\ \cancel{0}\ \cancel{0}\ \cancel{0} \\ -\ \ 4\,3\,9 \\ \hline 6\,5\,6\,1 \end{array}$$

Section 1.7 Exponents, Algebraic Expressions, and the Order of Operations

Section 1.7 Practice Exercises

1. **(a)** base; 4
(b) powers
(c) square root; 81
(d) order; operations
(e) variable; constants

2. False: $10 - (3 - 2) \neq (10 - 3) - 2$

3. True: $5 + 3 = 8$ and $3 + 5 = 8$

4. False: $5 - 3 = 2$, but $3 - 5 \neq 2$

5. False: $6 \times 0 = 0$

6. True: $0 \div 8 = 0$

7. True: $0 \times 8 = 0$

8. True: $5 \div 0$ is undefined

9. 9^4

10. 3^8

11. $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^6$

12. $7 \cdot 7 \cdot 7 \cdot 7 = 7^4$

13. $4 \cdot 4 \cdot 4 \cdot 4 \cdot 2 \cdot 2 \cdot 2 = 4^4 \cdot 2^3$

14. $5 \cdot 5 \cdot 5 \cdot 10 \cdot 10 \cdot 10 = 5^3 \cdot 10^3$

15. $8^4 = 8 \cdot 8 \cdot 8 \cdot 8$

16. $2^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

17. $4^8 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$

18. $6^2 = 6 \cdot 6$

19. $2^3 = 2 \cdot 2 \cdot 2 = 4 \cdot 2 = 8$

20. $4^2 = 4 \cdot 4 = 16$

21. $3^2 = 3 \cdot 3 = 9$

22. $5^2 = 5 \cdot 5 = 25$

23. $3^3 = 3 \cdot 3 \cdot 3 = 9 \cdot 3 = 27$

24. $11^2 = 11 \cdot 11 = 121$

25. $5^3 = 5 \cdot 5 \cdot 5 = 25 \cdot 5 = 125$

26. $10^3 = 10 \cdot 10 \cdot 10 = 100 \cdot 10 = 1000$

27. $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 4 \cdot 4 \cdot 2 = 16 \cdot 2 = 32$

28. $6^3 = 6 \cdot 6 \cdot 6 = 36 \cdot 6 = 216$

29. $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 9 \cdot 9 = 81$

30. $5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 25 \cdot 25 = 625$

31. $1^2 = 1 \cdot 1 = 1$; $1^3 = 1 \cdot 1 \cdot 1 = 1$; $1^4 = 1 \cdot 1 \cdot 1 \cdot 1 = 1$; $1^5 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$; The number 1 raised to any power equals 1.

32. $10^2 = 10 \cdot 10 = 100$

33. $10^3 = 10 \cdot 10 \cdot 10 = 1000$

34. $10^4 = 10 \cdot 10 \cdot 10 \cdot 10 = 10{,}000$

35. $10^5 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 100{,}000$

36. 10^9 simplifies to a 1 followed by 9 zeros: 1,000,000,000.

37. $\sqrt{4} = 2$ because $2 \cdot 2 = 4$.

38. $\sqrt{9} = 3$ because $3 \cdot 3 = 9$.

39. $\sqrt{36} = 6$ because $6 \cdot 6 = 36$.

40. $\sqrt{81} = 9$ because $9 \cdot 9 = 81$.

41. $\sqrt{100} = 10$ because $10 \cdot 10 = 100$.

42. $\sqrt{49} = 7$ because $7 \cdot 7 = 49$.

43. $\sqrt{0} = 0$ because $0 \cdot 0 = 0$.

44. $\sqrt{16} = 4$ because $4 \cdot 4 = 16$.

45. No, addition and subtraction should be performed in the order in which they appear from left to right.

46. No, multiplication and division should be performed in the order in which they appear from left to right.

47. $6 + 10 \cdot 2 = 6 + 20 = 26$

48. $4 + 3 \cdot 7 = 4 + 21 = 25$

49. $10 - 3^2 = 10 - 9 = 1$

50. $11 - 2^2 = 11 - 4 = 7$

51. $(10 - 3)^2 = 7^2 = 49$

52. $(11 - 2)^2 = 9^2 = 81$

53. $36 \div 2 \div 6 = 18 \div 6 = 3$

54. $48 \div 4 \div 2 = 12 \div 2 = 6$

55. $15 - (5 + 8) = 15 - 13 = 2$

56. $41 - (13 + 8) = 41 - 21 = 20$

57. $(13 - 2) \cdot 5 - 2 = 11 \cdot 5 - 2 = 55 - 2 = 53$

58. $(8 + 4) \cdot 6 + 8 = 12 \cdot 6 + 8 = 72 + 8 = 80$

59. $4 + 12 \div 3 = 4 + 4 = 8$

60. $9 + 15 \div \sqrt{25} = 9 + 15 \div 5 = 9 + 3 = 12$

61. $30 \div 2 \cdot \sqrt{9} = 30 \div 2 \cdot 3 = 15 \cdot 3 = 45$

62. $55 \div 11 \cdot 5 = 5 \cdot 5 = 25$

63. $7^2 - 5^2 = 49 - 25 = 24$

64. $3^3 - 2^3 = 27 - 8 = 19$

65. $(7 - 5)^2 = 2^2 = 4$

66. $(3 - 2)^3 = 1^3 = 1$

67. $100 \div 5 \cdot 2 = 20 \cdot 2 = 40$

68. $60 \div 3 \cdot 2 = 20 \cdot 2 = 40$

69. $20 - 5(11 - 8) = 20 - 5(3) = 20 - 15 = 5$

70. $38 - 6(10 - 5) = 38 - 6(5) = 38 - 30 = 8$

71. $\sqrt{36+64} + 2(9-1) = \sqrt{100} + 2(8)$
$= 10 + 2(8)$
$= 10 + 16$
$= 26$

72. $\sqrt{16+9} + 3(8-3) = \sqrt{25} + 3(5)$
$= 5 + 3(5)$
$= 5 + 15$
$= 20$

73. $\dfrac{36}{2^2+5} = \dfrac{36}{4+5} = \dfrac{36}{9} = 4$

74. $\dfrac{42}{3^2-2} = \dfrac{42}{9-2} = \dfrac{42}{7} = 6$

75. $80 - 20 \div 4 \cdot 6 = 80 - 5 \cdot 6 = 80 - 30 = 50$

76. $300 - 48 \div 8 \cdot 40 = 300 - 6 \cdot 40$
$= 300 - 240$
$= 60$

77. $\dfrac{42-26}{4^2-8} = \dfrac{42-26}{16-8} = \dfrac{16}{8} = 2$

78. $\dfrac{22+14}{2^2 \cdot 3} = \dfrac{22+14}{4 \cdot 3} = \dfrac{22+14}{12} = \dfrac{36}{12} = 3$

79. $(18-5) - \left(23 - \sqrt{100}\right) = 13 - (23-10)$
$= 13 - 13$
$= 0$

80. $\left(\sqrt{36} + 11\right) - (31-16) = (6+11) - 15$
$= 17 - 15$
$= 2$

81. $80 \div (9^2 - 7 \cdot 11)^2 = 80 \div (81 - 7 \cdot 11)^2$
$= 80 \div (81-77)^2$
$= 80 \div 4^2$
$= 80 \div 16$
$= 5$

82. $108 \div (3^3 - 6 \cdot 4)^2 = 108 \div (27 - 6 \cdot 4)^2$
$= 108 \div (27-24)^2$
$= 108 \div 3^2$
$= 108 \div 9$
$= 12$

83. $22 - 4\left(\sqrt{25} - 3\right)^2 = 22 - 4(5-3)^2$
$= 22 - 4(2)^2$
$= 22 - 4 \cdot 4$
$= 22 - 16$
$= 6$

84. $17 + 3\left(7 - \sqrt{9}\right)^2 = 17 + 3(7-3)^2$
$= 17 + 3(4)^2$
$= 17 + 3 \cdot 16$
$= 17 + 48$
$= 65$

85. $96 - 3(42 \div 7 \cdot 6 - 5) = 96 - 3(6 \cdot 6 - 5)$
$= 96 - 3(36-5)$
$= 96 - 3(31)$
$= 96 - 93$
$= 3$

86. $50 - 2(36 \div 12 \cdot 2 - 4) = 50 - 2(3 \cdot 2 - 4)$
$= 50 - 2(6-4)$
$= 50 - 2(2)$
$= 50 - 4$
$= 46$

87. $16 + 5(20 \div 4 \cdot 8 - 3) = 16 + 5(5 \cdot 8 - 3)$
$= 16 + 5(40-3)$
$= 16 + 5(37)$
$= 16 + 185$
$= 201$

88. $3[4+(6-3)^2]-15 = 3[4+3^2]-15$
$= 3[4+9]-15$
$= 3[13]-15$
$= 39-15$
$= 24$

89. $2[5(4-1)+3]\div 6 = 2[5(3)+3]\div 6$
$= 2[15+3]\div 6$
$= 2[18]\div 6$
$= 36\div 6$
$= 6$

90. $8^2-5\left[12-\left(8-6\right)\right] = 8^2-5\left[12-2\right]$
$= 8^2-5\left[10\right]$
$= 64-5\left(10\right)$
$= 64-50$
$= 14$

91. $3^3-2\left[15-\left(2+1\right)^2\right] = 3^3-2\left[15-3^2\right]$
$= 3^3-2\left[15-9\right]$
$= 3^3-2\left[6\right]$
$= 27-2\left(6\right)$
$= 27-12$
$= 15$

92. $3[(10-4)-(5-1)]^2 = 3[6-4]^2$
$= 3[2]^2$
$= 3[4]$
$= 12$

93. $10[(6+4)-(8-5)^2] = 10[10-3^2]$
$= 10[10-9]$
$= 10[1]$
$= 10$

94. $5\{21-[3^2-(4-2)]\} = 5\{21-[3^2-2]\}$
$= 5\{21-[9-2]\}$
$= 5\{21-7\}$
$= 5\{14\}$
$= 70$

95. $4\{18-[(10-8)+2^3]\} = 4\{18-[2+2^3]\}$
$= 4\{18-[2+8]\}$
$= 4\{18-10\}$
$= 4\{8\}$
$= 32$

96. $10y-z = 10\left(4\right)-25 = 40-25 = 15$

97. $8w-4x = 8\left(9\right)-4\left(12\right) = 72-48 = 24$

98. $3x+6y+9w = 3\left(12\right)+6\left(4\right)+9\left(9\right)$
$= 36+24+81$
$= 60+81$
$= 141$

99. $9y-4w+3z = 9\left(4\right)-4\left(9\right)+3\left(25\right)$
$= 36-36+75$
$= 0+75$
$= 75$

100. $\left(z-x-y\right)^2 = \left(25-12-4\right)^2$
$= \left(13-4\right)^2$
$= 9^2$
$= 81$

101. $\left(y+z-w\right)^2 = \left(4+25-9\right)^2$
$= \left(29-9\right)^2$
$= 20^2$
$= 400$

102. $\sqrt{z} = \sqrt{25} = 5$

103. $\sqrt{w} = \sqrt{9} = 3$

104. $156^2 = 24{,}336$

105. $418^2 = 174{,}724$

106. $12^5 = 248{,}832$

107. $35^4 = 1{,}500{,}625$

108. $43^3 = 79{,}507$

109. $71^3 = 357,911$

110. $8126 - 54,978 \div 561 = 8126 - 98 = 8028$

111. $92,168 + 6954 \times 29 = 92,168 + 201,666$
$= 293,834$

112. $(3548 - 3291)^2 = 257^2 = 66,049$

113. $(7500 \div 625)^3 = 12^3 = 1728$

114. $\dfrac{89,880}{384 + 2184} = \dfrac{89,880}{2568} = 35$

115. $\dfrac{54,137}{3393 - 2134} = \dfrac{54,137}{1259} = 43$

Section 1.8 Mixed Applications and Computing Mean

Section 1.8 Practice Exercises

1. mean

2. 20 – 15; 5

3. 71 + 14 = 85

4. 42 + 16 = 58

5. 2 · 14 = 28

6. 93 – 79 = 14

7. 102 – 32 = 70

8. 60 ÷ 12 = 5

9. 10 · 13 = 130

10. 12 + 14 + 15 = 41

11. 24 ÷ 6 = 4

12. 78 – 41 = 37

13. 5 + 13 + 25 = 43

14. *Given*: total price: $16,540
down payment: $2500
payment plan: 36 months
Find: Amount of monthly payments
Operations
(1) Subtract

$$\begin{array}{r} 16,540 \\ -\ 2\ 500 \\ \hline 14,040 \end{array}$$

(2) Divide

$$\begin{array}{r} 390 \\ 36\overline{)\ 14040} \\ -\ 108 \\ \hline 324 \\ -324 \\ \hline 00 \end{array}$$

Jackson's monthly payments were $390.

15. *Given*: total cost: 1170
down payment: 150
payment plan: 12 months
Find: Amount of monthly payments
Operations:
(1) Subtract

$$\begin{array}{r} 1170 \\ -\ 150 \\ \hline 1020 \end{array}$$

(2) Divide

$$\begin{array}{r} 85 \\ 12\overline{)1020} \\ -96 \\ \hline 60 \\ -60 \\ \hline 0 \end{array}$$

Lucio's monthly payment was $85.

16. *Given*: Distance for each route and speed traveled
Find: Time required for each route
Operations
(1) Watertown to Utica direct
Divide 80 ÷ 40 = 2 hr

(2) Watertown to Syracuse to Utica
Add distances $70 + 50 = 120$ mi
Divide $120 \div 60 = 2$ hr

Each trip will take 2 hours.

17. *Given*: Distance for each route and speed traveled
Find: Time required for each route
Operations

(1) Interstate:
Divide $220 \div 55 = 4$ hr

(2) Back roads:
Divide $200 \div 40 = 5$ hr
The interstate will take 4 hours and the back roads will take 5 hours. The interstate will take less time.

18. The distance around a figure is the perimeter.

19. The amount of space covered is the area.

20. *Given*: The dimensions of a room and cost per foot of molding
Find: Total cost
Operations:

(1) Add to find the perimeter, subtract doorway.

$$\begin{array}{r} 11 \\ 12 \\ 11 \\ +\,12 \\ \hline 46 \end{array} \qquad \begin{array}{r} 46 \\ -\,3 \\ \hline 43 \text{ ft} \end{array}$$

(2) Multiply to find the total cost.

$$\begin{array}{r} 43 \\ \times\ 2 \\ \hline 86 \end{array}$$

The cost will be \$86.

21. *Given*: The dimensions of a yard and the cost per foot of fence
Find: Total cost
Operations

(1) Add to find perimeter

$$\begin{array}{r} {\scriptstyle 1} \\ 75 \\ 90 \\ 75 \\ +\ 90 \\ \hline 330 \text{ ft} \end{array}$$

(2) Multiply the perimeter by cost per foot.

$$\begin{array}{r} {\scriptstyle 1} \\ 330 \\ \times\ \ 5 \\ \hline 1650 \end{array}$$

It will cost \$1650.

22. *Given*: dimensions of room and cost per square yard
Find: total cost
Operations

(1) Multiply to find area

$$6 \times 5 = 30 \text{ yd}^2$$

(2) Multiply to find total cost

$$\begin{array}{r} {\scriptstyle 1} \\ 34 \\ \times\ 30 \\ \hline 1020 \end{array}$$

The total cost is \$1020.

23. *Given*: Dimensions of room and cost per foot
Find: Total cost
Operations

(1) Multiply to find area.

$$\begin{array}{r} 12 \\ \times 20 \\ \hline 240 \text{ ft}^2 \end{array}$$

(2) Multiply to find total cost.

$$\begin{array}{r} {\scriptstyle 1} \\ 240 \\ \times\ 3 \\ \hline 720 \end{array}$$

The total cost is \$720.

24. *Given*: Starting balance in account and individual checks written
Find: Remaining balance in account
Operations

(1) Add the individual checks

$$\begin{array}{r} {\scriptstyle 1} \\ 82 \\ 159 \\ +\,101 \\ \hline \$242 \end{array}$$

(2) Subtract \$242 from the initial balance

$$\begin{array}{r} 278 \\ -\,242 \\ \hline 36 \end{array}$$

There will be \$36 left in Gina's account.

25. *Given*: Initial balance in account and individual checks written
Find: The remaining balance
Operations
(1) Add the individual checks.

$$\begin{array}{r} {\scriptstyle 11} \\ 587 \\ 36 \\ +\,156 \\ \hline \$779 \end{array}$$

(2) Subtract \$779 from the initial balance.

$$\begin{array}{r} {\scriptstyle 2\ 13\ 14\ 15} \\ \not{3}\ \not{4}\ \not{5}\ 5 \\ -\ 7\ \ 7\ 9 \\ \hline 2\ 6\ \ 7\ 6 \end{array}$$

There will be \$2676 left in Jose's account.

26. *Given*: Number of computers and printers purchased and the cost of each
Find: The total bill
Operations

(1) Multiply to find the amount spent on computers, then printers.

$$\begin{array}{r} {\scriptstyle 1\ 5} \\ {\scriptstyle 1} \\ 2118 \\ \times\ \ 72 \\ \hline {\scriptstyle 1} \\ 4\,236 \\ 148\,260 \\ \hline \$152,496 \end{array} \qquad \begin{array}{r} {\scriptstyle 3\ 3} \\ 256 \\ \times\ \ 6 \\ \hline \$1536 \end{array}$$

(2) Add to find the total bill.

$$\begin{array}{r} {\scriptstyle 1\ 11} \\ 152,496 \\ +\,1\,536 \\ \hline 154,032 \end{array}$$

The total bill was \$154,032.

27. *Given*: Price for children and adults, and the number of children and adults
Find: Total cost for the trip
Operations

(1) Multiply to find the amount for children and for adults.

$$\begin{array}{r} {\scriptstyle 2} \\ 33 \\ \times\ 27 \\ \hline 231 \\ +\,660 \\ \hline \$891 \end{array} \qquad \begin{array}{r} {\scriptstyle 4} \\ 37 \\ \times\ \ 6 \\ \hline \$222 \end{array}$$

(2) Add to find the total.

$$\begin{array}{r} {\scriptstyle 1} \\ 891 \\ +\ 222 \\ \hline \$1113 \end{array}$$

The amount of money required is \$1113.

28. *Given*: Amount to sell used CDs, amount to buy used CDs and number of CDs sold

(a) *Find*: Money from selling 16 CDs
Operation: Multiply

$$\begin{array}{r} 16 \\ \times\ 3 \\ \hline 48 \end{array}$$

Latayne will receive \$48.

(b) *Find*: Number of used CDs to buy for \$48.
Operation: Division
$48 \div 8 = 6$
She can buy 6 CDs.

29. *Given*: Wage per hour and number of hours worked

(a) *Find*: Amount of weekly paycheck
Operation: Multiply

$$\begin{array}{r} 40 \\ \times\ 12 \\ \hline 480 \end{array}$$

Shevona's paycheck is worth \$480.

(b) *Given*: Ticket price and number of tickets
Find: Amount left over from paycheck
Operations

(1) Multiply
$$\begin{array}{r} {\scriptstyle 1} \\ 89 \\ \times\ 2 \\ \hline 178 \end{array}$$

(2) Subtract
$$\begin{array}{r} {\scriptstyle 7\ 10} \\ 4\,\not{8}\,\not{0} \\ -\,1\ 7\ 8 \\ \hline 3\ 0\ 2 \end{array}$$

She will have $302 left.

30. *Given*: Number of field goals, three-point shots and free throws and point values
Find: Total points scored
Operations

(1) Multiply

field goals
$$\begin{array}{r} {\scriptstyle 1} \\ 12{,}192 \\ \times\ \ 2 \\ \hline 24{,}384 \end{array}$$

three-point shots
$$\begin{array}{r} {\scriptstyle 2} \\ 581 \\ \times\ \ 3 \\ \hline 1743 \end{array}$$

(2) Add
$$\begin{array}{r} {\scriptstyle 1\ 1\ 11} \\ 24\ 384 \\ 1\ 743 \\ +\ 7\ 327 \\ \hline 33{,}454 \end{array}$$

Michael Jordan scored 33,454 points with the Bulls.

31. *Given*: Width of each picture and width of the matte frame
Find: Space between each picture
Operations

(1) Multiply $5 \times 5 = 25$

(2) Subtract $37 - 25 = 12$

(3) Divide $12 \div 6 = 2$

There will be 2 in of matte between the pictures.

32. *Given*: Number of milliliters in the bottle and the dosage

(a) *Find*: Days the bottle will last
Operation: Divide
$60 \div 2 = 30$
One bottle will last for 30 days.

(b) *Find*: Date to reorder
Operation: Subtract
$30 - 2 = 28$
The owner should order a refill no later than September 28.

33. *Given*: Number of male and female doctors

(a) *Find*: Difference between male and female doctors
Operation: Subtract
$$\begin{array}{r} {\scriptstyle 9} \\ {\scriptstyle 2\,\not{1}\not{0}\ 13} \\ 6\,\not{3}\,\not{0},300 \\ -\,20\ 5{,}900 \\ \hline 42\ 4{,}400 \end{array}$$

The difference between the number of male and female doctors is 424,400.

(b) *Find*: The total number of doctors
Operation: Add
$$\begin{array}{r} {\scriptstyle 1} \\ 630{,}300 \\ +\ 205{,}900 \\ \hline 836{,}200 \end{array}$$

The total number of doctors is 836,200.

34. *Given*: Scale on a map

(a) *Find*: Actual distance between Las Vegas and Salt Lake City
Operation: Multiply
$$\begin{array}{r} 60 \\ \times\ 6 \\ \hline 360 \end{array}$$

The distance is 360 mi.

(b) *Find*: Distance on map between Madison and Dallas
Operation: Divide

$$\begin{array}{r} 14 \\ 60\overline{)\ 840} \\ \underline{-60} \\ 240 \\ \underline{-240} \\ 0 \end{array}$$

14 in. represents 840 mi.

35. *Given*: Scale on a map

(a) *Find*: Actual distance between Wichita and Des Moines
Operation: Multiply

$$\begin{array}{r} 40 \\ \times\ 8 \\ \hline 320 \end{array}$$

The distance is 320 mi..

(b) *Find*: The distance between Seattle and Sacramento on the map.
Operation: Divide

$$\begin{array}{r} 15 \\ 40\overline{)\ 600} \\ \underline{-40} \\ 200 \\ \underline{-200} \\ 0 \end{array}$$

15 in. represents 600 mi.

36. *Given*: Number of books per box and number of books ordered
Find: Number of boxes completely filled and number of books left over
Operation: Divide and find remainder

$$\begin{array}{r} 104\ \text{R}\ 2 \\ 12\overline{)\ 1250} \\ \underline{-12} \\ 050 \\ \underline{-48} \\ 2 \end{array}$$

104 boxes will be filled completely with 2 books left over.

37. *Given*: Number of eggs in a container and total number of eggs
Find: Number of containers filled and number of eggs left over
Operation: Divide and find remainder

$$\begin{array}{r} 354\ \text{R}\ 9 \\ 12\overline{)\ 4257} \\ \underline{-36} \\ 65 \\ \underline{-60} \\ 57 \\ \underline{-48} \\ 9 \end{array}$$

354 containers will be filled completely with 9 eggs left over.

38. *Given*: Total cost of dinner and type of bill used

(a) *Find*: Number of $20 bills needed
Operation: Division

$$\begin{array}{r} 4\ \text{R}\ 4 \\ 20\overline{)\ 84} \\ \underline{-80} \\ 4 \end{array}$$

Four $20 bills are not enough so Marc needs five $20 bills.

(b) *Find*: How much change
Operations: Multiply and subtract

$$\begin{array}{r} 20 \\ \times\ 5 \\ \hline 100 \end{array} \qquad \begin{array}{r} 100 \\ -\ 84 \\ \hline 16 \end{array}$$

He will receive $16 in change.

39. *Given*: total cost of CDs and type of bill used

(a) *Find*: How many $10 bills needed
Operation: Divide

$$\begin{array}{r} 5\ \text{R}\ 4 \\ 10\overline{)\ 54} \\ \underline{-50} \\ 4 \end{array}$$

Five $10 bills are not enough so Byron needs six $10 bills.

(b) *Find*: How much change
Operations: Multiply and subtract

$$\begin{array}{r} 10 \\ \times\ 6 \\ \hline 60 \end{array} \qquad \begin{array}{r} 60 \\ -\ 54 \\ \hline 6 \end{array}$$

He will receive $6 in change.

40. *Given*: Hourly wage and number of hours worked
Find: Amount earned per week
Operations

(1) Multiply to find amount per job.
$30 \times 4 = 120$
$10 \times 16 = 160$
$8 \times 30 = 240$

(2) Add to find total.

$$\begin{array}{r} {\scriptstyle 1} \\ 120 \\ 160 \\ +\ 240 \\ \hline 520 \end{array}$$

He earned \$520.

41. *Given*: Hourly wage and number of hours worked
Find: Total paid to all four workers
Operations

(1) Multiply to find amount per worker
$36 \times 18 = 648$ $26 \times 24 = 624$
$28 \times 15 = 420$ $22 \times 48 = 1056$

(2) Add to find total paid.

$$\begin{array}{r} {\scriptstyle 1\,1\,1} \\ 648 \\ 420 \\ 624 \\ +\,1056 \\ \hline 2748 \end{array}$$

The total amount paid was \$2748.

42. $\text{Mean} = \dfrac{19+21+18+21+16}{5} = \dfrac{95}{5} = 19$

43. $\text{Mean} = \dfrac{105+114+123+101+100+111}{6}$
$= \dfrac{654}{6} = 109$

44. $\text{Mean} = \dfrac{1480+1102+1032+1002}{4}$
$= \dfrac{4616}{4} = 1154$

45. $\text{Average} = \dfrac{19+20+18+19+18+14}{6}$
$= \dfrac{108}{6} = 18$

46. $\text{Average} = \dfrac{83+95+87+91}{4} = \dfrac{356}{4} = 89$

47. $\text{Average} = \dfrac{42+41+31+30}{4}$
$= \dfrac{144}{4} = 36 \text{ mpg}$

48. $\text{Average} = \dfrac{49+30+34+31+26}{5} = \dfrac{170}{5}$
$= 34 \text{ mpg}$

49. $\text{Average} = \dfrac{118+123+122}{3}$
$= \dfrac{363}{3} = 121 \text{ mm per month}$

50. $\text{Average} = \dfrac{9+20+22+16+13}{5}$
$= \dfrac{80}{5} = 16 \text{ in. per month}$

Chapter 1 Review Exercises

Section 1.2

1. 10,024 Ten-thousands

2. 821,811 Hundred-thousands

3. 92,046

4. 503,160

5. 3 millions + 4 hundred-thousand + 8 hundreds + 2 tens

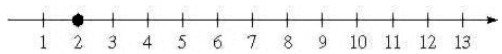
6. 3 ten-thousands + 5 hundreds + 5 tens + 4 ones

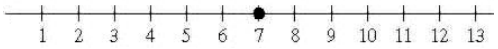
7. Two hundred forty-five

8. Thirty-thousand, eight hundred sixty-one

9. 3602

10. 800,039

11. 

12. 

13. $3 < 10$ True

14. $10 > 12$ False

Section 1.3

15. Addends: 105, 119; sum: 224

16. Addends: 53, 21; sum: 74

17.
$$\begin{array}{r} {\scriptstyle 2} \\ 18 \\ 24 \\ +\ 29 \\ \hline 71 \end{array}$$

18.
$$\begin{array}{r} {\scriptstyle 2} \\ 27 \\ 9 \\ +\ 18 \\ \hline 54 \end{array}$$

19.
$$\begin{array}{r} {\scriptstyle 1} \\ 8\,403 \\ +\ 9\,007 \\ \hline 17{,}410 \end{array}$$

20.
$$\begin{array}{r} {\scriptstyle 1} \\ 68{,}421 \\ +\ 2{,}221 \\ \hline 70{,}642 \end{array}$$

21. **(a)** The order changed so it is the commutative property.

(b) The grouping changed so it is the associative property.

(c) The order changed so it is the commutative property.

22. minuend: 14
subtrahend: 8
difference: 6

23. minuend: 102
subtrahend: 78
difference: 24

24.
$$\begin{array}{r} 37 \\ -\ 11 \\ \hline 26 \end{array}$$
$\underline{26} + 11 = 37$

25.
$$\begin{array}{r} 61 \\ -\ 41 \\ \hline 20 \end{array}$$
$\underline{20} + 41 = 61$

26.
$$\begin{array}{r} {\scriptstyle 9} \\ {\scriptstyle 1\ \cancel{10}\ 10} \\ \cancel{2}\ \cancel{0}\ \cancel{0}5 \\ -\ 1\ 8\ 84 \\ \hline 1\ 21 \end{array}$$

27.
$$\begin{array}{r} {\scriptstyle 2\ 18} \\ 1\cancel{3}\ \cancel{8}9 \\ -\ 2\ 99 \\ \hline 10\ 90 \end{array}$$

28.
$$\begin{array}{r} {\scriptstyle 9\ \ 9} \\ {\scriptstyle 5\ \ \cancel{10}\ \cancel{10}\ 10} \\ 8\cancel{6},\cancel{0}\ \cancel{0}\ \cancel{0} \\ -\ 54\ \ 9\ \ 8\ \ 1 \\ \hline 31,0\ \ 1\ \ 9 \end{array}$$

29.
$$\begin{array}{r} {\scriptstyle 9\ \ 9} \\ {\scriptstyle 6\ \ \cancel{10}\ \cancel{10}\ 10} \\ 6\cancel{7},\cancel{0}\ \cancel{0}\ \cancel{0} \\ -\ 32\ \ 8\ \ 1\ \ 2 \\ \hline 34,1\ \ 8\ \ 8 \end{array}$$

30. $403 + 79 = 482$
$$\begin{array}{r} {\scriptstyle 1} \\ 403 \\ +\ 79 \\ \hline 482 \end{array}$$

31. $44 + 92 = 136$
$$\begin{array}{r} 92 \\ +\ 44 \\ \hline 136 \end{array}$$

32. $38 - 31 = 7$

33. $111 - 15 = 96$

$$\begin{array}{r} {\scriptstyle 10} \\ 0\not{0}\,{\scriptstyle 11} \\ \not{1}\not{1}\;1 \\ -\,1\;5 \\ \hline 9\;6 \end{array}$$

34. $36 + 7 = 43$

35. $23 + 6 = 29$

36. $251 - 42 = 209$

$$\begin{array}{r} {\scriptstyle 4\,11} \\ 2\not{5}\not{1} \\ -\,4\;2 \\ \hline 20\,9 \end{array}$$

37. $90 - 52 = 38$

$$\begin{array}{r} {\scriptstyle 8\;10} \\ \not{9}\not{0} \\ -\,5\;2 \\ \hline 3\;8 \end{array}$$

38. **(a)** Add the numbers for AA Auto.

$$\begin{array}{r} 31 \\ 25 \\ +\,40 \\ \hline 96 \end{array}$$ cars

(b) Add the numbers of Fords.

$$\begin{array}{r} 21 \\ 25 \\ +\,20 \\ \hline 66 \end{array}$$ Fords

39.

$$\begin{array}{r} 35{,}377 \\ +\,10{,}420 \\ \hline 45{,}797 \end{array}$$ thousand seniors

40.

$$\begin{array}{r} {\scriptstyle 10} \\ {\scriptstyle 7\not{0}\;14\;2\;10} \\ \not{8}\not{1},\not{4}\;\not{3}\;\not{0} \\ -\,7\;3\;\;7\;\;2\;\;1 \\ \hline 7\;\;7\;0\;\;9 \end{array}$$ thousand people

41.

$$\begin{array}{r} {\scriptstyle 16} \\ {\scriptstyle 7\;10\;\;3\;\not{6}\;13} \\ \not{8}\not{0},\not{4}\;\not{7}\;\not{3} \\ -\,3\;5\;\;3\;\;7\;\;7 \\ \hline 4\;5{,}0\;\;9\;\;6 \end{array}$$ thousand people

42.

$$\begin{array}{r} {\scriptstyle 10\;18} \\ {\scriptstyle 4\;\not{9}\;\not{8}\;12} \\ 9\not{5},\not{1}\;\not{9}2{,}000 \\ -\,23,\;2\;9\;\;9{,}000 \\ \hline 71,\;8\;9\;\;3{,}000 \end{array}$$ tons

43.

$$\begin{array}{r} {\scriptstyle 115} \\ \not{2}\not{5},800{,}000 \\ -\,18{,}600{,}000 \\ \hline \$7{,}200{,}000 \end{array}$$

44.

$$\begin{array}{r} {\scriptstyle 1} \\ 30 \\ 44 \\ 25 \\ 53 \\ +\,25 \\ \hline 177 \end{array}$$ m

Section 1.4

45. $\underline{5},\boxed{2}34{,}446$
$5{,}000{,}000$

46. $9{,}33\underline{\boxed{2}},945$
$9{,}330{,}000$

47.

$$\begin{array}{rcr} 894{,}004 & \rightarrow & 900{,}000 \\ \underline{-\,123{,}883} & \rightarrow & \underline{-100{,}000} \\ & & 800{,}000 \end{array}$$

48.

$$\begin{array}{rcr} 330 & \rightarrow & 300 \\ 489 & \rightarrow & 500 \\ 123 & \rightarrow & 100 \\ \underline{+\,571} & \rightarrow & \underline{600} \\ & & 1500 \end{array}$$

49.

$$\begin{array}{rcr} & & {\scriptstyle 3\;10} \\ 140{,}041{,}247 & \rightarrow & 1\not{4}\not{0},000{,}000 \\ \underline{-\,127{,}078{,}679} & \rightarrow & \underline{-127{,}000{,}000} \\ & & 13{,}000{,}000 \end{array}$$

13,000,000 people

50.
$$\begin{array}{rcr} 96{,}050 & \rightarrow & 96{,}000 \\ +\ 66{,}517 & \rightarrow & +\ 67{,}000 \\ \hline & & 163{,}000 \text{ m}^3 \end{array}$$

Section 1.5

51. Factors: 33, 40
Product: 1320

52. **(a)** Yes

(b) Yes

(c) No

53. c

54. e

55. d

56. a

57. b

58.
$$\begin{array}{r} 142 \\ \times\ 43 \\ \hline 426 \\ +\ 5680 \\ \hline 6106 \end{array}$$

59.
$$\begin{array}{r} 1024 \\ \times\ \ 51 \\ \hline 1\ 024 \\ +\ 51\ 200 \\ \hline 52{,}224 \end{array}$$

60.
$$\begin{array}{r|l} 6 & 000 \\ 5 & 00 \\ \hline 30 & 00000 \end{array}$$
3,000,000

61.
$$\begin{array}{r} 26 \\ +\ 13 \\ \hline 39 \end{array} \qquad \begin{array}{r} 39 \\ \times\ 11 \\ \hline 39 \\ 390 \\ \hline \$429 \end{array}$$

62.
$$\begin{array}{r} 551 \\ \times\ \ 7 \\ \hline 3857 \end{array} \qquad \begin{array}{r} 3857 \\ \times\ \ 2 \\ \hline 7714 \text{ lb} \end{array}$$

Section 1.6

63. $42 \div 6 = 7$
divisor: 6, dividend: 42, quotient: 7

64. $4\overline{)52} = 13$
divisor: 4, dividend: 52, quotient: 13

65. $3 \div 1 = 3$ because $1 \times 3 = 3$.

66. $3 \div 3 = 1$ because $1 \times 3 = 3$.

67. $3 \div 0$ is undefined.

68. $0 \div 3 = 0$ because $0 \times 3 = 0$.

69. To check a division problem with no remainder you multiply the quotient by the divisor to get the dividend.

70. To check a division problem with a remainder you multiply the whole number part of the quotient by the divisor and add the remainder to get the dividend.

71.
$$\begin{array}{r} 58 \\ 6\overline{)\ 348} \\ \underline{-30} \\ 48 \\ \underline{-48} \\ 0 \end{array} \qquad \begin{array}{r} 58 \\ \times\ \ 6 \\ \hline 348\ \checkmark \end{array}$$

72.
$$\begin{array}{r} 41 \text{ R } 7 \\ 11\overline{)\ 458} \\ \underline{-44} \\ 18 \\ \underline{-11} \\ 7 \end{array} \qquad \begin{array}{r} 41 \\ \times 11 \\ \hline 41 \\ 410 \\ \hline 451 \\ +\ \ 7 \\ \hline 458\ \checkmark \end{array}$$

73.
$$\begin{array}{r} 52 \text{ R } 3 \\ 20\overline{)\,1043} \\ \underline{-100} \\ 43 \\ \underline{-40} \\ 3 \end{array} \qquad \begin{array}{r} 52 \\ \times\ 20 \\ \hline 1040 \\ +\ \ 3 \\ \hline 1043 \end{array} \checkmark$$

74. $\dfrac{72}{4} = 18$

75.
$$\begin{array}{r} 12 \\ 9\overline{)108} \\ \underline{-9} \\ 18 \\ \underline{-18} \\ 0 \end{array}$$

76. Divide 105 by 4.
$$\begin{array}{r} 26 \text{ R } 1 \\ 4\overline{)105} \\ \underline{-8} \\ 25 \\ \underline{-24} \\ 1 \end{array}$$
26 photos with 1 left over

77. **(a)** Divide 60 by 15.
60 ÷ 15 = 4 T-shirts

(b) Divide 60 by 12.
60 ÷ 12 = 5 hats

Section 1.7

78. $8 \cdot 8 \cdot 8 \cdot 8 \cdot 8 = 8^5$

79. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5 = 2^4 \cdot 5^3$

80. $5^3 = 5 \times 5 \times 5 = 25 \times 5 = 125$

81. $4^4 = 4 \times 4 \times 4 \times 4 = 16 \times 16 = 256$

82. $1^7 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$

83. $10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1{,}000{,}000$

84. $\sqrt{64} = 8$ because $8 \times 8 = 64$.

85. $\sqrt{144} = 12$ because $12 \times 12 = 144$.

86. $14 \div 7 \cdot 4 - 1 = 2 \cdot 4 - 1 = 8 - 1 = 7$

87. $10^2 - 5^2 = 100 - 25 = 75$

88.
$$\begin{aligned} 90 - 4 + 6 \div 3 \cdot 2 &= 90 - 4 + 2 \cdot 2 \\ &= 90 - 4 + 4 \\ &= 86 + 4 \\ &= 90 \end{aligned}$$

89.
$$\begin{aligned} 2 + 3 \cdot 12 \div 2 - \sqrt{25} &= 2 + 3 \cdot 12 \div 2 - 5 \\ &= 2 + 36 \div 2 - 5 \\ &= 2 + 18 - 5 \\ &= 20 - 5 \\ &= 15 \end{aligned}$$

90.
$$\begin{aligned} 6^2 - \left[4^2 + (9-7)^3\right] &= 6^2 - \left[4^2 + 2^3\right] \\ &= 36 - \left[16 + 8\right] \\ &= 36 - 24 \\ &= 12 \end{aligned}$$

91.
$$\begin{aligned} 26 - 2(10-1) + (3 + 4 \cdot 11) &= 26 - 2(9) + (3 + 44) \\ &= 26 - 2(9) + 47 \\ &= 26 - 18 + 47 \\ &= 8 + 47 \\ &= 55 \end{aligned}$$

92. $\dfrac{5 \cdot 3^2}{7+8} = \dfrac{5 \cdot 9}{7+8} = \dfrac{45}{15} = 3$

93.
$$\begin{aligned} a + b + 2c &= 20 + 10 + 2(6) \\ &= 20 + 10 + 12 \\ &= 30 + 12 \\ &= 42 \end{aligned}$$

94.
$$\begin{aligned} 5a - b^2 &= 5(20) - 10^2 \\ &= 5(20) - 100 \\ &= 100 - 100 \\ &= 0 \end{aligned}$$

95. $\sqrt{b+c} = \sqrt{10+6} = \sqrt{16} = 4$

96. $(a-b)^2 = (20-10)^2 = 10^2 = 100$

Section 1.8

97. *Given*: The distance traveled and the number of trips

(a) *Find*: Number of miles traveled in one week
Operations: Multiplication and addition

$$\begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array} \qquad \begin{array}{r} 15 \\ +\,6 \\ \hline 21 \end{array} \text{ miles per week}$$

(b) *Find*: Number of miles traveled in 10 months with 4 weeks a month
Operation: Multiplication

$$\begin{array}{r} 21 \\ \times 4 \\ \hline 84 \end{array} \text{ miles/month} \qquad \begin{array}{r} 84 \\ \times 10 \\ \hline 840 \end{array} \text{ miles/year}$$

98. *Given*: Contract: 252,000,000
Time period: 9 years
taxes: 75,600,000
Find: Amount per year after taxes
Operations

(1) Subtract

$$\begin{array}{r} {\scriptstyle 14\,11} \\ 252,000,000 \\ -\ 75,600,000 \\ \hline 176,400,000 \end{array}$$

(2) Divide

$$\begin{array}{r} 19,600,000 \\ 9\overline{)176,400,000} \\ \underline{-9} \\ 86 \\ \underline{-81} \\ 54 \\ \underline{-54} \\ 0 \end{array}$$

He received \$19,600,000 per year.

99. *Given*: dimensions of a rectangular garden and size of division for plants

(a) *Find*: Number of plants
Operations
(1) Multiply
$12 \times 8 = 96$
(2) Divide
$96 \div 2 = 48$
She should purchase 48 plants.

(b) *Find*: Cost of plants for \$3 each
Operation: Multiply

$$\begin{array}{r} {\scriptstyle 2} \\ 48 \\ \times\ 3 \\ \hline 144 \end{array}$$

The plants will cost \$144.

(c) *Find*: Perimeter of garden and cost of fence
Operations
(1) Add
$12 + 8 + 12 + 8 = 40$
(2) Multiply
$40 \times 2 = \$80$
The fence costs \$80.

(d) *Find*: Total cost of garden
Operations: Add

$$\begin{array}{r} 144 \\ +\ 80 \\ \hline 224 \end{array}$$

Aletha's total cost will be \$224.

100. $$\text{mean} = \frac{7+6+12+5+7+6+13}{7} = \frac{56}{7} = 8$$

101. $$\text{Average} = \frac{80+78+101+92+94}{5} = \frac{445}{5} = \$89$$

102. $$\text{Average} = \frac{6+9+11+13+5+4}{6} = \frac{48}{6} = 8 \text{ houses per month}$$

Chapter 1 Test

1. **(a)** 4̲92 hundreds

(b) 23̲,441 thousands

(c) 2̲,340,711 millions

(d) 34̲0,592 ten-thousands

2. **(a)** 4,365,000

(b) Twenty-five million, six hundred seventy-five thousand

(c) Twelve million, seven hundred fifty thousand

(d) 753,000

(e) Thirteen million, five hundred twenty thousand

3. **(a)** $14 > 6$

(b) $72 < 81$

4.
$$\begin{array}{r} 51 \\ +\ 78 \\ \hline 129 \end{array}$$

5.
$$\begin{array}{r} 82 \\ \times\ 4 \\ \hline 328 \end{array}$$

6.
$$\begin{array}{r} 154 \\ -\ 41 \\ \hline 113 \end{array}$$

7.
$$\begin{array}{r} 227 \\ 4\overline{)\ 908} \\ -8 \\ \hline 10 \\ -8 \\ \hline 28 \\ -28 \\ \hline 0 \end{array}$$

8.
$$\begin{array}{r} {\scriptstyle 3\ \ } \\ {\scriptstyle 7\ \ } \\ 58 \\ \times\ 49 \\ \hline 522 \\ 2320 \\ \hline 2\,842 \end{array}$$

9.
$$\begin{array}{r} {\scriptstyle 1\ 1\ } \\ 149 \\ +\ 298 \\ \hline 447 \end{array}$$

10.
$$\begin{array}{r} 21 \text{ R } 9 \\ 15\overline{)\ 324} \\ -30 \\ \hline 24 \\ -15 \\ \hline 9 \end{array}$$

11.
$$\begin{array}{r} {\scriptstyle 9\ \ 9\ \ } \\ {\scriptstyle 2\ \not{1}\not{0}\ \not{1}\not{0}\ 12} \\ \not{3}\ \not{0}\ \not{0}\ \not{2} \\ -\ 2\ 4\ 5\ 6 \\ \hline 5\ \ 4\ 6 \end{array}$$

12.
$$\begin{array}{r} {\scriptstyle 0\ 10\ } \\ \not{1}\not{0},984 \\ -\ 2\ 881 \\ \hline 8\ 103 \end{array}$$

13.
$$\begin{array}{r} 20 \\ 42\overline{)\ 840} \\ -84 \\ \hline 00 \end{array}$$

14.
$$\begin{array}{r|l} 5 & 00000 \\ \times\ 3 & 000 \\ \hline \multicolumn{2}{l}{1{,}500{,}000{,}000} \end{array}$$

15.
$$\begin{array}{r} {\scriptstyle 2\ 1\ } \\ 34 \\ 89 \\ 191 \\ +\ 22 \\ \hline 336 \end{array}$$

16. $403(0) = 0$

17. $0\overline{)16}$ is undefined.

18. **(a)** $(11 \cdot 6) \cdot 3 = 11 \cdot (6 \cdot 3)$
The associative property of multiplication; the expression shows a change in grouping.

(b) $(11 \cdot 6) \cdot 3 = 3 \cdot (11 \cdot 6)$
The commutative property of

multiplication; the expression shows a change in the order of the factors.

19. **(a)** $4,8\boxed{5}0 \rightarrow 4,900$

(b) $12,\boxed{4}93 \rightarrow 12,000$

(c) $7,\boxed{9}63,126 \rightarrow 8,000,000$

20.
$$\begin{array}{rcr} 690,951 & \rightarrow & 690,000 \\ +\ 739,117 & \rightarrow & +\ 740,000 \\ \hline & & 1,430,000 \end{array}$$

There were approximately 1,430,000 people.

21. $8^2 \div 2^4 = 64 \div 16 = 4$

22.
$$\begin{aligned} 26 \cdot \sqrt{4} - 4(8-1) &= 26 \cdot \sqrt{4} - 4 \cdot 7 \\ &= 26 \cdot 2 - 4 \cdot 7 \\ &= 52 - 28 \\ &= 24 \end{aligned}$$

23. $36 \div 3(14-10) = 36 \div 3(4) = 12(4) = 48$

24.
$$\begin{aligned} 65 - 2\left(5 \cdot 3 - 11\right)^2 &= 65 - 2\left(15 - 11\right)^2 \\ &= 65 - 2\left(4\right)^2 \\ &= 65 - 2 \cdot 16 \\ &= 65 - 32 \\ &= 33 \end{aligned}$$

25.
$$\begin{aligned} x^2 + 2y &= 5^2 + 2\left(16\right) \\ &= 25 + 2\left(16\right) \\ &= 25 + 32 \\ &= 57 \end{aligned}$$

26. $x + \sqrt{y} = 5 + \sqrt{16} = 5 + 4 = 9$

27. *Given*: Quiz scores and number of quizzes for Brittany and Jennifer
Find: Who has the higher average
Operations: Find the average of each group.
Brittany:

$$\frac{29+28+24+27+30+30}{6} = \frac{168}{6} = 28$$

Jennifer:

$$\frac{30+30+29+28+28}{5} = \frac{145}{5} = 29$$

Jennifer has the higher average of 29.
Brittany has an average of 28.

28. **(a)** Subtract to find the change from Year 2 to Year 3.

$$\begin{array}{r} {\scriptstyle 2\ \ 911} \\ 21\not{3},\not{0}\not{1}5 \\ -\ 212,573 \\ \hline 442 \end{array}$$

thousand pizzas

(b) The greatest increase was from Year 3 to Year 4. The increase was 15,430.

$$\begin{array}{r} 228,445 \\ -\ 213,015 \\ \hline 15,430 \end{array}$$

29. Divide the number of calls by the number of weeks.
North: $80 \div 16 = 5$
South: $72 \div 18 = 4$
East: $84 \div 28 = 3$

The North Side Fire Department is the busiest with 5 calls per week.

30. Add the sides.

$$\begin{array}{r} {\scriptstyle 1} \\ 15 \\ 31 \\ 32 \\ 15 \\ 32 \\ +\ 31 \\ \hline 156 \end{array}$$

mm

31. Add to find the perimeter.

$$\begin{array}{r} {\scriptstyle 13} \\ 47 \\ 128 \\ 47 \\ +\ 128 \\ \hline 350 \end{array}$$

ft

Multiply to find the area.

$$\begin{array}{r} {\scriptstyle 13} \\ {\scriptstyle 15} \\ 128 \\ \times\ 47 \\ \hline {\scriptstyle 11} \\ 896 \\ \underline{5120} \\ 6016 \end{array}$$

ft^2

32.
$$\begin{array}{rcl} 2379 & \rightarrow & \overset{3}{2400} \\ \underline{\times 1872} & \rightarrow & \times \quad 1900 \\ & & \overline{2\,160\,000} \\ & & \underline{2\,400\,000} \\ & & 4{,}560{,}000 \text{ m}^2 \end{array}$$

Chapter 2 Integers and Algebraic Expressions

Review Your Skills

A. $12-10-1+4=2-1+4=1+4=5$

B. $22-3\cdot 6-1=22-18-1=4-1=3$

C. $24\div 8\cdot 2=3\cdot 2=6$

D. $2^2=4$

E. $32\div 4\div 2=8\div 2=4$

F.
$$\begin{aligned} 9^2-4(30-2\cdot 5) &= 9^2-4(30-10)\\ &= 9^2-4(20)\\ &= 81-4(20)\\ &= 81-80\\ &= 1 \end{aligned}$$

G. $13-8\div 2\cdot 3=13-4\cdot 3=13-12=1$

H. $\sqrt{16-3\cdot 4}=\sqrt{16-12}=\sqrt{4}=2$

I. $\sqrt{10^2-8^2}=\sqrt{100-64}=\sqrt{36}=6$

J. $50\div 2\div 5=25\div 5=5$

K. $18\div 9\cdot 3=2\cdot 3=6$

L. $\dfrac{50-40}{5-3}=\dfrac{10}{2}=5$

M. $\sqrt{5^2-3^2}=\sqrt{25-9}=\sqrt{16}=4$

1	A 5	2	B 3	6	4
C 6	3	D 4	2	5	1
E 4	2	3	5	F 1	6
5	G 1	6	4	3	H 2
3	4	1	I 6	2	J 5
2	K 6	L 5	1	M 4	3

Section 2.1 Integers, Absolute Value, and Opposite

Section 2.1 Practice Exercises

1. **(a)** positive; negative
(b) integers
(c) absolute
(d) opposites

2. –340 ft

3. –86 m

4. –$45

5. $3800

6. 5

7. –$500

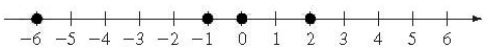
8. $23

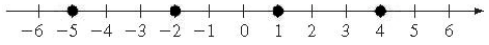
9. –14 lb

10. –2000 ft

11. 1,400,000

12. –$20,000

13. 

14. 

15. –2

16. 8

17. $0 > -3$

18. $-1 < 0$

19. $-8 > -9$

20. $-5 < -2$

21. $8 < 9$

22. $5 > 2$

23. $-226 < 198$

24. $408 > -416$

25. $|-2| = 2$

26. $|-9| = 9$

27. $|2| = 2$

28. $|9| = 9$

29. $|-427| = 427$

30. $|-615| = 615$

31. $|100,000| = 100,000$

32. $|64,000| = 64,000$

33. **(a)** –8

(b) $|-12|$

34. **(a)** –14

(b) $|-20|$

35. **(a)** 7

(b) $|7|$

36. **(a)** 4

(b) $|4|$

37. $|-5|$

38. $|-9|$

39. Neither, they are equal.

40. Neither, they are equal.

41. –5

42. –31

43. 12

44. 25

45. 0

46. –1

47. 1

48. 612

49. $-(-15) = 15$

50. $-(-4) = 4$

51. $-|-15| = -(15) = -15$

52. $-|-4| = -(4) = -4$

53. $-|15| = -(15) = -15$

54. $-|4| = -(4) = -4$

55. $|-15| = 15$

56. $|-4| = 4$

57. $-(-36) = 36$

58. $-(-19) = 19$

59. $-|-107| = -(107) = -107$

60. $-|-26| = -(26) = -26$

61. **(a)** $|-6| = 6$

(b) $-(-6) = 6$

(c) $-|6| = -(6) = -6$

(d) $|6| = 6$

(e) $-|-6| = -(6) = -6$

62. **(a)** $-(-12) = 12$

(b) $|12| = 12$

(c) $|-12| = 12$

(d) $-|-12| = -(12) = -12$

(e) $-|12| = -(12) = -12$

63. **(a)** $-|8| = -(8) = -8$

(b) $|8| = 8$

(c) $-|-8| = -(8) = -8$

(d) $-(-8) = 8$

(e) $|-8| = 8$

64. **(a)** $-|-1| = -(1) = -1$

(b) $-(-1) = 1$

(c) $|1| = 1$

(d) $|-1| = 1$

(e) $-|1| = -(1) = -1$

65. -6

66. -23

67. $-(-2)$

68. $-(-9)$

69. $|7|$

70. $|11|$

71. $|-3|$

72. $|-10|$

73. $-|14|$

74. $-|42|$

75. $|-12| = 12;\ |12| = 12;$ so $|-12| = |12|$

76. $-(-4) = 4;\ -|-4| = -4;$
so $-(-4) > -|-4|$

77. $|-22| = 22;\ -(22) = -22;$
so $|-22| > -(22)$

78. $-8 > -10$

79. $-44 > -54$

80. $-|0| = 0;\ -|1| = -1;$ so $-|0| > -|1|$

81. $|-55| = 55;\ -(-65) = 65;$
so $|-55| < -(-65)$

82. $-(82) = -82;\ |46| = 46;$
so $-(82) < |46|$

83. $-|32| = -32;\ |0| = 0;$ so $-|32| < |0|$

84. $-|22| = -22;\ 0 = 0;$ so $-|22| < 0$

85. Portland is between 20º and 30º; about 25ºF

86. Atlanta is between 40º and 50º; about 42ºF

87. Bismark is between –20º and –30º; about –22ºF

88. Denver is between 0º and –10º; about –8ºF

89. Eugene is between 0º and –10º; about –2ºF

90. Orlando is about 50ºF

91. Dallas is between 40º and 50º; about 44ºF

92. June is the greatest amount below average; -6 in.

93. September is the greatest amount above average.

94. August had the average amount of rainfall.

95. $-|-46| = -46$

$-(-24) = 24$

-60

$5^2 = 25$

$|-12| = 12$

$-60, -|-46|, |-12|, -(-24), 5^2$

96. -15

$-(-18) = 18$

$-|20| = -20$

$4^2 = 16$

$|-3|^2 = 3^2 = 9$

$-|20|, -15, |-3|^2, 4^2, -(-18)$

97. Positive

98. Positive

99. Negative

100. Negative

Section 2.2 Addition of Integers

Section 2.2 Practice Exercises

1.(a) 0

(b) negative; positive

(c) To find the sum of two numbers with different signs, subtract the smaller absolute value from the larger absolute value. The sum takes the sign of the addend with the greater absolute value.

2. $-6 < -5$

3. $-33 > -44$

4. $|-4| = 4;\ -|4| = -4;$ so $|-4| > -|4|$

5. $|6| = 6;\ |-6| = 6;$ so $|6| = |-6|$

6. $0 > -6$

7. $-|-10| = -10;\ 10 = 10;$ so $-|-10| < 10$

8. $-(-2) = 2;\ 2 = 2;$ so $-(-2) = 2$

9. $-3 + 5 = 2$

10. $-6 + 3 = -3$

11. $2 + (-4) = -2$

12. $5 + (-1) = 4$

13. $-4 + (-4) = -8$

14. $-2 + (-5) = -7$

15. $-3 + 9 = 6$

16. $-1 + 5 = 4$

17. $0 + (-7) = -7$

18. $(-5) + 0 = -5$

19. $-1 + (-3) = -4$

20. $-4 + (-3) = -7$

21. To add two numbers with the same sign, add their absolute values and apply the common sign.

22. $23 + 12 = 35$

23. $12 + 3 = 15$

24. $-8 + (-3) = -11$

25. $-10+(-6)=-16$

26. $-7+(-9)=-16$

27. $-100+(-24)=-124$

28. $23+50=73$

29. $44+45=89$

30. To add two numbers with different signs, subtract the smaller absolute value from the larger absolute value. Then apply the sign of the number having the larger absolute value.

31. $7+(-10)=-3$

32. $-8+2=-6$

33. $12+(-7)=5$

34. $-3+9=6$

35. $-90+66=-24$

36. $-23+49=26$

37. $78+(-33)=45$

38. $10+(-23)=-13$

39. $2+(-2)=0$

40. $-6+6=0$

41. $-13+13=0$

42. $45+(-45)=0$

43. $12+(-3)=9$

44. $-33+(-1)=-34$

45. $-23+(-3)=-26$

46. $-5+15=10$

47. $4+(-45)=-41$

48. $-13+(-12)=-25$

49. $(-103)+(-47)=-150$

50. $119+(-59)=60$

51. $0+(-17)=-17$

52. $-29+0=-29$

53. $-19+(-22)=-41$

54. $-300+(-24)=-324$

55. $-222+751=529$

56. $620+(-818)=-198$

57. $1158+(-378)=780$

58. $-2022+997=-1025$

59. $6+(-12)+8=-6+8=2$

60. $20+(-12)+(-5)=8+(-5)=3$

61. $-33+(-15)+18=-48+18=-30$

62. $3+5+(-1)=8+(-1)=7$

63. $7+(-3)+6=4+6=10$

64. $12+(-6)+(-9)=6+(-9)=-3$

65. $-10+(-3)+5=-13+5=-8$

66. $\begin{aligned}-23+(-4)+(-12)+(-5)&=-27+(-12)+(-5)\\&=-39+(-5)\\&=-44\end{aligned}$

67. $-18+(-5)+23=-23+23=0$

68. $\begin{aligned}14+(-15)+20+(-42)&=-1+20+(-42)\\&=19+(-42)\\&=-23\end{aligned}$

69. $4+(-12)+(-30)+16+10$
$=-8+(-30)+16+10$
$=-38+16+10$
$=-22+10$
$=-12$

70. $24+(-5)+(-19)=19+(-19)=0$

71. $-79+(-356)+244=-435+244=-191$

72. $620+(-949)+758=620+758+(-949)$
$=1378+(-949)=429$

73. $-23+49=26$

74. $89+(-11)=78$

75. $3+(-10)+5=-7+5=-2$

76. $-2+(-4)+14+20=-6+14+20$
$=8+20$
$=28$

77. $(-8+6)+(-5)=-2+(-5)=-7$

78. $(-25+7)+(-15)=-18+(-15)=-33$

79. $-6+(-1)+10+6+(-2)$
$=-7+10+6+(-2)$
$=3+6+(-2)$
$=9+(-2)$
$=7$ in.
Marquette had above average snowfall.

80. $1+(-3)+2+5+(-4)=-2+2+5+(-4)$
$=0+5+(-4)$
$=5+(-4)$
$=1$ in.
Hilo had above average rainfall.

81. $-5+(-1)+(-5)+(-5)=-6+(-5)+(-5)$
$=-11+(-5)$
$=-16$

82. $-6+3+(-4)+(-2)=-3+(-4)+(-2)$
$=-7+(-2)$
$=-9$

83. $-4+12=8^\circ\text{F}$

84. $-14+10=-4^\circ\text{F}$

85. $-\$56+\$389=\$333$

86. $\$23+(-\$40)=-\$17$

87. $-200+(-400)+1000+(-400)+600$
$=-\$600+\$1000+(-\$400)+\$600$
$=\$400+(-\$400)+\$600$
$=\$0+\$600$
$=\$600$

88. $3+2+(-8)+5+(-2)+4+21$
$=5+(-8)+5+(-2)+4+21$
$=-3+5+(-2)+4+21$
$=2+(-2)+4+21$
$=0+4+21$
$=4+21$
$=25$ yd

89. $0+2+(-1)+(-1)+0+(-1)+1+0+0$
$=2+(-1)+(-1)+0+(-1)+1+0+0$
$=1+(-1)+0+(-1)+1+0+0$
$=0+0+(-1)+1+0+0$
$=0+(-1)+1+0+0$
$=-1+1+0+0$
$=0+0+0$
$=0$

90. $1+1+0+0+(-1)+(-1)+0+0+2$
$=2+0+0+(-1)+(-1)+0+0+2$
$=2+(-1)+(-1)+0+0+2$
$=1+(-1)+0+0+2$
$=0+0+0+2$
$=2$

91. For example: $-12+2$

92. For example: $-6+(-8)$

93. For example: $-1+(-1)$

94. For example: $5+(-5)$

95. $302+(-422)=-120$

96. $-900+334=-566$

97. $-23,991+(-4423)=-28,414$

98. $-1034+(-23,291)=-24,325$

99.
$$\begin{aligned}23+(-125)+912+(-99)&=-102+912+(-99)\\&=810+(-99)\\&=711\end{aligned}$$

100.
$$\begin{aligned}891+12+(-223)+(-341)&=903+(-223)+(-341)\\&=680+(-341)\\&=339\end{aligned}$$

Section 2.3 Subtraction of Integers

Section 2.3 Practice Exercises

1. **(a)** $(-b)$

(b) $-5+4$

2. $34+(-13)=21$

3. $-34+(-13)=-47$

4. $-34+13=-21$

5. $-|-26|=-(26)=-26$

6. $-(-32)=32$

7.
$$\begin{aligned}-9+(-8)+5+(-3)+7&=-17+5+(-3)+7\\&=-12+(-3)+7\\&=-15+7\\&=-8\end{aligned}$$

8. To subtract two integers, add the opposite of the second number to the first number.

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

10. $5-11=5+(-11)=-6$

11. $4-(-3)=4+3=7$

12. $12-(-8)=12+8=20$

13. $-3-15=-3+(-15)=-18$

14. $-7-21=-7+(-21)=-28$

15. $-11-(-13)=-11+13=2$

16. $-23-(-9)=-23+9=-14$

17. $35-(-17)=35+17=52$

18. $23-(-12)=23+12=35$

19. $-24-9=-24+(-9)=-33$

20. $-5-15=-5+(-15)=-20$

21. $50-62=50+(-62)=-12$

22. $38-46=38+(-46)=-8$

23. $-17-(-25)=-17+25=8$

24. $-2-(-66)=-2+66=64$

25. $-8-(-8)=-8+8=0$

26. $-14-(-14)=-14+14=0$

27. $120-(-41)=120+41=161$

28. $91-(-62)=91+62=153$

29. $-15-19=-15+(-19)=-34$

30. $-82-44=-82+(-44)=-126$

31. $3-25=3+(-25)=-22$

32. $6-33=6+(-33)=-27$

33. $-13-13=-13+(-13)=-26$

34. $-43-43=-43+(-43)=-86$

35. $24-25=24+(-25)=-1$

36. $43-98=43+(-98)=-55$

37. $-6-(-38)=-6+38=32$

38. $-75-(-21)=-75+21=-54$

39. $-48-(-33)=-48+33=-15$

40. $-29-(-32)=-29+32=3$

41. $-320-(-198)=-320+198=-122$

42. $444-576=444+(-576)=-132$

43. $-1011-(-2020)=-1011+2020=1009$

44. $987-(-337)=987+337=1324$

45. $300-(-386)+575=300+386+576=1261$

46. $-40+605-815=-40+605+-815$
$=-40+-815+605$
$=-855+605=-250$

47. $2+5-(-3)-10=2+5+3+(-10)$
$=7+3+(-10)$
$=10+(-10)$
$=0$

48. $4-8+12-(-1)=4+(-8)+12+1$
$=-4+12+1$
$=8+1$
$=9$

49. $-5+6+(-7)-4-(-9)$
$=-5+6+(-7)+(-4)+9$
$=1+(-7)+(-4)+9$
$=-6+(-4)+9$
$=-10+9$
$=-1$

50. $-2-1+(-11)+6-(-8)$
$=-2+(-1)+(-11)+6+8$
$=-3+(-11)+6+8$
$=-14+6+8$
$=-8+8$
$=0$

51. $25-13-(-40)=25+(-13)+40$
$=12+40$
$=52$

52. $-35+15-(-28)=-35+15+28$
$=-20+28$
$=8$

53. minus, difference, decreased, less than, subtract from

54. Subtraction is not commutative.
$3-7\neq 7-3$

55. $14-23=14+(-23)=-9$

56. $27-40=27+(-40)=-13$

57. $105-110=105+(-110)=-5$

58. $70-98=70+(-98)=-28$

59. $320-(-20)=320+20=340$

60. $150-75=150+(-75)=75$

61. $5-12=5+(-12)=-7$

62. $16-10=16+(-10)=6$

63. $-34-21=-34+(-21)=-55$

64. $-90-22=-90+(-22)=-112$

65. $-35-24=-35+(-24)=-59$

66. $175-189=175+(-189)=-14$

67. $6000-(-423)=6000+423=6423^{\circ}\text{F}$

68. $214-(-184)=214+184=398^{\circ}\text{C}$

69. $-\$320-\$55=-\$320+(-\$55)=-\$375$
His balance is –$375.

70. $-\$210+\$25=-\$185$
His balance is –$185.

71. $17,476+1786-2342-754+321+1597$
$=19,262-2342-754+321+1597$
$=16,920-754+321+1597$
$=16,166+321+1597$
$=16,487+1597$
$=18,084$
The balance is $18,084.

72. $2036-150-25+480-200+80$
$=1886-25+480-200+80$
$=1861+480-200+80$
$=2341-200+80$
$=2141+80$
$=2221$
The balance is $2221.

73. $66-(-98)=66+98=164$

74. $16-(-40)=16+40=56$

75. $-56+66+(-98)+16+(-40)$
$=10+(-98)+16+(-40)$
$=-88+16+(-40)$
$=-72+(-40)$
$=-112$

76. Because the total change is negative, the Dow was down for the week.

77. The range is $3^{\circ}-(-8^{\circ})=3^{\circ}+8^{\circ}=11^{\circ}$.

78. The range is $-1^{\circ}-(-12^{\circ})=-1^{\circ}+12^{\circ}=11^{\circ}$.

79. For example: $4-10$

80. For example: $10-30$

81. $5, 1, -3, -7, -11, -15, -19$

82. $-13, -18, -23, -28, -33, -38, -43$

83. Positive

84. Negative

85. Positive

86. Positive or zero

87. Negative

88. Negative

89. Negative

90. Positive

91. $-190-223=-413$

92. $-288-145=-433$

93. $-23,624-(-9001)=-14,623$

94. $-14,593-(-34,499)=19,906$

95. $892,904-(-23,546)=916,450$

96. $104,839-(-24,938)=129,777$

97. $29,029-(-35,798)=64,827$ ft

98. $4392-(-86)=4478$ m

Section 2.4 Multiplication and Division of Integers

Section 2.4 Practice Exercises

1. **(a)** positive; negative
(b) positive; negative

2. **(a)** $|-5|=5$
(b) $|5|=5$
(c) $-|5|=-5$
(d) $-|-5|=-(5)=-5$
(e) $-(-5)=5$

3. $14-(-5)=14+5=19$

4. $-24-50=-24+(-50)=-74$

5. $-33+(-11)=-44$

6. $-7-(-23)=-7+23=16$

7. $23-12+(-4)-(-10)$
$=23+(-12)+(-4)+10$
$=11+(-4)+10$
$=7+10$
$=17$

8. $9+(-12)-17-4-(-15)$
$=9+(-12)+(-17)+(-4)+15$
$=-3+(-17)+(-4)+15$
$=-20+(-4)+15$
$=-24+15$
$=-9$

9. $-3(5)=-15$

10. $-2(13)=-26$

11. $-5(-8)=40$

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

13. $7(-3)=-21$

14. $5(-12)=-60$

15. $-12(-4)=48$

16. $-6(-11)=66$

17. $-15(3)=-45$

18. $-3(25)=-75$

19. $9(-8)=-72$

20. $8(-3)=-24$

21. $-14(0)=0$

22. $-8(0)=0$

23. $-95(-1)=95$

24. $-144(-1)=144$

25. $-3(-1)=3$

26. $-12(-4)=48$

27. $-5(3)=-15$

28. $9(-2)=-18$

29. $3(-5)=-15$

30. $-3(6)=-18$

31. $(-5)(-2)(-4)(-10)=10(-4)(-10)$
$=-40(-10)$
$=400$

32. $(-3)(-5)(-2)(-4)=15(-2)(-4)$
$=-30(-4)$
$=120$

33. $(-11)(-4)(-2)=44(-2)=-88$

34. $(-20)(-3)(-1)=60(-1)=-60$

35. $(24)(-2)(0)(-3)=-48(0)(-3)$
$=0(-3)$
$=0$

36. $(3)(0)(-13)(22)=0(-13)(22)$
$=0(22)$
$=0$

37. $(-1)(-1)(-1)(-1)(-1)(-1)$
$=1(-1)(-1)(-1)(-1)$
$=-1(-1)(-1)(-1)$
$=1(-1)(-1)$
$=-1(-1)$
$=1$

38. $(-1)(-1)(-1)(-1)(-1)(-1)(-1)$
$=1(-1)(-1)(-1)(-1)(-1)$
$=-1(-1)(-1)(-1)(-1)$
$=1(-1)(-1)(-1)$
$=-1(-1)(-1)$
$=1(-1)$
$=-1$

39. $(-2)(2)(2)(-2)(2)=-4(2)(-2)(2)$
$=-8(-2)(2)$
$=16(2)$
$=32$

40. $(2)(-2)(2)(2)=-4(2)(2)$
$=-8(2)$
$=-16$

41. $-10^2=-(10)(10)=-10(10)=-100$

42. $-8^2=-(8)(8)=-8(8)=-64$

43. $(-10)^2=(-10)(-10)=100$

44. $(-8)^2=(-8)(-8)=64$

45. $-10^3=-(10)(10)(10)$
$=-10(10)(10)$
$=-100(10)$
$=-1000$

46. $-8^3=-(8)(8)(8)$
$=-8(8)(8)$
$=-64(8)$
$=-512$

47. $(-10)^3 = (-10)(-10)(-10)$
$= 100(-10)$
$= -1000$

48. $(-8)^3 = (-8)(-8)(-8) = 64(-8) = -512$

49. $-5^4 = -(5)(5)(5)(5)$
$= -5(5)(5)(5)$
$= -25(5)(5)$
$= -125(5)$
$= -625$

50. $-4^4 = -(4)(4)(4)(4)$
$= -4(4)(4)(4)$
$= -16(4)(4)$
$= -64(4)$
$= -256$

51. $(-5)^4 = (-5)(-5)(-5)(-5)$
$= 25(-5)(-5)$
$= -125(-5)$
$= 625$

52. $(-4)^4 = (-4)(-4)(-4)(-4)$
$= 16(-4)(-4)$
$= -64(-4)$
$= 256$

53. $(-1)^2 = (-1)(-1) = 1$

54. $(-1)^3 = (-1)(-1)(-1) = 1(-1) = -1$

55. $-1^4 = -(1)(1)(1)(1)$
$= -1(1)(1)(1)$
$= -1(1)(1)$
$= -1(1)$
$= -1$

56. $-1^5 = -(1)(1)(1)(1)(1)$
$= -(1)(1)(1)(1)$
$= -1(1)(1)(1)$
$= -1(1)(1)$
$= -1(1)$
$= -1$

57. $60 \div (-3) = -20$

58. $46 \div (-2) = -23$

59. $\dfrac{-56}{-8} = 7$

60. $\dfrac{-48}{-3} = 16$

61. $\dfrac{-15}{5} = -3$

62. $\dfrac{30}{-6} = -5$

63. $-84 \div (-4) = 21$

64. $-48 \div (-6) = 8$

65. $\dfrac{-13}{0}$ = Undefined

66. $\dfrac{-41}{0}$ = Undefined

67. $\dfrac{0}{-18} = 0$

68. $\dfrac{0}{-6} = 0$

69. $(-20) \div (-5) = 4$

70. $(-10) \div (-2) = 5$

71. $\dfrac{204}{-6} = -34$

72. $\dfrac{300}{-2} = -150$

73. $(-100) \div (20) = -5$

74. $(46) \div (-23) = -2$

75. $(-64) \div (-32) = 2$

76. $(-108) \div (-4) = 27$

77. $(-52) \div (13) = -4$

78. $(-45) \div (-15) = 3$

79. $(-60) \div (10) = -6$ ft/min

80. $(-27) \div (3) = -9^\circ$ F

81. $-25 - 40 = -65$
$(-65) \div (5) = -13^\circ$ F

82. $-1804 - (-528) = -1804 + 528 = -1276$
$(-1276) \div (2) = -638$ m

83. $5(225) = 1125$
$890 - 1125 = -\$235$

84. $2(150) + 82 = 300 + 82 = 382$
$320 - 382 = -\$62$

85. $-3(6) = -18$ ft

86. $-9(5) = -45$ in

87. $18(-6) = -108$

88. $24(-2) = -48$

89. $18 \div (-6) = -3$

90. $24 \div (-2) = -12$

91. $(-9)(-12) = 108$

92. $-36 \div (-12) = 3$

93. $-90 \div (-6) = 15$

94. $(-5)(-4) = 20$

95. $\dfrac{0}{-2} = 0$

96. $-24 \div 0 =$ Undefined

97. $-90 \div 0 =$ Undefined

98. $\dfrac{0}{-5} = 0$

99. $(-2)(-5)(4) = 10(4) = 40$

100. $(10)(-2)(-3)(-5) = -20(-3)(-5)$
$= 60(-5)$
$= -300$

101. $(-7)^2 = (-7)(-7) = 49$

102. $-7^2 = -(7)(7) = -7(7) = -49$

103. **(a)** $-35 \div (-5) = 7$
(b) $35 \div (-5) = -7$

104. **(a)** $-36 \div (-4) = 9$
(b) $36 \div (-4) = -9$

105. $1(+1) + 0(-1) = 1 + 0 = +1$

106. $17(+1) + 18(-1) = 17 + (-18) = -1$

107. $8(+1) + 10(-1) = 8 + (-10) = -2$

108. $20(+1) + 18(-1) = 20 + (-18) = +2$

109. $a \cdot b = (\text{positive})(\text{negative}) = \text{negative}$

110. $b \div a = (\text{negative}) \div (\text{positive}) = \text{negative}$

111. $|a| \div b = (\text{positive}) \div (\text{negative}) = \text{negative}$

112. $a \cdot |b| = (\text{positive})(\text{positive}) = \text{positive}$

113. $-a \div b = (\text{negative}) \div (\text{negative}) = \text{positive}$

114. $a(-b) = (\text{positive})(\text{positive}) = \text{positive}$

115. $(-413)(871) = -359,723$

116. $(-6125)(-97) = 594,125$

117. $\dfrac{-576,828}{-10,682} = 54$

118. $5,945,308 \div (-9452) = -629$

Problem Recognition Exercises: Operations on Integers

1. **(a)** $(-24)(-2) = 48$

(b) $(-24) - (-2) = -24 + 2 = -22$

(c) $(-24) + (-2) = -26$

(d) $(-24) \div (-2) = 12$

2. **(a)** $12(-3) = -36$

(b) $12 - (-3) = 12 + 3 = 15$

(c) $12 + (-3) = 9$

(d) $12 \div (-3) = -4$

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

4. $9(-5) = -45$

5. $-3 - (-7) = -3 + 7 = 4$

6. $\dfrac{28}{-4} = -7$

7. $-23(-2) = 46$

8. $-4 - 18 = -4 + (-18) = -22$

9. $\dfrac{42}{-2} = -21$

10. $-18 + (-13) = -31$

11. $10 - (-12) = 10 + 12 = 22$

12. $\dfrac{-21}{-7} = 3$

13. $-6(-9) = 54$

14. $\begin{aligned} -7 + 4 + 8 + (-16) + (-5) &= -3 + 8 + (-16) + (-5) \\ &= 5 + (-16) + (-5) \\ &= -11 + (-5) \\ &= -16 \end{aligned}$

15. **(a)** $15 - (-5) = 15 + 5 = 20$

(b) $15(-5) = -75$

(c) $15 + (-5) = 10$

(d) $15 \div (-5) = -3$

16. **(a)** $-36(-2) = 72$

(b) $-36 - (-2) = -36 + 2 = -34$

(c) $\dfrac{-36}{-2} = 18$

(d) $-36 + (-2) = -38$

17. **(a)** $20(-4) = -80$

(b) $-20(-4) = 80$

(c) $-20(4) = -80$

(d) $20(4) = 80$

18. **(a)** $|-50| = 50$

(b) $-(-50) = 50$

(c) $|50| = 50$

(d) $-|-50| = -(50) = -50$

19. **(a)** $-5-9-2=-5+(-9)+(-2)$
$=-14+(-2)$
$=-16$

(b) $-5(-9)(-2)=45(-2)=-90$

20. **(a)** $10+(-3)+(-12)=7+(-12)=-5$

(b) $10-(-3)-(-12)=10+3+12$
$=13+12$
$=25$

21. **(a)** $(-1)(-2)(-3)(-4)=2(-3)(-4)$
$=-6(-4)$
$=24$

(b) $(-1)(-2)(-3)(4)=2(-3)(4)$
$=-6(4)$
$=-24$

22. **(a)** $(5)(-2)(-6)(1)=(-10)(-6)(1)$
$=60(1)$
$=60$

(b) $(-5)(-2)(6)(-1)=10(6)(-1)$
$=60(-1)$
$=-60$

23. $\dfrac{0}{-8}=0$

24. $-55\div 0=$ Undefined

25. $-615-(-705)=-615+705=90$

26. $-184-409=-184+(-409)=-593$

27. $420\div(-14)=-30$

28. $-3600\div(-90)=40$

29. $-44-(-44)=-44+44=0$

30. $-37-(-37)=-37+37=0$

31. $(-9)^2=(-9)(-9)=81$

32. $(-2)^5=(-2)(-2)(-2)(-2)(-2)$
$=4(-2)(-2)(-2)$
$=-8(-2)(-2)$
$=16(-2)$
$=-32$

33. $-9^2=-(9)(9)=-9(9)=-81$

34. $-2^5=-(2)(2)(2)(2)(2)$
$=-2(2)(2)(2)(2)$
$=-4(2)(2)(2)$
$=-8(2)(2)$
$=-16(2)$
$=-32$

35. $\dfrac{-46}{0}=$ Undefined

36. $0\div(-16)=0$

37. $-15,042+4893=-10,149$

38. $-84,506+(-542)=-85,048$

Section 2.5 Order of Operations and Algebraic Expressions

Section 2.5 Practice Exercises

1. $-7\div 0$ is undefined.

2. $0\div -7=0$

3. $-100\div(-4)=25$

4. $-100-(-4)=-100+4=-96$

5. $-100(-4)=400$

6. $-100+(-4)=-104$

7. $(-12)^2 = (-12)(-12) = 144$

8. $-12^2 = -(12)(12) = -12(12) = -144$

9. $-1-5-8-3 = -1+(-5)+(-8)+(-3)$
$= -6+(-8)+(-3)$
$= -14+(-3)$
$= -17$

10. $-2-6-3-10 = -2+(-6)+(-3)+(-10)$
$= -8+(-3)+(-10)$
$= -11+(-10)$
$= -21$

11. $(-1)(-5)(-8)(-3) = 5(-8)(-3)$
$= -40(-3)$
$= 120$

12. $(-2)(-6)(-3)(-10) = 12(-3)(-10)$
$= -36(-10)$
$= 360$

13. $5+2(3-5) = 5+2(3+(-5))$
$= 5+2(-2)$
$= 5+(-4)$
$= 1$

14. $6-4(8-10) = 6+(-4)(8+(-10))$
$= 6+(-4)(-2)$
$= 6+8$
$= 14$

15. $-2(3-6)+10 = -2(3+(-6))+10$
$= -2(-3)+10$
$= 6+10$
$= 16$

16. $-4(1-3)-8 = -4(1+(-3))+(-8)$
$= -4(-2)+(-8)$
$= 8+(-8)$
$= 0$

17. $-8-6^2 = -8-36 = -8+(-36) = -44$

18. $-10-5^2 = -10-25 = -10+(-25) = -35$

19. $120 \div (-4)(5) = -30(5) = -150$

20. $36 \div (-2)(3) = -18(3) = -54$

21. $40-32 \div (-4)(2) = 40-(-8)(2)$
$= 40-(-16)$
$= 40+16$
$= 56$

22. $48-36 \div (6)(-2) = 48-6(-2)$
$= 48-(-12)$
$= 48+12$
$= 60$

23. $100-2(3-8) = 100-2(3+(-8))$
$= 100-2(-5)$
$= 100-(-10)$
$= 100+10$
$= 110$

24. $55-3(2-6) = 55-3(2+(-6))$
$= 55-3(-4)$
$= 55-(-12)$
$= 55+12$
$= 67$

25. $|-10+13|-|-6| = |3|-|-6|$
$= 3-6$
$= 3+(-6)$
$= -3$

26. $|4-9|-|-10| = |-5|-|-10|$
$= 5-10$
$= -5$

27. $\sqrt{100-36}-3\sqrt{16}=\sqrt{64}-3\sqrt{16}$
$=8-3(4)$
$=8-12$
$=-4$

28. $\sqrt{36-11}+2\sqrt{9}=\sqrt{25}+2\sqrt{9}$
$=5+2(3)$
$=5+6$
$=11$

29. $5^2-(-3)^2=5\cdot5-(-3)(-3)=25-9=16$

30. $6^2-(-4)^2=6\cdot6-(-4)(-4)$
$=36-16$
$=20$

31. $-3+2(5-9)^2=-3+2(-4)^2$
$=-3+2(-4)(-4)$
$=-3+2(16)$
$=-3+32$
$=29$

32. $-5+4(8-10)^2=-5+4(-2)^2$
$=-5+4(-2)(-2)$
$=-5+4(4)$
$=-5+16$
$=11$

33. $12+(14-16)^2\div(-4)=12+(-2)^2\div(-4)$
$=12+(-2)(-2)\div(-4)$
$=12+4\div(-4)$
$=12+(-1)$
$=11$

34. $-7+(1-5)^2\div4=-7+(-4)^2\div4$
$=-7+(-4)(-4)\div4$
$=-7+16\div4$
$=-7+4$
$=-3$

35. $-48\div12\div(-2)=-4\div(-2)=2$

36. $-100\div(-5)\div(-5)=20\div(-5)=-4$

37. $90\div(-3)\cdot(-1)\div(-6)=-30\cdot(-1)\div(-6)$
$=30\div(-6)$
$=-5$

38. $64\div(-4)\cdot2\div(-16)=-16\cdot2\div(-16)$
$=-32\div(-16)$
$=2$

39. $\left[7^2-9^2\right]\div(-5+1)$
$=[49-81]\div(-5+1)$
$=-32\div(-4)$
$=8$

40. $\left[(-8)^2-5^2\right]\div(-4+1)$
$=[64-25]\div(-4+1)$
$=39\div(-3)$
$=-13$

41. $2+2^2-10-12=2+4-10-12$
$=2+4+(-10)+(-12)$
$=6+(-10)+(-12)$
$=-4+(-12)$
$=-16$

42. $14-4^2+2-10=14-16+2-10$
$=14+(-16)+2+(-10)$
$=-2+2+(-10)$
$=0+(-10)$
$=-10$

43. $\dfrac{3^2-27}{-9+6}=\dfrac{9-27}{-9+6}=\dfrac{-18}{-3}=6$

44. $\dfrac{8+(-2)^2}{-5+(-1)}=\dfrac{8+4}{-5+(-1)}=\dfrac{12}{-6}=-2$

45. $\dfrac{13-(2)(4)}{-1-2^2}=\dfrac{13-(2)(4)}{-1-4}$
$=\dfrac{13-8}{-1-4}$
$=\dfrac{5}{-5}$
$=-1$

46. $\dfrac{10-(-3)(5)}{-9-4^2}=\dfrac{10-(-3)(5)}{-9-16}$
$=\dfrac{10-(-15)}{-9-16}$
$=\dfrac{10+15}{-9-16}$
$=\dfrac{25}{-25}$
$=-1$

47. $\dfrac{|-23+7|}{5^2-(-3)^2}=\dfrac{|-23+7|}{25-9}=\dfrac{|-16|}{16}=\dfrac{16}{16}=1$

48. $\dfrac{|10-50|}{6^2-(-4)^2}=\dfrac{|10-50|}{36-16}=\dfrac{|-40|}{20}=\dfrac{40}{20}=2$

49. $21-\left[4-(5-8)\right]=21-\left[4-(-3)\right]$
$=21-[4+3]$
$=21-7$
$=14$

50. $15-\left[10-(20-25)\right]=15-\left[10-(-5)\right]$
$=15-[10+5]$
$=15-15$
$=0$

51. $-17-2\left[18\div(-3)\right]=-17-2[-6]$
$=-17-(-12)$
$=-17+12$
$=-5$

52. $-8-5(-45\div15)=-8-5(-3)$
$=-8-(-15)$
$=-8+15$
$=7$

53. $4+2\left[9+(-4+12)\right]=4+2[9+8]$
$=4+2[17]$
$=4+34$
$=38$

54. $-13+3\left[11+(-15+10)\right]$
$=-13+3\left[11+(-5)\right]$
$=-13+3[6]$
$=-13+18$
$=5$

55. $-36\div(-2)\div6(-3)\cdot2=18\div6(-3)\cdot2$
$=3(-3)\cdot2$
$=-9\cdot2$
$=-18$

56. $-48\div(4)\div2(-5)\cdot2=-12\div2(-5)\cdot2$
$=-6(-5)\cdot2$
$=30\cdot2$
$=60$

57. $\$15x$

58. $\$12p$

59. $(t+4)$ in.

60. $(h+1)$ hr

61. $(v-6)$ mph

62. $(A-30)$ yr

63. $2g$

64. $2t$

65. $-12n$

66. $-3z$

67. $-9-x$

68. $-18-p$

69. $\dfrac{t}{-2}$

70. $\dfrac{-10}{w}$

71. $y+(-14)$

72. $c+(-150)$

73. $2(c+d)$

74. $2(a+b)$

75. $x-(-8)$

76. $m-(-5)$

77. $x+9z=-10+9(-3)=-10+(-27)=-37$

78. $a+7b=-3+7(-6)=-3+(-42)=-45$

79. $\begin{aligned} x+5y+z &= -10+5(5)+2 \\ &= -10+25+2 \\ &= 15+2 \\ &= 17 \end{aligned}$

80. $\begin{aligned} 9p+4t+w &= 9(2)+4(6)+(-50) \\ &= 18+24+(-50) \\ &= 42+(-50) \\ &= -8 \end{aligned}$

81. $\begin{aligned} a-b+3c &= -7-(-2)+3(4) \\ &= -7+2+12 \\ &= -5+12 \\ &= 7 \end{aligned}$

82. $\begin{aligned} w+2y-z &= -9+2(10)-(-3) \\ &= -9+20+3 \\ &= 11+3 \\ &= 14 \end{aligned}$

83. $-3mn=-3(-8)(-2)=24(-2)=-48$

84. $-5pq=-5(-4)(-2)=20(-2)=-40$

85. $|-y|=|-(-9)|=|9|=9$

86. $|-z|=|-(-18)|=|18|=18$

87. $-|-w|=-|-(-4)|=-|4|=-4$

88. $-|-m|=-|-(-15)|=-|15|=-15$

89. $x^2=(-3)^2=(-3)(-3)=9$

90. $n^2=(-9)^2=(-9)(-9)=81$

91. $-x^2=-(-3)^2=-(-3)(-3)=3(-3)=-9$

92. $-n^2=-(-9)^2=-(-9)(-9)=9(-9)=-81$

93. $\begin{aligned} -4|x+3y| &= -4|5+3(-6)| \\ &= -4|5+(-18)| \\ &= -4|-13| \\ &= -4(13) \\ &= -52 \end{aligned}$

94. $\begin{aligned} -2|4a-b| &= -2|4(-8)-(-2)| \\ &= -2|-32+2| \\ &= -2|-30| \\ &= -2(30) \\ &= -60 \end{aligned}$

95. $\begin{aligned} 6-|m-n^2| &= 6-|-2-3^2| \\ &= 6-|-2-9| \\ &= 6-|-11| \\ &= 6-11 \\ &= -5 \end{aligned}$

96. $4-\left|c^2-d^2\right|=4-\left|3^2-(-5)^2\right|$

$=4-\left|9-25\right|$

$=4-\left|9+(-25)\right|$

$=4-\left|-16\right|$

$=4-16$

$=-12$

97. $\dfrac{-8+(-11)+(-4)+1+9+4+(-5)}{7}$

$=\dfrac{-19+(-4)+1+9+4+(-5)}{7}$

$=\dfrac{-23+1+9+4+(-5)}{7}$

$=\dfrac{-22+9+4+(-5)}{7}$

$=\dfrac{-13+4+(-5)}{7}$

$=\dfrac{-9+(-5)}{7}$

$=\dfrac{-14}{7}$

$=-2^{\circ}$

98. $\dfrac{15+12+10+3+0+(-2)+(-3)}{7}$

$=\dfrac{27+10+3+0+(-2)+(-3)}{7}$

$=\dfrac{37+3+0+(-2)+(-3)}{7}$

$=\dfrac{40+0+(-2)+(-3)}{7}$

$=\dfrac{38+(-3)}{7}$

$=\dfrac{35}{7}$

$=5^{\circ}$

99. $\dfrac{-8+(-8)+(-6)+(-5)+(-2)+(-3)+3+3+0+(-4)}{10}$

$=\dfrac{-16+(-6)+(-5)+(-2)+(-3)+3+3+0+(-4)}{10}$

$=\dfrac{-22+(-5)+(-2)+(-3)+3+3+0+(-4)}{10}$

$=\dfrac{-27+(-2)+(-3)+3+3+0+(-4)}{10}$

$=\dfrac{-29+(-3)+3+3+0+(-4)}{10}$

$=\dfrac{-32+3+3+0+(-4)}{10}$

$=\dfrac{-29+3+0+(-4)}{10}$

$=\dfrac{-26+0+(-4)}{10}$

$=\dfrac{-30}{10}$

$=-3$

100. $\dfrac{-6+(-2)+5+1+0+(-3)+4+2+(-7)+(-4)}{10}$

$=\dfrac{-8+5+1+0+(-3)+4+2+(-7)+(-4)}{10}$

$=\dfrac{-3+1+0+(-3)+4+2+(-7)+(-4)}{10}$

$=\dfrac{-2+0+(-3)+4+2+(-7)+(-4)}{10}$

$=\dfrac{-5+4+2+(-7)+(-4)}{10}$

$=\dfrac{-1+2+(-7)+(-4)}{10}$

$=\dfrac{1+(-7)+(-4)}{10}$

$=\dfrac{-6+(-4)}{10}$

$=\dfrac{-10}{10}$

$=-1$

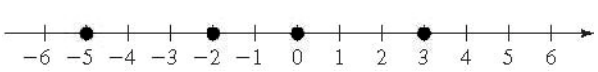
Chapter 2 Review Exercises

Section 2.1

1. -4250 ft

2. $-\$3,000,000$

3 – 6.



7. Opposite: 4; Absolute value: 4

8. Opposite: –6; Absolute value: 6

9. $|-3|=3$

10. $|-1000|=1000$

11. $|74|=74$

12. $|0|=0$

13. $-(-9)=9$

14. $-(-28)=28$

15. $-|-20|=-(20)=-20$

16. $-|-45|=-(45)=-45$

17. $-7=-7$;
$|-7|=7$;
$-7<|-7|$

18. $-12<-5$

19. $-(-4)=4$;
$-|-4|=-(4)=-4$;
$-(-4)>-|-4|$

20. $-20=-20$;
$-|-20|=-(20)=-20$;
$-20=-|-20|$

Section 2.2

21. $6+(-2)=4$

22. $-3+6=3$

23. $-3+(-2)=-5$

24. $-3+0=-3$

25. To add two numbers with the same sign, add their absolute values and apply the common sign.

26. To add two numbers with different signs, subtract the smaller absolute value from the larger absolute value. Then apply the sign of the number having the larger absolute value.

27. $35+(-22)=13$

28. $-105+90=-15$

29. $-29+(-41)=-70$

30. $-98+(-42)=-140$

31.
$$\begin{aligned}-3+(-10)+12+14+(-10)&=-13+12+14+(-10)\\&=-1+14+(-10)\\&=13+(-10)\\&=3\end{aligned}$$

32.
$$\begin{aligned}9+(-15)+2+(-7)+(-4)&=-6+2+(-7)+(-4)\\&=-4+(-7)+(-4)\\&=-11+(-4)\\&=-15\end{aligned}$$

33. $23+(-35)=-12$

34. $57+(-10)=47$

35. $-5+(-13)+20=-18+20=2$

36. $-42+12=-30$

37. $-12+3=-9$

38. $-89+(-22)=-111$

39. $-4+9+(-3)+1+(-5)$
$=5+(-3)+1+(-5)$
$=2+1+(-5)$
$=3+(-5)$
$=-2$
Caribou had below average snowfall.

40. $2+(-2)+(-1)+(-4)=0+(-1)+(-4)$
$=-1+(-4)$
$=-5$

Section 2.3

41. To subtract two integers, add the opposite of the second number to the first number.

42. $4-(-23)=4+23=27$

43. $19-44=19+(-44)=-25$

44. $-2-(-24)=-2+24=22$

45. $-289-130=-289+(-130)=-419$

46. $2-7-3=2+(-7)+(-3)$
$=-5+(-3)$
$=-8$

47. $-45-(-77)+8=-45+77+8$
$=32+8$
$=40$

48. $-16-4-(-3)=-16+(-4)+3$
$=-20+3$
$=-17$

49. $99-(-7)-6=99+7+(-6)$
$=106+(-6)$
$=100$

50. **(a)** $8-10=8+(-10)=-2$
(b) $10-8=10+(-8)=2$

51. For example: 14 subtracted from –2

52. For example: Subtract –7 from –25

53. $-1-(-6)=-1+6=5$
The temperature rose 5ºF.

54. $-40+132=92$
Sam's new balance is \$92.

55. $\dfrac{-3+4+0+9+(-2)+(-1)+0+5+(-3)}{9}$
$=\dfrac{1+0+9+(-2)+(-1)+0+5+(-3)}{9}$
$=\dfrac{10+(-2)+(-1)+0+5+(-3)}{9}$
$=\dfrac{8+(-1)+0+5+(-3)}{9}$
$=\dfrac{7+0+5+(-3)}{9}$
$=\dfrac{12+(-3)}{9}$
$=\dfrac{9}{9}$
$=1$
The average is 1 above par.

56. $2400-(-1050)=2400+1050=3450$ ft

Section 2.4

57. $6(-3)=-18$

58. $\dfrac{-12}{4}=-3$

59. $\dfrac{-900}{-60}=15$

60. $(-7)(-8)=56$

61. $-36\div 9=-4$

62. $60 \div (-5) = -12$

63. $(-12)(-4)(-1)(-2) = 48(-1)(-2)$
$= -48(-2)$
$= 96$

64. $(-1)(-8)(2)(1)(-2) = 8(2)(1)(-2)$
$= 16(1)(-2)$
$= 16(-2)$
$= -32$

65. $-15 \div 0 =$ Undefined

66. $\dfrac{0}{-5} = 0$

67. $-5^3 = -(5)(5)(5) = -5(5)(5)$
$= -25(5) = -125$

68. $(-5)^3 = (-5)(-5)(-5) = 25(-5) = -125$

69. $(-6)^2 = (-6)(-6) = 36$

70. $-6^2 = -(6)(6) = -6(6) = -36$

71. $(-1)^{10}$
$= -1(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)$
$= 1(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)$
$= -1(-1)(-1)(-1)(-1)(-1)(-1)(-1)$
$= 1(-1)(-1)(-1)(-1)(-1)(-1)$
$= -1(-1)(-1)(-1)(-1)(-1)$
$= 1(-1)(-1)(-1)(-1)$
$= -1(-1)(-1)(-1)$
$= 1(-1)(-1)$
$= -1(-1)$
$= 1$

72. $(-1)^{21} = -1$

73. Negative

74. Positive

75. $-45 \div (-15) = 3$

76. $-4 \cdot 19 = -76$

77. $\dfrac{-12}{4} = -3^\circ \text{F}$

78. $550 - 4(160) = 550 - 640$
$= 550 + (-640)$
$= -\$90$

Section 2.5

79. $50 - 3(6-2) = 50 - 3(4)$
$= 50 - 12$
$= 50 + (-12)$
$= 38$

80. $48 - 8 \div (-2) + 5 = 48 - (-4) + 5$
$= 48 + 4 + 5$
$= 52 + 5$
$= 57$

81. $28 \div (-7) \cdot 3 - (-1) = -4 \cdot 3 - (-1)$
$= -12 + 1$
$= -11$

82. $(-4)^2 \div 8 - (-6) = 16 \div 8 - (-6)$
$= 2 + 6$
$= 8$

83.

$\left[10 - (-3)^2\right] \cdot (-11) + 4 = [10 - 9] \cdot (-11) + 4$
$= 1 \cdot (-11) + 4$
$= -11 + 4$
$= -7$

84. $\left[-9-(-7)\right]^2 \bullet 3 \div (-6) = \left[-9+7\right]^2 \bullet 3 \div (-6)$
$= \left[-2\right]^2 \bullet 3 \div (-6)$
$= 4 \bullet 3 \div (-6)$
$= 12 \div (-6)$
$= -2$

85. $\dfrac{100-4^2}{(-7)(6)} = \dfrac{100-16}{(-7)(6)} = \dfrac{84}{-42} = -2$

86. $\dfrac{18-3(-2)}{4^2-8} = \dfrac{18-3(-2)}{16-8} = \dfrac{18-(-6)}{16-8}$
$= \dfrac{18+6}{16-8} = \dfrac{24}{8} = 3$

87. $5-2\left[-3+(2-5)\right] = 5-2\left[-3+(-3)\right]$
$= 5-2\left[-6\right]$
$= 5-(-12)$
$= 5+12$
$= 17$

88. $-10+3\left[4-(-2+7)\right] = -10+3\left[4-5\right]$
$= -10+3\left[-1\right]$
$= -10+(-3)$
$= -13$

89. $(a+8)$ yr

90. $\$3n$

91. $-5x$

92. $p-12$

93. $(a+b)+2$

94. $\dfrac{w}{4}$

95. $y-(-8)$

96. $2(5+z)$

97. $3x-2y = 3(-5)-2(4)$
$= -15-8$
$= -15+(-8)$
$= -23$

98. $5(a-4b) = 5(-3-4(2))$
$= 5(-3-8)$
$= 5(-3+(-8))$
$= 5(-11)$
$= -55$

99. $-2(x+y)^2 = -2(6+(-9))^2$
$= -2(-3)^2$
$= -2(9)$
$= -18$

100. $-3w^2-2z = -3(-4)^2-2(-9)$
$= -3(16)-2(-9)$
$= -48-(-18)$
$= -48+18$
$= -30$

101. $-|x| = -|-2| = -(2) = -2$

102. $-|-x| = -|-(-5)| = -|5| = -(5) = -5$

103. $-(-x) = -(-(-10)) = -(10) = -10$

104. $-(-x) = -(-5) = 5$

Chapter 2 Test

1. $-\$220$

2. 26

3. $-5 < -2$

4. $|-5| = 5;$
$|-2| = 2;$
$|-5| > |-2|$

5. $0 = 0;$
$-(-2) = 2;$
$0 < -(-2)$

6. $-|-12| = -(12) = -12;$
$-12 = -12;$
$-|-12| = -12$

7. $-|-9| = -(9) = -9;$
$9 = 9;$
$-|-9| < 9$

8. $-5^2 = -(5)(5) = -5(5) = -25;$
$(-5)^2 = (-5)(-5) = 25;$
$-5^2 < (-5)^2$

9. $|-10| = 10$

10. $-(-10) = 10$

11. $9 + (-14) = -5$

12. $-23 + (-5) = -28$

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

14. $-30 - 11 = -30 + (-11) = -41$

15. $-15 + 21 = 6$

16. $5 - 28 = 5 + (-28) = -23$

17. $6(-12) = -72$

18. $(-11)(-8) = 88$

19. $\dfrac{-24}{-12} = 2$

20. $\dfrac{54}{-3} = -18$

21. $\dfrac{-44}{0} =$ Undefined

22. $(-91)(0) = 0$

23. $-3(-7) = 21$

24. $-13 + 8 = -5$

25. $18 - (-4) = 18 + 4 = 22$

26. $6 \div (-2) = -3$

27. $-8 + 5 = -3$

28. $-3 + 15 + (-6) + (-1) = 12 + (-6) + (-1)$
$= 6 + (-1)$
$= 5$

29. $-1 + 2 + (-4) + (-2) + (-2)$
$= 1 + (-4) + (-2) + (-2)$
$= -3 + (-2) + (-2)$
$= -5 + (-2)$
$= -7$ in
Atlanta had below average rainfall.

30. $\dfrac{-35}{5} = -7^\circ \text{F}$

31. **(a)** $(-8)^2 = (-8)(-8) = 64$
(b) $-8^2 = -(8)(8) = -8(8) = -64$
(c) $(-4)^3 = (-4)(-4)(-4)$
$= 16(-4) = -64$
(d) $-4^3 = -(4)(4)(4) = -4(4)(4)$
$= -16(4) = -64$

32. $-14+22-(-5)+(-10)$
$=-14+22+5+(-10)$
$=8+5+(-10)$
$=13+(-10)$
$=3$

33. $(-3)(-1)(-4)(-1)(-5)$
$=3(-4)(-1)(-5)$
$=-12(-1)(-5)$
$=12(-5)$
$=-60$

34. $16-2\left[5-(1-4)\right]=16-2\left[5-(-3)\right]$
$=16-2[5+3]$
$=16-2[8]$
$=16-16$
$=0$

35. $-20\div(-2)^2+(-14)=-20\div 4+(-14)$
$=-5+(-14)$
$=-19$

36. $12\cdot(-6)+\left[20-(-12)\right]-15$
$=12\cdot(-6)+[20+12]-15$
$=12\cdot(-6)+32-15$
$=-72+32+(-15)$
$=-40+(-15)$
$=-55$

37. $\dfrac{24-2|3-9|}{8-2^2}=\dfrac{24-2|-6|}{8-2^2}$
$=\dfrac{24-2(6)}{8-4}$
$=\dfrac{24-12}{8-4}$
$=\dfrac{12}{4}$
$=3$

38. $\$18m$

39. $-x^2+y^2=-(4)^2+(-1)^2=-16+1=-15$

40. $-4m-3n=-4(-6)-3(4)=24-12=12$

Chapters 1–2 Cumulative Review Exercises

1. Ten-thousands place

2. One hundred thirty is less than two hundred forty-four.

3.
132	100
589	600
490	500
	1200 ft

4. $73+41=114$

5. $71+(-4)+81+(-106)=67+81+(-106)$
$=148+(-106)$
$=42$

6. $284-171-(-84)-393$
$=284+(-171)+84+(-393)$
$=113+84+(-393)$
$=197+(-393)$
$=-196$

7.
$$\begin{array}{r} {\not 9}\ {\not 9} \\ {\not 10}\ {\not 10}11 \\ 1\,0\,0\,1 \\ -\ 2\,3\,5 \\ \hline 7\,6\,6 \end{array}$$

8. $31\cdot(-8)=-248$

9. $-386\div(-2)=193$

10.
$$\begin{array}{r} 105 \text{ R } 2 \\ 7\overline{)\,737} \\ \underline{-7} \\ 03 \\ \underline{-0} \\ 37 \\ \underline{-35} \\ 2 \end{array}$$

11.
$$\begin{array}{r} 409 \\ \times\ 228 \\ \hline {\scriptstyle 1\ 1} \\ {\scriptstyle 1}\ 3\,272 \\ 8\,180 \\ +\ 81\,800 \\ \hline 93{,}252 \end{array}$$

12. $\dfrac{0}{-61} = 0$

13. $0\overline{)341}$ Undefined

14. $5(28) = 140 \text{ m}^2$

15. **(a)** $-|-4| = -(4) = -4$

(b) $-(-4) = 4$

(c) $-4^2 = -(4)(4) = -4(4) = -16$

(d) $(-4)^2 = (-4)(-4) = 16$

16.
$$\begin{aligned} -14 - 2(9 - 5^2) &= -14 - 2(9 - 25) \\ &= -14 - 2(9 + (-25)) \\ &= -14 - 2(-16) \\ &= -14 - (-32) \\ &= -14 + 32 \\ &= 18 \end{aligned}$$

17.
$$\begin{aligned} x^2 - x + y &= (-4)^2 - (-4) + 1 \\ &= 16 + 4 + 1 = 20 + 1 = 21 \end{aligned}$$

18. $|x - y| = |-4 - 1| = |-5| = 5$

19. **(a)** $30 \cdot 4 = 120$

$120 \div 3 = 40$ days

Torie can take the herb for 40 days if she takes 3 a day

(b) $120 \div 2 = 60$ days

Torie can take the herb for 60 days if she takes 2 a day.

20.
$$\begin{aligned} &\frac{-8 + (-11) + 3 + 6 + 0 + (-8) + (-10)}{7} \\ &= \frac{-19 + 3 + 6 + 0 + (-8) + (-10)}{7} \\ &= \frac{-16 + 6 + 0 + (-8) + (-10)}{7} \\ &= \frac{-10 + 0 + (-8) + (-10)}{7} \\ &= \frac{-18 + (-10)}{7} = \frac{-28}{7} = -4^\circ \text{F} \end{aligned}$$

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