CHAPTER 1   WHOLE NUMBERS

1.1   Reading and Writing Whole Numbers

1.1   Margin Exercises

1.   **(a)** 342

   4 is in the *tens* place.

   (b) 714

   4 is in the *ones* place.

   (c) 479

   4 is in the *hundreds* place.

2.   The place value of each digit:

   (a) 14,218; ones: 8; tens: 1; hundreds: 2;

   thousands: 4; ten-thousands: 1

   (b) 460,329; ones: 9; tens: 2; hundreds: 3;

   thousands: 0; ten-thousands: 6;

   hundred-thousands: 4

3.   The digits in each period (group) of
   3,251,609,328:

   (a) 3 is in the billions period.

   (b) 251 is in the millions period.

   (c) 609 is in the thousands period.

   (d) 328 is in the ones period.

4.   **(a)** 18 is eighteen.

   (b) 36 is thirty-six.

   (c) 418 is four hundred eighteen.

   (d) 902 is nine hundred two.

5.   **(a)** 3104 is three <u>thousand</u>, one <u>hundred</u> four.

   (b) 95,372 is ninety-five <u>thousand</u>, three hundred seventy-two.

   (c) 100,075,002 is one hundred million, seventy-five thousand, two.

   (d) 11,022,040,000 is eleven billion, twenty-two million, forty thousand.

6.   **(a)** One thousand, four hundred thirty-seven is 1437.

   (b) Nine hundred seventy-one thousand, six is 971,006.

   (c) Eighty-two million, three hundred twenty-five is 82,000,325.

7.   **(a)** The U.S. population in the 2010 column is 309 million and is written in digits as 3<u>09</u>,000,000.

   (b) The estimated U.S. population in the 2020 column is 338 million and is written in digits as 338,000,000.

   (c) The household income in 1990 was $42,936 and is written in words as forty-two thousand, nine hundred thirty-six dollars.

   (d) The estimated average yearly salary in 2020 is $32,080 and is written in words as thirty-two thousand, eighty dollars.

1.1   Section Exercises

1.   The digit in the hundreds place in the whole number 3<u>0</u>65 is 0. **(c)**

2.   The digit in the ten-thousands place in the whole number 1<u>3</u>4,681 is 3. **(b)**

3.   <u>18</u>,<u>0</u>15; ten-thousands: 1; hundreds: 0

4.   <u>8</u>6,33<u>2</u>; ten-thousands: 8; ones: 2

5.   7,62<u>8</u>,592,18<u>3</u>; millions: 8; thousands: 2

6.   <u>1</u>,7<u>00</u>,225,016; billions: 1; millions: 0

7.   The digits in the thousands period in the whole number 552,<u>687</u>,318 are 687.

8.   The digits in the millions period in the whole number 974,<u>321</u>,876,528 are 321.

9.   <u>3</u>,<u>561</u>,<u>435</u>; millions: 3; thousands: 561; ones: 435

10.   <u>100</u>,<u>258</u>,<u>100</u>,<u>006</u>; billions: 100; millions: 258; thousands: 100; ones: 6

11.   Evidence suggests that this is true. It is common to count using fingers.

12.   No doubt there is a relationship here. One answer might be that people could count using their fingers and toes and, therefore, thought of them as numbers or digits.

13.   23,115 is twenty-three thousand, one hundred fifteen. The statement is *false* (no "and").

14.   37,886 is thirty-seven thousand, eight hundred eighty-six. The statement is *true*.

15.   346,009 is three hundred forty-six <u>thousand</u>, <u>nine</u>.

16.   218,033 is two hundred eighteen <u>thousand</u>, thirty-<u>three</u>.

17.   25,756,665 is twenty-five million, seven hundred fifty-six thousand, six hundred sixty-five.

18.   999,993,000 is nine hundred ninety-nine million, nine hundred ninety-three thousand.

19. Sixty-three thousand, one hundred sixty-three is
6<u>3</u>,1<u>63</u>.

20. Ninety-five thousand, one hundred eleven is
9<u>5</u>,<u>111</u>.

21. Ten million, two hundred twenty-three is
10,000,223.

22. One hundred million, two hundred is 100,000,200.

23. Three million, two hundred thousand in digits is
3,200,000.

24. Two hundred forty-three thousand in digits is
243,000.

25. Fifty million, fifty-one thousand, five hundred
seven in digits is 50,051,507.

26. One hundred forty-six billion, three hundred
eighty-five million in digits is 146,385,000,000.

27. Fifty-four million, seven hundred fifty thousand in
digits is 54,750,000.

28. Two hundred twenty-one thousand in digits is
221,000.

29. Eight hundred trillion, six hundred twenty-one
million, twenty thousand, two hundred fifteen in
digits is 800,000,621,020,215.

30. 2,153,896,448 is two billion, one hundred fifty-
three million, eight hundred ninety-six thousand,
four hundred forty-eight.

31. The least used method of transportation is public
transportation. 6,069,589 in words is six million,
sixty-nine thousand, five hundred eighty-nine.

32. From the table, "drive alone" is the method of
transportation most used. 84,215,298 written out is
eighty-four million, two hundred fifteen thousand,
two hundred ninety-eight.

33. The number of people who walk to work or work
at home is 7,894,911. In words, 7,894,911 is
written as seven million, eight hundred ninety-four
thousand, nine hundred eleven.

34. From the table, the number of people who carpool
is 15,377,634. Written in words, 15,377,634 is
fifteen million, three hundred seventy-seven
thousand, six hundred thirty-four.

1.2 Adding Whole Numbers

1.2 Margin Exercises

1. **(a)** $2 + 6 = \underline{8}; 6 + \underline{2} = 8$

(b) $9 + 5 = 14; 5 + 9 = 14$

(c) $4 + 7 = 11; 7 + 4 = 11$

(d) $6 + 9 = 15; 9 + 6 = 15$

2. **(a)**
$$\begin{array}{r} 3 \\ 8 \\ 5 \\ 4 \\ + 6 \\ \hline 26 \end{array} \quad \begin{array}{l} 3 + 8 = 11 \\ 11 + 5 = 16 \\ 16 + 4 = 20 \\ 20 + 6 = 26 \end{array}$$

(b)
$$\begin{array}{r} 5 \\ 6 \\ 3 \\ 2 \\ + 4 \\ \hline 20 \end{array} \quad \begin{array}{l} 5 + 6 = 11 \\ 11 + 3 = 14 \\ 14 + 2 = 16 \\ 16 + 4 = 20 \end{array}$$

(c)
$$\begin{array}{r} 9 \\ 6 \\ 8 \\ 7 \\ + 3 \\ \hline 33 \end{array} \quad \begin{array}{l} 9 + 6 = 15 \\ 15 + 8 = 23 \\ 23 + 7 = 30 \\ 30 + 3 = 33 \end{array}$$

(d)
$$\begin{array}{r} 3 \\ 8 \\ 6 \\ 4 \\ + 8 \\ \hline 29 \end{array} \quad \begin{array}{l} 3 + 8 = 11 \\ 11 + 6 = 17 \\ 17 + 4 = 21 \\ 21 + 8 = 29 \end{array}$$

3. **(a)**
$$\begin{array}{r} 26 \\ + 73 \\ \hline 99 \end{array}$$

(b)
$$\begin{array}{r} 534 \\ + 265 \\ \hline 799 \end{array}$$

(c)
$$\begin{array}{r} 42,305 \\ + 11,563 \\ \hline 53,868 \end{array}$$

4. **(a)**
$$\begin{array}{r} \overset{1}{6}6 \\ + 27 \\ \hline 93 \end{array}$$ 6 ones and 7 ones = 13 ones

(b)
$$\begin{array}{r} \overset{1}{5}8 \\ + 33 \\ \hline 91 \end{array}$$ 8 ones and 3 ones = 11 ones

(c)
$$\begin{array}{r} \overset{1}{5}6 \\ + 37 \\ \hline 93 \end{array}$$ 6 ones and 7 ones = 13 ones

(d) $\overset{1}{3}4$
     $+\ 49$ 4 ones and 9 ones = 13 ones
     $\overline{83}$

5. (a) $\overset{1\ 21}{162}$
         $4\ 271$
         372
         $+\ 8\ 976$
         $\overline{13,\underline{781}}$

    (b) $\overset{2\ 21}{7\ 821}$
         435
         72
         305
         $+\ 1\ 693$
         $\overline{10,326}$

6. (a) 816
         363
         17
         2
         5
         $+\ 7654$
         $\overline{8857}$

    (b) $15,829$
         765
         78
         15
         9
         7
         $+\ 13,179$
         $\overline{29,882}$

7. The shortest route from Lake Buena Vista to Conway is as follows:

    4   *Lake Buena Vista to Resort Area*
    6   *Resort Area to Pine Castle*
    3   *Pine Castle to Belle Isle*
    $+\ \underline{6}$ *Belle Isle to Conway*
    $\overline{19}$ *miles*

8. The next shortest route from Orlando to Clear Lake is as follows:

    5   *Orlando to Pine Hills*
    8   *Pine Hills to Altamonte Springs*
    5   *Altamonte Springs to Casselberry*
    6   *Casselberry to Bertha*
    7   *Bertha to Winter Park*
    $+\ 7$ *Winter Park to Clear Lake*
    $\overline{38}$ *miles*

9. $\overset{22}{5}26$
     297
     526
     $+\ 297$
     $\overline{1646}$ feet

    The amount of fencing needed is 1646 feet, which is the perimeter of (distance around) the project.

10. (a) 63
         4
         9
         $+\ 28$
         $\overline{104}$ correct

    (b) 927
         395
         64
         $+\ 251$
         $\overline{1637}$ correct

    (c) 79
         218
         7
         $+\ 639$
         $\overline{943}$ (953 is incorrect.)

    (d) $21,892$
         $11,746$
         $+\ 43,925$
         $\overline{77,563}$ (79,563 is incorrect.)

1.2   Section Exercises

1. 43
     $+\ 54$
     $\overline{97}$

2. 18
     $+\ 11$
     $\overline{29}$

3. 56
     $+\ 33$
     $\overline{89}$

4. 83
     $+\ 15$
     $\overline{98}$

5. 317
     $+\ 572$
     $\overline{889}$

6. 574
     $+\ 325$
     $\overline{899}$

7.
$$\begin{array}{r} 318 \\ 151 \\ +\,420 \\ \hline 889 \end{array}$$

8.
$$\begin{array}{r} 135 \\ 253 \\ +\,410 \\ \hline 798 \end{array}$$

9.
$$\begin{array}{r} 6310 \\ 252 \\ +\,1223 \\ \hline 7785 \end{array}$$

10.
$$\begin{array}{r} 121 \\ 5705 \\ +\,3163 \\ \hline 8989 \end{array}$$

11. Line up:
$$\begin{array}{r} 932 \\ 44 \\ +\,613 \\ \hline 1589 \end{array}$$ correct

12. Line up:
$$\begin{array}{r} 517 \\ 131 \\ +\,250 \\ \hline 898 \end{array}$$ (1098 is incorrect.)

13. Line up:
$$\begin{array}{r} 1251 \\ 4311 \\ +\,2114 \\ \hline 7676 \end{array}$$ (7686 is incorrect.)

14. Line up:
$$\begin{array}{r} 3241 \\ 1513 \\ +\,2014 \\ \hline 6768 \end{array}$$ correct

15. Line up:
$$\begin{array}{r} 12{,}142 \\ 43{,}201 \\ +\,23{,}103 \\ \hline 78{,}446 \end{array}$$

16. Line up:
$$\begin{array}{r} 41{,}124 \\ 12{,}302 \\ +\,23{,}500 \\ \hline 76{,}926 \end{array}$$

17. Line up:
$$\begin{array}{r} 3213 \\ +\,5715 \\ \hline 8928 \end{array}$$

18. Line up:
$$\begin{array}{r} 6344 \\ +\,1655 \\ \hline 7999 \end{array}$$

19. Line up:
$$\begin{array}{r} 38{,}204 \\ +\,21{,}020 \\ \hline 59{,}224 \end{array}$$

20. Line up:
$$\begin{array}{r} 63{,}251 \\ +\,36{,}305 \\ \hline 99{,}556 \end{array}$$

21.
$$\begin{array}{r} \overset{1}{8}7 \\ +\,63 \\ \hline 150 \end{array}$$ correct

22.
$$\begin{array}{r} \overset{1}{1}9 \\ +\,92 \\ \hline 111 \end{array}$$ (101 is incorrect.)

23.
$$\begin{array}{r} \overset{1}{8}6 \\ +\,69 \\ \hline 155 \end{array}$$ correct

24.
$$\begin{array}{r} \overset{1}{3}7 \\ +\,85 \\ \hline 122 \end{array}$$ (132 is incorrect.)

25.
$$\begin{array}{r} \overset{1}{4}7 \\ +\,74 \\ \hline 121 \end{array}$$ (111 is incorrect.)

26.
$$\begin{array}{r} \overset{1}{9}7 \\ +\,79 \\ \hline 176 \end{array}$$

27.
$$\begin{array}{r} \overset{1}{6}7 \\ +\,78 \\ \hline 145 \end{array}$$

28.
$$\begin{array}{r} \overset{1}{9}6 \\ +\,47 \\ \hline 143 \end{array}$$

29.
$$\begin{array}{r} \overset{1}{7}3 \\ +\,29 \\ \hline 102 \end{array}$$

30.
$$\begin{array}{r} \overset{1}{6}8 \\ +\,37 \\ \hline 105 \end{array}$$

31.
$$\begin{array}{r} 7\overset{1}{4}6 \\ +\,905 \\ \hline 165\,1 \end{array}$$

32.
$$\begin{array}{r} \overset{1}{6}21 \\ +\ 359 \\ \hline 980 \end{array}$$

33.
$$\begin{array}{r} \overset{1}{3}06 \\ +\ 848 \\ \hline 1154 \end{array}$$

34.
$$\begin{array}{r} \overset{11}{7}98 \\ +\ 206 \\ \hline 1004 \end{array}$$

35.
$$\begin{array}{r} \overset{11}{2}78 \\ +\ 135 \\ \hline 413 \end{array}$$

36.
$$\begin{array}{r} \overset{1}{1}72 \\ +\ 156 \\ \hline 328 \end{array}$$

37.
$$\begin{array}{r} 9\overset{1}{2}8 \\ +\ 843 \\ \hline 1771 \end{array}$$

38.
$$\begin{array}{r} \overset{11}{6}86 \\ +\ 726 \\ \hline 1412 \end{array}$$

39.
$$\begin{array}{r} 5\overset{11}{2}6 \\ +\ 884 \\ \hline 1410 \end{array}$$

40.
$$\begin{array}{r} \overset{11}{1}16 \\ +\ 897 \\ \hline 1013 \end{array}$$

41.
$$\begin{array}{r} \overset{1}{3}5\overset{1}{7}4 \\ +\ 2817 \\ \hline 6391 \end{array}$$

42.
$$\begin{array}{r} \overset{1}{6}871 \\ +\ 7528 \\ \hline 14,399 \end{array}$$

43.
$$\begin{array}{r} \overset{1}{7}8\overset{1}{9}6 \\ +\ \ 3728 \\ \hline 11,624 \end{array}$$

44.
$$\begin{array}{r} 9\overset{1}{3}82 \\ +\ \ 7586 \\ \hline 16,968 \end{array}$$

45.
$$\begin{array}{r} 9\overset{1}{6}\overset{11}{2}5 \\ +\ \ 7986 \\ \hline 17,611 \end{array}$$

46.
$$\begin{array}{r} 5\overset{1}{7}\overset{1}{1}8 \\ 5623 \\ +\ \ 7436 \\ \hline 18,777 \end{array}$$

47.
$$\begin{array}{r} 9\overset{2}{0}\overset{2}{5}6 \\ 78 \\ 6089 \\ +\ \ \ \ 731 \\ \hline 15,954 \end{array}$$

48.
$$\begin{array}{r} 4\overset{1}{0}\overset{1}{2}2 \\ 709 \\ 8621 \\ +\ \ \ \ \ 37 \\ \hline 13,389 \end{array}$$

49.
$$\begin{array}{r} \overset{112}{1}8 \\ 708 \\ 9286 \\ +\ \ \ \ 636 \\ \hline 10,648 \end{array}$$

50.
$$\begin{array}{r} 1\overset{2}{7}\overset{11}{0}8 \\ 321 \\ 61 \\ +\ \ \ 8926 \\ \hline 11,016 \end{array}$$

51.
$$\begin{array}{r} 4\overset{1}{2}\overset{11}{2} \\ 6074 \\ 435 \\ +\ \ \ 8663 \\ \hline 15,594 \end{array}$$

52.
$$\begin{array}{r} 6\overset{12}{5}05 \\ 173 \\ 7044 \\ +\ \ \ \ 168 \\ \hline 13,890 \end{array}$$

53.
$$\begin{array}{r} 3\overset{1}{2}\overset{1}{1} \\ 9603 \\ 8 \\ 21 \\ +\ \ \ 1604 \\ \hline 11,557 \end{array}$$

54.
$$\overset{2\,1\,2}{7\,6\,3\,1}$$
$$5\,983$$
$$7$$
$$36$$
$$+\quad 505$$
$$\overline{14,162}$$

55.
$$\overset{1\,1\,2}{2\,1\,0\,9}$$
$$63$$
$$16$$
$$3$$
$$+\ 9\,887$$
$$\overline{12,078}$$

56.
$$\overset{1\,1\,3}{3\,2\,2}$$
$$6\,508$$
$$93$$
$$745$$
$$18$$
$$+\,2\,005$$
$$\overline{9\,691}$$

57.
$$\overset{2\,3\,3}{5\,5\,3}$$
$$97$$
$$2\,772$$
$$437$$
$$63$$
$$+\quad 328$$
$$\overline{4\,250}$$

58.
$$\overset{2\,2\,3}{3\,1\,8\,7}$$
$$810$$
$$527$$
$$76$$
$$2\,665$$
$$+\quad 317$$
$$\overline{7\,582}$$

59.
$$\overset{2\,1\,2}{4\,1\,3}$$
$$85$$
$$9\,919$$
$$602$$
$$31$$
$$+\ \ 1\,218$$
$$\overline{12,268}$$

60.
$$\overset{3\,3\,2}{5\,7\,6}$$
$$7\,934$$
$$60$$
$$781$$
$$5\,968$$
$$+\quad 371$$
$$\overline{15,690}$$

61. Add up to check addition.

$$\underline{2091}$$
$$832$$
$$468$$
$$+\,791$$
$$\overline{2091}\ \text{correct}$$

62. Add up to check addition.

$$\underline{1857}$$
$$326$$
$$852$$
$$+\,679$$
$$\overline{1857}\ \text{correct}$$

63. Add up to check addition.

$$\underline{769}$$
$$179$$
$$214$$
$$+\,376$$
$$\overline{759}\ \text{incorrect; should be 769}$$

64. Add up to check addition.

$$\underline{1120}$$
$$17$$
$$296$$
$$713$$
$$+\,94$$
$$\overline{1220}\ \text{incorrect; should be 1120}$$

65. Add up to check addition.

$$\underline{5420}$$
$$4713$$
$$28$$
$$615$$
$$+\,64$$
$$\overline{5420}\ \text{correct}$$

66. Add up to check addition.

$$11,583$$
$$\underline{}$$
$$3\,628$$
$$72$$
$$564$$
$$\underline{+\,7\,319}$$
$$11,583 \text{ correct}$$

67. Add up to check addition.

$$11,577$$
$$\underline{}$$
$$678$$
$$7\,952$$
$$56$$
$$718$$
$$\underline{+\,2\,173}$$
$$11,377 \text{ incorrect; should be } 11,577$$

68. Add up to check addition.

$$11,212$$
$$\underline{}$$
$$516$$
$$8\,760$$
$$24$$
$$189$$
$$\underline{+\,1\,723}$$
$$11,212 \text{ correct}$$

69. Add up to check addition.

$$14,332$$
$$\underline{}$$
$$4714$$
$$27$$
$$77$$
$$8878$$
$$\underline{+\,636}$$
$$14,332 \text{ correct}$$

70. Add up to check addition.

$$16,709$$
$$\underline{}$$
$$6\,715$$
$$283$$
$$9\,617$$
$$13$$
$$\underline{+\,81}$$
$$16,719 \text{ incorrect; should be } 16,709$$

71. Changing the order in which numbers are added does not change the sum. You can add from bottom to top when checking addition.

72. Grouping the addition of numbers in any order does not change the sum. You can add numbers in any order. For example, you can add pairs of numbers that add to 10.

73. The shortest route between Southtown and Rena is through Thomasville.

$$21 \quad \textit{Southtown to Thomasville}$$
$$\underline{+\,12} \quad \textit{Thomasville to Rena}$$
$$33 \quad \textit{miles}$$

74. The shortest route from Elk Hill to Oakton is through Thomasville.

$$18 \quad \textit{Elk Hill to Thomasville}$$
$$\underline{+\,17} \quad \textit{Thomasville to Oakton}$$
$$35 \quad \textit{miles}$$

75. The shortest route between Thomasville and Murphy is through Rena and Austin.

$$12 \quad \textit{Thomasville to Rena}$$
$$15 \quad \textit{Rena to Austin}$$
$$\underline{+\,11} \quad \textit{Austin to Murphy}$$
$$38 \quad \textit{miles}$$

76. The shortest route from Murphy to Thomasville is through Austin and Rena.

$$11 \quad \textit{Murphy to Austin}$$
$$15 \quad \textit{Austin to Rena}$$
$$\underline{+\,12} \quad \textit{Rena to Thomasville}$$
$$38 \quad \textit{miles}$$

77.
$$\$3\,482 \quad \textit{flea market}$$
$$\underline{+\,12,860} \quad \textit{annual auction}$$
$$\$16,342 \quad \textit{total amount raised}$$

78.
$$185 \quad \textit{hot dogs}$$
$$\underline{+\,129} \quad \textit{hamburgers}$$
$$314 \quad \textit{total items sold}$$

79.
$$413 \quad \textit{women}$$
$$\underline{+\,286} \quad \textit{men}$$
$$699 \quad \textit{total people}$$

80.
$$283 \quad \textit{employees}$$
$$\underline{+\,218} \quad \textit{employees}$$
$$501 \quad \textit{total employees}$$

81.
$$13,786 \quad \textit{on-campus day}$$
$$3\,497 \quad \textit{on-campus night}$$
$$\underline{+\,2\,874} \quad \textit{on-line}$$
$$20,157 \quad \textit{total students}$$

82.
$$\overset{3\,3}{887}$$
$$223$$
$$465$$
$$683$$
$$597$$
$$214$$
$$\underline{+\,1817}$$
$$4886 \quad \textit{total tornadoes}$$

83. To find the perimeter, add the lengths of the 4 sides in any order.

$$\begin{array}{r} 325 \\ 160 \\ 325 \\ + 160 \\ \hline 970 \end{array} \text{ feet}$$

970 feet is the total distance around the lot.

84. To find the perimeter, add the lengths of the 4 sides in any order.

$$\begin{array}{r} 48 \\ 32 \\ 48 \\ + 32 \\ \hline 160 \end{array} \text{ feet}$$

Maria will need 160 feet of gutters.

85. To find the perimeter, add the lengths of the 3 sides in any order.

$$\begin{array}{r} 30 \\ 24 \\ + 18 \\ \hline 72 \end{array} \text{ feet}$$

Martin will need 72 feet of lumber.

86. To find the perimeter, add the lengths of the 4 sides in any order.

$$\begin{array}{r} 465 \\ 573 \\ 498 \\ + 573 \\ \hline 2109 \end{array} \text{ meters}$$

2109 meters of fencing will be needed.

87. The largest four-digit number possible, using the digits 4, 1, 9, and 2 each once, will begin with the largest digit in the thousands place and the remaining digits will descend in size until the smallest digit is in the ones place. Therefore, the largest four-digit number possible is 9421.

88. The smallest four-digit number possible, using the digits 4, 1, 9, and 2 each once, will begin with the smallest digit in the thousands place and the remaining digits will ascend in size until the largest digit is in the ones place. Therefore, the smallest four-digit number possible is 1249.

89. The largest five-digit number possible, using the digits 6, 2, and 7 at least once, will use the largest digit in the ten-thousands, thousands, and hundreds place and the remaining digits will descend in size

until the smallest digit is in the ones place. Therefore, the largest five-digit number possible is 77,762.

90. The smallest five-digit number possible, using the digits 6, 2, and 7 at least once, will use the smallest digit in the ten-thousands, thousands, and hundreds place and the remaining digits will ascend in size until the largest digit is in the ones place. Therefore, the smallest five-digit number possible is 22,267.

91. The largest seven-digit number possible is 9,994,433.

92. The smallest seven-digit number possible is 3,334,499.

93. To write the largest seven-digit number possible, using the digits 4, 3, and 9, and using each digit at least twice, write the largest digits on the left, and use the smaller digits as you move right.

94. To write the smallest seven-digit number possible, using the digits 4, 3, and 9, and using each digit at least twice, write the smallest digits on the left, and use the larger digits as you move right.

1.3 Subtracting Whole Numbers

1.3 Margin Exercises

1. **(a)** $8 + 2 = 10$:

$$10 - \underline{2} = 8 \quad \text{or} \quad 10 - \underline{8} = \underline{2}$$

(b) $7 + 4 = 11$:

$$11 - 7 = 4 \quad \text{or} \quad 11 - 4 = 7$$

(c) $15 + 22 = 37$:

$$37 - 15 = 22 \quad \text{or} \quad 37 - 22 = 15$$

(d) $23 + 55 = 78$:

$$78 - 55 = 23 \quad \text{or} \quad 78 - 23 = 55$$

2. **(a)** $7 - 5 = 2$:

$$7 = 5 + \underline{2} \quad \text{or} \quad 7 = 2 + 5$$

(b) $9 - 4 = 5$:

$$9 = 4 + 5 \quad \text{or} \quad 9 = 5 + 4$$

(c) $21 - 15 = 6$:

$$21 = 15 + 6 \quad \text{or} \quad 21 = 6 + 15$$

(d) $58 - 42 = 16$:

$$58 = 42 + 16 \quad \text{or} \quad 58 = 16 + 42$$

3. **(a)** $\begin{array}{r} 74 \\ - 43 \\ \hline 31 \end{array}$ 4 ones $-$ 3 ones $=$ 1 one
7 tens $-$ 4 tens $=$ 3 tens

(b)   68   8 ones − 4 ones = 4 ones
$\begin{array}{r} -\ 24 \\ \hline 44 \end{array}$ 6 tens − 2 tens = 4 tens

(c)   429
$\begin{array}{r} 429 \\ -\ 318 \\ \hline 111 \end{array}$

(d)   3927
$\begin{array}{r} 3927 \\ -\ 2614 \\ \hline 1313 \end{array}$

4. **(a)**
$\begin{array}{r} 76 \\ -\ 45 \\ \hline 31 \end{array}$ *Subtraction problem* $\begin{array}{r} 45 \\ +\ \underline{31} \\ \hline \underline{76} \end{array}$ *Addition problem*

Match: 31 is correct.

(b)
$\begin{array}{r} 53 \\ -\ 22 \\ \hline 21 \end{array}$ *Subtraction problem* $\begin{array}{r} 22 \\ +\ 21 \\ \hline 43 \end{array}$ *Addition problem*

Not a match: 21 is incorrect.

Rework.

$\begin{array}{r} 53 \\ -\ 22 \\ \hline 31 \end{array}$ *Subtraction problem* $\begin{array}{r} 22 \\ +\ 31 \\ \hline 53 \end{array}$ *Addition problem*

Match: 31 is correct.

(c)
$\begin{array}{r} 374 \\ -\ 251 \\ \hline 113 \end{array}$ *Subtraction problem* $\begin{array}{r} 251 \\ +\ 113 \\ \hline 364 \end{array}$ *Addition problem*

Not a match: 113 is incorrect.

Rework.

$\begin{array}{r} 374 \\ -\ 251 \\ \hline 123 \end{array}$ *Subtraction problem* $\begin{array}{r} 251 \\ +\ 123 \\ \hline 374 \end{array}$ *Addition problem*

Match: 123 is correct.

(d)
$\begin{array}{r} 7531 \\ -\ 4301 \\ \hline 3230 \end{array}$ *Subtraction problem* $\begin{array}{r} 4301 \\ +\ 3230 \\ \hline 7531 \end{array}$ *Addition problem*

Match: 3230 is correct.

5. **(a)**
$\begin{array}{r} \overset{4\,18}{\cancel{5}\,\cancel{8}} \\ -\ 19 \\ \hline 39 \end{array}$

(b)
$\begin{array}{r} \overset{7\,16}{\cancel{8}\,\cancel{6}} \\ -\ 38 \\ \hline 48 \end{array}$

(c)
$\begin{array}{r} \overset{3\,11}{\cancel{4}\,\cancel{1}} \\ -\ 27 \\ \hline 14 \end{array}$

(d)
$\begin{array}{r} \overset{5\,13}{8\,\cancel{6}\,\cancel{3}} \\ -\ \ \ 47 \\ \hline 816 \end{array}$

(e)
$\begin{array}{r} \overset{5\,12}{7\,\cancel{6}\,\cancel{2}} \\ -\ 157 \\ \hline 605 \end{array}$

6. **(a)**
$\begin{array}{r} \overset{8\,12}{9\,\cancel{2}\,7} \\ -\ \ \ 43 \\ \hline 884 \end{array}$

(b)
$\begin{array}{r} \overset{5\,16\,15}{\cancel{6}\,\cancel{7}\,\cancel{5}} \\ -\ \ \ 86 \\ \hline 589 \end{array}$

(c)
$\begin{array}{r} \overset{3\,16\,17}{\cancel{4}\,\cancel{7}\,\cancel{7}} \\ -\ 389 \\ \hline 88 \end{array}$

(d)
$\begin{array}{r} \overset{0\,13\,10\,17}{\cancel{1}\,\cancel{4}\,\cancel{1}\,\cancel{7}} \\ -\ \ \ 988 \\ \hline 429 \end{array}$

(e)
$\begin{array}{r} \overset{7\,16\,13}{8\,\cancel{7}\,\cancel{3}\,9} \\ -\ 3892 \\ \hline 4847 \end{array}$

7. **(a)**
$\begin{array}{r} \overset{9}{\overset{1\,10\,16}{\cancel{2}\,\cancel{0}\,\cancel{6}}} \\ -\ 177 \\ \hline 29 \end{array}$

(b)
$\begin{array}{r} \overset{9}{\overset{6\,10\,13}{\cancel{7}\,\cancel{0}\,\cancel{3}}} \\ -\ 415 \\ \hline 288 \end{array}$

(c)
$\begin{array}{r} \overset{9}{\overset{6\,10\,12}{\cancel{7}\,\cancel{0}\,\cancel{2}\,4}} \\ -\ 2632 \\ \hline 4392 \end{array}$

8. **(a)**
$\begin{array}{r} \overset{9}{\overset{2\,10\,18}{\cancel{3}\,\cancel{0}\,\cancel{8}}} \\ -\ 159 \\ \hline 1\underline{4}9 \end{array}$

(b)
$\begin{array}{r} \overset{6\,10}{5\,\cancel{7}\,\cancel{0}} \\ -\ 368 \\ \hline 202 \end{array}$

(c)
$$
\begin{array}{r}
0\ 14\ 16\ 10 \\
1\ \cancel{5}\ \cancel{7}\ \cancel{0} \\
-\quad 9\ 8\ 3 \\
\hline
5\ 8\ 7
\end{array}
$$

(d)
$$
\begin{array}{r}
9\ 9 \\
6\ \cancel{10}\ \cancel{10}\ 11 \\
\cancel{7}\ \cancel{0}\ \cancel{0}\ \cancel{1} \\
-\ 5\ 1\ 9\ 3 \\
\hline
1\ 8\ 0\ 8
\end{array}
$$

(e)
$$
\begin{array}{r}
9\ 9 \\
3\ \cancel{10}\ \cancel{10}\ 10 \\
\cancel{4}\ \cancel{0}\ \cancel{0}\ \cancel{0} \\
-\ 1\ 7\ 8\ 2 \\
\hline
2\ 2\ 1\ 8
\end{array}
$$

9. (a)
$$
\begin{array}{r}
357 \\
-\ 168 \\
\hline
189
\end{array}
\qquad
\begin{array}{r}
168 \\
+\ 189 \\
\hline
357
\end{array}
$$

Match: 189 is correct.

(b)
$$
\begin{array}{r}
570 \\
-\ 328 \\
\hline
252
\end{array}
\qquad
\begin{array}{r}
328 \\
+\ 252 \\
\hline
580
\end{array}
$$

Not a match: 252 is incorrect.

Rework.

$$
\begin{array}{r}
6\ 10 \\
5\ \cancel{7}\ \cancel{0} \\
-\ 3\ 2\ 8 \\
\hline
2\ 4\ 2
\end{array}
\qquad
\begin{array}{r}
328 \\
+\ 242 \\
\hline
570
\end{array}
$$

Match: 242 is correct.

(c)
$$
\begin{array}{r}
14{,}726 \\
-\ 8\,839 \\
\hline
5\,887
\end{array}
\qquad
\begin{array}{r}
8839 \\
+\ 5887 \\
\hline
14{,}726
\end{array}
$$

Match: 5887 is correct.

10. (a)
$$
\begin{array}{r}
5\,1\,1 \\
\$5\,4{,}8\,\cancel{6}\,\cancel{1} \\
-\ 3\,3{,}4\,3\,5 \\
\hline
\$2\,1{,}4\,2\,6
\end{array}
$$
Associate of Arts degree
Not a high school graduate

(b)
$$
\begin{array}{r}
7\,1\,1\ \,1\,1 \\
\$8\,\cancel{2}{,}\,\cancel{1}\,9\,7 \\
-\ 5\,4{,}8\,6\,1 \\
\hline
\$2\,7{,}3\,3\,6
\end{array}
$$
Bachelor's degree
Associate of Arts degree
More earnings

1.3 Section Exercises

1.
$$
\begin{array}{r}
48 \\
-\ 32 \\
\hline
16
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
16 \\
+\ 32 \\
\hline
48
\end{array}
$$

2.
$$
\begin{array}{r}
17 \\
-\ 13 \\
\hline
4
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
4 \\
+\ 13 \\
\hline
17
\end{array}
$$

3.
$$
\begin{array}{r}
86 \\
-\ 53 \\
\hline
33
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
53 \\
+\ 33 \\
\hline
86
\end{array}
$$

4.
$$
\begin{array}{r}
78 \\
-\ 35 \\
\hline
43
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
35 \\
+\ 43 \\
\hline
78
\end{array}
$$

5.
$$
\begin{array}{r}
77 \\
-\ 60 \\
\hline
17
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
60 \\
+\ 17 \\
\hline
77
\end{array}
$$

6.
$$
\begin{array}{r}
87 \\
-\ 63 \\
\hline
24
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
63 \\
+\ 24 \\
\hline
87
\end{array}
$$

7.
$$
\begin{array}{r}
335 \\
-\ 122 \\
\hline
213
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
213 \\
+\ 122 \\
\hline
335
\end{array}
$$

8.
$$
\begin{array}{r}
602 \\
-\ 301 \\
\hline
301
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
301 \\
+\ 301 \\
\hline
602
\end{array}
$$

9.
$$
\begin{array}{r}
552 \\
-\ 451 \\
\hline
101
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
451 \\
+\ 101 \\
\hline
552
\end{array}
$$

10.
$$
\begin{array}{r}
888 \\
-\ 215 \\
\hline
673
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
215 \\
+\ 673 \\
\hline
888
\end{array}
$$

11.
$$
\begin{array}{r}
7352 \\
-\ 241 \\
\hline
7111
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
241 \\
+\ 7111 \\
\hline
7352
\end{array}
$$

12.
$$
\begin{array}{r}
4420 \\
-\ 310 \\
\hline
4110
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
4110 \\
+\ 310 \\
\hline
4420
\end{array}
$$

13.
$$
\begin{array}{r}
5546 \\
-\ 2134 \\
\hline
3412
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
3412 \\
+\ 2134 \\
\hline
5546
\end{array}
$$

14.
$$
\begin{array}{r}
1875 \\
-\ 1362 \\
\hline
513
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
1362 \\
+\ 513 \\
\hline
1875
\end{array}
$$

15.
$$
\begin{array}{r}
6259 \\
-\ 4148 \\
\hline
2111
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
4148 \\
+\ 2111 \\
\hline
6259
\end{array}
$$

16.
$$
\begin{array}{r}
9654 \\
-\ 4323 \\
\hline
5331
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
4323 \\
+\ 5331 \\
\hline
9654
\end{array}
$$

17.
$$
\begin{array}{r}
24{,}392 \\
-\ 11{,}232 \\
\hline
13{,}160
\end{array}
\qquad
\textbf{\textit{Check:}}
\qquad
\begin{array}{r}
13{,}160 \\
+\ 11{,}232 \\
\hline
24{,}392
\end{array}
$$

18. 57,921 *Check:* 23,120
$-$ 34,801   + 34,801
23,120   57,921

19. 46,253 *Check:* 41,110
$-$ 5 143   + 5 143
41,110   46,253

20. 75,904 *Check:* 72,202
$-$ 3 702   + 3 702
72,202   75,904

21. 54 *Check:* 42
$-$ 42   + 12
12   54   correct

22. 87 *Check:* 43
$-$ 43   + 44
44   87   correct

23. 89 *Check:* 63
$-$ 27   + 27
63   90   incorrect

Rework.

89 *Check:* 62
$-$ 27   + 27
62   89   correct

24. 47 *Check:* 13
$-$ 35   + 35
13   48   incorrect

Rework.

47 *Check:* 12
$-$ 35   + 35
12   47   correct

25. 382 *Check:* 261
$-$ 261   + 131
131   392   incorrect

Rework.

382 *Check:* 261
$-$ 261   + 121
121   382   correct

26. 754 *Check:* 342
$-$ 342   + 412
412   754   correct

27. 4683 *Check:* 3542
$-$ 3542   + 1141
1141   4683   correct

28. 5217 *Check:* 1132
$-$ 4105   + 4105
1132   5237   incorrect

Rework.

5217 *Check:* 1112
$-$ 4105   + 4105
1112   5217   correct

29. 8643 *Check:* 7212
$-$ 1421   + 1421
7212   8633   incorrect

Rework.

8643 *Check:* 7222
$-$ 1421   + 1421
7222   8643   correct

30. 9428 *Check:* 6324
$-$ 3124   + 3124
6324   9448   incorrect

Rework.

9428 *Check:* 6304
$-$ 3124   + 3124
6304   9428   correct

31. In subtraction, regrouping is necessary when the digit in the <u>minuend</u> has less value than the digit in the subtrahend, which is directly <u>below</u> it.

32. Subtraction problems **(b)** and **(d)** will require regrouping since they have a digit in the subtrahend that is greater than the digit above it in the minuend.

33. $\overset{6\,15}{7\,5}$
$-$ 3 7
3 8

34. $\overset{7\,16}{8\,6}$
$-$ 2 8
5 8

35. $\overset{8\,14}{9\,4}$
$-$ 4 9
4 5

36. $\overset{5\,18}{6\,8}$
$-$ 3 9
2 9

37. $\overset{4\,17}{5\,7}$
$-$ 3 8
1 9

38. $\overset{3\,17}{4\,7}$
$-$ 2 9
1 8

39.
$$\begin{array}{r} \overset{7}{\cancel{8}}\overset{12}{\cancel{2}}8 \\ -\ 5\ 4\ 7 \\ \hline 2\ 8\ 1 \end{array}$$

40.
$$\begin{array}{r} \overset{8}{\cancel{9}}\overset{10}{\cancel{1}}\overset{16}{\cancel{6}} \\ -\ 6\ 1\ 8 \\ \hline 2\ 9\ 8 \end{array}$$

41.
$$\begin{array}{r} 7\overset{6}{\cancel{7}}\overset{11}{\cancel{1}} \\ -\ 2\ 5\ 2 \\ \hline 5\ 1\ 9 \end{array}$$

42.
$$\begin{array}{r} \overset{8}{\cancel{9}}\overset{16}{\cancel{7}}\overset{13}{\cancel{3}} \\ -\ 7\ 8\ 8 \\ \hline 1\ 8\ 5 \end{array}$$

43.
$$\begin{array}{r} 7\overset{4}{\cancel{5}}\overset{12}{\cancel{3}}\overset{18}{\cancel{8}} \\ -\ \ \ 4\ 7\ 9 \\ \hline 7\ 0\ 5\ 9 \end{array}$$

44.
$$\begin{array}{r} 5\overset{7}{\cancel{8}}\overset{15}{\cancel{6}}\overset{13}{\cancel{3}} \\ -\ 1\ 2\ 9\ 5 \\ \hline 4\ 5\ 6\ 8 \end{array}$$

45.
$$\begin{array}{r} 9\overset{8}{\cancel{9}}\overset{17}{\cancel{8}}\overset{18}{\cancel{8}} \\ -\ 2\ 3\ 9\ 9 \\ \hline 7\ 5\ 8\ 9 \end{array}$$

46.
$$\begin{array}{r} \overset{2}{\cancel{3}}\overset{15}{\cancel{5}}\overset{6}{\cancel{7}}\overset{16}{\cancel{6}} \\ -\ 1\ 6\ 5\ 8 \\ \hline 1\ 9\ 1\ 8 \end{array}$$

47.
$$\begin{array}{r} \overset{7}{\cancel{8}}\overset{10}{\cancel{0}} \\ -\ 7\ 3 \\ \hline 7 \end{array}$$

48.
$$\begin{array}{r} \overset{5}{\cancel{6}}\overset{10}{\cancel{0}} \\ -\ 3\ 7 \\ \hline 2\ 3 \end{array}$$

49.
$$\begin{array}{r} \overset{2}{\cancel{3}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{18}{\cancel{8}} \\ -\ 2\ 8\ 9 \\ \hline 1\ 9 \end{array}$$

50.
$$\begin{array}{r} \overset{5}{\cancel{6}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{10}{\cancel{0}} \\ -\ 5\ 9\ 9 \\ \hline 1 \end{array}$$

51.
$$\begin{array}{r} \overset{3}{\cancel{4}}\overset{10}{\cancel{0}}\overset{3}{\cancel{4}}\overset{11}{\cancel{1}} \\ -\ 1\ 2\ 0\ 8 \\ \hline 2\ 8\ 3\ 3 \end{array}$$

52.
$$\begin{array}{r} 4\overset{5}{\cancel{6}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{12}{\cancel{2}} \\ -\ 2\ 0\ 6\ 3 \\ \hline 2\ 5\ 3\ 9 \end{array}$$

53.
$$\begin{array}{r} \overset{8}{\cancel{9}}\overset{12}{\cancel{3}}\overset{10}{\cancel{0}}5 \\ -\ 1\ 5\ 3\ 0 \\ \hline 7\ 7\ 7\ 5 \end{array}$$

54.
$$\begin{array}{r} 7\overset{0}{\cancel{1}}\overset{11}{\cancel{2}}\overset{10}{\cancel{0}} \\ -\ 6\ 0\ 3\ 3 \\ \hline 1\ 0\ 8\ 7 \end{array}$$

55.
$$\begin{array}{r} 1\ 5\overset{7}{\cancel{8}}\overset{10}{\cancel{0}} \\ -\ 1\ 0\ 7\ 7 \\ \hline 5\ 0\ 3 \end{array}$$

56.
$$\begin{array}{r} \overset{2}{\cancel{3}}\overset{10}{\cancel{0}}\ 6\ 8 \\ -\ 2\ 1\ 0\ 5 \\ \hline 9\ 6\ 3 \end{array}$$

57.
$$\begin{array}{r} 1\overset{\overset{9}{\cancel{10}}}{\cancel{1}}\overset{10}{\cancel{0}}\ 6 \\ -\ 1\ 8\ 5\ 0 \\ \hline 1\ 5\ 6 \end{array}$$

58.
$$\begin{array}{r} \overset{7}{\cancel{8}}\overset{11}{\cancel{2}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{13}{\cancel{3}} \\ -\ 5\ 3\ 6\ 5 \\ \hline 2\ 8\ 3\ 8 \end{array}$$

59.
$$\begin{array}{r} \overset{1}{\cancel{2}}\overset{13}{\cancel{4}}\overset{10}{\cancel{0}} \\ 8\overset{}{\cancel{2}}\ 4\ 0 \\ -\ 6\ 0\ 5\ 6 \\ \hline 2\ 1\ 8\ 4 \end{array}$$

60.
$$\begin{array}{r} 7\ 0\overset{4}{\cancel{5}}\overset{10}{\cancel{0}} \\ -\ 6\ 0\ 4\ 5 \\ \hline 1\ 0\ 0\ 5 \end{array}$$

61.
$$\begin{array}{r} \overset{7}{\cancel{8}}\overset{14}{\cancel{5}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{13}{\cancel{3}} \\ -\ 2\ 8\ 1\ 6 \\ \hline 5\ 6\ 8\ 7 \end{array}$$

62.
$$\begin{array}{r} \overset{5}{\cancel{6}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{14}{\cancel{4}} \\ 1\cancel{6},0\ 0\ 4 \\ -\ \ \ 5\ 0\ 8\ 7 \\ \hline 1\ 0,9\ 1\ 7 \end{array}$$

63.
$$\begin{array}{r} \overset{7}{\cancel{8}}\overset{10}{\cancel{0}},\overset{6}{\cancel{7}}\overset{\overset{9}{\cancel{10}}}{\cancel{0}}\overset{15}{\cancel{5}} \\ -\ 6\ 1,6\ 6\ 7 \\ \hline 1\ 9,0\ 3\ 8 \end{array}$$

64.
$$\overset{\overset{\;\;\;9\;\;9}{\overset{7\,10\;\;\cancel{10}\,\cancel{10}\,10}{8\;\cancel{1},\,0\;\cancel{0}\;\cancel{0}}}}{}$$
$$\underline{-\;5\;5,\,4\;5\;6}$$
$$2\;5,\,5\;4\;4$$

65.
$$\overset{\overset{\;\;9\;\;9}{\overset{5\;\;\cancel{10}\,\cancel{10}\,10}{6\,\cancel{6},\,0\;\cancel{0}\;\cancel{0}}}}{}$$
$$\underline{-\;3\;4,\,4\;4\;4}$$
$$3\;1,\,5\;5\;6$$

66.
$$\overset{\overset{\;\;9\;\;9}{\overset{6\;\;\cancel{10}\,\cancel{10}\,10}{7\,\cancel{7},\,0\;\cancel{0}\;\cancel{0}}}}{}$$
$$\underline{-\;6\;5,\,3\;0\;8}$$
$$1\;1,\,6\;9\;2$$

67.
$$\overset{\overset{\;\;9\;\;9}{\overset{1\,\cancel{10}\;\;\cancel{10}\,17\,10}{2\;\cancel{0},\,0\;\cancel{8}\;\cancel{0}}}}{}$$
$$\underline{-\;1\;3,\,4\;9\;6}$$
$$6\;\;5\;8\;4$$

68. To avoid errors when solving math problems, it's a good idea to <u>check</u> your work.

69. When checking the accuracy of an answer to an addition problem, you can use <u>subtraction</u>.

70. An answer to a subtraction problem may be checked using <u>addition</u>.

71.
$$\begin{array}{r} 9428 \\ -\;4509 \\ \hline 4919 \end{array} \qquad \begin{array}{r} 4509 \\ +\;4919 \\ \hline 9428 \quad \text{correct} \end{array}$$

72.
$$\begin{array}{r} 1671 \\ -\;1325 \\ \hline 1346 \end{array} \qquad \begin{array}{r} 1325 \\ +\;1346 \\ \hline 2671 \quad \text{incorrect} \end{array}$$

Rework.

$$\begin{array}{r} \overset{6\,11}{16\,\cancel{7}\,\cancel{1}} \\ -\;132\,5 \\ \hline 34\,6 \end{array} \qquad \begin{array}{r} 1325 \\ +\;\;346 \\ \hline 1671 \quad \text{correct} \end{array}$$

73.
$$\begin{array}{r} 2548 \\ -\;2278 \\ \hline 270 \end{array} \qquad \begin{array}{r} 2278 \\ +\;270 \\ \hline 2548 \quad \text{correct} \end{array}$$

74.
$$\begin{array}{r} 5274 \\ -\;1130 \\ \hline 4144 \end{array} \qquad \begin{array}{r} 4144 \\ +\;1130 \\ \hline 5274 \quad \text{correct} \end{array}$$

75.
$$\begin{array}{r} 93{,}758 \\ -\;52{,}869 \\ \hline 40{,}889 \end{array} \qquad \begin{array}{r} 52{,}869 \\ +\;40{,}889 \\ \hline 93{,}758 \quad \text{correct} \end{array}$$

76.
$$\begin{array}{r} 82{,}357 \\ -\;14{,}396 \\ \hline 68{,}961 \end{array} \qquad \begin{array}{r} 68{,}961 \\ +\;14{,}396 \\ \hline 83{,}357 \quad \text{incorrect} \end{array}$$

Rework.

$$\begin{array}{r} \overset{7\,11\;\;12\,15}{8\,\cancel{2},\,3\,\cancel{5}\,7} \\ -\;14{,}396 \\ \hline 67{,}961 \end{array} \qquad \begin{array}{r} 67{,}961 \\ +\;14{,}396 \\ \hline 82{,}357 \quad \text{correct} \end{array}$$

77.
$$\begin{array}{r} 36{,}778 \\ -\;17{,}405 \\ \hline 19{,}373 \end{array} \qquad \begin{array}{r} 19{,}373 \\ +\;17{,}405 \\ \hline 36{,}778 \quad \text{correct} \end{array}$$

78.
$$\begin{array}{r} 34{,}821 \\ -\;17{,}735 \\ \hline 17{,}735 \end{array} \qquad \begin{array}{r} 17{,}735 \\ +\;17{,}735 \\ \hline 35{,}470 \quad \text{incorrect} \end{array}$$

Rework.

$$\begin{array}{r} \overset{2\,14\;\;7\,11\,11}{3\,\cancel{4},\,8\,\cancel{2}\,\cancel{1}} \\ -\;17{,}735 \\ \hline 17{,}086 \end{array} \qquad \begin{array}{r} 17{,}086 \\ +\;17{,}735 \\ \hline 34{,}821 \quad \text{correct} \end{array}$$

79. Possible answers are:

$3 + 2 = 5$ could be changed to $5 - 2 = 3$ or $5 - 3 = 2$.

$6 - 4 = 2$ could be changed to $2 + 4 = 6$ or $4 + 2 = 6$.

80. No, you cannot. Numbers must be subtracted in the order given. The difference found in subtracting is the result of subtracting the subtrahend from the minuend. Changing the order of the minuend and subtrahend *does* change the answer.

81.
$$\begin{array}{r} 187 \quad \textit{calories man burns} \\ -\;140 \quad \textit{calories woman burns} \\ \hline 47 \quad \textit{fewer calories woman burned} \end{array}$$

A woman burns 47 fewer calories.

82.
$$\begin{array}{r} 403 \quad \textit{calories man burns} \\ -\;302 \quad \textit{calories woman burns} \\ \hline 101 \quad \textit{more calories man burned} \end{array}$$

A man burns 101 more calories.

83.
$$\begin{array}{r} 612 \quad \textit{new record} \\ -\;543 \quad \textit{old record} \\ \hline 69 \quad \textit{difference in numbers} \end{array}$$

There are 69 more tornadoes in the new record.

84.
$$\begin{array}{r} 747 \quad \textit{deaths in April 1925} \\ -\;327 \quad \textit{deaths in April 2011} \\ \hline 420 \quad \textit{difference} \end{array}$$

There were 420 more deaths in the deadliest tornado outbreak than in the tornado outbreak of April 2011.

85.

746	*height tower top is above the water*
− 500	*height tower top is above the roadway*
246	*height roadway is above the water*

The roadway is 246 feet above the water.

86. The Ford Explorers had greater sales.

81,465	*Ford Explorers*
− 70,449	*Jeep Grand Cherokees*
11,016	

There were 11,016 more Ford Explorers sold.

87.

6970	*jobs six years ago*
− 3700	*jobs that remain*
3270	*jobs eliminated*

There were 3270 jobs eliminated.

88.

$28,065	*price of 2013 Ford Mustang*
− 2 500	*price of 1964 Ford Mustang*
$25,565	*increase in price*

The increase in price is $25,565.

89.

14,608	*flags manufactured*
− 5 069	*flags sold*
9 539	*flags remaining*

There are 9539 flags that remain unsold.

90.

23,156	*total students*
− 14 679	*students with eye exams*
8 477	*students without eye exams*

In the district, 8477 students have not received eye exams.

91.

$913	*monthly housing expense*
− 650	*monthly rent*
$263	*increase in monthly housing expense*

They will pay $263 more per month if they buy a house.

92.

$1568	*new amount*
− 1479	*old amount*
$89	*difference*

The monthly increase is $89.

93.

5299	*distance from NYC to Buenos Aires*
− 5158	*distance from Los Angeles to Dublin*
141	*difference*

The first trip is 141 miles longer than the second.

94.

2,820,000	*nurses needed in 2020*
− 1,810,000	*nurses will be available*
1,010,000	*difference*

Based on these predictions, the shortage in the number of nurses will be 1,010,000.

95.

264,311	*total hip replacement patients*
− 125,423	*patients 65 years or older*
138,888	*difference*

This year, there were 138,888 hip replacement procedures were done in the United States on patients under age 65.

96.

555,800	*knee surgeries this year*
− 328,900	*knee surgeries six years ago*
226,900	*difference*

There were 226,900 more knee surgeries this year than six years ago.

97.

540	*calories in a Big Mac*
− 230	*calories in a 6-inch Veggie Delite*
310	*fewer calories in the Veggie Delite*

29	*grams of fat in a Big Mac*
− 3	*grams of fat in a 6-inch Veggie Delite*
26	*fewer grams of fat in the Veggie Delite*

98.

670	*calories in a Whopper*
− 280	*calories in a 6" Turkey Breast & Ham*
390	*fewer calories in the Turkey & Ham*

40	*grams of fat in a Whopper*
− 4	*grams of fat in a 6" Turkey Breast & Ham*
36	*fewer grams of fat in the Turkey & Ham*

99.

320	*calories in Roasted Chicken*
5	*calories in 2 tsp. of mustard*
+ 45	*calories in 1 tsp. of olive oil*
370	*total calories*

5	*grams of fat in Roasted Chicken*
0	*grams of fat in 2 tsp. of mustard*
+ 5	*grams of fat in 1 tsp. of olive oil*
10	*total grams of fat*

100. The sandwich with the least calories is the Veggie Delite and the sandwich with the most calories is the Sweet Onion Chicken Teriyaki.

230	*calories in Veggie Delite*
+ 380	*calories in Sweet Onion Ch. Teriyaki*
610	*total calories*

3	*grams of fat in Veggie Delite*
+ 5	*grams of fat in Sweet Onion Ch. Teriyaki*
8	*total grams of fat*

1.4 Multiplying Whole Numbers

1.4 Margin Exercises

1. **(a)**

8	*factor*
× 5	*factor*
40	*product*

(b) $\quad\quad 6\quad$ *factor*

$\quad\quad \underline{\times\ 4}\quad$ *factor*

$\quad\quad 24\quad$ *product*

(c) $\quad\quad 7\quad$ *factor*

$\quad\quad \underline{\times\ 6}\quad$ *factor*

$\quad\quad 42\quad$ *product*

(d) $\quad\quad 3\quad$ *factor*

$\quad\quad \underline{\times\ 9}\quad$ *factor*

$\quad\quad 27\quad$ *product*

2. **(a)** $7 \times 4 = 28$

(b) $0 \times 9 = 0$

(c) $8(5) = 40$

(d) $6 \cdot 5 = 30$

(e) $(1)(8) = 8$

3. **(a)** $3 \times 2 \times 5 = (3 \times 2) \times 5 = 6 \times 5 = 30$

(b) $4 \cdot 7 \cdot 1 = (4 \cdot 7) \cdot 1 = 28 \cdot 1 = 28$

(c) $(8)(3)(0) = 24(0) = 0$

4. **(a)** $\overset{1}{5}3$

$\quad \underline{\times\ 5}$

$\quad \underline{265}$

(b) $\quad 79$

$\quad \underline{\times\ 0}$

$\quad\quad 0$

(c) $\overset{46}{75}8$

$\quad \underline{\times\ 8}$

$\quad 6064$

(d) $\overset{52}{28}31$

$\quad \underline{\times\ 7}$

$\quad 19{,}817$

(e) $\overset{513}{47}14$

$\quad \underline{\times\ 8}$

$\quad 37{,}712$

5. **(a)** $63 \times 10 = 63\underline{0}$ *Attach* 0.

(b) $305 \times 100 = 30{,}5\underline{00}$ *Attach* 00.

(c) $714 \times 1000 = 714{,}\underline{000}$ *Attach* 000.

6. **(a)** 17×50

$\quad 17$

$\underline{\times\ 5}$

$\quad 85\quad 17 \times 50 = 85\underline{0}$ *Attach* 0.

(b) 73×400

$\quad 73$

$\underline{\times\ 4}$

$\ 292\quad 73 \times 400 = 29{,}200$ *Attach* 00.

(c) 180×30

$\quad 18$

$\underline{\times\ 3}$

$\ 54\quad 180 \times 30 = 5400$ *Attach* 00.

(d) 4200×80

$\quad 42$

$\underline{\times\ 8}$

$336\quad 4200 \times 80 = 336{,}000$ *Attach* 000.

(e) 800×600

$\quad 8$

$\underline{\times\ 6}$

$48\quad 800 \times 600 = 480{,}000$ *Attach* 0000.

7. **(a)** $\quad\quad 35$

$\quad \underline{\times\ 54}$

$\quad\ 140$

$\quad\ \underline{175}\quad$ *Add*

$\quad \underline{18}90$

(b) $\quad\quad 76$

$\quad \underline{\times\ 49}$

$\quad\ 684$

$\quad\ \underline{304}\quad$ *Add*

$\quad 3724$

8. **(a)** $\quad\quad 52$

$\quad \underline{\times\ 16}$

$\quad\ 312\quad \leftarrow 6 \times 52$

$\quad\ \underline{52}\quad\ \leftarrow 1 \times 52$

$\quad\ 832$

(b) $\quad\quad 81$

$\quad \underline{\times\ 49}$

$\quad\ 729\quad \leftarrow 9 \times 81$

$\quad \underline{324}\quad\ \leftarrow 4 \times 81$

$\quad 3969$

(c) $\quad\ 234$

$\quad \underline{\times\ 73}$

$\quad\ 702\quad \leftarrow 3 \times 234$

$\quad \underline{1638}\quad \leftarrow 7 \times 234$

$\quad 17{,}082$

(d)
$$\begin{array}{r} 835 \\ \times\ 189 \\ \hline 7515 \\ 6680 \\ 835 \\ \hline 157{,}815 \end{array}$$
$\leftarrow 9 \times 835$
$\leftarrow 8 \times 835$
$\leftarrow 1 \times 835$

9. **(a)**
$$\begin{array}{r} 28 \\ \times\ 60 \\ \hline 00 \\ 168 \\ \hline 1680 \end{array}$$

(b)
$$\begin{array}{r} 728 \\ \times\ 50 \\ \hline 36{,}400 \end{array}$$

(c)
$$\begin{array}{r} 562 \\ \times\ 109 \\ \hline 5058 \\ 5620 \\ \hline 61{,}258 \end{array}$$
$1 \times 562 = 562$ *Insert 0*

(d)
$$\begin{array}{r} 3526 \\ \times\ 6002 \\ \hline 7052 \\ 21\,156\,00 \\ \hline 21{,}163{,}052 \end{array}$$
$6 \times 3526 = 21{,}156$ *Insert 00*

10. **(a)**
$$\begin{array}{r} 314 \\ \times\ 14 \\ \hline 1256 \\ 314 \\ \hline 4396 \end{array}$$

The total cost of 314 garden sprayers is $4396.

(b)
$$\begin{array}{r} 139 \\ \times\ 64 \\ \hline 556 \\ 834 \\ \hline 8896 \end{array}$$

The total cost of 64 tires is $8896.

(c)
$$\begin{array}{r} 28{,}300 \\ \times\ 12 \\ \hline 56600 \\ 28300 \\ \hline 339{,}600 \end{array}$$

The total cost of 12 delivery vans is $339,600.

1.4 Section Exercises

1. In a chain multiplication, if you multiply by the largest number first, rather than the smallest number first, the product will always be <u>the same</u>.

2. The property described in Exercise 1 is the <u>commutative</u> property of multiplication.

3. When you multiply any number by zero, the answer is always <u>zero</u>.

4. When you multiply a whole number by 10, by 100, or by 1000, you can get the answer by attaching one, two, or three <u>zeros</u>, respectively, to the <u>right</u> of the whole number.

5. $2 \times 6 \times 2 = (2 \times 6) \times 2 = 12 \times 2 = 24$
or $2 \times (6 \times 2) = 2 \times 12 = 24$.

6. $8 \times 6 \times 1 = (8 \times 6) \times 1 = 48 \times 1 = 48$
or $8 \times (6 \times 1) = 8 \times 6 = 48$.

7. $7 \cdot 8 \cdot 0 = (7 \cdot 8) \cdot 0 = 56 \cdot 0 = 0$
or $7 \cdot (8 \cdot 0) = 7 \cdot 0 = 0$.

The product of any number and 0 is 0.

8. $9 \cdot 0 \cdot 5 = (9 \cdot 0) \cdot 5 = 0 \cdot 5 = 0$
or $9 \cdot (0 \cdot 5) = 9 \cdot 0 = 0$.

The product of any number and 0 is 0.

9. $4 \cdot 1 \cdot 6 = (4 \cdot 1) \cdot 6 = 4 \cdot 6 = 24$
or $4 \cdot (1 \cdot 6) = 4 \cdot 6 = 24$.

10. $1 \cdot 5 \cdot 7 = (1 \cdot 5) \cdot 7 = 5 \cdot 7 = 35$
or $1 \cdot (5 \cdot 7) = 1 \cdot 35 = 35$.

11. $(4)(5)(2) = [(4)(5)](2) = 20(2) = 40$
or $(4)[(5)(2)] = (4)(10) = 40$.

12. $(4)(1)(9) = [(4)(1)](9) = 4(9) = 36$
or $(4)[(1)(9)] = (4)(9) = 36$.

13. Factors may be multiplied in any order to get the same answer. The commutative properties of addition and multiplication are similar since with either you may add or multiply numbers in any order.

14. You may shift the parentheses in a multiplication problem. Just as in addition, the different grouping results in the same answer.

15.
$$\begin{array}{r} \overset{3}{3}5 \\ \times\ 6 \\ \hline 210 \end{array}$$

$6 \cdot 5 = 30$ Write 0, carry 3 tens.
$6 \cdot 3 = 18$ Add 3 to get 21. Write 21.

16.
$$\overset{2}{5}3$$
$$\underline{\times\ 7}$$
$$371$$

$7\cdot 3=21$ Write 1, carry 2 tens.
$7\cdot 5=35$ Add 2 to get 37. Write 37.

17.
$$\overset{2}{3}4$$
$$\underline{\times\ 7}$$
$$238$$

$7\cdot 4=28$ Write 8, carry 2 tens.
$7\cdot 3=21$ Add 2 to get 23. Write 23.

18.
$$\overset{3}{7}6$$
$$\underline{\times\ 5}$$
$$380$$

$5\cdot 6=30$ Write 0, carry 3 tens.
$5\cdot 7=35$ Add 3 to get 38. Write 38.

19.
$$\overset{21}{6}42$$
$$\underline{\times\ \ 5}$$
$$3210$$

$5\cdot 2=10$ Write 0, carry 1 ten.
$5\cdot 4=20$ Add 1 to get 21. Write 1, carry 2.
$5\cdot 6=30$ Add 2 to get 32. Write 32.

20.
$$\overset{2}{4}72$$
$$\underline{\times\ \ 4}$$
$$1888$$

$4\cdot 2=8$ Write 8.
$4\cdot 7=28$ Write 8, carry 2.
$4\cdot 4=16$ Add 2 to get 18. Write 18.

21.
$$6\overset{1}{2}4$$
$$\underline{\times\ \ 3}$$
$$1872$$

$3\cdot 4=12$ Write 2, carry 1 ten.
$3\cdot 2=6$ Add 1 to get 7. Write 7.
$3\cdot 6=18$ Write 18.

22.
$$\overset{31}{8}52$$
$$\underline{\times\ \ 7}$$
$$5964$$

$7\cdot 2=14$ Write 4, carry 1 ten.
$7\cdot 5=35$ Add 1 to get 36. Write 6, carry 3.
$7\cdot 8=56$ Add 3 to get 59. Write 59.

23.
$$\overset{21}{2}153$$
$$\underline{\times\ \ 4}$$
$$8612$$

$4\cdot 3=12$ Write 2, carry 1 ten.
$4\cdot 5=20$ Add 1 to get 21. Write 1, carry 2.
$4\cdot 1=4$ Add 2 to get 6. Write 6.
$4\cdot 2=8$ Write 8.

24.
$$1\overset{12}{1}37$$
$$\underline{\times\ \ 3}$$
$$3411$$

$3\cdot 7=21$ Write 1, carry 2 tens.
$3\cdot 3=9$ Add 2 to get 11. Write 1, carry 1.
$3\cdot 1=3$ Add 1 to get 4. Write 4.
$3\cdot 1=3$ Write 3.

25.
$$\overset{2}{2}521$$
$$\underline{\times\ \ \ 4}$$
$$10,084$$

$4\cdot 1=4$ Write 4.
$4\cdot 2=8$ Write 8.
$4\cdot 5=20$ Write 0, carry 2.
$4\cdot 2=8$ Add 2 to get 10. Write 10.

26.
$$\overset{111}{2}544$$
$$\underline{\times\ \ 3}$$
$$7632$$

$3\cdot 4=12$ Write 2, carry 1 ten.
$3\cdot 4=12$ Add 1 to get 13. Write 3, carry 1.
$3\cdot 5=15$ Add 1 to get 16. Write 6, carry 1.
$3\cdot 2=6$ Add 1 to get 7. Write 7.

27.
$$\overset{44}{2}561$$
$$\underline{\times\ \ 8}$$
$$20,488$$

$8\cdot 1=8$ Write 8.
$8\cdot 6=48$ Write 8, carry 4.
$8\cdot 5=40$ Add 4 to get 44. Write 4, carry 4.
$8\cdot 2=16$ Add 4 to get 20. Write 20.

28.
$$\overset{113}{7}326$$
$$\underline{\times\ \ 5}$$
$$36,630$$

$5\cdot 6=30$ Write 0, carry 3 tens.
$5\cdot 2=10$ Add 3 to get 13. Write 3, carry 1.
$5\cdot 3=15$ Add 1 to get 16. Write 6, carry 1.
$5\cdot 7=35$ Add 1 to get 36. Write 36.

29.
$$\begin{array}{r} {}^{46\ 1}36{,}921 \\ \times\quad 7 \\ \hline 258{,}447 \end{array}$$

$7 \cdot 1 = 7$ Write 7.
$7 \cdot 2 = 14$ Write 4, carry 1.
$7 \cdot 9 = 63$ Add 1 to get 64. Write 4, carry 6.
$7 \cdot 6 = 42$ Add 6 to get 48. Write 8, carry 4.
$7 \cdot 3 = 21$ Add 4 to get 25. Write 25.

30.
$$\begin{array}{r} {}^{3}\ \ {}^{2}28{,}116 \\ \times\quad 4 \\ \hline 112{,}464 \end{array}$$

$4 \cdot 6 = 24$ Write 4, carry 2 tens.
$4 \cdot 1 = 4$ Add 2 to get 6. Write 6.
$4 \cdot 1 = 4$ Write 4.
$4 \cdot 8 = 32$ Write 2, carry 3.
$4 \cdot 2 = 8$ Add 3 to get 11. Write 11.

31. You can use multiples of 10 to multiply 86×200. First, multiply $\underline{86} \times 2$ to get $\underline{172}$. Then, attach <u>two</u> zeros to the right of this number for a final answer of $\underline{17{,}200}$.

32. You can use multiples of 10 to multiply 7800×450. First, multiply $78 \times \underline{45}$ to get $\underline{3510}$. Then, attach <u>three</u> zeros to the right of this number for a final answer of $\underline{3{,}510{,}000}$.

33.
$$\begin{array}{ccc} 80 & 8 & 80 \\ \times\,6 & \times\,6 & \times\,6 \\ \hline & 48 & 480 \end{array}$$ *Attach* 0.

34.
$$\begin{array}{ccc} 70 & 7 & 70 \\ \times\,5 & \times\,5 & \times\,5 \\ \hline & 35 & 350 \end{array}$$ *Attach* 0.

35.
$$\begin{array}{ccc} 740 & 74 & 740 \\ \times\,3 & \times\,3 & \times\,3 \\ \hline & 222 & 2220 \end{array}$$ *Attach* 0.

36.
$$\begin{array}{ccc} 400 & 4 & 400 \\ \times\,8 & \times\,8 & \times\,8 \\ \hline & 32 & 3200 \end{array}$$ *Attach* 00.

37.
$$\begin{array}{ccc} 600 & 6 & 600 \\ \times\,6 & \times\,6 & \times\,6 \\ \hline & 36 & 3600 \end{array}$$ *Attach* 00.

38.
$$\begin{array}{ccc} 860 & 86 & 860 \\ \times\,7 & \times\,7 & \times\,7 \\ \hline & 602 & 6020 \end{array}$$ *Attach* 0.

39.
$$\begin{array}{ccc} 125 & 125 & 125 \\ \times\,30 & \times\,3 & \times\,30 \\ \hline & 375 & 3750 \end{array}$$ *Attach* 0.

40.
$$\begin{array}{ccc} 246 & 246 & 246 \\ \times\,50 & \times\,5 & \times\,50 \\ \hline & 1230 & 12{,}300 \end{array}$$ *Attach* 0.

41.
$$\begin{array}{ccc} 1635 & 1635 & 1635 \\ \times\,40 & \times\,4 & \times\,40 \\ \hline & 6540 & 65{,}400 \end{array}$$ *Attach* 0.

42.
$$\begin{array}{ccc} 7311 & 7311 & 7311 \\ \times\,50 & \times\,5 & \times\,50 \\ \hline & 36{,}555 & 365{,}550 \end{array}$$ *Attach* 0.

43.
$$\begin{array}{ccc} 900 & 9 & 900 \\ \times\,300 & \times\,3 & \times\,300 \\ \hline & 27 & 270{,}000 \end{array}$$ *Attach* 0000.

44.
$$\begin{array}{ccc} 400 & 4 & 400 \\ \times\,700 & \times\,7 & \times\,700 \\ \hline & 28 & 280{,}000 \end{array}$$ *Attach* 0000.

45.
$$\begin{array}{ccc} 43{,}000 & 43 & 43{,}000 \\ \times\,2\,000 & \times\,2 & \times\,2\,000 \\ \hline & 86 & 86{,}000{,}000 \end{array}$$ *Attach* 000000.

46.
$$\begin{array}{ccc} 11{,}000 & 11 & 11{,}000 \\ \times\,9\,000 & \times\,9 & \times\,9\,000 \\ \hline & 99 & 99{,}000{,}000 \end{array}$$ *Attach* 000000.

47. $970 \cdot 50$
$$\begin{array}{r} 97 \\ \times\,5 \\ \hline 485 \end{array}$$

$970 \cdot 50 = 48{,}500$ *Attach* 00.

48. $730 \cdot 40$
$$\begin{array}{r} 73 \\ \times\,4 \\ \hline 292 \end{array}$$

$730 \cdot 40 = 29{,}200$ *Attach* 00.

49. $800 \cdot 900$
$$\begin{array}{r} 8 \\ \times\,9 \\ \hline 72 \end{array}$$

$800 \cdot 900 = 720{,}000$ *Attach* 0000.

50. $850 \cdot 700$
$$\begin{array}{r} 85 \\ \times\,7 \\ \hline 595 \end{array}$$

$850 \cdot 700 = 595{,}000$ *Attach* 000.

51. $9700 \cdot 200$
$$\begin{array}{r} 97 \\ \times\,2 \\ \hline 194 \end{array}$$

$9700 \cdot 200 = 1{,}940{,}000$ *Attach* 0000.

52. $10,050 \cdot 300$

$$
\begin{array}{r}
1005 \\
\times \ 3 \\
\hline
3015
\end{array}
$$

$10,050 \cdot 300 = 3,015,000$ *Attach* 000.

53.
$$
\begin{array}{r}
28 \\
\times \ 17 \\
\hline
196 \\
28 \\
\hline
476
\end{array}
$$
$\leftarrow 7 \times 28$
$\leftarrow 1 \times 28$

54.
$$
\begin{array}{r}
16 \\
\times \ 34 \\
\hline
64 \\
48 \\
\hline
544
\end{array}
$$
$\leftarrow 4 \times 16$
$\leftarrow 3 \times 16$

55.
$$
\begin{array}{r}
75 \\
\times \ 32 \\
\hline
150 \\
225 \\
\hline
2400
\end{array}
$$
$\leftarrow 2 \times 75$
$\leftarrow 3 \times 75$

56.
$$
\begin{array}{r}
82 \\
\times \ 32 \\
\hline
164 \\
246 \\
\hline
2624
\end{array}
$$
$\leftarrow 2 \times 82$
$\leftarrow 3 \times 82$

57.
$$
\begin{array}{r}
83 \\
\times \ 45 \\
\hline
415 \\
332 \\
\hline
3735
\end{array}
$$
$\leftarrow 5 \times 83$
$\leftarrow 4 \times 83$

58. $(75)(21)$
$$
\begin{array}{r}
75 \\
\times \ 21 \\
\hline
75 \\
150 \\
\hline
1575
\end{array}
$$
$\leftarrow 1 \times 75$
$\leftarrow 2 \times 75$

59. $(58)(41)$
$$
\begin{array}{r}
58 \\
\times \ 41 \\
\hline
58 \\
232 \\
\hline
2378
\end{array}
$$
$\leftarrow 1 \times 58$
$\leftarrow 4 \times 58$

60. $(82)(67)$
$$
\begin{array}{r}
82 \\
\times \ 67 \\
\hline
574 \\
492 \\
\hline
5494
\end{array}
$$
$\leftarrow 7 \times 82$
$\leftarrow 6 \times 82$

61. $(67)(92)$
$$
\begin{array}{r}
67 \\
\times \ 92 \\
\hline
134 \\
603 \\
\hline
6164
\end{array}
$$
$\leftarrow 2 \times 67$
$\leftarrow 9 \times 67$

62. $(26)(33)$
$$
\begin{array}{r}
26 \\
\times \ 33 \\
\hline
78 \\
78 \\
\hline
858
\end{array}
$$
$\leftarrow 3 \times 26$
$\leftarrow 3 \times 26$

63. $(28)(564)$
$$
\begin{array}{r}
564 \\
\times \ 28 \\
\hline
4512 \\
1128 \\
\hline
15,792
\end{array}
$$
$\leftarrow 8 \times 564$
$\leftarrow 2 \times 564$

64. $(58)(312)$
$$
\begin{array}{r}
312 \\
\times \ 58 \\
\hline
2496 \\
1560 \\
\hline
18,096
\end{array}
$$
$\leftarrow 8 \times 312$
$\leftarrow 5 \times 312$

65. $(619)(35)$
$$
\begin{array}{r}
619 \\
\times \ 35 \\
\hline
3095 \\
1857 \\
\hline
21,665
\end{array}
$$
$\leftarrow 5 \times 619$
$\leftarrow 3 \times 619$

66. $(681)(47)$
$$
\begin{array}{r}
681 \\
\times \ 47 \\
\hline
4767 \\
2724 \\
\hline
32,007
\end{array}
$$
$\leftarrow 7 \times 681$
$\leftarrow 4 \times 681$

67. $(55)(286)$
$$
\begin{array}{r}
286 \\
\times \ 55 \\
\hline
1430 \\
1430 \\
\hline
15,730
\end{array}
$$
$\leftarrow 5 \times 286$
$\leftarrow 5 \times 286$

68.
$$
\begin{array}{r}
286 \\
\times \ 574 \\
\hline
1144 \\
2002 \\
1430 \\
\hline
164,164
\end{array}
$$
$\leftarrow 4 \times 286$
$\leftarrow 7 \times 286$
$\leftarrow 5 \times 286$

69.
```
      735
   ×  112
     1470   ← 2 × 735
      735   ← 1 × 735
      735   ← 1 × 735
    82,320
```

70.
```
      621
   ×  415
     3105   ← 5 × 621
      621   ← 1 × 621
     2484   ← 4 × 621
   257,715
```

71.
```
      538
   ×  342
     1076   ← 2 × 538
     2152   ← 4 × 538
     1614   ← 3 × 538
   183,996
```

72.
```
     3228
   ×  751
     3228   ← 1 × 3228
    16140   ← 5 × 3228
    22596   ← 7 × 3228
  2,424,228
```

73.
```
     9352
   ×  264
    37408   ← 4 × 9352
    56112   ← 6 × 9352
    18704   ← 2 × 9352
  2,468,928
```

74.
```
      528
   ×  106
     3168   ← 6 × 528
     5280   ← 10 × 528
    55,968
```

75.
```
      215
   ×  307
     1505   ← 7 × 215
     6450   ← 30 × 215
    66,005
```

76.
```
      218
   ×  106
     1308   ← 6 × 218
     2180   ← 10 × 218
    23,108
```

77.
```
      428
   ×  201
      428   ← 1 × 428
     8560   ← 20 × 428
    86,028
```

78.
```
     3706
   ×  208
    29648   ← 8 × 3706
    74120   ← 20 × 3706
   770,848
```

79.
```
     6310
   × 3078
    50480   ← 8 × 6310
    44170   ← 7 × 6310
   189300   ← 30 × 6310
  19,422,180
```

80.
```
     3533
   × 5001
     3533   ← 1 × 3533
  1766500   ← 500 × 3533
  17,668,533
```

81.
```
     2195
   × 1038
    17560   ← 8 × 2195
     6585   ← 3 × 2195
    21950   ← 10 × 2195
  2,278,410
```

82.
```
     1502
   × 2009
    13518   ← 9 × 1502
   300400   ← 200 × 1502
  3,017,518
```

83. To multiply by 10, 100, or 1000, just attach one, two, or three zeros, respectively, to the number you are multiplying and that's your answer.

84.
```
    291        291
  × 307      × 307
   2037       2037
    000       8730
   873       89,337
  89,337
```

85.
```
  300   cartons
× 10    balls per carton
 3000   balls
```

3000 balls were purchased.

86.
$$\begin{array}{r} 500 \\ \times\ 30 \\ \hline 15{,}000 \end{array}$$ *tablets per bottle* *bottles* *tablets*

15,000 tablets are in the medical supply house.

87.
$$\begin{array}{r} 194 \\ \times\ 12 \\ \hline 388 \\ 194 \\ \hline 2328 \end{array}$$ *cost per night* *nights* *cost*

The cost of a 12-night stay is $2328.

88.
$$\begin{array}{r} 45 \\ \times\ 4 \\ \hline 180 \end{array}$$ *million per year* *years* *million*

The total amount of her earnings on this contract is $180 million (or $180,000,000).

89.
$$\begin{array}{r} 365 \\ \times\ 66 \\ \hline 2190 \\ 2190 \\ \hline 24{,}090 \end{array}$$ *days per year* *gallons per day* *gallons per year*

The average person in the United States uses 24,090 gallons of water in one year.

90.
$$\begin{array}{r} 27 \\ \times\ 40 \\ \hline 1080 \end{array}$$ *fishing boats* *tons of squid per boat* *tons*

The total catch for the night was 1080 tons.

91. 75 first-aid kits at $8 per kit

$$\begin{array}{r} 75 \\ \times\ 8 \\ \hline 600 \end{array}$$

The total cost is $600.

92. 27 days of child care at $82 per day

$$\begin{array}{r} 82 \\ \times\ 27 \\ \hline 574 \\ 164 \\ \hline 2214 \end{array}$$

The total cost is $2214.

93. 65 rebuilt alternators at $24 per alternator

$$\begin{array}{r} 65 \\ \times\ 24 \\ \hline 260 \\ 130 \\ \hline 1560 \end{array}$$

The total cost is $1560.

94. 62 wheelchair cushions at $44 per cushion

$$\begin{array}{r} 62 \\ \times\ 44 \\ \hline 248 \\ 248 \\ \hline 2728 \end{array}$$

The total cost is $2728.

95. 206 laptop computers at $548 per computer

$$\begin{array}{r} 548 \\ \times\ 206 \\ \hline 3288 \\ 10960 \\ \hline 112{,}888 \end{array}$$

The total cost is $112,888.

96. 520 printers at $219 per printer

$$\begin{array}{r} 520 \\ \times\ 219 \\ \hline 4680 \\ 520 \\ 1040 \\ \hline \$113{,}880 \end{array}$$

The total cost is $113,880.

97. $21 \cdot 43 \cdot 56 = (21 \cdot 43) \cdot 56$
$$= 903 \cdot 56$$
$$= 50{,}568$$

98. $(600)(8)(75)(40) = [(600)(8)](75)(40)$
$$= [(4800)(75)](40)$$
$$= 360{,}000(40)$$
$$= 14{,}400{,}000$$

99.
$$\begin{array}{r} 450 \\ \times\ 85 \\ \hline 2250 \\ 3600 \\ \hline 38{,}250 \end{array}$$ *trees per acre* *acres* *trees*

38,250 trees are needed to plant 85 acres.

100.
$$\begin{array}{r} 15{,}225 \\ \times\ 28 \\ \hline 121800 \\ 30450 \\ \hline 426{,}300 \end{array}$$

The blue whale weighs 426,300 pounds.

101. 8,391,881   *population of New York City*
  $-$ 645,169   *population of Boston*
  ―――
  7,746,712   *more people*

7,746,712 more people live in New York City than in Boston.

102.   3,849,378   *population of Los Angeles*
  $-$ 1,232,940   *population of Dallas*
  ―――
  2,616,438   *more people*

2,616,438 more people live in Los Angeles than in Dallas.

103.   970   *cost per laptop*
  $\times$ 12   *number of laptops*
  ―――
  11,640   *total cost of laptops*

  315   *cost per printer*
  $\times$ 8   *number of printers*
  ―――
  2520   *total cost of printers*

The total cost is the sum of these values:

$$\$11{,}640 + \$2520 = \$14{,}160$$

104.   954   *millions of pounds of food in 17 years*
  $+$ 77   *millions of pounds of food last year*
  ―――
  1031   *total*

In 18 years, the total amount of food collected was 1031 million pounds (or 1,031,000,000 pounds).

105. (a) $189 + 263 = 452$

(b) $263 + 189 = 452$

106. commutative

107. (a) $(65 + 81) + 135 = 146 + 135 = 281$

(b) $65 + (81 + 135) = 65 + 216 = 281$

108. associative

109. (a) $220 \times 72 = 15{,}840$

(b) $72 \times 220 = 15{,}840$

110. commutative

111. (a) $(26 \times 18) \times 14 = 468 \times 14 = 6552$

(b) $26(18 \times 14) = 26 \times 252 = 6552$

112. associative

113. No. Some examples are

1. $7 - 5 = 2$, but $5 - 7$ does not equal 2.

2. $12 - 6 = 6$, but $6 - 12$ does not equal 6.

3. $(8 - 2) - 5 = 1$, but $8 - (2 - 5)$ does not equal 1.

114. No. Some examples are

1. $10 \div 2 = 5$, but $2 \div 10$ does not equal 5.

2. $(16 \div 8) \div 2 = 1$, but $16 \div (8 \div 2)$ does not equal 1.

1.5   Dividing Whole Numbers

1.5   Margin Exercises

1.   (a) $24 \div 6 = 4$: $6\overline{)24}$ or $\dfrac{24}{6} = 4$

(b) $9\overline{)36}$: $36 \div 9 = 4$ or $\dfrac{36}{9} = 4$

(c) $48 \div 6 = 8$: $6\overline{)48}$ or $\dfrac{48}{6} = 8$

(d) $\dfrac{42}{6} = 7$: $42 \div 6 = 7$ or $6\overline{)42}$

2.   (a) $15 \div 3 = 5$
dividend: 15; divisor: 3; quotient: 5

(b) $18 \div 6 = 3$
dividend: 18; divisor: 6; quotient: 3

(c) $\dfrac{28}{7} = 4$
dividend: 28; divisor: 7; quotient: 4

(d) $9\overline{)27}$
dividend: 27; divisor: 9; quotient: 3

3.   (a) $0 \div 5 = 0$

(b) $\dfrac{0}{9} = 0$

(c) $\dfrac{0}{24} = 0$

(d) $37\overline{)0}$

4.   (a) $5\overline{)15}$; $5 \cdot 3 = \underline{15}$ or $\underline{3} \cdot 5 = \underline{15}$

(b) $\dfrac{32}{4} = 8$; $4 \cdot 8 = 32$ or $8 \cdot 4 = 32$

(c) $45 \div 9 = 5$; $9 \cdot 5 = 45$ or $5 \cdot 9 = 45$

5.   (a) $\dfrac{4}{0}$; undefined

(b) $\dfrac{0}{4} = 0$

(c) $0\overline{)36}$; undefined

(d) $36 \overline{\smash{\big)}\,0}$ with quotient 0

(e) $100 \div 0$; undefined

(f) $0 \div 100 = 0$

6.   (a) $8 \div 8 = 1$

(b) $15 \overline{\smash{\big)}\,15}$ with quotient 1

(c) $\dfrac{37}{37} = 1$

7.   (a) $9 \div 1 = 9$

(b) $1 \overline{\smash{\big)}\,18}$ with quotient 18

(c) $\dfrac{43}{1} = 43$

8.   (a) $2 \overline{\smash{\big)}\,24}$ with quotient 12 $\dfrac{2}{2} = 1,\ \dfrac{4}{2} = 2$

(b) $3 \overline{\smash{\big)}\,93}$ with quotient 31 $\dfrac{9}{3} = 3,\ \dfrac{3}{3} = 1$

(c) $4 \overline{\smash{\big)}\,88}$ with quotient 22 $\dfrac{8}{4} = 2,\ \dfrac{8}{4} = 2$

(d) $2 \overline{\smash{\big)}\,624}$ with quotient 312 $\dfrac{6}{2} = 3,\ \dfrac{2}{2} = 1,\ \dfrac{4}{2} = 2$

9.   (a) $2 \overline{\smash{\big)}\,125}$ with quotient $62\,\mathbf{R1}$ $\dfrac{12}{2} = 6,\ \dfrac{5}{2} = 2\,\mathbf{R1}$

(b) $3 \overline{\smash{\big)}\,215}$ with quotient $71\,\mathbf{R2}$ $\dfrac{21}{3} = 7,\ \dfrac{5}{3} = 1\,\mathbf{R2}$

(c) $4 \overline{\smash{\big)}\,5^{1}3^{1}8}$ with quotient $1\ 3\ 4\,\mathbf{R2}$ $\dfrac{5}{4} = 1\,\mathbf{R1},\ \dfrac{13}{4} = 3\,\mathbf{R1},$

$\dfrac{18}{4} = 4\,\mathbf{R2}$

(d) $\dfrac{819}{5}$

$5 \overline{\smash{\big)}\,8^{3}1^{1}9}$ with quotient $1\ 6\ 3\,\mathbf{R4}$ $\dfrac{8}{5} = 1\,\mathbf{R3},\ \dfrac{31}{5} = 6\,\mathbf{R1},$

$\dfrac{19}{5} = 3\,\mathbf{R4}$

10.   (a) $4 \overline{\smash{\big)}\,5^{1}3^{1}0}$ with quotient $1\ 3\ \underline{2}\,\mathbf{R}\underline{2}$

(b) $7 \overline{\smash{\big)}\,5\ 1^{2}5}$ with quotient $7\ 3\,\mathbf{R4}$

(c) $3 \overline{\smash{\big)}\,1\ 8\ 8^{2}5}$ with quotient $6\ 2\ 8\,\mathbf{R1}$

(d) $6 \overline{\smash{\big)}\,1\ 4^{2}1^{3}5}$ with quotient $2\ 3\ 5\,\mathbf{R5}$

11.   (a) $2 \overline{\smash{\big)}\,65}$ with quotient $32\,\mathbf{R1}$

divisor $\times$ *quotient* $+$ *remainder* $=$ *dividend*

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

2 $\times$ 32 $+$ 1

$\underline{64}$ $+$ $\underline{1}$ $=$ 65

The answer is correct.

(b) $7 \overline{\smash{\big)}\,586}$ with quotient $83\,\mathbf{R4}$

divisor $\times$ *quotient* $+$ *remainder* $=$ *dividend*

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

7 $\times$ 83 $+$ 4

581 $+$ 4 $=$ 585

$\uparrow$

incorrect

Rework.

$7 \overline{\smash{\big)}\,58^{2}6}$ with quotient $8\ 3\,\mathbf{R5}$ *Now check:*

divisor $\times$ *quotient* $+$ *remainder* $=$ *dividend*

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

7 $\times$ 83 $+$ 5

581 $+$ 5 $=$ 586

$\uparrow$

correct

The correct answer is $83\,\mathbf{R5}$.

(c) $3 \overline{\smash{\big)}\,1223}$ with quotient $407\,\mathbf{R2}$

divisor $\times$ *quotient* $+$ *remainder* $=$ *dividend*

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

3 $\times$ 407 $+$ 2

1221 $+$ 2 $=$ 1223

The answer is correct.

(d) $5 \overline{\smash{\big)}\,2383}$ with quotient $476\,\mathbf{R3}$

divisor $\times$ *quotient* $+$ *remainder* $=$ *dividend*

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

5 $\times$ 476 $+$ 3

2380 $+$ 3 $=$ 2383

The answer is correct.

12.   **(a)** 258: ends in 8, divisible by 2

(b) 307: ends in 7, not divisible by 2

(c) 4216: ends in 6, divisible by 2

(d) 73,000: ends in 0, divisible by 2

13.   **(a)** 743: $7 + 4 + 3 = 14$
14 is *not* divisible by 3.
So, 743 is *not* divisible by 3.

(b) 5325: $5 + 3 + 2 + 5 = \underline{15}$
$\underline{15}$ is divisible by 3.
So, 5325 is divisible by $\underline{3}$.

(c) 374,214: $3 + 7 + 4 + 2 + 1 + 4 = 21$
21 is divisible by 3.
So, 374,214 is divisible by 3.

(d) 205,633: $2 + 0 + 5 + 6 + 3 + 3 = 19$
19 is *not* divisible by 3.
So, 205,633 is *not* divisible by 3.

14.   **(a)** 180: ends in 0, divisible by 5

(b) 635: ends in 5, divisible by 5

(c) 8364: does not end in 0 or 5, not divisible by 5

(d) 206,105: ends in 5, divisible by 5

15.   **(a)** 270: ends in 0, divisible by 10

(b) 495: does not end in 0, not divisible by 10

(c) 5030: ends in 0, divisible by 10

(d) 14,380: ends in 0, divisible by 10

1.5 Section Exercises

1.   Three common symbols used to indicate multiplication are

$\times$; ()() ; and $\cdot$ (dot).

2.   Three common symbols used to indicate division are

$\div$; $\rceil$; and $-$ (fraction bar).

3. $24 \div 4 = 6$: $4\overline{)24}^{\,6}$ or $\dfrac{24}{4} = 6$

4. $36 \div 3 = 12$: $3\overline{)36}^{\,12}$ or $\dfrac{36}{3} = 12$

5. $\dfrac{45}{9} = 5$: $9\overline{)45}^{\,5}$ or $45 \div 9 = 5$

6. $\dfrac{56}{8} = 7$: $8\overline{)56}^{\,7}$ or $56 \div 8 = 7$

7. $2\overline{)16}^{\,8}$: $16 \div 2 = 8$ or $\dfrac{16}{2} = 8$

8. $8\overline{)48}^{\,6}$: $48 \div 8 = 6$ or $\dfrac{48}{8} = 6$

9.   When a number is divided by 1, the answer is always the <u>number</u> itself.

10. When zero is divided by a number, the answer is always $\underline{0}$.

11. $9 \div 9 = 1$

Any nonzero number divided by itself is 1.

12. $36 \div 9 = 4$

13. $\dfrac{14}{2} = 7$

14. $\dfrac{10}{0}$ is undefined

15. $22 \div 0$; When 0 is the divisor, write <u>undefined</u> as the answer.

16. $6 \div 6 = 1$. When a number is divided by itself, write $\underline{1}$ as the answer.

17. $\dfrac{24}{1} = 24$

18. $\dfrac{12}{1} = 12$

19. $15\overline{)0}^{\,0}$; When dividing 0 by a nonzero number, the answer is $\underline{0}$.

20. $\dfrac{0}{12} = 0$; When dividing 0 by a nonzero number, the answer is 0.

21. $0\overline{)43}$ is undefined

22. $\dfrac{8}{0}$ is undefined

23. 8670 ends in 0, so it is divisible by 2, 5, and 10. The sum of its digits, 21, is divisible by 3, so 8670 is divisible by 3.

24. 13,785 ends in 5, so it is divisible by 5, but not divisible by 2 or 10. The sum of its digits, 24, is divisible by 3, so 13,785 is divisible by 3.

25. 9,221,784 ends in 4, so it is divisible by 2, but not divisible by 5 or 10. The sum of its digits, 33, is divisible by 3, so 9,221,784 is divisible by 3.

26. 5,409,720 ends in 0, so it is divisible by 2, 5, and 10. The sum of its digits, 27, is divisible by 3, so 5,409,720 is divisible by 3.

27. $3\overline{)7\,^15}$ with quotient $2\,5$ *Check:* $\begin{array}{r} 25 \\ \times\ 3 \\ \hline 75 \end{array}$

28. $5\overline{)8\,^35}$ with quotient $1\,7$ *Check:* $5 \times 17 = 85$

29. $7\overline{)12\,^56}$ with quotient $1\,8$ *Check:* $\begin{array}{r} 18 \\ \times\ 7 \\ \hline 126 \end{array}$

30. $6\overline{)16\,^48}$ with quotient $2\,8$ *Check:* $6 \times 28 = 168$

31. $4\overline{)1216}$ with quotient 304 *Check:* $\begin{array}{r} 304 \\ \times\ 4 \\ \hline 1216 \end{array}$

32. $5\overline{)23\,^30\,5}$ with quotient $4\,61$ *Check:* $5 \times 461 = 2305$

33. $4\overline{)25\,^10\,^29}$ with quotient $6\ 2\ 7$ **R1**

Check: $4 \times 627 + 1 = 2508 + 1 = 2509$

34. $8\overline{)13\,^53\,^55}$ with quotient $1\ 6\ 6$ **R7**

Check: $8 \times 166 + 7 = 1328 + 7 = 1335$

35. $6\overline{)9\,^31\,^13\,^17}$ with quotient $1\ 5\ 2\ 2$ **R5**

Check: $6 \times 1522 + 5 = 9132 + 5 = 9137$

36. $9\overline{)83\,^271}$ with quotient $9\ 30$ **R1**

Check: $9 \times 930 + 1 = 8370 + 1 = 8371$

37. $6\overline{)1854}$ with quotient 309

Check: $6 \times 309 = 1854$

38. $8\overline{)85\,^56}$ with quotient $10\ 7$ *Check:* $8 \times 107 = 856$

39. $12{,}020 \div 4$ $4\overline{)12{,}020}$ with quotient $3\,005$

Check: $4 \times 3005 = 12{,}020$

40. $8012 \div 4$ $4\overline{)801\,^12}$ with quotient $200\ 3$

Check: $4 \times 2003 = 8012$

41. $30{,}036 \div 6$ $6\overline{)30{,}036}$ with quotient $5\,006$

Check: $6 \times 5006 = 30{,}036$

42. $32{,}008 \div 8$ $8\overline{)32{,}008}$ with quotient $4\,001$

Check: $8 \times 4001 = 32{,}008$

43. $2434 \div 3$ $3\overline{)2434}$ with quotient 811 **R1**

Check: $3 \times 811 + 1 = 2433 + 1 = 2434$

44. $5993 \div 7$ $7\overline{)59\,^39\,^43}$ with quotient $8\ 5\ 6$ **R1**

Check: $7 \times 856 + 1 = 5992 + 1 = 5993$

45. $12{,}947 \div 5$ $5\overline{)12,\,^29\,^44\,^47}$ with quotient $2\ 5\ 8\ 9$ **R2**

Check: $5 \times 2589 + 2 = 12{,}945 + 2 = 12{,}947$

46. $33{,}285 \div 9$ $9\overline{)33,\,^62\,^88\,^75}$ with quotient $3\ 6\ 9\ 8$ **R3**

Check: $9 \times 3698 + 3 = 33{,}282 + 3 = 33{,}285$

47. $\dfrac{21{,}040}{8}$ $8\overline{)21,\,^50\,^240}$ with quotient $2\ 6\ 30$

Check: $8 \times 2630 = 21{,}040$

48. $\dfrac{8199}{9}$ $9\overline{)8199}$ with quotient 911

Check: $9 \times 911 = 8199$

49. $\dfrac{74{,}751}{6}$ $6\overline{)7\,^14,\,^27\,^35\,^51}$ with quotient $1\ 2,\ 4\ 5\ 8$ **R3**

Check: $6 \times 12{,}458 + 3 = 74{,}748 + 3 = 74{,}751$

50. $\dfrac{72{,}543}{5}$ $5\overline{)7\,^22,\,^254\,^43}$ with quotient $1\ 4,\ 50\ 8$ **R3**

Check: $5 \times 14{,}508 + 3 = 72{,}540 + 3 = 72{,}543$

51. $\dfrac{71{,}776}{7}$ $7\overline{)71,\,^17\,^37\,^26}$ with quotient $10,\ 2\ 5\ 3$ **R5**

Check: $7 \times 10{,}253 + 5 = 71{,}771 + 5 = 71{,}776$

52. $\dfrac{77{,}621}{3}$ $3\overline{)7\,^17,\,^26\,^22\,^11}$ with quotient $2\ 5,\ 8\ 7\ 3$ **R2**

Check: $3 \times 25{,}873 + 2 = 77{,}619 + 2 = 77{,}621$

53. $\dfrac{128{,}645}{7}$ $7\overline{)12\,^58,\,^26\,^54\,^55}$ with quotient $1\ 8,\ 3\ 7\ 7$ **R6**

Check: $7 \times 18{,}377 + 6 = 128{,}639 + 6 = 128{,}645$

54. $\dfrac{172{,}255}{4}$ $4\overline{)17\,^12,\,2\,^25\,^15}$ with quotient $4\ 3,0\ 6\ 3$ **R3**

Check: $4 \times 43{,}063 + 3 = 172{,}252 + 3 = 172{,}255$

55.
$$5\overline{)1877} \quad \dfrac{375 \text{ } \mathbf{R}2}{}$$

Check: $5 \times 375 + 2 = 1875 + 2 = \underline{1877} \quad correct$

56.
$$3\overline{)1282} \quad \dfrac{427 \text{ } \mathbf{R}1}{}$$

Check: $3 \times 427 + 1 = 1281 + 1 = \underline{1282} \quad correct$

57.
$$3\overline{)5725} \quad \dfrac{1908 \text{ } \mathbf{R}2}{}$$

Check: $3 \times 1908 + 2 = 5724 + 2 = 5726$
incorrect

Rework.
$$3\overline{)5\,{}^{2}72\,{}^{2}5} \quad \dfrac{1 \; 90 \; 8 \text{ } \mathbf{R}1}{}$$

Check: $3 \times 1908 + 1 = 5724 + 1 = 5725$

58.
$$5\overline{)2158} \quad \dfrac{432 \text{ } \mathbf{R}3}{}$$

Check: $5 \times 432 + 3 = 2160 + 3 = 2163$
incorrect

Rework.
$$5\overline{)21\,{}^{1}58} \quad \dfrac{4 \; 31 \text{ } \mathbf{R}3}{}$$

Check: $5 \times 431 + 3 = 2155 + 3 = 2158 \quad correct$

59.
$$7\overline{)4692} \quad \dfrac{650 \text{ } \mathbf{R}2}{}$$

Check: $7 \times 650 + 2 = 4550 + 2 = 4552$
incorrect

Rework.
$$7\overline{)46\,{}^{4}92} \quad \dfrac{6 \; 70 \text{ } \mathbf{R}2}{}$$

Check: $7 \times 670 + 2 = 4690 + 2 = 4692 \quad correct$

60.
$$9\overline{)5974} \quad \dfrac{663 \text{ } \mathbf{R}5}{}$$

Check: $9 \times 663 + 5 = 5967 + 5 = 5972$
incorrect

Rework.
$$9\overline{)59\,{}^{5}7\,{}^{3}4} \quad \dfrac{6 \; 6 \; 3 \text{ } \mathbf{R}7}{}$$

Check: $9 \times 663 + 7 = 5967 + 7 = 5974 \quad correct$

61.
$$6\overline{)21,409} \quad \dfrac{3\;568 \text{ } \mathbf{R}2}{}$$

Check: $6 \times 3568 + 2 = 21,408 + 2 = 21,410$
incorrect

Rework.
$$6\overline{)21,\,{}^{3}4\,{}^{4}0\,{}^{4}9} \quad \dfrac{3 \; 5 \; 6 \; 8 \text{ } \mathbf{R}1}{}$$

Check: $6 \times 3568 + 1 = 21,408 + 1 = 21,409$

62.
$$6\overline{)3192} \quad \dfrac{532}{}$$

Check: $6 \times 532 = 3192 \quad correct$

63.
$$8\overline{)16,019} \quad \dfrac{2\;002 \text{ } \mathbf{R}3}{}$$

Check: $8 \times 2002 + 3 = 16,016 + 3 = 16,019$
correct

64.
$$8\overline{)33,664} \quad \dfrac{4\;208}{}$$

Check: $8 \times 4208 = 33,664 \quad correct$

65.
$$6\overline{)69,140} \quad \dfrac{11,523 \text{ } \mathbf{R}2}{}$$

Check: $6 \times 11,523 + 2 = 69,138 + 2 = 69,140$
correct

66.
$$3\overline{)82,598} \quad \dfrac{27,532 \text{ } \mathbf{R}1}{}$$

Check: $3 \times 27,532 + 1 = 82,596 + 1 = 82,597$
incorrect

Rework.
$$3\overline{)8\,{}^{2}2,\,{}^{1}598} \quad \dfrac{2 \; 7, \; 5\,3\,2 \text{ } \mathbf{R}2}{}$$

Check: $3 \times 27,532 + 2 = 82,596 + 2 = 82,598$

67.
$$9\overline{)86,655} \quad \dfrac{9\;628 \text{ } \mathbf{R}7}{}$$

Check: $9 \times 9628 + 7 = 86,652 + 7 = 86,659$
incorrect

Rework.
$$9\overline{)86,\,{}^{5}6\,{}^{2}5\,{}^{7}5} \quad \dfrac{9 \; 6 \; 2 \; 8 \text{ } \mathbf{R}3}{}$$

Check: $9 \times 9628 + 3 = 86,652 + 3 = 86,655$

68.
$$7\overline{)50,809} \quad \dfrac{7\;258 \text{ } \mathbf{R}4}{}$$

Check: $7 \times 7258 + 4 = 50,806 + 4 = 50,810$
incorrect

Rework.
$$7\overline{)50,\,{}^{1}8\,{}^{4}0\,{}^{5}9} \quad \dfrac{7 \; 2 \; 5 \; 8 \text{ } \mathbf{R}3}{}$$

Check: $7 \times 7258 + 3 = 50,806 + 3 = 50,809$

69.
$$\begin{array}{r} 27{,}822 \\ 8\overline{\smash{)}222{,}576} \end{array}$$

Check: $8 \times 27{,}822 = 222{,}576$ *correct*

70.
$$\begin{array}{r} 77{,}804 \\ 4\overline{\smash{)}311{,}216} \end{array}$$

Check: $4 \times 77{,}804 = 311{,}216$ *correct*

71. Multiply the quotient by the divisor and add any remainder. The result should be the dividend.

72. Answers will vary. Three choices might be:

A number is divisible by 2 if it ends in a 0, 2, 4, 6, or 8;
A number is divisible by 5 if it ends in 0 or 5;
A number is divisible by 10 if it ends in 0.

73.
$$\begin{array}{r} 3\,2\,8 \\ 8\overline{\smash{)}26\,^22\,^64} \end{array}$$

328 tables can be set.

74.
$$\begin{array}{r} 1\,3\,5 \\ 12\overline{\smash{)}16\,^42\,^60} \end{array}$$

Each school will receive 135 books.

75.
$$\begin{array}{r} 9\,\,600 \\ 8\overline{\smash{)}76{,}^4800} \end{array}$$

9600 drumsticks are produced each hour.

76.
$$\begin{array}{r} 8\,\,3{,}000{,}000 \\ 5\overline{\smash{)}41\,^15{,}000{,}000} \end{array}$$

83,000,000 or 83 million Tootsie Rolls are produced each day.

77.
$$\begin{array}{r} 4\,8{,}\,500 \\ 9\overline{\smash{)}43\,^76{,}^4500} \end{array}$$

Each employee received $48,500.

78.
$$\begin{array}{r} 3\,\,4\,3\,5 \\ 5\overline{\smash{)}17{,}^21\,^17\,^25} \end{array}$$

3435 5-pound bags of flour can be filled.

79.
$$\begin{array}{r} 1\,6\,5 \\ 4\overline{\smash{)}6\,^26\,^20} \end{array}$$

There are 165 locations in this area.

80.
$$\begin{array}{r} 1\,7 \\ 5\overline{\smash{)}8\,^35} \end{array}$$

The average number of Wiis sold in the first five years was 17 million (or 17,000,000).

81.
$$\begin{array}{r} 1{,}1\,3\,7{,}\,500 \\ 6\overline{\smash{)}6{,}8\,^22\,^45{,}^3000} \end{array}$$ (or use a calculator)

Each person received $1,137,500.

82.
$$\begin{array}{r} 5{,}\,6\,2\,5{,}000 \\ 8\overline{\smash{)}45{,}^50\,^20\,^40{,}000} \end{array}$$ (or use a calculator)

Each payment is $5,625,000.

83.
$$\begin{array}{r} 8\,\,6\,2{,}\,500 \\ 8\overline{\smash{)}6{,}9\,^50\,^20{,}^4000} \end{array}$$

The number of blueberries picked each hour was 862,500.

84.
$$\begin{array}{r} 5{,}\,4\,8\,4{,}\,3\,7\,5 \\ 4\overline{\smash{)}21{,}^19\,^33\,^17{,}^15\,^30\,^20} \end{array}$$

Assuming the salary each year was the same, the salary was $5,484,375.

85. 60 ends in 0, so it is divisible by 2, 5, and 10. The sum of its digits, 6, is divisible by 3, so 60 is divisible by 3.

86. 35 ends in 5, so it is divisible by 5, but not divisible by 2 or 10. The sum of its digits, 8, is not divisible by 3, so 35 is not divisible by 3.

87. 92 ends in 2, so it is divisible by 2, but not divisible by 5 or 10. The sum of its digits, 11, is not divisible by 3, so 92 is not divisible by 3.

88. 96 ends in 6, so it is divisible by 2, but not divisible by 5 or 10. The sum of its digits, 15, is divisible by 3, so 96 is divisible by 3.

89. 445 ends in 5, so it is divisible by 5, but not divisible by 2 or 10. The sum of its digits, 13, is not divisible by 3, so 445 is not divisible by 3.

90. 897 ends in 7, so it is not divisible by 2, 5, or 10. The sum of its digits, 24, is divisible by 3, so 897 is divisible by 3.

91. 903 ends in 3, so it is not divisible by 2, 5, or 10. The sum of its digits, 12, is divisible by 3, so 903 is divisible by 3.

92. 500 ends in 0, so it is divisible by 2, 5, and 10. The sum of its digits, 5, is not divisible by 3, so 500 is not divisible by 3.

93. 5166 ends in 6, so it is divisible by 2, but not divisible by 5 or 10. The sum of its digits, 18, is divisible by 3, so 5166 is divisible by 3.

94. 8302 ends in 2, so it is divisible by 2, but not divisible by 5 or 10. The sum of its digits, 13, is not divisible by 3, so 8302 is not divisible by 3.

95. 21,763 ends in 3, so it is not divisible by 2, 5, or 10. The sum of its digits, 19, is not divisible by 3, so 21,763 is not divisible by 3.

96. 32,472 ends in 2, so it is divisible by 2, but not divisible by 5 or 10. The sum of its digits, 18, is divisible by 3, so 32,472 is divisible by 3.

1.6 Long Division

1.6 Margin Exercises

1.   (a)
```
         8 2
  28│2 2 9 6
     2 2 4      ← 8 × 28
       5 6
       5 6      ← 2 × 28
         0
```

(b)
```
         6 4
  16│1 0 2 4
       9 6      ← 6 × 16
       6 4
       6 4      ← 4 × 16
         0
```

(c)
```
       1 4 4
  61│8 7 8 4
     6 1        ← 1 × 61
     2 6 8
     2 4 4      ← 4 × 61
       2 4 4
       2 4 4    ← 4 × 61
           0
```

(d)
```
         2 9
  93│2 6 9 7
     1 8 6      ← 2 × 93
       8 3 7
       8 3 7    ← 9 × 93
           0
```

2.   (a)
```
         5 6
  24│1 3 4 4
     1 2 0      ← 5 × 24
       1 4 4
       1 4 4    ← 6 × 24
           0
```

(b)
```
         6 2 R8
  72│4 4 7 2
     4 3 2      ← 6 × 72
       1 5 2
       1 4 4    ← 2 × 72
           8
```

(c)
```
         8 3 R21
  65│5 4 1 6
     5 2 0      ← 8 × 65
       2 1 6
       1 9 5    ← 3 × 65
           2 1
```

(d)
```
         7 4 R63
  89│6 6 4 9
     6 2 3      ← 7 × 89
       4 1 9
       3 5 6    ← 4 × 89
           6 3
```

3.   (a)
```
       1 0 7 R4
  17│1 8 2 3
     1 7        ← 1 × 17
     1 2 3
     1 1 9      ← 7 × 17
         4
```

(b)
```
       2 0 8 R7
  23│4 7 9 1
     4 6        ← 2 × 23
     1 9 1
     1 8 4      ← 8 × 23
         7
```

(c)
```
         4 0 8 R21
  39│1 5, 9 3 3
     1 5 6      ← 4 × 39
       3 3 3
       3 1 2    ← 8 × 39
         2 1
```

(d)
```
         3 0 0 R62
  78│2 3, 4 6 2
     2 3 4      ← 3 × 78
         6 2
```

4.   (a) $70 \div 10 = 7$

One zero is dropped.

(b) $2600 \div 100 = 26$

Two zeros are dropped.

(c) $505,000 \div 1000 = 505$

Three zeros are dropped.

5.   (a) 50│6250

Drop 1 zero from the divisor and the dividend.

```
     1 2 5
  5│6 2 5
    5
    1 2
    1 0
      2 5
      2 5
        0
```

The quotient is 125.

(b) 130 $\overline{|131,040}$

Drop 1 zero from the divisor and the dividend.

```
        1  0 0 8
13 | 1 3, 1 0 4
     1 3
     ──────
         1 0 4
         1 0 4
         ──────
             0
```

The quotient is 1008.

(c) 3400 $\overline{|190,400}$

Drop 2 zeros from the divisor and the dividend.

```
         5 6
34 | 1 9 0 4
     1 7 0
     ──────
       2 0 4
       2 0 4
       ──────
           0
```

The quotient is 56.

6.   (a)

```
          3 8              38  Multiply the
16 | 6 0 8          ×   16  quotient and
     4 8               228  the divisor.
     ────
     1 2 8              38
     1 2 8             608   ← correct
     ────
         0
```

(b)

```
            4 2 R178              426
426 | 1 9, 1 7 0          ×      4 2
      1 7  0 4                   852
      ──────              17 0 4
      1 1 3 0             ──────
        9 5 2             17,892
        ────              +   178
        1 7 8             ──────
                         18,070
```

The result does not match the dividend.
Rework.

```
            4 5
426 | 1 9, 1 7 0
      1 7  0 4
      ──────
        2 1 3 0
        2 1 3 0
        ──────
             0
```

A check shows that 45 is correct.

(c)

```
              5 7 R18
514 | 2 9, 3 1 6
      2 5  7 0
      ──────
        3 6 1 6
        3 5 9 8
        ──────
          1 8
```

```
        5 1 4  Multiply the
     ×     5 7  quotient and
     ──────
       3 5 9 8  the divisor.
      25 7 0
      ──────
      29,298
     +     1 8  Add the remainder
     ──────
      29,3 1 6  ← correct
```

1.6 Section Exercises

1. $\dfrac{5}{50 | 2650}$ 5; 53; 530

5 goes over the 5, because $\frac{265}{50}$ is about 5. The answer must then be a two-digit number or 53.

2. $\dfrac{3}{14 | 476}$ 3; 34; 304

3 goes over the 7, because $\frac{47}{14}$ is about 3. The answer must then be a two-digit number or 34.

3. $\dfrac{2}{18 | 4500}$ 2; 25; 250

2 goes over the 5, because $\frac{45}{18}$ is about 2. The answer must then be a three-digit number or 250.

4. $\dfrac{1}{35 | 5600}$ 16; 160; 1600

1 goes over the 6, because $\frac{56}{35}$ is about 1. The answer must then be a three-digit number or 160.

5. $\dfrac{1}{86 | 10,327}$ 12; 120 **R**7; 1200

1 goes over the 3, because $\frac{103}{86}$ is about 1. The answer must then be a three-digit number or 120 **R**7.

6. $\dfrac{5}{46 | 24,026}$ 5; 52; 522 **R**14

5 goes over the 0, because $\frac{240}{46}$ is about 5. The answer must then be a three-digit number or 522 **R**14.

7. $\dfrac{1}{26 | 28,735}$ 11; 110; 1105 **R**5

1 goes over the 8, because $\frac{28}{26}$ is about 1. The answer must then be a four-digit number or 1105 **R**5.

8. $\dfrac{9}{12 | 116,953}$ 974 **R**2; 9746 **R**1; 97,460

9 goes over the 6, because $\frac{116}{12}$ is about 9. The answer must then be a four-digit number or 9746 **R**1.

9. $\dfrac{7}{21\overline{)\,149{,}826}}$ 71; 713; 7134 **R**12

7 goes over the 9, because $\frac{149}{21}$ is about 7. The answer must then be a four-digit number or 7134 **R**12.

10. $\dfrac{3}{64\overline{)\,208{,}138}}$ 325 **R**2; 3252 **R**10; 32,521

3 goes over the 8, because $\frac{208}{64}$ is about 3. The answer must then be a four-digit number or 3252 **R**10.

11. $\dfrac{9}{523\overline{)\,470{,}800}}$ 9 **R**100; 90 **R**100; 900 **R**100

9 goes over the 8, because $\frac{4708}{523}$ is about 9. The answer must then be a three-digit number or 900 **R**100.

12. $\dfrac{1}{230\overline{)\,253{,}230}}$ 11; 110; 1101

1 goes over the 3, because $\frac{253}{230}$ is about 1. The answer must then be a four-digit number or 1101.

13.

```
        7 3  R5    Check:        7 3
18 )1 3 1 9                 ×    1 8
   1 2 6                        5 8 4
     5 9                          7 3
     5 4                       1 3 1 4
        5                    +      5
                               1 3 1 9
```

14.

```
        6 3       Check:        6 3
58 )3 6 5 4                ×    5 8
   3 4 8                       5 0 4
     1 7 4                      3 1 5
     1 7 4                     3 6 5 4
         0
```

15.

```
         4 7 6  R15   Check:       4 7 6
23 )1 0, 9 6 3                 ×     2 3
    9 2                           1 4 2 8
    1 7 6                            9 5 2
    1 6 1                        1 0, 9 4 8
      1 5 3                     +      1 5
      1 3 8                        1 0, 9 6 3
        1 5
```

16.

```
         4 7 8  R18   Check:        4 7 8
83 )3 9, 6 9 2                  ×      8 3
   3 3 2                           1 4 3 4
     6 4 9                         3 8 2 4
     5 8 1                        3 9, 6 7 4
       6 8 2                     +      1 8
       6 6 4                      3 9, 6 9 2
         1 8
```

17.

```
        2 4 0 7  R1   Check:       2 4 0 7
26 )6 2, 5 8 3                  ×      2 6
   5 2                            1 4 4 4 2
   1 0 5                          4 8 1 4
   1 0 4                         6 2, 5 8 2
       1 8 3                     +       1
       1 8 2                      6 2, 5 8 3
           1
```

18.

```
        3 0 0 8  R25   Check:       3 0 0 8
28 )8 4, 2 4 9                  ×       2 8
   8 4                            2 4, 0 6 4
       2 4 9                      6 0 1 6
       2 2 4                     8 4, 2 2 4
         2 5                     +      2 5
                                  8 4, 2 4 9
```

19.

```
        1 1 4 6  R15   Check:       1 1 4 6
74 )8 4, 8 1 9                  ×       7 4
   7 4                            4 5 8 4
   1 0 8                          8 0 2 2
     7 4                         8 4, 8 0 4
     3 4 1                       +      1 5
     2 9 6                        8 4, 8 1 9
       4 5 9
       4 4 4
         1 5
```

20.

```
          7 8 5  R118   Check:        7 8 5
238 )1 8 6, 9 4 8                 ×      2 3 8
    1 6 6 6                           6 2 8 0
      2 0 3 4                         2 3 5 5
      1 9 0 4                         1 5 7 0
        1 3 0 8                     1 8 6, 8 3 0
        1 1 9 0                     +    1 1 8
          1 1 8                     1 8 6, 9 4 8
```

21.

```
          3 3 3 1  R82   Check:       3 3 3 1
153 )5 0 9, 7 2 5                 ×      1 5 3
    4 5 9                              9 9 9 3
      5 0 7                         1 6 6 5 5
      4 5 9                           3 3 3 1
        4 8 2                       5 0 9, 6 4 3
        4 5 9                       +      8 2
          2 3 5                     5 0 9, 7 2 5
          1 5 3
            8 2
```

22.

```
           8 7   Check:        3 0 8
308 )2 6, 7 9 6            ×      8 7
    2 4 6 4                    2 1 5 6
      2 1 5 6                  2 4 6 4
      2 1 5 6                 2 6, 7 9 6
            0
```

23.
```
              8 5 0    Check:        8 5 0
420 ⟌3 5 7, 0 0 0               ×   4 2 0
     3 3 6 0                    ──────────
     ─────                        1 7 0 0 0
       2 1 0 0                   3 4 0 0
       2 1 0 0                  ──────────
       ─────                    3 5 7, 0 0 0
             0
```

24.
```
              1 7 0    Check:        1 7 0
900 ⟌1 5 3, 0 0 0               ×   9 0 0
     9 0 0                      ──────────
     ─────                      1 5 3, 0 0 0
     6 3 0 0
     6 3 0 0
     ─────
           0
```

25.
```
        1 0 1 R4   Check:          1 0 1
35 ⟌3 5 4 9                   ×      3 5
                             ──────────
                                  5 0 5
                                3 0 3
                             ──────────
                                3 5 3 5
                             +      4
                             ──────────
                                3 5 3 9  incorrect
```
Rework.
```
        1 0 1 R14
35 ⟌3 5 4 9
     3 5
     ───
       0 4 9
         3 5
         ───
         1 4
```
The correct answer is 101 **R**14.

26.
```
        4 2 R26   Check:            6 4
64 ⟌2 7 1 2                   ×      4 2
                             ──────────
                                  1 2 8
                                2 5 6
                             ──────────
                                2 6 8 8
                             +    2 6
                             ──────────
                                2 7 1 4  incorrect
```
Rework.
```
          4 2 R24
64 ⟌2 7 1 2
     2 5 6
     ─────
       1 5 2
       1 2 8
       ─────
         2 4
```
The correct answer is 42 **R**24.

27.
```
          6 5 8 R9   Check:          6 5 8
28 ⟌1 8, 4 2 4                 ×       2 8
                              ──────────
                                  5 2 6 4
                                1 3 1 6
                              ──────────
                                1 8, 4 2 4
                              +        9
                              ──────────
                                1 8, 4 3 3  incorrect
```
Rework.
```
          6 5 8
28 ⟌1 8, 4 2 4
     1 6 8
     ─────
       1 6 2
       1 4 0
       ─────
         2 2 4
         2 2 4
         ─────
             0
```
The correct answer is 658.

28.
```
          2 3 9 R121   Check:        2 3 9
145 ⟌3 4, 7 7 6                ×     1 4 5
                              ──────────
                                  1 1 9 5
                                  9 5 6
                                2 3 9
                              ──────────
                                3 4, 6 5 5
                              +    1 2 1
                              ──────────
                                3 4, 7 7 6  correct
```

29.
```
          6 2 R3   Check:            6 1 4
614 ⟌3 8, 0 6 8               ×        6 2
                              ──────────
                                  1 2 2 8
                                3 6 8 4
                              ──────────
                                3 8, 0 6 8
                              +        3
                              ──────────
                                3 8, 0 7 1  incorrect
```
Rework.
```
            6 2
614 ⟌3 8, 0 6 8
     3 6  8 4
     ──────
       1 2 2 8
       1 2 2 8
       ──────
             0
```
The correct answer is 62.

30.
```
          1 7 4 R368   Check:        1 7 4
557 ⟌9 7, 2 8 6               ×     5 5 7
                              ──────────
                                  1 2 1 8
                                  8 7 0
                                8 7 0
                              ──────────
                                9 6, 9 1 8
                              +    3 6 8
                              ──────────
                                9 7, 2 8 6  correct
```

31. Divide. (We could drop one zero.)

$$
\begin{array}{r}
1\ 1\ 7 \\
720\overline{)8\ 4,\ 2\ 4\ 0} \\
\underline{7\ 2\ 0} \\
1\ 2\ 2\ 4 \\
\underline{7\ \ 2\ 0} \\
5\ 0\ 4\ 0 \\
\underline{5\ 0\ 4\ 0} \\
0
\end{array}
$$

There were 117 episodes filmed each season.

32. Divide to find the number of containers for one tower. (We could drop one zero.)

$$
\begin{array}{r}
3\ \ 7\ 5\ 0 \\
160\overline{)6\ 0\ 0,\ 0\ 0\ 0} \\
\underline{4\ 8\ 0} \\
1\ 2\ 0\ 0 \\
\underline{1\ 1\ 2\ 0} \\
8\ \ 0\ 0 \\
\underline{8\ \ 0\ 0} \\
0
\end{array}
$$

Now multiply by two to find the number of containers for *both* towers.

$$2 \times 3750 = 7500$$

33. First, add the number of wall and table clocks.

$$
\begin{array}{rl}
& 272 \ \textit{wall clocks} \\
+ & 308 \ \textit{table clocks} \\
\hline
& 580 \ \textit{wall and table sum}
\end{array}
$$

Subtract the sum from the total number of clocks.

$$
\begin{array}{rl}
& 636 \ \textit{total number of clocks} \\
- & 580 \ \textit{wall and table sum} \\
\hline
& 56 \ \textit{standing floor clocks}
\end{array}
$$

He worked on 56 floor clocks this year.

We could also arrange our work as follows:

$$
\begin{array}{ccccccc}
\text{total} & - & \text{wall} & - & \text{table} & = & \text{floor} \\
\text{clocks} & & \text{clocks} & & \text{clocks} & & \text{clocks} \\
636 & - & 272 & - & 308 & = & 56
\end{array}
$$

34.
$$
\begin{array}{rl}
& 24,000,000 \ \textit{total businesses} \\
- & 7\ 000 \ \textit{larger businesses} \\
\hline
& 23,993,000 \ \textit{remaining}
\end{array}
$$

There are 23,993,000 small to mid-size businesses.

35. Divide. (or use a calculator)

$$
\begin{array}{r}
3\ 5\ 5 \\
96\overline{)3\ 4,\ 0\ 8\ 0} \\
\underline{2\ 8\ 8} \\
5\ 2\ 8 \\
\underline{4\ 8\ 0} \\
4\ 8\ 0 \\
\underline{4\ 8\ 0} \\
0
\end{array}
$$

Judy's monthly payment is $355.

36. Divide. (or use a calculator)

$$
\begin{array}{r}
8\ 8 \\
225\overline{)1\ 9,\ 8\ 0\ 0} \\
\underline{1\ 8\ 0\ 0} \\
1\ 8\ 0\ 0 \\
\underline{1\ 8\ 0\ 0} \\
0
\end{array}
$$

The consultant charged $88 per hour.

37. If one ring is sold each minute, then 60 rings are sold each hour.

$$
\begin{array}{rl}
60 & \textit{rings per hour} \\
\times \quad 24 & \textit{hours per day} \\
\hline
1440 & \textit{rings per day} \\
\times \quad 30 & \textit{days} \\
\hline
43,200 & \textit{rings}
\end{array}
$$

There are 43,200 diamond rings sold in 30 days.

38. If he ate one Twinkie each day, then he ate 365 Twinkies each year.

$$
\begin{array}{rl}
365 & \textit{Twinkies per year} \\
\times\ 60 & \textit{years} \\
\hline
21,900 & \textit{Twinkies}
\end{array}
$$

He ate 21,900 Twinkies in 60 years.

39. **(a)** Divide.

$$
\begin{array}{r}
6\ 4\ 8 \\
39\overline{)2\ 5,\ 2\ 7\ 2} \\
\underline{2\ 3\ 4} \\
1\ 8\ 7 \\
\underline{1\ 5\ 6} \\
3\ 1\ 2 \\
\underline{3\ 1\ 2} \\
0
\end{array}
$$

He has eaten an average of 648 Big Macs a year for the last 39 years.

(b) We could divide 648 by 365, but it is fairly easy to see that this division result is between 1 and 2, so the answer to the problem is less than 2 Big Macs per day.

40. $\dfrac{220,020}{30} = \dfrac{22,002}{3}$ (Drop 1 zero.)

$$
\begin{array}{r}
7\ 3\ 3\ 4 \\
3\,\overline{)2\ 2,\,0\ 0\ 2} \\
2\ 1 \\
\overline{1\ 0} \\
9 \\
\overline{1\ 0} \\
9 \\
\overline{1\ 2} \\
1\ 2 \\
\overline{0}
\end{array}
$$

Each team used 7334 baseballs.

41. $\dfrac{\$0}{3} = \$0$ Each person will receive \$0.

42. When 0 is divided by any nonzero number, the result is 0.

43. $8 \div 0$ is undefined.

44. It is impossible. If you have 6 cookies, it is not possible to divide them among zero people.

45. **(a)** $14 \div 1 = 14$

  (b) $\begin{array}{r} 1\ 7 \\ 1\,\overline{)1\ 7} \end{array}$

  (c) $\dfrac{38}{1} = 38$

46. Yes. Some examples are $18 \cdot 1 = 18$; $26 \cdot 1 = 26$; and $43 \cdot 1 = 43$.

47. **(a)** $32,000 \div 10 = 3200$

  Drop 1 zero from the dividend and 1 zero from the divisor.

  (b) $32,000 \div 100 = 320$

  Drop 2 zeros from the dividend and 2 zeros from the divisor.

  (c) $32,000 \div 1000 = 32$

  Drop 3 zeros from the dividend and 3 zeros from the divisor.

48. Drop the same number of zeros from the dividend that appear in the divisor. The result is the quotient. With a divisor of 10, drop one zero; with 100, drop two zeros; with 1000, drop three zeros.

Summary Exercises *Whole Numbers Computation*

1. 6<u>3</u>1,5<u>4</u>8; ten-thousands: 3; tens: 4

2. 7<u>6</u>,<u>0</u>47,309; millions: 6; hundred-thousands: 0

3. 9,<u>1</u>81,57<u>6</u>,423; hundred-millions: 1; thousands: 6

4. 86,002 is eighty-six thousand, two.

5. 425,208,733 is four hundred twenty-five million, two hundred eight thousand, seven hundred thirty-three.

6. $\begin{array}{r} 46 \\ +\,51 \\ \hline 97 \end{array}$

7. $166 + 739$ $\begin{array}{r} \overset{1\,1}{166} \\ +\,739 \\ \hline 905 \end{array}$

8. $\begin{array}{r} 82 \\ -\,61 \\ \hline 21 \end{array}$

9. $\begin{array}{r} 7\overset{8}{9}\overset{18}{8} \\ -\,38\ 9 \\ \hline 40\ 9 \end{array}$

10. $6382 + 4062 + 7129$ $\begin{array}{r} 6\overset{1\,1}{3}82 \\ 4062 \\ +\,7129 \\ \hline 17{,}573 \end{array}$

11. $75 + 81,579 + 506 + 4$ $\begin{array}{r} \overset{1\ 1\,2}{75} \\ 81{,}579 \\ 506 \\ +\,\quad 4 \\ \hline 82{,}164 \end{array}$

12. $\begin{array}{r} 1\overset{6}{7}\overset{9}{0}\overset{14}{4} \\ -\,102\ 7 \\ \hline 67\ 7 \end{array}$

13. $\begin{array}{r} \overset{4}{5}\overset{14}{5}{,}\overset{9}{0}\overset{9}{0}\overset{10}{0} \\ -\,17{,}32\ 6 \\ \hline 37{,}67\ 4 \end{array}$

14. $\begin{array}{r} 7\overset{6}{0}{,}\overset{9}{5}\overset{14}{5}\overset{14}{}\overset{12}{2} \\ -\,34{,}6\ 6\ 3 \\ \hline 35{,}8\ 8\ 9 \end{array}$

15. $56 \times 10 = 560$ *Attach 0.*

16. 140×40

$$\begin{array}{r} 14 \\ \times\, 4 \\ \hline 56 \end{array} \qquad \begin{array}{r} 140 \\ \times\, 40 \\ \hline 5600 \end{array} \quad \textit{Attach} \; 00.$$

17.

$$\begin{array}{r} 500 \\ \times\, 700 \end{array} \qquad \begin{array}{r} 5 \\ \times\, 7 \\ \hline 35 \end{array} \qquad \begin{array}{r} 500 \\ \times\, 700 \\ \hline 350{,}000 \end{array} \quad \textit{Attach} \; 0000.$$

18.

$$\begin{array}{r} 3600 \\ \times\, 70 \end{array} \qquad \begin{array}{r} 36 \\ \times\, 7 \\ \hline 252 \end{array} \qquad \begin{array}{r} 3600 \\ \times\, 70 \\ \hline 252{,}000 \end{array} \quad \textit{Attach} \; 000.$$

19. One million, two hundred thirty-eight thousand, two hundred one is written as 1,238,201.

20. Five million, five hundred forty-nine thousand, three hundred seventy-five is written as 5,549,375.

21. $8 \div 8 = 1$

22. $0 \div 9 = 0$

23. $\dfrac{12}{0}$ is undefined.

24. $\dfrac{15}{1} = 15$

25. $7 \times 8 = 56$

26. $(6)(0)(5) = [6 \cdot 0](5) = 0(5) = 0$

27. $8 \cdot 4 \cdot 3 = (8 \cdot 4) \cdot 3 = 32 \cdot 3 = 96$

28. $\dfrac{608}{2}$

$$\begin{array}{r} 304 \\ 2\overline{)608} \end{array} \qquad \frac{6}{2} = 3, \; \frac{0}{2} = 0, \; \frac{8}{2} = 4$$

29.
$$\begin{array}{r} 2\,7\,50 \; \textbf{R}2 \\ 3\overline{)8\, ^2 2\, ^1 5\, 2} \end{array}$$

Check: $3 \times 2750 + 2 = 8250 + 2 = 8252$

30.
$$\begin{array}{r} 7\,61 \; \textbf{R}3 \\ 6\overline{)45\, ^3 6\, 9} \end{array}$$

Check: $6 \times 761 + 3 = 4566 + 3 = 4569$

31.
$$\begin{array}{r} 65 \\ \times\;\; 52 \\ \hline 130 \\ 325\;\; \\ \hline 3380 \end{array}$$

32.
$$\begin{array}{r} 507 \\ \times\; 435 \\ \hline 2535 \\ 1521\;\; \\ 2028\;\;\; \\ \hline 220{,}545 \end{array}$$

33. $(28)(72)$

$$\begin{array}{r} 72 \\ \times\;\; 28 \\ \hline 576 \quad \leftarrow 8 \times 72 \\ 144\;\; \quad \leftarrow 2 \times 72 \\ \hline 2016 \end{array}$$

34. $(41)(36)$

$$\begin{array}{r} 41 \\ \times\;\; 36 \\ \hline 246 \quad \leftarrow 6 \times 41 \\ 123\;\; \quad \leftarrow 3 \times 41 \\ \hline 1476 \end{array}$$

35.
$$\begin{array}{r} 78 \\ 25\overline{)1950} \\ \underline{175}\quad \leftarrow 7 \times 25 \\ 200 \\ \underline{200} \leftarrow 8 \times 25 \\ 0 \end{array}$$

36.
$$\begin{array}{r} 210 \\ 18\overline{)3780} \\ \underline{36}\quad\quad \leftarrow 2 \times 18 \\ 18 \\ \underline{18} \leftarrow 1 \times 18 \\ 0 \end{array}$$

37.
$$\begin{array}{r} 3602 \\ \times\, 5008 \\ \hline 28816 \\ 1801000\;\;\; \\ \hline 18{,}038{,}816 \end{array}$$

38.
$$\begin{array}{r} 506 \; \textbf{R}28 \\ 62\overline{)31{,}400} \\ \underline{310}\quad\quad \leftarrow 5 \times 62 \\ 400 \\ \underline{372} \leftarrow 6 \times 62 \\ 28 \end{array}$$

Check: $62 \times 506 + 28 = 31{,}372 + 28 = 31{,}400$

39. $630\overline{)32{,}760}$ Drop 1 zero.

$$\begin{array}{r} 52 \\ 63\overline{)3276} \\ \underline{315}\quad \leftarrow 5 \times 63 \\ 126 \\ \underline{126} \leftarrow 2 \times 63 \\ 0 \end{array}$$

40.
$$\begin{array}{r} 1208 \; \textbf{R}3 \\ 351\overline{)424{,}011} \\ \underline{351}\quad\quad\quad \leftarrow 1 \times 351 \\ 730 \\ \underline{702}\quad\quad \leftarrow 2 \times 351 \\ 2811 \\ \underline{2808} \leftarrow 8 \times 351 \\ 3 \end{array}$$

Check:
$351 \times 1208 + 3 = 424{,}008 + 3 = 424{,}011$

41.
$$8 \overline{)4\,5\,{}^{5}8\,{}^{2}7} \quad \begin{array}{r} 5\ 7\ 3\ \textbf{R3} \end{array}$$

Check: $8 \times 573 + 3 = 4584 + 3 = 4587$

42.
$$72 \overline{)2\,9\,5\,2} \quad \begin{array}{r} 4\ 1 \end{array}$$
$$\begin{array}{r} 2\,8\,8 \quad \leftarrow 4 \times 72 \\ \hline 7\ 2 \\ 7\ 2 \quad \leftarrow 1 \times 72 \\ \hline 0 \end{array}$$

43.
$$\begin{array}{r} 6\,6\,2 \\ \times\ 3\,1\,5 \\ \hline 3\,3\,1\,0 \\ 6\,6\,2 \\ 1\,9\,8\,6 \\ \hline 2\,0\,8,5\,3\,0 \end{array}$$

44.
$$\begin{array}{r} 2\,1\,8\,6 \\ \times\ \ 5\,0\,4 \\ \hline 8\,7\,4\,4 \quad \leftarrow 4 \times 2186 \\ 1\,0\,9\,3\,0\,0 \quad \leftarrow 50 \times 2186 \\ \hline 1,101,7\,4\,4 \end{array}$$

45. From the table, there were 2154 million bridge crossing since construction. This number in digits is 2,154,000,000.

46. From the table, there were an average of 40 million bridge crossing each year. This number in digits is 40,000,000.

47. From the table, the number of full-time painters was 38. Each painter works 8 hours a day, 5 days a week for a 40 hour work week.

$$\begin{array}{r} \overset{3}{3}8 \\ \times\ 40 \\ \hline 1520 \end{array}$$

The total hours spent on painting each week was 1520.

48. Subtract the weight today from the weight when built.

$$\begin{array}{r} \overset{814}{89\,4},500 \ \textit{weight when built} \\ -\ \ 88\,7,000 \ \textit{weight today} \\ \hline 7\ 500 \ \textit{difference} \end{array}$$

The total weight is 7500 tons lighter today than when it was built.

49. From the table, 80,000 miles of wire were needed to make the two cables. Multiply by 5280 to convert to feet.

$$\begin{array}{r} 528 \\ \times\ 8 \\ \hline 4224 \end{array} \qquad \begin{array}{r} 5\,280 \\ \times\ \ 80,000 \\ \hline 422,400,000 \quad \textit{Attach } 00000. \end{array}$$

The number of feet of wire in the two main bridge cables is four hundred twenty-two million, four hundred thousand.

50. **(a)** From the table, the total length of the bridge, including the approaches, is 8981 feet. This is *more* than a mile, which is equal to 5280 feet.

$$\begin{array}{r} 8981 \ \textit{total length of bridge} \\ -\ 5280 \ \textit{feet in a mile} \\ \hline 3701 \ \textit{difference} \end{array}$$

The total length of the bridge is 3701 feet more than a mile.

(b) From the table, the length of the middle span of the bridge is 4200 feet. This is *less* than a mile, which is equal to 5280 feet.

$$\begin{array}{r} 5280 \ \textit{feet in a mile} \\ -\ 4200 \ \textit{length of middle span} \\ \hline 1080 \ \textit{difference} \end{array}$$

The length of the middle span of the bridge is 1080 feet less than a mile.

1.7 Rounding Whole Numbers

1.7 Margin Exercises

1. **(a)** 373 (nearest ten)

Underline the tens place: 3$\underline{7}$3

373 is closer to 3$\underline{7}$0.

(b) 1482 (nearest thousand)

Underline the thousands place: $\underline{1}$482

1482 is closer to $\underline{1}$000.

(c) 89,512 (nearest hundred)

Underline the hundreds place: 89,$\underline{5}$12

89,512 is closer to 89,$\underline{5}$00.

(d) 546,325 (nearest ten-thousand)

Underline the ten-thousands place: 5$\underline{4}$6,325

546,325 is closer to 5$\underline{5}$0,000.

2. **(a)** $\underline{6}$2

Underline the tens place. Next digit is $\underline{4}$ or less. Change the digit to the right of the underlined place to zero.

62 rounded to the nearest ten is 60.

(b) 9̲4

Underline the tens place. Next digit is 4 or less. Change the digit to the right of the underlined place to zero.

94 rounded to the nearest ten is 90.

(c) 1̲34

Underline the tens place. Next digit is 4 or less. Change the digit to the right of the underlined place to zero.

134 rounded to the nearest ten is 130.

(d) 75̲43

Underline the tens place. Next digit is 4 or less. Change the digit to the right of the underlined place to zero.

7543 rounded to the nearest ten is 7540.

3.   **(a)** 3̲683 Next digit is 5 or more.

Change 3 to 4. All digits to the right of the underlined place are changed to zero.

3683 rounded to the nearest thousand is 4000.

(b) 6̲502 Next digit is 5 or more.

Change 6 to 7. All digits to the right of the underlined place are changed to zero.

6502 rounded to the nearest thousand is 7000.

(c) 8̲4,621 Next digit is 5 or more.

Change 4 to 5. All digits to the right of the underlined place are changed to zero.

84,621 rounded to the nearest thousand is 85,000.

(d) 55̲,960 Next digit is 5 or more.

Change 5 to 6. All digits to the right of the underlined place are changed to zero.

55,960 rounded to the nearest thousand is 56,000.

4.   **(a)** 3458 to the nearest ten

34̲58   Next digit is 5 or more.

Change 5 to 6. All digits to the right of the underlined place are changed to zeros.

3458 rounded to the nearest ten is 3460.

(b) 6448 to the nearest hundred

6̲448   Next digit is 4 or less.

Leave 4 as 4.

All digits to the right of the underlined place are changed to zeros.

6448 rounded to the nearest hundred is 6400.

(c) 73,077 to the nearest hundred

73,̲077   Next digit is 5 or more.

Change 0 to 1. All digits to the right of the underlined place are changed to zeros.

73,077 rounded to the nearest hundred is 73,100.

(d) 85,972 to the nearest hundred

85,̲972   Next digit is 5 or more.

Change 9 to 10. Write zero and carry the 1. All digits to the right of the underlined place are changed to zeros.

85,972 rounded to the nearest hundred is 86,000.

5.   **(a)** 14,598 to the nearest ten-thousand

1̲4,598

The ten-thousands place does not change because the digit to the right is 4 or less. All digits to the right of the underlined place are changed to zeros.

14,598 rounded to the nearest ten-thousand is 10,000.

(b) 724,518,715 to the nearest million

72̲4,518,715

Change 4 to 5 because the digit to the right is 5 or more.

All digits to the right of the underlined place are changed to zeros.

724,518,715 rounded to the nearest million is 725,000,000.

6.   **(a) To the nearest ten:** 54̲9

Next digit is 5 or more.

Tens place $(4 + 1 = 5)$ changes.

549 rounded to the nearest ten is 550.

To the nearest hundred: 5̲49

Next digit is 4 or less.

Hundreds place stays the same.

549 rounded to the nearest hundred is 500.

(b) To the nearest ten: 45̲8

Next digit is 5 or more.

Tens place $(5 + 1 = 6)$ changes.

458 rounded to the nearest ten is 460.

To the nearest hundred: 4̲58

Next digit is 5 or more.

Hundreds place $(4 + 1 = 5)$ changes. All digits to the right of the underlined place are changed to zeros.

458 rounded to the nearest hundred is 500.

(c) To the nearest ten: 93<u>0</u>8

Next digit is 5 or more.

Tens place $(0 + 1 = 1)$ changes.

9308 rounded to the nearest ten is 9310.

To the nearest hundred: 9<u>3</u>08

Next digit is 4 or less.

Hundreds place stays the same.

9308 rounded to the nearest hundred is 9300.

7. **(a) To the nearest ten:** 40<u>7</u>8

Next digit is 5 or more.

Tens place $(7 + 1 = 8)$ changes.

4078 rounded to the nearest ten is 4080.

To the nearest hundred: 4<u>0</u>78

Next digit is 5 or more.

Hundreds place $(0 + 1 = 1)$ changes.

4078 rounded to the nearest hundred is 4100.

To the nearest thousand: <u>4</u>078

Next digit is 4 or less.

Thousands place stays the same.

4078 rounded to the nearest thousand is 4000.

(b) To the nearest ten: 46,3<u>6</u>4

Next digit is 4 or less.

Tens place stays the same.

46,364 rounded to the nearest ten is 46,360.

To the nearest hundred: 46,<u>3</u>64

Next digit is 5 or more.

Hundreds place $(3 + 1 = 4)$ changes.

46,364 rounded to the nearest hundred is 46,400.

To the nearest thousand: 46,<u>3</u>64

Next digit is 4 or less.

Thousands place stays the same.

46,364 rounded to the nearest thousand is 46,000.

(c) To the nearest ten: 268,3<u>2</u>8

Next digit is 5 or more.

Tens place $(2 + 1 = 3)$ changes.

268,328 rounded to the nearest ten is 268,330.

To the nearest hundred: 268,<u>3</u>28

Next digit is 4 or less.

Hundreds place stays the same.

268,328 rounded to the nearest hundred is 268,300.

To the nearest thousand: 26<u>8</u>,328

Next digit is 4 or less.

Thousands place stays the same.

268,328 rounded to the nearest thousand is 268,000.

8. **(a)**

16	20	rounded to the nearest ten
74	70	
58	60	
+ 31	+ 30	
	180	estimated answer

(b)

53	50	rounded to the nearest ten
− 19	− <u>2</u>0	
	30	estimated answer

(c)

46	<u>5</u>0	rounded to the nearest ten
× 74	× 7<u>0</u>	
	35<u>00</u>	estimated answer

9. **(a)**

358	400	rounded to the nearest
743	700	hundred
822	800	
+ 978	+ 1000	
	2900	estimated answer

(b)

842	800	rounded to the nearest
− 475	− 500	hundred
	300	estimated answer

(c)

723	700	rounded to the nearest
× 478	× 500	hundred
	350,000	estimated answer

10. **(a)**

36	40	first digit rounded; all
3852	4000	others changed to zero
749	7<u>00</u>	
+ 5474	+ <u>5</u>000	
	9740	estimated answer

(b)

2583	3000	first digit rounded; all
− 765	− 800	others changed to zero
	2200	estimated answer

(c)

648	600	first digit rounded; all
× 67	× 70	others changed to zero
	42,000	estimated answer

1.7   Section Exercises

1.   624 to the nearest <u>te</u>n is 620.

2.   509 to the nearest <u>te</u>n is 510.

3.   86,813 to the nearest <u>hundred</u> is 86,800.

4.   17,211 to the nearest <u>hundred</u> is 17,200.

5.   78,499 to the nearest <u>thousand</u> is 78,000.

6.   14,314 to the nearest <u>thousand</u> is 14,000.

7.   12,987 to the nearest <u>ten-thousand</u> is 10,000.

8.   6599 to the nearest <u>ten-thousand</u> is 10,000.

9.   855 rounded to the nearest ten: 860

   8<u>5</u>5   Next digit is 5 or more. Tens place changes $(5 + 1 = 6)$. All digits to the right of the underlined place change to zero.

10.   946 rounded to the nearest ten: 950

   9<u>4</u>6   Next digit is 5 or more. Tens place changes $(4 + 1 = 5)$. The digit to the right of the underlined place changes to zero.

11.   6771 rounded to the nearest hundred: 6800

   6<u>7</u>71   Next digit is 5 or more. Hundreds place changes $(7 + 1 = 8)$. All digits to the right of the underlined place change to zero.

12.   5847 rounded to the nearest hundred: 5800

   5<u>8</u>47   Next digit is 4 or less. Hundreds place does not change. All digits to the right of the underlined place change to zero.

13.   28,472 rounded to the nearest hundred: 28,500

   28,<u>4</u>72   Next digit is 5 or more. Hundreds place changes $(4 + 1 = 5)$. All digits to the right of the underlined place change to zero.

14.   18,249 rounded to the nearest hundred: 18,200

   18,<u>2</u>49   Next digit is 4 or less. Hundreds place does not change. All digits to the right of the underlined place change to zero.

15.   5996 rounded to the nearest hundred: 6000

   5<u>9</u>96   Next digit is 5 or more. Hundreds place changes $(9 + 1 = 10)$. Write 0 and carry 1. All digits to the right of the underlined place change to zero.

16.   4452 rounded to the nearest hundred: 4500

   4<u>4</u>52   Next digit is 5 or more. Hundreds place changes $(4 + 1 = 5)$. All digits to the right of the underlined place change to zero.

17.   15,758 rounded to the nearest thousand: 16,000

   1<u>5</u>,758   Next digit is 5 or more. Thousands place changes $(5 + 1 = 6)$. All digits to the right of the underlined place change to zero.

18.   28,465 rounded to the nearest thousand: 28,000

   2<u>8</u>,465   Next digit is 4 or less. Thousands place does not change. All digits to the right of the underlined place change to zero.

19.   7,760,058,721 rounded to the nearest billion: 8,000,000,000

   <u>7</u>,760,058,721   Next digit is 5 or more. Billions place changes $(7 + 1 = 8)$. All digits to the right of the underlined place change to zero.

20.   4,468,523,628 rounded to the nearest billion: 4,000,000,000

   <u>4</u>,468,523,628   Next digit is 4 or less. Billions place does not change. All digits to the right of the underlined place change to zero.

21.   595,008 rounded to the nearest ten-thousand: 600,000

   5<u>9</u>5,008   Next digit is 5 or more. Ten-thousands place changes $(9 + 1 = 10)$. Write 0 and carry 1. All digits to the right of the underlined place change to zero.

22.   725,182 rounded to the nearest ten-thousand: 730,000

   7<u>2</u>5,182   Next digit is 5 or more. Ten-thousands place changes $(2 + 1 = 3)$. All digits to the right of the underlined place change to zero.

23.   4,860,220 rounded to the nearest million: 5,000,000

   <u>4</u>,860,220   Next digit is 5 or more. Millions place changes $(4 + 1 = 5)$. All digits to the right of the underlined place change to zero.

24.   13,713,409 rounded to the nearest million: 14,000,000

   1<u>3</u>,713,409   Next digit is 5 or more. Millions place changes $(3 + 1 = 4)$. All digits to the right of the underlined place change to zero.

25.   **To the nearest ten:** 44<u>7</u>6

   Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 7. **4480**

   To the nearest hundred: 4<u>4</u>76

   Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 4. **4500**

To the nearest thousand: 4̲476

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 4 as 4. **4000**

26. **To the nearest ten:** 64̲83

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 8 as 8. **6480**

To the nearest hundred: 6̲483

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 4. **6500**

To the nearest thousand: 6̲483

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 6 as 6. **6000**

27. **To the nearest ten:** 3̲3̲74

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 7 as 7. **3370**

To the nearest hundred: 3̲374

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 3. **3400**

To the nearest thousand: 3̲374

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 3 as 3. **3000**

28. **To the nearest ten:** 76̲32

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 3 as 3. **7630**

To the nearest hundred: 7̲632

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 6 as 6. **7600**

To the nearest thousand: 7̲632

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 7. **8000**

29. **To the nearest ten:** 60̲48

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 4. **6050**

To the nearest hundred: 6̲048

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 0 as 0. **6000**

To the nearest thousand: 6̲048

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 6 as 6. **6000**

30. **To the nearest ten:** 70̲65

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 6. **7070**

To the nearest hundred: 7̲065

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 0. **7100**

To the nearest thousand: 7̲065

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 7 as 7. **7000**

31. **To the nearest ten:** 53̲43

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 4 as 4. **5340**

To the nearest hundred: 5̲343

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 3 as 3. **5300**

To the nearest thousand: 5̲343

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 5 as 5. **5000**

32. **To the nearest ten:** 74̲56

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 5. **7460**

To the nearest hundred: 7̲456

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 4. **7500**

To the nearest thousand: 7̲456

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 7 as 7. **7000**

33.   To the nearest ten: 19,5<u>3</u>9

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 3. **19,540**

To the nearest hundred: 19,<u>5</u>39

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 5 as 5. **19,500**

To the nearest thousand: 1<u>9</u>,539

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 9. Write 0 and carry 1.   **20,000**

34.   To the nearest ten: 59,8<u>0</u>6

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 0. **59,810**

To the nearest hundred: 59,<u>8</u>06

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 8 as 8. **59,800**

To the nearest thousand: 5<u>9</u>,806

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 9. Write 0 and carry 1. **60,000**

35.   To the nearest ten: 26,2<u>9</u>2

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 9 as 9. **26,290**

To the nearest hundred: 26,<u>2</u>92

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 2. **26,300**

To the nearest thousand: 2<u>6</u>,292

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 6 as 6. **26,000**

36.   To the nearest ten: 78,5<u>1</u>9

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 1. **78,520**

To the nearest hundred: 78,<u>5</u>19

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 5 as 5. **78,500**

To the nearest thousand: 7<u>8</u>,519

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 8. **79,000**

37.   To the nearest ten: 93,7<u>0</u>6

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 0. **93,710**

To the nearest hundred: 93,<u>7</u>06

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 7 as 7. **93,700**

To the nearest thousand: 9<u>3</u>,706

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 3. **94,000**

38.   To the nearest ten: 84,6<u>3</u>9

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 3. **84,640**

To the nearest hundred: 84,<u>6</u>39

Next digit is 4 or less. All digits to the right of the underlined place are changed to zero. Leave 6 as 6. **84,600**

To the nearest thousand: 8<u>4</u>,639

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 4. **85,000**

39.   *Step 1*   Locate the place to be rounded and underline it.

Step 2   Look only at the next digit to the right. If this digit is 5 or more, increase the underlined digit by 1.

Step 3   Change all digits to the right of the underlined place to zeros.

40.   *Step 1* Locate the place to be rounded and underline it.

Step 2 Look only at the next digit to the right. If this digit is 4 or less, do not change the underlined digit.

Step 3 Change all digits to the right of the underlined place to zeros.

41.   *Estimate: Exact:*

30	25
60	63
50	47
+ 80	+ 84
220	219

42. *Estimate:* *Exact:*

```
    60        56
    20        24
    90        85
  + 70      + 71
   240       236
```

43. *Estimate:* *Exact:*

```
    80        78
  - 40      - 43
    40        35
```

44. *Estimate:* *Exact:*

```
    60        57
  - 20      - 24
    40        33
```

45. *Estimate:* *Exact:*

```
    70        67
  × 30      × 34
  2100       268
             201
            2278
```

46. *Estimate:* *Exact:*

```
    50        53
  × 80      × 75
  4000       265
             371
            3975
```

47. *Estimate:* *Exact:*

```
   900       863
   700       735
   400       438
 + 800     + 792
  2800      2828
```

48. *Estimate:* *Exact:*

```
   600       623
   400       362
   200       189
 + 700     + 736
  1900      1910
```

49. *Estimate:* *Exact:*

```
   900       883
 - 400     - 448
   500       435
```

50. *Estimate:* *Exact:*

```
   600       614
 - 300     - 276
   300       338
```

51. *Estimate:* *Exact:*

```
   800       752
 × 400     × 375
 320,000    3760
            5264
           2256
          282,000
```

52. *Estimate:* *Exact:*

```
   800       845
 × 400     × 396
 320,000    5070
            7605
           2535
          334,620
```

53. *Estimate:* *Exact:*

```
  8 000     8 215
    60        56
   700       729
 + 4 000   + 3 605
  12,760    12,605
```

54. *Estimate:* *Exact:*

```
  3 000     2 685
    70        73
   600       592
 + 7 000   + 7 183
  10,670    10,533
```

55. *Estimate:* *Exact:*

```
   700       687
 - 500     - 529
   200       158
```

56. *Estimate:* *Exact:*

```
   500       543
 - 200     - 174
   300       369
```

57. *Estimate:* *Exact:*

```
   900       939
 × 30      × 29
 27,000     8451
           1878
          27,231
```

58. *Estimate:*   *Exact:*

$$\begin{array}{r} 900 \\ \times\ 70 \\ \hline 63{,}000 \end{array} \qquad \begin{array}{r} 864 \\ \times\ 74 \\ \hline 3456 \\ 6048 \\ \hline 63{,}936 \end{array}$$

59. Perhaps the best explanation is that 3492 is closer to 3500 than 3400, but 3492 is closer to 3000 than to 4000.

60. Rounding numbers usually allows for faster calculation and results in an estimated answer prior to getting an exact answer. One example is:

Estimate: *Exact:*

$$\begin{array}{r} 400 \\ -\ 200 \\ \hline 200 \end{array} \qquad \begin{array}{r} 432 \\ -\ 209 \\ \hline 223 \end{array}$$

61. 7̲6,000,000   Next digit is 5 or more. Change digit to the right of the underlined place to zero. Add 1 to 7. **80 million people**

3̲11,000,000   Next digit is 4 or less. Change digit to the right of the underlined place to zero. **310 million people**

62. 22,3̲62,180   Next digit is 4 or less. Change digits to the right of the underlined place to zeros. **22,360,000 hot dogs**

22,3̲62,180   Next digit is 5 or more. Change digits to the right of the underlined place to zeros. Add 1 to 3. **22,400,000 hot dogs**

63. 348̲,900   Next digit is 5 or more. Change digit to the right of the underlined place to zero. Add 1 to 8. **349,000 streets**

34̲8,900   Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 4. **350,000 streets**

64. 9̲5   Next digit is 5 or more, so add 1 to 9. Change digit to the right of the underlined place to zero. **100 streets**

2̲7   Next digit is 5 or more, so add 1 to 2. Change digit to the right of the underlined place to zero. **30 streets**

65. **To the nearest ten-thousand:** 39,8̲36,000

Next digit is 5 or more, so add 1 to 3. Change digits to the right of the underlined place to zeros.

39,840,000 tickets

To the nearest hundred-thousand: 39,8̲36,000

Next digit is 4 or less. Hundred-thousands place doesn't change. All digits to the right of the underlined place are changed to zero.

39,800,000 tickets

To the nearest million: 39̲,836,000

Next digit is 5 or more, so add 1 to 9. Change digits to the right of the underlined place to zeros.

40,000,000 tickets

66. **To the nearest ten-million:** 57,4̲63,625,000

Next digit is 4 or less. Ten-millions place doesn't change. All digits to the right of the underlined place are changed to zero. **$57,460,000,000**

To the nearest hundred-million: 57,4̲63,625,000

Next digit is 5 or more. All digits to the right of the underlined place are changed to zero. Add 1 to 4. **$57,500,000,000**

To the nearest billion: 57̲,463,625,000

Next digit is 4 or less. Billions place doesn't change. All digits to the right of the underlined place are changed to zero. **$57,000,000,000**

67. **To the nearest thousand:** 19,265̲,780

Next digit is 5 or more, so add 1 to 5. Change digits to the right of the underlined place to zeros.

19,266,000 players

To the nearest ten-thousand: 19,26̲5,780

Next digit is 5 or more, so add 1 to 6. Change digits to the right of the underlined place to zeros.

19,270,000 players

To the nearest hundred-thousand: 19,2̲65,780

Next digit is 5 or more, so add 1 to 2. Change digits to the right of the underlined place to zeros.

19,300,000 players

68. **To the nearest ten:** 221,54̲3

Next digit is 4 or less. Tens place doesn't change. All digits to the right of the underlined place are changed to zero. **221,540 cars**

To the nearest hundred: 221,5̲43

Next digit is 4 or less. Hundreds place doesn't change. All digits to the right of the underlined place are changed to zero. **221,500 cars**

To the nearest thousand: 221̲,543

Next digit is 5 or more, so add 1 to 1. Change digits to the right of the underlined place to zeros. **222,000 cars**

69. 71,499 would round to 71,000, so the smallest whole number it could have been is 71,500.

70. 72,500 would round to 73,000, so the largest whole number it could have been is 72,499.

71. 7500 is the smallest possible whole number that will round to 8000 using front end rounding.

72. 8499 is the largest possible whole number that will round to 8000 using front end rounding.

73.

Exact:	Rounding to the nearest ten:
3925	3930
11,243	11,240
15,974	15,970
17,916	17,920
534,883	534,880
2,788,000	2,788,000

74.

Exact:	Front end rounded:
3925	4000
11,243	10,000
15,974	20,000
17,916	20,000
534,883	500,000
2,788,000	3,000,000

75. **(a)** When using front end rounding, all digits are 0 except the first digit. These numbers are easier to work with when estimating answers.

(b) Sometimes when using front end rounding, the estimated answer can vary greatly from the exact answer.

1.8 Exponents, Roots, and Order of Operations

1.8 Margin Exercises

1. **(a)** 4^2: exponent is 2; base is 4.

$4^2 = 4 \times 4 = 16$

(b) 5^3: exponent is 3; base is 5.

$5^3 = 5 \times 5 \times 5 = 125$

(c) 3^4: exponent is 4; base is 3.

$3^4 = 3 \times 3 \times 3 \times 3 = 81$

(d) 2^6: exponent is 6; base is 2.

$2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$

2. **(a)** Because $2^2 = 4$, $\sqrt{4} = 2$.

(b) Because $5^2 = 25$, $\sqrt{25} = 5$.

(c) Because $6^2 = 36$, $\sqrt{36} = 6$.

(d) Because $15^2 = 225$, $\sqrt{225} = 15$.

(e) Because $1^2 = 1$, $\sqrt{1} = 1$.

3. **(a)** $4 + 5 + 2^2$ *Evaluate exponent.*
$4 + 5 + 2 \cdot 2$ *Multiply.*
$4 + 5 + \underline{4}$ *Add from left to right.*
$9 + \underline{4} = \underline{13}$

(b) $3^2 + 2^3$ *Evaluate exponent.*
$3 \cdot 3 + 2 \cdot 2 \cdot 2$ *Multiply from left to right.*
$9 + 8 = 17$ *Add.*

(c) $60 \div \sqrt{36} \div 2$ *Square root*
$60 \div 6 \div 2$ *Divide left to right.*
$10 \div 2 = 5$ *Divide.*

(d) $8 + 6(14 \div 2)$ *Work inside parentheses.*
$8 + 6(7)$ *Multiply.*
$8 + 42 = 50$ *Add.*

4. **(a)** $12 - 6 + 4^2$ *Evaluate exponent.*
$12 - 6 + \underline{4} \cdot \underline{4}$ *Multiply.*
$12 - 6 + 16$ *Subtract left to right.*
$6 + 16 = \underline{22}$ *Add.*

(b) $2^3 + 3^2 - (5 \cdot 3)$ *Work inside parentheses.*
$2^3 + 3^2 - 15$ *Evaluate exponents.*
$8 + 9 - 15$ *Add left to right.*
$17 - 15 = 2$ *Subtract.*

(c) $20 \div 2 + (7 - 5)$ *Work inside parentheses.*
$20 \div 2 + 2$ *Divide.*
$10 + 2 = 12$ *Add.*

(d) $15 \cdot \sqrt{9} - 8 \cdot \sqrt{4}$ *Square roots*
$15 \cdot 3 - 8 \cdot 2$ *Multiply.*
$45 - 16 = 29$ *Subtract.*

1.8 Section Exercises

1. 3^2: exponent is 2, base is 3.

2. 2^3: exponent is 3, base is 2.

3. 5^2: exponent is 2, base is 5.

4. 4^2: exponent is 2, base is 4.

5. 8^2: exponent is 2, base is 8.

$8^2 = 8 \cdot 8 = 64$

6. 10^3: exponent is 3, base is 10.

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

7. 15^2: exponent is 2, base is 15.

$15^2 = 15 \cdot 15 = 225$

8. 11^3: exponent is 3, base is 11.

$11^3 = 11 \cdot 11 \cdot 11 = 121 \cdot 11 = 1331$

9. From the table, $4^2 = 16$, so $\sqrt{16} = 4$.

10. From the table, $5^2 = 25$, so $\sqrt{25} = 5$.

11. From the table, $8^2 = 64$, so $\sqrt{64} = 8$.

12. From the table, $6^2 = 36$, so $\sqrt{36} = 6$.

13. From the table, $10^2 = 100$, so $\sqrt{100} = 10$.

14. From the table, $7^2 = 49$, so $\sqrt{49} = 7$.

15. From the table, $12^2 = 144$, so $\sqrt{144} = 12$.

16. From the table, $15^2 = 225$, so $\sqrt{225} = 15$.

17. *False:* 5^2 means that 5 is used as a factor 2 times, so $5^2 = 5 \cdot 5 = 25$.

18. *False:* $4^2 = 4 \cdot 4 = 16$.

19. *False:* 1 raised to any power is 1. Here, $1^3 = 1 \cdot 1 \cdot 1 = 1$.

20. *False:* a number raised to the first power is the number itself, so $6^1 = 6$.

21. $6^2 = \underline{36}$, so $\sqrt{36} = 6$.

22. $9^2 = \underline{81}$, so $\sqrt{81} = 9$.

23. $25^2 = \underline{625}$, so $\sqrt{625} = 25$.

24. $50^2 = \underline{2500}$, so $\sqrt{2500} = 50$.

25. $100^2 = \underline{10,000}$, so $\sqrt{10,000} = 100$.

26. $60^2 = \underline{3600}$, so $\sqrt{3600} = 60$.

27. A perfect square is the square of a whole number. The number 25 is the square of 5 because $5 \cdot 5 = 25$.

The number 50 is not a perfect square. There is no whole number that can be squared to get 50.

28. (1) Do all operations inside parentheses or other grouping symbols.

(2) Simplify any expressions with exponents and find any square roots.

(3) Multiply or divide, proceeding from left to right.

(4) Add or subtract, proceeding from left to right.

29. $3^2 + 8 - 5$ *Exponent*
$9 + 8 - 5$ *Add.*
$17 - 5 = 12$ *Subtract.*   **TRUE**

30. $5^2 + 5 - 6$ *Exponent*
$25 + 5 - 6$ *Add.*
$30 - 6 = 24$ *Subtract.*   **TRUE**

31. $6 + 8 \div 2$ *Divide.*
$6 + 4 = 10$ *Add.*

The given statement is *false*. Multiplications and divisions are performed from *left* to *right*, then additions and subtractions.

32. $4 + 5(6 - 4)$ *Parentheses*
$4 + 5(2)$ *Multiply.*
$4 + 10 = 14$ *Add.*

The given statement is *false*. A common error is adding 4 to 5 first and then multiplying by 2. Follow the order of operations.

33. $3^2 + 8 - 5$ *Exponent*
$9 + 8 - 5$ *Add.*
$17 - 5 = 12$ *Subtract.*

34. $5^2 + 5 - 6$ *Exponent*
$25 + 5 - 6$ *Add.*
$30 - 6 = 24$ *Subtract.*

35. $25 \div 5(8 - 4)$ *Parentheses*
$25 \div 5(4)$ *Divide.*
$5(4) = 20$ *Multiply.*

36. $36 \div 18(7 - 3)$ *Parentheses*
$36 \div 18 \cdot 4$ *Divide.*
$2 \cdot 4 = 8$ *Multiply.*

37. $5 \cdot 3^2 + \dfrac{0}{8}$ *Exponent*
$5 \cdot 9 + \dfrac{0}{8}$ *Multiply.*
$45 + \dfrac{0}{8}$ *Divide.*
$45 + 0 = 45$ *Add.*

38. $8 \cdot 3^2 - \dfrac{10}{2}$ *Exponent*
$8 \cdot 9 - \dfrac{10}{2}$ *Multiply.*
$72 - \dfrac{10}{2}$ *Divide.*
$72 - 5 = 67$ *Subtract.*

39. $4 \cdot 1 + 8(9 - 2) + 3$ *Parentheses*
$4 \cdot 1 + 8 \cdot 7 + 3$ *Multiply.*
$4 + 56 + 3$ *Add.*
$60 + 3 = 63$ *Add.*

40. $3 \cdot 2 + 7(3 + 1) + 5$ *Parentheses*
$3 \cdot 2 + 7 \cdot 4 + 5$ *Multiply.*
$6 + 28 + 5$ *Add.*
$34 + 5 = 39$ *Add.*

41. $2^2 \cdot 3^3 + (20 - 15) \cdot 2$ *Parentheses*
$2^2 \cdot 3^3 + 5 \cdot 2$ *Exponents*
$4 \cdot 27 + 5 \cdot 2$ *Multiply.*
$108 + 10 = 118$ *Add.*

42. $4^2 \cdot 5^2 + (20 - 9) \cdot 3$ *Parentheses*
$4^2 \cdot 5^2 + 11 \cdot 3$ *Exponents*
$16 \cdot 25 + 11 \cdot 3$ *Multiply.*
$400 + 33 = 433$ *Add.*

43. $5 \cdot \sqrt{36} - 2(4)$ *Square root*
  $5 \cdot 6 - 2(4)$ *Multiply.*
  $30 - 8 = 22$ *Subtract.*

44. $2 \cdot \sqrt{100} - 3(4)$ *Square root*
  $2 \cdot 10 - 3(4)$ *Multiply.*
  $20 - 12 = 8$ *Subtract.*

45. $8(2) + 3 \cdot 7 - 7$ *Multiply.*
  $16 + 21 - 7$ *Add.*
  $37 - 7 = 30$ *Subtract.*

46. $10(3) + 6 \cdot 5 - 20$ *Multiply.*
  $30 + 30 - 20$ *Add.*
  $60 - 20 = 40$ *Subtract.*

47. $2^3 \cdot 3^2 + 3(14 - 4)$ *Parentheses*
  $2^3 \cdot 3^2 + 3(10)$ *Exponents*
  $8 \cdot 9 + 3(10)$ *Multiply.*
  $72 + 30 = 102$ *Add.*

48. $3^2 \cdot 4^2 + 2(15 - 6)$ *Parentheses*
  $3^2 \cdot 4^2 + 2(9)$ *Exponents*
  $9 \cdot 16 + 2(9)$ *Multiply.*
  $144 + 18 = 162$ *Add.*

49. $7 + 8 \div 4 + \dfrac{0}{7}$ *Divide.*
  $7 + 2 + \dfrac{0}{7}$ *Divide.*
  $7 + 2 + 0$ *Add.*
  $9 + 0 = 9$ *Add.*

50. $6 + 8 \div 2 + \dfrac{0}{8}$ *Divide.*
  $6 + 4 + \dfrac{0}{8}$ *Divide.*
  $6 + 4 + 0$ *Add.*
  $10 + 0 = 10$ *Add.*

51. $3^2 + 6^2 + (30 - 21) \cdot 2$ *Parentheses*
  $3^2 + 6^2 + 9 \cdot 2$ *Exponents*
  $9 + 36 + 9 \cdot 2$ *Multiply.*
  $9 + 36 + 18$ *Add.*
  $45 + 18 = 63$ *Add.*

52. $4^2 + 5^2 + (25 - 9) \cdot 3$ *Parentheses*
  $4^2 + 5^2 + 16 \cdot 3$ *Exponents*
  $16 + 25 + 16 \cdot 3$ *Multiply.*
  $16 + 25 + 48$ *Add.*
  $41 + 48 = 89$ *Add.*

53. $7 \cdot \sqrt{81} - 5 \cdot 6$ *Square root*
  $7 \cdot 9 - 5 \cdot 6$ *Multiply.*
  $63 - 30 = 33$ *Subtract.*

54. $6 \cdot \sqrt{64} - 6 \cdot 5$ *Square root*
  $6 \cdot 8 - 6 \cdot 5$ *Multiply.*
  $48 - 30 = 18$ *Subtract.*

55. $8 \cdot 2 + 5(3 \cdot 4) - 6$ *Parentheses*
  $8 \cdot 2 + 5(12) - 6$ *Multiply.*
  $16 + 60 - 6$ *Add.*
  $76 - 6 = 70$ *Subtract.*

56. $5 \cdot 2 + 3(5 + 3) - 6$ *Parentheses*
  $5 \cdot 2 + 3(8) - 6$ *Multiply.*
  $10 + 24 - 6$ *Add.*
  $34 - 6 = 28$ *Subtract.*

57. $4 \cdot \sqrt{49} - 7(5 - 2)$ *Parentheses*
  $4 \cdot \sqrt{49} - 7 \cdot 3$ *Square root*
  $4 \cdot 7 - 7 \cdot 3$ *Multiply.*
  $28 - 21 = 7$ *Subtract.*

58. $3 \cdot \sqrt{25} - 6(3 - 1)$ *Parentheses*
  $3 \cdot \sqrt{25} - 6 \cdot 2$ *Square root*
  $3 \cdot 5 - 6 \cdot 2$ *Multiply.*
  $15 - 12 = 3$ *Subtract.*

59. $7(4 - 2) + \sqrt{9}$ *Parentheses*
  $7(2) + \sqrt{9}$ *Square root*
  $7(2) + 3$ *Multiply.*
  $14 + 3 = 17$ *Add.*

60. $5(4 - 3) + \sqrt{9}$ *Parentheses*
  $5(1) + \sqrt{9}$ *Square root*
  $5(1) + 3$ *Multiply.*
  $5 + 3 = 8$ *Add.*

61. $7^2 + 3^2 - 8 + 5$ *Exponents*
  $49 + 9 - 8 + 5$ *Add.*
  $58 - 8 + 5$ *Subtract.*
  $50 + 5 = 55$ *Add.*

62. $3^2 - 2^2 + 3 - 2$ *Exponents*
  $9 - 4 + 3 - 2$ *Subtract.*
  $5 + 3 - 2$ *Add.*
  $8 - 2 = 6$ *Subtract.*

63. $5^2 \cdot 2^2 + (8 - 4) \cdot 2$ *Parentheses*
  $5^2 \cdot 2^2 + 4 \cdot 2$ *Exponents*
  $25 \cdot 4 + 4 \cdot 2$ *Multiply.*
  $100 + 8 = 108$ *Add.*

64. $5^2 \cdot 3^2 + (30 - 20) \cdot 2$ *Parentheses*
  $5^2 \cdot 3^2 + 10 \cdot 2$ *Exponents*
  $25 \cdot 9 + 10 \cdot 2$ *Multiply.*
  $225 + 20 = 245$ *Add.*

65. $5 + 9 \div 3 + 6 \cdot 3$ *Divide.*
    $5 + 3 + 6 \cdot 3$ *Multiply.*
    $5 + 3 + 18$ *Add.*
    $8 + 18 = 26$ *Add.*

66. $8 + 3 \div 3 + 6 \cdot 3$ *Divide.*
    $8 + 1 + 6 \cdot 3$ *Multiply.*
    $8 + 1 + 18$ *Add.*
    $9 + 18 = 27$ *Add.*

67. $8 \cdot \sqrt{49} - 6(9 - 4)$ *Parentheses*
    $8 \cdot \sqrt{49} - 6(5)$ *Square root*
    $8 \cdot 7 - 6(5)$ *Multiply.*
    $56 - 30 = 26$ *Subtract.*

68. $8 \cdot \sqrt{49} - 6(5 + 3)$ *Parentheses*
    $8 \cdot \sqrt{49} - 6(8)$ *Square root*
    $8 \cdot 7 - 6(8)$ *Multiply.*
    $56 - 48 = 8$ *Subtract.*

69. $5^2 - 4^2 + 3 \cdot 6$ *Exponent*
    $25 - 16 + 3 \cdot 6$ *Multiply.*
    $25 - 16 + 18$ *Subtract.*
    $9 + 18 = 27$ *Add.*

70. $3^2 + 6^2 - 5 \cdot 8$ *Exponent*
    $9 + 36 - 5 \cdot 8$ *Multiply.*
    $9 + 36 - 40$ *Add.*
    $45 - 40 = 5$ *Subtract.*

71. $8 + 8 \div 8 + 6 + \dfrac{5}{5}$ *Divide.*
    $8 + 1 + 6 + 1$ *Add.*
    $9 + 6 + 1$ *Add.*
    $15 + 1 = 16$ *Add.*

72. $3 + 14 \div 2 + 7 + \dfrac{8}{8}$ *Divide.*
    $3 + 7 + 7 + 1$ *Add.*
    $10 + 7 + 1$ *Add.*
    $17 + 1 = 18$ *Add.*

73. $6 \cdot \sqrt{25} - 7(2)$ *Square root*
    $6 \cdot 5 - 7 \cdot 2$ *Multiply.*
    $30 - 14 = 16$ *Subtract.*

74. $8 \cdot \sqrt{36} - 4(6)$ *Square root*
    $8 \cdot 6 - 4(6)$ *Multiply.*
    $48 - 24 = 24$ *Subtract.*

75. $9 \cdot \sqrt{16} - 3 \cdot \sqrt{25}$ *Square roots*
    $9 \cdot 4 - 3 \cdot 5$ *Multiply.*
    $36 - 15 = 21$ *Subtract.*

76. $6 \cdot \sqrt{81} - 3 \cdot \sqrt{49}$ *Square roots*
    $6 \cdot 9 - 3 \cdot 7$ *Multiply.*
    $54 - 21 = 33$ *Subtract.*

77. $7 \div 1 \cdot 8 \cdot 2 \div (21 - 5)$ *Parentheses*
    $7 \div 1 \cdot 8 \cdot 2 \div 16$ *Divide.*
    $7 \cdot 8 \cdot 2 \div 16$ *Multiply.*
    $56 \cdot 2 \div 16$ *Multiply.*
    $112 \div 16 = 7$ *Divide.*

78. $12 \div 4 \cdot 5 \cdot 4 \div (15 - 13)$ *Parentheses*
    $12 \div 4 \cdot 5 \cdot 4 \div 2$ *Divide.*
    $3 \cdot 5 \cdot 4 \div 2$ *Multiply.*
    $15 \cdot 4 \div 2$ *Multiply.*
    $60 \div 2 = 30$ *Divide.*

79. $15 \div 3 \cdot 2 \cdot 6 \div (14 - 11)$ *Parentheses*
    $15 \div 3 \cdot 2 \cdot 6 \div 3$ *Divide.*
    $5 \cdot 2 \cdot 6 \div 3$ *Multiply.*
    $10 \cdot 6 \div 3$ *Multiply.*
    $60 \div 3 = 20$ *Divide.*

80. $9 \div 1 \cdot 4 \cdot 2 \div (11 - 5)$ *Parentheses*
    $9 \div 1 \cdot 4 \cdot 2 \div 6$ *Divide.*
    $9 \cdot 4 \cdot 2 \div 6$ *Multiply.*
    $36 \cdot 2 \div 6$ *Multiply.*
    $72 \div 6 = 12$ *Divide.*

81. $6 \cdot \sqrt{25} - 4 \cdot \sqrt{16}$ *Square roots*
    $6 \cdot 5 - 4 \cdot 4$ *Multiply.*
    $30 - 16 = 14$ *Subtract.*

82. $10 \cdot \sqrt{49} - 4 \cdot \sqrt{64}$ *Square roots*
    $10 \cdot 7 - 4 \cdot 8$ *Multiply.*
    $70 - 32 = 38$ *Subtract.*

83. $5 \div 1 \cdot 10 \cdot 4 \div (17 - 9)$ *Parentheses*
    $5 \div 1 \cdot 10 \cdot 4 \div 8$ *Divide.*
    $5 \cdot 10 \cdot 4 \div 8$ *Multiply.*
    $50 \cdot 4 \div 8$ *Multiply.*
    $200 \div 8 = 25$ *Divide.*

84. $15 \div 3 \cdot 8 \cdot 9 \div (12 - 8)$ *Parentheses*
    $15 \div 3 \cdot 8 \cdot 9 \div 4$ *Divide.*
    $5 \cdot 8 \cdot 9 \div 4$ *Multiply.*
    $40 \cdot 9 \div 4$ *Multiply.*
    $360 \div 4 = 90$ *Divide.*

85. $8 \cdot 9 \div \sqrt{36} - 4 \div 2 + (14 - 8)$ *Parentheses*
    $8 \cdot 9 \div \sqrt{36} - 4 \div 2 + 6$ *Square root*
    $8 \cdot 9 \div 6 - 4 \div 2 + 6$ *Multiply.*
    $72 \div 6 - 4 \div 2 + 6$ *Divide.*
    $12 - 2 + 6$ *Subtract.*
    $10 + 6 = 16$ *Add.*

86. $3 - 2 + 5 \cdot 4 \cdot \sqrt{144} \div \sqrt{36}$ *Square roots*
    $3 - 2 + 5 \cdot 4 \cdot 12 \div 6$ *Multiply.*
    $3 - 2 + 20 \cdot 12 \div 6$ *Multiply.*
    $3 - 2 + 240 \div 6$ *Divide.*
    $3 - 2 + 40$ *Subtract.*
    $1 + 40 = 41$ *Add.*

87. $2 + 1 - 2 \cdot \sqrt{1} + 4 \cdot \sqrt{81} - 7 \cdot 2$ *Square roots*
   $2 + 1 - 2 \cdot 1 + 4 \cdot 9 - 7 \cdot 2$ *Multiply.*
   $2 + 1 - 2 + 36 - 14$ *Add.*
   $3 - 2 + 36 - 14$ *Subtract.*
   $1 + 36 - 14$ *Add.*
   $37 - 14 = 23$ *Subtract.*

88. $6 - 4 + 2 \cdot 9 - 3 \cdot \sqrt{225} \div \sqrt{25}$ *Square roots*
   $6 - 4 + 2 \cdot 9 - 3 \cdot 15 \div 5$ *Multiply.*
   $6 - 4 + 18 - 45 \div 5$ *Divide.*
   $6 - 4 + 18 - 9$ *Subtract.*
   $2 + 18 - 9$ *Add.*
   $20 - 9 = 11$ *Subtract.*

89. $5 \cdot \sqrt{36} \cdot \sqrt{100} \div 4 \cdot \sqrt{9} + 8$ *Square roots*
   $5 \cdot 6 \cdot 10 \div 4 \cdot 3 + 8$ *Multiply.*
   $30 \cdot 10 \div 4 \cdot 3 + 8$ *Multiply.*
   $300 \div 4 \cdot 3 + 8$ *Divide.*
   $75 \cdot 3 + 8$ *Multiply.*
   $225 + 8 = 233$ *Add.*

90. $9 \cdot \sqrt{36} \cdot \sqrt{81} \div 2 + 6 - 3 - 5$ *Square roots*
   $9 \cdot 6 \cdot 9 \div 2 + 6 - 3 - 5$ *Multiply.*
   $54 \cdot 9 \div 2 + 6 - 3 - 5$ *Multiply.*
   $486 \div 2 + 6 - 3 - 5$ *Divide.*
   $243 + 6 - 3 - 5$ *Add.*
   $249 - 3 - 5$ *Subtract.*
   $246 - 5 = 241$ *Subtract.*

1.9 Reading Pictographs, Bar Graphs, and Line Graphs

1.9 Margin Exercises

1. **(a)** The Rock and Roll/Rhythm and Blues stamp had the second greatest number (4) of sales since that row has the second most stamp symbols.

(b) There is about one more stamp in the Rock and Roll/Rhythm and Blues row than in the Art of Disney Romance row. Since one stamp represents 20 million stamps, there were about 20,000,000 more Rock and Roll/Rhythm and Blues stamps sold.

2. **(a)** Secret account or card: 27 out of 100

(b) Misrepresented purchased price: 39 out of 100

(c) Hid purchases: 42 out of 100

(d) Hid debt: 26 out of 100

(e) Did not tell credit score: 12 out of 100

3. **(a)** For the year 2050, the dot is very close to the horizontal line marked 4, so the predicted population is about 400,000,000 people in 2050.

(b) About 475,000,000 people in 2075

(c) About 575,000,000 people in 2100

1.9 Section Exercises

1. The number of pictures or symbols for the Walgreens retail stores is 8. Since each symbol represents 500 stores, Walgreens has $8 \cdot 500 = 4000$ stores.

2. The number of pictures or symbols for the CVS retail stores is $8\frac{1}{2}$. Since each symbol represents 500 stores, CVS has $8\frac{1}{2} \cdot 500 = 4250$ stores.

3. There are 9 symbols, so the number of retail stores for Family Dollar is about $9 \cdot 500 = 4500$ stores.

4. There are $10\frac{1}{2}$ symbols, so the number of retail stores for 7-Eleven is about

$(10 \cdot 500) + \frac{1}{2} \cdot 500 = 5000 + 250 = 5250.$

5. From the pictograph, Dollar General has the greatest number of retail stores. There are $11\frac{1}{2}$ symbols, so the number of retail stores for Dollar General is about

$11 \cdot 500 + \frac{1}{2} \cdot 500 = 5500 + 250 = 5750.$

6. According to the pictograph, the two companies that have the least number of retail stores are Rite-Aid and Walmart. There are 7 symbols, so the number of retail stores for Rite-Aid and Walmart is about $7 \cdot 500 = 3500.$

7. Using the results from Exercises 3 and 5, we see that Family Dollar has about

$5750 - 4500 = 1250$ fewer stores

than does Dollar General.

8. Walgreens has one more symbol than Walmart, so Walgreens has 500 more stores than Walmart.

9. The number of working adults who were surveyed is 100 (see the directions above the chart).

10. The number of career paths that were included in the survey is 7 (see the horizontal labels in the chart).

11. From the bar graph, 9 people out of 100 found their career as a result of training for a job.

12. From the bar graph, 18 people out of 100 found their careers because they studied for the career in school.

13. **(a)** According to the bar graph, the greatest number of people found their job by seeing an ad.

(b) From the bar graph, 25 people out of 100 found their career as a result of seeing an ad.

14. **(a)** From the bar graph, the least number of people found their career by being <u>promoted from within</u>.

(b) From the bar graph, <u>6 people</u> out of 100 found their career as a result of being promoted from within.

15. According to the bar graph, $18 - 9 = 9$ more people out of 100 found their career as a result of "Studied in school" than "Luck or chance."

16. From the bar graph, $18 + 9 = 27$ people out of 100 found their career as a result of either "Studied in school" or "Trained for a job."

17. According to the line graph, the year with the greatest number of installations is <u>2014</u>, with <u>7000 installations</u>.

18. From the line graph, <u>2009</u> and <u>2013</u> were the two years with the least number of installations. There were <u>2500</u> installations in each of these years.

19. According to the line graph the increase in the number of installations from 2013 to 2014 is $7000 - 2500 = 4500$.

20.
$$\begin{array}{ll} 4000 & \textit{installations in 2012} \\ -\,2500 & \textit{installations in 2013} \\ \hline 1500 & \textit{decrease in installations} \end{array}$$

The decrease in the number of installations from 2012 to 2013 is 1500.

21. Possible answers are

1. shortage of units to install.
2. lack of qualified workers.
3. poor economy.
4. less demand for solar products.

22. Possible answers are

1. greater demand.
2. more units available.
3. many qualified workers.
4. tax incentives for solar projects.

23. We want to insert parentheses in $7 - 2 \cdot 3 - 6$ so that it simplifies to 9. There isn't a method to use, so just use trial and error.

$$(7 - 2) \cdot 3 - 6 = 5 \cdot 3 - 6 = 15 - 6 = 9$$

24. $(4 + 2) \cdot (5 + 1) = 6 \cdot 6 = 36$

25. $36 \div (3 \cdot 3) \cdot 4 = 36 \div 9 \cdot 4 = 4 \cdot 4 = 16$

26. $56 \div (2 \cdot 2 \cdot 2) + \dfrac{0}{6} = 56 \div 8 + \dfrac{0}{6}$
$$= 7 + \dfrac{0}{6}$$
$$= 7 + 0 = 7$$

27. **(a)** Start with the top and work counterclockwise:

$$7920 + 1320 + 2640 + (5280 - 1320 - 1320)$$
$$+ 2640 + 1320 + 7920 + 5280$$

(b) $(5280 - 1320 - 1320) = 2640$, so we can add as follows:

$$\begin{array}{ll} \overset{4\,2}{7\,920} & \textit{top measurement} \\ 1\,320 & \\ 2\,640 & \\ 2\,640 & \textit{from parentheses} \\ 2\,640 & \\ 1\,320 & \\ 7\,920 & \\ +\ \ 5\,280 & \textit{right measurement} \\ \hline 31{,}680 & \textit{total} \end{array}$$

So 31,680 feet are needed for one strand and thus, $3 \times 31{,}680 = 95{,}040$ feet are needed for a three-strand barbed wire fence.

(c) Divide the answer from part (b) by 5280.

$$\begin{array}{r} 1\ 8 \\ 5280\,\overline{\smash{)}\,9\,5,\,0\,4\,0} \\ \underline{5\,2\,8\,0} \\ 4\,2\,2\,4\,0 \\ \underline{4\,2\,2\,4\,0} \\ 0 \end{array}$$

18 miles of barbed wire are needed for the fence.

1.10 Solving Application Problems

1.10 Margin Exercises

1. **(a)** A grocery clerk's hourly wage:
$1.40 is eliminated (too low)
$140 is eliminated (too high)
$14 is most reasonable
$1.40; $\boxed{\$14}$; $140

(b) The total length of five sports-utility vehicles: One vehicle is at least 10 feet, so five vehicles measure at least 50 feet. Only 80 feet is reasonable.
8 feet; 18 feet; $\boxed{\text{80 feet}}$; 800 feet

(c) The cost of heart bypass surgery:
$1000; $\boxed{\$100{,}000}$; $10,000,000

2. **(a)** *Step 1*
The total number of fossils is given, and the number each person receives must be found.

Step 2
"Divided equally" indicates division should be used.

Step 3
80 fossils divided equally among 4 people gives an estimate of 20 fossils per person.

Step 4
$$4\overline{\smash{)}84}$$
$$21$$

Step 5
Each person receives 21 fossils.

Step 6

21	*amount received by each person*
× 4	*number of people*
84	*total fossils; matches*

(b) *Step 1*
The total number of children and the number of children assigned to each counselor is given. The number of counselors needed must be found.

Step 2
"12 children are assigned to *each* camp counselor" indicates division should be used.

Step 3
If we replace 408 and 12 with 400 and 10, our estimate is $400 \div 10 = 40$.

Step 4
$$
\begin{array}{r}
3\ 4 \\
12\overline{\smash{)}4\ 0\ 8} \\
3\ 6 \\
\hline
4\ 8 \\
4\ 8 \\
\hline
0
\end{array}
$$

Step 5
There are 34 counselors needed.

Step 6

34	*counselors*
× 12	*children per counselor*
408	*total children; matches*

3. (a) *Step 1*
The number of points on examinations and quizzes is given. The total number of points must be found.

Step 2
"Her total points" indicates addition should be used.

Step 3
Rounding each score to the nearest ten gives 90, 80, 80, 100, 20, 10, 20, and 10. The sum of these scores gives an estimate of 410 points.

Step 4
$$
\begin{array}{r}
\overset{3}{9}2 \\
81 \\
83 \\
98 \\
15 \\
14 \\
15 \\
+\,12 \\
\hline
410 \quad \textit{matches estimate}
\end{array}
$$

Step 5
Her total is 410 points.

Step 6
The answer is the same as the estimate, so it is reasonable. Add the numbers again to check.

(b) *Step 1*
The customer contacts for each day are given. The total number of contacts for the week must be found.

Step 2
Adding the daily numbers to find the weekly total seems reasonable.

Step 3
Rounding each day's contacts to the nearest ten gives 80, 60, 120, 100, and 200. The sum gives an estimate of 560 customer contacts.

Step 4
$$
\begin{array}{r}
\overset{22}{78} \\
64 \\
118 \\
102 \\
+\,196 \\
\hline
558
\end{array}
$$

Step 5
Stephanie had 558 customer contacts for the week.

Step 6
The answer is reasonable. A check shows that the answer is correct.

4. (a) *Step 1*
The areas in square miles of two states is given. The difference must be found.

Step 2
"Difference" indicates subtraction should be used.

Step 3
Rounding each number of square miles to the nearest thousand gives
$663,000 - 269,000 = 394,000$ square miles.

Step 4

663,267
− 268,580
──────
394,687

Step 5
The difference in the number of square miles is 394,687 square miles.

Step 6
The answer is reasonable.

Check: 268,580
         + 394,687
         ──────
         663,267   *matches*

(b) *Step 1*
We know the beginning balance and the check amount, and need to find the new balance.

Step 2
Subtracting the numbers seems reasonable.

Step 3
Using the values $14,900 and $1200 in place of $14,863 and $1180 gives us
$14,900 − $1200 = $13,700 as an estimate.

Step 4

14,863
− 1 180
──────
13,683

Step 5
The amount remaining in the club account is $13,683.

Step 6
The answer is reasonable.

Check: 13,683
         + 1 180
         ──────
         14,863   *matches*

5.   **(a)** *Step 1*
The amount per camera, number of cameras, and total rebate are given. The final cost is to be found.

Step 2
Use multiplication to find the cost for all cameras, and then use subtraction to find the final cost.

Step 3
An estimate would be $320 \cdot \$130 - \$2500$
$= \$41,600 - \$2500 = \$39,100.$

Step 4

$129 $41,022
× 318   − 2 470
──────   ──────
$41,022 $38,552

Step 5
The final cost of the cameras is $38,552.

Step 6
The answer is close to the estimate, so it is reasonable. Check by adding the rebate to the final cost and then dividing by 318.
$\$38,552 + \$2470 = \$41,022$

```
              1 2 9
      318 ⟌ 4 1, 0 2 2
            3 1 8      ← 1 × 318
            ─────
            9 2 2
            6 3 6      ← 2 × 318
            ─────
            2 8 6 2
            2 8 6 2    ← 9 × 318
            ───────
                  0
```

$129 matches the amount per camera given in the problem.

(b) *Step 1*
The number of books sold and the number of those returned is given. The profit for each book sold is also given. The total profit on the books sold and not returned must be found.

Step 2
"Remaining" indicates subtraction. The number of books returned should be subtracted from the number sold and that number multiplied by the profit per book.

Step 3
Estimate that 13,000 books are sold, and 1000 of those are returned. A reasonable estimate of the number of books remaining after the returns is
$13,000 − 1000 = 12,000$. Each book has a profit of $6, so $12,000 \times \$6 = \$72,000.$

Step 4

12,628   11,765
− 863   ×   6
──────   ──────
11,765 $70,590

Step 5
The total profit for the books remaining after the returns is $70,590.

Step 6
The answer is reasonable since it is close to the estimate.

Check: 1 1, 7 6 5   11,765
         6 ⟌ 7 0, 5 9 0   + 863
                           ──────
                           12,628

1.10   Section Exercises

1.   Choice **(c)**, 25 hours, is *not* reasonable since there are only 24 hours in a day.

2. Choice **(b)**, $100/hr., is *not* reasonable for the hourly earnings of a part-time student employee.

3. Choice **(a)**, $5, is reasonable for the cost of lunch at a fast food restaurant.

4. Choice **(b)**, 25 mpg, is reasonable for the gas mileage of your car.

5. *Step 1*
Given the number of five types of sandwiches sold, find the total number of sandwiches sold.

Step 2
Addition seems reasonable since we want a total.

Step 3
The total number of sandwiches should be about $600 + 900 + \underline{1000} + 800 + \underline{2000} = \underline{5300}$ sandwiches.

Step 4
$$\begin{array}{r} \overset{3\,2\,2}{602} \\ 935 \\ 1328 \\ 757 \\ +\,1586 \\ \hline 5208 \end{array}$$

Step 5
The total number of sandwiches sold is 5208.

Step 6
The answer is reasonably close to the estimate. Check by adding the values again.

6. *Step 1*
Given the number of five types of items manufactured, find the total.

Step 2
Addition seems reasonable to use.

Step 3
$\underline{30,000} + 5000 + 2000 + 20,000 + \underline{10,000}$
$= \underline{67,000 \text{ units}}$ is an estimate.

Step 4
$$\begin{array}{r} \overset{2\,3\ 1\,2}{32,8\,15} \\ 4\,875 \\ 1\,975 \\ 15,308 \\ +\,9\,815 \\ \hline 64,788 \end{array}$$

Step 5
The total number of items manufactured is 64,788.

Step 6
The answer is reasonably close to the estimate. Check by adding the values again.

7. *Step 1*
Given two prices for car rentals, find the difference.

Step 2
"How much is saved" indicates subtraction could be used.

Step 3
An estimate is $300 - $200 = \underline{$100 \text{ saved}}$.

Step 4
$$\begin{array}{r} 296 \\ -\,192 \\ \hline 104 \end{array}$$

Step 5
Paying ahead will save $104.

Step 6
The answer is reasonably close to the estimate.
Check: $104 + $192 = $296

8. *Step 1*
Given two population numbers, find the difference.

Step 2
"Find the expected increase" indicates subtraction could be used.

Step 3
An estimate is $500 - 300 = 200$ million people.

Step 4
$$\begin{array}{r} 478 \\ -\,311 \\ \hline 167 \end{array}$$

Step 5
The expected increase in population is 167 million people.

Step 6
The answer is reasonably close to the estimate.
Check: $167 + 311 = 478$

9. *Step 1*
The number of kits packaged in one hour is given and the total number of kits packaged in 24 hours must be found.

Step 2
Multiply the number of kits packaged in 1 hour by 24.

Step 3
A reasonable answer would be $200 \times 20 = 4000$.

Step 4

$$\begin{array}{r} 236 \\ \times\ 24 \\ \hline 944 \\ 472 \\ \hline 5664 \end{array}$$

Step 5
5664 kits are packaged in 24 hours.

Step 6
The answer is reasonably close to the estimate, which is clearly low.

Check:
$$24\overline{\smash{)}\begin{array}{r} 236 \\ 5664 \end{array}}$$

10. *Step 1*
Find the number of tickets sold in a 12-day period.

Step 2
The number of tickets sold in one day is given. To find "how many in a 12-day period," multiply.

Step 3
10 times 500 gives an estimate of 5000 tickets.

Step 4

$$\begin{array}{r} 450 \\ \times\ 12 \\ \hline 900 \\ 450 \\ \hline 5400 \end{array}$$

Step 5
In a 12-day period, 5400 tickets are sold.

Step 6
Check:
$$12\overline{\smash{)}\begin{array}{r} 450 \\ 5400 \end{array}}$$

11. *Step 1*
Find the number of toys each child will receive.

Step 2
"Same number of toys to each" indicates division should be used.

Step 3
3000 divided by 700 gives an estimate of about 4 toys.

Step 4

$$657\overline{\smash{)}\begin{array}{r} 4 \\ 2628 \\ 2628 \\ \hline 0 \end{array}}$$

Step 5
Each child will receive 4 toys.

Step 6
$4 \times 657 = 2628$

12. *Step 1*
Find the amount each employee will receive.

Step 2
"Divide evenly" indicates division.

Step 3
$700,000 \div 1000$ gives an estimate of $700.

Step 4

$$1000\overline{\smash{)}680{,}000} \qquad \rightarrow \qquad 1\overline{\smash{)}\begin{array}{r} 680 \\ 680 \end{array}}$$

Step 5
Each employee will receive $680.

Step 6
Check: $680 \times 1000 = 680{,}000$

13. *Step 1*
The amount saved per month and the number of months are given. Find the total amount saved.

Step 2
Multiply the two given values.

Step 3
A reasonable answer would be $30 \times 5 = \$150$.

Step 4

$$\begin{array}{r} 34 \\ \times\ 5 \\ \hline 170 \end{array}$$

Step 5
$170 could be saved.

Step 6
The answer is reasonably close to the estimate.

Check:
$$5\overline{\smash{)}\begin{array}{r} 3\ 4 \\ 1\ 7\ {}^{2}0 \end{array}}$$

14. *Step 1*
The cost of tuition and fees per quarter and the number of quarters are given. Find the total amount needed for tuition and fees.

Step 2
Multiply the two given values.

Step 3
A reasonable answer would be $800 \times 5 = \$4000$.

Step 4

$$\begin{array}{r} 785 \\ \times\ 5 \\ \hline 3925 \end{array}$$

Step 5
The total amount needed for tuition and fees is $3925.

Step 6
The answer is reasonably close to the estimate.

Check:
$$5\overline{\smash{)}3\ 9\ {}^42\ {}^25}\quad\begin{array}{c}7\ \ 8\ \ 5\end{array}$$

15. *Step 1*
Given two numbers, find the total.

Step 2
"Find the total" indicates addition could be used.

Step 3
An estimate is $100{,}000 + 300{,}000 = \underline{400{,}000}$ deaths.

Step 4
$$\begin{array}{r} 110{,}070 \\ +\ 250{,}152 \\ \hline 360{,}222 \end{array}$$

Step 5
The total number of Union deaths in the Civil War was 360,222.

Step 6
The answer is reasonably close to the estimate.
Check: $360{,}222 - 250{,}152 = 110{,}070$

16. *Step 1*
Given two numbers, find the total.

Step 2
"Find the total" indicates addition could be used.

Step 3
An estimate is $90{,}000 + 200{,}000 = 290{,}000$ deaths.

Step 4
$$\begin{array}{r} 94{,}120 \\ +\ 164{,}300 \\ \hline 258{,}420 \end{array}$$

Step 5
The total number of Confederate deaths in the Civil War was 258,420.

Step 6
The answer is reasonably close to the estimate.
Check: $258{,}420 - 164{,}300 = 94{,}120$

17. *Step 1*
Given two numbers, find the difference.

Step 2
"How many more" indicates subtraction could be used.

Step 3
An estimate is $300{,}000 - 100{,}000 = 200{,}000$ deaths.

Step 4
$$\begin{array}{r} 250{,}152 \\ -\ 110{,}070 \\ \hline 140{,}082 \end{array}$$

Step 5
There were 140,082 more Union deaths that resulted from disease than from battle.

Step 6
The answer is reasonably close to the estimate.
Check: $140{,}082 + 110{,}070 = 250{,}152$

18. *Step 1*
Given two numbers, find the difference.

Step 2
"How many more" indicates subtraction could be used.

Step 3
An estimate is $200{,}000 - 90{,}000 = 110{,}000$ deaths.

Step 4
$$\begin{array}{r} 164{,}300 \\ -\ 94{,}120 \\ \hline 70{,}180 \end{array}$$

Step 5
There were 70,180 more Confederate deaths that resulted from disease than from battle.

Step 6
The answer is reasonably close to the estimate.
Check: $70{,}180 + 94{,}120 = 164{,}300$

19. *Step 1*
Given four numbers, find the total.

Step 2
"Find the total" indicates addition could be used.

Step 3
An estimate is $100{,}000 + 300{,}000 + 90{,}000 + 200{,}000 = 690{,}000$ deaths.

Step 4
$$\begin{array}{r} 110{,}070 \\ 250{,}152 \\ 94{,}120 \\ +\ 164{,}300 \\ \hline 618{,}642 \end{array}$$

Step 5
The total number of deaths in the Civil War was 618,642.

Step 6
The answer is reasonably close to the estimate.
Check: $618{,}642 - 164{,}300 - 94{,}120 - 250{,}152 = 110{,}070$

20. *Step 1*
Given four numbers, find the difference between the sum of the first pair and the sum of the second pair.

Step 2
"How many more" indicates subtraction could be used after adding the pairs.

Step 3
An estimate is $100,000 + 300,000 - (90,000 + 200,000) = 110,000$ deaths.

Step 4
$110,070 + 250,152 - (94,120 + 164,300)$
$= 360,222 - (258,420)$
$= 101,802$

Step 5
There were 101,802 more Union deaths than Confederate deaths in the Civil War.

Step 6
The answer is reasonably close to the estimate.
Check: Using the sums of the pairs of numbers, $101,802 + 258,420 = 360,222$.

21. *Step 1*
Find her monthly savings.

Step 2
Her monthly take home pay and expenses are given. "Remainder" indicates subtraction may be used.

Step 3
Estimate:
$2000 - \$700 - \$300 - \$400 - \$200 - \$200$
$= \$200$

Step 4
$\begin{array}{r} \$695 \\ 340 \\ 435 \\ 240 \\ +180 \\ \hline 1890 \end{array}$ $\begin{array}{r} \$2240 \\ -1890 \\ \hline \$350 \end{array}$

Step 5
Her monthly savings are $350.

Step 6
The answer seems reasonable for the given estimate.

Check: $350 + \$1890 = \$2240$. Re-add the expenses to check the sum of $1890.

22. *Step 1*
Find the amount remaining in the bank account.

Step 2
Add to find the total amount of the payments. Subtract that total from the balance in the account.

Step 3
About $300 + \$600 + \$800 = \$1700$ was spent. His balance is about $3000 - \$1700 = \$1300$.

Step 4
$\begin{array}{r} \$308 \\ 580 \\ +778 \\ \hline \$1666 \end{array}$ $\begin{array}{r} \$2874 \\ -1666 \\ \hline \$1208 \end{array}$

Step 5
$1208 remains in the account.

Step 6
The answer is reasonably close to the estimate.

Check: $1208 + \$1666 = \$2874$. Re-add the payments to check the sum of $1666.

23. *Step 1*
The square feet in one acre is given and the square feet in the given number of acres must be found.

Step 2
Multiply the square feet in one acre by the total number of acres.

Step 3
An estimate is $40,000 \times 100 = 4,000,000 \text{ ft}^2$.

Step 4
$\begin{array}{r} 43,560 \\ \times 138 \\ \hline 348\,480 \\ 1\,306\,80 \\ 4\,356\,0 \\ \hline 6,011,280 \end{array}$

Step 5
There are 6,011,280 square feet in 138 acres. The answer is reasonable considering the rounding that was done in finding the estimate.

Step 6
Check: $\begin{array}{r} 43,560 \\ 138\,\overline{)6,011,280} \end{array}$

24. *Step 1*
Find the number of gallons polluted in a year.

Step 2
Multiply by 365 to find the amount polluted in a year.

Step 3
$200,000 \times 400$ gives an estimate of 80,000,000 gallons.

Step 4
```
    209,670
  ×    365
  ─────────
  1 048 350
 12 580 20
 62 901 0
 ─────────
 76,529,550
```

Step 5
Each year 76,529,550 gallons are polluted.

Step 6
The answer is reasonably close to the estimate.
Check: $76,529,550 \div 209,670 = 365$

25. *Step 1*
Find the total cost of all Safety and Security Options.

Step 2
Add the costs of the options to find the total cost.

Step 3
Estimate:
$300 + \$200 + \$100 + \$70 + \$400 + \$200$
$= \$1270$

Step 4
```
      144
  $   299
      185
       99
       67
      395
  +   209
  ───────
   $1254
```

Step 5
The total cost is $1254.

Step 6
The answer is reasonably close to the estimate.
Check by re-adding the costs.

26. *Step 1*
The total cost of all Interior Options must be found.

Step 2
Add the costs of the options to find the total cost.

Step 3
Estimate:
$300 + \$50 + \$300 + \$1800 + \$80 + \$400$
$= \$2930$

Step 4
```
      43
   $321
     51
    299
   1799
     82
  + 449
  ──────
  $3001
```

Step 5
The total cost is $3001.

Step 6
The answer is reasonably close to the estimate.
Check by re-adding the costs.

27. *Step 1*
An option package is offered. We must find how much can be saved if the customer buys the option package instead of paying for each option separately.

Step 2
First, add the costs of the options. Then subtract the cost of the option package from this total.

Step 3
Estimate:
$300 + \$70 + \$400 + \$200 = \$970$
$970 - \$800 = \$170$

Step 4
Add.
```
      23
   $299    VIP Plus Security System
     67    Alloy wheel locks
    395    Paint protection
  + 209    Lower body moulding
  ──────
   $970    Total cost
```

Subtract.
```
   $970    Total cost
  - 785    Option package
  ──────
   $185    Amount saved
```

Step 5
Jill can save $185 by buying the option package.

Step 6
The answer is reasonably close to the estimate.
Check:
```
   $785
  + 185
  ─────
   $970
```

28. *Step 1*
An option package is offered. We must find how much can be saved if the customer buys the option package instead of paying for each option separately.

Step 2
First, add the costs of the options. Then subtract the cost of the option package from this total.

Step 3
Estimate:
$300 + $200 + $400 + $300 + $50 + $400
 = $1650
$1650 − $1500 = $150

Step 4

Add.
$$\overset{43}{\$299} \quad \textit{VIP Plus Security System}$$
185   *Roof rack crossbars*
395   *Paint protection*
321   *Carpet floor mats*
 51   *Cargo nets*
+ 449   *XM Satellite Radio*
$1700   *Total cost*

Subtract. $1700   *Total cost*
          − 1495   *Option package*
           $205   *Amount saved*

Step 5
Samuel can save $205 by buying the option package.

Step 6
The answer is reasonably close to the estimate.
Check: $1495
        + 205
        $1700

29. *Step 1*
The number and cost of wheelchairs and recorder-players are given and the total cost of all items must be found.

Step 2
Find the cost of all wheelchairs and the cost of all recorder-players. Then add these costs to get the total cost.

Step 3
The cost of the wheelchairs is about
$1000 × 6 = $6000.

The cost of the recorder-players is about
$900 × 20 = $18,000.

Estimate: $6000 + $18,000 = $24,000

Step 4
cost of wheelchairs: $1256
              ×   6
            $7536

cost of recorder-players: $895
                    × 15
                  4475
                  895
                $13,425

Step 5
The total cost is $13,425 + $7536 = $20,961.

Step 6
The answer is reasonably close to the estimate.
Check by repeating Step 4.

30. *Step 1*
Find the total cost.

Step 2
To find the cost of the computers use multiplication. The cost of the printers must also be found using multiplication. Finally, the two totals must be added.

Step 3
Estimate: ($500 × 20) + ($500 × 10)
 = $10,000 + $5000 = $15,000

Step 4

506	482	8 602
× 17	× 13	+ 6 266
3542	1446	14,868
506	482	
8602	6266	

Step 5
The total cost is $14,868.

Step 6
The answer is reasonably close to the estimate.
Check by repeating Step 4.

31. Possible answers are

Addition: more; total; gain of
Subtraction: less; loss of; decreased by
Multiplication: twice; of; product
Division: divided by; goes into; per
Equals: is; are

32. (1) Read the problem carefully.

(2) Work out a plan.

(3) Estimate a reasonable answer.

(4) Solve the problem.

(5) State the answer.

(6) Check your work.

33. *Step 1*
The daily sales figures are given and the weekly total must be found.

Step 2
Add the daily sales figures to get the weekly total.

Step 3
Estimate: $2000 + $3000 + $3000 + $2000 + $4000 + $3000 + $3000 = $20,000

Step 4
Add.

$$\begin{array}{rl}
\overset{3\ 34}{\$2\,358} & Monday \\
3\,056 & Tuesday \\
2\,515 & Wednesday \\
1\,875 & Thursday \\
3\,978 & Friday \\
3\,219 & Saturday \\
+\ 3\,008 & Sunday \\
\hline
\$20,009 & Total\ cost
\end{array}$$

Step 5
The weekly total is $20,009.

Step 6
The answer is reasonably close to the estimate. Check by repeating Step 4.

34. *Step 1*
The daily number of visitors is given and the weekly total must be found. Assume the numbers correspond to Monday through Sunday.

Step 2
Add the daily figures to get the weekly total.

Step 3
Estimate: $5000 + 3000 + 5000 + 2000 + 4000 + 2000 + 7000 = 28,000$

Step 4
Add.

$$\begin{array}{rl}
\overset{4\ 44}{5\,318} & Monday \\
2\,865 & Tuesday \\
4\,786 & Wednesday \\
1\,998 & Thursday \\
3\,899 & Friday \\
2\,343 & Saturday \\
+\ 7\,221 & Sunday \\
\hline
28,430 & Total\ cost
\end{array}$$

Step 5
The weekly total is 28,430 visitors.

Step 6
The answer is reasonably close to the estimate. Check by repeating Step 4.

35. *Step 1*
Find the final weight of the car.

Step 2
The second engine weighs more than the first engine. Find the difference and add it to the weight of the car.

Step 3
582 and 634 both round to 600, so the difference is 0 and an estimate of the car's weight is just its original weight, 2425 pounds.

Step 4

$$\begin{array}{rl rl}
634 & new\ engine & 2425 & original\ weight \\
-\ 582 & old\ engine & +\ 52 & additional\ weight \\
\hline
52 & difference & 2477 & new\ weight
\end{array}$$

Step 5
The car will weigh 2477 pounds.

Step 6
The answer is reasonable since it's just slightly more than the original weight.

Check:
$$\begin{array}{rl rl}
2425 & & 1843 \\
-\ 582 & & +\ 634 \\
\hline
1843 & & 2477
\end{array}$$

36. *Step 1*
Find the balance in the preschool operating account.

Step 2
Subtract the expenses and add the amount raised by the parents to the account balance.

Step 3
Estimate: $2300 - $700 + $600 = $2200

Step 4

$$\begin{array}{rl rl}
\$2324 & & \$1590 \\
-\ 734 & & +\ 568 \\
\hline
\$1590 & & \$2158
\end{array}$$

Step 5
The balance in the account is $2158.

Step 6
The answer is reasonably close to the estimate. The expenses were $734 - $568 = $166 more than the amount raised, so the balance is lowered. $2324 - $166 = $2158.

37. *Step 1*
The costs of two hotels are given. Find the amount saved by staying at the less expensive hotel for seven nights.

Step 2
First subtract the cost of the least expensive hotel and then multiply this savings by seven.

Step 3
Estimate: $100 - $50 = 50
$50 \times 7 = 350

Step 4
Subtract. $99   *Harrah's Lake Tahoe*
        $- 45$ *Harrah's Reno*
        $54   *Savings for 1 night*

Multiply. $54
       $\times\ 7$
       $378

Step 5
The savings for 7 nights is $378.

Step 6
The answer is reasonably close to the estimate.

Check: Lake Tahoe cost: $7 \times $99 = 693
            Reno cost: $7 \times $45 = 315
            Difference: $693 - $315 = 378

38. *Step 1*
The costs of two hotels are given. Find the amount saved by staying at the least expensive hotel for four nights.

Step 2
First subtract the cost of the least expensive hotel and then multiply this savings by four.

Step 3
Estimate: $600 - $100 = 500
$500 \times 4 = 2000

Step 4
Subtract. $645   *Ritz-Carlton*
        $- 74$ *Motel 6*
        $571

Multiply. $571
       $\times\ 4$
       $2284

Step 5
The savings for 4 nights is $2284.

Step 6
The answer is reasonably close to the estimate.

Check: Ritz-Carlton cost: $4 \times $645 = 2580
            Motel 6 cost: $4 \times $74 = 296
            Difference: $2580 - $296 = 2284

39. *Step 1*
Find out how much money each team received given the amount of money raised, the expenses, and the number of teams.

Step 2
Subtract the expenses from the amount raised, then divide the result by the number of teams.

Step 3
Estimate: $8000 - $800 = 7200
$7200 \div 20 = 360

Step 4
Subtract. $7588
       $- 838$
       $6750

Divide.
```
        $ 3 7 5
   18 $6 7 5 0
      5 4
      1 3 5
      1 2 6
          9 0
          9 0
            0
```

Step 5
Each team received $375.

Step 6
The answer is reasonably close to the estimate.
Check: $18 \times $375 = 6750
$6750 + $838 = 7588

40. *Step 1*
Find the total number of flats needed.

Step 2
Add the eggs collected in the morning to the eggs collected in the afternoon and divide the total by the number of eggs in each flat.

Step 3
Estimate: $4000 + 3000 = 7000$
         $7000 \div 30 \approx 230$

Step 4
```
  3545   morning           2 0 4
+ 2575   afternoon    30 6 1 2 0
  6120   total           6 0
                          1 2
                            0
                          1 2 0
                          1 2 0
                              0
```

Step 5
204 flats are needed for packing.

Step 6
The answer is reasonably close to the estimate.
Check: $30 \times 204 = 6120$
$6120 - 2575 = 3545$

41. *Step 1*
The total seating requirement is given along with the information needed to find the number of seats on the main floor. The number of rows of seats in the balcony is given and the number of seats in each row of the balcony must be found.

Step 2
First, the number of seats on the main floor must be found. Next, the number of seats on the main floor must be subtracted from the total number of seats to find the number of seats in the balcony. Finally, the number of seats in the balcony must be divided by the number of rows of seats in the balcony.

Step 3
Seats on main floor: $30 \times 25 = 750$
Seats in balcony: $1250 - 750 = 500$
Seats in each row in balcony: $500 \div 25 = 20$
Since we didn't round, our estimate matches our exact answer.

Step 4
See the calculations in Step 3.

Step 5
The number of seats in each row of the balcony is 20.

Step 6
The answer matches the estimate, as expected.
Check: Seats in balcony: $20 \times 25 = 500$
                  Seats on main floor: $30 \times 25 = 750$
                  Total seats: $500 + 750 = 1250$

42. *Step 1*
Find the number of boxes each store will receive.

Step 2
Use multiplication to find the total number of grapevine wreaths made per year. Use division to find the number of boxes used per year and the number of boxes each store receives.

Step 3
Estimate:

$24 \times 40 = 960$ wreaths per year
$960 \div 6 = 160$ boxes per year
$160 \div 5 = 32$ boxes per store

Since we didn't round, our estimate matches our exact answer.

Step 4
See the calculations in Step 3.

Step 5
Each store will receive 32 boxes.

Step 6
The answer matches the estimate, as expected.

Check:
Total number of boxes: $5 \times 32 = 160$
Boxed wreaths: $6 \times 160 = 960$
Wreaths made: $24 \times 40 = 960$

Chapter 1 Review Exercises

1. $\underline{6,573}$; thousands: 6; ones: 573

2. $\underline{36,215}$; thousands: 36; ones: 215

3. $\underline{105,724}$; thousands: 105; ones: 724

4. $\underline{1,768,710,618}$; billions: 1; millions: 768; thousands: 710; ones: 618

5.   728 is seven hundred twenty-eight.

6.   15,310 is fifteen thousand, three hundred ten.

7.   319,215 is three hundred nineteen thousand, two hundred fifteen.

8.   62,500,005 is sixty-two million, five hundred thousand, five.

9.   Ten-thousand, eight is 10,008.

10. Two hundred million, four hundred fifty-five is 200,000,455.

11.
$$\begin{array}{r} \overset{1}{7}2 \\ +\,38 \\ \hline 110 \end{array}$$

12.
$$\begin{array}{r} \overset{1}{5}4 \\ +\,67 \\ \hline 121 \end{array}$$

13.
$$\begin{array}{r} \overset{1}{8}\overset{1}{0}7 \\ 4606 \\ +\quad 51 \\ \hline 5464 \end{array}$$

14.
$$\begin{array}{r} 8\,2\overset{1}{1}5 \\ 9 \\ +\,7\,433 \\ \hline 15,657 \end{array}$$

15.
$$\begin{array}{r} 2\,\overset{11}{1}30 \\ 453 \\ 8\,107 \\ +\quad 296 \\ \hline 10,986 \end{array}$$

16.
$$\begin{array}{r} \overset{221}{56}84 \\ 218 \\ 2960 \\ +\quad 983 \\ \hline 9845 \end{array}$$

17.
$$\overset{1\,1\ \ 3\,3}{5\,\overset{}{7}32}$$
$$11{,}069$$
$$37$$
$$1\,595$$
$$+\,22{,}169$$
$$\overline{40{,}602}$$

18.
$$\overset{1\ 3\,1}{3\,451}$$
$$12{,}286$$
$$43$$
$$1\,291$$
$$+\,32{,}784$$
$$\overline{49{,}855}$$

19.
$$\overset{5\,14}{6\,4}\quad \textit{Check:}\quad \overset{1}{28}$$
$$-\,28\qquad\qquad\quad\ +\,36$$
$$\overline{3\,6}\qquad\qquad\qquad \overline{64}$$

20.
$$\overset{3\,16}{4\,6}\quad \textit{Check:}\quad \overset{1}{19}$$
$$-\,19\qquad\qquad\quad\ +\,27$$
$$\overline{2\,7}\qquad\qquad\qquad \overline{46}$$

21.
$$\overset{2\,16\,15}{3\,7\,5}\quad \textit{Check:}\quad \overset{1\,1}{186}$$
$$-\,18\,6\qquad\qquad\quad +\,189$$
$$\overline{1\,8\,9}\qquad\qquad\qquad \overline{375}$$

22.
$$\overset{4\,16\,13}{5\,7\,3}\quad \textit{Check:}\quad \overset{1\,1}{389}$$
$$-\,38\,9\qquad\qquad\quad +\,184$$
$$\overline{1\,8\,4}\qquad\qquad\qquad \overline{573}$$

23.
$$\overset{6\,13\,10\,16}{7\,4\,1\,6}\quad \textit{Check:}\quad \overset{1\,1\,1}{567}$$
$$-\ \ 5\,6\,7\qquad\qquad\ \ +\,6849$$
$$\overline{6\,8\,4\,9}\qquad\qquad\qquad \overline{7416}$$

24.
$$\overset{4\,11\,10\,10}{5\,2\,1\,0}\quad \textit{Check:}\quad \overset{1\,1\,1}{4327}$$
$$-\ \ 8\,8\,3\qquad\qquad\ \ +\,883$$
$$\overline{4\,3\,2\,7}\qquad\qquad\qquad \overline{5210}$$

25.
$$\overset{1\,11\,10\,10}{2\,2\,1\,0}\quad \textit{Check:}\quad \overset{1\,1\,1}{1986}$$
$$-\,1\,9\,8\,6\qquad\qquad\ +\,224$$
$$\overline{2\,2\,4}\qquad\qquad\qquad \overline{2210}$$

26.
$$\overset{\ \ \ \ \ \ 9}{\overset{8\ 16\,10\,14}{9\,9{,}\,7\,0\,4}}\quad \textit{Check:}\quad \overset{1\ 11}{25{,}866}$$
$$-\,73{,}8\,3\,8\qquad\qquad +\,73{,}838$$
$$\overline{25{,}8\,6\,6}\qquad\qquad\qquad \overline{99{,}704}$$

27.
$$7$$
$$\times\,7$$
$$\overline{49}$$

28.
$$8$$
$$\times\,0$$
$$\overline{0}$$

29. $8(4) = 32$

30. $8(8) = 64$

31. $(5)(9) = 45$

32. $(6)(7) = 42$

33. $7 \cdot 8 = 56$

34. $9 \cdot 9 = 81$

35. $5 \times 4 \times 2$
$(5 \times 4) \times 2$
$20 \times 2 = 40$

36. $9 \times 1 \times 5$
$(9 \times 1) \times 5$
$9 \times 5 = 45$

37. $4 \times 4 \times 3$
$(4 \times 4) \times 3$
$16 \times 3 = 48$

38. $2 \times 2 \times 2$
$(2 \times 2) \times 2$
$4 \times 2 = 8$

39. $(6)(0)(8) = 0$ Any number times 0 equals 0.

40. $(7)(1)(6)$
$(7 \cdot 1) \cdot 6$
$7 \cdot 6 = 42$

41. $6 \cdot 1 \cdot 8$
$(6 \cdot 1) \cdot 8$
$6 \cdot 8 = 48$

42. $7 \cdot 7 \cdot 0 = 0$ Any number times 0 equals 0.

43.
$$\overset{2}{28}$$
$$\times\,3$$
$$\overline{84}$$

44.
$$\overset{4}{46}$$
$$\times\,8$$
$$\overline{368}$$

45.
$$\overset{7}{58}$$
$$\times\,9$$
$$\overline{522}$$

46.
$$98$$
$$\times\,1$$
$$\overline{98}$$

47.
$$\overset{2\,4}{625}$$
$$\times\ \ 8$$
$$\overline{5000}$$

48.
$$\begin{array}{r} \overset{5\,3}{3\,7\,4} \\ \times\ \ 8 \\ \hline 2992 \end{array}$$

49.
$$\begin{array}{r} \overset{1\,1\,3}{1\,3\,4\,9} \\ \times\ \ \ 4 \\ \hline 5396 \end{array}$$

50.
$$\begin{array}{r} \overset{3\,1}{9\,1\,6\,3} \\ \times\ \ \ 5 \\ \hline 45{,}815 \end{array}$$

51.
$$\begin{array}{r} \overset{1\,1}{7\,4\,5\,6} \\ \times\ \ \ 2 \\ \hline 14{,}912 \end{array}$$

52.
$$\begin{array}{r} \overset{6\,5}{2\,8\,8\,0} \\ \times\ \ \ 7 \\ \hline 20{,}160 \end{array}$$

53.
$$\begin{array}{r} \overset{1\ \ \ 2}{9\,3,1\,0\,5} \\ \times\ \ \ \ 5 \\ \hline 465{,}525 \end{array}$$

54.
$$\begin{array}{r} \overset{1\,6\ \,5\,2}{2\,1,8\,7\,3} \\ \times\ \ \ \ \ 8 \\ \hline 174{,}984 \end{array}$$

55.
$$\begin{array}{r} 3\,5 \\ \times\ \ 2\,5 \\ \hline 1\,7\,5 \quad \leftarrow 5 \times 35 \\ 7\,0 \quad\ \ \leftarrow 2 \times 35 \\ \hline 8\,7\,5 \end{array}$$

56.
$$\begin{array}{r} 7\,4 \\ \times\ \ 3\,2 \\ \hline 1\,4\,8 \quad \leftarrow 2 \times 74 \\ 2\,2\,2 \quad\ \ \leftarrow 3 \times 74 \\ \hline 2\,3\,6\,8 \end{array}$$

57.
$$\begin{array}{r} 9\,8 \\ \times\ \ 1\,2 \\ \hline 1\,9\,6 \quad \leftarrow 2 \times 98 \\ 9\,8 \quad\ \ \leftarrow 1 \times 98 \\ \hline 1\,1\,7\,6 \end{array}$$

58.
$$\begin{array}{r} 6\,8 \\ \times\ \ 7\,5 \\ \hline 3\,4\,0 \quad \leftarrow 5 \times 68 \\ 4\,7\,6 \quad\ \ \leftarrow 7 \times 68 \\ \hline 5\,1\,0\,0 \end{array}$$

59.
$$\begin{array}{r} 4\,7\,2 \\ \times\ \ 3\,3 \\ \hline 1\,4\,1\,6 \quad \leftarrow 3 \times 472 \\ 1\,4\,1\,6 \\ \hline 15{,}5\,7\,6 \end{array}$$

60.
$$\begin{array}{r} 3\,9\,2 \\ \times\ \ 7\,7 \\ \hline 2\,7\,4\,4 \quad \leftarrow 7 \times 392 \\ 2\,7\,4\,4 \\ \hline 30{,}1\,8\,4 \end{array}$$

61. (use a calculator)
$$\begin{array}{r} 4051 \\ \times\ 219 \\ \hline 887{,}169 \end{array}$$

62. (use a calculator)
$$\begin{array}{r} 1527 \\ \times\ 328 \\ \hline 500{,}856 \end{array}$$

63.
$$\begin{array}{r} \$12 \quad \textit{cost per calculator} \\ \times\ 30 \quad \textit{calculators} \\ \hline \$360 \quad \textit{total cost} \end{array}$$

64.
$$\begin{array}{r} \$1\,4 \quad \textit{cost of subscription} \\ \times\ \ 7\,6 \quad \textit{subscribers} \\ \hline 8\,4 \\ 9\,8 \\ \hline \$1\,0\,6\,4 \quad \textit{total cost} \end{array}$$

65.
$$\begin{array}{r} 3\,1\,8 \quad \textit{sets} \\ \times\ \$6\,4 \quad \textit{cost per set} \\ \hline 1\,2\,7\,2 \\ 1\,9\,0\,8 \\ \hline \$20{,}3\,5\,2 \quad \textit{total cost} \end{array}$$

66.
$$\begin{array}{r} 114 \quad \textit{ear plugs} \\ \times\ \$6 \quad \textit{cost per plug} \\ \hline \$684 \quad \textit{total cost} \end{array}$$

67.
$$\begin{array}{r} 280 \\ \times\ 50 \\ \hline \end{array} \qquad \begin{array}{r} 28 \\ \times\ 5 \\ \hline 140 \end{array} \qquad \begin{array}{r} 280 \\ \times\ 50 \\ \hline 14{,}000 \quad \textit{Attach} \ 00. \end{array}$$

68.
$$\begin{array}{r} 340 \\ \times\ 70 \\ \hline \end{array} \qquad \begin{array}{r} 34 \\ \times\ 7 \\ \hline 238 \end{array} \qquad \begin{array}{r} 340 \\ \times\ 70 \\ \hline 23{,}800 \quad \textit{Attach} \ 00. \end{array}$$

69.
$$\begin{array}{r} 517 \\ \times\ 400 \\ \hline \end{array} \qquad \begin{array}{r} 517 \\ \times\ 4 \\ \hline 2068 \end{array} \qquad \begin{array}{r} 517 \\ \times\ 400 \\ \hline 206{,}800 \quad \textit{Attach} \ 00. \end{array}$$

70.
$$\begin{array}{r} 637 \\ \times\ 500 \\ \hline \end{array} \qquad \begin{array}{r} 637 \\ \times\ 5 \\ \hline 3185 \end{array} \qquad \begin{array}{r} 637 \\ \times\ 500 \\ \hline 318{,}500 \quad \textit{Attach} \ 00. \end{array}$$

71.

$$\begin{array}{r} 16{,}000 \\ \times\ 8000 \\ \hline \end{array} \qquad \begin{array}{r} 16 \\ \times\ 8 \\ \hline 128 \end{array} \qquad \begin{array}{r} 16{,}000 \\ \times\ 8000 \\ \hline 128{,}000{,}000 \end{array} \quad \textit{Attach } 000000.$$

72.

$$\begin{array}{r} 43{,}000 \\ \times\ 2100 \\ \hline \end{array} \qquad \begin{array}{r} 43 \\ \times\ 21 \\ \hline 903 \end{array} \qquad \begin{array}{r} 43{,}000 \\ \times\ 2100 \\ \hline 90{,}300{,}000 \end{array} \quad \textit{Attach } 00000.$$

73. $20 \div 4 = 5$

74. $35 \div 5 = 7$

75. $42 \div 7 = 6$

76. $18 \div 9 = 2$

77. $\dfrac{54}{9} = 6$

78. $\dfrac{36}{9} = 4$

79. $\dfrac{49}{7} = 7$

80. $\dfrac{0}{6} = 0$

81. $\dfrac{148}{0}$ is undefined.

82. $\dfrac{0}{23} = 0$

83. $\dfrac{64}{8} = 8$

84. $\dfrac{81}{9} = 9$

85.

$$4\overline{)328} = 82 \qquad \textit{Check:} \quad \begin{array}{r} 82 \\ \times\ 4 \\ \hline 328 \end{array}$$

86.

$$3\overline{)29\,{}^24} = 98 \qquad \textit{Check:} \quad \begin{array}{r} 98 \\ \times\ 3 \\ \hline 294 \end{array}$$

87.

$$6\overline{)26{,}{}^25\,{}^13\,{}^12} = 4\,4\,2\,2 \qquad \textit{Check:} \quad \begin{array}{r} 211 \\ 4422 \\ \times\ \ \ 6 \\ \hline 26{,}532 \end{array}$$

88.

$$\begin{array}{r} 3\,5\,2 \\ 76\overline{)2\,6{,}\,7\,5\,2} \\ 2\,2\,8 \\ \hline 3\,9\,5 \\ 3\,8\,0 \\ \hline 1\,5\,2 \\ 1\,5\,2 \\ \hline 0 \end{array} \qquad \textit{Check:} \quad \begin{array}{r} 3\,5\,2 \\ \times\ \ 7\,6 \\ \hline 2\,1\,1\,2 \\ 24\,6\,4 \\ \hline 26{,}752 \end{array}$$

89. $2704 \div 18$

$$\begin{array}{r} 1\ 5\ 0 \ \ \mathbf{R}4 \\ 18\overline{)2\ 7\ 0\ 4} \\ 1\ 8 \\ \hline 9\ 0 \\ 9\ 0 \\ \hline 0\ 4 \\ 0\ 0 \\ \hline 4 \end{array}$$

Check:

$$\begin{array}{r} 1\,5\,0 \\ \times\ \ \ 1\,8 \\ \hline 1\,2\,0\,0 \\ 1\,5\,0 \\ \hline 2\,7\,0\,0 \\ +\ \ \ \ 4 \\ \hline 2\,7\,0\,4 \end{array}$$

90. $15{,}525 \div 125$

$$\begin{array}{r} 1\ 2\ 4 \ \ \mathbf{R}25 \\ 125\overline{)1\ 5,\ 5\ 2\ 5} \\ 1\ 2\ 5 \\ \hline 3\ 0\ 2 \\ 2\ 5\ 0 \\ \hline 5\ 2\ 5 \\ 5\ 0\ 0 \\ \hline 2\ 5 \end{array}$$

Check:

$$\begin{array}{r} 1\,2\,4 \\ \times\ \ \ 1\,2\,5 \\ \hline 6\,2\,0 \\ 2\ 4\,8 \\ 12\ 4 \\ \hline 15{,}500 \\ +\ \ \ \ 2\,5 \\ \hline 15{,}525 \end{array}$$

91.   817 rounded to the nearest ten: 820

8**1**7   Next digit is 5 or more. Tens place changes $(1 + 1 = 2)$. The digit to the right of the underlined place changes to zero.

92.   15,208 rounded to the nearest hundred: 15,200

15,**2**08   Next digit is 4 or less. Hundreds place does not change. All digits to the right of the underlined place change to zero.

93.   20,643 rounded to the nearest thousand: 21,000

2**0**,643   Next digit is 5 or more. Thousands place changes $(0 + 1 = 1)$. All digits to the right of the underlined place change to zero.

94.   67,485 rounded to the nearest ten-thousand: 70,000

67,485   Next digit is 5 or more. Ten-thousands place changes $(6 + 1 = 7)$. All digits to the right of the underlined place change to zero.

95. **To the nearest ten:** 34$\underline{8}$7

Next digit is 5 or more. Tens place changes $(8 + 1 = 9)$. The digit to the right of the underlined place changes to zero. **3490**

To the nearest hundred: 3$\underline{4}$87

Next digit is 5 or more. Hundreds place changes $(4 + 1 = 5)$. All digits to the right of the underlined place are changed to zero. **3500**

To the nearest thousand: $\underline{3}$487

Next digit is 4 or less. Thousands place does not change. All digits to the right of the underlined place are changed to zero. **3000**

96. **To the nearest ten:** 20,0$\underline{6}$5

Next digit is 5 or more. Tens place changes $(6 + 1 = 7)$. The digit to the right of the underlined place changes to zero. **20,070**

To the nearest hundred: 20,$\underline{0}$65

Next digit is 5 or more. Hundreds place changes $(0 + 1 = 1)$. All digits to the right of the underlined place are changed to zero. **20,100**

To the nearest thousand: 20,$\underline{0}$65

Next digit is 4 or less. Thousands place does not change. All digits to the right of the underlined place are changed to zero. **20,000**

97. **To the nearest ten:** 98,2$\underline{0}$1

Next digit is 4 or less. Tens place does not change. The digit to the right of the underlined place changes to zero. **98,200**

To the nearest hundred: 98,$\underline{2}$01

Next digit is 4 or less. Hundreds place does not change. All digits to the right of the underlined place are changed to zero. **98,200**

To the nearest thousand: 9$\underline{8}$,201

Next digit is 4 or less. Thousands place does not change. All digits to the right of the underlined place are changed to zero. **98,000**

98. **To the nearest ten:** 352,1$\underline{1}$8

Next digit is 5 or more. Tens place changes $(1 + 1 = 2)$. The digit to the right of the underlined place changes to zero. **352,120**

To the nearest hundred: 352,$\underline{1}$18

Next digit is 4 or less. Hundreds place does not change. All digits to the right of the underlined place are changed to zero. **352,100**

To the nearest thousand: 35$\underline{2}$,118

Next digit is 4 or less. Thousands place does not change. All digits to the right of the underlined place are changed to zero. **352,000**

99. From the table, $4^2 = 16$, so $\sqrt{16} = 4$.

100. From the table, $7^2 = 49$, so $\sqrt{49} = 7$.

101. From the table, $12^2 = 144$, so $\sqrt{144} = 12$.

102. From the table, $14^2 = 196$, so $\sqrt{196} = 14$.

103. 7^3: exponent is 3; base is 7.
$7^3 = 7 \cdot 7 \cdot 7 = 343$

104. 3^6: exponent is 6; base is 3.
$3^6 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 729$

105. 5^3: exponent is 3; base is 5.
$5^3 = 5 \cdot 5 \cdot 5 = 125$

106. 4^5: exponent is 5; base is 4.
$4^5 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 1024$

107. $7^2 - 15$ *Exponent*
$49 - 15 = 34$ *Subtract.*

108. $6^2 - 10$ *Exponent*
$36 - 10 = 26$ *Subtract.*

109. $2 \cdot 3^2 \div 2$ *Exponent*
$2 \cdot 9 \div 2$ *Multiply.*
$18 \div 2 = 9$ *Divide.*

110. $9 \div 1 \cdot 2 \cdot 2 \div (11 - 2)$ *Parentheses*
$9 \div 1 \cdot 2 \cdot 2 \div 9$ *Divide.*
$9 \cdot 2 \cdot 2 \div 9$ *Multiply.*
$18 \cdot 2 \div 9$ *Multiply.*
$36 \div 9 = 4$ *Divide.*

111. $\sqrt{9} + 2(3)$ *Square root*
$3 + 2 \cdot 3$ *Multiply.*
$3 + 6 = 9$ *Add.*

112. $6 \cdot \sqrt{16} - 6 \cdot \sqrt{9}$ *Square root*
$6 \cdot 4 - 6 \cdot 3$ *Multiply.*
$24 - 18 = 6$ *Subtract.*

113. From the bar graph, 8 parents out of 100 nagged their children about washing hands after using the bathroom.

114. From the bar graph, 5 parents out of 100 nagged their children about taking shoes off when coming inside.

115. From the bar graph, the greatest number of parents, 25, nagged their children about keeping bedroom clean.

116. From the bar graph, the least number of parents, 3, nagged their children about hanging up wet bath towels.

117. *Estimate:* 40 million × 365

$$\begin{array}{r} 400 \\ \times\ \ 40 \\ \hline 16{,}000 \end{array}$$

40 million × 400 = 16,000 million or 16,000,000,000 checks   (*Attach* 000 000.)

Exact: 40 million × 365

$$\begin{array}{r} 365 \\ \times\ \ 40 \\ \hline 14{,}600 \end{array}$$

40 million × 365 = 14,600 million or 14,600,000,000 checks   (*Attach* 000 000.)

The bank processes 14,600 million checks in a year.

118. *Step 1*
Find the total revolutions.

Step 2
We know the revolutions per minute and the number of minutes.

Number of revolutions × minutes = total revolutions.

Step 3
An estimate is 1000 × 60 = 60,000 revolutions.

Step 4
1400 × 60 = 84,000 revolutions

Step 5
There were 84,000 revolutions.

Step 6
The answer is reasonably close to the estimate considering the rounding.

Check: 84,000 ÷ 60 = 1400

119. *Step 1*
Find the difference in the populations of California and Texas.

Step 2
Difference indicates subtraction.

Step 3
An estimate is 40,000,000 − 30,000,000 = 10,000,000 people.

Step 4
Exact:
$$\begin{array}{r} 37{,}341{,}989 \\ -\ 25{,}268{,}418 \\ \hline 12{,}073{,}571 \end{array}$$

Step 5
The difference in population is 12,073,571.

Step 6
The answer is reasonably close to the estimate.
Check: 12,073,571 + 25,268,418 = 37,341,989

120. *Step 1*
Find the difference in the populations of Alaska and Wyoming.

Step 2
Difference indicates subtraction.

Step 3
An estimate is 700,000 − 600,000 = 100,000 people.

Step 4
Exact:
$$\begin{array}{r} 721{,}523 \\ -\ 568{,}300 \\ \hline 153{,}223 \end{array}$$

Step 5
The difference in population is 153,223.

Step 6
The answer is reasonably close to the estimate.
Check: 153,223 + 568,300 = 721,523

121. *Step 1*
Find the total cost to replace her transmission.

Step 2
Add the cost of the transaxle, the labor (multiply the number of hours times the hourly rate), and the sales tax.

Step 3
Estimate:
Transaxle: round $2633 to $3000
Labor: 8 × $90 = $720
Tax: round $230 to $200
Total: $3000 + $720 + $200 = $3920

Step 4
Exact:
Transaxle: $2633
Labor: 8 × $90 = $720
Tax: $230
Total: $2633 + $720 + $230 = $3583

Step 5
The total cost is $3583.

Step 6
The answer is reasonably close to the estimate.
Check by repeating Step 4.

122. *Step 1*
Find the total cost to rent a truck.

Step 2
Add the cost of the rental and the cost of the mileage (multiply the number of miles times the rate per mile).

Step 3
Estimate:
Rental: round $55 to $60
Mileage: round 89 to 90 and multiply by $2,
 $90 \times \$2 = \$180$
Total: $\$60 + \$180 = \$240$

Step 4
Rental: $55
Mileage: $89 \times \$2 = \$178$
Total: $\$55 + \$178 = \$233$

Step 5
The total cost is $233.

Step 6
The answer is reasonably close to the estimate.
Check by repeating Step 4.

123. *Step 1*
Find the total cost to buy the ovens.

Step 2
Multiply the number of baking ovens times the
cost of each baking oven and the number of
warming ovens times the cost of each warming
oven. Add to find the total cost.

Step 3
Estimate:
Baking ovens: $30 \times \$2000 = \$60,000$
Warming ovens: $30 \times \$900 = \$27,000$
Total: $\$60,000 + \$27,000 = \$87,000$

Step 4
Exact:
Baking ovens: $32 \times \$1538 = \$49,216$
Warming ovens: $28 \times \$887 = \$24,836$
Total: $\$49,216 + \$24,836 = \$74,052$

Step 5
The total cost is $74,052.

Step 6
The answer is reasonably close to the estimate.
Check by repeating Step 4.

124. *Step 1*
Find the total monthly collections.

Step 2
We know the number of daily customers and the
daily rate. We know the number of weekend-only
customers and the rate.
Number of customers $\times$ daily rate
$+$ number of customers $\times$ weekend rate
$=$ total collections.

Step 3
Estimate:
$(60 \times \$20) + (20 \times \$7) = \$1200 + \$140 = \$1340$

Step 4
$(62 \times \$16) + (21 \times \$7) = \$992 + \$147 = \$1139$

Step 5
The total monthly collections are $1139.

Step 6
The answer is reasonably close to the estimate.
Check by repeating Step 4.

125. *Step 1*
Find the difference in the amount spent on others
and the amount spent on themselves.

Step 2
Difference indicates subtraction.

Step 3
An estimate is $\$600 - \$100 = \$500$.

Step 4
Exact: $620
    $- \$107$
    $\overline{\$513}$

Step 5
The difference in amount spent is $513.

Step 6
The answer is reasonably close to the estimate.
Check: $\$513 + \$107 = \$620$

126. *Step 1*
Find the new account balance.

Step 2
We know the amount of the payments and the old
balance.

Old balance $-$ payment amounts $=$ new balance.

Step 3
Estimate: $\$2000 - \$500 - \$400 = \$1100$

Step 4
$\$1924 - \$520 - \$385 = \$1019$

Step 5
She has $1019 in her bank account.

Step 6
The answer is reasonably close to the estimate.
Check: $\$1019 + \$520 + \$385 = \$1924$

127. *Step 1*
Find out how many pounds of pork are needed.

Step 2
We know the total number of cans and we must
divide that total by 175 since each group of 175
cans requires 1 pound of pork. The number of
groups $\times$ 1 pound $=$ total pounds.

Step 3
Estimate: $9000 \div 200 = 45$ pounds

Step 4
$\dfrac{8750}{175} = 50$ pounds

Step 5
50 pounds of pork are needed.

Step 6
The answer is reasonably close to the estimate.

Check:
$(175 \text{ cans per pound}) \cdot (50 \text{ pounds}) = 8750$ cans

128. *Step 1*
Find how many hours it takes to produce all the plates.

Step 2
We know the total number of plates and we know how many are produced each hour.

$\dfrac{total\ number}{number\ per\ hour} = total\ hours$

Step 3
An estimate: $30{,}000 \div 1000 = 30$ hours

Step 4
$\dfrac{32{,}538}{986} = 33$ hours

Step 5
It will take 33 hours.

Step 6
The answer is reasonably close to the estimate.
Check: $33 \cdot 986 = 32{,}538$

129. *Step 1*
Find the total number of acres fertilized.

Step 2
We know the total amount of fertilizer and how much each acre needs. Total pounds $\div$ pounds needed per acre $=$ total acres.

Step 3
Estimate: $30{,}000 \div 600 = 50$

Step 4
$\dfrac{32{,}500}{625} = 52$ acres

Step 5
52 acres can be spread with 32,500 pounds of nitrogen sulfate.

Step 6
The answer is reasonably close to the estimate.
Check: $52 \times 625 = 32{,}500$

130. *Step 1*
Find the number of homes that can be fenced.

Step 2
Divide the number of feet of fencing available by the number of feet needed for each home.

Step 3
Estimate: $6000 \div 200 = 30$ homes

Step 4
$\dfrac{5760}{180} = 32$ homes

Step 5
32 homes can be fenced.

Step 6
The answer is reasonably close to the estimate.
Check: $(180 \text{ feet per home}) \cdot (32 \text{ homes}) = 5760$ feet

131. [1.4] $4(83)$

$$\begin{array}{r} \overset{1}{8}3 \\ \times\ 4 \\ \hline 332 \end{array}$$

132. [1.4] $7(64)$

$$\begin{array}{r} \overset{2}{6}4 \\ \times\ 7 \\ \hline 448 \end{array}$$

133. [1.3]

$$\begin{array}{r} \overset{2}{\cancel{3}}\,\overset{10}{\cancel{0}}\,9 \\ -\ \ \ 5\ 6 \\ \hline 2\ 5\ 3 \end{array}$$

134. [1.3]

$$\begin{array}{r} \overset{12}{}\,15 \\ 7\ \overset{\ }{\cancel{2}}\ \\ \cancel{8}\ \cancel{3}\ \cancel{5} \\ -\ 2\ 4\ 7 \\ \hline 5\ 8\ 8 \end{array}$$

135. [1.2]

$$\begin{array}{r} \overset{1}{6}\,\overset{1}{6}\,2 \\ +\ 3\ 7\ 9 \\ \hline 1\ 0\ 4\ 1 \end{array}$$

136. [1.2]

$$\begin{array}{r} \overset{1}{7}\,\overset{1}{8}\,9 \\ +\ 8\ 7\ 2 \\ \hline 1\ 6\ 6\ 1 \end{array}$$

137. [1.3]

$$\begin{array}{r} \overset{13}{} \\ 0\ \overset{3}{\cancel{3}}\ 10 \\ 38{,}1\ \cancel{4}\ \cancel{0} \\ -\ \ \ 6\ 0\ 7\ 8 \\ \hline 32{,}0\ 6\ 2 \end{array}$$
Check:
$$\begin{array}{r} \overset{1}{\ }\overset{1}{\ } \\ 32{,}062 \\ +\ 6\ 078 \\ \hline 38{,}140 \end{array}$$

138. [1.3]

$$\begin{array}{r} 8\ 11{4}\ 16 \\ 2\cancel{9}{,}1\cancel{5}\ \cancel{6} \\ -\ \ \ 4\ 2\ 0\ 9 \\ \hline 24{,}9\ 4\ 7 \end{array}$$
Check:
$$\begin{array}{r} \overset{1}{\ }\ \overset{1}{\ } \\ 24{,}947 \\ +\ 4\ 209 \\ \hline 29{,}156 \end{array}$$

139. [1.5] $21 \div 7 = 3$

140. [1.5] $\dfrac{42}{6} = 7$ $(7 \cdot 6 = 42)$

141. [1.2]

$$
\begin{array}{r}
{\scriptstyle 1\,2\ \ 2\,2} \\
7\,2\,1\,8 \\
3 \\
1\,8 \\
1\,7\,9\,1 \\
8\,2,6\,2\,3 \\
+\ \ 1\,9\,8\,2 \\
\hline
9\,3,6\,3\,5
\end{array}
$$

142. [1.2]

$$
\begin{array}{r}
{\scriptstyle 1\,2\ \ 1\,2} \\
3\,8\,1\,2 \\
5 \\
2\,2 \\
1\,8\,3\,6 \\
7\,5,1\,3\,4 \\
+\ \ 2\,3\,6\,9 \\
\hline
8\,3,1\,7\,8
\end{array}
$$

143. [1.5] $\dfrac{9}{0}$ is undefined.

144. [1.5] $\dfrac{7}{1} = 7$ $(7 \cdot 1 = 7)$

145. [1.5] $27,600 \div 4 = 6900$

$$
\begin{array}{r}
6\ 9 \\
4\,\overline{)2\,7\,{}^{3}6}\quad Attach\ 00.
\end{array}
$$

146. [1.5] $18,480 \div 8$

$$
\begin{array}{r}
2\ 3\ 1\,0 \\
8\,\overline{)1\,8,{}^{2}4\,8\,0}
\end{array}
$$

147. [1.4]

$$
\begin{array}{r}
8\ 4\,3\,0 \\
\times\ \ \ 1\,2\,8 \\
\hline
6\,7\ 4\,4\,0 \leftarrow 8 \times 8430 \\
1\,6\,8\ 6\,0\quad \leftarrow 2 \times 8430 \\
8\,4\,3\ 0 \\
\hline
1,0\,7\,9,0\,4\,0
\end{array}
$$

148. [1.4]

$$
\begin{array}{r}
{\scriptstyle 1\,4\ \ 1} \\
2\,1,7\,0\,2 \\
\times\ \ \ \ \ \ 6 \\
\hline
1\,3\,0,2\,1\,2
\end{array}
$$

149. [1.6] Use a calculator to show that
$$34\,\overline{)3\ 6\ 7\ 2} = 108.$$

150. [1.6] Use a calculator to show that
$$68\,\overline{)1\ 4,0\ 7\ 6} = 207.$$

151. [1.1] 376,853 is three hundred seventy-six thousand, eight hundred fifty-three in words.

152. [1.1] 408,610 is four hundred eight thousand, six hundred ten in words.

153. [1.7] 8749 rounded to the nearest hundred: 8749
Next digit is 4 or less. Hundreds place doesn't change. All digits to the right of the underlined place are changed to zero. **8700**

154. [1.7] 400,503 rounded to the nearest thousand: 400,503
Next digit is 5 or more. Thousands place changes $(0 + 1 = 1)$. All digits to the right of the underlined place are changed to zero. **401,000**

155. [1.8] From the table, $8^2 = 64$, so $\sqrt{64} = 8$.

156. [1.8] From the table, $9^2 = 81$, so $\sqrt{81} = 9$.

157. [1.4]

$$
\begin{array}{r}
\$3\,0\,8\ \textit{cost per pair} \\
\times\ \ \ 1\,8\ \textit{pairs} \\
\hline
2\,4\,6\,4 \\
3\,0\,8 \\
\hline
\$5\,5\,4\,4\ \textit{total cost}
\end{array}
$$

158. [1.4]

$$
\begin{array}{r}
\$3\,7\,0\ \textit{cost per dishwasher} \\
\times\ \ \ 8\,4\ \textit{dishwashers} \\
\hline
1\,4\,8\,0 \\
2\,9\,6\,0 \\
\hline
\$3\,1,0\,8\,0\ \textit{total cost}
\end{array}
$$

159. [1.4]

$$
\begin{array}{r}
2\,0\,8\ \textit{baseball hats} \\
\times\ \ \$1\,1\ \textit{cost of hat} \\
\hline
2\,0\,8 \\
2\,0\,8 \\
\hline
\$2\,2\,8\,8\ \textit{total cost}
\end{array}
$$

160. [1.4]

$$
\begin{array}{r}
6\,0\,7\ \textit{boxes of avocados} \\
\times\ \ \$2\,6\ \textit{cost per box} \\
\hline
3\,6\,4\,2 \\
1\,2\,1\,4 \\
\hline
\$1\,5,7\,8\,2\ \textit{total cost}
\end{array}
$$

161. [1.4]

$$
\begin{array}{r}
{\scriptstyle 1} \\
5\,2\ \textit{cards per deck} \\
\times\ \ \ 9\ \textit{decks} \\
\hline
4\,6\,8\ \textit{total cards}
\end{array}
$$

There are 468 cards in nine decks.

162. [1.4]

$$
\begin{array}{r}
1\,7\,0\,0\ \textit{volunteers} \\
\times\ \ \ 3\,1\ \textit{pounds per volunteer} \\
\hline
5\,2,7\,0\,0\ \textit{pounds}
\end{array}
$$

There were 52,700 pounds of fruits and vegetables picked by the volunteers.

163. [1.3]

$$
\begin{array}{r}
\$3\,8\,0 \\
-\ \$1\,0\,0 \\
\hline
\$2\,8\,0
\end{array}
$$

A "push-type" mower costs $280.

164. [1.3]

$$\begin{array}{r} \overset{\;\;7\;14\;4\;10}{\$2\,1\,\cancel{8,4}\,\cancel{5}\,\cancel{0}} \quad \textit{Amount needed} \\ -\,\$1\,0\,3,8\;1\;5 \quad \textit{Amount raised} \\ \hline \$1\,1\,4,6\;3\;5 \quad \textit{Amount left to be raised} \end{array}$$

$114,635 more needs to be raised.

165. [1.10] Multiply the number of rentals times the sum of the rental fee and the launch fee.

4-*person*	$6 \times (\$28 + \$2) = 6(\$30)$	$180
6-*person*	$15 \times (\$38 + \$2) = 15(\$40)$	600
10-*person*	$10 \times (\$70 + \$2) = 10(\$72)$	720
12-*person*	$3 \times (\$75 + \$2) = 3(\$77)$	231
16-*person*	$2 \times (\$85 + \$2) = 2(\$87)$	$+\,174$
		$1905

Total receipts were $1905.

166. [1.10] Multiply the number of rentals times the sum of the rental fee and the launch fee.

4-*person*	$38 \times (\$28 + \$2) = 38(\$30)$	$1\,140
6-*person*	$73 \times (\$38 + \$2) = 73(\$40)$	2\,920
10-*person*	$58 \times (\$70 + \$2) = 58(\$72)$	4\,176
12-*person*	$34 \times (\$75 + \$2) = 34(\$77)$	2\,618
16-*person*	$18 \times (\$85 + \$2) = 18(\$87)$	$+\,1\,566$
		$12,420

Total receipts were $12,420.

167. [1.9]

$$\begin{array}{r} \overset{\;\;6\;11}{2\,7\,\cancel{1}\;7} \quad \textit{Burj Dubai} \\ -\,1\;2\;5\;0 \quad \textit{Empire State Building} \\ \hline 1\;4\;6\;7 \quad \textit{difference} \end{array}$$

The Burj Dubai is 1467 feet taller than the Empire State Building.

168. [1.9]

$$\begin{array}{r} \overset{\;\;6\;17}{1\,7\,\cancel{7}\;6} \quad \textit{1 WTC in New York} \\ -\,1\;4\;8\;3 \quad \textit{Petronas Towers} \\ \hline 2\;9\;3 \quad \textit{difference} \end{array}$$

The 1 WTC in New York will be 293 feet taller than the Petronas Towers.

169. [1.9] (a)

$$\begin{array}{r} \overset{\;3\;3\,2}{2\,7\,1\,7} \quad \textit{Burj Dubai} \\ 1\,7\,7\,6 \quad \textit{1 WTC in New York} \\ 1\,6\,6\,7 \quad \textit{Taipei 101} \\ 1\,6\,1\,4 \quad \textit{World Financial Center} \\ 1\,4\,8\,3 \quad \textit{Petronas Towers} \\ 1\,4\,5\,1 \quad \textit{Willis Tower} \\ +\,1\,2\,5\,0 \quad \textit{Empire State Building} \\ \hline 11,958 \quad \textit{combined height in feet} \end{array}$$

The combined height of these seven buildings is 11,958 feet.

(b) Two miles is the same as $2 \times 5280 = 10,560$ feet, so the combined height is greater than two miles.

$$\begin{array}{r} \overset{\;\;8\;15}{11,\cancel{9}\;\cancel{5}\;8} \quad \textit{combined height} \\ -\,10,5\;6\;0 \quad \textit{feet in two miles} \\ \hline 1\;3\;9\;8 \quad \textit{difference} \end{array}$$

The combined height of the seven buildings is 1398 feet more than a two miles.

170. [1.9] One yard is the same as three feet, so 100 yards is the same as 300 feet. The Willis Tower is 1451 feet tall, so divide 1451 by 300.

$$\begin{array}{r} 4 \\ 300\,\overline{\smash{)}\,1\;4\;5\;1} \\ \underline{1\;2\;0\;0} \\ 2\;5\;1 \end{array}$$

The height of the Willis Tower is equivalent to more than the length of 4 football fields (a little less than 5).

Chapter 1 Test

1. 9205 is nine thousand, two hundred five.

2. 25,065 is twenty-five thousand, sixty-five.

3. Four hundred twenty-six thousand, five is 426,005.

4.
$$\begin{array}{r} \overset{1\,2\,2}{8\,5\,3} \\ 6\,6 \\ 4\,0\,2\,2 \\ +\,3\,5\,8\,9 \\ \hline 8\,5\,3\,0 \end{array}$$

5.
$$\begin{array}{r} \overset{1\,1\;1\,2}{1\,7,0\,6\,3} \\ 7 \\ 1\,2 \\ 1\,5\,0\,5 \\ 9\,3,7\,1\,0 \\ +\quad\;\; 3\,3\,3 \\ \hline 1\,1\,2,6\,3\,0 \end{array}$$

6.
$$\begin{array}{r} \overset{\;\;\;9}{\overset{8\;\cancel{1}\,0\,10}{\cancel{9}\,\cancel{0}\,\cancel{0}\,9}} \\ -\,7\,9\,6\,4 \\ \hline 1\,0\,4\,5 \end{array}$$

7.
$$\begin{array}{r} \overset{8\;10\,6\,15}{\cancel{9}\,\cancel{0}\,\cancel{7}\,\cancel{5}} \\ -\,2\,8\,6\,9 \\ \hline 6\,2\,0\,6 \end{array}$$

8. $7 \times 6 \times 4 = (7 \times 6) \times 4 = 42 \times 4 = 168$

9. $57 \cdot 3000$

$$
\begin{array}{r}
5\,7 \\
\times \ \ 3 \\
\hline
1\,7\,1
\end{array}
$$

$57 \cdot 3000 = 171{,}000$ *Attach* 000.

10. $85(19)$

$$
\begin{array}{r}
8\,5 \\
\times \ \ 1\,9 \\
\hline
7\,6\,5 \\
8\,5 \ \ \\
\hline
1\,6\,1\,5
\end{array}
$$

Check:

$$
\begin{array}{r}
8\,5 \\
19\,\overline{)1\,6\,1\,5} \\
1\,5\,2 \ \ \\
\hline
9\,5 \\
9\,5 \\
\hline
0
\end{array}
$$

11.

$$
\begin{array}{r}
7\,3\,8\,1 \\
\times \ \ \ \ 6\,0\,3 \\
\hline
2\,2\,1\,4\,3 \\
4\,4\,2\,8\,6\,0 \ \ \\
\hline
4{,}450{,}7\,4\,3
\end{array}
$$

Check:

$$
\begin{array}{r}
7\ 3\ 8\ 1 \\
603\,\overline{)4,\,4\,5\,0,\,7\,4\,3} \\
4\ \ 2\,2\,1 \ \ \ \ \\
\hline
2\,2\,9\ 7 \ \ \ \\
1\,8\,0\ 9 \ \ \\
\hline
4\ 8\ 8\ 4 \\
4\ 8\ 2\ 4 \\
\hline
6\ 0\ 3 \\
6\ 0\ 3 \\
\hline
0
\end{array}
$$

12.

$$
\begin{array}{r}
7\ 0\ 4\ 7 \\
16\,\overline{)1\,1\,2,\,7\,5\,2} \\
1\,1\,2 \ \ \ \ \\
\hline
0\ 7\,5 \ \ \\
6\,4 \ \ \\
\hline
1\,1\,2 \\
1\,1\,2 \\
\hline
0
\end{array}
$$

Check:

$$
\begin{array}{r}
7\,0\,4\,7 \\
\times \ \ \ \ 1\,6 \\
\hline
4\,2\,2\,8\,2 \\
7\,0\,4\,7 \ \ \\
\hline
112{,}7\,5\,2
\end{array}
$$

13. $\dfrac{835}{0}$ is undefined

14. $19{,}241 \div 42$

$$
\begin{array}{r}
4\ 5\ 8 \ \textbf{R}5 \\
42\,\overline{)1\,9,\,2\,4\,1} \\
1\,6\,8 \ \ \ \ \\
\hline
2\ 4\,4 \ \ \\
2\ 1\,0 \ \ \\
\hline
3\ 4\ 1 \\
3\ 3\ 6 \\
\hline
5
\end{array}
$$

15.

$$
\begin{array}{r}
1\ 6\ 0 \\
280\,\overline{)4\,4,\,8\,0\,0} \\
2\ 8\ 0 \ \ \ \ \\
\hline
1\ 6\ 8\ 0 \ \\
1\ 6\ 8\ 0 \ \\
\hline
0\ 0
\end{array}
$$

16. 6347 rounded to the nearest ten: $63\underline{4}7$

Next digit is 5 or more. Tens place changes $(4 + 1 = 5)$. The digit to the right of the underlined place changes to zero. **6350**

17. 76,489 rounded to the nearest thousand: $7\underline{6}{,}489$

Next digit is 4 or less. Thousands place does not change. All digits to the right of the underlined place change to zero. **76,000**

18. $5^2 + 8(2)$ *Exponent*
$25 + 8(2)$ *Multiply.*
$25 + 16 = 41$ *Add.*

19. $7 \cdot \sqrt{64} - 14 \cdot 2$ *Square root*
$7 \cdot 8 - 14 \cdot 2$ *Multiply.*
$56 - 28 = 28$ *Subtract.*

20. Estimate:
$\$500 + \$500 + \$500 + \$400 - \$800 = \$1100$

Exact: Add the rent collected.

$$
\begin{array}{r}
\$ \ \ ^{1}\ ^{11}485 \\
500 \\
515 \\
+ \ \ 425 \\
\hline
\$1925
\end{array}
$$

Subtract expenses.

$$
\begin{array}{r}
\$1\overset{812}{9 2}5 \\
- 7 8 5 \\
\hline
\$1 1 4 0 \ \ \textit{amount left}
\end{array}
$$

She has $1140 left.

21. Estimate: $90{,}000 \div 400 = 225$ acres

Exact: Divide the total number of gallons by the number of gallons produced from one acre.

$$
\begin{array}{r}
2\ 3\ 1 \\
374\,\overline{)8\,6,\,3\,9\,4} \\
7\ 4\ 8 \ \ \ \ \\
\hline
1\ 1\ 5\ 9 \ \\
1\ 1\ 2\ 2 \ \\
\hline
3\ 7\ 4 \\
3\ 7\ 4 \\
\hline
0
\end{array}
$$

It would take 231 acres.

22. Estimate: $\$2000 - \$500 - \$200 - \$200 = \$1100$
Exact: $\$1906 - \$528 - \$195 - \$235 = \$948$

Her new balance is $948.

23. If we multiply the number of identifications each minute, 48, by the number of minutes in an hour, 60, and then multiply that number by the number of hours, 4, we'll get the total number of identifications in 4 hours.

Estimate: $(50 \times 60 \times 4) + (40 \times 60 \times 3)$
$= (3000 \times 4) + (2400 \times 3)$
$= 12{,}000 + 7200 = 19{,}200 \text{ chicks}$

Exact: $(48 \times 60 \times 4) + (36 \times 60 \times 3)$
$= (2880 \times 4) + (2160 \times 3)$
$= 11{,}520 + 6480 = 18{,}000 \text{ chicks}$

The total number of baby chicks identified is 18,000.

24. (1) Locate the place to which you are rounding and underline it.

(2) Look only at the next digit to the right. If this digit is a 4 or less, do not change the underlined digit. If the digit is a 5 or more, increase the underlined digit by 1.

(3) Change all digits to the right of the underlined place to zeros.

Each person's example will vary, but the following two examples illustrate the two general cases.

(A) 1<u>2</u>4,999 rounds to 120,000

(B) 1<u>2</u>5,000 rounds to 130,000

25. (1) Read the problem carefully.

(2) Work out a plan.

(3) Estimate a reasonable answer.

(4) Solve the problem.

(5) State the answer.

(6) Check your work.