

CHAPTER 1 WHOLE NUMBERS

1.1 Reading and Writing Whole Numbers

1.1 Margin Exercises

- (a) 342
4 is in the *tens* place.

(b) 714
4 is in the *ones* place.

(c) 479
4 is in the *hundreds* place.
- 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
- 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.
- (a) 18 is eighteen.

(b) 36 is thirty-six.

(c) 418 is four hundred eighteen.

(d) 902 is nine hundred two.
- (a) 3104 is three thousand, one hundred four.

(b) 95,372 is ninety-five thousand, 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.
- (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.

1.1 Reading and Writing Whole Numbers 1

- (a) The U.S. population in the 2010 column is 309 million and is written in digits as 309,000,000.

(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

- The digit in the hundreds place in the whole number 3065 is 0. Choice **C**
- The digit in the ten-thousands place in the whole number 134,681 is 3. Choice **B**
- 18,015; ten-thousands: 1; hundreds: 0
- 86,332; ten-thousands: 8; ones: 2
- 7,628,592,183; millions: 8; thousands: 2
- 1,700,225,016; billions: 1; millions: 0
- The digits in the thousands period in the whole number 552,687,318 are 687.
- The digits in the millions period in the whole number 974,321,876,528 are 321.
- 3,561,435; millions: 3; thousands: 561; ones: 435
- 100,258,100,006; billions: 100; millions: 258; thousands: 100; ones: 6
- Evidence suggests that this is true. It is common to count using fingers.
- 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.
- 23,115 is twenty-three thousand, one hundred fifteen. The statement is *false* (no "and").
- 37,886 is thirty-seven thousand, eight hundred eighty-six. The statement is *true*.
- 346,009 is three hundred forty-six thousand, nine.
- 218,033 is two hundred eighteen thousand, thirty-three.
- 25,756,665 is twenty-five million, seven hundred fifty-six thousand, six hundred sixty-five.
- 999,993,000 is nine hundred ninety-nine million, nine hundred ninety-three thousand.

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19. Sixty-three thousand, one hundred sixty-three is 63,163.
20. Ninety-five thousand, one hundred eleven is 95,111.
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.

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

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

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

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

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

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

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)
$$\begin{array}{r} \frac{1}{66} \\ + 27 \quad 6 \text{ ones and } 7 \text{ ones} = 13 \text{ ones} \\ \hline 93 \end{array}$$

(b)
$$\begin{array}{r} \frac{1}{58} \\ + 33 \quad 8 \text{ ones and } 3 \text{ ones} = 11 \text{ ones} \\ \hline 91 \end{array}$$

(c)
$$\begin{array}{r} \frac{1}{56} \\ + 37 \quad 6 \text{ ones and } 7 \text{ ones} = 13 \text{ ones} \\ \hline 93 \end{array}$$

1.2 Adding Whole Numbers

1.2 Margin Exercises

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

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

(d)
$$\begin{array}{r} 1 \\ 34 \\ + 49 \text{ 4 ones and 9 ones} = 13 \text{ ones} \\ \hline 83 \end{array}$$

5. (a)
$$\begin{array}{r} 1 \ 21 \\ 162 \\ 4271 \\ 372 \\ + 8976 \\ \hline 13,781 \end{array}$$

(b)
$$\begin{array}{r} 2 \ 21 \\ 7821 \\ 435 \\ 72 \\ 305 \\ + 1693 \\ \hline 10,326 \end{array}$$

6. (a)
$$\begin{array}{r} 816 \\ 363 \\ 17 \\ 2 \\ 5 \\ + 7654 \\ \hline 8857 \end{array}$$

(b)
$$\begin{array}{r} 15,829 \\ 765 \\ 78 \\ 15 \\ 9 \\ 7 \\ + 13,179 \\ \hline 29,882 \end{array}$$

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*
- + 6 *Belle Isle to Conway*
- 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*
- 38 *miles*

9.
$$\begin{array}{r} 22 \\ 526 \\ 297 \\ 526 \\ + 297 \\ \hline 1646 \text{ feet} \end{array}$$

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

10. (a)
$$\begin{array}{r} 63 \\ 4 \\ 9 \\ + 28 \\ \hline 104 \text{ correct} \end{array}$$

(b)
$$\begin{array}{r} 927 \\ 395 \\ 64 \\ + 251 \\ \hline 1637 \text{ correct} \end{array}$$

(c)
$$\begin{array}{r} 79 \\ 218 \\ 7 \\ + 639 \\ \hline 943 \text{ (953 is incorrect.)} \end{array}$$

(d)
$$\begin{array}{r} 21,892 \\ 11,746 \\ + 43,925 \\ \hline 77,563 \text{ (79,563 is incorrect.)} \end{array}$$

1.2 Section Exercises

1.
$$\begin{array}{r} 43 \\ + 54 \\ \hline 97 \end{array}$$

2.
$$\begin{array}{r} 18 \\ + 11 \\ \hline 29 \end{array}$$

3.
$$\begin{array}{r} 56 \\ + 33 \\ \hline 89 \end{array}$$

4.
$$\begin{array}{r} 83 \\ + 15 \\ \hline 98 \end{array}$$

5.
$$\begin{array}{r} 317 \\ + 572 \\ \hline 889 \end{array}$$

6.
$$\begin{array}{r} 574 \\ + 325 \\ \hline 899 \end{array}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\begin{array}{r} 21. \quad \frac{1}{87} \\ + 63 \\ \hline 150 \text{ correct} \end{array}$$

$$\begin{array}{r} 22. \quad \frac{1}{19} \\ + 92 \\ \hline 111 \text{ (101 is incorrect.)} \end{array}$$

$$\begin{array}{r} 23. \quad \frac{1}{86} \\ + 69 \\ \hline 155 \text{ correct} \end{array}$$

$$\begin{array}{r} 24. \quad \frac{1}{37} \\ + 85 \\ \hline 122 \text{ (132 is incorrect.)} \end{array}$$

$$\begin{array}{r} 25. \quad \frac{1}{47} \\ + 74 \\ \hline 121 \text{ (111 is incorrect.)} \end{array}$$

$$\begin{array}{r} 26. \quad \frac{1}{97} \\ + 79 \\ \hline 176 \end{array}$$

$$\begin{array}{r} 27. \quad \frac{1}{67} \\ + 78 \\ \hline 145 \end{array}$$

$$\begin{array}{r} 28. \quad \frac{1}{96} \\ + 47 \\ \hline 143 \end{array}$$

$$\begin{array}{r} 29. \quad \frac{1}{73} \\ + 29 \\ \hline 102 \end{array}$$

$$\begin{array}{r} 30. \quad \frac{1}{68} \\ + 37 \\ \hline 105 \end{array}$$

$$\begin{array}{r} 31. \quad \frac{1}{746} \\ + 905 \\ \hline 1651 \end{array}$$

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

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

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

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

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

$$\begin{array}{r} 37. \quad \overset{1}{9}28 \\ + 843 \\ \hline 1771 \end{array}$$

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

$$\begin{array}{r} 39. \quad \overset{11}{5}26 \\ + 884 \\ \hline 1410 \end{array}$$

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

$$\begin{array}{r} 41. \quad \overset{1}{3}\overset{1}{5}74 \\ + 2817 \\ \hline 6391 \end{array}$$

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

$$\begin{array}{r} 43. \quad \overset{1}{7}\overset{11}{8}96 \\ + 3728 \\ \hline 11,624 \end{array}$$

$$\begin{array}{r} 44. \quad \overset{1}{9}382 \\ + 7586 \\ \hline 16,968 \end{array}$$

$$\begin{array}{r} 45. \quad \overset{1}{9}\overset{11}{6}25 \\ + 7986 \\ \hline 17,611 \end{array}$$

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

$$\begin{array}{r} 47. \quad \overset{22}{9}056 \\ 78 \\ 6089 \\ + 731 \\ \hline 15,954 \end{array}$$

$$\begin{array}{r} 48. \quad \overset{1}{4}\overset{1}{0}22 \\ 709 \\ 8621 \\ + 37 \\ \hline 13,389 \end{array}$$

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

$$\begin{array}{r} 50. \quad \overset{211}{1}708 \\ 321 \\ 61 \\ + 8926 \\ \hline 11,016 \end{array}$$

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

$$\begin{array}{r} 52. \quad \overset{12}{6}\overset{5}{0}5 \\ 173 \\ 7044 \\ + 168 \\ \hline 13,890 \end{array}$$

$$\begin{array}{r} 53. \quad \overset{1}{9}\overset{1}{3}21 \\ 9603 \\ 8 \\ 21 \\ + 1604 \\ \hline 11,557 \end{array}$$

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$$\begin{array}{r}
 54. \quad \begin{array}{r} 212 \\ 7631 \\ 5983 \\ 7 \\ 36 \\ + 505 \\ \hline 14,162 \end{array}
 \end{array}$$

$$\begin{array}{r}
 55. \quad \begin{array}{r} 112 \\ 2109 \\ 63 \\ 16 \\ 3 \\ + 9887 \\ \hline 12,078 \end{array}
 \end{array}$$

$$\begin{array}{r}
 56. \quad \begin{array}{r} 113 \\ 322 \\ 6508 \\ 93 \\ 745 \\ 18 \\ + 2005 \\ \hline 9691 \end{array}
 \end{array}$$

$$\begin{array}{r}
 57. \quad \begin{array}{r} 233 \\ 553 \\ 97 \\ 2772 \\ 437 \\ 63 \\ + 328 \\ \hline 4250 \end{array}
 \end{array}$$

$$\begin{array}{r}
 58. \quad \begin{array}{r} 223 \\ 3187 \\ 810 \\ 527 \\ 76 \\ 2665 \\ + 317 \\ \hline 7582 \end{array}
 \end{array}$$

$$\begin{array}{r}
 59. \quad \begin{array}{r} 212 \\ 413 \\ 85 \\ 9919 \\ 602 \\ 31 \\ + 1218 \\ \hline 12,268 \end{array}
 \end{array}$$

$$\begin{array}{r}
 60. \quad \begin{array}{r} 332 \\ 576 \\ 7934 \\ 60 \\ 781 \\ 5968 \\ + 371 \\ \hline 15,690 \end{array}
 \end{array}$$

61. Add up to check addition.

$$\begin{array}{r}
 2091 \\
 \hline
 832 \\
 468 \\
 + 791 \\
 \hline
 2091 \text{ correct}
 \end{array}$$

62. Add up to check addition.

$$\begin{array}{r}
 1857 \\
 \hline
 326 \\
 852 \\
 + 679 \\
 \hline
 1857 \text{ correct}
 \end{array}$$

63. Add up to check addition.

$$\begin{array}{r}
 769 \\
 \hline
 179 \\
 214 \\
 + 376 \\
 \hline
 759 \text{ incorrect; should be 769}
 \end{array}$$

64. Add up to check addition.

$$\begin{array}{r}
 1120 \\
 \hline
 17 \\
 296 \\
 713 \\
 + 94 \\
 \hline
 1220 \text{ incorrect; should be 1120}
 \end{array}$$

65. Add up to check addition.

$$\begin{array}{r}
 5420 \\
 \hline
 4713 \\
 28 \\
 615 \\
 + 64 \\
 \hline
 5420 \text{ correct}
 \end{array}$$

66. Add up to check addition.

$$\begin{array}{r} 11,583 \\ \underline{3\ 628} \\ 72 \\ 564 \\ + 7\ 319 \\ \hline 11,583 \text{ correct} \end{array}$$

67. Add up to check addition.

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

68. Add up to check addition.

$$\begin{array}{r} 11,212 \\ \underline{516} \\ 8\ 760 \\ 24 \\ 189 \\ + 1\ 723 \\ \hline 11,212 \text{ correct} \end{array}$$

69. Add up to check addition.

$$\begin{array}{r} 14,332 \\ \underline{4714} \\ 27 \\ 77 \\ 8878 \\ + 636 \\ \hline 14,332 \text{ correct} \end{array}$$

70. Add up to check addition.

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

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.

$$\begin{array}{r} 21 \text{ Southtown to Thomasville} \\ + 12 \text{ Thomasville to Rena} \\ \hline 33 \text{ miles} \end{array}$$

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

$$\begin{array}{r} 18 \text{ Elk Hill to Thomasville} \\ + 17 \text{ Thomasville to Oakton} \\ \hline 35 \text{ miles} \end{array}$$

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

$$\begin{array}{r} 12 \text{ Thomasville to Rena} \\ 15 \text{ Rena to Austin} \\ + 11 \text{ Austin to Murphy} \\ \hline 38 \text{ miles} \end{array}$$

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

$$\begin{array}{r} 11 \text{ Murphy to Austin} \\ 15 \text{ Austin to Rena} \\ + 12 \text{ Rena to Thomasville} \\ \hline 38 \text{ miles} \end{array}$$

77. \$3 482 flea market
+ 12,860 annual auction
\$16,342 total amount raised

78. 185 hot dogs
+ 129 hamburgers
314 total items sold

79. 413 women
+ 286 men
699 total people

80. 283 employees
+ 218 employees
501 total employees

81. 13,786 on-campus day
3 497 on-campus night
+ 2 874 on-line
20,157 total students

82. 33
887
223
465
683
597
214
+ 1817
4886 total tornadoes

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

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

970 feet is the total distance around the lot.

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

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

Maria will need 160 feet of gutters.

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

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

Martin will need 72 feet of lumber.

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

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

2109 meters of fencing will be needed.

Relating Concepts (Exercises 87–94)

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) $8 + 2 = 10$:
 $10 - \underline{2} = 8$ or $10 - \underline{8} = 2$
- (b) $7 + 4 = 11$:
 $11 - 7 = 4$ or $11 - 4 = 7$
- (c) $15 + 22 = 37$:
 $37 - 15 = 22$ or $37 - 22 = 15$
- (d) $23 + 55 = 78$:
 $78 - 55 = 23$ or $78 - 23 = 55$
2. (a) $7 - 5 = 2$:
 $7 = 5 + \underline{2}$ or $7 = 2 + 5$
- (b) $9 - 4 = 5$:
 $9 = 4 + 5$ or $9 = 5 + 4$
- (c) $21 - 15 = 6$:
 $21 = 15 + 6$ or $21 = 6 + 15$
- (d) $58 - 42 = 16$:
 $58 = 42 + 16$ or $58 = 16 + 42$
3. (a) $\begin{array}{r} 74 \text{ 4 ones} - 3 \text{ ones} = 1 \text{ one} \\ - 43 \text{ 7 tens} - 4 \text{ tens} = 3 \text{ tens} \\ \hline 31 \end{array}$

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

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

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

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

Match: 31 is correct.

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

Not a match: 21 is incorrect.

Rework.

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

Match: 31 is correct.

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

Not a match: 113 is incorrect.

Rework.

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

Match: 123 is correct.

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

Match: 3230 is correct.

5. (a)
$$\begin{array}{r} 418 \\ 58 \\ - 19 \\ \hline 39 \end{array}$$

(b)
$$\begin{array}{r} 716 \\ 86 \\ - 38 \\ \hline 48 \end{array}$$

(c)
$$\begin{array}{r} 311 \\ 41 \\ - 27 \\ \hline 14 \end{array}$$

(d)
$$\begin{array}{r} 513 \\ 863 \\ - 47 \\ \hline 816 \end{array}$$

(e)
$$\begin{array}{r} 512 \\ 762 \\ - 157 \\ \hline 605 \end{array}$$

6. (a)
$$\begin{array}{r} 812 \\ 927 \\ - 43 \\ \hline 884 \end{array}$$

(b)
$$\begin{array}{r} 51615 \\ 675 \\ - 86 \\ \hline 589 \end{array}$$

(c)
$$\begin{array}{r} 31617 \\ 477 \\ - 389 \\ \hline 88 \end{array}$$

(d)
$$\begin{array}{r} 0131017 \\ 1417 \\ - 988 \\ \hline 429 \end{array}$$

(e)
$$\begin{array}{r} 71613 \\ 8739 \\ - 3892 \\ \hline 4847 \end{array}$$

7. (a)
$$\begin{array}{r} 9 \\ 1016 \\ 206 \\ - 177 \\ \hline 29 \end{array}$$

(b)
$$\begin{array}{r} 9 \\ 61013 \\ 703 \\ - 415 \\ \hline 288 \end{array}$$

(c)
$$\begin{array}{r} 9 \\ 61012 \\ 7024 \\ - 2632 \\ \hline 4392 \end{array}$$

8. (a)
$$\begin{array}{r} 9 \\ 21018 \\ 308 \\ - 159 \\ \hline 149 \end{array}$$

(b)
$$\begin{array}{r} 610 \\ 570 \\ - 368 \\ \hline 202 \end{array}$$

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$$\begin{array}{r} \text{(c)} \quad 0141610 \\ \quad 1570 \\ - \quad 983 \\ \hline \quad 587 \end{array}$$

$$\begin{array}{r} \text{(d)} \quad 99 \\ \quad 6101011 \\ \quad 7001 \\ - \quad 5193 \\ \hline \quad 1808 \end{array}$$

$$\begin{array}{r} \text{(e)} \quad 99 \\ \quad 3101010 \\ \quad 4000 \\ - \quad 1782 \\ \hline \quad 2218 \end{array}$$

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

Match: 189 is correct.

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

Not a match: 252 is incorrect.

Rework.

$$\begin{array}{r} \quad 610 \\ \quad 570 \\ - \quad 328 \\ \hline \quad 242 \end{array} \quad \begin{array}{r} 328 \\ + 242 \\ \hline 570 \end{array}$$

Match: 242 is correct.

$$\begin{array}{r} \text{(c)} \quad 14,726 \quad 8839 \\ - 8839 \quad + 5887 \\ \hline 5887 \quad 14,726 \end{array}$$

Match: 5887 is correct.

$$\begin{array}{r} \text{10. (a)} \quad \$54,861^{511} \quad \text{Associate of Arts degree} \\ - 33,435 \quad \text{Not a high school graduate} \\ \hline \$21,426 \end{array}$$

$$\begin{array}{r} \text{(b)} \quad 71111 \\ \$82,197 \quad \text{Bachelor's degree} \\ - 54,861 \quad \text{Associate of Arts degree} \\ \hline \$27,336 \quad \text{More earnings} \end{array}$$

1.3 Section Exercises

$$\begin{array}{r} \text{1.} \quad 48 \quad \text{Check} \quad 16 \\ - 32 \quad + 32 \\ \hline 16 \quad 48 \end{array}$$

$$\begin{array}{r} \text{2.} \quad 17 \quad \text{Check} \quad 4 \\ - 13 \quad + 13 \\ \hline 4 \quad 17 \end{array}$$

$$\begin{array}{r} \text{3.} \quad 86 \quad \text{Check} \quad 53 \\ - 53 \quad + 33 \\ \hline 33 \quad 86 \end{array}$$

$$\begin{array}{r} \text{4.} \quad 78 \quad \text{Check} \quad 35 \\ - 35 \quad + 43 \\ \hline 43 \quad 78 \end{array}$$

$$\begin{array}{r} \text{5.} \quad 77 \quad \text{Check} \quad 60 \\ - 60 \quad + 17 \\ \hline 17 \quad 77 \end{array}$$

$$\begin{array}{r} \text{6.} \quad 87 \quad \text{Check} \quad 63 \\ - 63 \quad + 24 \\ \hline 24 \quad 87 \end{array}$$

$$\begin{array}{r} \text{7.} \quad 335 \quad \text{Check} \quad 213 \\ - 122 \quad + 122 \\ \hline 213 \quad 335 \end{array}$$

$$\begin{array}{r} \text{8.} \quad 602 \quad \text{Check} \quad 301 \\ - 301 \quad + 301 \\ \hline 301 \quad 602 \end{array}$$

$$\begin{array}{r} \text{9.} \quad 552 \quad \text{Check} \quad 451 \\ - 451 \quad + 101 \\ \hline 101 \quad 552 \end{array}$$

$$\begin{array}{r} \text{10.} \quad 888 \quad \text{Check} \quad 215 \\ - 215 \quad + 673 \\ \hline 673 \quad 888 \end{array}$$

$$\begin{array}{r} \text{11.} \quad 7352 \quad \text{Check} \quad 241 \\ - 241 \quad + 7111 \\ \hline 7111 \quad 7352 \end{array}$$

$$\begin{array}{r} \text{12.} \quad 4420 \quad \text{Check} \quad 4110 \\ - 310 \quad + 310 \\ \hline 4110 \quad 4420 \end{array}$$

$$\begin{array}{r} \text{13.} \quad 5546 \quad \text{Check} \quad 3412 \\ - 2134 \quad + 2134 \\ \hline 3412 \quad 5546 \end{array}$$

$$\begin{array}{r} \text{14.} \quad 1875 \quad \text{Check} \quad 1362 \\ - 1362 \quad + 513 \\ \hline 513 \quad 1875 \end{array}$$

$$\begin{array}{r} \text{15.} \quad 6259 \quad \text{Check} \quad 4148 \\ - 4148 \quad + 2111 \\ \hline 2111 \quad 6259 \end{array}$$

$$\begin{array}{r} \text{16.} \quad 9654 \quad \text{Check} \quad 4323 \\ - 4323 \quad + 5331 \\ \hline 5331 \quad 9654 \end{array}$$

$$\begin{array}{r} \text{17.} \quad 24,392 \quad \text{Check} \quad 13,160 \\ - 11,232 \quad + 11,232 \\ \hline 13,160 \quad 24,392 \end{array}$$

18.
$$\begin{array}{r} 57,921 \\ - 34,801 \\ \hline 23,120 \end{array}$$
 Check
$$\begin{array}{r} 23,120 \\ + 34,801 \\ \hline 57,921 \end{array}$$
19.
$$\begin{array}{r} 46,253 \\ - 5,143 \\ \hline 41,110 \end{array}$$
 Check
$$\begin{array}{r} 41,110 \\ + 5,143 \\ \hline 46,253 \end{array}$$
20.
$$\begin{array}{r} 75,904 \\ - 3,702 \\ \hline 72,202 \end{array}$$
 Check
$$\begin{array}{r} 72,202 \\ + 3,702 \\ \hline 75,904 \end{array}$$
21.
$$\begin{array}{r} 54 \\ - 42 \\ \hline 12 \end{array}$$
 Check
$$\begin{array}{r} 42 \\ + 12 \\ \hline 54 \end{array}$$
 correct
22.
$$\begin{array}{r} 87 \\ - 43 \\ \hline 44 \end{array}$$
 Check
$$\begin{array}{r} 43 \\ + 44 \\ \hline 87 \end{array}$$
 correct
23.
$$\begin{array}{r} 89 \\ - 27 \\ \hline 63 \end{array}$$
 Check
$$\begin{array}{r} 63 \\ + 27 \\ \hline 90 \end{array}$$
 incorrect
- Rework.**
- $$\begin{array}{r} 89 \\ - 27 \\ \hline 62 \end{array}$$
 Check
$$\begin{array}{r} 62 \\ + 27 \\ \hline 89 \end{array}$$
 correct
24.
$$\begin{array}{r} 47 \\ - 35 \\ \hline 13 \end{array}$$
 Check
$$\begin{array}{r} 13 \\ + 35 \\ \hline 48 \end{array}$$
 incorrect
- Rework.**
- $$\begin{array}{r} 47 \\ - 35 \\ \hline 12 \end{array}$$
 Check
$$\begin{array}{r} 12 \\ + 35 \\ \hline 47 \end{array}$$
 correct
25.
$$\begin{array}{r} 382 \\ - 261 \\ \hline 131 \end{array}$$
 Check
$$\begin{array}{r} 261 \\ + 131 \\ \hline 392 \end{array}$$
 incorrect
- Rework.**
- $$\begin{array}{r} 382 \\ - 261 \\ \hline 121 \end{array}$$
 Check
$$\begin{array}{r} 261 \\ + 121 \\ \hline 382 \end{array}$$
 correct
26.
$$\begin{array}{r} 754 \\ - 342 \\ \hline 412 \end{array}$$
 Check
$$\begin{array}{r} 342 \\ + 412 \\ \hline 754 \end{array}$$
 correct
27.
$$\begin{array}{r} 4683 \\ - 3542 \\ \hline 1141 \end{array}$$
 Check
$$\begin{array}{r} 3542 \\ + 1141 \\ \hline 4683 \end{array}$$
 correct
28.
$$\begin{array}{r} 5217 \\ - 4105 \\ \hline 1132 \end{array}$$
 Check
$$\begin{array}{r} 1132 \\ + 4105 \\ \hline 5237 \end{array}$$
 incorrect

Rework.

- $$\begin{array}{r} 5217 \\ - 4105 \\ \hline 1112 \end{array}$$
 Check
$$\begin{array}{r} 1112 \\ + 4105 \\ \hline 5217 \end{array}$$
 correct
29.
$$\begin{array}{r} 8643 \\ - 1421 \\ \hline 7212 \end{array}$$
 Check
$$\begin{array}{r} 7212 \\ + 1421 \\ \hline 8633 \end{array}$$
 incorrect
- Rework.**
- $$\begin{array}{r} 8643 \\ - 1421 \\ \hline 7222 \end{array}$$
 Check
$$\begin{array}{r} 7222 \\ + 1421 \\ \hline 8643 \end{array}$$
 correct
30.
$$\begin{array}{r} 9428 \\ - 3124 \\ \hline 6324 \end{array}$$
 Check
$$\begin{array}{r} 6324 \\ + 3124 \\ \hline 9448 \end{array}$$
 incorrect
- Rework.**
- $$\begin{array}{r} 9428 \\ - 3124 \\ \hline 6304 \end{array}$$
 Check
$$\begin{array}{r} 6304 \\ + 3124 \\ \hline 9428 \end{array}$$
 correct
31. In subtraction, regrouping is necessary when the digit in the minuend has less value than the digit in the subtrahend, which is directly below 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.
$$\begin{array}{r} 615 \\ 75 \\ - 37 \\ \hline 38 \end{array}$$
34.
$$\begin{array}{r} 716 \\ 86 \\ - 28 \\ \hline 58 \end{array}$$
35.
$$\begin{array}{r} 814 \\ 94 \\ - 49 \\ \hline 45 \end{array}$$
36.
$$\begin{array}{r} 518 \\ 68 \\ - 39 \\ \hline 29 \end{array}$$
37.
$$\begin{array}{r} 417 \\ 57 \\ - 38 \\ \hline 19 \end{array}$$
38.
$$\begin{array}{r} 317 \\ 47 \\ - 29 \\ \hline 18 \end{array}$$

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$$\begin{array}{r} 712 \\ 828 \\ - 547 \\ \hline 281 \end{array}$$

$$\begin{array}{r} 81016 \\ 916 \\ - 618 \\ \hline 298 \end{array}$$

$$\begin{array}{r} 611 \\ 771 \\ - 252 \\ \hline 519 \end{array}$$

$$\begin{array}{r} 81613 \\ 973 \\ - 788 \\ \hline 185 \end{array}$$

$$\begin{array}{r} 41218 \\ 7538 \\ - 479 \\ \hline 7059 \end{array}$$

$$\begin{array}{r} 71513 \\ 5863 \\ - 1295 \\ \hline 4568 \end{array}$$

$$\begin{array}{r} 81718 \\ 9988 \\ - 2399 \\ \hline 7589 \end{array}$$

$$\begin{array}{r} 215616 \\ 3576 \\ - 1658 \\ \hline 1918 \end{array}$$

$$\begin{array}{r} 710 \\ 80 \\ - 73 \\ \hline 7 \end{array}$$

$$\begin{array}{r} 510 \\ 60 \\ - 37 \\ \hline 23 \end{array}$$

$$\begin{array}{r} 9 \\ 21018 \\ 308 \\ - 289 \\ \hline 19 \end{array}$$

$$\begin{array}{r} 9 \\ 51010 \\ 600 \\ - 599 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 310311 \\ 4041 \\ - 1208 \\ \hline 2833 \end{array}$$

$$\begin{array}{r} 9 \\ 51012 \\ 4602 \\ - 2063 \\ \hline 2539 \end{array}$$

$$\begin{array}{r} 81210 \\ 9305 \\ - 1530 \\ \hline 7775 \end{array}$$

$$\begin{array}{r} 01110 \\ 7120 \\ - 6033 \\ \hline 1087 \end{array}$$

$$\begin{array}{r} 710 \\ 1580 \\ - 1077 \\ \hline 503 \end{array}$$

$$\begin{array}{r} 210 \\ 3068 \\ - 2105 \\ \hline 963 \end{array}$$

$$\begin{array}{r} 9 \\ 11010 \\ 2006 \\ - 1850 \\ \hline 156 \end{array}$$

$$\begin{array}{r} 9 \\ 7111013 \\ 8203 \\ - 5365 \\ \hline 2838 \end{array}$$

$$\begin{array}{r} 11310 \\ 8240 \\ - 6056 \\ \hline 2184 \end{array}$$

$$\begin{array}{r} 410 \\ 7050 \\ - 6045 \\ \hline 1005 \end{array}$$

$$\begin{array}{r} 9 \\ 7141013 \\ 8503 \\ - 2816 \\ \hline 5687 \end{array}$$

$$\begin{array}{r} 99 \\ 5101014 \\ 10004 \\ - 5087 \\ \hline 10917 \end{array}$$

$$\begin{array}{r} 9 \\ 71061015 \\ 80703 \\ - 61667 \\ \hline 19038 \end{array}$$

$$\begin{array}{r}
 710 \overset{9}{\cancel{10}} \overset{10}{\cancel{10}} \\
 8 \overset{9}{\cancel{1}}, \overset{10}{\cancel{0}} \overset{10}{\cancel{0}} \\
 - 55,456 \\
 \hline
 25,544
 \end{array}$$

$$\begin{array}{r}
 66, \overset{9}{\cancel{0}} \overset{10}{\cancel{0}} \overset{10}{\cancel{0}} \\
 - 34,444 \\
 \hline
 31,556
 \end{array}$$

$$\begin{array}{r}
 77, \overset{9}{\cancel{0}} \overset{10}{\cancel{0}} \overset{10}{\cancel{0}} \\
 - 65,308 \\
 \hline
 11,692
 \end{array}$$

$$\begin{array}{r}
 20, \overset{9}{\cancel{0}} \overset{10}{\cancel{0}} \overset{17}{\cancel{10}} \\
 - 13,496 \\
 \hline
 6584
 \end{array}$$

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

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

70. An answer to a subtraction problem may be checked using addition.

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

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

Rework.

$$\begin{array}{r}
 167 \overset{6}{\cancel{1}} \\
 - 1325 \\
 \hline
 346
 \end{array}
 \quad
 \begin{array}{r}
 1325 \\
 + 346 \\
 \hline
 1671 \quad \text{correct}
 \end{array}$$

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

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

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

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

Rework.

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

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

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

Rework.

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

79. Possible answers are:

$$3 + 2 = 5 \text{ could be changed to } 5 - 2 = 3 \text{ or } 5 - 3 = 2.$$

$$6 - 4 = 2 \text{ could be changed to } 2 + 4 = 6 \text{ or } 4 + 2 = 6.$$

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.

$$\begin{array}{r}
 187 \text{ calories man burns} \\
 - 140 \text{ calories woman burns} \\
 \hline
 47 \text{ fewer calories woman burned}
 \end{array}$$

A woman burns 47 fewer calories.

$$\begin{array}{r}
 403 \text{ calories man burns} \\
 - 302 \text{ calories woman burns} \\
 \hline
 101 \text{ more calories man burned}
 \end{array}$$

A man burns 101 more calories.

$$\begin{array}{r}
 612 \text{ new record} \\
 - 543 \text{ old record} \\
 \hline
 69 \text{ difference in numbers}
 \end{array}$$

There are 69 more tornadoes in the new record.

$$\begin{array}{r}
 747 \text{ deaths in April 1925} \\
 - 327 \text{ deaths in April 2011} \\
 \hline
 420 \text{ difference}
 \end{array}$$

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

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$$\begin{array}{r} 85. \quad 746 \text{ height tower top is above the water} \\ - 500 \text{ height tower top is above the roadway} \\ \hline 246 \text{ height roadway is above the water} \end{array}$$

The roadway is 246 feet above the water.

86. The Ford Explorers had greater sales.

$$\begin{array}{r} 81,465 \text{ Ford Explorers} \\ - 70,449 \text{ Jeep Grand Cherokees} \\ \hline 11,016 \end{array}$$

There were 11,016 more Ford Explorers sold.

$$\begin{array}{r} 87. \quad 6970 \text{ jobs six years ago} \\ - 3700 \text{ jobs that remain} \\ \hline 3270 \text{ jobs eliminated} \end{array}$$

There were 3270 jobs eliminated.

$$\begin{array}{r} 88. \quad \$28,065 \text{ price of 2013 Ford Mustang} \\ - 2,500 \text{ price of 1964 Ford Mustang} \\ \hline \$25,565 \text{ increase in price} \end{array}$$

The increase in price is \$25,565.

$$\begin{array}{r} 89. \quad 14,608 \text{ flags manufactured} \\ - 5,069 \text{ flags sold} \\ \hline 9,539 \text{ flags remaining} \end{array}$$

There are 9539 flags that remain unsold.

$$\begin{array}{r} 90. \quad 23,156 \text{ total students} \\ - 14,679 \text{ students with eye exams} \\ \hline 8,477 \text{ students without eye exams} \end{array}$$

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

$$\begin{array}{r} 91. \quad \$913 \text{ monthly housing expense} \\ - 650 \text{ monthly rent} \\ \hline \$263 \text{ increase in monthly housing expense} \end{array}$$

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

$$\begin{array}{r} 92. \quad \$1568 \text{ new amount} \\ - 1479 \text{ old amount} \\ \hline \$89 \text{ difference} \end{array}$$

The monthly increase is \$89.

$$\begin{array}{r} 93. \quad 5299 \text{ distance from NYC to Buenos Aires} \\ - 5158 \text{ distance from Los Angeles to Dublin} \\ \hline 141 \text{ difference} \end{array}$$

The first trip is 141 miles longer than the second.

$$\begin{array}{r} 94. \quad 2,820,000 \text{ nurses needed in 2020} \\ - 1,810,000 \text{ nurses will be available} \\ \hline 1,010,000 \text{ difference} \end{array}$$

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

$$\begin{array}{r} 95. \quad 264,311 \text{ total hip replacement patients} \\ - 125,423 \text{ patients 65 years or older} \\ \hline 138,888 \text{ difference} \end{array}$$

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

$$\begin{array}{r} 96. \quad 555,800 \text{ knee surgeries this year} \\ - 328,900 \text{ knee surgeries six years ago} \\ \hline 226,900 \text{ difference} \end{array}$$

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

$$\begin{array}{r} 97. \quad 540 \text{ calories in a Big Mac} \\ - 230 \text{ calories in a 6-inch Veggie Delite} \\ \hline 310 \text{ fewer calories in the Veggie Delite} \end{array}$$

$$29 \text{ grams of fat in a Big Mac}$$

$$- 3 \text{ grams of fat in a 6-inch Veggie Delite}$$

$$26 \text{ fewer grams of fat in the Veggie Delite}$$

$$\begin{array}{r} 98. \quad 670 \text{ calories in a Whopper} \\ - 280 \text{ calories in a 6" Turkey Breast \& Ham} \\ \hline 390 \text{ fewer calories in the Turkey \& Ham} \end{array}$$

$$40 \text{ grams of fat in a Whopper}$$

$$- 4 \text{ grams of fat in a 6" Turkey Breast \& Ham}$$

$$36 \text{ fewer grams of fat in the Turkey \& Ham}$$

$$\begin{array}{r} 99. \quad 320 \text{ calories in Roasted Chicken} \\ 5 \text{ calories in 2 tsp. of mustard} \\ + 45 \text{ calories in 1 tsp. of olive oil} \\ \hline 370 \text{ total calories} \end{array}$$

$$5 \text{ grams of fat in Roasted Chicken}$$

$$0 \text{ grams of fat in 2 tsp. of mustard}$$

$$+ 5 \text{ grams of fat in 1 tsp. of olive oil}$$

$$10 \text{ total grams of fat}$$

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

$$230 \text{ calories in Veggie Delite}$$

$$+ 380 \text{ calories in Sweet Onion Ch. Teriyaki}$$

$$610 \text{ total calories}$$

$$3 \text{ grams of fat in Veggie Delite}$$

$$+ 5 \text{ grams of fat in Sweet Onion Ch. Teriyaki}$$

$$8 \text{ total grams of fat}$$

1.4 Multiplying Whole Numbers

1.4 Margin Exercises

$$\begin{array}{r} 1. \quad (a) \quad 8 \text{ factor} \\ \quad \quad \times 5 \text{ factor} \\ \hline \quad \quad 40 \text{ product} \end{array}$$

$$\begin{array}{r} \text{(b)} \quad 6 \text{ factor} \\ \times 4 \text{ factor} \\ \hline 24 \text{ product} \end{array}$$

$$\begin{array}{r} \text{(c)} \quad 7 \text{ factor} \\ \times 6 \text{ factor} \\ \hline 42 \text{ product} \end{array}$$

$$\begin{array}{r} \text{(d)} \quad 3 \text{ factor} \\ \times 9 \text{ factor} \\ \hline 27 \text{ product} \end{array}$$

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)
$$\begin{array}{r} \frac{1}{53} \\ \times 5 \\ \hline 265 \end{array}$$

(b)
$$\begin{array}{r} 79 \\ \times 0 \\ \hline 0 \end{array}$$

(c)
$$\begin{array}{r} 46 \\ 758 \\ \times 8 \\ \hline 6064 \end{array}$$

(d)
$$\begin{array}{r} 52 \\ 2831 \\ \times 7 \\ \hline 19,817 \end{array}$$

(e)
$$\begin{array}{r} 513 \\ 4714 \\ \times 8 \\ \hline 37,712 \end{array}$$

5. (a) $63 \times 10 = 630$ Attach 0.

(b) $305 \times 100 = 30,500$ Attach 00.

(c) $714 \times 1000 = 714,000$ Attach 000.

6. (a) 17×50

$$\begin{array}{r} 17 \\ \times 5 \\ \hline 85 \end{array} \quad 17 \times 50 = 850 \text{ Attach 0.}$$

(b) 73×400

$$\begin{array}{r} 73 \\ \times 4 \\ \hline 292 \end{array} \quad 73 \times 400 = 29,200 \text{ Attach 00.}$$

(c) 180×30

$$\begin{array}{r} 18 \\ \times 3 \\ \hline 54 \end{array} \quad 180 \times 30 = 5400 \text{ Attach 00.}$$

(d) 4200×80

$$\begin{array}{r} 42 \\ \times 8 \\ \hline 336 \end{array} \quad 4200 \times 80 = 336,000 \text{ Attach 000.}$$

(e) 800×600

$$\begin{array}{r} 8 \\ \times 6 \\ \hline 48 \end{array} \quad 800 \times 600 = 480,000 \text{ Attach 0000.}$$

7. (a) 35

$$\begin{array}{r} \times 54 \\ \hline 140 \\ 175 \text{ Add} \\ \hline 1890 \end{array}$$

(b) 76

$$\begin{array}{r} \times 49 \\ \hline 684 \\ 304 \text{ Add} \\ \hline 3724 \end{array}$$

8. (a) 52

$$\begin{array}{r} \times 16 \\ \hline 312 \leftarrow 6 \times 52 \\ 52 \leftarrow 1 \times 52 \\ \hline 832 \end{array}$$

(b) 81

$$\begin{array}{r} \times 49 \\ \hline 729 \leftarrow 9 \times 81 \\ 324 \leftarrow 4 \times 81 \\ \hline 3969 \end{array}$$

(c) 234

$$\begin{array}{r} \times 73 \\ \hline 702 \leftarrow 3 \times 234 \\ 1638 \leftarrow 7 \times 234 \\ \hline 17,082 \end{array}$$

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

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

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

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

$$\begin{array}{r}
 \text{(d)} \quad 3526 \\
 \times 6002 \\
 \hline
 7052 \\
 2115600 \quad 6 \times 3526 = 21,156 \quad \text{Insert 00} \\
 \hline
 21,163,052
 \end{array}$$

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

The total cost of 314 garden sprayers is \$4396.

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

The total cost of 64 tires is \$8896.

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

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

1.4 Section Exercises

- In a chain multiplication, if you multiply by the largest number first, rather than the smallest number first, the product will always be the same.
- The property described in Exercise 1 is the commutative property of multiplication.
- When you multiply any number by zero, the answer is always zero.
- When you multiply a whole number by 10, by 100, or by 1000, you can get the answer by attaching one, two, or three zeros, respectively, to the right of the whole number.
- $2 \times 6 \times 2 = (2 \times 6) \times 2 = 12 \times 2 = 24$
or $2 \times (6 \times 2) = 2 \times 12 = 24$.
- $8 \times 6 \times 1 = (8 \times 6) \times 1 = 48 \times 1 = 48$
or $8 \times (6 \times 1) = 8 \times 6 = 48$.
- $7 \cdot 8 \cdot 0 = (7 \cdot 8) \cdot 0 = 56 \cdot 0 = 0$
or $7 \cdot (8 \cdot 0) = 7 \cdot 0 = 0$.
The product of any number and 0 is 0.
- $9 \cdot 0 \cdot 5 = (9 \cdot 0) \cdot 5 = 0 \cdot 5 = 0$
or $9 \cdot (0 \cdot 5) = 9 \cdot 0 = 0$.
The product of any number and 0 is 0.
- $4 \cdot 1 \cdot 6 = (4 \cdot 1) \cdot 6 = 4 \cdot 6 = 24$
or $4 \cdot (1 \cdot 6) = 4 \cdot 6 = 24$.
- $1 \cdot 5 \cdot 7 = (1 \cdot 5) \cdot 7 = 5 \cdot 7 = 35$
or $1 \cdot (5 \cdot 7) = 1 \cdot 35 = 35$.
- $(4)(5)(2) = [(4)(5)](2) = 20(2) = 40$
or $(4)[(5)(2)] = (4)(10) = 40$.
- $(4)(1)(9) = [(4)(1)](9) = 4(9) = 36$
or $(4)[(1)(9)] = (4)(9) = 36$.
- 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.
- You may shift the parentheses in a multiplication problem. Just as in addition, the different grouping results in the same answer.
- $$\begin{array}{r}
 3 \\
 35 \\
 \times 6 \\
 \hline
 210
 \end{array}$$
 $6 \cdot 5 = 30$ Write 0, carry 3 tens.
 $6 \cdot 3 = 18$ Add 3 to get 21. Write 21.

$$16. \begin{array}{r} 2 \\ 53 \\ \times 7 \\ \hline 371 \end{array}$$

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

$$17. \begin{array}{r} 2 \\ 34 \\ \times 7 \\ \hline 238 \end{array}$$

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

$$18. \begin{array}{r} 3 \\ 76 \\ \times 5 \\ \hline 380 \end{array}$$

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

$$19. \begin{array}{r} 21 \\ 642 \\ \times 5 \\ \hline 3210 \end{array}$$

$5 \cdot 2 = 10$ 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.

$$20. \begin{array}{r} 2 \\ 472 \\ \times 4 \\ \hline 1888 \end{array}$$

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

$$21. \begin{array}{r} 1 \\ 624 \\ \times 3 \\ \hline 1872 \end{array}$$

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

$$22. \begin{array}{r} 31 \\ 852 \\ \times 7 \\ \hline 5964 \end{array}$$

$7 \cdot 2 = 14$ 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.

$$23. \begin{array}{r} 21 \\ 2153 \\ \times 4 \\ \hline 8612 \end{array}$$

$4 \cdot 3 = 12$ 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.

$$24. \begin{array}{r} 12 \\ 1137 \\ \times 3 \\ \hline 3411 \end{array}$$

$3 \cdot 7 = 21$ 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.

$$25. \begin{array}{r} 2 \\ 2521 \\ \times 4 \\ \hline 10,084 \end{array}$$

$4 \cdot 1 = 4$ 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.

$$26. \begin{array}{r} 111 \\ 2544 \\ \times 3 \\ \hline 7632 \end{array}$$

$3 \cdot 4 = 12$ 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.

$$27. \begin{array}{r} 44 \\ 2561 \\ \times 8 \\ \hline 20,488 \end{array}$$

$8 \cdot 1 = 8$ 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.

$$28. \begin{array}{r} 113 \\ 7326 \\ \times 5 \\ \hline 36,630 \end{array}$$

$5 \cdot 6 = 30$ 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.

18 Chapter 1 Whole Numbers

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

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

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

- 4 • 6 = 24 Write 4, carry 2 tens.
 4 • 1 = 4 Add 2 to get 6. Write 6.
 4 • 1 = 4 Write 4.
 4 • 8 = 32 Write 2, carry 3.
 4 • 2 = 8 Add 3 to get 11. Write 11.

31. You can use multiples of 10 to multiply 86×200 . First, multiply 86×2 to get 172. Then, attach two zeros to the right of this number for a final answer of 17,200.

32. You can use multiples of 10 to multiply 7800×450 . First, multiply 78×45 to get 3510. Then, attach three zeros to the right of this number for a final answer of 3,510,000.

$$\begin{array}{r} 33. \quad \begin{array}{r} 80 \\ \times 6 \\ \hline 480 \end{array} \end{array} \quad \begin{array}{r} 8 \\ \times 6 \\ \hline 48 \end{array} \quad \begin{array}{r} 80 \\ \times 6 \\ \hline 480 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 34. \quad \begin{array}{r} 70 \\ \times 5 \\ \hline 350 \end{array} \end{array} \quad \begin{array}{r} 7 \\ \times 5 \\ \hline 35 \end{array} \quad \begin{array}{r} 70 \\ \times 5 \\ \hline 350 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 35. \quad \begin{array}{r} 740 \\ \times 3 \\ \hline 2220 \end{array} \end{array} \quad \begin{array}{r} 74 \\ \times 3 \\ \hline 222 \end{array} \quad \begin{array}{r} 740 \\ \times 3 \\ \hline 2220 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 36. \quad \begin{array}{r} 400 \\ \times 8 \\ \hline 3200 \end{array} \end{array} \quad \begin{array}{r} 4 \\ \times 8 \\ \hline 32 \end{array} \quad \begin{array}{r} 400 \\ \times 8 \\ \hline 3200 \end{array} \quad \text{Attach 00.}$$

$$\begin{array}{r} 37. \quad \begin{array}{r} 600 \\ \times 6 \\ \hline 3600 \end{array} \end{array} \quad \begin{array}{r} 6 \\ \times 6 \\ \hline 36 \end{array} \quad \begin{array}{r} 600 \\ \times 6 \\ \hline 3600 \end{array} \quad \text{Attach 00.}$$

$$\begin{array}{r} 38. \quad \begin{array}{r} 860 \\ \times 7 \\ \hline 6020 \end{array} \end{array} \quad \begin{array}{r} 86 \\ \times 7 \\ \hline 602 \end{array} \quad \begin{array}{r} 860 \\ \times 7 \\ \hline 6020 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 39. \quad \begin{array}{r} 125 \\ \times 30 \\ \hline 3750 \end{array} \end{array} \quad \begin{array}{r} 125 \\ \times 3 \\ \hline 375 \end{array} \quad \begin{array}{r} 125 \\ \times 30 \\ \hline 3750 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 40. \quad \begin{array}{r} 246 \\ \times 50 \\ \hline 1230 \end{array} \quad \begin{array}{r} 246 \\ \times 5 \\ \hline 1230 \end{array} \quad \begin{array}{r} 246 \\ \times 50 \\ \hline 12,300 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 41. \quad \begin{array}{r} 1635 \\ \times 40 \\ \hline 6540 \end{array} \quad \begin{array}{r} 1635 \\ \times 4 \\ \hline 6540 \end{array} \quad \begin{array}{r} 1635 \\ \times 40 \\ \hline 65,400 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 42. \quad \begin{array}{r} 7311 \\ \times 50 \\ \hline 36,555 \end{array} \quad \begin{array}{r} 7311 \\ \times 5 \\ \hline 36,555 \end{array} \quad \begin{array}{r} 7311 \\ \times 50 \\ \hline 365,550 \end{array} \quad \text{Attach 0.}$$

$$\begin{array}{r} 43. \quad \begin{array}{r} 900 \\ \times 300 \\ \hline 270,000 \end{array} \end{array} \quad \begin{array}{r} 9 \\ \times 3 \\ \hline 27 \end{array} \quad \begin{array}{r} 900 \\ \times 300 \\ \hline 270,000 \end{array} \quad \text{Attach 0000.}$$

$$\begin{array}{r} 44. \quad \begin{array}{r} 400 \\ \times 700 \\ \hline 280,000 \end{array} \end{array} \quad \begin{array}{r} 4 \\ \times 7 \\ \hline 28 \end{array} \quad \begin{array}{r} 400 \\ \times 700 \\ \hline 280,000 \end{array} \quad \text{Attach 0000.}$$

$$\begin{array}{r} 45. \quad \begin{array}{r} 43,000 \\ \times 2,000 \\ \hline 86,000,000 \end{array} \end{array} \quad \begin{array}{r} 43 \\ \times 2 \\ \hline 86 \end{array} \quad \begin{array}{r} 43,000 \\ \times 2,000 \\ \hline 86,000,000 \end{array} \quad \text{Attach 000000.}$$

$$\begin{array}{r} 46. \quad \begin{array}{r} 11,000 \\ \times 9,000 \\ \hline 99,000,000 \end{array} \end{array} \quad \begin{array}{r} 11 \\ \times 9 \\ \hline 99 \end{array} \quad \begin{array}{r} 11,000 \\ \times 9,000 \\ \hline 99,000,000 \end{array} \quad \text{Attach 000000.}$$

$$\begin{array}{r} 47. \quad 970 \cdot 50 \\ \times 5 \\ \hline 4850 \end{array} \quad 970 \cdot 50 = 48,500 \quad \text{Attach 00.}$$

$$\begin{array}{r} 48. \quad 730 \cdot 40 \\ \times 4 \\ \hline 2920 \end{array} \quad 730 \cdot 40 = 29,200 \quad \text{Attach 00.}$$

$$\begin{array}{r} 49. \quad 800 \cdot 900 \\ \times 9 \\ \hline 7200 \end{array} \quad 800 \cdot 900 = 720,000 \quad \text{Attach 0000.}$$

$$\begin{array}{r} 50. \quad 850 \cdot 700 \\ \times 7 \\ \hline 5950 \end{array} \quad 850 \cdot 700 = 595,000 \quad \text{Attach 000.}$$

$$\begin{array}{r} 51. \quad 9700 \cdot 200 \\ \times 2 \\ \hline 19400 \end{array} \quad 9700 \cdot 200 = 1,940,000 \quad \text{Attach 0000.}$$

$$52. \quad 10,050 \cdot 300 \quad \begin{array}{r} 1005 \\ \times 3 \\ \hline 3015 \end{array}$$

$$10,050 \cdot 300 = 3,015,000 \quad \text{Attach 000.}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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$$\begin{array}{r}
 69. \quad 735 \\
 \times 112 \\
 \hline
 1470 \leftarrow 2 \times 735 \\
 735 \leftarrow 1 \times 735 \\
 735 \leftarrow 1 \times 735 \\
 \hline
 82,320
 \end{array}$$

$$\begin{array}{r}
 70. \quad 621 \\
 \times 415 \\
 \hline
 3105 \leftarrow 5 \times 621 \\
 621 \leftarrow 1 \times 621 \\
 2484 \leftarrow 4 \times 621 \\
 \hline
 257,715
 \end{array}$$

$$\begin{array}{r}
 71. \quad 538 \\
 \times 342 \\
 \hline
 1076 \leftarrow 2 \times 538 \\
 2152 \leftarrow 4 \times 538 \\
 1614 \leftarrow 3 \times 538 \\
 \hline
 183,996
 \end{array}$$

$$\begin{array}{r}
 72. \quad 3228 \\
 \times 751 \\
 \hline
 3228 \leftarrow 1 \times 3228 \\
 16140 \leftarrow 5 \times 3228 \\
 22596 \leftarrow 7 \times 3228 \\
 \hline
 2,424,228
 \end{array}$$

$$\begin{array}{r}
 73. \quad 9352 \\
 \times 264 \\
 \hline
 37408 \leftarrow 4 \times 9352 \\
 56112 \leftarrow 6 \times 9352 \\
 18704 \leftarrow 2 \times 9352 \\
 \hline
 2,468,928
 \end{array}$$

$$\begin{array}{r}
 74. \quad 528 \\
 \times 106 \\
 \hline
 3168 \leftarrow 6 \times 528 \\
 5280 \leftarrow 10 \times 528 \\
 \hline
 55,968
 \end{array}$$

$$\begin{array}{r}
 75. \quad 215 \\
 \times 307 \\
 \hline
 1505 \leftarrow 7 \times 215 \\
 6450 \leftarrow 30 \times 215 \\
 \hline
 66,005
 \end{array}$$

$$\begin{array}{r}
 76. \quad 218 \\
 \times 106 \\
 \hline
 1308 \leftarrow 6 \times 218 \\
 2180 \leftarrow 10 \times 218 \\
 \hline
 23,108
 \end{array}$$

$$\begin{array}{r}
 77. \quad 428 \\
 \times 201 \\
 \hline
 428 \leftarrow 1 \times 428 \\
 8560 \leftarrow 20 \times 428 \\
 \hline
 86,028
 \end{array}$$

$$\begin{array}{r}
 78. \quad 3706 \\
 \times 208 \\
 \hline
 29648 \leftarrow 8 \times 3706 \\
 74120 \leftarrow 20 \times 3706 \\
 \hline
 770,848
 \end{array}$$

$$\begin{array}{r}
 79. \quad 6310 \\
 \times 3078 \\
 \hline
 50480 \leftarrow 8 \times 6310 \\
 44170 \leftarrow 7 \times 6310 \\
 189300 \leftarrow 30 \times 6310 \\
 \hline
 19,422,180
 \end{array}$$

$$\begin{array}{r}
 80. \quad 3533 \\
 \times 5001 \\
 \hline
 3533 \leftarrow 1 \times 3533 \\
 1766500 \leftarrow 500 \times 3533 \\
 \hline
 17,668,533
 \end{array}$$

$$\begin{array}{r}
 81. \quad 2195 \\
 \times 1038 \\
 \hline
 17560 \leftarrow 8 \times 2195 \\
 6585 \leftarrow 3 \times 2195 \\
 21950 \leftarrow 10 \times 2195 \\
 \hline
 2,278,410
 \end{array}$$

$$\begin{array}{r}
 82. \quad 1502 \\
 \times 2009 \\
 \hline
 13518 \leftarrow 9 \times 1502 \\
 300400 \leftarrow 200 \times 1502 \\
 \hline
 3,017,518
 \end{array}$$

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.

$$\begin{array}{r}
 84. \quad 291 \quad 291 \\
 \times 307 \quad \times 307 \\
 \hline
 2037 \quad 2037 \\
 000 \quad 8730 \\
 \hline
 873 \quad 89,337 \\
 \hline
 89,337
 \end{array}$$

$$\begin{array}{r}
 85. \quad 300 \text{ cartons} \\
 \times 10 \text{ balls per carton} \\
 \hline
 3000 \text{ balls}
 \end{array}$$

3000 balls were purchased.

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

15,000 tablets are in the medical supply house.

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

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

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

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

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

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

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

The total catch for the night was 1080 tons.

$$\begin{array}{r} 91. \quad 75 \text{ first-aid kits at } \$8 \text{ per kit} \\ \times 8 \\ \hline 600 \end{array}$$

The total cost is \$600.

$$\begin{array}{r} 92. \quad 27 \text{ days of child care at } \$82 \text{ per day} \\ \times 27 \\ \hline 574 \\ 164 \\ \hline 2214 \end{array}$$

The total cost is \$2214.

$$\begin{array}{r} 93. \quad 65 \text{ rebuilt alternators at } \$24 \text{ per alternator} \\ \times 24 \\ \hline 260 \\ 130 \\ \hline 1560 \end{array}$$

The total cost is \$1560.

$$94. \quad 62 \text{ wheelchair cushions at } \$44 \text{ per cushion}$$

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

The total cost is \$2728.

$$95. \quad 206 \text{ laptop computers at } \$548 \text{ per computer}$$

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

The total cost is \$112,888.

$$96. \quad 520 \text{ printers at } \$219 \text{ per printer}$$

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

The total cost is \$113,880.

$$\begin{aligned} 97. \quad 21 \cdot 43 \cdot 56 &= (21 \cdot 43) \cdot 56 \\ &= 903 \cdot 56 \\ &= 50,568 \end{aligned}$$

$$\begin{aligned} 98. \quad (600)(8)(75)(40) &= [(600)(8)](75)(40) \\ &= [(4800)(75)](40) \\ &= 360,000(40) \\ &= 14,400,000 \end{aligned}$$

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

38,250 trees are needed to plant 85 acres.

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

The blue whale weighs 426,300 pounds.

22 Chapter 1 Whole Numbers

$$\begin{array}{r} 101. \quad 8,391,881 \text{ population of New York City} \\ - 645,169 \text{ population of Boston} \\ \hline 7,746,712 \text{ more people} \end{array}$$

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

$$\begin{array}{r} 102. \quad 3,849,378 \text{ population of Los Angeles} \\ - 1,232,940 \text{ population of Dallas} \\ \hline 2,616,438 \text{ more people} \end{array}$$

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

$$\begin{array}{r} 103. \quad 970 \text{ cost per laptop} \\ \times 12 \text{ number of laptops} \\ \hline 11,640 \text{ total cost of laptops} \\ \\ 315 \text{ cost per printer} \\ \times 8 \text{ number of printers} \\ \hline 2520 \text{ total cost of printers} \end{array}$$

The total cost is the sum of these values:

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

$$\begin{array}{r} 104. \quad 954 \text{ millions of pounds of food in 17 years} \\ + 77 \text{ millions of pounds of food last year} \\ \hline 1031 \text{ total} \end{array}$$

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

Relating Concepts (Exercises 105–114)

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) $24 \div 6 = 4$: $6 \overline{)24}^4$ or $\frac{24}{6} = 4$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- (d) $36\overline{)0}$
 (e) $100 \div 0$; undefined
 (f) $0 \div 100 = 0$
6. (a) $8 \div 8 = 1$
 (b) $15\overline{)15}$
 (c) $\frac{37}{37} = 1$
7. (a) $9 \div 1 = 9$
 (b) $1\overline{)18}$
 (c) $\frac{43}{1} = 43$
8. (a) $2\overline{)24} \frac{2}{2} = 1, \frac{4}{2} = 2$
 (b) $3\overline{)93} \frac{31}{3} = 3, \frac{3}{3} = 1$
 (c) $4\overline{)88} \frac{22}{4} = 2, \frac{8}{4} = 2$
 (d) $2\overline{)624} \frac{312}{2} = 3, \frac{2}{2} = 1, \frac{4}{2} = 2$
9. (a) $2\overline{)125} \frac{62}{2} = 6, \frac{5}{2} = 2 \text{ R}1$
 (b) $3\overline{)215} \frac{71}{3} = 7, \frac{5}{3} = 1 \text{ R}2$
 (c) $4\overline{)51318} \frac{134}{4} = 1 \text{ R}1, \frac{13}{4} = 3 \text{ R}1, \frac{18}{4} = 4 \text{ R}2$
 (d) $\frac{819}{5}$
 $5\overline{)83119} \frac{163}{5} = 1 \text{ R}3, \frac{31}{5} = 6 \text{ R}1, \frac{19}{5} = 3 \text{ R}4$
10. (a) $4\overline{)51310} \frac{132}{4}$
 (b) $7\overline{)5125} \frac{73}{7}$

(c) $3\overline{)62825} \frac{209}{3}$

(d) $6\overline{)142135} \frac{2369}{6}$

11. (a) $2\overline{)3265} \frac{1632}{2}$

$$\begin{array}{r} \text{divisor} \times \text{quotient} + \text{remainder} = \text{dividend} \\ \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ 2 \times 32 + 1 \\ \underline{64} \quad + \quad \underline{1} = 65 \end{array}$$

The answer is correct.

(b) $7\overline{)586} \frac{83}{7}$

$$\begin{array}{r} \text{divisor} \times \text{quotient} + \text{remainder} = \text{dividend} \\ \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ 7 \times 83 + 4 \\ 581 \quad + \quad 4 = 585 \\ \uparrow \\ \text{incorrect} \end{array}$$

Rework.

$7\overline{)5826} \frac{835}{7}$

Now check:

$$\begin{array}{r} \text{divisor} \times \text{quotient} + \text{remainder} = \text{dividend} \\ \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ 7 \times 83 + 5 \\ 581 \quad + \quad 5 = 586 \\ \uparrow \\ \text{correct} \end{array}$$

The correct answer is 83 R5.

(c) $3\overline{)40723} \frac{1357}{3}$

$$\begin{array}{r} \text{divisor} \times \text{quotient} + \text{remainder} = \text{dividend} \\ \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ 3 \times 1357 + 2 \\ 4071 \quad + \quad 2 = 4073 \end{array}$$

The answer is correct.

(d) $5\overline{)2383} \frac{476}{5}$

$$\begin{array}{r} \text{divisor} \times \text{quotient} + \text{remainder} = \text{dividend} \\ \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\ 5 \times 476 + 3 \\ 2380 \quad + \quad 3 = 2383 \end{array}$$

The answer is correct.

24 Chapter 1 Whole Numbers

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) $5325: 5 + 3 + 2 + 5 = 15$
 15 is divisible by 3.
 So, 5325 is divisible by 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 ; $\overline{\hspace{1cm}}$; and — (fraction bar).

3. $24 \div 4 = 6$: $4\overline{)24}$ or $\frac{24}{4} = 6$

4. $36 \div 3 = 12$: $3\overline{)36}$ or $\frac{36}{3} = 12$

5. $\frac{45}{9} = 5$: $9\overline{)45}$ or $45 \div 9 = 5$

6. $\frac{56}{8} = 7$: $8\overline{)56}$ or $56 \div 8 = 7$

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

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

9. When a number is divided by 1, the answer is always the number itself.

10. When zero is divided by a number, the answer is always 0.

11. $9 \div 9 = 1$

Any nonzero number divided by itself is 1.

12. $36 \div 9 = 4$

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

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

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

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

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

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

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

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

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

22. $\frac{8}{0}$ 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.

$$27. \quad \begin{array}{r} 25 \\ 3\overline{)715} \\ \underline{00} \\ 15 \\ \underline{00} \\ 15 \\ \underline{00} \\ 0 \end{array} \quad \text{Check } \begin{array}{r} 25 \\ \times 3 \\ \hline 75 \end{array}$$

$$28. \quad \begin{array}{r} 17 \\ 5\overline{)835} \\ \underline{00} \\ 35 \\ \underline{00} \\ 35 \\ \underline{00} \\ 0 \end{array} \quad \text{Check } 5 \times 17 = 85$$

$$29. \quad \begin{array}{r} 18 \\ 7\overline{)1256} \\ \underline{00} \\ 56 \\ \underline{00} \\ 16 \\ \underline{00} \\ 16 \\ \underline{00} \\ 0 \end{array} \quad \text{Check } \begin{array}{r} 18 \\ \times 7 \\ \hline 126 \end{array}$$

$$30. \quad \begin{array}{r} 28 \\ 6\overline{)168} \\ \underline{00} \\ 48 \\ \underline{00} \\ 48 \\ \underline{00} \\ 0 \end{array} \quad \text{Check } 6 \times 28 = 168$$

$$31. \quad \begin{array}{r} 304 \\ 4\overline{)1216} \\ \underline{00} \\ 816 \\ \underline{000} \\ 16 \\ \underline{00} \\ 16 \\ \underline{00} \\ 0 \end{array} \quad \text{Check } \begin{array}{r} 304 \\ \times 4 \\ \hline 1216 \end{array}$$

$$32. \quad \begin{array}{r} 461 \\ 5\overline{)2305} \\ \underline{00} \\ 305 \\ \underline{000} \\ 5 \\ \underline{00} \\ 5 \\ \underline{00} \\ 0 \end{array} \quad \text{Check } 5 \times 461 = 2305$$

$$33. \quad \begin{array}{r} 627 \text{ R1} \\ 4\overline{)251029} \\ \underline{000} \\ 1029 \\ \underline{0000} \\ 29 \\ \underline{000} \\ 28 \\ \underline{000} \\ 9 \\ \underline{000} \\ 1 \end{array} \quad \text{Check } 4 \times 627 + 1 = 2508 + 1 = 2509$$

$$34. \quad \begin{array}{r} 166 \text{ R7} \\ 8\overline{)135355} \\ \underline{000} \\ 5355 \\ \underline{0000} \\ 355 \\ \underline{0000} \\ 75 \\ \underline{0000} \\ 7 \end{array} \quad \text{Check } 8 \times 166 + 7 = 1328 + 7 = 1335$$

$$35. \quad \begin{array}{r} 1522 \text{ R5} \\ 6\overline{)9311317} \\ \underline{000} \\ 311317 \\ \underline{00000} \\ 1317 \\ \underline{00000} \\ 517 \\ \underline{00000} \\ 17 \end{array} \quad \text{Check } 6 \times 1522 + 5 = 9132 + 5 = 9137$$

$$36. \quad \begin{array}{r} 930 \text{ R1} \\ 9\overline{)83271} \\ \underline{000} \\ 3271 \\ \underline{0000} \\ 271 \\ \underline{0000} \\ 1 \end{array} \quad \text{Check } 9 \times 930 + 1 = 8370 + 1 = 8371$$

$$37. \quad \begin{array}{r} 309 \\ 6\overline{)1854} \\ \underline{000} \\ 854 \\ \underline{0000} \\ 54 \\ \underline{0000} \\ 4 \end{array} \quad \text{Check } 6 \times 309 = 1854$$

$$38. \quad \begin{array}{r} 107 \\ 8\overline{)856} \\ \underline{00} \\ 56 \\ \underline{000} \\ 6 \end{array} \quad \text{Check } 8 \times 107 = 856$$

$$39. \quad 12,020 \div 4 \quad \begin{array}{r} 3005 \\ 4\overline{)12,020} \\ \underline{0000} \\ 2020 \\ \underline{0000} \\ 2020 \\ \underline{0000} \\ 0 \end{array} \quad \text{Check } 4 \times 3005 = 12,020$$

$$40. \quad 8012 \div 4 \quad \begin{array}{r} 2003 \\ 4\overline{)8012} \\ \underline{000} \\ 12 \\ \underline{000} \\ 12 \\ \underline{000} \\ 0 \end{array} \quad \text{Check } 4 \times 2003 = 8012$$

$$41. \quad 30,036 \div 6 \quad \begin{array}{r} 5006 \\ 6\overline{)30,036} \\ \underline{0000} \\ 036 \\ \underline{0000} \\ 36 \\ \underline{0000} \\ 0 \end{array} \quad \text{Check } 6 \times 5006 = 30,036$$

$$42. \quad 32,008 \div 8 \quad \begin{array}{r} 4001 \\ 8\overline{)32,008} \\ \underline{0000} \\ 008 \\ \underline{0000} \\ 0 \end{array}$$

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

$$43. \quad 2434 \div 3 \quad \begin{array}{r} 811 \text{ R1} \\ 3\overline{)2434} \\ \underline{000} \\ 434 \\ \underline{0000} \\ 434 \\ \underline{0000} \\ 0 \end{array}$$

$$\text{Check } 3 \times 811 + 1 = 2433 + 1 = 2434$$

$$44. \quad 5993 \div 7 \quad \begin{array}{r} 856 \text{ R1} \\ 7\overline{)5993} \\ \underline{000} \\ 293 \\ \underline{0000} \\ 93 \\ \underline{0000} \\ 13 \\ \underline{0000} \\ 6 \end{array}$$

$$\text{Check } 7 \times 856 + 1 = 5992 + 1 = 5993$$

$$45. \quad 12,947 \div 5 \quad \begin{array}{r} 2589 \text{ R2} \\ 5\overline{)12,947} \\ \underline{0000} \\ 947 \\ \underline{00000} \\ 47 \\ \underline{00000} \\ 2 \end{array}$$

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

$$46. \quad 33,285 \div 9 \quad \begin{array}{r} 3698 \text{ R3} \\ 9\overline{)33,285} \\ \underline{0000} \\ 3285 \\ \underline{00000} \\ 85 \\ \underline{00000} \\ 5 \end{array}$$

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

$$47. \quad \frac{21,040}{8} \quad \begin{array}{r} 2630 \\ 8\overline{)21,040} \\ \underline{0000} \\ 1040 \\ \underline{00000} \\ 40 \\ \underline{00000} \\ 0 \end{array}$$

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

$$48. \quad \frac{8199}{9} \quad \begin{array}{r} 911 \\ 9\overline{)8199} \\ \underline{0000} \\ 199 \\ \underline{00000} \\ 99 \\ \underline{00000} \\ 0 \end{array}$$

$$\text{Check } 9 \times 911 = 8199$$

$$49. \quad \frac{74,751}{6} \quad \begin{array}{r} 12,458 \text{ R3} \\ 6\overline{)74,751} \\ \underline{00000} \\ 14751 \\ \underline{000000} \\ 751 \\ \underline{000000} \\ 1 \end{array}$$

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

$$50. \quad \frac{72,543}{5} \quad \begin{array}{r} 14,508 \text{ R3} \\ 5\overline{)72,543} \\ \underline{00000} \\ 2543 \\ \underline{000000} \\ 43 \\ \underline{000000} \\ 3 \end{array}$$

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

$$51. \quad \frac{71,776}{7} \quad \begin{array}{r} 10,253 \text{ R5} \\ 7\overline{)71,776} \\ \underline{00000} \\ 1776 \\ \underline{000000} \\ 76 \\ \underline{000000} \\ 6 \end{array}$$

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

$$52. \quad \frac{77,621}{3} \quad \begin{array}{r} 25,873 \text{ R2} \\ 3\overline{)77,621} \\ \underline{00000} \\ 2621 \\ \underline{000000} \\ 21 \\ \underline{000000} \\ 2 \end{array}$$

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

$$53. \quad \frac{128,645}{7} \quad \begin{array}{r} 18,377 \text{ R6} \\ 7\overline{)128,645} \\ \underline{00000} \\ 58645 \\ \underline{000000} \\ 645 \\ \underline{000000} \\ 5 \end{array}$$

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

$$54. \quad \frac{172,255}{4} \quad \begin{array}{r} 43,063 \text{ R3} \\ 4\overline{)172,255} \\ \underline{00000} \\ 3255 \\ \underline{000000} \\ 55 \\ \underline{000000} \\ 3 \end{array}$$

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

55.
$$\begin{array}{r} 375 \text{ R2} \\ 5 \overline{)1877} \end{array}$$

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

56.
$$\begin{array}{r} 427 \text{ R1} \\ 3 \overline{)1282} \end{array}$$

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

57.
$$\begin{array}{r} 1908 \text{ R2} \\ 3 \overline{)5725} \end{array}$$

Check $3 \times 1908 + 2 = 5724 + 2 = 5726$
incorrect**Rework.**

$$\begin{array}{r} 1908 \text{ R1} \\ 3 \overline{)57225} \end{array}$$

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

58.
$$\begin{array}{r} 432 \text{ R3} \\ 5 \overline{)2158} \end{array}$$

Check $5 \times 432 + 3 = 2160 + 3 = 2163$
incorrect**Rework.**

$$\begin{array}{r} 431 \text{ R3} \\ 5 \overline{)2158} \end{array}$$

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

59.
$$\begin{array}{r} 650 \text{ R2} \\ 7 \overline{)4692} \end{array}$$

Check $7 \times 650 + 2 = 4550 + 2 = 4552$
incorrect**Rework.**

$$\begin{array}{r} 670 \text{ R2} \\ 7 \overline{)4692} \end{array}$$

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

60.
$$\begin{array}{r} 663 \text{ R5} \\ 9 \overline{)5974} \end{array}$$

Check $9 \times 663 + 5 = 5967 + 5 = 5972$
incorrect**Rework.**

$$\begin{array}{r} 663 \text{ R7} \\ 9 \overline{)59734} \end{array}$$

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

61.
$$\begin{array}{r} 3568 \text{ R2} \\ 6 \overline{)21,409} \end{array}$$

Check $6 \times 3568 + 2 = 21,408 + 2 = 21,410$
incorrect**Rework.**

$$\begin{array}{r} 3568 \text{ R1} \\ 6 \overline{)21,3409} \end{array}$$

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

62.
$$\begin{array}{r} 532 \\ 6 \overline{)3192} \end{array}$$

Check $6 \times 532 = 3192$ correct

63.
$$\begin{array}{r} 2002 \text{ R3} \\ 8 \overline{)16,019} \end{array}$$

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

64.
$$\begin{array}{r} 4208 \\ 8 \overline{)33,664} \end{array}$$

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

65.
$$\begin{array}{r} 11,523 \text{ R2} \\ 6 \overline{)69,140} \end{array}$$

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

66.
$$\begin{array}{r} 27,532 \text{ R1} \\ 3 \overline{)82,598} \end{array}$$

Check $3 \times 27,532 + 1 = 82,596 + 1 = 82,597$
incorrect**Rework.**

$$\begin{array}{r} 27,532 \text{ R2} \\ 3 \overline{)82,598} \end{array}$$

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

67.
$$\begin{array}{r} 9628 \text{ R7} \\ 9 \overline{)86,655} \end{array}$$

Check $9 \times 9628 + 7 = 86,652 + 7 = 86,659$
incorrect**Rework.**

$$\begin{array}{r} 9628 \text{ R3} \\ 9 \overline{)86,56575} \end{array}$$

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

68.
$$\begin{array}{r} 7258 \text{ R4} \\ 7 \overline{)50,809} \end{array}$$

Check $7 \times 7258 + 4 = 50,806 + 4 = 50,810$
incorrect**Rework.**

$$\begin{array}{r} 7258 \text{ R3} \\ 7 \overline{)50,1809} \end{array}$$

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

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

Check $8 \times 27,822 = 222,576$ correct

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

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.
$$\begin{array}{r} 328 \\ 8 \overline{)2624} \end{array}$$

328 tables can be set.

74.
$$\begin{array}{r} 135 \\ 12 \overline{)1620} \end{array}$$

Each school will receive 135 books.

75.
$$\begin{array}{r} 9600 \\ 8 \overline{)76800} \end{array}$$

9600 drumsticks are produced each hour.

76.
$$\begin{array}{r} 83,000,000 \\ 5 \overline{)415,000,000} \end{array}$$

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

77.
$$\begin{array}{r} 48,500 \\ 9 \overline{)4376500} \end{array}$$

Each employee received \$48,500.

78.
$$\begin{array}{r} 3435 \\ 5 \overline{)172175} \end{array}$$

3435 5-pound bags of flour can be filled.

79.
$$\begin{array}{r} 165 \\ 4 \overline{)6260} \end{array}$$

There are 165 locations in this area.

80.
$$\begin{array}{r} 17 \\ 5 \overline{)835} \end{array}$$

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

81.
$$\begin{array}{r} 1,137,500 \\ 6 \overline{)6,8245,3000} \end{array}$$
 (or use a calculator)

Each person received \$1,137,500.

82.
$$\begin{array}{r} 5,625,000 \\ 8 \overline{)45,502040,000} \end{array}$$
 (or use a calculator)

Each payment is \$5,625,000.

83.
$$\begin{array}{r} 862,500 \\ 8 \overline{)6,95020,4000} \end{array}$$

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

84.
$$\begin{array}{r} 5,484,375 \\ 4 \overline{)21,93217,153020} \end{array}$$

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)
$$\begin{array}{r} 8 \underline{2} \\ 28 \overline{) 2296} \\ \underline{224} \quad \leftarrow 8 \times 28 \\ 56 \\ \underline{56} \quad \leftarrow 2 \times 28 \\ 0 \end{array}$$

(b)
$$\begin{array}{r} 64 \\ 16 \overline{) 1024} \\ \underline{96} \quad \leftarrow 6 \times 16 \\ 64 \\ \underline{64} \quad \leftarrow 4 \times 16 \\ 0 \end{array}$$

(c)
$$\begin{array}{r} 144 \\ 61 \overline{) 8784} \\ \underline{61} \quad \leftarrow 1 \times 61 \\ 268 \\ \underline{244} \quad \leftarrow 4 \times 61 \\ 244 \\ \underline{244} \quad \leftarrow 4 \times 61 \\ 0 \end{array}$$

(d)
$$\begin{array}{r} 29 \\ 93 \overline{) 2697} \\ \underline{186} \quad \leftarrow 2 \times 93 \\ 837 \\ \underline{837} \quad \leftarrow 9 \times 93 \\ 0 \end{array}$$

2. (a)
$$\begin{array}{r} 56 \\ 24 \overline{) 1344} \\ \underline{120} \quad \leftarrow 5 \times 24 \\ 144 \\ \underline{144} \quad \leftarrow 6 \times 24 \\ 0 \end{array}$$

(b)
$$\begin{array}{r} 62 \text{ R8} \\ 72 \overline{) 4472} \\ \underline{432} \quad \leftarrow 6 \times 72 \\ 152 \\ \underline{144} \quad \leftarrow 2 \times 72 \\ 8 \end{array}$$

(c)
$$\begin{array}{r} 83 \text{ R21} \\ 65 \overline{) 5416} \\ \underline{520} \quad \leftarrow 8 \times 65 \\ 216 \\ \underline{195} \quad \leftarrow 3 \times 65 \\ 21 \end{array}$$

(d)
$$\begin{array}{r} 74 \text{ R63} \\ 89 \overline{) 6649} \\ \underline{623} \quad \leftarrow 7 \times 89 \\ 419 \\ \underline{356} \quad \leftarrow 4 \times 89 \\ 63 \end{array}$$

3. (a)
$$\begin{array}{r} 107 \text{ R4} \\ 17 \overline{) 1823} \\ \underline{17} \quad \leftarrow 1 \times 17 \\ 123 \\ \underline{119} \quad \leftarrow 7 \times 17 \\ 4 \end{array}$$

(b)
$$\begin{array}{r} 208 \text{ R7} \\ 23 \overline{) 4791} \\ \underline{46} \quad \leftarrow 2 \times 23 \\ 191 \\ \underline{184} \quad \leftarrow 8 \times 23 \\ 7 \end{array}$$

(c)
$$\begin{array}{r} 408 \text{ R21} \\ 39 \overline{) 15,933} \\ \underline{156} \quad \leftarrow 4 \times 39 \\ 333 \\ \underline{312} \quad \leftarrow 8 \times 39 \\ 21 \end{array}$$

(d)
$$\begin{array}{r} 300 \text{ R62} \\ 78 \overline{) 23,462} \\ \underline{234} \quad \leftarrow 3 \times 78 \\ 62 \end{array}$$

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) $50 \overline{) 6250}$

Drop 1 zero from the divisor and the dividend.

$$\begin{array}{r} 125 \\ 5 \overline{) 625} \\ \underline{5} \\ 12 \\ \underline{10} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

The quotient is 125.

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

Drop 1 zero from the divisor and the dividend.

$$\begin{array}{r} 1008 \\ 13 \overline{)13,104} \\ \underline{13} \\ 104 \\ \underline{104} \\ 0 \end{array}$$

The quotient is 1008.

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

Drop 2 zeros from the divisor and the dividend.

$$\begin{array}{r} 56 \\ 34 \overline{)1904} \\ \underline{170} \\ 204 \\ \underline{204} \\ 0 \end{array}$$

The quotient is 56.

6. (a) $16 \overline{)608} \times 38$ *Multiply the quotient and the divisor.*

$$\begin{array}{r} 38 \\ 16 \overline{)608} \\ \underline{48} \\ 128 \\ \underline{128} \\ 0 \end{array}$$

← correct

(b) $426 \overline{)19,170} \text{ R}178$

$$\begin{array}{r} 426 \overline{)19,170} \\ \underline{1704} \\ 1130 \\ \underline{952} \\ 178 \end{array}$$

The result does not match the dividend.

Rework.

$$\begin{array}{r} 45 \\ 426 \overline{)19,170} \\ \underline{1704} \\ 2130 \\ \underline{2130} \\ 0 \end{array}$$

A check shows that 45 is correct.

(c) $514 \overline{)29,316} \text{ R}18$

$$\begin{array}{r} 57 \text{ R}18 \\ 514 \overline{)29,316} \\ \underline{2570} \\ 3616 \\ \underline{3598} \\ 18 \end{array}$$

$$\begin{array}{r} 514 \text{ Multiply the} \\ \times 57 \text{ quotient and} \\ \hline 3598 \text{ the divisor.} \\ 2570 \\ \hline 29,298 \\ + 18 \text{ Add the remainder} \\ \hline 29,316 \leftarrow \text{correct} \end{array}$$

1.6 Section Exercises

1. $50 \overline{)2650}$ 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. $14 \overline{)476}$ 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. $18 \overline{)4500}$ 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. $35 \overline{)5600}$ 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. $86 \overline{)10,327}$ 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. $46 \overline{)24,026}$ 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. $26 \overline{)28,735}$ 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. $12 \overline{)116,953}$ 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.

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9. $21 \overline{)149,826}$ 71; 713; 7134 **R12**
 7 goes over the 9, because $\frac{149}{21}$ is about 7. The answer must then be a four-digit number or 7134 **R12**.

10. $64 \overline{)208,138}$ 325 **R2**; 3252 **R10**; 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 **R10**.

11. $523 \overline{)470,800}$ 9 **R100**; 90 **R100**; 900 **R100**
 9 goes over the 8, because $\frac{4708}{523}$ is about 9. The answer must then be a three-digit number or 900 **R100**.

12. $230 \overline{)253,230}$ 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. $18 \overline{)1319}$ **R5 Check** 73

$$\begin{array}{r} 18 \overline{)1319} \\ \underline{126} \\ 59 \\ \underline{54} \\ 5 \end{array}$$

$$\begin{array}{r} \times 73 \\ \times 18 \\ \hline 584 \\ 73 \\ \hline 1314 \\ + 5 \\ \hline 1319 \end{array}$$

14. $58 \overline{)3654}$ **Check** 63

$$\begin{array}{r} 58 \overline{)3654} \\ \underline{348} \\ 174 \\ \underline{174} \\ 0 \end{array}$$

$$\begin{array}{r} \times 63 \\ \times 58 \\ \hline 504 \\ 315 \\ \hline 3654 \end{array}$$

15. $23 \overline{)10,963}$ **R15 Check** 476

$$\begin{array}{r} 23 \overline{)10,963} \\ \underline{92} \\ 176 \\ \underline{161} \\ 153 \\ \underline{138} \\ 15 \end{array}$$

$$\begin{array}{r} \times 476 \\ \times 23 \\ \hline 1428 \\ 952 \\ \hline 10,948 \\ + 15 \\ \hline 10,963 \end{array}$$

16. $83 \overline{)39,692}$ **R18 Check** 478

$$\begin{array}{r} 83 \overline{)39,692} \\ \underline{332} \\ 649 \\ \underline{581} \\ 682 \\ \underline{664} \\ 18 \end{array}$$

$$\begin{array}{r} \times 478 \\ \times 83 \\ \hline 3824 \\ 39,674 \\ \hline + 18 \\ \hline 39,692 \end{array}$$

17. $26 \overline{)2,407}$ **R1 Check** 2407

$$\begin{array}{r} 26 \overline{)2,407} \\ \underline{52} \\ 105 \\ \underline{104} \\ 183 \\ \underline{182} \\ 1 \end{array}$$

$$\begin{array}{r} \times 2407 \\ \times 26 \\ \hline 14442 \\ 4814 \\ \hline 62,582 \\ + 1 \\ \hline 62,583 \end{array}$$

18. $28 \overline{)84,249}$ **R25 Check** 3008

$$\begin{array}{r} 28 \overline{)84,249} \\ \underline{84} \\ 249 \\ \underline{224} \\ 25 \end{array}$$

$$\begin{array}{r} \times 3008 \\ \times 28 \\ \hline 24,064 \\ 6016 \\ \hline 84,224 \\ + 25 \\ \hline 84,249 \end{array}$$

19. $74 \overline{)84,819}$ **R15 Check** 1146

$$\begin{array}{r} 74 \overline{)84,819} \\ \underline{74} \\ 108 \\ \underline{74} \\ 341 \\ \underline{296} \\ 459 \\ \underline{444} \\ 15 \end{array}$$

$$\begin{array}{r} \times 1146 \\ \times 74 \\ \hline 4584 \\ 8022 \\ \hline 84,804 \\ + 15 \\ \hline 84,819 \end{array}$$

20. $238 \overline{)186,948}$ **R118 Check** 785

$$\begin{array}{r} 238 \overline{)186,948} \\ \underline{1666} \\ 2034 \\ \underline{1904} \\ 1308 \\ \underline{1190} \\ 118 \end{array}$$

$$\begin{array}{r} \times 785 \\ \times 238 \\ \hline 6280 \\ 2355 \\ \hline 1570 \\ 186,830 \\ \hline + 118 \\ \hline 186,948 \end{array}$$

21. $153 \overline{)509,725}$ **R82 Check** 3331

$$\begin{array}{r} 153 \overline{)509,725} \\ \underline{459} \\ 507 \\ \underline{459} \\ 482 \\ \underline{459} \\ 235 \\ \underline{153} \\ 82 \end{array}$$

$$\begin{array}{r} \times 3331 \\ \times 153 \\ \hline 9993 \\ 16655 \\ \hline 3331 \\ 509,643 \\ \hline + 82 \\ \hline 509,725 \end{array}$$

22. $308 \overline{)26,796}$ **Check** 308

$$\begin{array}{r} 308 \overline{)26,796} \\ \underline{2464} \\ 2156 \\ \underline{2156} \\ 0 \end{array}$$

$$\begin{array}{r} \times 308 \\ \times 87 \\ \hline 2156 \\ 2464 \\ \hline 26,796 \end{array}$$

$$\begin{array}{r}
 23. \quad \begin{array}{r} 850 \\ 420 \overline{) 357,000} \\ \underline{3360} \\ 2100 \\ \underline{2100} \\ 0 \end{array} \quad \text{Check} \quad \begin{array}{r} 850 \\ \times 420 \\ \hline 17000 \\ 3400 \\ \hline 357,000 \end{array}
 \end{array}$$

$$\begin{array}{r}
 24. \quad \begin{array}{r} 170 \\ 900 \overline{) 153,000} \\ \underline{900} \\ 6300 \\ \underline{6300} \\ 0 \end{array} \quad \text{Check} \quad \begin{array}{r} 170 \\ \times 900 \\ \hline 153,000 \end{array}
 \end{array}$$

$$\begin{array}{r}
 25. \quad \begin{array}{r} 101 \text{ R4} \\ 35 \overline{) 3549} \\ \underline{35} \\ 049 \\ \underline{35} \\ 14 \end{array} \quad \text{Check} \quad \begin{array}{r} 101 \\ \times 35 \\ \hline 505 \\ 303 \\ \hline 3535 \\ + 4 \\ \hline 3539 \end{array} \text{ incorrect}
 \end{array}$$

Rework.

$$\begin{array}{r}
 \begin{array}{r} 101 \text{ R14} \\ 35 \overline{) 3549} \\ \underline{35} \\ 049 \\ \underline{35} \\ 14 \end{array}
 \end{array}$$

The correct answer is 101 **R14**.

$$\begin{array}{r}
 26. \quad \begin{array}{r} 42 \text{ R26} \\ 64 \overline{) 2712} \\ \underline{128} \\ 256 \\ \underline{2688} \\ + 26 \\ \hline 2714 \end{array} \quad \text{Check} \quad \begin{array}{r} 64 \\ \times 42 \\ \hline 128 \\ 256 \\ \hline 2688 \\ + 26 \\ \hline 2714 \end{array} \text{ incorrect}
 \end{array}$$

Rework.

$$\begin{array}{r}
 \begin{array}{r} 42 \text{ R24} \\ 64 \overline{) 2712} \\ \underline{256} \\ 152 \\ \underline{128} \\ 24 \end{array}
 \end{array}$$

The correct answer is 42 **R24**.

$$\begin{array}{r}
 27. \quad \begin{array}{r} 658 \text{ R9} \\ 28 \overline{) 18,424} \\ \underline{56} \\ 136 \\ \underline{136} \\ 0 \end{array} \quad \text{Check} \quad \begin{array}{r} 658 \\ \times 28 \\ \hline 5264 \\ 1316 \\ \hline 18,424 \\ + 9 \\ \hline 18,433 \end{array} \text{ incorrect}
 \end{array}$$

Rework.

$$\begin{array}{r}
 \begin{array}{r} 658 \\ 28 \overline{) 18,424} \\ \underline{168} \\ 162 \\ \underline{140} \\ 224 \\ \underline{224} \\ 0 \end{array}
 \end{array}$$

The correct answer is 658.

$$\begin{array}{r}
 28. \quad \begin{array}{r} 239 \text{ R121} \\ 145 \overline{) 34,776} \\ \underline{289} \\ 586 \\ \underline{586} \\ 0 \end{array} \quad \text{Check} \quad \begin{array}{r} 239 \\ \times 145 \\ \hline 1195 \\ 956 \\ 239 \\ \hline 34,655 \\ + 121 \\ \hline 34,776 \end{array} \text{ correct}
 \end{array}$$

$$\begin{array}{r}
 29. \quad \begin{array}{r} 62 \text{ R3} \\ 614 \overline{) 38,068} \\ \underline{368} \\ 128 \\ \underline{128} \\ 0 \end{array} \quad \text{Check} \quad \begin{array}{r} 614 \\ \times 62 \\ \hline 1228 \\ 3684 \\ \hline 38,068 \\ + 3 \\ \hline 38,071 \end{array} \text{ incorrect}
 \end{array}$$

Rework.

$$\begin{array}{r}
 \begin{array}{r} 62 \\ 614 \overline{) 38,068} \\ \underline{3684} \\ 1228 \\ \underline{1228} \\ 0 \end{array}
 \end{array}$$

The correct answer is 62.

$$\begin{array}{r}
 30. \quad \begin{array}{r} 174 \text{ R368} \\ 557 \overline{) 97,286} \\ \underline{1114} \\ 858 \\ \underline{858} \\ 0 \end{array} \quad \text{Check} \quad \begin{array}{r} 174 \\ \times 557 \\ \hline 1218 \\ 870 \\ 870 \\ \hline 96,918 \\ + 368 \\ \hline 97,286 \end{array} \text{ correct}
 \end{array}$$

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31. Divide. (We could drop one zero.)

$$\begin{array}{r} 117 \\ 720 \overline{) 84,240} \\ \underline{720} \\ 1224 \\ \underline{720} \\ 5040 \\ \underline{5040} \\ 0 \end{array}$$

There were 117 episodes filmed each season.

32. Divide to find the number of containers for one tower. (We could drop one zero.)

$$\begin{array}{r} 3750 \\ 160 \overline{) 600,000} \\ \underline{480} \\ 1200 \\ \underline{1120} \\ 8000 \\ \underline{8000} \\ 0 \end{array}$$

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.

$$\begin{array}{r} 272 \text{ wall clocks} \\ + 308 \text{ table clocks} \\ \hline 580 \text{ wall and table sum} \end{array}$$

Subtract the sum from the total number of clocks.

$$\begin{array}{r} 636 \text{ total number of clocks} \\ - 580 \text{ wall and table sum} \\ \hline 56 \text{ standing floor clocks} \end{array}$$

He worked on 56 floor clocks this year.

We could also arrange our work as follows:

$$\begin{array}{r} \text{total} - \text{wall} - \text{table} = \text{floor} \\ \text{clocks} \quad \text{clocks} \quad \text{clocks} \quad \text{clocks} \\ 636 - 272 - 308 = 56 \end{array}$$

34. $\begin{array}{r} 24,000,000 \text{ total businesses} \\ - 7,000 \text{ larger businesses} \\ \hline 23,993,000 \text{ remaining} \end{array}$

There are 23,993,000 small to mid-size businesses.

35. Divide. (or use a calculator)

$$\begin{array}{r} 355 \\ 96 \overline{) 34,080} \\ \underline{288} \\ 528 \\ \underline{480} \\ 480 \\ \underline{480} \\ 0 \end{array}$$

Judy's monthly payment is \$355.

36. Divide. (or use a calculator)

$$\begin{array}{r} 88 \\ 225 \overline{) 19,800} \\ \underline{1800} \\ 1800 \\ \underline{1800} \\ 0 \end{array}$$

The consultant charged \$88 per hour.

37. If one ring is sold each minute, then 60 rings are sold each hour.

$$\begin{array}{r} 60 \text{ rings per hour} \\ \times 24 \text{ hours per day} \\ \hline 1440 \text{ rings per day} \\ \times 30 \text{ days} \\ \hline 43,200 \text{ rings} \end{array}$$

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.

$$\begin{array}{r} 365 \text{ Twinkies per year} \\ \times 60 \text{ years} \\ \hline 21,900 \text{ Twinkies} \end{array}$$

He ate 21,900 Twinkies in 60 years.

39. (a) Divide.

$$\begin{array}{r} 648 \\ 39 \overline{) 25,272} \\ \underline{234} \\ 187 \\ \underline{156} \\ 312 \\ \underline{312} \\ 0 \end{array}$$

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. $\frac{220,020}{30} = \frac{22,002}{3}$ (Drop 1 zero.)

$$\begin{array}{r} 7334 \\ 3 \overline{) 22,002} \\ \underline{21} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

Each team used 7334 baseballs.

Relating Concepts (Exercises 41–48)

41. $\frac{\$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)
$$\begin{array}{r} 17 \\ 1 \overline{) 17} \end{array}$$
- (c) $\frac{38}{1} = 38$
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.

1.7 Rounding Whole Numbers

1.7 Margin Exercises

1. (a) 373 (nearest ten)
- Underline the tens place: 373
- 373 is closer to 370.
- (b) 1482 (nearest thousand)
- Underline the thousands place: 1482
- 1482 is closer to 1000.
- (c) 89,512 (nearest hundred)
- Underline the hundreds place: 89,512
- 89,512 is closer to 89,500.
- (d) 546,325 (nearest ten-thousand)
- Underline the ten-thousands place: 546,325
- 546,325 is closer to 550,000.
2. (a) 62
- Underline the tens place. Next digit is 4 or less. Change the digit to the right of the underlined place to zero.
- 62 rounded to the nearest ten is 60.
- (b) 94
- 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) 134
- 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) 7543
- 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) 3683 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) 6502 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) $\underline{84}$,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) $\underline{55}$,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

$\underline{34}$ 58 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

$\underline{64}$ 48 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, $\underline{0}$ 77 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, $\underline{9}$ 72 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

$\underline{14}$,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

$\underline{724}$,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: $\underline{54}$ 9

Next digit is 5 or more.

Tens place ($4 + 1 = 5$) changes.

549 rounded to the nearest ten is 550.

To the nearest hundred: $\underline{5}$ 49

Next digit is 4 or less.

Hundreds place stays the same.

549 rounded to the nearest hundred is 500.

(b) To the nearest ten: $\underline{45}$ 8

Next digit is 5 or more.

Tens place ($5 + 1 = 6$) changes.

458 rounded to the nearest ten is 460.

To the nearest hundred: $\underline{4}$ 58

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: $\underline{93}$ 08

Next digit is 5 or more.

Tens place ($0 + 1 = 1$) changes.

9308 rounded to the nearest ten is 9310.

To the nearest hundred: $\underline{93}$ 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: $\underline{40}$ 78

Next digit is 5 or more.

Tens place ($7 + 1 = 8$) changes.

4078 rounded to the nearest ten is 4080.

To the nearest hundred: $\underline{40}$ 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: $\underline{4}$ 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: 46,364

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: 46,364

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: 46,364

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: 268,328

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: 268,328

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: 268,328

Next digit is 4 or less.

Thousands place stays the same.

268,328 rounded to the nearest thousand is 268,000.

8. (a)
$$\begin{array}{r} 16 \\ 74 \\ 58 \\ + 31 \\ \hline \end{array}$$

$$\begin{array}{r} 20 \\ 70 \\ 60 \\ + 30 \\ \hline \end{array}$$
 rounded to the nearest ten
180 estimated answer
- (b)
$$\begin{array}{r} 53 \\ - 19 \\ \hline \end{array}$$

$$\begin{array}{r} 50 \\ - 20 \\ \hline \end{array}$$
 rounded to the nearest ten
30 estimated answer
- (c)
$$\begin{array}{r} 46 \\ \times 74 \\ \hline \end{array}$$

$$\begin{array}{r} 50 \\ \times 70 \\ \hline \end{array}$$
 rounded to the nearest ten
3500 estimated answer
9. (a)
$$\begin{array}{r} 358 \\ 743 \\ 822 \\ + 978 \\ \hline \end{array}$$

$$\begin{array}{r} 400 \\ 700 \\ 800 \\ + 1000 \\ \hline \end{array}$$
 rounded to the nearest
2900 estimated answer

(b)
$$\begin{array}{r} 842 \\ - 475 \\ \hline \end{array}$$

$$\begin{array}{r} 800 \\ - 500 \\ \hline \end{array}$$
 rounded to the nearest
300 estimated answer

(c)
$$\begin{array}{r} 723 \\ \times 478 \\ \hline \end{array}$$

$$\begin{array}{r} 700 \\ \times 500 \\ \hline \end{array}$$
 rounded to the nearest
350,000 estimated answer

10. (a)
$$\begin{array}{r} 36 \\ 3852 \\ 749 \\ + 5474 \\ \hline \end{array}$$

$$\begin{array}{r} 40 \\ 4000 \\ 700 \\ + 5000 \\ \hline \end{array}$$
 first digit rounded; all
9740 others changed to zero
estimated answer

(b)
$$\begin{array}{r} 2583 \\ - 765 \\ \hline \end{array}$$

$$\begin{array}{r} 3000 \\ - 800 \\ \hline \end{array}$$
 first digit rounded; all
2200 others changed to zero
estimated answer

(c)
$$\begin{array}{r} 648 \\ \times 67 \\ \hline \end{array}$$

$$\begin{array}{r} 600 \\ \times 70 \\ \hline \end{array}$$
 first digit rounded; all
42,000 others changed to zero
estimated answer

1.7 Section Exercises

- 624 to the nearest ten is 620.
- 509 to the nearest ten is 510.
- 86,813 to the nearest hundred is 86,800.
- 17,211 to the nearest hundred is 17,200.
- 78,499 to the nearest thousand is 78,000.
- 14,314 to the nearest thousand is 14,000.
- 12,987 to the nearest ten-thousand is 10,000.
- 6599 to the nearest ten-thousand is 10,000.
- 855 rounded to the nearest ten: 860
855 Next digit is 5 or more. Tens place changes (5 + 1 = 6). All digits to the right of the underlined place change to zero.
- 946 rounded to the nearest ten: 950
946 Next digit is 5 or more. Tens place changes (4 + 1 = 5). The digit to the right of the underlined place changes to zero.
- 6771 rounded to the nearest hundred: 6800
6771 Next digit is 5 or more. Hundreds place changes (7 + 1 = 8). All digits to the right of the underlined place change to zero.
- 5847 rounded to the nearest hundred: 5800
5847 Next digit is 4 or less. Hundreds place does not change. All digits to the right of the underlined place change to zero.

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- 13.** 28,472 rounded to the nearest hundred: 28,500
28,472 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
18,249 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
5996 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
4452 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
15,758 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
28,465 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
7,760,058,721 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
4,468,523,628 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
595,008 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
725,182 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
4,860,220 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
13,713,409 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:** 4476
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: 4476
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: 4476
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:** 6483
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: 6483
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: 6483
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:** 3374
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: 3374
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: 3374
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:** 7632
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: 7632
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: 7632
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:** 6048
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: 6048
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: 6048
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:** 7065
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: 7065
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: 7065
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:** 5343
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: 5343
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: 5343
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:** 7456
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: 7456
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: 7456
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:** 19,539
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: 19,539
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: 19,539
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:** 59,806
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: 59,806
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: 59,806
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:** 26,292
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: 26,292
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: 26,292
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**

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36. To the nearest ten: 78,519

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: 78,519

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: 78,519

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: 93,706

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: 93,706

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: 93,706

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: 84,639

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: 84,639

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: 84,639

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:

$$\begin{array}{r} 30 \quad 25 \\ 60 \quad 63 \\ 50 \quad 47 \\ + 80 \quad + 84 \\ \hline 220 \quad 219 \end{array}$$

42. Estimate: Exact:

$$\begin{array}{r} 60 \quad 56 \\ 20 \quad 24 \\ 90 \quad 85 \\ + 70 \quad + 71 \\ \hline 240 \quad 236 \end{array}$$

43. Estimate: Exact:

$$\begin{array}{r} 80 \quad 78 \\ - 40 \quad - 43 \\ \hline 40 \quad 35 \end{array}$$

44. Estimate: Exact:

$$\begin{array}{r} 60 \quad 57 \\ - 20 \quad - 24 \\ \hline 40 \quad 33 \end{array}$$

45. Estimate: Exact:

$$\begin{array}{r} 70 \quad 67 \\ \times 30 \quad \times 34 \\ \hline 2100 \quad 268 \\ \quad 201 \\ \hline 2278 \end{array}$$

46. Estimate: Exact:

$$\begin{array}{r} 50 \quad 53 \\ \times 80 \quad \times 75 \\ \hline 4000 \quad 265 \\ \quad 371 \\ \hline 3975 \end{array}$$

47. Estimate: Exact:

$$\begin{array}{r} 900 \quad 863 \\ 700 \quad 735 \\ 400 \quad 438 \\ + 800 \quad + 792 \\ \hline 2800 \quad 2828 \end{array}$$

48. *Estimate:* *Exact:*

$$\begin{array}{r} 600 \\ 400 \\ 200 \\ + 700 \\ \hline 1900 \end{array} \qquad \begin{array}{r} 623 \\ 362 \\ 189 \\ + 736 \\ \hline 1910 \end{array}$$

49. *Estimate:* *Exact:*

$$\begin{array}{r} 900 \\ - 400 \\ \hline 500 \end{array} \qquad \begin{array}{r} 883 \\ - 448 \\ \hline 435 \end{array}$$

50. *Estimate:* *Exact:*

$$\begin{array}{r} 600 \\ - 300 \\ \hline 300 \end{array} \qquad \begin{array}{r} 614 \\ - 276 \\ \hline 338 \end{array}$$

51. *Estimate:* *Exact:*

$$\begin{array}{r} 800 \\ \times 400 \\ \hline 320,000 \end{array} \qquad \begin{array}{r} 752 \\ \times 375 \\ \hline 3760 \\ 5264 \\ 2256 \\ \hline 282,000 \end{array}$$

52. *Estimate:* *Exact:*

$$\begin{array}{r} 800 \\ \times 400 \\ \hline 320,000 \end{array} \qquad \begin{array}{r} 845 \\ \times 396 \\ \hline 5070 \\ 7605 \\ 2535 \\ \hline 334,620 \end{array}$$

53. *Estimate:* *Exact:*

$$\begin{array}{r} 8000 \\ 60 \\ 700 \\ + 4000 \\ \hline 12,760 \end{array} \qquad \begin{array}{r} 8215 \\ 56 \\ 729 \\ + 3605 \\ \hline 12,605 \end{array}$$

54. *Estimate:* *Exact:*

$$\begin{array}{r} 3000 \\ 70 \\ 600 \\ + 7000 \\ \hline 10,670 \end{array} \qquad \begin{array}{r} 2685 \\ 73 \\ 592 \\ + 7183 \\ \hline 10,533 \end{array}$$

55. *Estimate:* *Exact:*

$$\begin{array}{r} 700 \\ - 500 \\ \hline 200 \end{array} \qquad \begin{array}{r} 687 \\ - 529 \\ \hline 158 \end{array}$$

56. *Estimate:* *Exact:*

$$\begin{array}{r} 500 \\ - 200 \\ \hline 300 \end{array} \qquad \begin{array}{r} 543 \\ - 174 \\ \hline 369 \end{array}$$

57. *Estimate:* *Exact:*

$$\begin{array}{r} 900 \\ \times 30 \\ \hline 27,000 \end{array} \qquad \begin{array}{r} 939 \\ \times 29 \\ \hline 8451 \\ 1878 \\ \hline 27,231 \end{array}$$

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. 76,000,000 Next digit is 5 or more. Change digit to the right of the underlined place to zero. Add 1 to 7. **80 million people**

311,000,000 Next digit is 4 or less. Change digit to the right of the underlined place to zero. **310 million people**

62. 22,362,180 Next digit is 4 or less. Change digits to the right of the underlined place to zeros. **22,360,000 hot dogs**

22,362,180 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. 348,900 Next digit is 5 or more. Change digit to the right of the underlined place to zero. Add 1 to 8. **349,000 streets**

348,900 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. 95 Next digit is 5 or more, so add 1 to 9. Change digit to the right of the underlined place to zero.
100 streets

27 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:** 39,836,000
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: 39,836,000
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: 39,836,000

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:** 57,463,625,000
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: 57,463,625,000
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: 57,463,625,000
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:** 19,265,780
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: 19,265,780
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: 19,265,780
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:** 221,543
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: 221,543
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: 221,543
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

Relating Concepts (Exercises 69–75)

- 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.
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.

1.8 Section Exercises

- 3^2 : exponent is 2, base is 3.
- 2^3 : exponent is 3, base is 2.
- 5^2 : exponent is 2, base is 5.
- 4^2 : exponent is 2, base is 4.

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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. $5 \cdot 3^2 + \frac{0}{8}$ Exponent
 $5 \cdot 9 + \frac{0}{8}$ Multiply.
 $45 + \frac{0}{8}$ Divide.
 $45 + 0 = 45$ Add.

38. $8 \cdot 3^2 - \frac{10}{2}$ Exponent
 $8 \cdot 9 - \frac{10}{2}$ Multiply.
 $72 - \frac{10}{2}$ 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. $7 + 8 \div 4 + \frac{0}{7}$ Divide.
 $7 + 2 + \frac{0}{7}$ Divide.
 $7 + 2 + 0$ Add.
 $9 + 0 = 9$ Add.

50. $6 + 8 \div 2 + \frac{0}{8}$ Divide.
 $6 + 4 + \frac{0}{8}$ 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. $8 + 8 \div 8 + 6 + \frac{5}{5}$ *Divide.*
 $8 + 1 + 6 + 1$ *Add.*
 $9 + 6 + 1$ *Add.*
 $15 + 1 = 16$ *Add.*
72. $3 + 14 \div 2 + 7 + \frac{8}{8}$ *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

- (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.
- (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 promoted from within.
 (b) From the bar graph, 6 people 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 2014, with 7000 installations.
18. From the line graph, 2009 and 2013 were the two years with the least number of installations. There were 2500 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.
$$\begin{array}{r} 4000 \text{ installations in 2012} \\ - 2500 \text{ installations in 2013} \\ \hline 1500 \text{ decrease in installations} \end{array}$$

 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.
- Relating Concepts (Exercises 23–27)**
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. $36 \div (3 \cdot 3) \cdot 4 = 36 \div 9 \cdot 4 = 4 \cdot 4 = 16$

$$26. \quad 56 \div (2 \cdot 2 \cdot 2) + \frac{0}{6} = 56 \div 8 + \frac{0}{6}$$

$$= 7 + \frac{0}{6}$$

$$= 7 + 0 = 7$$

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:

$$\begin{array}{r}
 \overset{42}{7}920 \quad \textit{top measurement} \\
 1\ 320 \\
 2\ 640 \\
 2\ 640 \quad \textit{from parentheses} \\
 2\ 640 \\
 1\ 320 \\
 7\ 920 \\
 + 5\ 280 \quad \textit{right measurement} \\
 \hline
 31,680 \quad \textit{total}
 \end{array}$$

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.

$$\begin{array}{r}
 \overline{) 95,040} \\
 \underline{5280} \\
 42240 \\
 \underline{42240} \\
 0
 \end{array}$$

18 miles of barbed wire are needed for the fence.

1.10 Solving Application Problems

1.10 Margin Exercises

- (a) A grocery clerk's hourly wage:
 \$1.40 is eliminated (too low)
 \$140 is eliminated (too high)
 \$14 is most reasonable
 \$1.40; \$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; 80 feet; 800 feet

(c) The cost of heart bypass surgery:
 \$1000; \$100,000; \$10,000,000
- (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 $\frac{21}{4 \overline{)84}}$

Step 5 Each person receives 21 fossils.

Step 6 $\frac{21}{\times 4} \begin{array}{l} \textit{amount received by each person} \\ \textit{number of people} \end{array}$

$$\frac{84}{84} \quad \textit{total fossils; matches}$$

(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 $\frac{34}{12 \overline{)408}}$

$$\begin{array}{r}
 \overline{) 408} \\
 \underline{36} \\
 48 \\
 \underline{48} \\
 0
 \end{array}$$

Step 5 There are 34 counselors needed.

Step 6 $\frac{34}{\times 12} \begin{array}{l} \textit{counselors} \\ \textit{children per counselor} \end{array}$

$$\frac{408}{408} \quad \textit{total children; matches}$$

- (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 $\frac{3}{92}$

$$\begin{array}{r}
 81 \\
 83 \\
 98 \\
 15 \\
 14 \\
 15 \\
 15 \\
 + 12 \\
 \hline
 410 \quad \textit{matches estimate}
 \end{array}$$

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.

$$\begin{array}{r} \text{Step 4} \quad 22 \\ \quad 78 \\ \quad 64 \\ \quad 118 \\ \quad 102 \\ + 196 \\ \hline 558 \end{array}$$

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.

$$\begin{array}{r} \text{Step 4} \quad 663,267 \\ \quad - 268,580 \\ \hline 394,687 \end{array}$$

Step 5 The difference in the number of square miles is 394,687 square miles.

Step 6 The answer is reasonable.

$$\begin{array}{r} \text{Check} \quad 268,580 \\ \quad + 394,687 \\ \hline 663,267 \text{ matches} \end{array}$$

(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.

$$\begin{array}{r} \text{Step 4} \quad 14,863 \\ \quad - 1,180 \\ \hline 13,683 \end{array}$$

Step 5 The amount remaining in the club account is \$13,683.

Step 6 The answer is reasonable.

$$\begin{array}{r} \text{Check} \quad 13,683 \\ \quad + 1,180 \\ \hline 14,863 \text{ matches} \end{array}$$

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 $320 \cdot \$130 - \$2500 = \$41,600 - \$2500 = \$39,100$.

$$\begin{array}{r} \text{Step 4} \quad \$129 \quad \$41,022 \\ \quad \times 318 \quad - 2,470 \\ \hline \$41,022 \quad \$38,552 \end{array}$$

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.
 $\$38,552 + \$2470 = \$41,022$

$$\begin{array}{r} \quad \quad \quad 1 \ 2 \ 9 \\ 318 \overline{) 41,022} \\ \underline{3 \ 1 \ 8} \quad \leftarrow 1 \times 318 \\ \quad 9 \ 2 \ 2 \\ \underline{\quad 6 \ 3 \ 6} \quad \leftarrow 2 \times 318 \\ \quad \quad 2 \ 8 \ 6 \ 2 \\ \underline{\quad \quad 2 \ 8 \ 6 \ 2} \quad \leftarrow 9 \times 318 \\ \quad \quad \quad \quad 0 \end{array}$$

\$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 $12,000 \times \$6 = \$72,000$.

$$\begin{array}{r} \text{Step 4} \quad 12,628 \quad 11,765 \\ \quad - 863 \quad \times 6 \\ \hline 11,765 \quad \$70,590 \end{array}$$

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

$$\begin{array}{r} 11,765 \\ 6 \overline{)70,590} \\ \underline{+863} \\ 12,628 \end{array}$$

1.10 Section Exercises

- Choice **C**, 25 hours, is *not* reasonable since there are only 24 hours in a day.
- Choice **B**, \$100/hour, is *not* reasonable for the hourly earnings of a part-time student employee.
- Choice **A**, \$5, is reasonable for the cost of lunch at a fast food restaurant.
- Choice **B**, 25 mpg, is reasonable for the gas mileage of your car.
- 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

$$\begin{array}{r} 322 \\ 602 \\ 935 \\ 1328 \\ 757 \\ + 1586 \\ \hline 5208 \end{array}$$

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.

- Step 1** Given the number of five types of items manufactured, find the total.

Step 2 Addition seems reasonable to use.

Step 3 $\underline{30,000} + 5000 + 2000 + 20,000 + \underline{10,000} = \underline{67,000}$ units is an estimate.

Step 4

$$\begin{array}{r} 2312 \\ 32,815 \\ 4875 \\ 1975 \\ 15,308 \\ + 9815 \\ \hline 64,788 \end{array}$$

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.

- 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 $\$300 - \$200 = \underline{\$100}$ 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** $\$104 + \$192 = \$296$

- 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** $167 + 311 = 478$

- 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

$$\begin{array}{r} 236 \\ 24 \overline{)5664} \end{array}$$

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

$$12 \overline{) 450} = 37.5$$

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

$$657 \overline{) 2628} = 4$$

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

$$1000 \overline{) 680,000} = 680$$

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**

$$5 \overline{) 1720} = 344$$

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**

$$5 \overline{) 3925} = 785$$

15. **Step 1** Given two numbers, find the total.

Step 2 "Find the total" indicates addition could be used.

Step 3 An estimate is $100,000 + 300,000 = 400,000$ 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

$$\begin{aligned} &110,070 + 250,152 - (94,120 + 164,300) \\ &= 360,222 - (258,420) \\ &= 101,802 \end{aligned}$$

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

$$\begin{array}{r} \$695 \quad \$2240 \\ \quad 340 \quad - 1890 \\ \quad 435 \quad \hline \quad 240 \quad \$350 \\ + 180 \\ \hline 1890 \end{array}$$

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

$$\begin{array}{r} \$308 \quad \$2874 \\ \quad 580 \quad - 1666 \\ + 778 \quad \hline \$1666 \end{array}$$

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
 $40,000 \times 100 = 4,000,000 \text{ ft}^2$.

$$\begin{array}{r}
 \text{Step 4} \quad 43,560 \\
 \times 138 \\
 \hline
 348480 \\
 130680 \\
 43560 \\
 \hline
 6,011,280
 \end{array}$$

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.

$$\begin{array}{r}
 \text{Step 6 Check} \quad 43,560 \\
 138 \overline{)6,011,280}
 \end{array}$$

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.

$$\begin{array}{r}
 \text{Step 4} \quad 209,670 \\
 \times 365 \\
 \hline
 1\,048\,350 \\
 12\,580\,20 \\
 62\,901\,0 \\
 \hline
 76,529,550
 \end{array}$$

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: $\$300 + \$200 + \$100 + \$70 + \$400 + \$200 = \$1270$

$$\begin{array}{r}
 \text{Step 4} \quad \$ \begin{array}{r} 144 \\ 299 \\ 185 \\ 99 \\ 67 \\ 395 \\ + 209 \\ \hline 1254 \end{array}
 \end{array}$$

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: $\$300 + \$50 + \$300 + \$1800 + \$80 + \$400 = \$2930$

$$\begin{array}{r}
 \text{Step 4} \quad \begin{array}{r} 43 \\ \$321 \\ 51 \\ 299 \\ 1799 \\ 82 \\ + 449 \\ \hline \$3001 \end{array}
 \end{array}$$

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

$$\begin{array}{r}
 \text{Add.} \quad \begin{array}{r} 23 \\ \$299 \text{ VIP Plus Security System} \\ 67 \text{ Alloy wheel locks} \\ 395 \text{ Paint protection} \\ + 209 \text{ Lower body moulding} \\ \hline \$970 \text{ Total cost} \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{Subtract.} \quad \begin{array}{r} \$970 \text{ Total cost} \\ - 785 \text{ Option package} \\ \hline \$185 \text{ Amount saved} \end{array}
 \end{array}$$

Step 5 Jill can save \$185 by buying the option package.

Step 6 The answer is reasonably close to the estimate. **Check**

$$\begin{array}{r}
 \$785 \\
 + 185 \\
 \hline
 \$970
 \end{array}$$

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.	\$299	<i>VIP Plus Security System</i>
	185	<i>Roof rack crossbars</i>
	395	<i>Paint protection</i>
	321	<i>Carpet floor mats</i>
	51	<i>Cargo nets</i>
	+ 449	<i>XM Satellite Radio</i>
	\$1700	<i>Total cost</i>

Subtract.	\$1700	<i>Total cost</i>
	- 1495	<i>Option package</i>
	\$205	<i>Amount saved</i>

Step 5 Samuel can save \$205 by buying the option package.

Step 6 The answer is reasonably close to the estimate. **Check** \$1495

$$\begin{array}{r} + 205 \\ \hline \$1700 \end{array}$$

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 \times 6 = \6000 .

The cost of the recorder-players is about $\$900 \times 20 = \$18,000$.

Estimate: $\$6000 + \$18,000 = \$24,000$

Step 4 cost of wheelchairs: \$1256

$$\begin{array}{r} \times 6 \\ \hline \$7536 \end{array}$$

cost of recorder-players: \$895

$$\begin{array}{r} \times 15 \\ \hline 4475 \\ \hline 895 \\ \hline \$13,425 \end{array}$$

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: $(\$500 \times 20) + (\$500 \times 10) = \$10,000 + \$5000 = \$15,000$

Step 4

$$\begin{array}{r} 506 \quad 482 \quad 8602 \\ \times 17 \quad \times 13 \quad + 6266 \\ \hline 3542 \quad 1446 \quad 14,868 \\ \hline 506 \quad 482 \\ \hline 8602 \quad 6266 \end{array}$$

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.

	\$2 ³³⁴ 358	<i>Monday</i>
	3056	<i>Tuesday</i>
	2515	<i>Wednesday</i>
	1875	<i>Thursday</i>
	3978	<i>Friday</i>
	3219	<i>Saturday</i>
	+ 3008	<i>Sunday</i>
	\$20,009	<i>Total cost</i>

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:
 $5000 + 3000 + 5000 + 2000 +$
 $4000 + 2000 + 7000 = 28,000$

$$\begin{array}{r}
 \text{Step 4 Add.} \quad \begin{array}{r} 444 \\ 5318 \\ 2865 \\ 4786 \\ 1998 \\ 3899 \\ 2343 \\ + 7221 \\ \hline 28,430 \end{array} \quad \begin{array}{l} \text{Monday} \\ \text{Tuesday} \\ \text{Wednesday} \\ \text{Thursday} \\ \text{Friday} \\ \text{Saturday} \\ \text{Sunday} \\ \text{Total cost} \end{array}
 \end{array}$$

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

$$\begin{array}{r}
 634 \text{ new engine} \quad 2425 \text{ original weight} \\
 - 582 \text{ old engine} \quad + 52 \text{ additional weight} \\
 \hline
 52 \text{ difference} \quad 2477 \text{ new weight}
 \end{array}$$

Step 5 The car will weigh 2477 pounds.

Step 6 The answer is reasonable since it's just slightly more than the original weight.

$$\begin{array}{r}
 \text{Check} \quad \begin{array}{r} 2425 \quad 1843 \\ - 582 \quad + 634 \\ \hline 1843 \quad 2477 \end{array}
 \end{array}$$

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

$$\begin{array}{r}
 \text{Step 4} \quad \begin{array}{r} \$2324 \quad \$1590 \\ - 734 \quad + 568 \\ \hline \$1590 \quad \$2158 \end{array}
 \end{array}$$

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

$$\begin{array}{r}
 \text{Subtract.} \quad \begin{array}{r} \$99 \text{ Harrah's Lake Tahoe} \\ - 45 \text{ Harrah's Reno} \\ \hline \$54 \text{ Savings for 1 night} \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{Multiply.} \quad \begin{array}{r} \$54 \\ \times 7 \\ \hline \$378 \end{array}
 \end{array}$$

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

$$\begin{array}{r}
 \text{Step 4 Subtract.} \quad \begin{array}{r} \$645 \text{ Ritz-Carlton} \\ - 74 \text{ Motel 6} \\ \hline \$571 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{Multiply.} \quad \begin{array}{r} \$571 \\ \times 4 \\ \hline \$2284 \end{array}
 \end{array}$$

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

$$\begin{array}{r}
 \text{Step 4 Subtract.} \quad \begin{array}{r} \$7588 \\ - 838 \\ \hline \$6750 \end{array}
 \end{array}$$

Divide.

$$\begin{array}{r} \overline{) \$ 6750} \\ \underline{54} \\ 135 \\ \underline{126} \\ 90 \\ \underline{90} \\ 0 \end{array}$$

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	<i>morning</i>	204
	$+ 2575$	<i>afternoon</i>	6120
	$\underline{}$	<i>total</i>	$\underline{}$
			60
			$\underline{12}$
			0
			$\underline{120}$
			$\underline{120}$
			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:

$$\begin{aligned} 24 \times 40 &= 960 \text{ wreaths per year} \\ 960 \div 6 &= 160 \text{ boxes per year} \\ 160 \div 5 &= 32 \text{ boxes per store} \end{aligned}$$

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. 6,573; thousands: 6; ones: 573
2. 36,215; thousands: 36; ones: 215
3. 105,724; thousands: 105; ones: 724
4. 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.
$$\begin{array}{r} \overline{) 1} \\ \overline{) 72} \\ \overline{) 110} \end{array}$$

$$\begin{array}{r} 12. \quad \begin{array}{r} 1 \\ 54 \\ + 67 \\ \hline 121 \end{array} \end{array}$$

$$\begin{array}{r} 13. \quad \begin{array}{r} 1 \quad 1 \\ 807 \\ 4606 \\ + 51 \\ \hline 5464 \end{array} \end{array}$$

$$\begin{array}{r} 14. \quad \begin{array}{r} 1 \\ 8 \ 2 \ 15 \\ 9 \\ + 7 \ 433 \\ \hline 15,657 \end{array} \end{array}$$

$$\begin{array}{r} 15. \quad \begin{array}{r} 11 \\ 2 \ 130 \\ 453 \\ 8 \ 107 \\ + 296 \\ \hline 10,986 \end{array} \end{array}$$

$$\begin{array}{r} 16. \quad \begin{array}{r} 221 \\ 5684 \\ 218 \\ 2960 \\ + 983 \\ \hline 9845 \end{array} \end{array}$$

$$\begin{array}{r} 17. \quad \begin{array}{r} 11 \ 33 \\ 5 \ 732 \\ 11,069 \\ 37 \\ 1 \ 595 \\ + 22,169 \\ \hline 40,602 \end{array} \end{array}$$

$$\begin{array}{r} 18. \quad \begin{array}{r} 1 \ 31 \\ 3 \ 451 \\ 12,286 \\ 43 \\ 1 \ 291 \\ + 32,784 \\ \hline 49,855 \end{array} \end{array}$$

$$\begin{array}{r} 19. \quad \begin{array}{r} 514 \\ 64 \\ - 28 \\ \hline 36 \end{array} \quad \text{Check} \quad \begin{array}{r} 1 \\ 28 \\ + 36 \\ \hline 64 \end{array} \end{array}$$

$$\begin{array}{r} 20. \quad \begin{array}{r} 316 \\ 46 \\ - 19 \\ \hline 27 \end{array} \quad \text{Check} \quad \begin{array}{r} 1 \\ 19 \\ + 27 \\ \hline 46 \end{array} \end{array}$$

$$\begin{array}{r} 21. \quad \begin{array}{r} 21615 \\ 375 \\ - 186 \\ \hline 189 \end{array} \quad \text{Check} \quad \begin{array}{r} 11 \\ 186 \\ + 189 \\ \hline 375 \end{array} \end{array}$$

$$\begin{array}{r} 22. \quad \begin{array}{r} 41613 \\ 573 \\ - 389 \\ \hline 184 \end{array} \quad \text{Check} \quad \begin{array}{r} 11 \\ 389 \\ + 184 \\ \hline 573 \end{array} \end{array}$$

$$\begin{array}{r} 23. \quad \begin{array}{r} 6131016 \\ 7416 \\ - 567 \\ \hline 6849 \end{array} \quad \text{Check} \quad \begin{array}{r} 111 \\ 567 \\ + 6849 \\ \hline 7416 \end{array} \end{array}$$

$$\begin{array}{r} 24. \quad \begin{array}{r} 4111010 \\ 5210 \\ - 883 \\ \hline 4327 \end{array} \quad \text{Check} \quad \begin{array}{r} 111 \\ 4327 \\ + 883 \\ \hline 5210 \end{array} \end{array}$$

$$\begin{array}{r} 25. \quad \begin{array}{r} 1111010 \\ 2210 \\ - 1986 \\ \hline 224 \end{array} \quad \text{Check} \quad \begin{array}{r} 111 \\ 1986 \\ + 224 \\ \hline 2210 \end{array} \end{array}$$

$$\begin{array}{r} 26. \quad \begin{array}{r} 9 \\ 8 \ 161014 \\ 99,704 \\ - 73,838 \\ \hline 25,866 \end{array} \quad \text{Check} \quad \begin{array}{r} 1 \ 11 \\ 25,866 \\ + 73,838 \\ \hline 99,704 \end{array} \end{array}$$

$$27. \quad \begin{array}{r} 7 \\ \times 7 \\ \hline 49 \end{array}$$

$$28. \quad \begin{array}{r} 8 \\ \times 0 \\ \hline 0 \end{array}$$

$$29. \quad 8(4) = 32$$

$$30. \quad 8(8) = 64$$

$$31. \quad (5)(9) = 45$$

$$32. \quad (6)(7) = 42$$

$$33. \quad 7 \cdot 8 = 56$$

$$34. \quad 9 \cdot 9 = 81$$

$$35. \quad \begin{array}{l} 5 \times 4 \times 2 \\ (5 \times 4) \times 2 \\ 20 \times 2 = 40 \end{array}$$

$$36. \quad \begin{array}{l} 9 \times 1 \times 5 \\ (9 \times 1) \times 5 \\ 9 \times 5 = 45 \end{array}$$

$$37. \quad \begin{array}{l} 4 \times 4 \times 3 \\ (4 \times 4) \times 3 \\ 16 \times 3 = 48 \end{array}$$

$$38. \quad \begin{array}{l} 2 \times 2 \times 2 \\ (2 \times 2) \times 2 \\ 4 \times 2 = 8 \end{array}$$

$$39. \quad (6)(0)(8) = 0 \quad \text{Any number times 0 equals 0.}$$

$$40. \quad \begin{array}{l} (7)(1)(6) \\ (7 \cdot 1) \cdot 6 \\ 7 \cdot 6 = 42 \end{array}$$

56 Chapter 1 Whole Numbers

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.
$$\begin{array}{r} 2 \\ 28 \\ \times 3 \\ \hline 84 \end{array}$$

44.
$$\begin{array}{r} 4 \\ 46 \\ \times 8 \\ \hline 368 \end{array}$$

45.
$$\begin{array}{r} 7 \\ 58 \\ \times 9 \\ \hline 522 \end{array}$$

46.
$$\begin{array}{r} 98 \\ \times 1 \\ \hline 98 \end{array}$$

47.
$$\begin{array}{r} 24 \\ 625 \\ \times 8 \\ \hline 5000 \end{array}$$

48.
$$\begin{array}{r} 53 \\ 374 \\ \times 8 \\ \hline 2992 \end{array}$$

49.
$$\begin{array}{r} 113 \\ 1349 \\ \times 4 \\ \hline 5396 \end{array}$$

50.
$$\begin{array}{r} 31 \\ 9163 \\ \times 5 \\ \hline 45,815 \end{array}$$

51.
$$\begin{array}{r} 11 \\ 7456 \\ \times 2 \\ \hline 14,912 \end{array}$$

52.
$$\begin{array}{r} 65 \\ 2880 \\ \times 7 \\ \hline 20,160 \end{array}$$

53.
$$\begin{array}{r} 1 \quad 2 \\ 93,105 \\ \times 5 \\ \hline 465,525 \end{array}$$

54.
$$\begin{array}{r} 16 \quad 52 \\ 21,873 \\ \times 8 \\ \hline 174,984 \end{array}$$

55.
$$\begin{array}{r} 35 \\ \times 25 \\ \hline 175 \leftarrow 5 \times 35 \\ 70 \leftarrow 2 \times 35 \\ \hline 875 \end{array}$$

56.
$$\begin{array}{r} 74 \\ \times 32 \\ \hline 148 \leftarrow 2 \times 74 \\ 222 \leftarrow 3 \times 74 \\ \hline 2368 \end{array}$$

57.
$$\begin{array}{r} 98 \\ \times 12 \\ \hline 196 \leftarrow 2 \times 98 \\ 98 \leftarrow 1 \times 98 \\ \hline 1176 \end{array}$$

58.
$$\begin{array}{r} 68 \\ \times 75 \\ \hline 340 \leftarrow 5 \times 68 \\ 476 \leftarrow 7 \times 68 \\ \hline 5100 \end{array}$$

59.
$$\begin{array}{r} 472 \\ \times 33 \\ \hline 1416 \leftarrow 3 \times 472 \\ 1416 \\ \hline 15,576 \end{array}$$

60.
$$\begin{array}{r} 392 \\ \times 77 \\ \hline 2744 \leftarrow 7 \times 392 \\ 2744 \\ \hline 30,184 \end{array}$$

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.
$$\begin{array}{r} \$12 \text{ cost per calculator} \\ \times 30 \text{ calculators} \\ \hline \$360 \text{ total cost} \end{array}$$

64.
$$\begin{array}{r} \$14 \text{ cost of subscription} \\ \times 76 \text{ subscribers} \\ \hline 84 \\ 98 \\ \hline \$1064 \text{ total cost} \end{array}$$

$$\begin{array}{r}
 65. \quad 318 \text{ sets} \\
 \times \$64 \text{ cost per set} \\
 \hline
 1272 \\
 1908 \\
 \hline
 \$20,352 \text{ total cost}
 \end{array}$$

$$\begin{array}{r}
 66. \quad 114 \text{ ear plugs} \\
 \times \$6 \text{ cost per plug} \\
 \hline
 \$684 \text{ total cost}
 \end{array}$$

$$\begin{array}{r}
 67. \quad 280 \quad 28 \quad 280 \\
 \times 50 \quad \times 5 \quad \times 50 \\
 \hline
 \quad 140 \quad 14,000 \text{ Attach 00.}
 \end{array}$$

$$\begin{array}{r}
 68. \quad 340 \quad 34 \quad 340 \\
 \times 70 \quad \times 7 \quad \times 70 \\
 \hline
 \quad 238 \quad 23,800 \text{ Attach 00.}
 \end{array}$$

$$\begin{array}{r}
 69. \quad 517 \quad 517 \quad 517 \\
 \times 400 \quad \times 4 \quad \times 400 \\
 \hline
 \quad 2068 \quad 206,800 \text{ Attach 00.}
 \end{array}$$

$$\begin{array}{r}
 70. \quad 637 \quad 637 \quad 637 \\
 \times 500 \quad \times 5 \quad \times 500 \\
 \hline
 \quad 3185 \quad 318,500 \text{ Attach 00.}
 \end{array}$$

$$\begin{array}{r}
 71. \quad 16,000 \quad 16 \quad 16,000 \\
 \times 8000 \quad \times 8 \quad \times 8000 \\
 \hline
 \quad 128 \quad 128,000,000 \text{ Attach 000000.}
 \end{array}$$

$$\begin{array}{r}
 72. \quad 43,000 \quad 43 \quad 43,000 \\
 \times 2100 \quad \times 21 \quad \times 2100 \\
 \hline
 \quad 903 \quad 90,300,000 \text{ Attach 00000.}
 \end{array}$$

73. $20 \div 4 = 5$

74. $35 \div 5 = 7$

75. $42 \div 7 = 6$

76. $18 \div 9 = 2$

77. $\frac{54}{9} = 6$

78. $\frac{36}{9} = 4$

79. $\frac{49}{7} = 7$

80. $\frac{0}{6} = 0$

81. $\frac{148}{0}$ is undefined.

82. $\frac{0}{23} = 0$

83. $\frac{64}{8} = 8$

84. $\frac{81}{9} = 9$

$$\begin{array}{r}
 85. \quad \begin{array}{r} 82 \\ 4 \overline{)328} \end{array} \text{ Check } \begin{array}{r} 82 \\ \times 4 \\ \hline 328 \end{array}
 \end{array}$$

$$\begin{array}{r}
 86. \quad \begin{array}{r} 98 \\ 3 \overline{)2924} \end{array} \text{ Check } \begin{array}{r} 98 \\ \times 3 \\ \hline 294 \end{array}
 \end{array}$$

$$\begin{array}{r}
 87. \quad \begin{array}{r} 4422 \\ 6 \overline{)26,251312} \end{array} \text{ Check } \begin{array}{r} 211 \\ 4422 \\ \times 6 \\ \hline 26,532 \end{array}
 \end{array}$$

$$\begin{array}{r}
 88. \quad \begin{array}{r} 352 \\ 76 \overline{)26,752} \\ \underline{228} \\ 395 \\ \underline{380} \\ 152 \\ \underline{152} \\ 0 \end{array} \text{ Check } \begin{array}{r} 352 \\ \times 76 \\ \hline 2112 \\ 2464 \\ \hline 26,752 \end{array}
 \end{array}$$

$$\begin{array}{r}
 89. \quad 2704 \div 18 \quad \begin{array}{r} 150 \text{ R4} \\ 18 \overline{)2704} \\ \underline{18} \\ 90 \\ \underline{90} \\ 04 \\ \underline{00} \\ 4 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{Check } \begin{array}{r} 150 \\ \times 18 \\ \hline 1200 \\ 150 \\ \hline 2700 \\ + 4 \\ \hline 2704 \end{array}
 \end{array}$$

$$\begin{array}{r}
 90. \quad 15,525 \div 125 \quad \begin{array}{r} 124 \text{ R25} \\ 125 \overline{)15,525} \\ \underline{125} \\ 302 \\ \underline{250} \\ 525 \\ \underline{500} \\ 25 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{Check } \begin{array}{r} 124 \\ \times 125 \\ \hline 620 \\ 248 \\ 124 \\ \hline 15,500 \\ + 25 \\ \hline 15,525 \end{array}
 \end{array}$$

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91. 817 rounded to the nearest ten: 820
 817 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
 15,208 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
 20,643 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: 3487
 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: 3487
 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: 3487
 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: 20,065
 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: 20,065
 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: 20,065
 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: 98,201
 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: 98,201
 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: 98,201
 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: 352,118
 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: 352,118
 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: 352,118
 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: $40 \text{ million} \times 365$

$$\begin{array}{r} 400 \\ \times 40 \\ \hline 16,000 \end{array}$$

40 million \times 400 = 16,000 million or
 16,000,000,000 checks (Attach 000 000.)

Exact: $40 \text{ million} \times 365$

$$\begin{array}{r} 365 \\ \times 40 \\ \hline 14,600 \end{array}$$

40 million \times 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 \times minutes
 = total revolutions
- Step 3** An estimate is $1000 \times 60 = 60,000$ revolutions.
- Step 4** $1400 \times 60 = 84,000$ revolutions
- Step 5** There were 84,000 revolutions.
- Step 6** The answer is reasonably close to the estimate considering the rounding.

Check $84,000 \div 60 = 1400$

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 \times \$90 = \720
 Tax: round \$230 to \$200
 Total: $\$3000 + \$720 + \$200 = \3920

Step 4 Exact:
 Transaxle: \$2633
 Labor: $8 \times \$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 Exact:

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 Exact:

$(62 \times \$16) + (21 \times \$7) = \$992 + \$147 = \$1139$

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:

$$\begin{array}{r} \$620 \\ - \$107 \\ \hline \$513 \end{array}$$

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 Exact:

$\$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 $\frac{8750}{175} = 50$ pounds

Step 5 50 pounds of pork are needed.

Step 6 The answer is reasonably close to the estimate. **Check**
 $(175 \text{ cans per pound}) \cdot (50 \text{ pounds}) = 8750 \text{ cans}$

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.

$$\frac{\text{total number}}{\text{number per hour}} = \text{total hours}$$

Step 3 An estimate: $30,000 \div 1000 = 30$ hours

Step 4 $\frac{32,538}{986} = 33$ 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 $\frac{32,500}{625} = 52$ 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 $\frac{5760}{180} = 32$ homes

Step 5 32 homes can be fenced.

Step 6 The answer is reasonably close to the estimate. **Check**
 $(180 \text{ feet per home}) \cdot (32 \text{ homes}) = 5760 \text{ feet}$

$$131. [1.4] \quad 4(83) \quad \begin{array}{r} 1 \\ 83 \\ \times 4 \\ \hline 332 \end{array}$$

$$132. [1.4] \quad 7(64) \quad \begin{array}{r} 2 \\ 64 \\ \times 7 \\ \hline 448 \end{array}$$

$$133. [1.3] \quad \begin{array}{r} 210 \\ 309 \\ - 56 \\ \hline 253 \end{array}$$

$$134. [1.3] \quad \begin{array}{r} 12 \\ 7215 \\ 835 \\ - 247 \\ \hline 588 \end{array}$$

$$135. [1.2] \quad \begin{array}{r} 11 \\ 662 \\ + 379 \\ \hline 1041 \end{array}$$

$$136. [1.2] \quad \begin{array}{r} 11 \\ 789 \\ + 872 \\ \hline 1661 \end{array}$$

$$137. [1.3] \quad \begin{array}{r} 13 \\ 0310 \\ 38,140 \\ - 6078 \\ \hline 32,062 \end{array} \quad \text{Check} \quad \begin{array}{r} 11 \\ 32,062 \\ + 6078 \\ \hline 38,140 \end{array}$$

$$138. [1.3] \quad \begin{array}{r} 811416 \\ 29,156 \\ - 4209 \\ \hline 24,947 \end{array} \quad \text{Check} \quad \begin{array}{r} 11 \\ 24,947 \\ + 4209 \\ \hline 29,156 \end{array}$$

$$139. [1.5] \quad 21 \div 7 = 3$$

$$140. [1.5] \quad \frac{42}{6} = 7 \quad (7 \cdot 6 = 42)$$

$$141. [1.2] \quad \begin{array}{r} 1222 \\ 7218 \\ 3 \\ 18 \\ 1791 \\ 82,623 \\ + 1982 \\ \hline 93,635 \end{array}$$

$$142. [1.2] \quad \begin{array}{r} 1212 \\ 3812 \\ 5 \\ 22 \\ 1836 \\ 75,134 \\ + 2369 \\ \hline 83,178 \end{array}$$

$$143. [1.5] \quad \frac{9}{0} \text{ is undefined.}$$

$$144. [1.5] \quad \frac{7}{1} = 7 \quad (7 \cdot 1 = 7)$$

$$145. [1.5] \quad 27,600 \div 4 = 6900$$

$$\begin{array}{r} 69 \\ 4 \overline{)2736} \text{ Attach } 00. \end{array}$$

$$146. [1.5] \quad 18,480 \div 8$$

$$\begin{array}{r} 2310 \\ 8 \overline{)18,480} \end{array}$$

$$147. [1.4] \quad \begin{array}{r} 8430 \\ \times 128 \\ \hline 67440 \leftarrow 8 \times 8430 \\ 16860 \leftarrow 2 \times 8430 \\ 8430 \\ \hline 1,079,040 \end{array}$$

$$148. [1.4] \quad \begin{array}{r} 141 \\ 21,702 \\ \times 6 \\ \hline 130,212 \end{array}$$

$$149. [1.6] \quad \text{Use a calculator to show that}$$

$$34 \overline{)3672} = 108.$$

$$150. [1.6] \quad \text{Use a calculator to show that}$$

$$68 \overline{)14,076} = 207.$$

$$151. [1.1] \quad 376,853 \text{ is three hundred seventy-six thousand, eight hundred fifty-three in words.}$$

$$152. [1.1] \quad 408,610 \text{ is four hundred eight thousand, six hundred ten in words.}$$

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153. [1.7] 8749 rounded to the nearest hundred: $\underline{87}49
Next digit is 4 or less. Hundreds place doesn't change. All digits to the right of the underlined place are changed to zero. **8700**$

154. [1.7] 400,503 rounded to the nearest thousand: $\underline{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] $\begin{array}{r} \$308 \text{ cost per pair} \\ \times 18 \text{ pairs} \\ \hline 2464 \\ 308 \\ \hline \$5544 \text{ total cost} \end{array}$

158. [1.4] $\begin{array}{r} \$370 \text{ cost per dishwasher} \\ \times 84 \text{ dishwashers} \\ \hline 1480 \\ 2960 \\ \hline \$31,080 \text{ total cost} \end{array}$

159. [1.4] $\begin{array}{r} 208 \text{ baseball hats} \\ \times \$11 \text{ cost of hat} \\ \hline 208 \\ 208 \\ \hline \$2288 \text{ total cost} \end{array}$

160. [1.4] $\begin{array}{r} 607 \text{ boxes of avocados} \\ \times \$26 \text{ cost per box} \\ \hline 3642 \\ 1214 \\ \hline \$15,782 \text{ total cost} \end{array}$

161. [1.4] $\begin{array}{r} \frac{1}{5} 2 \text{ cards per deck} \\ \times 9 \text{ decks} \\ \hline 468 \text{ total cards} \end{array}$

There are 468 cards in nine decks.

162. [1.4] $\begin{array}{r} 1700 \text{ volunteers} \\ \times 31 \text{ pounds per volunteer} \\ \hline 52,700 \text{ pounds} \end{array}$

There were 52,700 pounds of fruits and vegetables picked by the volunteers.

163. [1.3] $\begin{array}{r} \$380 \\ - \$100 \\ \hline \$280 \end{array}$

A "push-type" mower costs \$280.

164. [1.3] $\begin{array}{r} 714410 \\ \$218,450 \text{ Amount needed} \\ - \$103,815 \text{ Amount raised} \\ \hline \$114,635 \text{ Amount left to be raised} \end{array}$

\$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
		<hr/> \$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	$38 \times (\$28 + \$2) = 38(\$30)$	\$1140
6-person	$73 \times (\$38 + \$2) = 73(\$40)$	2920
10-person	$58 \times (\$70 + \$2) = 58(\$72)$	4176
12-person	$34 \times (\$75 + \$2) = 34(\$77)$	2618
16-person	$18 \times (\$85 + \$2) = 18(\$87)$	+ 1566
		<hr/> \$12,420

Total receipts were \$12,420.

167. [1.9] $\begin{array}{r} 611 \\ 2717 \text{ Burj Dubai} \\ - 1250 \text{ Empire State Building} \\ \hline 1467 \text{ difference} \end{array}$

The Burj Dubai is 1467 feet taller than the Empire State Building.

168. [1.9] $\begin{array}{r} 617 \\ 1776 \text{ 1 WTC in New York} \\ - 1483 \text{ Petronas Towers} \\ \hline 293 \text{ difference} \end{array}$

The 1 WTC in New York will be 293 feet taller than the Petronas Towers.

169. [1.9] (a) $\begin{array}{r} 332 \\ 2717 \text{ Burj Dubai} \\ 1776 \text{ 1 WTC in New York} \\ 1667 \text{ Taipel 101} \\ 1614 \text{ World Financial Center} \\ 1483 \text{ Petronas Towers} \\ 1451 \text{ Willis Tower} \\ + 1250 \text{ Empire State Building} \\ \hline 11,958 \text{ combined height in feet} \end{array}$

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.

$$\begin{array}{r} 11,9\overset{8}{5}8 \text{ combined height} \\ - 10,560 \text{ feet in two miles} \\ \hline 1398 \text{ difference} \end{array}$$

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.

$$\begin{array}{r} 300 \overline{) 1451} \\ \underline{1200} \\ 251 \end{array}$$

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

- 9205 is nine thousand, two hundred five.
- 25,065 is twenty-five thousand, sixty-five.
- Four hundred twenty-six thousand, five is 426,005.

$$\begin{array}{r} 122 \\ 853 \\ 66 \\ 4022 \\ + 3589 \\ \hline 8530 \end{array}$$

$$\begin{array}{r} 1112 \\ 17,063 \\ 7 \\ 12 \\ 1505 \\ 93,710 \\ + 333 \\ \hline 112,630 \end{array}$$

$$\begin{array}{r} 9 \\ 81010 \\ 9009 \\ - 7964 \\ \hline 1045 \end{array}$$

$$\begin{array}{r} 810615 \\ 9075 \\ - 2869 \\ \hline 6206 \end{array}$$

8. $7 \times 6 \times 4 = (7 \times 6) \times 4 = 42 \times 4 = 168$

$$\begin{array}{r} 57 \cdot 3000 \quad 57 \\ \times 3 \\ \hline 171 \end{array}$$

$$57 \cdot 3000 = 171,000 \text{ Attach } 000.$$

10. 85(19)

$$\begin{array}{r} 85 \quad \text{Check} \quad 85 \\ \times 19 \quad 19 \overline{) 1615} \\ \hline 765 \\ 85 \\ \hline 1615 \end{array}$$

$$\begin{array}{r} 7381 \quad \text{Check} \quad 7381 \\ \times 603 \quad 603 \overline{) 4450743} \\ \hline 22143 \\ 442860 \\ \hline 4,450,743 \end{array}$$

$$\begin{array}{r} 7047 \quad \text{Check} \quad 7047 \\ 16 \overline{) 112,752} \quad \times 16 \\ \underline{112} \quad 42282 \\ 075 \quad 7047 \\ \underline{64} \quad 112,752 \\ 112 \\ \underline{112} \\ 0 \end{array}$$

13. $\frac{835}{0}$ is undefined

$$\begin{array}{r} 19,241 \div 42 \quad 458 \text{ R}5 \\ 42 \overline{) 19,241} \\ \underline{168} \\ 244 \\ \underline{210} \\ 341 \\ \underline{336} \\ 5 \end{array}$$

$$\begin{array}{r} 160 \\ 280 \overline{) 44,800} \\ \underline{280} \\ 1680 \\ \underline{1680} \\ 00 \end{array}$$

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- 16.** 6347 rounded to the nearest ten: 6347
 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: 76,489
 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.

$$\begin{array}{r} \$ \quad 1 \quad 11 \\ \quad \quad 485 \\ \quad \quad 500 \\ \quad \quad 515 \\ + \quad 425 \\ \hline \quad \quad \$1925 \end{array}$$

Subtract expenses.

$$\begin{array}{r} \quad \quad 812 \\ \$1925 \\ - \quad 785 \\ \hline \$1140 \quad \text{amount left} \end{array}$$

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.

$$\begin{array}{r} \quad \quad \quad 231 \\ 374 \overline{) 86,394} \\ \quad \underline{748} \\ \quad \quad 1159 \\ \quad \quad \underline{1122} \\ \quad \quad \quad 374 \\ \quad \quad \quad \underline{374} \\ \quad \quad \quad \quad 0 \end{array}$$

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.

$$\begin{aligned} \text{Estimate: } & (50 \times 60 \times 4) + (40 \times 60 \times 3) \\ & = (3000 \times 4) + (2400 \times 3) \\ & = 12,000 + 7200 = 19,200 \text{ chicks} \end{aligned}$$

$$\begin{aligned} \text{Exact: } & (48 \times 60 \times 4) + (36 \times 60 \times 3) \\ & = (2880 \times 4) + (2160 \times 3) \\ & = 11,520 + 6480 = 18,000 \text{ chicks} \end{aligned}$$

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) 124,999 rounds to 120,000
 (B) 125,000 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.