

Chapter 1

Whole Numbers

Exercise Set 1.1

RC2. In 615,702, the number 615 is in the thousands period.

RC4. The number 721 is written in standard notation.

2. 5 ten thousands
4. 5 hundred thousands
6. 8
8. 1
10. 1 thousand + 7 hundreds + 7 tens + 6 ones
12. 1 thousand + 0 hundreds + 8 tens + 1 one, or 1 thousand + 8 tens + 1 one
14. 3 thousands + 0 hundreds + 9 tens + 7 ones, or 3 thousands + 9 tens + 7 ones
16. 3 ten thousands + 8 thousands + 4 hundreds + 5 tens + 3 ones
18. 1 billion + 2 hundred millions + 0 ten millions + 5 millions + 0 hundred thousands + 7 ten thousands + 3 thousands + 6 hundreds + 1 ten + 2 ones, or 1 billion + 2 hundred millions + 5 millions + 7 ten thousands + 3 thousands + 6 hundreds + 1 ten + 2 ones
20. 3 hundred millions + 1 ten million + 3 millions + 8 hundred thousands + 4 ten thousands + 7 thousands + 4 hundreds + 6 tens + 5 ones
22. Forty-eight
24. Forty-five thousand, nine hundred eighty-seven
26. One hundred eleven thousand, thirteen
28. Forty-three billion, five hundred fifty million, six hundred fifty-one thousand, eight hundred eight
30. Ninety-one thousand, two hundred forty-five
32. Eighty-nine million, three hundred thirty-one thousand, six hundred twenty-two
34. 354,702
36. 17,112
38. 19,610,439
40. 700,000,000
42. 26,000,000,000
44. 200,017

46. 2,793,000,000

48. All digits are 9's. Answers may vary. For an 8-digit read-out, for example, it would be 99,999,999. This number has three periods.

Exercise Set 1.2

RC2. In the addition $5 + 2 = 7$, the number 7 is the sum.

RC4. The distance around an object is its perimeter.

$$\begin{array}{r} 2. \quad 1\ 5\ 2\ 1 \\ + \quad 3\ 4\ 8 \\ \hline 1\ 8\ 6\ 9 \end{array}$$

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

$$\begin{array}{r} 6. \quad 1 \\ \quad 7\ 5\ 0\ 3 \\ + \quad 2\ 6\ 8\ 3 \\ \hline 1\ 0,\ 1\ 8\ 6 \end{array}$$

$$\begin{array}{r} 8. \quad 1\ 1 \\ \quad 9\ 9\ 9 \\ + \quad 1\ 1 \\ \hline 1\ 0\ 1\ 0 \end{array}$$

$$\begin{array}{r} 10. \quad 1 \\ \quad 2\ 7\ 1 \\ + \quad 3\ 3\ 3\ 8 \\ \hline 3\ 6\ 0\ 9 \end{array}$$

$$\begin{array}{r} 12. \quad 1 \\ \quad 2\ 8\ 0 \\ + \quad 3\ 4,\ 9\ 0\ 2 \\ \hline 3\ 5,\ 1\ 8\ 2 \end{array}$$

$$\begin{array}{r} 14. \quad 1\ 1\ 1 \\ \quad 1\ 0,\ 1\ 2\ 0 \\ \quad 1\ 2,\ 9\ 8\ 9 \\ + \quad 5\ 7\ 3\ 8 \\ \hline 2\ 8,\ 8\ 4\ 7 \end{array}$$

$$\begin{array}{r} 16. \quad 1 \\ \quad 3\ 6\ 5\ 4 \\ + \quad 2\ 7\ 0\ 0 \\ \hline 6\ 3\ 5\ 4 \end{array}$$

$$\begin{array}{r} 18. \quad 1\ 1\ 1 \\ \quad 4\ 5,\ 8\ 7\ 9 \\ + \quad 2\ 1,\ 7\ 8\ 6 \\ \hline 6\ 7,\ 6\ 6\ 5 \end{array}$$

$$\begin{array}{r} 20. \quad 1\ 1\ 1\ 1 \\ \quad 9\ 9,\ 9\ 9\ 9 \\ + \quad 1\ 1\ 2 \\ \hline 1\ 0\ 0,\ 1\ 1\ 1 \end{array}$$

$$\begin{array}{r} 2 \\ 38 \\ 27 \\ 32 \\ 14 \\ + 76 \\ \hline 187 \end{array}$$

$$\begin{array}{r} 1111 \\ 42,487 \\ 83,141 \\ + 36,712 \\ \hline 162,340 \end{array}$$

$$\begin{array}{r} 22 \\ 989 \\ 566 \\ 834 \\ 920 \\ + 703 \\ \hline 4012 \end{array}$$

- 28.** Perimeter = 14 mi + 13 mi + 8 mi + 10 mi + 47 mi + 22 mi

We carry out the addition.

$$\begin{array}{r} 2 \\ 14 \\ 13 \\ 8 \\ 10 \\ 47 \\ + 22 \\ \hline 114 \end{array}$$

The perimeter of the figure is 114 mi.

- 30.** Perimeter = 62 yd + 39 yd + 54 yd + 46 yd + 28 yd

We carry out the addition.

$$\begin{array}{r} 2 \\ 62 \\ 39 \\ 54 \\ 46 \\ + 28 \\ \hline 229 \end{array}$$

The perimeter of the figure is 229 yd.

- 32.** 90 ft + 90 ft + 90 ft + 90 ft = Perimeter

We carry out the addition.

$$\begin{array}{r} 90 \\ 90 \\ 90 \\ + 90 \\ \hline 360 \end{array}$$

The batter travels 360 ft when a home run is hit.

- 34.** Nine billion, three hundred forty-six million, three hundred ninety-nine thousand, four hundred sixty-eight

Exercise Set 1.3

RC2. subtraction symbol

RC4. difference

$$\begin{array}{r} 87 \\ - 34 \\ \hline 53 \end{array}$$

$$\begin{array}{r} 526 \\ - 323 \\ \hline 203 \end{array}$$

$$\begin{array}{r} 613 \\ 7\cancel{3} \\ - 28 \\ \hline 45 \end{array}$$

$$\begin{array}{r} 514 \\ \cancel{6}\cancel{4} \\ - 19 \\ \hline 45 \end{array}$$

$$\begin{array}{r} 18 \\ 6\cancel{8}\cancel{15} \\ 7\cancel{9}\cancel{5} \\ - 398 \\ \hline 397 \end{array}$$

$$\begin{array}{r} 10 \\ 2\cancel{0}\cancel{16} \\ \cancel{3}\cancel{1}\cancel{6} \\ - 247 \\ \hline 69 \end{array}$$

$$\begin{array}{r} 17 \\ 7\cancel{7}\cancel{17} \\ \cancel{8}\cancel{8}\cancel{7} \\ - 698 \\ \hline 189 \end{array}$$

$$\begin{array}{r} 312 \\ 3\cancel{4}\cancel{2} \\ - 217 \\ \hline 125 \end{array}$$

$$\begin{array}{r} 1312 \\ 5\cancel{3}\cancel{2}\cancel{11} \\ \cancel{6}\cancel{4}\cancel{3}\cancel{1} \\ - 2896 \\ \hline 3535 \end{array}$$

$$\begin{array}{r} 1215 \\ 7\cancel{2}\cancel{5}\cancel{14} \\ \cancel{8}\cancel{3}\cancel{6}\cancel{4} \\ - 5375 \\ \hline 2989 \end{array}$$

$$\begin{array}{r} 1113 \\ 8\cancel{1}\cancel{3}\cancel{11} \\ \cancel{9}\cancel{2}\cancel{4}\cancel{1} \\ - 5643 \\ \hline 3598 \end{array}$$

$$\begin{array}{r} 6 \ 15 \\ 24. \quad \overline{7 \cancel{5} 8 3} \\ - \quad 3 \ 6 \ 4 \ 1 \\ \hline 3 \ 9 \ 4 \ 2 \end{array}$$

$$\begin{array}{r} 11 \ 11 \\ 26. \quad \overline{1 \cancel{6} \cancel{2} \cancel{2} \cancel{2}} \\ - \quad 5 \ 8 \ 8 \ 8 \\ \hline 1 \ 0 \ 3 \ 3 \ 4 \end{array}$$

$$\begin{array}{r} 11 \\ 28. \quad \overline{\cancel{2} \cancel{2} \cancel{1} \cancel{9} \cancel{4}} \\ - \quad 2 \ 9 \ 2 \ 3 \ 6 \\ \hline 2 \ 9 \ 5 \ 8 \end{array}$$

$$\begin{array}{r} 8 \ 10 \\ 30. \quad \overline{\cancel{9} \cancel{0}} \\ - \quad 7 \ 8 \\ \hline 1 \ 2 \end{array}$$

$$\begin{array}{r} 7 \ 9 \ 13 \\ 32. \quad \overline{\cancel{8} \cancel{0} 3} \\ - \quad 4 \ 1 \ 8 \\ \hline 3 \ 8 \ 5 \end{array}$$

$$\begin{array}{r} 3 \ 9 \ 15 \\ 34. \quad \overline{9 \cancel{4} \cancel{0} \cancel{5}} \\ - \quad 2 \ 5 \ 8 \\ \hline 9 \ 1 \ 4 \ 7 \end{array}$$

$$\begin{array}{r} 14 \\ 36. \quad \overline{\cancel{6} \cancel{4} \cancel{9} \cancel{0}} \\ - \quad 3 \ 6 \ 0 \ 4 \\ \hline 3 \ 8 \ 9 \ 6 \end{array}$$

$$\begin{array}{r} 6 \ 9 \ 13 \\ 38. \quad \overline{8 \ 4, \cancel{7} \cancel{0} \cancel{3}} \\ - \quad 2 \ 9 \ 8 \\ \hline 8 \ 4, \ 4 \ 0 \ 5 \end{array}$$

$$\begin{array}{r} 14 \\ 40. \quad \overline{\cancel{1} \cancel{5}, \cancel{0} \cancel{1} \cancel{7}} \\ - \quad 7 \ 8 \ 0 \ 9 \\ \hline 7 \ 2 \ 0 \ 8 \end{array}$$

$$\begin{array}{r} 7 \ 9 \ 9 \ 13 \\ 42. \quad \overline{\cancel{8} \cancel{0} \cancel{0} \cancel{3}} \\ - \quad 5 \ 9 \ 9 \\ \hline 7 \ 4 \ 0 \ 4 \end{array}$$

$$\begin{array}{r} 6 \ 9 \ 9 \ 10 \\ 44. \quad \overline{1 \cancel{7}, \cancel{0} \cancel{0} \cancel{0}} \\ - \quad 1 \ 1, \ 5 \ 9 \ 8 \\ \hline 5 \ 4 \ 0 \ 2 \end{array}$$

$$\begin{array}{r} 3 \ 9 \ 9 \ 9 \ 16 \\ 46. \quad \overline{\cancel{4} \cancel{0}, \cancel{0} \cancel{0} \cancel{0}} \\ - \quad 1 \ 4 \ 7 \\ \hline 3 \ 9, \ 8 \ 5 \ 9 \end{array}$$

$$\begin{array}{r} 2 \ 9 \ 9 \ 9 \ 14 \\ 48. \quad \overline{\cancel{3} \cancel{0}, \cancel{0} \cancel{0} \cancel{4}} \\ - \quad 6 \ 7 \ 4 \ 9 \\ \hline 2 \ 3, \ 2 \ 5 \ 5 \end{array}$$

$$\begin{array}{r} 50. \quad 9 \ 0 \ 1 \\ + \quad 2 \ 3 \\ \hline 9 \ 2 \ 4 \end{array}$$

$$\begin{array}{r} 1 \\ 52. \quad 9 \ 9 \ 0 \ 9 \\ + \quad 1 \ 0 \ 1 \ 1 \\ \hline 1 \ 0, \ 9 \ 2 \ 0 \end{array}$$

54. 9 thousands + 1 hundred + 0 tens + 3 ones, or 9 thousands + 1 hundred + 3 ones

56. 3,928,124 - 1,098,947

Using a calculator to carry out the subtraction, we find that the difference is 2,829,177.

Exercise Set 1.4

RC2. In the multiplication $4 \times 3 = 12$, 12 is the product.

RC4. The product of 1 and any number a is a .

$$\begin{array}{r} 2 \\ 2. \quad \overline{8 \ 7} \\ \times \quad 4 \\ \hline 3 \ 4 \ 8 \end{array}$$

$$\begin{array}{r} 5 \\ 4. \quad \overline{7 \ 6} \\ \times \quad 9 \\ \hline 6 \ 8 \ 4 \end{array}$$

$$\begin{array}{r} 4 \\ 6. \quad \overline{8 \ 0 \ 6} \\ \times \quad 7 \\ \hline 5 \ 6 \ 4 \ 2 \end{array}$$

$$\begin{array}{r} 3 \ 2 \ 2 \\ 8. \quad \overline{7 \ 8 \ 6 \ 7} \\ \times \quad 4 \\ \hline 3 \ 1, \ 4 \ 6 \ 8 \end{array}$$

$$\begin{array}{r} 4 \\ 10. \quad \overline{7 \ 8} \\ \times \quad 6 \ 0 \\ \hline 4 \ 6 \ 8 \ 0 \end{array}$$

$$\begin{array}{r} 2 \\ 12. \quad \overline{8 \ 7} \\ \times \quad 3 \ 4 \\ \hline 3 \ 4 \ 8 \\ 2 \ 6 \ 1 \ 0 \\ \hline 2 \ 9 \ 5 \ 8 \end{array}$$

$$\begin{array}{r} 2 \ 3 \ 4 \ 0 \\ 14. \quad \overline{ \times 1 \ 0 \ 0 \ 0} \\ \hline 2, \ 3 \ 4 \ 0, \ 0 \ 0 \ 0 \end{array}$$

$$\begin{array}{r} 8 \ 0 \ 0 \\ 16. \quad \overline{ \times 7 \ 0 \ 0} \\ \hline 5 \ 6 \ 0, \ 0 \ 0 \ 0 \end{array}$$

$$\begin{array}{r}
 18. \quad \begin{array}{r}
 \begin{array}{r}
 54 \\
 54 \\
 777 \\
 \times 77 \\
 \hline
 5439 \\
 54390 \\
 \hline
 59,829
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 20. \quad \begin{array}{r}
 \begin{array}{r}
 37 \\
 37 \\
 549 \\
 \times 88 \\
 \hline
 4392 \\
 43920 \\
 \hline
 48,312
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 22. \quad \begin{array}{r}
 \begin{array}{r}
 21 \\
 11 \\
 432 \\
 \times 375 \\
 \hline
 2160 \\
 30240 \\
 129600 \\
 \hline
 162,000
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 24. \quad \begin{array}{r}
 \begin{array}{r}
 23 \\
 23 \\
 45 \\
 346 \\
 \times 659 \\
 \hline
 3114 \\
 17300 \\
 207600 \\
 \hline
 228,014
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 26. \quad \begin{array}{r}
 \begin{array}{r}
 22 \\
 615 \\
 11 \\
 8928 \\
 \times 3172 \\
 \hline
 17856 \\
 624960 \\
 892800 \\
 26784000 \\
 \hline
 28,319,616
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 28. \quad \begin{array}{r}
 \begin{array}{r}
 24 \\
 24 \\
 13 \\
 6408 \\
 \times 6064 \\
 \hline
 25632 \\
 384480 \\
 38448000 \\
 \hline
 38,858,112
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 30. \quad \begin{array}{r}
 \begin{array}{r}
 11 \\
 44 \\
 44 \\
 355 \\
 \times 299 \\
 \hline
 3195 \\
 31950 \\
 71000 \\
 \hline
 106,145
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 32. \quad \begin{array}{r}
 \begin{array}{r}
 1 \\
 2 \\
 2 \\
 41 \\
 6521 \\
 \times 3449 \\
 \hline
 58689 \\
 260840 \\
 2608400 \\
 19563000 \\
 \hline
 22,490,929
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 34. \quad \begin{array}{r}
 \begin{array}{r}
 34 \\
 44 \\
 4506 \\
 \times 7800 \\
 \hline
 3604800 \\
 31542000 \\
 \hline
 35,146,800
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 36. \quad \begin{array}{r}
 \begin{array}{r}
 1 \\
 2 \\
 6009 \\
 \times 2003 \\
 \hline
 18027 \\
 12018000 \\
 \hline
 12,036,027
 \end{array}
 \end{array}
 \end{array}$$

$$38. A = l \times w = 129 \text{ yd} \times 65 \text{ yd} = 8385 \text{ sq yd}$$

$$40. A = l \times w = 200 \text{ ft} \times 85 \text{ ft} = 17,000 \text{ sq ft}$$

$$\begin{array}{r}
 42. \quad \begin{array}{r}
 \begin{array}{r}
 122 \\
 9876 \\
 876 \\
 76 \\
 + \\
 6 \\
 \hline
 10,834
 \end{array}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 44. \quad \begin{array}{r}
 \begin{array}{r}
 13 \\
 2810818 \\
 340,798 \\
 - 86,679 \\
 \hline
 254,119
 \end{array}
 \end{array}
 \end{array}$$

$$46. 0$$

$$48. \text{ Seven million, four hundred thirty-two thousand}$$

Exercise Set 1.5

RC2. dividend

RC4. divisor

2. $54 \div 9 = 6$ because $54 = 9 \cdot 6$.

4. $\frac{37}{37} = 1$ Any nonzero number divided by itself is 1.

6. $\frac{56}{1} = 56$ Any number divided by 1 is that same number.

8. $\frac{0}{32} = 0$ Zero divided by any nonzero number is 0.

10. $74 \div 0$ is not defined, because division by 0 is not defined.

12. $\frac{20}{4} = 5$ because $20 = 4 \cdot 5$.

$$\begin{array}{r}
 14. \quad 3 \overline{) 699} \\
 \underline{6} \\
 9 \\
 \underline{9} \\
 0
 \end{array}$$

The answer is 233.

$$\begin{array}{r}
 16. \quad 8 \overline{) 869} \\
 \underline{8} \\
 6 \\
 \underline{6} \\
 0
 \end{array}$$

The answer is 108 R 5.

$$\begin{array}{r}
 18. \quad 3 \overline{) 2124} \\
 \underline{21} \\
 2 \\
 \underline{2} \\
 0
 \end{array}$$

The answer is 708.

$$\begin{array}{r}
 20. \quad 9 \overline{) 9110} \\
 \underline{9} \\
 1 \\
 \underline{9} \\
 2 \\
 \underline{18} \\
 2
 \end{array}$$

The answer is 1012 R 2.

$$\begin{array}{r}
 22. \quad 2 \overline{) 389} \\
 \underline{2} \\
 1 \\
 \underline{18} \\
 9 \\
 \underline{8} \\
 1
 \end{array}$$

The answer is 194 R 1.

$$\begin{array}{r}
 24. \quad 6 \overline{) 881} \\
 \underline{6} \\
 2 \\
 \underline{24} \\
 4 \\
 \underline{36} \\
 5
 \end{array}$$

The answer is 146 R 5.

$$\begin{array}{r}
 26. \quad 3 \overline{) 6027} \\
 \underline{6} \\
 2 \\
 \underline{27} \\
 0
 \end{array}$$

The answer is 2009.

$$\begin{array}{r}
 28. \quad 8 \overline{) 4139} \\
 \underline{40} \\
 1 \\
 \underline{8} \\
 5 \\
 \underline{56} \\
 3
 \end{array}$$

The answer is 517 R 3.

$$\begin{array}{r}
 30. \quad 100 \overline{) 127000} \\
 \underline{100} \\
 2 \\
 \underline{200} \\
 7 \\
 \underline{700} \\
 0 \\
 \underline{0} \\
 0
 \end{array}$$

The answer is 1270.

$$\begin{array}{r}
 32. \quad 10 \overline{) 4260} \\
 \underline{40} \\
 2 \\
 \underline{20} \\
 6 \\
 \underline{60} \\
 0 \\
 \underline{0} \\
 0
 \end{array}$$

The answer is 426.

$$\begin{array}{r}
 34. \quad 20 \overline{) 5798} \\
 \underline{40} \\
 1 \\
 \underline{179} \\
 160 \\
 \underline{198} \\
 180 \\
 \underline{18}
 \end{array}$$

The answer is 289 R 18.

$$\begin{array}{r}
 36. \quad 40 \overline{) 987} \\
 \underline{80} \\
 1 \\
 \underline{187} \\
 160 \\
 \underline{27}
 \end{array}$$

The answer is 24 R 27.

$$\begin{array}{r} 40 \\ 23 \overline{)942} \\ \underline{92} \\ 22 \end{array}$$

The answer is 40 R 22.

$$\begin{array}{r} 50 \\ 54 \overline{)2729} \\ \underline{270} \\ 29 \end{array}$$

The answer is 50 R 29.

$$\begin{array}{r} 55 \\ 102 \overline{)5612} \\ \underline{510} \\ 512 \\ \underline{510} \\ 2 \end{array}$$

The answer is 55 R 2.

$$\begin{array}{r} 107 \\ 7 \overline{)749} \\ \underline{7} \\ 49 \\ \underline{49} \\ 0 \end{array}$$

The answer is 107.

$$\begin{array}{r} 808 \\ 9 \overline{)7273} \\ \underline{72} \\ 73 \\ \underline{72} \\ 1 \end{array}$$

The answer is 808 R 1.

$$\begin{array}{r} 1010 \\ 7 \overline{)7074} \\ \underline{70} \\ 7 \\ \underline{7} \\ 4 \end{array}$$

The answer is 1010 R 4.

$$\begin{array}{r} 301 \\ 24 \overline{)7242} \\ \underline{72} \\ 42 \\ \underline{24} \\ 18 \end{array}$$

The answer is 301 R 18.

$$\begin{array}{r} 102 \\ 48 \overline{)4899} \\ \underline{48} \\ 99 \\ \underline{96} \\ 3 \end{array}$$

The answer is 102 R 3.

$$\begin{array}{r} 210 \\ 36 \overline{)7563} \\ \underline{72} \\ 36 \\ \underline{36} \\ 3 \end{array}$$

The answer is 210 R 3.

$$\begin{array}{r} 803 \\ 36 \overline{)28929} \\ \underline{288} \\ 129 \\ \underline{108} \\ 21 \end{array}$$

The answer is 803 R 21.

$$\begin{array}{r} 984 \\ 90 \overline{)88560} \\ \underline{810} \\ 756 \\ \underline{720} \\ 360 \\ \underline{360} \\ 0 \end{array}$$

The answer is 984.

$$\begin{array}{r} 2904 \\ 306 \overline{)888888} \\ \underline{612} \\ 2768 \\ \underline{2754} \\ 1488 \\ \underline{1224} \\ 264 \end{array}$$

The answer is 2904 R 264.

$$\begin{array}{r} 7002 \\ 803 \overline{)5622606} \\ \underline{5621} \\ 1606 \\ \underline{1606} \\ 0 \end{array}$$

The answer is 7002.

$$\begin{array}{r} 88,777 \\ - 22,333 \\ \hline 66,444 \end{array}$$

$$\begin{array}{r} 268 \\ \times 35 \\ \hline 1340 \\ 8040 \\ \hline 9380 \end{array}$$

$$68. A = l \times w = 11 \text{ ft} \times 9 \text{ ft} = 99 \text{ sq ft}$$

70. Pairs of factors whose product is 36 are:

1 and 36
2 and 18
3 and 12
4 and 9
6 and 6

- a) The pair above whose sum is 13 is 4 and 9.
b) The pair above whose difference is 0 is 6 and 6.
c) The pair above whose sum is 20 is 2 and 18.
d) The pair above whose difference is 9 is 3 and 12.

72. $34,584,132 \div 76 \underline{\hspace{1cm}} = 4 \underline{\hspace{1cm}}, 386$

Consider the related multiplication sentence:

$$4 \underline{\hspace{1cm}}, 386 \cdot 76 \underline{\hspace{1cm}} = 34,584,132$$

Since the ones digit of the product is 2, the missing ones digit must be either 2 or 7 ($6 \cdot 2 = 12$ and $6 \cdot 7 = 42$).

We try 2:

$$34,584,132 \div 762 = 45,386$$

We see that the missing ones digit is 2 and the missing thousands digit is 5.

Chapter 1 Mid-Chapter Review

- The statement is false. For example, $8 - 5 = 3$, but 5 is not equal to $8 + 3$.
- The statement is true. See page 19 in the text.
- The statement is true. See page 19 in the text.
- The statement is false. For example, $3 \cdot 0 = 0$ and 0 is not greater than 3. Also, $1 \cdot 1 = 1$ and 1 is not greater than 1.
- It is true that zero divided by any nonzero number is 0.
- The statement is false. Any number divided by 1 is the number itself. For example, $\frac{27}{1} = 27$.

- 7.
- | | | | |
|----------------------------|-----|------|-----|
| | 95, | 406, | 237 |
| Ninety-five million, | ↑ | ↑ | ↑ |
| four hundred six thousand, | ↑ | ↑ | ↑ |
| two hundred thirty-seven | ↑ | ↑ | ↑ |

8.

$$\begin{array}{r} ^5 ^9 ^{14} \\ \cancel{6} \cancel{0} \cancel{4} \\ - 497 \\ \hline 107 \end{array}$$

9. $2 \boxed{6} 98$

The digit 6 names the number of hundreds.

10. $\boxed{6} 1,204$

The digit 6 names the number of ten thousands.

11. $14 \boxed{6}, 237$

The digit 6 names the number of thousands.

12. $58 \boxed{6}$

The digit 6 names the number of ones.

13. $306, 458, 1 \boxed{2} 9$

The digit 2 names the number of tens.

14. $30 \boxed{6}, 458, 129$

The digit 6 names the number of millions.

15. $306, 4 \boxed{5} 8, 129$

The digit 5 names the number of ten thousands.

16. $306, 458, \boxed{1} 29$

The digit 1 names the number of hundreds.

17. $5602 = 5 \text{ thousands} + 6 \text{ hundreds} + 0 \text{ tens} + 2 \text{ ones}$, or $5 \text{ thousands} + 6 \text{ hundreds} + 2 \text{ ones}$

18. $69,345 = 6 \text{ ten thousands} + 9 \text{ thousands} + 3 \text{ hundreds} + 4 \text{ tens} + 5 \text{ ones}$

19. A word name for 136 is one hundred thirty-six.

20. A word name for 64,325 is sixty-four thousand, three hundred twenty-five.

21. Standard notation for three hundred eight thousand, seven hundred sixteen is 308,716.

22. Standard notation for four million, five hundred sixty-seven thousand, two hundred ninety-one is 4,567,291.

23.

$$\begin{array}{r} 316 \\ + 482 \\ \hline 798 \end{array}$$

24.

$$\begin{array}{r} ^1 ^1 \\ 593 \\ + 437 \\ \hline 1030 \end{array}$$

25.

$$\begin{array}{r} ^1 ^1 \\ 2638 \\ + 5284 \\ \hline 7922 \end{array}$$

26.

$$\begin{array}{r} ^1 ^1 ^1 \\ 4617 \\ 2436 \\ + 481 \\ \hline 7534 \end{array}$$

27.

$$\begin{array}{r} 786 \\ - 321 \\ \hline 465 \end{array}$$

28.

$$\begin{array}{r} ^{11} \\ ^5 ^1 ^{14} \\ \cancel{6} \cancel{2} \cancel{4} \\ - 285 \\ \hline 339 \end{array}$$

29.

$$\begin{array}{r} ^{15} \\ ^2 ^5 ^9 ^{12} \\ \cancel{3} \cancel{6} \cancel{0} \cancel{2} \\ - 1748 \\ \hline 1854 \end{array}$$

$$\begin{array}{r} 49914 \\ 3004 \\ - 676 \\ \hline 4328 \end{array}$$

$$\begin{array}{r} 3 \\ 36 \\ \times 6 \\ \hline 216 \end{array}$$

$$\begin{array}{r} 11 \\ 55 \\ 567 \\ \times 28 \\ \hline 4536 \\ 11340 \\ \hline 15,876 \end{array}$$

$$\begin{array}{r} 2 \\ 1 \\ 3 \\ 407 \\ \times 325 \\ \hline 2035 \\ 8140 \\ 122100 \\ \hline 132,275 \end{array}$$

$$\begin{array}{r} 223 \\ 1 \\ 9435 \\ \times 602 \\ \hline 18870 \\ 5661000 \\ \hline 5,679,870 \end{array}$$

$$\begin{array}{r} 253 \\ 4 \overline{)1012} \\ \underline{8} \\ 21 \\ \underline{20} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

The answer is 253.

$$\begin{array}{r} 112 \\ 38 \overline{)4261} \\ \underline{38} \\ 46 \\ \underline{38} \\ 81 \\ \underline{76} \\ 5 \end{array}$$

The answer is 112 R 5.

$$\begin{array}{r} 23 \\ 60 \overline{)1399} \\ \underline{120} \\ 199 \\ \underline{180} \\ 19 \end{array}$$

The answer is 23 R 19.

$$\begin{array}{r} 144 \\ 56 \overline{)8095} \\ \underline{56} \\ 249 \\ \underline{224} \\ 255 \\ \underline{224} \\ 31 \end{array}$$

The answer is 144 R 31.

$$39. \text{ Perimeter} = 10 \text{ m} + 4 \text{ m} + 8 \text{ m} + 3 \text{ m} = 25 \text{ m}$$

$$40. A = 4 \text{ in.} \times 2 \text{ in.} = 8 \text{ sq in.}$$

41. When numbers are being added, it does not matter how they are grouped.

42. Subtraction is not commutative. For example, $5 - 2 = 3$, but $2 - 5 \neq 3$.

43. Answers will vary. Suppose one coat costs \$150. Then the multiplication $4 \cdot \$150$ gives the cost of four coats.

Suppose one ream of copy paper costs \$4. Then the multiplication $\$4 \cdot 150$ gives the cost of 150 reams.

44. Using the definition of division, $0 \div 0 = a$ such that $a \cdot 0 = 0$. We see that a could be *any* number since $a \cdot 0 = 0$ for any number a . Thus, we cannot say that $0 \div 0 = 0$. This is why we agree not to allow division by 0.

Exercise Set 1.6

RC2. Because the digit in the hundreds place, 5, is 5 or higher, we round up. The statement is false.

RC4. The statement is true. See page 40 in the text.

2. 530

4. 8950

6. 50

8. 800

10. 900

12. 700

14. 4600

16. 198,400

18. 5000

20. 2000

22. 736,000

24. 6,713,000

$$\begin{array}{r} 62 \\ 97 \\ 46 \\ + 81 \\ \hline \end{array} \qquad \begin{array}{r} 60 \\ 100 \\ 50 \\ + 80 \\ \hline 290 \end{array}$$

$$\begin{array}{r} 28. \quad 673 \\ - 28 \\ \hline \end{array} \qquad \begin{array}{r} 670 \\ - 30 \\ \hline 640 \end{array}$$

$$\begin{array}{r} 30. \quad 41 \\ 21 \\ 55 \\ + 60 \\ \hline 177 \end{array} \qquad \begin{array}{r} 40 \\ 20 \\ 60 \\ + 60 \\ \hline 180 \end{array}$$

$$\begin{array}{r} 32. \quad 836 \\ 374 \\ 794 \\ + 938 \\ \hline 3947 \end{array} \qquad \begin{array}{r} 840 \\ 370 \\ 790 \\ + 940 \\ \hline 2940 \end{array}$$

3947 seems to be incorrect.

$$\begin{array}{r} 34. \quad 568 \\ 472 \\ 938 \\ + 402 \\ \hline \end{array} \qquad \begin{array}{r} 600 \\ 500 \\ 900 \\ + 400 \\ \hline 2400 \end{array}$$

$$\begin{array}{r} 36. \quad 9438 \\ - 2787 \\ \hline \end{array} \qquad \begin{array}{r} 9400 \\ - 2800 \\ \hline 6600 \end{array}$$

$$\begin{array}{r} 38. \quad 481 \\ 702 \\ 623 \\ + 1043 \\ \hline 1849 \end{array} \qquad \begin{array}{r} 500 \\ 700 \\ 600 \\ + 1000 \\ \hline 2800 \end{array}$$

1849 seems to be incorrect.

$$\begin{array}{r} 40. \quad 326 \\ 275 \\ 758 \\ + 943 \\ \hline 2302 \end{array} \qquad \begin{array}{r} 300 \\ 300 \\ 800 \\ + 900 \\ \hline 2300 \end{array}$$

$$\begin{array}{r} 42. \quad 7648 \\ 9348 \\ 7842 \\ + 2222 \\ \hline \end{array} \qquad \begin{array}{r} 8000 \\ 9000 \\ 8000 \\ + 2000 \\ \hline 27,000 \end{array}$$

$$\begin{array}{r} 44. \quad 84,890 \\ - 11,110 \\ \hline \end{array} \qquad \begin{array}{r} 85,000 \\ - 11,000 \\ \hline 74,000 \end{array}$$

$$\begin{array}{r} 46. \quad 51 \\ \times 78 \\ \hline \end{array} \qquad \begin{array}{r} 50 \\ \times 80 \\ \hline 4000 \end{array}$$

$$\begin{array}{r} 48. \quad 63 \\ \times 54 \\ \hline \end{array} \qquad \begin{array}{r} 60 \\ \times 50 \\ \hline 3000 \end{array}$$

$$\begin{array}{r} 50. \quad 355 \\ \times 299 \\ \hline \end{array} \qquad \begin{array}{r} 400 \\ \times 300 \\ \hline 120,000 \end{array}$$

$$\begin{array}{r} 52. \quad 789 \\ \times 434 \\ \hline \end{array} \qquad \begin{array}{r} 800 \\ \times 400 \\ \hline 320,000 \end{array}$$

$$54. 454 \div 87 \approx 450 \div 90 = 5$$

$$56. 1263 \div 29 \approx 1260 \div 30 = 42$$

$$58. 3641 \div 571 \approx 3600 \div 600 = 6$$

$$60. 32,854 \div 748 \approx 32,900 \div 700 = 47$$

$$\begin{array}{r} 62. \quad \$686 \\ 95 \\ + 199 \\ \hline \end{array} \qquad \begin{array}{r} \$700 \\ 100 \\ + 200 \\ \hline \$1000 \end{array}$$

$$\begin{array}{r} 64. \quad \$536 \\ 289 \\ 95 \\ 130 \\ + 199 \\ \hline \end{array} \qquad \begin{array}{r} \$500 \\ 300 \\ 100 \\ 100 \\ + 200 \\ \hline \$1200 \end{array}$$

Alyssa's budget covers her choices.

66. Answers will vary depending on the options chosen.

68. a) Total cost of attending:

$$\$250 \cdot 490 = \$122,500$$

Total cost of hotel rooms:

$$\$170 \cdot 2 \cdot 320 = \$108,800$$

Total amount spent:

$$\$122,500 + \$108,800 = \$231,300$$

b) Total cost of attending:

$$\$200 \cdot 500 = \$100,000$$

Total cost of hotel rooms:

$$\$200 \cdot 2 \cdot 300 = \$120,000$$

Total amount spent:

$$\$100,000 + \$120,000 = \$220,000$$

$$70. \$2211 \div \$11 \approx \$2200 \div \$10 = 220 \text{ boxes}$$

$$72. 32 > 0$$

$$74. 28 > 18$$

$$76. 77 < 117$$

$$78. 999 > 997$$

$$80. 345 < 456$$

$$82. 12 < 32$$

$$84. 4,134,519 > 1,532,623, \text{ or } 1,532,623 < 4,134,519$$

$$86. 82 > 77, \text{ or } 77 < 82$$

$$\begin{array}{r} 88. \quad 9002 \\ + 4587 \\ \hline 13,589 \end{array}$$

$$\begin{array}{r} 90. \quad 89912 \\ - 9002 \\ \hline 89,010 \end{array}$$

$$\begin{array}{r}
 3 \\
 4 \\
 92. \quad 306 \\
 \times 58 \\
 \hline
 2448 \\
 15300 \\
 \hline
 17,748
 \end{array}$$

$$\begin{array}{r}
 208 \\
 94. \quad 23 \overline{)4784} \\
 \underline{46} \\
 184 \\
 \underline{184} \\
 0
 \end{array}$$

The answer is 208.

96. 27,060; this is close to the estimated sum found in Exercise 42.

98. 73,780; this is close to the estimated difference found in Exercise 44.

Exercise Set 1.7

RC2. (a)

RC4. (b)

2. 25

4. 8

6. $t = 5678 + 9034 = 14,712$

8. $m = 9007 - 5667 = 3340$

10. $z = 34 \cdot 15 = 510$

12. $w = 256 \div 16 = 16$

14. $t = 22 - 15 = 7$

16. $t = 16 - 16 = 0$

18. $x = 57 - 20 = 37$

20. $w = 53 - 17 = 36$

22. $x = \frac{42}{6} = 7$

24. $m = \frac{162}{9} = 18$

26. $y = \frac{96}{4} = 24$

28. $t = \frac{741}{3} = 247$

30. $y = 9281 - 8322 = 959$

32. $p = 92 - 56 = 36$

34. $y = 23 \times 78 = 1794$

36. $z = 133 - 67 = 66$

38. $w = \frac{3404}{4} = 851$

40. $x = 807 - 438 = 369$

42. $q = 10,534 \div 458 = 23$

44. $x = \frac{6080}{19} = 320$

46. $x = \frac{1500}{20} = 75$

48. $t = 9281 - 8322 = 959$

50. $n = 3004 - 1745 = 1259$

52. $n = \frac{660}{12} = 55$

54. $x = \frac{22,135}{233} = 95$

56. $z = 512 - 63 = 449$

$$\begin{array}{r}
 142 \\
 58. \quad 9 \overline{)1278} \\
 \underline{9} \\
 37 \\
 \underline{36} \\
 18 \\
 \underline{18} \\
 0
 \end{array}$$

The answer is 142.

$$\begin{array}{r}
 334 \\
 60. \quad 17 \overline{)5689} \\
 \underline{51} \\
 58 \\
 \underline{51} \\
 79 \\
 \underline{68} \\
 11
 \end{array}$$

The answer is 334 R 11.

62. $342 > 339$

64. $0 < 11$

66. 6,375,600

68. $x = \frac{14,332,388}{48,916} = 293$

Exercise Set 1.8

RC2. Translate.

RC4. Check.

2. Let h = the number of feet by which the height of the Grollo Tower would have exceeded the height of the Miglin-Beitler Skyneedle.

Solve: $2001 + h = 2224$

$h = 223$ ft

4. Let h = the height of the Burj Khalifa, in feet.

Solve: $h + 1883 = 4600$

$h = 2717$ ft

6. Let c = the number of milligrams of caffeine in a 20-oz bottle of Coca Cola.
Solve: $25 + 32 = c$
 $c = 57$ milligrams
8. Let n = the number of entries in each row.
Solve: $504 \div 36 = n$
 $n = 14$ entries
10. Let r = the number of active rotary oil rigs in 2007.
Solve: $r + 687 = 984$
 $r = 297$ rigs
12. Let n = the number of miles by which the length of the Nile exceeds the length of the Missouri-Mississippi.
Solve: $3860 + n = 4135$
 $n = 275$ mi
14. Let p = the total number of squares in the puzzle.
Solve: $15 \cdot 15 = p$
 $p = 225$ squares
16. Let m = the number of minutes in a day.
Solve: $60 \cdot 24 = m$
 $m = 1440$ minutes
18. Let r = the amount by which the average monthly rent in Atlanta exceeds the average monthly rent in Phoenix.
Solve: $625 + r = 846$
 $r = \$221$ per month
20. Let r = the amount of rent each sister pays.
Solve: $2r = 1030$
 $r = \$515$ per month
22. Let r = the amount of rent a tenant would pay for a one-bedroom apartment, on average, in Seattle during a 6-month period.
Solve: $6 \cdot 1303 = r$
 $r = \$7818$
24. Let s = the speed limit for trucks.
Solve: $s + 10 = 75$
 $s = 65$ mph
26. Let q = the number of quires in a ream.
Solve: $25 \cdot q = 500$
 $q = 20$ quires
28. Let s = the amount by which spending by visitors to the United States exceeded spending by Americans traveling abroad.
Solve: $110,200,000,000 + s = 153,000,000,000$
 $s = \$42,800,000,000$
30. Let c = the total cost of the purchase.
Solve: $96 \cdot 88 = c$
 $c = \$8448$
32. Let w = the number of full weeks that will pass before the station must begin re-airing episodes.
Solve: $5 \cdot w = 208$
 $w = 41$ R 3, so 41 full weeks will pass and 3 episodes will be shown the following week before previously aired episodes are rerun.
34. Let l = the number of labels on each sheet.
Solve: $25 \cdot l = 750$
 $l = 30$ labels
36. Let g = the number of gallons required for 3465 mi of city driving.
Solve: $3465 \div 21 = g$
 $g = 165$ gal
38. a) Let A = the area of the court, in square feet.
Solve: $A = 94 \cdot 50$
 $A = 4700$ square feet
b) Let P = the perimeter of the court, in feet.
Solve: $P = 94 + 50 + 94 + 50$
 $P = 288$ ft
c) Let a = the amount by which the area of a college court exceeds the area of a high school court, in square feet.
Solve: $4200 + a = 4700$
 $a = 500$ square feet
40. Let c = the number of cartons needed.
Solve: $528 \div 12 = c$
 $c = 44$ cartons
42. Let m = the distance on the map, in inches, between two cities that, in reality, are 2016 mi apart.
Solve: $2016 \div 288 = m$
 $m = 7$ in.
Let r = the distance in miles, in reality, between two cities that are 8 in. apart on the map.
Solve: $288 \cdot 8 = r$
 $r = 2304$ mi
44. Let m = the number of months required to pay off the loan.
Solve: $7824 \div 163 = m$
 $m = 48$ months
46. Let n = the number of 100's in 3500.
Solve: $3500 \div 100 = n$
 $n = 35$

Let t = the number of minutes you must bicycle in order to lose one pound.

Solve: $t = 35 \cdot 15$

$t = 525$ min; we could also express this as 8 hr, 45 min.

48. Let n = the number of new jobs that will be created for postsecondary teachers and elementary teachers.

$n = 305,700 + 248,800 = 554,500$

Let s = the number of new jobs that will be created for secondary teachers.

Solve: $s + 484,600 = 554,500$

$s = 69,900$ jobs

50. Let F = the number of seats in first class, E = the number of seats in economy class, and T = the total number of seats.

Solve: $3 \cdot 4 = F$, $21 \cdot 6 = E$, and $T = F + E$

$F = 12$, $E = 126$, $T = 12 + 126 = 138$ seats

52. Let c = the total cost of the 5 video games.

Solve: $5 \cdot 64 = c$

$c = \$320$

Then let n = the number of \$20 bills required.

Solve: $320 \div 20 = n$

$n = 16$ \$20 bills

54. Let b = the new balance.

Solve: $749 - 34 - 65 + 123 = b$

$b = \$773$

56. Let l = the total length of the bookshelves, in feet.

Solve: $6 \cdot 3 = l$

$l = 18$ ft

Since the total length of the bookshelves is greater than 16 ft, the shelves cannot be put side by side on the 16-ft wall.

$$\begin{array}{r} 15 \\ 8 \cancel{5} 9 12 \\ 9 \cancel{6} \cancel{0} \cancel{2} \\ - 1 8 4 3 \\ \hline 7 7 5 9 \end{array}$$

$$\begin{array}{r} 147 \\ 32 \overline{)4708} \\ \underline{32} \\ 150 \\ \underline{128} \\ 228 \\ \underline{224} \\ 4 \end{array}$$

The answer is 147 R 4.

62. $A = l \times w = 211 \text{ ft} \times 46 \text{ ft} = 9706 \text{ sq ft}$

64. $x = 81 - 15 = 66$

66. Consider one student taking one class a “student-class unit.” Then let s = the total number of student-class units and p = the number of students taught by each instructor.

Solve: $1200 \cdot 5 = s$, $4 \cdot 30 = p$

$s = 6000$, $p = 120$

Now let n = the number of instructors.

Solve: $6000 \div 120 = n$

$n = 50$ instructors

Exercise Set 1.9

RC2. The expression 9^2 can be read “nine squared.”

RC4. To find the average of 7, 8, and 9, we add the numbers and divide the sum by 3.

2. 2^5

4. 13^3

6. 9^2

8. 1^4

10. 125

12. 64

14. 100,000

16. 64

18. $(12 + 6) + 18 = 18 + 18$
 $= 36$

20. $(52 - 40) - 8 = 12 - 8$
 $= 4$

22. $(1000 \div 100) \div 10 = 10 \div 10$
 $= 1$

24. $256 \div (64 \div 4) = 256 \div 16$
 $= 16$

26. $2^2 + 5^2 = 4 + 25$
 $= 29$

28. $(32 - 27)^3 + (19 + 1)^3 = 5^3 + 20^3$
 $= 125 + 8000$
 $= 8125$

30. $23 + 18 \cdot 20 = 23 + 360$
 $= 383$

32. $10 \cdot 7 - 4 = 70 - 4$
 $= 66$

34. $90 - 5 \cdot 5 \cdot 2 = 90 - 50$
 $= 40$

36. $8^2 - 8 \cdot 2 = 64 - 8 \cdot 2$
 $= 64 - 16$
 $= 48$

$$\begin{aligned} 38. \quad 1000 \div 25 - (15 + 5) &= 1000 \div 25 - 20 \\ &= 40 - 20 \\ &= 20 \end{aligned}$$

$$\begin{aligned} 40. \quad 3 \cdot 8 + 5 \cdot 8 &= 24 + 40 \\ &= 64 \end{aligned}$$

$$\begin{aligned} 42. \quad 144 \div 4 - 2 &= 36 - 2 \\ &= 34 \end{aligned}$$

$$\begin{aligned} 44. \quad 7 \cdot (10 - 3)^2 - 2 \cdot (3 + 1)^2 &= 7 \cdot 7^2 - 2 \cdot 4^2 \\ &= 7 \cdot 49 - 2 \cdot 16 \\ &= 343 - 32 \\ &= 311 \end{aligned}$$

$$\begin{aligned} 46. \quad 6^2 - 3^4 \div 3^3 &= 36 - 81 \div 27 \\ &= 36 - 3 \\ &= 33 \end{aligned}$$

$$\begin{aligned} 48. \quad 7^2 + 20 \cdot 4 - (28 + 9 \cdot 2) \\ &= 7^2 + 20 \cdot 4 - (28 + 18) \\ &= 7^2 + 20 \cdot 4 - 46 \\ &= 49 + 20 \cdot 4 - 46 \\ &= 49 + 80 - 46 \\ &= 83 \end{aligned}$$

$$\begin{aligned} 50. \quad 8 \times 9 - (12 - 8) \div 4 - (10 - 7) \\ &= 8 \times 9 - 4 \div 4 - 3 \\ &= 72 - 1 - 3 \\ &= 68 \end{aligned}$$

$$\begin{aligned} 52. \quad 80 - 2^4 \cdot 15 \div (7 \cdot 5 - 45 \div 3) \\ &= 80 - 2^4 \cdot 15 \div (35 - 15) \\ &= 80 - 2^4 \cdot 15 \div 20 \\ &= 80 - 16 \cdot 15 \div 20 \\ &= 80 - 240 \div 20 \\ &= 80 - 12 \\ &= 68 \end{aligned}$$

$$\begin{aligned} 54. \quad 2^7 \div 2^5 \cdot 2^4 \div 2^2 \\ &= 128 \div 32 \cdot 16 \div 4 \\ &= 4 \cdot 16 \div 4 \\ &= 64 \div 4 \\ &= 16 \end{aligned}$$

$$56. \quad \frac{86 + 92 + 80 + 78}{4} = \frac{336}{4} = 84$$

$$58. \quad \frac{\$1025 + \$775 + \$2062 + \$942 + \$3721}{5} = \frac{\$8525}{5} = \$1705$$

$$\begin{aligned} 60. \quad 72 \div 6 - \{2 \times [9 - (4 \times 2)]\} \\ &= 72 \div 6 - \{2 \times [9 - 8]\} \\ &= 72 \div 6 - \{2 \times 1\} \\ &= 72 \div 6 - 2 \\ &= 12 - 2 \\ &= 10 \end{aligned}$$

$$\begin{aligned} 62. \quad [92 \times (6 - 4) \div 8] + [7 \times (8 - 3)] \\ &= [92 \times 2 \div 8] + [7 \times 5] \\ &= [184 \div 8] + 35 \\ &= 23 + 35 \\ &= 58 \end{aligned}$$

$$\begin{aligned} 64. \quad (18 \div 2) \cdot \{[(9 \cdot 9 - 1) \div 2] - [5 \cdot 20 - (7 \cdot 9 - 2)]\} \\ &= 9 \cdot \{[(81 - 1) \div 2] - [5 \cdot 20 - (63 - 2)]\} \\ &= 9 \cdot \{[80 \div 2] - [5 \cdot 20 - 61]\} \\ &= 9 \cdot \{40 - [100 - 61]\} \\ &= 9 \cdot \{40 - 39\} \\ &= 9 \cdot \{1\} \\ &= 9 \end{aligned}$$

$$\begin{aligned} 66. \quad 15(23 - 4 \cdot 2)^3 \div (3 \cdot 25) \\ &= 15(23 - 8)^3 \div 75 \quad \text{Multiplying inside parentheses} \\ &= 15 \cdot 15^3 \div 75 \quad \text{Subtracting inside parentheses} \\ &= 15 \cdot 3375 \div 75 \quad \text{Evaluating the exponential expression} \\ &= 50,625 \div 75 \quad \text{Doing all multiplication and divisions in order from left to right} \\ &= 675 \end{aligned}$$

$$\begin{aligned} 68. \quad (19 - 2^4)^5 - (141 \div 47)^2 \\ &= (19 - 16)^5 - 3^2 \\ &= 3^5 - 3^2 \\ &= 243 - 9 \\ &= 234 \end{aligned}$$

$$70. \quad x = 5032 - 4197 = 835$$

$$72. \quad y = \frac{1554}{42} = 37$$

$$74. \quad t = \frac{10,000}{100} = 100$$

$$\begin{aligned} 76. \quad &\text{Let } g = \text{the total number of gallons of gasoline purchased.} \\ &\text{Solve: } 23 + 24 + 26 + 25 = g \\ &g = 98 \text{ gallons} \end{aligned}$$

$$\begin{aligned} 78. \quad 12 \div 4 + 2 \cdot 3 - 2 &= 3 + 6 - 2 \\ &= 7 \quad \text{Correct answer} \\ 12 \div (4 + 2) \cdot (3 - 2) &= 2 \end{aligned}$$

$$\begin{aligned} 80. \quad &\text{Answers may vary. One correct answer is} \\ &9 \cdot 8 + 7 \cdot 6 - 5 \cdot 4 + 3 \cdot 2 \cdot 1 = 100. \end{aligned}$$

Chapter 1 Vocabulary Reinforcement

1. The distance around an object is its perimeter.
2. The minuend is the number from which another number is being subtracted.
3. For large numbers, digits are separated by commas into groups of three, called periods.
4. In the sentence $28 \div 7 = 4$, the dividend is 28.
5. In the sentence $10 \times 1000 = 10,000$, 10 and 1000 are called factors and 10,000 is called the product.
6. The number 0 is called the additive identity.
7. The sentence $3 \times (6 \times 2) = (3 \times 6) \times 2$ illustrates the associative law of multiplication.
8. We can use the following rule to check division:
quotient \cdot divisor + remainder = dividend.

Chapter 1 Concept Reinforcement

- The statement is true. See page 42 in the text.
- $a \div a = \frac{a}{a} = 1$, $a \neq 0$; the statement is true.
- $a \div 0$ is not defined, so the statement is false.
- The statement is false. For example, $1 + 2 = 5$ is not a true equation.
- The statement is true. See page 71 in the text.
- The statement is false. See page 73 in the text.

Chapter 1 Study Guide

- 43 2, 079

The digit 2 names the number of thousands.

$$\begin{array}{r} 1 \quad 1 \quad 1 \\ 36,047 \\ + 29,255 \\ \hline 65,302 \end{array}$$

$$\begin{array}{r} 7 \quad 9 \quad 15 \\ 4 \cancel{8} \cancel{0} \cancel{5} \\ - 1568 \\ \hline 3237 \end{array}$$

$$\begin{array}{r} 2 \quad 1 \\ 1 \\ 7 \quad 3 \\ 684 \\ \times 329 \\ \hline 6156 \quad \text{Multiplying by 9} \\ 13680 \quad \text{Multiplying by 20} \\ 205200 \quad \text{Multiplying by 300} \\ \hline 225,036 \end{array}$$

$$\begin{array}{r} 315 \\ 27 \overline{)8519} \\ \underline{81} \\ 41 \\ \underline{27} \\ 149 \\ \underline{135} \\ 14 \end{array}$$

The answer is 315 R 14.

- Round 36,468 to the nearest thousand.

$$36, \boxed{4} 68$$

↑

The digit 6 is in the thousands place. Consider the next digit to the right. Since the digit, 4, is 4 or lower, round down, meaning that 6 thousands stays as 6 thousands. Then change the digits to the right of the thousands digit to zeros.

The answer is 36,000.

- Since 78 is to the left of 81 on the number line, $78 < 81$.

- $24 \cdot x = 864$

$$\frac{24 \cdot x}{24} = \frac{864}{24} \quad \text{Dividing by 24}$$

$$x = 36$$

$$\text{Check: } 24 \cdot x = 864$$

$$\begin{array}{r} 24 \cdot 36 \quad ? \quad 864 \\ 864 \quad | \quad \text{TRUE} \end{array}$$

The solution is 36.

- $6^3 = 6 \cdot 6 \cdot 6 = 216$

Chapter 1 Review Exercises

- 4, 67 8, 952

The digit 8 means 8 thousands.

- 1 3, 768,940

The digit 3 names the number of millions.

- $2793 = 2 \text{ thousands} + 7 \text{ hundreds} + 9 \text{ tens} + 3 \text{ ones}$

- $56,078 = 5 \text{ ten thousands} + 6 \text{ thousands} + 0 \text{ hundreds} + 7 \text{ tens} + 8 \text{ ones}$, or $5 \text{ ten thousands} + 6 \text{ thousands} + 7 \text{ tens} + 8 \text{ ones}$

- $4,007,101 = 4 \text{ millions} + 0 \text{ hundred thousands} + 0 \text{ ten thousands} + 7 \text{ thousands} + 1 \text{ hundred} + 0 \text{ tens} + 1 \text{ one}$, or $4 \text{ millions} + 7 \text{ thousands} + 1 \text{ hundred} + 1 \text{ one}$

- $$\begin{array}{r} 67,819 \\ \hline \end{array}$$

Sixty-seven thousand, eight hundred nineteen

- $$\begin{array}{r} 2,781,427 \\ \hline \end{array}$$

Two million, seven hundred eighty-one thousand, four hundred twenty-seven

- Four hundred seventy-six thousand, five hundred eighty-eight

Standard notation is $\begin{array}{r} 476,588 \end{array}$.

- One billion, six hundred forty million,

Standard notation is $\begin{array}{r} 1,640,000,000 \end{array}$.

$$\begin{array}{r} 1 \quad 1 \\ 7304 \\ + 6968 \\ \hline 14,272 \end{array}$$

$$\begin{array}{r} 11. \quad \begin{array}{r} 1 \ 1 \ 1 \\ 2 \ 7, \ 6 \ 0 \ 9 \\ + \ 3 \ 8, \ 4 \ 1 \ 5 \\ \hline 6 \ 6, \ 0 \ 2 \ 4 \end{array} \end{array}$$

$$\begin{array}{r} 12. \quad \begin{array}{r} 1 \ 1 \\ 2 \ 7 \ 0 \ 3 \\ 4 \ 1 \ 2 \ 5 \\ 6 \ 0 \ 0 \ 4 \\ + \ 8 \ 9 \ 5 \ 6 \\ \hline 2 \ 1, \ 7 \ 8 \ 8 \end{array} \end{array}$$

$$\begin{array}{r} 13. \quad \begin{array}{r} 1 \ 1 \\ 9 \ 1, \ 4 \ 2 \ 6 \\ + \ 7, \ 4 \ 9 \ 5 \\ \hline 9 \ 8, \ 9 \ 2 \ 1 \end{array} \end{array}$$

$$\begin{array}{r} 14. \quad \begin{array}{r} 13 \\ 7 \ 9 \ 3 \ 15 \\ \cancel{8 \ 0 \ 4 \ 5} \\ - \ 2 \ 8 \ 9 \ 7 \\ \hline 5 \ 1 \ 4 \ 8 \end{array} \end{array}$$

$$\begin{array}{r} 15. \quad \begin{array}{r} 8 \ 9 \ 9 \ 11 \\ \cancel{9 \ 0 \ 0 \ 1} \\ - \ 7 \ 3 \ 1 \ 2 \\ \hline 1 \ 6 \ 8 \ 9 \end{array} \end{array}$$

$$\begin{array}{r} 16. \quad \begin{array}{r} 5 \ 9 \ 9 \ 13 \\ \cancel{6 \ 0 \ 0 \ 3} \\ - \ 3 \ 7 \ 2 \ 9 \\ \hline 2 \ 2 \ 7 \ 4 \end{array} \end{array}$$

$$\begin{array}{r} 17. \quad \begin{array}{r} 16 \ 13 \\ 2 \ 6 \ 3 \ 9 \ 15 \\ \cancel{3 \ 7, \ 4 \ 0 \ 5} \\ - \ 1 \ 9, \ 6 \ 4 \ 8 \\ \hline 1 \ 7, \ 7 \ 5 \ 7 \end{array} \end{array}$$

$$\begin{array}{r} 18. \quad \begin{array}{r} 2 \\ 1 \ 7, \ 0 \ 0 \ 0 \\ \times \quad 3 \ 0 \ 0 \\ \hline 5, \ 1 \ 0 \ 0, \ 0 \ 0 \ 0 \end{array} \end{array}$$

Multiplying by 300
(Write 00 and then
multiply 17,000 by 3.)

$$\begin{array}{r} 19. \quad \begin{array}{r} 6 \ 3 \ 4 \\ 7 \ 8 \ 4 \ 6 \\ \times \quad 8 \ 0 \ 0 \\ \hline 6, \ 2 \ 7 \ 6, \ 8 \ 0 \ 0 \end{array} \end{array}$$

Multiplying by 800
(Write 00 and then
multiply 7846 by 8.)

$$\begin{array}{r} 20. \quad \begin{array}{r} 1 \ 3 \\ 2 \ 5 \\ 2 \ 4 \\ 7 \ 2 \ 6 \\ \times \ 6 \ 9 \ 8 \\ \hline 5 \ 8 \ 0 \ 8 \\ 6 \ 5 \ 3 \ 4 \ 0 \\ 4 \ 3 \ 5 \ 6 \ 0 \ 0 \\ \hline 5 \ 0 \ 6, \ 7 \ 4 \ 8 \end{array} \end{array}$$

Multiplying by 8

Multiplying by 90

Multiplying by 600

$$\begin{array}{r} 21. \quad \begin{array}{r} 3 \ 2 \\ 6 \ 4 \\ 5 \ 8 \ 7 \\ \times \quad 4 \ 7 \\ \hline 4 \ 1 \ 0 \ 9 \\ 2 \ 3 \ 4 \ 8 \ 0 \\ \hline 2 \ 7, \ 5 \ 8 \ 9 \end{array} \end{array}$$

Multiplying by 7
Multiplying by 40

$$\begin{array}{r} 22. \quad \begin{array}{r} 8 \ 3 \ 0 \ 5 \\ \times \quad 6 \ 4 \ 2 \\ \hline 1 \ 6 \ 6 \ 1 \ 0 \\ 3 \ 3 \ 2 \ 2 \ 0 \ 0 \\ 4 \ 9 \ 8 \ 3 \ 0 \ 0 \ 0 \\ \hline 5, \ 3 \ 3 \ 1, \ 8 \ 1 \ 0 \end{array} \end{array}$$

$$\begin{array}{r} 23. \quad \begin{array}{r} 1 \ 2 \\ 5 \overline{) 6 \ 3} \\ \underline{5} \\ 1 \ 3 \\ \underline{1 \ 0} \\ 3 \end{array} \end{array}$$

The answer is 12 R 3.

$$\begin{array}{r} 24. \quad \begin{array}{r} 5 \\ 1 \ 6 \overline{) 8 \ 0} \\ \underline{8 \ 0} \\ 0 \end{array} \end{array}$$

The answer is 5.

$$\begin{array}{r} 25. \quad \begin{array}{r} 9 \ 1 \ 3 \\ 7 \overline{) 6 \ 3 \ 9 \ 4} \\ \underline{6 \ 3} \\ 9 \\ \underline{7} \\ 2 \ 4 \\ \underline{2 \ 1} \\ 3 \end{array} \end{array}$$

The answer is 913 R 3.

$$\begin{array}{r} 26. \quad \begin{array}{r} 3 \ 8 \ 4 \\ 8 \overline{) 3 \ 0 \ 7 \ 3} \\ \underline{2 \ 4} \\ 6 \ 7 \\ \underline{6 \ 4} \\ 3 \ 3 \\ \underline{3 \ 2} \\ 1 \end{array} \end{array}$$

The answer is 384 R 1.

$$\begin{array}{r} 27. \quad \begin{array}{r} 4 \\ 6 \ 0 \overline{) 2 \ 8 \ 6} \\ \underline{2 \ 4 \ 0} \\ 4 \ 6 \end{array} \end{array}$$

The answer is 4 R 46.

$$\begin{array}{r} 28. \quad \begin{array}{r} 5 \ 4 \\ 7 \ 9 \overline{) 4 \ 2 \ 6 \ 6} \\ \underline{3 \ 9 \ 5} \\ 3 \ 1 \ 6 \\ \underline{3 \ 1 \ 6} \\ 0 \end{array} \end{array}$$

The answer is 54.

$$\begin{array}{r} 29. \quad \begin{array}{r} 4 \ 5 \ 2 \\ 3 \ 8 \overline{) 1 \ 7, \ 1 \ 7 \ 6} \\ \underline{1 \ 5 \ 2} \\ 1 \ 9 \ 7 \\ \underline{1 \ 9 \ 0} \\ 7 \ 6 \\ \underline{7 \ 6} \\ 0 \end{array} \end{array}$$

The answer is 452.

$$\begin{array}{r}
 5008 \\
 30. \quad 14 \overline{) 70,112} \\
 \underline{70} \\
 112 \\
 \underline{112} \\
 0
 \end{array}$$

The answer is 5008.

$$\begin{array}{r}
 4389 \\
 31. \quad 12 \overline{) 52,668} \\
 \underline{48} \\
 46 \\
 \underline{36} \\
 106 \\
 \underline{96} \\
 108 \\
 \underline{108} \\
 0
 \end{array}$$

The answer is 4389.

32. Round 345,759 to the nearest hundred.

$$\begin{array}{c}
 345,7\boxed{5}9 \\
 \uparrow
 \end{array}$$

The digit 7 is in the hundreds place. Consider the next digit to the right. Since the digit, 5, is 5 or higher, round 7 hundreds up to 8 hundreds. Then change the digits to the right of the hundreds digit to zero.

The answer is 345,800.

33. Round 345,759 to the nearest ten.

$$\begin{array}{c}
 345,75\boxed{9} \\
 \uparrow
 \end{array}$$

The digit 5 is in the tens place. Consider the next digit to the right. Since the digit, 9, is 5 or higher, round 5 tens up to 6 tens. Then change the digit to the right of the tens digit to zero.

The answer is 345,760.

34. Round 345,759 to the nearest thousand.

$$\begin{array}{c}
 345,\boxed{7}59 \\
 \uparrow
 \end{array}$$

The digit 5 is in the thousands place. Consider the next digit to the right. Since the digit, 7, is 5 or higher, round 5 thousands up to 6 thousands. Then change the digits to the right of the thousands digit to zero.

The answer is 346,000.

35. Round 345,759 to the nearest hundred thousand.

$$\begin{array}{c}
 3\boxed{4}5,759 \\
 \uparrow
 \end{array}$$

The digit 3 is in the hundred thousands place. Consider the next digit to the right. Since the digit, 4, is 4 or lower, round down, meaning that 3 hundred thousands stays as 3 hundred thousands. Then change the digits to the right of the hundred thousands digit to zero.

The answer is 300,000.

36. Since 67 is to the right of 56 on the number line, $67 > 56$.

37. Since 1 is to the left of 23 on the number line, $1 < 23$.

38. Rounded to the nearest hundred

$$\begin{array}{r}
 41,348 \\
 + 19,749 \\
 \hline
 61,097
 \end{array}
 \qquad
 \begin{array}{r}
 41,300 \\
 + 19,700 \\
 \hline
 61,000 \leftarrow \text{Estimated answer}
 \end{array}$$

39. Rounded to the nearest hundred

$$\begin{array}{r}
 38,652 \\
 - 24,549 \\
 \hline
 14,103
 \end{array}
 \qquad
 \begin{array}{r}
 38,700 \\
 - 24,500 \\
 \hline
 14,200 \leftarrow \text{Estimated answer}
 \end{array}$$

40. Rounded to the nearest hundred

$$\begin{array}{r}
 396 \\
 \times 748 \\
 \hline
 280,008
 \end{array}
 \qquad
 \begin{array}{r}
 400 \\
 \times 700 \\
 \hline
 280,000 \leftarrow \text{Estimated answer}
 \end{array}$$

41. $46 \cdot n = 368$

$$\begin{array}{r}
 46 \cdot n = 368 \\
 \underline{46} \\
 368 \\
 n = 8
 \end{array}$$

Check: $46 \cdot n = 368$

$$\begin{array}{r}
 46 \cdot 8 \stackrel{?}{=} 368 \\
 368 \mid \quad \text{TRUE}
 \end{array}$$

The solution is 8.

42. $47 + x = 92$

$$\begin{array}{r}
 47 + x - 47 = 92 - 47 \\
 x = 45
 \end{array}$$

Check: $47 + x = 92$

$$\begin{array}{r}
 47 + 45 \stackrel{?}{=} 92 \\
 92 \mid \quad \text{TRUE}
 \end{array}$$

The solution is 45.

43. $1 \cdot y = 58$

$$y = 58 \quad (1 \cdot y = y)$$

The number 58 checks. It is the solution.

44. $24 = x + 24$

$$\begin{array}{r}
 24 - 24 = x + 24 - 24 \\
 0 = x
 \end{array}$$

The number 0 checks. It is the solution.

45. Exponential notation for $4 \cdot 4 \cdot 4$ is 4^3 .

$$46. 10^4 = 10 \cdot 10 \cdot 10 \cdot 10 = 10,000$$

$$47. 6^2 = 6 \cdot 6 = 36$$

$$\begin{array}{r}
 48. \quad 8 \cdot 6 + 17 = 48 + 17 \quad \text{Multiplying} \\
 = 65 \quad \text{Adding}
 \end{array}$$

$$\begin{aligned}
 49. \quad & 10 \cdot 24 - (18 + 2) \div 4 - (9 - 7) \\
 & = 10 \cdot 24 - 20 \div 4 - 2 \quad \text{Doing the calculations} \\
 & \quad \quad \quad \text{inside the parentheses} \\
 & = 240 - 5 - 2 \quad \text{Multiplying and dividing} \\
 & = 235 - 2 \quad \text{Subtracting from} \\
 & = 233 \quad \text{left to right}
 \end{aligned}$$

$$\begin{aligned}
 50. \quad & (80 \div 16) \times [(20 - 56 \div 8) + (8 \cdot 8 - 5 \cdot 5)] \\
 & = 5 \times [(20 - 7) + (64 - 25)] \\
 & = 5 \times [13 + 39] \\
 & = 5 \times 52 \\
 & = 260
 \end{aligned}$$

51. We add the numbers and divide by the number of addends.

$$\frac{157 + 170 + 168}{3} = \frac{495}{3} = 165$$

52. **Familiarize.** Let x = the additional amount of money, in dollars, Natasha needs to buy the desk.

Translate.

$$\begin{array}{ccccccc}
 \text{Money} & & \text{plus} & & \text{Additional} & & \text{is} & & \text{Price} \\
 \text{available} & & & & \text{amount} & & & & \text{of desk} \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 196 & & + & & x & & = & & 698
 \end{array}$$

Solve. We subtract 196 on both sides of the equation.

$$\begin{aligned}
 196 + x &= 698 \\
 196 + x - 196 &= 698 - 196 \\
 x &= 502
 \end{aligned}$$

Check. We can estimate.

$$196 + 502 \approx 200 + 500 \approx 700 \approx 698$$

The answer checks.

State. Natasha needs \$502 dollars.

53. **Familiarize.** Let b = the balance in Toni's account after the deposit.

Translate.

$$\begin{array}{ccccccc}
 \text{Original balance} & & \text{plus} & & \text{Deposit} & & \text{is} & & \text{New balance} \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 406 & & + & & 78 & & = & & b
 \end{array}$$

Solve. We add on the left side.

$$\begin{aligned}
 406 + 78 &= b \\
 484 &= b
 \end{aligned}$$

Check. We can repeat the calculation. The answer checks.

State. The new balance is \$484.

54. **Familiarize.** Let y = the year in which the copper content of pennies was reduced.

$$\begin{array}{ccccccc}
 \text{Original} & & \text{plus} & & \text{73 yr} & & \text{is} & & \text{Year of} \\
 \text{year} & & & & & & & & \text{copper reduction} \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 1909 & & + & & 73 & & = & & y
 \end{array}$$

Solve. We add on the left side.

$$\begin{aligned}
 1909 + 73 &= y \\
 1982 &= y
 \end{aligned}$$

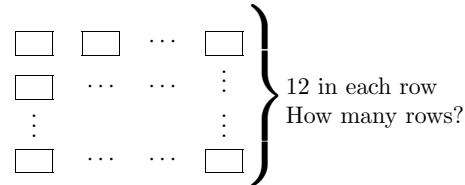
Check. We can estimate.

$$1909 + 73 \approx 1910 + 70 \approx 1980 \approx 1982$$

The answer checks.

State. The copper content of pennies was reduced in 1982.

55. **Familiarize.** We first make a drawing. Let c = the number of cartons filled.



Translate.

$$\begin{array}{ccccccc}
 \text{Number} & & \text{divided} & & \text{Number} & & \text{is} & & \text{Number} \\
 \text{of cans} & & \text{by} & & \text{per carton} & & & & \text{of cartons} \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 228 & & \div & & 12 & & = & & c
 \end{array}$$

Solve. We carry out the division.

$$\begin{array}{r}
 19 \\
 12 \overline{) 228} \\
 \underline{12} \\
 108 \\
 \underline{108} \\
 0
 \end{array}$$

Thus, $19 = c$, or $c = 19$.

Check. We can check by multiplying: $12 \cdot 19 = 228$. Our answer checks.

State. 19 cartons were filled.

56. **Familiarize.** This is a multistep problem. Let s = the cost of 13 stoves, r = the cost of 13 refrigerators, and t = the total cost of the stoves and refrigerators.

Translate.

$$\begin{array}{ccccccc}
 \text{Number} & & \text{times} & & \text{Price per} & & \text{is} & & \text{Total cost} \\
 \text{of stoves} & & & & \text{stove} & & & & \text{of stoves} \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 13 & & \cdot & & 425 & & = & & s \\
 \\
 \text{Number of} & & \text{times} & & \text{Price per} & & \text{is} & & \text{Total cost of} \\
 \text{refrigerators} & & & & \text{refrigerator} & & & & \text{refrigerators} \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 13 & & \cdot & & 620 & & = & & r \\
 \\
 \text{Cost of} & & \text{plus} & & \text{Cost of} & & \text{is} & & \text{Total cost} \\
 \text{stoves} & & & & \text{refrigerators} & & & & \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 s & & + & & r & & = & & t
 \end{array}$$

Solve. We first carry out the multiplications in the first two equations.

$$\begin{aligned}
 13 \cdot 425 &= s & 13 \cdot 620 &= r \\
 5525 &= s & 8060 &= r
 \end{aligned}$$

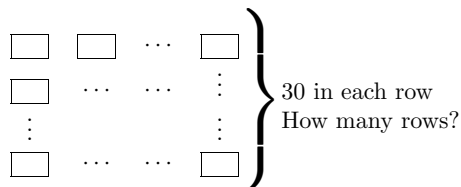
Now we substitute 5525 for s and 8060 for r in the third equation and then add on the left side.

$$\begin{aligned}s + r &= t \\ 5525 + 8060 &= t \\ 13,585 &= t\end{aligned}$$

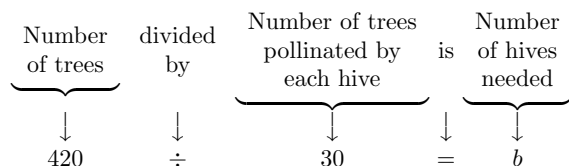
Check. We repeat the calculations. The answer checks.

State. The total cost was \$13,585.

- 57. Familiarize.** Let b = the number of beehives the farmer needs.



Translate.



Solve. We carry out the division.

$$\begin{array}{r} 14 \\ 30 \overline{) 420} \\ \underline{30} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Thus, $14 = b$, or $b = 14$.

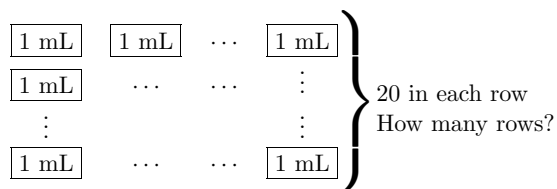
Check. We can check by multiplying: $30 \cdot 14 = 420$. The answer checks.

State. The farmer needs 14 beehives.

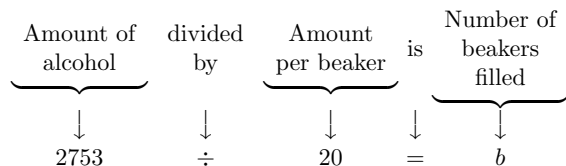
- 58.** $A = l \cdot w = 14 \text{ ft} \cdot 7 \text{ ft} = 98 \text{ square ft}$

$$\text{Perimeter} = 14 \text{ ft} + 7 \text{ ft} + 14 \text{ ft} + 7 \text{ ft} = 42 \text{ ft}$$

- 59. Familiarize.** We make a drawing. Let b = the number of beakers that will be filled.



Translate.



Solve. We carry out the division.

$$\begin{array}{r} 137 \\ 20 \overline{) 2753} \\ \underline{20} \\ 75 \\ \underline{60} \\ 153 \\ \underline{140} \\ 13 \end{array}$$

Thus, $137 \text{ R } 13 = b$.

Check. We can check by multiplying the number of beakers by 137 and then adding the remainder, 13.

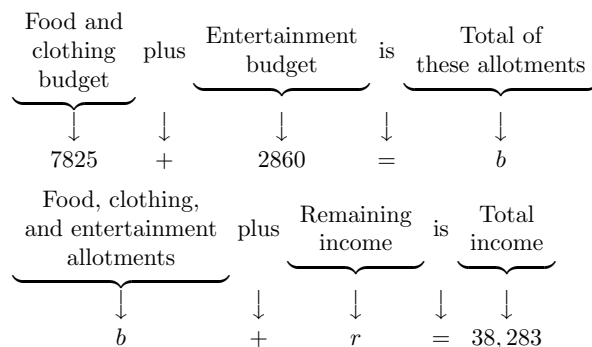
$$137 \cdot 20 = 2740 \text{ and } 2740 + 13 = 2753$$

The answer checks.

State. 137 beakers can be filled; 13 mL will be left over.

- 60. Familiarize.** This is a multistep problem. Let b = the total amount budgeted for food, clothing, and entertainment and let r = the income remaining after these allotments.

Translate.



Solve. We add on the left side to solve the first equation.

$$\begin{aligned}7825 + 2860 &= b \\ 10,685 &= b\end{aligned}$$

Now we substitute 10,685 for b in the second equation and solve for r .

$$\begin{aligned}b + r &= 38,283 \\ 10,685 + r &= 38,283 \\ 10,685 + r - 10,685 &= 38,283 - 10,685 \\ r &= 27,598\end{aligned}$$

Check. We repeat the calculations. The answer checks.

State. After the allotments for food, clothing, and entertainment, \$27,598 remains.

- 61.** $7 + (4 + 3)^2 = 7 + 7^2$
 $= 7 + 49$
 $= 56$

Answer B is correct.

- 62.** $7 + 4^2 + 3^2 = 7 + 16 + 9$
 $= 23 + 9$
 $= 32$

Answer A is correct.

$$\begin{aligned}
 63. \quad & [46 - (4 - 2) \cdot 5] \div 2 + 4 \\
 & = [46 - 2 \cdot 5] \div 2 + 4 \\
 & = [46 - 10] \div 2 + 4 \\
 & = 36 \div 2 + 4 \\
 & = 18 + 4 \\
 & = 22
 \end{aligned}$$

Answer D is correct.

$$\begin{array}{r}
 64. \quad \quad 9d \\
 \times \quad d2 \\
 \hline
 8036
 \end{array}$$

By using rough estimates, we see that the factor $d2 \approx 8100 \div 90 = 90$ or $d2 \approx 8000 \div 100 = 80$. Since $99 \times 92 = 9108$ and $98 \times 82 = 8036$, we have $d = 8$.

$$\begin{array}{r}
 65. \quad \quad 9a1 \\
 2b1 \overline{)236,421}
 \end{array}$$

Since $250 \times 1000 = 250,000 \approx 236,421$ we deduce that $2b1 \approx 250$ and $9a1 \approx 1000$. By trial we find that $a = 8$ and $b = 4$.

66. At the beginning of each day the tunnel reaches 500 ft – 200 ft, or 300 ft, farther into the mountain than it did the day before. We calculate how far the tunnel reaches into the mountain at the beginning of each day, starting with Day 2.

Day 2: 300 ft

Day 3: 300 ft + 300 ft = 600 ft

Day 4: 600 ft + 300 ft = 900 ft

Day 5: 900 ft + 300 ft = 1200 ft

Day 6: 1200 ft + 300 ft = 1500 ft

We see that the tunnel reaches 1500 ft into the mountain at the beginning of Day 6. On Day 6 the crew tunnels an additional 500 ft, so the tunnel reaches 1500 ft + 500 ft, or 2000 ft, into the mountain. Thus, it takes 6 days to reach the copper deposit.

Chapter 1 Discussion and Writing Exercises

1. No; if subtraction were associative, then $a - (b - c) = (a - b) - c$ for any a , b , and c . But, for example,

$$12 - (8 - 4) = 12 - 4 = 8,$$

whereas

$$(12 - 8) - 4 = 4 - 4 = 0.$$

Since $8 \neq 0$, this example shows that subtraction is not associative.

2. By rounding prices and estimating their sum a shopper can estimate the total grocery bill while shopping. This is particularly useful if the shopper wants to spend no more than a certain amount.
3. Answers will vary. Anthony is driving from Kansas City to Minneapolis, a distance of 512 miles. He stops for gas after driving 183 miles. How much farther must he drive?

4. The parentheses are not necessary in the expression $9 - (4 \cdot 2)$. Using the rules for order of operations, the multiplication would be performed before the subtraction even if the parentheses were not present.

The parentheses are necessary in the expression $(3 \cdot 4)^2$; $(3 \cdot 4)^2 = 12^2 = 144$, but $3 \cdot 4^2 = 3 \cdot 16 = 48$.

Chapter 1 Test

1. $\boxed{5} 46,789$

The digit 5 tells the number of hundred thousands.

2. $8843 = 8 \text{ thousands} + 8 \text{ hundreds} + 4 \text{ tens} + 3 \text{ ones}$

3.

Thirty-eight million,
four hundred three thousand,
two hundred seventy-seven

4.

$$\begin{array}{r}
 6811 \\
 + 3178 \\
 \hline
 9989
 \end{array}$$

Add ones, add tens, add hundreds, and then add thousands.

5.

$$\begin{array}{r}
 45,889 \\
 + 17,902 \\
 \hline
 63,791
 \end{array}$$

6.

$$\begin{array}{r}
 1239 \\
 843 \\
 301 \\
 + 782 \\
 \hline
 3165
 \end{array}$$

7.

$$\begin{array}{r}
 6203 \\
 + 4312 \\
 \hline
 10,515
 \end{array}$$

8.

$$\begin{array}{r}
 7983 \\
 - 4353 \\
 \hline
 3630
 \end{array}$$

Subtract ones, subtract tens, subtract hundreds, and then subtract thousands.

9.

$$\begin{array}{r}
 2974 \\
 - 1935 \\
 \hline
 1039
 \end{array}$$

10.

$$\begin{array}{r}
 8917 \\
 - 2059 \\
 \hline
 6848
 \end{array}$$

11.

$$\begin{array}{r}
 23916 \\
 - 17892 \\
 \hline
 5175
 \end{array}$$

30. $38 \cdot y = 532$

$$\frac{38 \cdot y}{38} = \frac{532}{38} \quad \text{Dividing by 38 on both sides}$$

$$y = 14$$

Check: $38 \cdot y = 532$

$$\begin{array}{r} 38 \cdot 14 \quad ? \quad 532 \\ 532 \quad | \quad \text{TRUE} \end{array}$$

The solution is 14.

31. $381 = 0 + a$

$$381 = a \quad \text{Adding on the right side}$$

The solution is 381.

32. **Familiarize.** Let s = the number of calories in an 8-oz serving of skim milk.

Translate.

Number of calories in skim milk	plus	How many more calories	is	Number of calories in whole milk
s	$+$	63	$=$	146

Solve. We subtract 63 on both sides of the equation.

$$\begin{aligned} s + 63 &= 146 \\ s + 63 - 63 &= 146 - 63 \\ s &= 83 \end{aligned}$$

Check. Since 63 calories more than 83 calories is $83 + 63$, or 146 calories, the answer checks.

State. An 8-oz serving of skim milk contains 83 calories.

33. **Familiarize.** Let s = the number of staplers that can be filled. We can think of this as repeated subtraction, taking successive sets of 250 staples and putting them into s staplers.

Translate.

Number of staples	divided by	Number in each stapler	is	Number of staplers filled
5000	\div	250	$=$	s

Solve. We carry out the division.

$$\begin{array}{r} 20 \\ 250 \overline{) 5000} \\ \underline{500} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

Then $20 = s$.

Check. We can multiply the number of staplers filled by the number of staples in each one.

$$20 \cdot 250 = 5000$$

The answer checks.

State. 20 staplers can be filled from a box of 5000 staples.

34. **Familiarize.** Let a = the total land area of the five largest states, in square meters. Since we are combining the areas of the states, we can add.

Translate.

$$571,951 + 261,797 + 155,959 + 145,552 + 121,356 = a$$

Solve. We carry out the addition.

$$\begin{array}{r} 21332 \\ 571,951 \\ 261,797 \\ 155,959 \\ 145,552 \\ + 121,356 \\ \hline 1,256,615 \end{array}$$

Then $1,256,615 = a$.

Check. We can repeat the calculation. We can also estimate the result by rounding. We will round to the nearest ten thousand.

$$\begin{aligned} 571,951 + 261,797 + 155,959 + 145,552 + 121,356 \\ \approx 570,000 + 260,000 + 160,000 + 150,000 + 120,000 \\ = 1,260,000 \end{aligned}$$

Since $1,260,000 \approx 1,256,615$, we have a partial check.

State. The total land area of Alaska, Texas, California, Montana, and New Mexico is 1,256,615 sq mi.

35. a) We will use the formula Perimeter = $2 \cdot \text{length} + 2 \cdot \text{width}$ to find the perimeter of each pool table in inches. We will use the formula Area = $\text{length} \cdot \text{width}$ to find the area of each pool table, in sq in.

For the 50 in. by 100 in. table:

$$\begin{aligned} \text{Perimeter} &= 2 \cdot 100 \text{ in.} + 2 \cdot 50 \text{ in.} \\ &= 200 \text{ in.} + 100 \text{ in.} \\ &= 300 \text{ in.} \end{aligned}$$

$$\text{Area} = 100 \text{ in.} \cdot 50 \text{ in.} = 5000 \text{ sq in.}$$

For the 44 in. by 88 in. table:

$$\begin{aligned} \text{Perimeter} &= 2 \cdot 88 \text{ in.} + 2 \cdot 44 \text{ in.} \\ &= 176 \text{ in.} + 88 \text{ in.} \\ &= 264 \text{ in.} \end{aligned}$$

$$\text{Area} = 88 \text{ in.} \cdot 44 \text{ in.} = 3872 \text{ sq in.}$$

For the 38 in. by 76 in. table:

$$\begin{aligned} \text{Perimeter} &= 2 \cdot 76 \text{ in.} + 2 \cdot 38 \text{ in.} \\ &= 152 \text{ in.} + 76 \text{ in.} \\ &= 228 \text{ in.} \end{aligned}$$

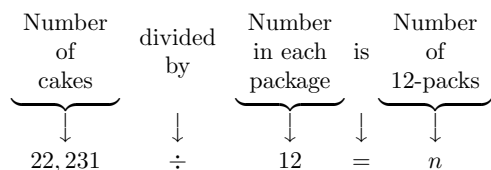
$$\text{Area} = 76 \text{ in.} \cdot 38 \text{ in.} = 2888 \text{ sq in.}$$

- b) Let a = the number of square inches by which the area of the largest table exceeds the area of the smallest table. We subtract to find a .

$$a = 5000 \text{ sq in.} - 2888 \text{ sq in.} = 2112 \text{ sq in.}$$

36. **Familiarize.** Let n = the number of 12-packs that can be filled. We can think of this as repeated subtraction, taking successive sets of 12 snack cakes and putting them into n packages.

Translate.



Solve. We carry out the division.

$$\begin{array}{r}
 1852 \\
 12 \overline{) 22,231} \\
 \underline{12} \\
 102 \\
 \underline{96} \\
 63 \\
 \underline{60} \\
 31 \\
 \underline{24} \\
 7
 \end{array}$$

Then $1852 \text{ R } 7 = n$.

Check. We multiply the number of packages by 12 and then add the remainder, 7.

$$12 \cdot 1852 = 22,224$$

$$22,224 + 7 = 22,231$$

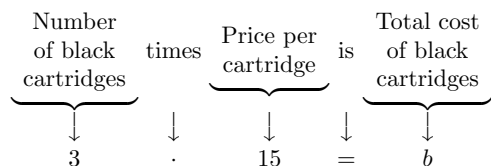
The answer checks.

State. 1852 twelve-packs can be filled. There will be 7 cakes left over.

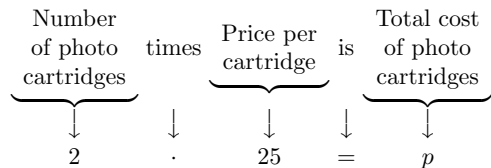
- 37. Familiarize.** This is a multistep problem. Let b = the total cost of the black cartridges, p = the total cost of the photo cartridges, and t = the total cost of the entire purchase.

Translate.

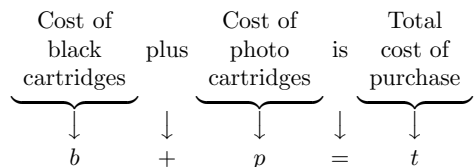
For the black ink cartridges:



For the photo cartridges:



For the total cost of the order:



Solve. We solve the first two equations and then add the solutions.

$$3 \cdot 15 = b$$

$$45 = b$$

$$2 \cdot 25 = p$$

$$50 = p$$

$$b + p = t$$

$$45 + 50 = t$$

$$95 = t$$

Check. We repeat the calculations. The answer checks.

State. The total cost of the purchase was \$95.

- 38.** Exponential notation for $12 \cdot 12 \cdot 12 \cdot 12$ is 12^4 .

39. $7^3 = 7 \cdot 7 \cdot 7 = 343$

40. $10^5 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 100,000$

41. $35 - 1 \cdot 28 \div 4 + 3$

$$= 35 - 28 \div 4 + 3 \text{ Doing all multiplications and}$$

$$= 35 - 7 + 3 \text{ divisions in order from left to right}$$

$$= 28 + 3 \text{ Doing all additions and subtractions}$$

$$= 31 \text{ in order from left to right}$$

42. $10^2 - 2^2 \div 2$

$$= 100 - 4 \div 2 \text{ Evaluating the exponential expressions}$$

$$= 100 - 2 \text{ Dividing}$$

$$= 98 \text{ Subtracting}$$

43. $(25 - 15) \div 5$

$$= 10 \div 5 \text{ Doing the calculation inside the parentheses}$$

$$= 2 \text{ Dividing}$$

44. $2^4 + 24 \div 12$

$$= 16 + 24 \div 12 \text{ Evaluating the exponential expression}$$

$$= 16 + 2 \text{ Dividing}$$

$$= 18 \text{ Adding}$$

45. $8 \times \{(20 - 11) \cdot [(12 + 48) \div 6 - (9 - 2)]\}$

$$= 8 \times \{9 \cdot [60 \div 6 - 7]\}$$

$$= 8 \times \{9 \cdot [10 - 7]\}$$

$$= 8 \times \{9 \cdot 3\}$$

$$= 8 \times 27$$

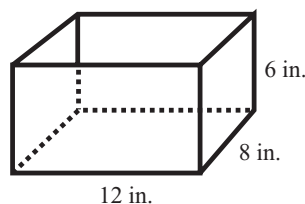
$$= 216$$

- 46.** We add the numbers and then divide by the number of addends.

$$\frac{97 + 99 + 87 + 89}{4} = \frac{372}{4} = 93$$

Answer A is correct.

- 47. Familiarize.** We make a drawing.



Observe that the dimensions of two sides of the container are 8 in. by 6 in. The area of each is 8 in. \cdot 6 in. and their total area is 2 \cdot 8 in. \cdot 6 in. The dimensions of the other two sides are 12 in. by 6 in. The area of each is 12 in. \cdot 6 in. and their total area is 2 \cdot 12 in. \cdot 6 in. The dimensions of the bottom of the box are 12 in. by 8 in. and its area is 12 in. \cdot 8 in. Let c = the number of square inches of cardboard that are used for the container.

Translate. We add the areas of the sides and the bottom of the container.

$$2 \cdot 8 \text{ in.} \cdot 6 \text{ in.} + 2 \cdot 12 \text{ in.} \cdot 6 \text{ in.} + 12 \text{ in.} \cdot 8 \text{ in.} = c$$

Solve. We carry out the calculation.

$$\begin{aligned} 2 \cdot 8 \text{ in.} \cdot 6 \text{ in.} + 2 \cdot 12 \text{ in.} \cdot 6 \text{ in.} + 12 \text{ in.} \cdot 8 \text{ in.} &= c \\ 96 \text{ sq in.} + 144 \text{ sq in.} + 96 \text{ sq in.} &= c \\ 336 \text{ sq in.} &= c \end{aligned}$$

Check. We can repeat the calculations. The answer checks.

State. 336 sq in. of cardboard are used for the container.

48. We can reduce the number of trials required by simplifying the expression on the left side of the equation and then using the addition principle.

$$\begin{aligned} 359 - 46 + a \div 3 \times 25 - 7^2 &= 339 \\ 359 - 46 + a \div 3 \times 25 - 49 &= 339 \\ 359 - 46 + \frac{a}{3} \times 25 - 49 &= 339 \\ 359 - 46 + \frac{25 \cdot a}{3} - 49 &= 339 \\ 313 + \frac{25 \cdot a}{3} - 49 &= 339 \\ 264 + \frac{25 \cdot a}{3} &= 339 \\ 264 + \frac{25 \cdot a}{3} - 264 &= 339 - 264 \\ \frac{25 \cdot a}{3} &= 75 \end{aligned}$$

We see that when we multiply a by 25 and divide by 3, the result is 75. By trial, we find that $\frac{25 \cdot 9}{3} = \frac{225}{3} = 75$, so $a = 9$. We could also reason that since $75 = 25 \cdot 3$ and $9/3 = 3$, we have $a = 9$.

49. **Familiarize.** First observe that a 10-yr loan with monthly payments has a total of 10 \cdot 12, or 120, payments. Let m = the number of monthly payments represented by \$9160 and let p = the number of payments remaining after \$9160 has been repaid.

Translate. First we will translate to an equation that can be used to find m . Then we will write an equation that can be used to find p .

Payments to date	divided by	Amount of each payment	is	Number of payments made
↓	↓	↓	↓	↓
9160	÷	229	=	m

Payments already made	plus	Remaining payments	is	Total number of payments
↓	↓	↓	↓	↓
m	+	p	=	120

Solve. To solve the first equation we carry out the division.

$$\begin{array}{r} 40 \\ 229 \overline{) 9160} \\ \underline{916} \\ 0 \\ 0 \\ \underline{0} \end{array}$$

Thus, $m = 40$.

Now we solve the second equation.

$$\begin{aligned} m + p &= 120 \\ 40 + p &= 120 && \text{Substituting 40 for } m \\ 40 + p - 40 &= 120 - 40 \\ p &= 80 \end{aligned}$$

Check. We can approach the problem in a different way to check the answer. In 10 years, Cara's loan payments will total 120 \cdot \$229, or \$27,480. If \$9160 has already been paid, then \$27,480 $-$ \$9160, or \$18,320, remains to be paid. Since 80 \cdot \$229 = \$18,320, the answer checks.

State. 80 payments remain on the loan.

