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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.

CC2. A word name for 42,000,000 is forty-two million.

CC4. A word name for 18,000,000,000 is eighteen billion.

CC6. A word name for 40,000,000,000,000 is forty trillion.

2. 5 ten thousands

4. 5 hundred thousands

6. 9

8. 3

10. 6 thousands + 6 hundreds + 8 tens + 8 ones

12. 1 thousand + 7 hundreds + 8 tens + 6 ones

14. 3 ten thousands + 8 thousands + 4 hundreds + 5 tens + 3 ones

16. 1 hundred thousand + 3 ten thousands + 5 thousands + 0 hundreds + 8 tens + 0 ones, or 1 hundred thousand + 3 ten thousands + 5 thousands + 8 tens

18. 1 billion + 2 hundred millions + 6 ten millions + 6 millions + 8 hundred thousands + 8 ten thousands + 3 thousands + 5 hundreds + 9 tens + 8 ones

20. 3 hundred millions + 2 ten millions + 3 millions + 9 hundred thousands + 9 ten thousands + 5 thousands + 5 hundreds + 2 tens + 8 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-nine thousand, eight hundred fifty-three

32. Two hundred twenty-six million, one thousand, two hundred eighty-eight

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 readout, 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.

CC2. 110

CC4. 1700

CC6. 10,000

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

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

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

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

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

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

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

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

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

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

22.
$$\begin{array}{r} {\scriptstyle 2} \\ 3\,8 \\ 2\,7 \\ 3\,2 \\ 1\,4 \\ +\,7\,6 \\ \hline 1\,8\,7 \end{array}$$

24.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1\ 1} \\ 4\,2,\,4\,8\,7 \\ 8\,3,\,1\,4\,1 \\ +\,3\,6,\,7\,1\,2 \\ \hline 1\,6\,2,\,3\,4\,0 \end{array}$$

26.
$$\begin{array}{r} {\scriptstyle 2\ 2} \\ 9\,8\,9 \\ 5\,6\,6 \\ 8\,3\,4 \\ 9\,2\,0 \\ +\,7\,0\,3 \\ \hline 4\,0\,1\,2 \end{array}$$

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

We carry out the addition.

$$\begin{array}{r} {\scriptstyle 2} \\ 1\,4 \\ 1\,3 \\ \,8 \\ 1\,0 \\ 4\,7 \\ +\,2\,2 \\ \hline 1\,1\,4 \end{array}$$

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.

$$\begin{array}{r} {\scriptstyle 2} \\ 6\,2 \\ 3\,9 \\ 5\,4 \\ 4\,6 \\ +\,2\,8 \\ \hline 2\,2\,9 \end{array}$$

The perimeter of the figure is 229 yd.

32. 90 ft + 90 ft + 90 ft + 90 ft = Perimeter

We carry out the addition.

$$\begin{array}{r} 9\,0 \\ 9\,0 \\ 9\,0 \\ +\,9\,0 \\ \hline 3\,6\,0 \end{array}$$

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

CC2.
$$\begin{array}{r} {\scriptstyle 9\ 10} \\ \cancel{1}\,\cancel{0}\,\cancel{0} \\ -\qquad 7 \\ \hline 9\,3 \end{array}$$

CC4.
$$\begin{array}{r} {\scriptstyle 10} \\ \cancel{1}\,\cancel{0}\,0\,0 \\ -\quad 4\,0\,0 \\ \hline 6\,0\,0 \end{array}$$

CC6.
$$\begin{array}{r} {\scriptstyle 9\ 9\ 10} \\ \cancel{1}\,\cancel{0}\,\cancel{0}\,\cancel{0} \\ -\quad 9\,9\,9 \\ \hline 1 \end{array}$$

2.
$$\begin{array}{r} 8\,7 \\ -\,3\,4 \\ \hline 5\,3 \end{array}$$

4.
$$\begin{array}{r} 5\,2\,6 \\ -\,3\,2\,3 \\ \hline 2\,0\,3 \end{array}$$

6.
$$\begin{array}{r} {\scriptstyle 6\ 13} \\ 7\,\cancel{3} \\ -\,2\,8 \\ \hline 4\,5 \end{array}$$

8.
$$\begin{array}{r} {\scriptstyle 5\ 14} \\ \cancel{6}\,\cancel{4} \\ -\,1\,9 \\ \hline 4\,5 \end{array}$$

10.
$$\begin{array}{r} {\scriptstyle 18} \\ {\scriptstyle 6\ \cancel{8}\ 15} \\ 7\,\cancel{9}\,\cancel{5} \\ -\,3\,9\,8 \\ \hline 3\,9\,7 \end{array}$$

12.
$$\begin{array}{r} {\scriptstyle 10} \\ {\scriptstyle 2\ \cancel{0}\ 16} \\ \cancel{3}\,\cancel{1}\,\cancel{6} \\ -\,2\,4\,7 \\ \hline 6\,9 \end{array}$$

14.
$$\begin{array}{r} {\scriptstyle 17} \\ {\scriptstyle 7\ 7\ 17} \\ \cancel{8}\,\cancel{8}\,\cancel{7} \\ -\,6\,9\,8 \\ \hline 1\,8\,9 \end{array}$$

16.
$$\begin{array}{r} {\scriptstyle 3\ 12} \\ 3\,\cancel{4}\,\cancel{2} \\ -\,2\,1\,7 \\ \hline 1\,2\,5 \end{array}$$

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18.
$$\begin{array}{r} {\scriptstyle 5\ \ 13\ 12} \\ \not{6}\ \not{4}\ \not{3}\ \not{1} \\ -\ 2\ 8\ 9\ 6 \\ \hline 3\ 5\ 3\ 5 \end{array}$$

20.
$$\begin{array}{r} {\scriptstyle 7\ \ 12\ 15} \\ \not{8}\ \not{3}\ \not{6}\ \not{4} \\ -\ 5\ 3\ 7\ 5 \\ \hline 2\ 9\ 8\ 9 \end{array}$$

22.
$$\begin{array}{r} {\scriptstyle 8\ \ 11\ 13} \\ \not{9}\ \not{2}\ \not{4}\ \not{1} \\ -\ 5\ 6\ 4\ 3 \\ \hline 3\ 5\ 9\ 8 \end{array}$$

24.
$$\begin{array}{r} {\scriptstyle 6\ \ 15} \\ \not{7}\ \not{5}\ 8\ 3 \\ -\ 3\ 6\ 4\ 1 \\ \hline 3\ 9\ 4\ 2 \end{array}$$

26.
$$\begin{array}{r} {\scriptstyle \ \ 5\ \ 11\ 11\ 12} \\ 1\ \not{6},\ \not{2}\ \not{2}\ \not{2} \\ -\ \ 5,\ 8\ 8\ 8 \\ \hline 1\ 0,\ 3\ 3\ 4 \end{array}$$

28.
$$\begin{array}{r} {\scriptstyle 2\ \ 11\ \ 11\ 8\ 14} \\ \not{3}\ \not{2},\ \not{1}\ \not{9}\ \not{4} \\ -\ 2\ 9,\ 2\ 3\ 6 \\ \hline \ \ 2\ 9\ 5\ 8 \end{array}$$

30.
$$\begin{array}{r} {\scriptstyle 8\ 10} \\ \not{9}\ \not{0} \\ -\ 7\ 8 \\ \hline 1\ 2 \end{array}$$

32.
$$\begin{array}{r} {\scriptstyle 7\ \ 9\ 13} \\ \not{8}\ \not{0}3 \\ -\ 4\ 1\ 8 \\ \hline 3\ 8\ 5 \end{array}$$

34.
$$\begin{array}{r} {\scriptstyle \ \ 3\ \ 9\ 15} \\ 9\ \not{4}\ \not{0}\ \not{5} \\ -\ \ \ 2\ 5\ 8 \\ \hline 9\ 1\ 4\ 7 \end{array}$$

36.
$$\begin{array}{r} {\scriptstyle \ \ 14} \\ {\scriptstyle 6\ \not{4}\ 9\ 10} \\ \not{7}\ \not{5}\ 0\ \not{0} \\ -\ 3\ 6\ 0\ 4 \\ \hline 3\ 8\ 9\ 6 \end{array}$$

38.
$$\begin{array}{r} {\scriptstyle \ \ \ \ 6\ \ 9\ \ 13} \\ 8\ 4,\ \not{7}\ \not{0}\ \not{3} \\ -\ \ \ \ \ 2\ 9\ 8 \\ \hline 8\ 4,\ 4\ 0\ 5 \end{array}$$

40.
$$\begin{array}{r} {\scriptstyle \ \ 14} \\ {\scriptstyle \not{4}\ \ 10\ 0\ 17} \\ \not{1}\ \not{5},\ \not{0}\ \not{1}\ \not{7} \\ -\ 7\ 8\ 0\ 9 \\ \hline 7\ 2\ 0\ 8 \end{array}$$

42.
$$\begin{array}{r} {\scriptstyle 7\ \ 9\ \ 9\ 13} \\ \not{8}\ 0\ 0\ \not{3} \\ -\ \ \ 5\ 9\ 9 \\ \hline 7\ 4\ 0\ 4 \end{array}$$

44.
$$\begin{array}{r} {\scriptstyle \ \ \ 6\ \ 9\ \ 9\ 10} \\ 1\ \not{7},\ 0\ 0\ \not{0} \\ -1\ 1,\ 5\ 9\ 8 \\ \hline \ \ \ 5\ 4\ 0\ 2 \end{array}$$

46.
$$\begin{array}{r} {\scriptstyle 3\ \ 9\ \ 9\ \ 9\ 16} \\ \not{4}\ 0,\ 0\ 0\ \not{0} \\ -\ \ \ \ \ 1\ 4\ 7 \\ \hline 3\ 9,\ 8\ 5\ 9 \end{array}$$

48.
$$\begin{array}{r} {\scriptstyle 2\ \ 9\ \ 9\ \ 9\ 14} \\ \not{3}\ 0,\ 0\ 0\ \not{4} \\ -\ \ \ 6\ 7\ 4\ 9 \\ \hline 2\ 3,\ 2\ 5\ 5 \end{array}$$

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

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

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.

CC2. 4800

CC4. 80,000

CC6. 400,000

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

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

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

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

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10.
$$\begin{array}{r} {\scriptstyle 4} \\ 78 \\ \times\ 60 \\ \hline 4680 \end{array}$$

12.
$$\begin{array}{r} {\scriptstyle 2} \\ {\scriptstyle 2} \\ 87 \\ \times\ 34 \\ \hline 348 \\ 2610 \\ \hline 2958 \end{array}$$

14.
$$\begin{array}{r} 2340 \\ \times\ 1000 \\ \hline 2,340,000 \end{array}$$

16.
$$\begin{array}{r} 800 \\ \times\ 700 \\ \hline 560,000 \end{array}$$

18.
$$\begin{array}{r} {\scriptstyle 5\ 4} \\ {\scriptstyle 5\ 4} \\ 777 \\ \times\ \ 77 \\ \hline 5439 \\ 54390 \\ \hline 59,829 \end{array}$$

20.
$$\begin{array}{r} {\scriptstyle 3\ 7} \\ {\scriptstyle 3\ 7} \\ 549 \\ \times\ \ 88 \\ \hline 4392 \\ 43920 \\ \hline 48,312 \end{array}$$

22.
$$\begin{array}{r} {\scriptstyle 2\ 1} \\ {\scriptstyle 1\ 1} \\ 432 \\ \times\ 375 \\ \hline 2160 \\ 30240 \\ 129600 \\ \hline 162,000 \end{array}$$

24.
$$\begin{array}{r} {\scriptstyle 2\ 3} \\ {\scriptstyle 2\ 3} \\ {\scriptstyle 4\ 5} \\ 346 \\ \times\ 659 \\ \hline 3114 \\ 17300 \\ 207600 \\ \hline 228,014 \end{array}$$

26.
$$\begin{array}{r} {\scriptstyle 2\ \ 2} \\ {\scriptstyle 6\ 1\ 5} \\ {\scriptstyle 1\ \ 1} \\ 8928 \\ \times\ 3172 \\ \hline 17856 \\ 624960 \\ 8928000 \\ \hline 26784000 \\ \hline 28,319,616 \end{array}$$

28.
$$\begin{array}{r} {\scriptstyle 2\ \ 4} \\ {\scriptstyle 2\ \ 4} \\ {\scriptstyle 1\ \ 3} \\ 6408 \\ \times\ 6064 \\ \hline 25632 \\ 3844800 \\ 38448000 \\ \hline 38,858,112 \end{array}$$

30.
$$\begin{array}{r} {\scriptstyle 1\ 1} \\ {\scriptstyle 4\ 4} \\ {\scriptstyle 4\ 4} \\ 355 \\ \times\ 299 \\ \hline 3195 \\ 31950 \\ 71000 \\ \hline 106,145 \end{array}$$

32.
$$\begin{array}{r} {\scriptstyle 1} \\ {\scriptstyle 2} \\ {\scriptstyle 2} \\ {\scriptstyle 4\ 1} \\ 6521 \\ \times\ 3449 \\ \hline 58689 \\ 2608400 \\ 26084000 \\ 195630000 \\ \hline 224,909,29 \end{array}$$

34.
$$\begin{array}{r} {\scriptstyle 3\ \ 4} \\ {\scriptstyle 4\ \ 4} \\ 4506 \\ \times\ 7800 \\ \hline 36048000 \\ 315420000 \\ \hline 35,146,800 \end{array}$$

36.
$$\begin{array}{r} {\scriptstyle 1} \\ {\scriptstyle 2} \\ 6009 \\ \times\ 2003 \\ \hline 18027 \\ 120180000 \\ \hline 12,036,027 \end{array}$$

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

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

42.
$$\begin{array}{r} {\scriptstyle 1\ 2\ 2} \\ 9876 \\ 876 \\ 76 \\ +\ \ \ 6 \\ \hline 10,834 \end{array}$$

44.
$$\begin{array}{r} {\scriptstyle 13} \\ {\scriptstyle 2\ \not{3}\ 10\ \ \ 8\ 18} \\ \not{3}\ \not{4}\ \not{0},7\not{9}\ \not{8} \\ -\ \ 86,679 \\ \hline 254,119 \end{array}$$

46. 0

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48. Seven million, four hundred thirty-two thousand

Exercise Set 1.5

RC2. dividend

RC4. divisor

CC2.
$$\begin{array}{r} 3 \\ 4\overline{)15} \\ \underline{12} \\ 3 \end{array}$$

The answer is 3 R 3.

CC4.
$$\begin{array}{r} 48 \\ 2\overline{)97} \\ \underline{8} \\ 17 \\ \underline{16} \\ 1 \end{array}$$

The answer is 48 R 1.

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 $20 = 4 \cdot 5$.

14.
$$\begin{array}{r} 233 \\ 3\overline{)699} \\ \underline{6} \\ 9 \\ \underline{9} \\ 9 \\ \underline{9} \\ 0 \end{array}$$

The answer is 233.

16.
$$\begin{array}{r} 108 \\ 8\overline{)869} \\ \underline{8} \\ 69 \\ \underline{64} \\ 5 \end{array}$$

The answer is 108 R 5.

18.
$$\begin{array}{r} 708 \\ 3\overline{)2124} \\ \underline{21} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

The answer is 708.

20.
$$\begin{array}{r} 1012 \\ 9\overline{)9110} \\ \underline{9} \\ 11 \\ \underline{9} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

The answer is 1012 R 2.

22.
$$\begin{array}{r} 194 \\ 2\overline{)389} \\ \underline{2} \\ 18 \\ \underline{18} \\ 9 \\ \underline{8} \\ 1 \end{array}$$

The answer is 194 R 1.

24.
$$\begin{array}{r} 146 \\ 6\overline{)881} \\ \underline{6} \\ 28 \\ \underline{24} \\ 41 \\ \underline{36} \\ 5 \end{array}$$

The answer is 146 R 5.

26.
$$\begin{array}{r} 2009 \\ 3\overline{)6027} \\ \underline{6} \\ 27 \\ \underline{27} \\ 0 \end{array}$$

The answer is 2009.

28.
$$\begin{array}{r} 517 \\ 8\overline{)4139} \\ \underline{40} \\ 13 \\ \underline{8} \\ 59 \\ \underline{56} \\ 3 \end{array}$$

The answer is 517 R 3.

30.
$$\begin{array}{r} 1270 \\ 100\overline{)127,000} \\ \underline{100} \\ 270 \\ \underline{200} \\ 700 \\ \underline{700} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

The answer is 1270.

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32.
$$\begin{array}{r} 4\,2\,6 \\ 10\overline{)\,4\,2\,6\,0} \\ \underline{4\,0} \\ 2\,6 \\ \underline{2\,0} \\ 6\,0 \\ \underline{6\,0} \\ 0 \end{array}$$

The answer is 426.

34.
$$\begin{array}{r} 2\,8\,9 \\ 20\overline{)\,5\,7\,9\,8} \\ \underline{4\,0} \\ 1\,7\,9 \\ \underline{1\,6\,0} \\ 1\,9\,8 \\ \underline{1\,8\,0} \\ 1\,8 \end{array}$$

The answer is 289 R 18.

36.
$$\begin{array}{r} 2\,4 \\ 40\overline{)\,9\,8\,7} \\ \underline{8\,0} \\ 1\,8\,7 \\ \underline{1\,6\,0} \\ 2\,7 \end{array}$$

The answer is 24 R 27.

38.
$$\begin{array}{r} 4\,0 \\ 23\overline{)\,9\,4\,2} \\ \underline{9\,2} \\ 2\,2 \end{array}$$

The answer is 40 R 22.

40.
$$\begin{array}{r} 5\,0 \\ 54\overline{)\,2\,7\,2\,9} \\ \underline{2\,7\,0} \\ 2\,9 \end{array}$$

The answer is 50 R 29.

42.
$$\begin{array}{r} 5\,5 \\ 102\overline{)\,5\,6\,1\,2} \\ \underline{5\,1\,0} \\ 5\,1\,2 \\ \underline{5\,1\,0} \\ 2 \end{array}$$

The answer is 55 R 2.

44.
$$\begin{array}{r} 1\,0\,7 \\ 7\overline{)\,7\,4\,9} \\ \underline{7} \\ 4\,9 \\ \underline{4\,9} \\ 0 \end{array}$$

The answer is 107.

46.
$$\begin{array}{r} 8\,0\,8 \\ 9\overline{)\,7\,2\,7\,3} \\ \underline{7\,2} \\ 7\,3 \\ \underline{7\,2} \\ 1 \end{array}$$

The answer is 808 R 1.

48.
$$\begin{array}{r} 1\,0\,1\,0 \\ 7\overline{)\,7\,0\,7\,4} \\ \underline{7\,0} \\ 7 \\ \underline{7} \\ 4 \end{array}$$

The answer is 1010 R 4.

50.
$$\begin{array}{r} 3\,0\,1 \\ 24\overline{)\,7\,2\,4\,2} \\ \underline{7\,2} \\ 4\,2 \\ \underline{2\,4} \\ 1\,8 \end{array}$$

The answer is 301 R 18.

52.
$$\begin{array}{r} 1\,0\,2 \\ 48\overline{)\,4\,8\,9\,9} \\ \underline{4\,8} \\ 9\,9 \\ \underline{9\,6} \\ 3 \end{array}$$

The answer is 102 R 3.

54.
$$\begin{array}{r} 2\,1\,0 \\ 36\overline{)\,7\,5\,6\,3} \\ \underline{7\,2} \\ 3\,6 \\ \underline{3\,6} \\ 3 \end{array}$$

The answer is 210 R 3.

56.
$$\begin{array}{r} 8\,0\,3 \\ 36\overline{)\,2\,8,\,9\,2\,9} \\ \underline{2\,8\,8} \\ 1\,2\,9 \\ \underline{1\,0\,8} \\ 2\,1 \end{array}$$

The answer is 803 R 21.

58.
$$\begin{array}{r} 9\,8\,4 \\ 90\overline{)\,8\,8,\,5\,6\,0} \\ \underline{8\,1\,0} \\ 7\,5\,6 \\ \underline{7\,2\,0} \\ 3\,6\,0 \\ \underline{3\,6\,0} \\ 0 \end{array}$$

The answer is 984.

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60.
$$\begin{array}{r} 2\,9\,0\,4 \\ 3\,0\,6\overline{)\,8\,8\,8,\,8\,8\,8} \\ \underline{6\,1\,2} \\ 2\,7\,6\,8 \\ \underline{2\,7\,5\,4} \\ 1\,4\,8\,8 \\ \underline{1\,2\,2\,4} \\ 2\,6\,4 \end{array}$$

The answer is 2904 R 264.

62.
$$\begin{array}{r} 7\,0\,0\,2 \\ 8\,0\,3\overline{)\,5,\,6\,2\,2,\,6\,0\,6} \\ \underline{5\,6\,2\,1} \\ 1\,6\,0\,6 \\ \underline{1\,6\,0\,6} \\ 0 \end{array}$$

The answer is 7002.

64.
$$\begin{array}{r} 8\,8,\,7\,7\,7 \\ -\,2\,2,\,3\,3\,3 \\ \hline 6\,6,\,4\,4\,4 \end{array}$$

66.
$$\begin{array}{r} 2\,6\,8 \\ \times\quad 3\,5 \\ \hline 1\,3\,4\,0 \\ 8\,0\,4\,0 \\ \hline 9\,3\,8\,0 \end{array}$$

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. $34,584,132 \div 76__ = 4__,386$

Consider the related multiplication sentence:

$4__,386 \cdot 76__ = 34,584,132$

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

1. The statement is false. For example, $8 - 5 = 3$, but 5 is not equal to $8 + 3$.

2. The statement is true. See page 19 in the text.

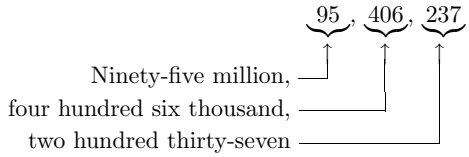
3. The statement is true. See page 19 in the text.

4. 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.

5. It is true that zero divided by any nonzero number is 0.

6. The statement is false. Any number divided by 1 is the number itself. For example, $\frac{27}{1} = 27$.

7.



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

9. $2\ \boxed{6}\ 9\ 8$

The digit 6 names the number of hundreds.

10. $\boxed{6}\ 1,\ 2\ 0\ 4$

The digit 6 names the number of ten thousands.

11. $1\ 4\ \boxed{6},\ 2\ 3\ 7$

The digit 6 names the number of thousands.

12. $5\ 8\ \boxed{6}$

The digit 6 names the number of ones.

13. $3\ 0\ 6,\ 4\ 5\ 8,\ 1\ \boxed{2}\ 9$

The digit 2 names the number of tens.

14. $3\ 0\ \boxed{6},\ 4\ 5\ 8,\ 1\ 2\ 9$

The digit 6 names the number of millions.

15. $3\ 0\ 6,\ 4\ \boxed{5}\ 8,\ 1\ 2\ 9$

The digit 5 names the number of ten thousands.

16. $3\ 0\ 6,\ 4\ 5\ 8,\ \boxed{1}\ 2\ 9$

The digit 1 names the number of hundreds.

17. 5602 = 5 thousands + 6 hundreds + 0 tens + 2 ones, or 5 thousands + 6 hundreds + 2 ones

18. 69,345 = 6 ten thousands + 9 thousands + 3 hundreds + 4 tens + 5 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.

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23.
$$\begin{array}{r} 3\,1\,6 \\ +\,4\,8\,2 \\ \hline 7\,9\,8 \end{array}$$

24.
$$\begin{array}{r} {\scriptstyle 1\ 1\ \ } \\ 5\,9\,3 \\ +\,4\,3\,7 \\ \hline 1\,0\,3\,0 \end{array}$$

25.
$$\begin{array}{r} {\scriptstyle \ 1\ 1\ } \\ 2\,6\,3\,8 \\ +\,5\,2\,8\,4 \\ \hline 7\,9\,2\,2 \end{array}$$

26.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1\ } \\ 4\,6\,1\,7 \\ 2\,4\,3\,6 \\ +\quad 4\,8\,1 \\ \hline 7\,5\,3\,4 \end{array}$$

27.
$$\begin{array}{r} 7\,8\,6 \\ -\,3\,2\,1 \\ \hline 4\,6\,5 \end{array}$$

28.
$$\begin{array}{r} {\scriptstyle 5\ \ 11\ \ 14} \\ \not{6}\ \not{2}\ \not{4} \\ -\,2\,8\,5 \\ \hline 3\,3\,9 \end{array}$$

29.
$$\begin{array}{r} {\scriptstyle 2\ \ 15\ \ 9\ 12} \\ \not{3}\ \not{5}\ 9\ \not{2} \\ -\,1\,7\,4\,8 \\ \hline 1\,8\,5\,4 \end{array}$$

30.
$$\begin{array}{r} {\scriptstyle 4\ \ 9\ \ 9\ 14} \\ \not{5}\,0\,0\,\not{4} \\ -\quad 6\,7\,6 \\ \hline 4\,3\,2\,8 \end{array}$$

31.
$$\begin{array}{r} {\scriptstyle 3\ \ } \\ 3\,6 \\ \times\quad 6 \\ \hline 2\,1\,6 \end{array}$$

32.
$$\begin{array}{r} {\scriptstyle 1\ 1\ \ } \\ {\scriptstyle 5\ 5\ \ } \\ 5\,6\,7 \\ \times\quad 2\,8 \\ \hline 4\,5\,3\,6 \\ 1\,1\,3\,4\,0 \\ \hline 1\,5,8\,7\,6 \end{array}$$

33.
$$\begin{array}{r} {\scriptstyle \ \ 2\ \ } \\ {\scriptstyle \ 1\ \ } \\ {\scriptstyle \ 3\ \ } \\ 4\,0\,7 \\ \times\,3\,2\,5 \\ \hline 2\,0\,3\,5 \\ 8\,1\,4\,0 \\ 1\,2\,2\,1\,0\,0 \\ \hline 1\,3\,2,2\,7\,5 \end{array}$$

34.
$$\begin{array}{r} {\scriptstyle \ \ 2\ 2\ 3} \\ {\scriptstyle \ \ \ \ 1\ \ } \\ 9\,4\,3\,5 \\ \times\quad 6\,0\,2 \\ \hline 1\,8\,8\,7\,0 \\ 5\,6\,6\,1\,0\,0\,0 \\ \hline 5,6\,7\,9,8\,7\,0 \end{array}$$

35.
$$\begin{array}{r} 2\,5\,3 \\ 4\overline{)\,1\,0\,1\,2} \\ \underline{\ 8\ \ } \\ 2\,1 \\ \underline{2\,0\ } \\ \ \ 1\,2 \\ \ \ \underline{1\,2} \\ \ \ \ \ 0 \end{array}$$

The answer is 253.

36.
$$\begin{array}{r} 1\,1\,2 \\ 3\,8\overline{)\,4\,2\,6\,1} \\ \underline{3\,8\ \ } \\ \ \ 4\,6 \\ \ \ \underline{3\,8} \\ \ \ \ \ 8\,1 \\ \ \ \ \ \underline{7\,6} \\ \ \ \ \ \ \ 5 \end{array}$$

The answer is 112 R 5.

37.
$$\begin{array}{r} 2\,3 \\ 6\,0\overline{)\,1\,3\,9\,9} \\ \underline{1\,2\,0\ \ } \\ \ \ 1\,9\,9 \\ \ \ \underline{1\,8\,0} \\ \ \ \ \ 1\,9 \end{array}$$

The answer is 23 R 19.

38.
$$\begin{array}{r} 1\,4\,4 \\ 5\,6\overline{)\,8\,0\,9\,5} \\ \underline{5\,6\ \ } \\ 2\,4\,9 \\ \underline{2\,2\,4} \\ \ \ 2\,5\,5 \\ \ \ \underline{2\,2\,4} \\ \ \ \ \ 3\,1 \end{array}$$

The answer is 144 R 31.

39. Perimeter = 10 m + 4 m + 8 m + 3 m = 25 m

40. $A = 4$ in. $\times$ 2 in. = 8 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.

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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.

CC2. 1000

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

26.
$$\begin{array}{r} 62 \\ 97 \\ 46 \\ +\,81 \\ \hline \end{array} \qquad \begin{array}{r} 60 \\ 100 \\ 50 \\ +\,\,80 \\ \hline 290 \end{array}$$

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

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

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

3947 seems to be incorrect.

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

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

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

1849 seems to be incorrect.

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

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

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

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

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

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

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

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

62.
$$\begin{array}{r} \$\,498 \\ 289 \\ +\,145 \\ \hline \end{array} \qquad \begin{array}{r} \$\,500 \\ 300 \\ +\,100 \\ \hline \$\,900 \end{array}$$

64.
$$\begin{array}{r} \$\,498 \\ 289 \\ 62 \\ 159 \\ +\,320 \\ \hline \end{array} \qquad \begin{array}{r} \$\,500 \\ 300 \\ 100 \\ 200 \\ +\,\,300 \\ \hline \$\,1400 \end{array}$$

The budget covers the choices.

66. Answers will vary depending on the options chosen.

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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. $\$2211 \div \$11 \approx \$2200 \div \$10 = 220$ rolls

72. $32 > 0$

74. $28 > 18$

76. $77 < 117$

78. $999 > 997$

80. $345 < 456$

82. $12 < 32$

84. $1,014,023 > 758,708$, or $758,708 < 1,014,023$

86. $843,393 > 842,583$, or $842,583 < 843,393$

88.
$$\begin{array}{r} 9\,0\,0\,2 \\ +\ 4\,5\,8\,7 \\ \hline 1\,3,5\,8\,9 \end{array}$$

90.
$$\begin{array}{r} {\scriptstyle 8\ \ 9\ \ 9\ 12} \\ \cancel{9}\,\cancel{0}\,\cancel{0}\,\cancel{2} \\ -\ 4\,5\,8\,7 \\ \hline 4\,4\,1\,5 \end{array}$$

92.
$$\begin{array}{r} {\scriptstyle 3\ \ \ } \\ {\scriptstyle 4\ \ \ } \\ 3\,0\,6 \\ \times\quad 5\,8 \\ \hline 2\,4\,4\,8 \\ 1\,5\,3\,0\,0 \\ \hline 1\,7,7\,4\,8 \end{array}$$

94.
$$\begin{array}{r} \ \ \ 2\,0\,8 \\ 2\,3\overline{)\,4\,7\,8\,4} \\ \ \ \ 4\,6\ \ \\ \hline \ \ \ 1\,8\,4 \\ \ \ \ 1\,8\,4 \\ \hline \ \ \ \ \ 0 \end{array}$$

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)

CC2.
$$\begin{array}{r|l} 672 = 6 \cdot n & \\ \hline 672\ ?\ 6 \cdot 112 & \\ \quad | \quad 672 & \text{TRUE} \end{array}$$

112 is a solution.

CC4.
$$\begin{array}{r|l} 5462 = 3189 + t & \\ \hline 5462\ ?\ 3189 + 2327 & \\ \quad | \quad 5516 & \text{FALSE} \end{array}$$

2327 is not a solution.

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. $x = \dfrac{42}{6} = 7$

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

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

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

30. $y = 9281 - 8322 = 959$

32. $p = 92 - 56 = 36$

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

36. $z = 133 - 67 = 66$

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

40. $x = 807 - 438 = 369$

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

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

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

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48. $t = 9281 - 8322 = 959$

50. $n = 3004 - 1745 = 1259$

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

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

56. $z = 512 - 63 = 449$

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

The answer is 142.

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

The answer is 334 R 11.

62. $342 > 339$

64. $0 < 11$

66. 6,375,600

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

Exercise Set 1.8

RC2. Translate.

RC4. Check.

CC2. Let x = the number of miles by which Wednesday's drive exceeded Thursday's drive. Then we have $500 = x + 125$. The correct answer is (b).

CC4. Let x = the total amount spent on groceries in May and June. Then we have $500 + 125 = x$. The correct answer is (a).

2. Let w = the number of pounds by which the waste generated annually per capita in the United States exceeds the waste generated in Denmark.

Solve: $1473 + w = 1606$

$w = 123$ lb

4. Let w = the number of pounds of waste generated annually per capita in Iceland.

Solve: $w + 531 = 1713$

$w = 1182$ lb

6. Let n = the number of entries in each row.

Solve: $504 \div 36 = n$

$n = 14$ entries

8. Let r = the number of active rotary oil rigs in 2007.

Solve: $r + 687 = 984$

$r = 297$ rigs

10. 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

12. Let p = the total number of squares in the puzzle.

Solve: $15 \cdot 15 = p$

$p = 225$ squares

14. Let c = the number of milligrams of caffeine in a 20-oz bottle of Coca Cola.

Solve: $25 + 32 = c$

$c = 57$ milligrams

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 Indianapolis.

Solve: $905 + r = 1401$

$r = \$496$ per month

20. Let r = the amount of rent each sister pays.

Solve: $2r = 936$

$r = \$468$ 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: $6 \cdot 2063 = r$

$r = \$12,378$

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

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28. Let s = the amount by which spending by visitors to the United States exceeded spending by Americans traveling abroad.

Solve: $110,500,000,000 + s = 153,700,000,000$

$s = \$43,200,000,000$

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 3795 mi of city driving.

Solve: $3795 \div 23 = g$

$g = 165$ 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 golf, walking, in order to lose one pound.

Solve: $t = 35 \cdot 20$

$t = 700$ min; we could also express this as 11 hr, 40 min.

48. Let n = the number of new jobs that will be created for marketing managers and accountants.

$n = 19,700 + 142,400 = 162,100$

Let s = the number of new jobs that will be created for sales managers.

Solve: $s + 143,100 = 162,100$

$s = 19,000$ 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: $3 \cdot 4 = F$, $23 \cdot 6 = E$, and $T = F + E$

$F = 12$, $E = 138$, $T = 12 + 138 = 150$ 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.

58.
$$\begin{array}{r} {\scriptstyle 8\ 15\ 9\ 12} \\ 9\ \cancel{6}\ \cancel{0}\ 2 \\ -\ 1\ 8\ 4\ 3 \\ \hline 7\ 7\ 5\ 9 \end{array}$$

60.
$$\begin{array}{r} 1\ 4\ 7 \\ 3\ 2\overline{)\,4\ 7\ 0\ 8} \\ \underline{3\ 2} \\ 1\ 5\ 0 \\ \underline{1\ 2\ 8} \\ 2\ 2\ 8 \\ \underline{2\ 2\ 4} \\ 4 \end{array}$$

The answer is 147 R 4.

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

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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.

CC2. Division

CC4. Multiplication

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

38. $1000 \div 25 - (15 + 5) = 1000 \div 25 - 20$
$= 40 - 20$
$= 20$

40. $3 \cdot 8 + 5 \cdot 8 = 24 + 40$
$= 64$

42. $144 \div 4 - 2 = 36 - 2$
$= 34$

44. $7 \cdot (10 - 3)^2 - 2 \cdot (3 + 1)^2 = 7 \cdot 7^2 - 2 \cdot 4^2$
$= 7 \cdot 49 - 2 \cdot 16$
$= 343 - 32$
$= 311$

46. $6^2 - 3^4 \div 3^3 = 36 - 81 \div 27$
$= 36 - 3$
$= 33$

48. $7^2 + 20 \cdot 4 - (28 + 9 \cdot 2)$
$= 7^2 + 20 \cdot 4 - (28 + 18)$
$= 7^2 + 20 \cdot 4 - 46$
$= 49 + 20 \cdot 4 - 46$
$= 49 + 80 - 46$
$= 83$

50. $8 \times 9 - (12 - 8) \div 4 - (10 - 7)$
$= 8 \times 9 - 4 \div 4 - 3$
$= 72 - 1 - 3$
$= 68$

52. $80 - 2^4 \cdot 15 \div (7 \cdot 5 - 45 \div 3)$
$= 80 - 2^4 \cdot 15 \div (35 - 15)$
$= 80 - 2^4 \cdot 15 \div 20$
$= 80 - 16 \cdot 15 \div 20$
$= 80 - 240 \div 20$
$= 80 - 12$
$= 68$

54. $2^7 \div 2^5 \cdot 2^4 \div 2^2$
$= 128 \div 32 \cdot 16 \div 4$
$= 4 \cdot 16 \div 4$
$= 64 \div 4$
$= 16$

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

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

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

62. $[92 \times (6 - 4) \div 8] + [7 \times (8 - 3)]$
$= [92 \times 2 \div 8] + [7 \times 5]$
$= [184 \div 8] + 35$
$= 23 + 35$
$= 58$

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

66. $15(23 - 4 \cdot 2)^3 \div (3 \cdot 25)$

$= 15(23 - 8)^3 \div 75$	Multiplying inside parentheses
$= 15 \cdot 15^3 \div 75$	Subtracting inside parentheses
$= 15 \cdot 3375 \div 75$	Evaluating the exponential expression
$= 50,625 \div 75$	Doing all multiplication and
$= 675$	divisions in order from left to right

68. $(19 - 2^4)^5 - (141 \div 47)^2$
$= (19 - 16)^5 - 3^2$
$= 3^5 - 3^2$
$= 243 - 9$
$= 234$

70. $x = 5032 - 4197 = 835$

72. $y = \dfrac{1554}{42} = 37$

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

76. Let g = the total number of gallons of gasoline purchased.
Solve: $23 + 24 + 26 + 25 = g$
$g = 98$ gallons

78. $12 \div 4 + 2 \cdot 3 - 2 = 3 + 6 - 2$
$= 7$ Correct answer
$12 \div (4 + 2) \cdot (3 - 2) = 2$

80. Answers may vary. One correct answer is
$9 \cdot 8 + 7 \cdot 6 - 5 \cdot 4 + 3 \cdot 2 \cdot 1 = 100$.

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

1. The statement is true. See page 42 in the text.

2. $a \div a = \dfrac{a}{a} = 1$, $a \neq 0$; the statement is true.

3. $a \div 0$ is not defined, so the statement is false.

4. The statement is false. For example, $1 + 2 = 5$ is not a true equation.

5. The statement is true. See page 71 in the text.

6. The statement is false. See page 73 in the text.

Chapter 1 Study Guide

1. 4 3 $\boxed{2}$, 0 7 9
The digit 2 names the number of thousands.

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

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

4.
$$\begin{array}{r} {\scriptstyle 2\ 1} \\ {\scriptstyle 1} \\ {\scriptstyle 7\ 3} \\ 6\,8\,4 \\ \times\ 3\,2\,9 \\ \hline 6\,1\,5\,6 \\ 1\,3\,6\,8\,0 \\ 2\,0\,5\,2\,0\,0 \\ \hline 2\,2\,5,0\,3\,6 \end{array}$$
Multiplying by 9
Multiplying by 20
Multiplying by 300

5.
$$\begin{array}{r|l} & 3\,1\,5 \\ \hline 2\,7 & 8\,5\,1\,9 \\ & \underline{8\,1} \\ & \quad 4\,1 \\ & \quad \underline{2\,7} \\ & \quad\ 1\,4\,9 \\ & \quad\ \underline{1\,3\,5} \\ & \quad\quad 1\,4 \end{array}$$
The answer is 315 R 14.

6. Round 36,468 to the nearest thousand.
3 6, $\boxed{4}$ 6 8
↑
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.

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

8. $24 \cdot x = 864$

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

$x = 36$

Check: $24 \cdot x = 864$

$24 \cdot 36 \stackrel{?}{=} 864$

$864 \mid$ TRUE

The solution is 36.

9. $6^3 = 6 \cdot 6 \cdot 6 = 216$

Chapter 1 Review Exercises

1. 4, 6 7 $\boxed{8}$, 9 5 2

The digit 8 means 8 thousands.

2. 1 $\boxed{3}$, 7 6 8, 9 4 0

The digit 3 names the number of millions.

3. 2793 = 2 thousands + 7 hundreds + 9 tens + 3 ones

4. 56,078 = 5 ten thousands + 6 thousands + 0 hundreds + 7 tens + 8 ones, or 5 ten thousands + 6 thousands + 7 tens + 8 ones

5. 4,007,101 = 4 millions + 0 hundred thousands + 0 ten thousands + 7 thousands + 1 hundred + 0 tens + 1 one, or 4 millions + 7 thousands + 1 hundred + 1 one

6. 67,819

Sixty-seven thousand,
eight hundred nineteen

7. 2, 781, 427

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

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

Standard notation is 476, 588.

9. One billion,
five hundred million,

Standard notation is 1,500,000,000.

10.
$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ } \\ 7\,3\,0\,4 \\ +\,6\,9\,6\,8 \\ \hline 1\,4,2\,7\,2 \end{array}$$

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

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

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

14.
$$\begin{array}{r} {\scriptstyle 13} \\ {\scriptstyle 7\ \ 9\ \ \not{3}\ 15} \\ \not{8}\,0\,\not{4}\,\not{5} \\ -\,2\,8\,9\,7 \\ \hline 5\,1\,4\,8 \end{array}$$

15.
$$\begin{array}{r} {\scriptstyle 8\ \ 9\ \ 9\ 11} \\ \not{9}\,0\,0\,\not{1} \\ -\,7\,3\,1\,2 \\ \hline 1\,6\,8\,9 \end{array}$$

16.
$$\begin{array}{r} {\scriptstyle 5\ \ 9\ \ 9\ 13} \\ \not{6}\,0\,0\,\not{3} \\ -\,3\,7\,2\,9 \\ \hline 2\,2\,7\,4 \end{array}$$

17.
$$\begin{array}{r} {\scriptstyle 16\,13} \\ {\scriptstyle 2\ \not{6}\ \not{3}\ \ 9\ 15} \\ \not{3}\,\not{7},\not{4}\,0\,\not{5} \\ -\,1\,9,6\,4\,8 \\ \hline 1\,7,7\,5\,7 \end{array}$$

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

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

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

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

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

Multiplying by 8
Multiplying by 90
Multiplying by 600

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

Multiplying by 7
Multiplying by 40

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

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

The answer is 12 R 3.

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

The answer is 5.

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

The answer is 913 R 3.

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

The answer is 384 R 1.

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

The answer is 4 R 46.

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

The answer is 54.

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

The answer is 452.

30.
$$\begin{array}{r} \phantom{1\,4\overline{)\,}}5\,0\,0\,8 \\ 1\,4\overline{)\,7\,0,1\,1\,2} \\ \underline{7\,0} \\ 1\,1\,2 \\ \underline{1\,1\,2} \\ 0 \end{array}$$

The answer is 5008.

31.
$$\begin{array}{r} \phantom{1\,2\overline{)\,}}4\,3\,8\,9 \\ 1\,2\overline{)\,5\,2,6\,6\,8} \\ \underline{4\,8} \\ 4\,6 \\ \underline{3\,6} \\ 1\,0\,6 \\ \underline{9\,6} \\ 1\,0\,8 \\ \underline{1\,0\,8} \\ 0 \end{array}$$

The answer is 4389.

32. Round 345,759 to the nearest hundred.

$3\,4\,5,7\,\boxed{5}\,9$
$\uparrow$

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.

$3\,4\,5,7\,5\,\boxed{9}$
$\uparrow$

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.

$3\,4\,5,\,\boxed{7}\,5\,9$
$\uparrow$

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.

$3\,\boxed{4}\,5,7\,5\,9$
$\uparrow$

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, $67 > 56$.

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

38.

	Rounded to the nearest hundred
$41,348$	$41,300$
$+\ 19,749$	$+\ 19,700$
	$61,000 \leftarrow$ Estimated answer

39.

	Rounded to the nearest hundred
$38,652$	$38,700$
$-\ 24,549$	$-\ 24,500$
	$14,200 \leftarrow$ Estimated answer

40.

Rounded to the nearest hundred	
396	400
$\times\ 748$	$\times\ 700$
	$280,000 \leftarrow$ Estimated answer

41. $46 \cdot n = 368$

$$\frac{46 \cdot n}{46} = \frac{368}{46}$$

$$n = 8$$

Check: $46 \cdot n = 368$

$46 \cdot 8 \stackrel{?}{=} 368$

$368 \mid$ TRUE

The solution is 8.

42. $47 + x = 92$

$47 + x - 47 = 92 - 47$

$x = 45$

Check: $47 + x = 92$

$47 + 45 \stackrel{?}{=} 92$

$92 \mid$ TRUE

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. $24 = x + 24$

$24 - 24 = x + 24 - 24$

$0 = x$

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

48. $8 \cdot 6 + 17 = 48 + 17$ Multiplying

$= 65$ Adding

49. $10 \cdot 24 - (18 + 2) \div 4 - (9 - 7)$

$= 10 \cdot 24 - 20 \div 4 - 2$ Doing the calculations inside the parentheses

$= 240 - 5 - 2$ Multiplying and dividing

$= 235 - 2$ Subtracting from

$= 233$ left to right

50. $(80 \div 16) \times [(20 - 56 \div 8) + (8 \cdot 8 - 5 \cdot 5)]$

$= 5 \times [(20 - 7) + (64 - 25)]$

$= 5 \times [13 + 39]$

$= 5 \times 52$

$= 260$

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.

Money available	plus	Additional amount	is	Price of desk
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
196	$+$	x	$=$	698

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

$$196 + x = 698$$

$$196 + x - 196 = 698 - 196$$

$$x = 502$$

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.

Original balance	plus	Deposit	is	New balance
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
406	$+$	78	$=$	b

Solve. We add on the left side.

$$406 + 78 = b$$

$$484 = b$$

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.

Original year	plus	73 yr	is	Year of copper reduction
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
1909	$+$	73	$=$	y

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Solve. We add on the left side.

$$1909 + 73 = y$$
$$1982 = y$$

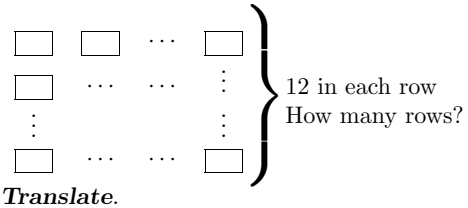
Check. We can estimate.

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

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.

Number of cans	divided by	Number per carton	is	Number of cartons
228	$\div$	12	$=$	c

Solve. We carry out the division.

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

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.

Number of stoves	times	Price per stove	is	Total cost of stoves
13	$\cdot$	425	$=$	s

Number of refrigerators	times	Price per refrigerator	is	Total cost of refrigerators
13	$\cdot$	620	$=$	r

Cost of stoves	plus	Cost of refrigerators	is	Total cost
s	$+$	r	$=$	t

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

$$13 \cdot 425 = s \qquad 13 \cdot 620 = r$$
$$5525 = s \qquad 8060 = r$$

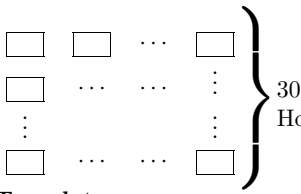
Now we substitute 5525 for s and 8060 for r in the third equation and then add on the left side.

$$s + r = t$$
$$5525 + 8060 = t$$
$$13,585 = t$$

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.

Number of trees	divided by	Number of trees pollinated by each hive	is	Number of hives needed
420	$\div$	30	$=$	b

Solve. We carry out the division.

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

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

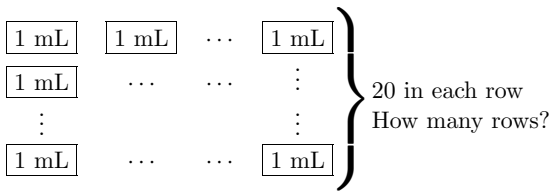
Check. We can check by multiplying: $30 \cdot 14 = 420$. The answer checks.

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.

Amount of alcohol	divided by	Amount per beaker	is	Number of beakers filled
2753	$\div$	20	$=$	b

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Solve. We carry out the division.

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

Thus, 137 R 13 $= b$.

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

$137 \cdot 20 = 2740$ 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.

Food and clothing budget	plus	Entertainment budget	is	Total of these allotments
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
7825	$+$	2860	$=$	b

Food, clothing, and entertainment allotments	plus	Remaining income	is	Total income
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
b	$+$	r	$=$	$38,283$

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

$$7825 + 2860 = b$$
$$10,685 = b$$

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. $$\begin{aligned} 7 + (4+3)^2 &= 7 + 7^2 \\ &= 7 + 49 \\ &= 56 \end{aligned}$$

Answer B is correct.

62. $$\begin{aligned} 7 + 4^2 + 3^2 &= 7 + 16 + 9 \\ &= 23 + 9 \\ &= 32 \end{aligned}$$

Answer A is correct.

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

Answer D is correct.

64. $$\begin{array}{r} 9\ d \\ \times\quad d\ 2 \\ \hline 8\ 0\ 3\ 6 \end{array}$$

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 $d = 8$.

65. $$\begin{array}{r} 9\ a\ 1 \\ 2\ b\ 1\overline{)\,2\,3\,6{,}4\,2\,1} \end{array}$$

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?

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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. $\boxed{5}\,4\,6,\,7\,8\,9$

The digit 5 tells the number of hundred thousands.

2. 8843 = 8 thousands + 8 hundreds + 4 tens + 3 ones

3.

38, 403, 277

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

4.
$$\begin{array}{r} 6\,8\,1\,1 \\ +\,3\,1\,7\,8 \\ \hline 9\,9\,8\,9 \end{array}$$
Add ones, add tens, add hundreds, and then add thousands.

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

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

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

8.
$$\begin{array}{r} 7\,9\,8\,3 \\ -\,4\,3\,5\,3 \\ \hline 3\,6\,3\,0 \end{array}$$
Subtract ones, subtract tens, subtract hundreds, and then subtract thousands.

9.
$$\begin{array}{r} {\scriptstyle \ \ \ 6\ 14} \\ 2\,9\,\not{7}\,\not{4} \\ -\,1\,9\,3\,5 \\ \hline 1\,0\,3\,9 \end{array}$$

10.
$$\begin{array}{r} {\scriptstyle 8\ \ 9\ 17} \\ 8\,\not{9}\,\not{0}\,\not{7} \\ -\,2\,0\,5\,9 \\ \hline 6\,8\,4\,8 \end{array}$$

11.
$$\begin{array}{r} {\scriptstyle \ \ 12} \\ {\scriptstyle 1\ \ 2\ \ 9\ 16} \\ \not{2}\,\not{3},\not{0}\,\not{6}\,7 \\ -\,1\,7,\,8\,9\,2 \\ \hline 5\,1\,7\,5 \end{array}$$

12.
$$\begin{array}{r} {\scriptstyle 5\ 6\ 7} \\ 4\,5\,6\,8 \\ \times\qquad 9 \\ \hline 4\,1,\,1\,1\,2 \end{array}$$

13.
$$\begin{array}{r} {\scriptstyle 5\ 4\ 3} \\ 8\,8\,7\,6 \\ \times\,6\,0\,0 \\ \hline 5,\,3\,2\,5,\,6\,0\,0 \end{array}$$
Multiply by 6 hundreds (We write 00 and then multiply 8876 by 6.)

14.
$$\begin{array}{r} 6\,5 \\ \times\,3\,7 \\ \hline 4\,5\,5 \\ 1\,9\,5\,0 \\ \hline 2\,4\,0\,5 \end{array}$$
Multiplying by 7
Multiplying by 30
Adding

15.
$$\begin{array}{r} 6\,7\,8 \\ \times\,7\,8\,8 \\ \hline 5\,4\,2\,4 \\ 5\,4\,2\,4\,0 \\ 4\,7\,4\,6\,0\,0 \\ \hline 5\,3\,4,\,2\,6\,4 \end{array}$$

16.
$$\begin{array}{r} 3 \\ 4\overline{)\,1\,5} \\ 1\,2 \\ \hline 3 \end{array}$$
The answer is 3 R 3.

17.
$$\begin{array}{r} 7\,0 \\ 6\overline{)\,4\,2\,0} \\ 4\,2 \\ \hline 0 \\ 0 \\ \hline 0 \end{array}$$
The answer is 70.

18.
$$\begin{array}{r} 9\,7 \\ 8\,9\overline{)\,8\,6\,3\,3} \\ 8\,0\,1 \\ \hline 6\,2\,3 \\ 6\,2\,3 \\ \hline 0 \end{array}$$
The answer is 97.

19.
$$\begin{array}{r} 8\,0\,5 \\ 4\,4\overline{)\,3\,5,\,4\,2\,8} \\ 3\,5\,2 \\ \hline 2\,2\,8 \\ 2\,2\,0 \\ \hline 8 \end{array}$$
The answer is 805 R 8.

20. Round 34,528 to the nearest thousand.

$3\,4,\,\boxed{5}\,2\,8$
$\uparrow$

The digit 4 is in the thousands place. Consider the next digit to the right, 5. Since 5 is 5 or higher, round 4 thousands up to 5 thousands. Then change all digits to the right of thousands to zeros.

The answer is 35,000.

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21. Round 34,528 to the nearest ten.

$$3\,4,\,5\,\underset{\uparrow}{2}\,\boxed{8}$$

The digit 2 is in the tens place. Consider the next digit to the right, 8. Since 8 is 5 or higher, round 2 tens up to 3 tens. Then change the digit to the right of tens to zero.

The answer is 34,530.

22. Round 34,528 to the nearest hundred.

$$3\,4,\,5\,\underset{\uparrow}{\boxed{2}}\,8$$

The digit 5 is in the hundreds place. Consider the next digit to the right, 2. Since 2 is 4 or lower, round down, meaning that 5 hundreds stays as 5 hundreds. Then change all digits to the right of hundreds to zero.

The answer is 34,500.

23.

	Rounded to the nearest hundred
$2\,3,\,6\,4\,9$	$2\,3,\,6\,0\,0$
$+\,5\,4,\,7\,4\,6$	$+\,5\,4,\,7\,0\,0$
	$7\,8,\,3\,0\,0 \leftarrow$ Estimated answer

24.

	Rounded to the nearest hundred
$5\,4,\,7\,5\,1$	$5\,4,\,8\,0\,0$
$-\,2\,3,\,6\,4\,9$	$-\,2\,3,\,6\,0\,0$
	$3\,1,\,2\,0\,0 \leftarrow$ Estimated answer

25.

	Rounded to the nearest hundred
$8\,2\,4$	$8\,0\,0$
$\times\,4\,8\,9$	$\times\,5\,0\,0$
	$4\,0\,0,\,0\,0\,0 \leftarrow$ Estimated answer

26. Since 34 is to the right of 17 on the number line, $34 > 17$.

27. Since 117 is to the left of 157 on the number line, $117 < 157$.

28. $28 + x = 74$

$28 + x - 28 = 74 - 28$ Subtracting 28 on both sides

$x = 46$

Check:

$$\begin{array}{r|l} 28 + x = 74 & \\ \hline 28 + 46 \;?\; 74 & \\ 74 & \text{TRUE} \end{array}$$

The solution is 46.

29. $169 \div 13 = n$

We carry out the division.

$$\begin{array}{r} 1\,3 \\ 1\,3\overline{)\,1\,6\,9} \\ \underline{1\,3} \\ 3\,9 \\ \underline{3\,9} \\ 0 \end{array}$$

The solution is 13.

30. $38 \cdot y = 532$

$\dfrac{38 \cdot y}{38} = \dfrac{532}{38}$ Dividing by 38 on both sides

$y = 14$

Check:

$$\begin{array}{r|l} 38 \cdot y = 532 & \\ \hline 38 \cdot 14 \;?\; 532 & \\ 532 & \text{TRUE} \end{array}$$

The solution is 14.

31. $381 = 0 + a$

$381 = a$ 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
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
s	$+$	63	$=$	146

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

$$s + 63 = 146$$
$$s + 63 - 63 = 146 - 63$$
$$s = 83$$

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
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
5000	$\div$	250	$=$	s

Solve. We carry out the division.

$$\begin{array}{r} 2\,0 \\ 2\,5\,0\overline{)\,5\,0\,0\,0} \\ \underline{5\,0\,0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

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.

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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.

$$\begin{array}{r} {\scriptstyle 2\ 1\ 3\ 3\ 2} \\ 5\,7\,1,\,9\,5\,1 \\ 2\,6\,1,\,7\,9\,7 \\ 1\,5\,5,\,9\,5\,9 \\ 1\,4\,5,\,5\,5\,2 \\ +\,1\,2\,1,\,3\,5\,6 \\ \hline 1,\,2\,5\,6,\,6\,1\,5 \end{array}$$

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 $= 2 \cdot$ length $+$ $2 \cdot$ width to find the perimeter of each pool table in inches. We will use the formula Area $=$ length $\cdot$ width to find the area of each pool table, in sq in.

For the 50 in. by 100 in. table:

$$\begin{aligned} \text{Perimeter} &= 2 \cdot 100 \text{ in.} + 2 \cdot 50 \text{ in.} \\ &= 200 \text{ in.} + 100 \text{ in.} \\ &= 300 \text{ in.} \\ \text{Area} &= 100 \text{ in.} \cdot 50 \text{ in.} = 5000 \text{ sq in.} \end{aligned}$$

For the 44 in. by 88 in. table:

$$\begin{aligned} \text{Perimeter} &= 2 \cdot 88 \text{ in.} + 2 \cdot 44 \text{ in.} \\ &= 176 \text{ in.} + 88 \text{ in.} \\ &= 264 \text{ in.} \\ \text{Area} &= 88 \text{ in.} \cdot 44 \text{ in.} = 3872 \text{ sq in.} \end{aligned}$$

For the 38 in. by 76 in. table:

$$\begin{aligned} \text{Perimeter} &= 2 \cdot 76 \text{ in.} + 2 \cdot 38 \text{ in.} \\ &= 152 \text{ in.} + 76 \text{ in.} \\ &= 228 \text{ in.} \\ \text{Area} &= 76 \text{ in.} \cdot 38 \text{ in.} = 2888 \text{ sq in.} \end{aligned}$$

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.

$a = 5000$ sq in. $- 2888$ sq in. $= 2112$ 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.

Number of cakes		divided by		Number in each package		is		Number of 12-packs
$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$
$22,231$		$\div$		12		$=$		n

Solve. We carry out the division.

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

Then 1852 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 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:

Number of black cartridges		times		Price per cartridge		is		Total cost of black cartridges
$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$
3		$\cdot$		15		$=$		b

For the photo cartridges:

Number of photo cartridges		times		Price per cartridge		is		Total cost of photo cartridges
$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$
2		$\cdot$		25		$=$		p

For the total cost of the order:

Cost of black cartridges		plus		Cost of photo cartridges		is		Total cost of purchase
$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$		$\downarrow$
b		$+$		p		$=$		t

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

$3 \cdot 15 = b$

$45 = b$

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$$2 \cdot 25 = p$$
$$50 = p$$
$$b + p = t$$
$$45 + 50 = t$$
$$95 = t$$

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.
$$\begin{aligned} & 35 - 1 \cdot 28 \div 4 + 3 \\ &= 35 - 28 \div 4 + 3 && \text{Doing all multiplications and} \\ &= 35 - 7 + 3 && \text{divisions in order from left to right} \\ &= 28 + 3 && \text{Doing all additions and subtractions} \\ &= 31 && \text{in order from left to right} \end{aligned}$$

42.
$$\begin{aligned} & 10^2 - 2^2 \div 2 \\ &= 100 - 4 \div 2 && \text{Evaluating the exponential expressions} \\ &= 100 - 2 && \text{Dividing} \\ &= 98 && \text{Subtracting} \end{aligned}$$

43.
$$\begin{aligned} & (25 - 15) \div 5 \\ &= 10 \div 5 && \text{Doing the calculation inside the parentheses} \\ &= 2 && \text{Dividing} \end{aligned}$$

44.
$$\begin{aligned} & 2^4 + 24 \div 12 \\ &= 16 + 24 \div 12 && \text{Evaluating the exponential expression} \\ &= 16 + 2 && \text{Dividing} \\ &= 18 && \text{Adding} \end{aligned}$$

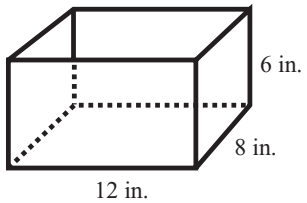
45.
$$\begin{aligned} & 8 \times \{(20 - 11) \cdot [(12 + 48) \div 6 - (9 - 2)]\} \\ &= 8 \times \{9 \cdot [60 \div 6 - 7]\} \\ &= 8 \times \{9 \cdot [10 - 7]\} \\ &= 8 \times \{9 \cdot 3\} \\ &= 8 \times 27 \\ &= 216 \end{aligned}$$

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
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
9160	$\div$	229	$=$	m

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$$\underbrace{\text{Payments already made}}_{m} \quad \text{plus} \quad \underbrace{\text{Remaining payments}}_{p} \quad \text{is} \quad \underbrace{\text{Total number of payments}}_{120}$$

$$m + p = 120$$

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

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

Thus, $m = 40$.

Now we solve the second equation.

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

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.

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