

Chapter 1

Whole Numbers and Introduction to Algebra

1.1 Check Points

1. a. millions place

Millions Period			Thousands Period			Ones Period		
Hundred Millions	Ten Millions	<u>Millions</u>	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
6	4	9	3	1	7	0		

b. ones place

Thousands Period			Ones Period		
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	<u>Ones</u>
3	0	0	5	2	

c. hundreds place

Thousands Period			Ones Period		
Hundred Thousands	Ten Thousands	Thousands	<u>Hundreds</u>	Tens	Ones
6	1	4	0	2	3

d. millions place

Millions Period			Thousands Period			Ones Period		
Hundred Millions	Ten Millions	<u>Millions</u>	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
2	5		4	3	2	9	8	7

2. Work from left to right. Write the name of the three-digit number in each period, followed by the name of the period and a comma. Do not write the name of the last period, "ones."

a. twenty-seven thousand, one hundred forty-three

b. five hundred twenty-one million, six hundred thirty thousand, fifty-seven

3. a. Begin by noting how to write the number within each period.

$\overbrace{53}^{53}$ $\overbrace{406}^{406}$
 fifty-three thousand, four hundred six

Write the digits for the number in each period, followed by a comma.

The standard form for the number is 53,406.

- b. Begin by noting how to write the number within each period.

$\overbrace{204}^{\text{two hundred four}}$ million, $\overbrace{932}^{\text{nine hundred thirty-two}}$ thousand, $\overbrace{016}^{\text{sixteen}}$

Write the digits for the number in each period, followed by a comma.

The standard form for the number is 204,932,016.

4. a. The place value chart shows that 704,663 contains 7 hundred-thousands, 0 ten-thousands, 4 thousands, 6 hundreds, 6 tens, and 3 ones. Thus 704,663 is written in expanded form as follows: $704,663 = 700,000 + 4000 + 600 + 60 + 3$.
- b. The place value chart shows that 49,063,400 contains 4 ten-millions, 9 millions, 0 hundred-thousands, 6 ten-thousands, 3 thousands, 4 hundreds, 0 tens, and 0 ones. Thus 49,063,400 is written in expanded form as follows: $49,063,400 = 40,000,000 + 9,000,000 + 60,000 + 3000 + 400$.
5. a. $14 > 5$ because 14 is to the right of 5 on the number line.
- b. $0 < 16$ because 0 is to the left of 16 on the number line.
6. a. The digit to the right of the thousands digit is 4, which is less than 5. This indicates to leave the thousands digit the same. Replace all digits to the right with zeros.
 $57,498 \approx 57,000$
- b. The digit to the right of the hundred-thousands digit is 5. This indicates to add one to the hundred-thousands digit. Replace all digits to the right with zeros.
 $4,856,902 \approx 4,900,000$
- c. The digit to the right of the thousands digit is 6, which is greater than 5. This implies to add one to the thousands digit. Replace all digits to the right with zeros.
 $9602 \approx 10,000$
- d. The digit to the right of the millions digit is 2, which is less than 5. This implies to leave the millions digit the same. Replace all digits to the right with zeros.
 $684,236,042 \approx 684,000,000$
7. a. The digit to the right of the billions digit is 0, which is less than 5. This implies to leave the billions digit the same. Replace all digits to the right with zeros.
 $7,058,746,857 \approx 7,000,000,000$
- b. The digit to the right of the ten-thousands digit is 6, which is greater than 5. This implies to add one to the ten-thousands digit. Replace all digits to the right with zeros.
 $7,058,746,857 \approx 7,058,750,000$
8. a. The cost of a coronary bypass in the United States is \$67,583
- b. The country with the least amount in the CT scan column is India.
The average cost for this procedure in India is \$43.
- c. The charge for an appendectomy in Chile is \$5509. The countries in which an appendectomy costs more than in Chile are Canada, Switzerland, and United States.
9. a. We begin with the number of marriages between an African-American husband and a white wife in 2010. Look at the bars labeled with the year 2010. The yellow bar to the right represents the number of marriages between an African-American husband and a white wife. The number above this bar is 390, representing 390 thousand. Thus, in 2010, there were 390,000 marriages between an African-American husband and a white wife.
- b. Look for the red bar labeled 61 (for 61 thousand, or 61,000). This is the bar to the left for the year labeled 1990. Thus, in 1990, there were 61,000 marriages between a white husband and an African-American wife.

1.1 Concept and Vocabulary Check

1. whole; 0
2. standard
3. periods
4. millions; hundred-thousands; thousands; tens
5. millions; forty-two; nine
6. expanded; 5000; 60; 8
7. number line
8. <
9. >
10. 8; 5; add 1; 9,000,000
11. 2; 3; do not change; 8,542,000

1.1 Exercise Set

Note that exercises #1 - 22 use the following table:

Millions Period			Thousands Period			Ones Period		
Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

1. hundreds
2. hundreds
3. ones
4. ones
5. hundred-thousands
6. hundred-thousands
7. millions
8. millions
9. ten-millions
10. ten-millions

11. hundred-millions
12. hundred-millions
13. two hundred fifty-eight
14. three hundred twenty-four
15. eight thousand, three hundred seventy-six
16. six thousand, two hundred twenty-six
17. thirty-six thousand, eight hundred eighty
18. fifty-two thousand, seven
19. seven million, five hundred sixty-six thousand
20. four million, three hundred two thousand
21. thirty-five million, two hundred sixty thousand, three hundred seventy-five
22. fifty-seven million, forty-four thousand, two hundred eight
23. The standard form is 3468.
24. The standard form is 5283.
25. The standard form is 86,500.
26. The standard form is 58,004.
27. The standard form is 16,402,012.
28. The standard form is 14,204,015.
29. The standard form is 9,000,009.
30. The standard form is 5,000,005.
31. The standard form is 26,034,203.
32. The standard form is 52,028,706.
33. The standard form is 620,595.
34. The standard form is 430,696.
35. The expanded form is $600 + 40 + 3$.
36. The expanded form is $500 + 70 + 2$.
37. The expanded form is $5000 + 40 + 6$.
38. The expanded form is $3000 + 50 + 7$.
39. The expanded form is $80,000 + 1000 + 300 + 60 + 4$.

40. The expanded form is $70,000 + 2000 + 500 + 40 + 6$.
41. The expanded form is $50,000 + 5000 + 30 + 8$.
42. The expanded form is $40,000 + 4000 + 20 + 9$.
43. The expanded form is $20,000,000 + 8,000,000 + 600,000 + 40,000$.
44. The expanded form is $50,000,000 + 6,000,000 + 300,000 + 7000 + 30 + 2$.
45. $9 > 3$ because 9 is to the right of 3 on the number line.
46. $7 > 2$ because 7 is to the right of 2 on the number line.
47. $0 < 14$ because 0 is to the left of 14 on the number line.
48. $0 < 16$ because 0 is to the left of 16 on the number line.
49. $3600 < 4500$ because 36000 is to the left of 4500 on the number line.
50. $2300 < 3200$ because 2300 is to the left of 3200 on the number line.
51. $200,000 > 20,000$ because 200,000 is to the right of 20,000 on the number line.
52. $300,000 > 30,000$ because 300,000 is to the right of 30,000 on the number line.
53. 624 rounded to the nearest ten is 620.
54. 372 rounded to the nearest ten is 370.
55. 627 rounded to the nearest ten is 630.
56. 378 rounded to the nearest ten is 380.
57. 4891 rounded to the nearest hundred is 4900.
58. 5482 rounded to the nearest hundred is 5500.
59. 4831 rounded to the nearest hundred is 4800.
60. 5432 rounded to the nearest hundred is 5400.
61. 61,529 rounded to the nearest thousand is 62,000.
62. 72,503 rounded to the nearest thousand is 73,000.
63. 61,129 rounded to the nearest thousand is 61,000.
64. 72,103 rounded to the nearest thousand is 72,000.
65. 24,628 rounded to the nearest ten-thousand is 20,000.
66. 34,628 rounded to the nearest ten-thousand is 30,000.
67. 345,207 rounded to the nearest ten-thousand is 350,000.
68. 645,308 rounded to the nearest ten-thousand is 650,000.
69. 86,609,100 rounded to the nearest million is 87,000,000.
70. 75,809,100 rounded to the nearest million is 76,000,000.
71. 86,409,100 rounded to the nearest million is 86,000,000.
72. 75,309,100 rounded to the nearest million is 75,000,000.
73. 86,609,100 rounded to the nearest ten-million is 90,000,000.
74. 75,809,100 rounded to the nearest million is 80,000,000.
75. ninety-two quadrillion, two hundred thirty-three trillion, seven hundred twenty billion, three hundred sixty-eight million, five hundred forty-seven thousand, eight hundred.
76. ten-quadrillions
77. $700,000,000,000 + 20,000,000,000$
78. $90,000,000,000,000,000 + 2,000,000,000,000,000$
79. 92,233,720,368,547,800 rounded to the nearest ten-quadrillion is 90,000,000,000,000,000. The word name is ninety quadrillion.
80. 92,233,720,368,547,800 rounded to the nearest quadrillion is 92,000,000,000,000,000. The word name is ninety-two quadrillion
81. Steven Spielberg generates the greatest revenue per year which is \$27,400,000. In word form this is twenty-seven million, four hundred thousand dollars.

82. Tom Cruise generates the greatest revenue per movie which is \$17,100,000. In word form this is seventeen million, one hundred thousand dollars.
83. Samuel L. Jackson generates the least revenue per movie. His yearly revenue is \$24,400,000. In word form this is twenty-four million, four hundred thousand dollars.
84. Johnny Depp generates between ten million dollars and eleven million dollars per movie. His yearly revenue is \$24,300,000. In word form this is twenty-four million, three hundred thousand dollars.
85. Tom Cruise and Tom Hanks generate the same revenue per year.
Tom Cruise generates the greatest revenue per movie which is \$17,100,000. In word form this is seventeen million, one hundred thousand dollars.
86. Tom Cruise and Tom Hanks generate the same revenue per year.
Tom Hanks generates the lesser revenue per movie which is \$12,000,000. In word form this is 12 million dollars.
87. \$53,664
88. \$53,285
89. 2011
90. 2010
91. The maximum is shown by the highest bar in the graph. This occurs in 2007 at \$55,627.
92. The minimum is shown by the lowest bar in the graph. This occurs in 2012 at \$51,017.
93. 2,376,206; two million, three hundred seventy-six thousand, two hundred six
94. 1,857,160; one million; eight hundred fifty-seven thousand, one hundred sixty
95. Williams
96. Brown and Jones
97. 1,857,160 rounded to the nearest hundred-thousand is 1,900,000.
98. 2,376,206 rounded to the nearest hundred-thousand is 2,400,000.
99. The 3 is in the ten-thousands place.
100. The 8 is in the ten-thousands place.
101. $1,380,145 < 1,534,042$
102. $1,857,160 > 1,380,145$
103. two thousand, four hundred fifty-three
104. two hundred two thousand, twenty-two
105. 102,063
106. 12,042
107. – 117. Answers will vary.
118. does not make sense; Explanations will vary.
Sample explanation: Adding one to this number would create a bigger number.
119. makes sense
120. makes sense
121. makes sense
122. true
123. false; Changes to make the statement true will vary.
A sample change is: The number 32,864 is written in standard form.
124. false; Changes to make the statement true will vary.
A sample change is: When rounding whole numbers, the digit to be rounded either stays the same or increases by 1.
125. false; Changes to make the statement true will vary.
A sample change is: When comparing numbers of various items, tables are just as effective as bar graphs.
126. The whole numbers from 10 to 40 would be rounded to 10 or 20 or 30 or 40. So there are four different rounded numbers.
127. a. 46 rounded to the nearest ten is 50.
b. 23 rounded to the nearest ten is 20.
c. $46 + 23 \approx 50 + 20 = 70$
128. a. 10; 10
b. 8; 8
c. No the order does not make a difference.

129. a. 9

b. 9

c. No the group changes does not change the answer.

b. Bob Hope's number

= Johnny Carson's number + 13

= 5 + 13

= 18

Bob Hope hosted the Oscars 18 times.

c. $5 + 9 + 18 = 32$

Johnny Carson, Billy Crystal, and Bob Hope hosted the Oscars a total of 32 times.

1.2 Check Points

1. 7243

+ 632

7875

2. $\begin{array}{r} 1 \quad 1 \\ 2,097 \end{array}$

+ 8,544

10,641

3. $\begin{array}{r} 222 \\ 25,572 \end{array}$

329,874

+ 4,882

360,328

4. Exact Estimate

25,572 \approx 26,000

329,874 \approx 330,000

+ 4,882 \approx + 5,000

361,000

The exact sum from Check Point 3 seems reasonable.

5. a. associative property of addition

b. identity property of addition

c. commutative property of addition

d. commutative property of addition

6. $15 + 3 + 5 + 7 + 8$ could be rearranged as

$\overbrace{15+5}^{20} + \overbrace{3+7}^{10} + 8$ which is $20 + 10 + 8 = 38$.

7. a. Billy Crystal's number

= Johnny Carson's number + 4

= 5 + 4

= 9

Billy Crystal hosted the Oscars 9 times.

8. 11 feet + 11 feet + 9 feet + 9 feet + 13 feet = 53 feet

9. 38 yd

19 yd

38 yd

+ 19 yd

114 yd

The yard requires 114 yd of fencing.

1.2 Concept and Vocabulary Check

1. sum; addends

2. carrying

3. identity

4. commutative

5. associative

6. rectangle; length

7. perimeter

1.2 Exercise Set

1. 23

+ 42

65

2. 26

+ 33

59

3. 53

+ 340

393

$$\begin{array}{r} 4. \quad 67 \\ + 230 \\ \hline 297 \end{array}$$

$$\begin{array}{r} 5. \quad 4762 \\ + 124 \\ \hline 4886 \end{array}$$

$$\begin{array}{r} 6. \quad 5643 \\ + 325 \\ \hline 5968 \end{array}$$

$$\begin{array}{r} 7. \quad 2542 \\ + 126 \\ \hline 2668 \end{array}$$

$$\begin{array}{r} 8. \quad 3427 \\ + 261 \\ \hline 3688 \end{array}$$

$$\begin{array}{r} 9. \quad 89 \\ + 32 \\ \hline 121 \end{array}$$

$$\begin{array}{r} 10. \quad 97 \\ + 54 \\ \hline 151 \end{array}$$

$$\begin{array}{r} 11. \quad 4308 \\ + 2956 \\ \hline 7264 \end{array}$$

$$\begin{array}{r} 12. \quad 5706 \\ + 3645 \\ \hline 9351 \end{array}$$

$$\begin{array}{r} 13. \quad 5274 \\ + 6298 \\ \hline 11,572 \end{array}$$

$$\begin{array}{r} 14. \quad 3748 \\ + 8397 \\ \hline 12,145 \end{array}$$

$$\begin{array}{r} 15. \quad 741 \\ 325 \\ + 986 \\ \hline 2052 \end{array}$$

$$\begin{array}{r} 16. \quad 876 \\ 521 \\ + 994 \\ \hline 2391 \end{array}$$

$$\begin{array}{r} 17. \quad 62,833 \\ 8,763 \\ + 98 \\ \hline 71,694 \end{array}$$

$$\begin{array}{r} 18. \quad 57,926 \\ 5,843 \\ + 79 \\ \hline 63,848 \end{array}$$

$$\begin{array}{r} 19. \quad 804,127 \\ 39,705 \\ + 2,008 \\ \hline 845,840 \end{array}$$

$$\begin{array}{r} 20. \quad 906,238 \\ 29,507 \\ + 4,007 \\ \hline 939,752 \end{array}$$

$$\begin{array}{r} 21. \quad 3,788 \\ 9,546 \\ 2,030 \\ + 83,947 \\ \hline 99,311 \end{array}$$

$$\begin{array}{r} 22. \quad 5,877 \\ 8,493 \\ 5,060 \\ + 94,726 \\ \hline 114,156 \end{array}$$

$$\begin{array}{rcl}
 \text{23. Exact} & & \text{Estimate} \\
 49 & \approx & 50 \\
 37 & \approx & 40 \\
 + 22 & \approx & + 20 \\
 \hline
 & & 110
 \end{array}$$

$$\begin{array}{rcl}
 \text{24. Exact} & & \text{Estimate} \\
 62 & \approx & 60 \\
 43 & \approx & 40 \\
 + 19 & \approx & + 20 \\
 \hline
 & & 120
 \end{array}$$

$$\begin{array}{rcl}
 \text{25. Exact} & & \text{Estimate} \\
 2513 & \approx & 2500 \\
 864 & \approx & 900 \\
 + 1937 & \approx & + 1900 \\
 \hline
 & & 5300
 \end{array}$$

$$\begin{array}{rcl}
 \text{26. Exact} & & \text{Estimate} \\
 3416 & \approx & 3400 \\
 778 & \approx & 800 \\
 + 1926 & \approx & + 1900 \\
 \hline
 & & 6100
 \end{array}$$

$$\begin{array}{rcl}
 \text{27. Exact} & & \text{Estimate} \\
 62,534 & \approx & 63,000 \\
 4107 & \approx & 4000 \\
 + 8612 & \approx & + 9000 \\
 \hline
 & & 76,000
 \end{array}$$

$$\begin{array}{rcl}
 \text{28. Exact} & & \text{Estimate} \\
 84,517 & \approx & 85,000 \\
 6103 & \approx & 6000 \\
 + 7814 & \approx & + 8000 \\
 \hline
 & & 99,000
 \end{array}$$

29. a. $6234 + 7983 \approx 6000 + 8000$
 $= 14,000$

b. No, the estimate does not seem reasonable.

30. a. $6807 + 4150 \approx 7000 + 4000$
 $= 11,000$

b. No, the estimate does not seem reasonable.

31. a. $18,972 + 378,641 + 6874$
 $\approx 20,000 + 380,000 + 7000$
 $= 407,000$

b. Yes, the estimate seems reasonable.

32. a. $28,612 + 287,611 + 7862$
 $\approx 30,000 + 290,000 + 8000$
 $= 328,000$

b. Yes, the estimate seems reasonable.

33. commutative property of addition

34. commutative property of addition

35. associative property of addition

36. associative property of addition

37. identity property of addition

38. identity property of addition

39. identity property of addition

40. identity property of addition

41. commutative property of addition

42. commutative property of addition

43. $12 + 7 + 8 + 3 = \overbrace{12+8}^{20} + \overbrace{7+3}^{10}$
 $= 20 + 10$
 $= 30$

44. $18 + 9 + 2 + 1 = \overbrace{18+2}^{20} + \overbrace{9+1}^{10}$
 $= 20 + 10$
 $= 30$

45. $32 + 7 + 11 + 8 + 39 = \overbrace{32+8}^{40} + \overbrace{11+39}^{50} + 7$
 $= 40 + 50 + 7$
 $= 97$

46. $22 + 4 + 1 + 8 + 59 = \overbrace{22+8}^{30} + \overbrace{1+59}^{60} + 4$
 $= 30 + 60 + 4$
 $= 94$

$$\begin{aligned} 47. \quad 96 + 5 + 4 + 195 + 17 &= \overbrace{96 + 4}^{100} + \overbrace{5 + 195}^{200} + 17 \\ &= 100 + 200 + 17 \\ &= 317 \end{aligned}$$

$$\begin{aligned} 48. \quad 93 + 4 + 7 + 196 + 12 &= \overbrace{93 + 7}^{100} + \overbrace{4 + 196}^{200} + 12 \\ &= 100 + 200 + 12 \\ &= 312 \end{aligned}$$

$$49. \quad 412 + 123 = 535$$

$$50. \quad 514 + 226 = 740$$

$$51. \quad 89 + 45 = 134$$

$$52. \quad 93 + 28 = 121$$

$$53. \quad 5492 + 12,326 = 17,818$$

$$54. \quad 8943 + 13,517 = 22,460$$

$$55. \quad 127,813 + 2799 = 130,612$$

$$56. \quad 138,514 + 3786 = 142,300$$

$$57. \quad 87 + 93 + 8 + 2015 = 2203$$

$$58. \quad 94 + 72 + 5 + 3017 = 3188$$

$$59. \quad 2917 + 306 + 14,999 = 18,222$$

$$60. \quad 3716 + 504 + 15,998 = 20,218$$

$$\begin{aligned} 61. \quad &8 \text{ inches} \\ &10 \text{ inches} \\ &8 \text{ inches} \\ &\underline{+ 10 \text{ inches}} \\ &36 \text{ inches} \\ &\text{The perimeter is 36 inches.} \end{aligned}$$

$$\begin{aligned} 62. \quad &14 \text{ inches} \\ &9 \text{ inches} \\ &14 \text{ inches} \\ &\underline{+ 9 \text{ inches}} \\ &46 \text{ inches} \\ &\text{The perimeter is 46 inches.} \end{aligned}$$

$$\begin{aligned} 63. \quad &9 \text{ feet} \\ &7 \text{ feet} \\ &\underline{+ 11 \text{ feet}} \\ &27 \text{ feet} \\ &\text{The perimeter is 27 feet.} \end{aligned}$$

$$\begin{aligned} 64. \quad &10 \text{ feet} \\ &16 \text{ feet} \\ &\underline{+ 9 \text{ feet}} \\ &35 \text{ feet} \\ &\text{The perimeter is 35 feet.} \end{aligned}$$

$$\begin{aligned} 65. \quad &6 \text{ yards} \\ &8 \text{ yards} \\ &6 \text{ yards} \\ &\underline{+ 8 \text{ yards}} \\ &28 \text{ yards} \\ &\text{The perimeter is 28 yards.} \end{aligned}$$

$$\begin{aligned} 66. \quad &7 \text{ yards} \\ &18 \text{ yards} \\ &7 \text{ yards} \\ &\underline{+ 18 \text{ yards}} \\ &50 \text{ yards} \\ &\text{The perimeter is 50 yards.} \end{aligned}$$

$$\begin{aligned} 67. \quad &250 \text{ inches} \\ &250 \text{ inches} \\ &250 \text{ inches} \\ &\underline{+ 250 \text{ inches}} \\ &1000 \text{ inches} \\ &\text{The perimeter is 1000 inches.} \end{aligned}$$

$$\begin{aligned} 68. \quad &50 \text{ inches} \\ &50 \text{ inches} \\ &50 \text{ inches} \\ &\underline{+ 50 \text{ inches}} \\ &200 \text{ inches} \\ &\text{The perimeter is 200 inches.} \end{aligned}$$

69. 9 yards

9 yards

12 yards

12 yards

21 yards

+ 21 yards

84 yards

The perimeter is 84 yards.

70. 5 inches

13 inches

9 inches

4 inches

14 inches

+ 17 inches

62 inches

The perimeter is 62 inches.

71. $\overbrace{517+0}^{517} = \overbrace{514+3}^{517}$

72. $\overbrace{825+0}^{825} = \overbrace{821+4}^{825}$

73. $\overbrace{53+64}^{117} > \overbrace{41+74}^{115}$

74. $\overbrace{62+14+18}^{94} > \overbrace{23+49+18}^{90}$

75. $\overbrace{61+10}^{71} < \overbrace{50+35}^{85}$

76. $\overbrace{57+30}^{87} < \overbrace{66+22}^{88}$

77. $\overbrace{239+1268+1590}^{3097} > \overbrace{598+1248+71}^{1917}$

78. $\overbrace{2105+2892+4300}^{9297} > \overbrace{1400+3429+99}^{4928}$

79. Number of dogs named Bella = Number of dogs named Lucy + 2089
 $= 3571 + 2089$
 $= 5660$

5660 dogs are named Bella.

80. Number of dogs named Bailey = Number of dogs named Lucy + 417
 $= 3571 + 417$
 $= 3988$

3988 dogs are named Bailey.

81. Number of dogs named Bailey = Number of dogs named Molly + 707
 $= 3281 + 707$
 $= 3988$

3988 dogs are named Bailey.

82. Number of dogs named Bella = Number of dogs named Molly + 2379
 $= 3281 + 2379$
 $= 5660$

5660 dogs are named Bella.

83. 5660 Named Bella (from a previous exercise)
 3958 Named Max (from bar graph)
 $+ 3571$ Named Max (from bar graph)
 13,189

84. 3988 Named Bailey (from a previous exercise)
 3958 Named Max (from bar graph)
 $+ 3571$ Named Max (from bar graph)
 11,517

85. a. Exact Estimate
 59 feet \approx 60 feet
 23 feet \approx 20 feet
 25 feet \approx 30 feet
 46 feet \approx 50 feet
 $+ 43$ feet \approx $+ 40$ feet
 200 feet

The estimate is 200 feet.

b. 59 feet
 23 feet
 25 feet
 46 feet
 $+ 43$ feet
 196 feet
 The perimeter is 196 feet.

86. a.	Exact	Estimate
	3 feet \approx	0 feet
	15 feet \approx	20 feet
	21 feet \approx	20 feet
	15 feet \approx	20 feet
	9 feet \approx	10 feet
	<u>+ 24 feet</u>	<u>+ 20 feet</u>
		90 feet

The estimate is 90 feet.

b.	3 feet
	15 feet
	21 feet
	15 feet
	9 feet
	<u>+ 24 feet</u>
	87 feet

The perimeter is 87 feet.

87. – 96. Answers will vary.

97. does not make sense; Explanations will vary.
Sample explanation: No column's sum exceeded 9.

98. makes sense

99. makes sense

100. makes sense

101. false; Changes to make the statement true will vary.
A sample change is: The expressions are equal because of the commutative property of addition.

102. true

103. true

104. true

105. The two smaller vertical sides total 7 inches, so the unlabeled vertical side must also be 7 inches. The two smaller horizontal sides total 9 inches, so the unlabeled horizontal side must also be 9 inches.

3 inches

4 inches

7 inches

3 inches

6 inches

+ 9 inches

32 inches

The perimeter is 32 inches.

106. The labeled vertical side is 8 inches, so the 2 smaller vertical sides must total 8 inches. Since one of these vertical sides is labeled 3 inches, the unlabeled vertical side must be 5 inches

The horizontal vertical side is 10 inches, so the 2 smaller horizontal sides must total 10 inches. Since one of these horizontal sides is labeled 5 inches, the unlabeled horizontal side must also be 5 inches.

8 inches

5 inches

3 inches

10 inches

5 inches

+ 5 inches

36 inches

The perimeter is 36 inches.

107. Answers will vary.

108. $8 - 2 = 6$ because $6 + 2 = 8$.

109. Yes, the sum is 92.

78

+ 14

92

110. $5 - 3 = 2$

1.3 Check Points

1. a. $13 - 10 = 3$

Check: $3 + 10 = 13$

b. $8 - 2 = 6$

Check: $6 + 2 = 8$

c. $12 - 12 = 0$

Check: $0 + 12 = 12$

d. $40 - 0 = 40$

Check: $40 + 0 = 40$

$$\begin{array}{r} 2. \quad 6893 \\ - 721 \\ \hline 6172 \end{array} \quad \begin{array}{l} \text{Check: } 6172 \\ + 721 \\ \hline 6893 \end{array}$$

$$\begin{array}{r} 3. \quad \overset{5}{\cancel{5}} \overset{12}{\cancel{2}} \\ - 45 \\ \hline 517 \end{array} \quad \begin{array}{l} \text{Check: } 517 \\ + 45 \\ \hline 562 \end{array}$$

$$\begin{array}{r} 4. \quad \overset{4}{\cancel{4}} \overset{15}{\cancel{15}} \overset{17}{\cancel{17}} 4 \\ - 893 \\ \hline 4781 \end{array} \quad \begin{array}{l} \text{Check: } 4781 \\ + 893 \\ \hline 5674 \end{array}$$

$$\begin{array}{r} 5. \quad \overset{9}{\cancel{6}} \overset{10}{\cancel{10}} \overset{10}{\cancel{10}} \\ - 256 \\ \hline 444 \end{array} \quad \begin{array}{l} \text{Check: } 444 \\ + 256 \\ \hline 700 \end{array}$$

$$\begin{array}{r} 6. \quad \text{Exact} \quad \text{Estimate} \\ 5674 \approx 6000 \\ - 893 \approx -1000 \\ \hline 5000 \end{array}$$

The exact difference of 4781, determined in Check Point 4, seems reasonable.

$$\begin{array}{r} 7. \quad \text{a. } 130,490 \quad (\text{Lawyers}) \\ - 45,230 \quad (\text{All Occupations}) \\ \hline 85,260 \end{array}$$

The difference is \$85,260.

$$\begin{array}{r} \text{b. } 130,490 \quad (\text{Lawyers}) \\ - 60,360 \\ \hline 70,130 \quad (\text{Accountants}) \end{array}$$

The average salary for accountants is \$70,130.

$$\begin{array}{r} 8. \quad \text{Balance after May 10} = \overbrace{820}^{\text{Balance May 1}} - \overbrace{(450+85+5+37)}^{\text{Withdrawals on or before May 10}} \\ = 820 - 577 \\ = 243 \end{array}$$

The balance after May 10 is \$243.

1.3 Concept and Vocabulary Check

1. minuend; subtrahend; difference
2. 2; 10; 12
3. 0
4. borrowing

1.3 Exercise Set

$$\begin{array}{r} 1. \quad 87 \\ - 25 \\ \hline 62 \end{array} \quad \begin{array}{l} \text{Check: } 62 \\ + 25 \\ \hline 87 \end{array}$$

$$\begin{array}{r} 2. \quad 73 \\ - 42 \\ \hline 31 \end{array} \quad \begin{array}{l} \text{Check: } 31 \\ + 42 \\ \hline 73 \end{array}$$

$$\begin{array}{r} 3. \quad 598 \\ - 325 \\ \hline 273 \end{array} \quad \begin{array}{l} \text{Check: } 273 \\ + 325 \\ \hline 598 \end{array}$$

$$\begin{array}{r} 4. \quad 752 \\ - 431 \\ \hline 321 \end{array} \quad \begin{array}{l} \text{Check: } 321 \\ + 431 \\ \hline 752 \end{array}$$

$$\begin{array}{r} 5. \quad 376 \\ - 52 \\ \hline 324 \end{array} \quad \begin{array}{l} \text{Check: } 324 \\ + 52 \\ \hline 376 \end{array}$$

$$\begin{array}{r} 6. \quad 387 \\ - 65 \\ \hline 322 \end{array} \quad \begin{array}{l} \text{Check: } 322 \\ + 65 \\ \hline 387 \end{array}$$

$$\begin{array}{r} 7. \quad 6288 \\ - 178 \\ \hline 6110 \end{array} \quad \begin{array}{l} \text{Check: } 6110 \\ + 178 \\ \hline 6288 \end{array}$$

$$\begin{array}{r} 8. \quad 9366 \\ - 246 \\ \hline 9120 \end{array} \quad \begin{array}{l} \text{Check: } 9120 \\ + 246 \\ \hline 9366 \end{array}$$

$$\begin{array}{r} 9. \quad 6785 \\ - 2385 \\ \hline 4400 \end{array} \quad \begin{array}{r} \text{Check: } 4400 \\ + 2385 \\ \hline 6785 \end{array}$$

$$\begin{array}{r} 20. \quad 634 \\ - 452 \\ \hline 182 \end{array} \quad \begin{array}{r} \text{Check: } 182 \\ + 452 \\ \hline 634 \end{array}$$

$$\begin{array}{r} 10. \quad 8453 \\ - 3253 \\ \hline 5200 \end{array} \quad \begin{array}{r} \text{Check: } 5200 \\ + 3253 \\ \hline 8453 \end{array}$$

$$\begin{array}{r} 21. \quad 933 \\ - 457 \\ \hline 476 \end{array} \quad \begin{array}{r} \text{Check: } 476 \\ + 457 \\ \hline 933 \end{array}$$

$$\begin{array}{r} 11. \quad 78,993 \\ - 4,491 \\ \hline 74,502 \end{array} \quad \begin{array}{r} \text{Check: } 74,502 \\ + 4,491 \\ \hline 78,993 \end{array}$$

$$\begin{array}{r} 22. \quad 746 \\ - 399 \\ \hline 347 \end{array} \quad \begin{array}{r} \text{Check: } 347 \\ + 399 \\ \hline 746 \end{array}$$

$$\begin{array}{r} 12. \quad 67,876 \\ - 3,271 \\ \hline 64,605 \end{array} \quad \begin{array}{r} \text{Check: } 64,605 \\ + 3,271 \\ \hline 67,876 \end{array}$$

$$\begin{array}{r} 23. \quad 800 \\ - 523 \\ \hline 277 \end{array} \quad \begin{array}{r} \text{Check: } 277 \\ + 523 \\ \hline 800 \end{array}$$

$$\begin{array}{r} 13. \quad 25,176 \\ - 25,176 \\ \hline 0 \end{array} \quad \begin{array}{r} \text{Check: } 0 \\ + 25,176 \\ \hline 25,176 \end{array}$$

$$\begin{array}{r} 24. \quad 500 \\ - 276 \\ \hline 224 \end{array} \quad \begin{array}{r} \text{Check: } 224 \\ + 276 \\ \hline 500 \end{array}$$

$$\begin{array}{r} 14. \quad 32,574 \\ - 32,574 \\ \hline 0 \end{array} \quad \begin{array}{r} \text{Check: } 0 \\ + 32,574 \\ \hline 32,574 \end{array}$$

$$\begin{array}{r} 25. \quad 253 \\ - 47 \\ \hline 206 \end{array} \quad \begin{array}{r} \text{Check: } 206 \\ + 47 \\ \hline 253 \end{array}$$

$$\begin{array}{r} 15. \quad 82 \\ - 35 \\ \hline 47 \end{array} \quad \begin{array}{r} \text{Check: } 47 \\ + 35 \\ \hline 82 \end{array}$$

$$\begin{array}{r} 26. \quad 468 \\ - 59 \\ \hline 409 \end{array} \quad \begin{array}{r} \text{Check: } 409 \\ + 59 \\ \hline 468 \end{array}$$

$$\begin{array}{r} 16. \quad 63 \\ - 28 \\ \hline 35 \end{array} \quad \begin{array}{r} \text{Check: } 35 \\ + 28 \\ \hline 63 \end{array}$$

$$\begin{array}{r} 27. \quad 7382 \\ - 460 \\ \hline 6922 \end{array} \quad \begin{array}{r} \text{Check: } 6922 \\ + 460 \\ \hline 7382 \end{array}$$

$$\begin{array}{r} 17. \quad 80 \\ - 27 \\ \hline 53 \end{array} \quad \begin{array}{r} \text{Check: } 53 \\ + 27 \\ \hline 80 \end{array}$$

$$\begin{array}{r} 28. \quad 8249 \\ - 320 \\ \hline 7929 \end{array} \quad \begin{array}{r} \text{Check: } 7929 \\ + 320 \\ \hline 8249 \end{array}$$

$$\begin{array}{r} 18. \quad 90 \\ - 43 \\ \hline 47 \end{array} \quad \begin{array}{r} \text{Check: } 47 \\ + 43 \\ \hline 90 \end{array}$$

$$\begin{array}{r} 29. \quad 1533 \\ - 49 \\ \hline 1484 \end{array} \quad \begin{array}{r} \text{Check: } 1484 \\ + 49 \\ \hline 1533 \end{array}$$

$$\begin{array}{r} 19. \quad 857 \\ - 673 \\ \hline 184 \end{array} \quad \begin{array}{r} \text{Check: } 184 \\ + 673 \\ \hline 857 \end{array}$$

$$\begin{array}{r} 30. \quad 1746 \\ - 89 \\ \hline 1657 \end{array} \quad \begin{array}{r} \text{Check: } 1657 \\ + 89 \\ \hline 1746 \end{array}$$

$$\begin{array}{r} 31. \quad 1967 \\ - 1928 \\ \hline 39 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 1928 \\ \hline 1967 \end{array}$$

$$\begin{array}{r} 32. \quad 2952 \\ - 2947 \\ \hline 5 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 2947 \\ \hline 2952 \end{array}$$

$$\begin{array}{r} 33. \quad 42,566 \\ - 13,708 \\ \hline 28,858 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 13,708 \\ \hline 42,566 \end{array}$$

$$\begin{array}{r} 34. \quad 65,722 \\ - 26,807 \\ \hline 38,915 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 26,807 \\ \hline 65,722 \end{array}$$

$$\begin{array}{r} 35. \quad 60,000 \\ - 27,983 \\ \hline 32,017 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 27,983 \\ \hline 60,000 \end{array}$$

$$\begin{array}{r} 36. \quad 80,000 \\ - 39,982 \\ \hline 40,018 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 39,982 \\ \hline 80,000 \end{array}$$

$$\begin{array}{r} 37. \quad 86,497 \\ - 25,850 \\ \hline 60,647 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 25,850 \\ \hline 86,497 \end{array}$$

$$\begin{array}{r} 38. \quad 71,111 \\ - 18,998 \\ \hline 52,113 \end{array} \quad \begin{array}{r} \text{Check:} \\ + 18,998 \\ \hline 71,111 \end{array}$$

$$\begin{array}{r} 39. \quad \text{Exact} \\ 338 \\ - 223 \\ \hline 115 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 340 \\ - 220 \\ \hline 120 \end{array}$$

$$\begin{array}{r} 40. \quad \text{Exact} \\ 586 \\ - 123 \\ \hline 463 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 590 \\ - 120 \\ \hline 470 \end{array}$$

$$\begin{array}{r} 41. \quad \text{Exact} \\ 1875 \\ - 1387 \\ \hline 488 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 1900 \\ - 1400 \\ \hline 500 \end{array}$$

$$\begin{array}{r} 42. \quad \text{Exact} \\ 2813 \\ - 2271 \\ \hline 542 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 2800 \\ - 2300 \\ \hline 500 \end{array}$$

$$\begin{array}{r} 43. \quad \text{Exact} \\ 18,963 \\ - 16,218 \\ \hline 2,745 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 19,000 \\ - 16,000 \\ \hline 3,000 \end{array}$$

$$\begin{array}{r} 44. \quad \text{Exact} \\ 24,817 \\ - 13,199 \\ \hline 11,618 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 25,000 \\ - 13,000 \\ \hline 12,000 \end{array}$$

$$\begin{array}{r} 45. \text{ a. } \text{Exact} \\ 3635 \\ - 462 \\ \hline 3173 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 3600 \\ - 500 \\ \hline 3100 \end{array}$$

b. No; An exact difference of 2173 does not seem reasonable.

$$\begin{array}{r} 46. \text{ a. } \text{Exact} \\ 1852 \\ - 427 \\ \hline 1425 \end{array} \quad \begin{array}{r} \text{Estimate} \\ \approx 1900 \\ - 400 \\ \hline 1500 \end{array}$$

b. No; An exact difference of 1025 does not seem reasonable.

$$47. \quad 53 - 6 = 47$$

$$48. \quad 73 - 7 = 66$$

$$49. \quad 71 - 11 = 60$$

$$50. \quad 57 - 35 = 22$$

$$51. \quad 88 - 62 = 26$$

$$52. \quad 97 - 55 = 42$$

$$53. \quad 49 - 7 = 42$$

54. $55 - 4 = 51$

55. $43 - 3 = 40$

56. $68 - 8 = 60$

57. $80 - 36 = 44$

58. $90 - 39 = 51$

59. $548 - 30 = 518$

60. $876 - 60 = 816$

61. $758 - 654 = 104$

62. $497 - 293 = 204$

63. $9083 - 134 = 8949$

64. $3935 - 885 = 3050$

65.
$$\begin{array}{r} 905,008 \\ - 280,034 \\ \hline 624,974 \end{array}$$

66.
$$\begin{array}{r} 2,013,000 \\ - 507,093 \\ \hline 1,505,907 \end{array}$$

67.
$$\overbrace{35 - 15}^{20} = \overbrace{80 - 60}^{20}$$

68.
$$\overbrace{40 - 35}^5 = \overbrace{85 - 80}^5$$

69.
$$\overbrace{458 - 84}^{374} < \overbrace{716 - 330}^{386}$$

70.
$$\overbrace{121 - 53}^{68} > \overbrace{761 - 706}^{55}$$

71.
$$\begin{array}{r} 70 \quad (\text{Minuend}) \\ - 40 \quad (\text{Subtrahend}) \\ \hline 30 \quad (\text{Difference}) \end{array}$$

72.
$$\begin{array}{r} 100 \quad (\text{Minuend}) \\ - 90 \quad (\text{Subtrahend}) \\ \hline 10 \quad (\text{Difference}) \end{array}$$

73. 1550

$$\begin{array}{r} - 122 \\ \hline 1428 \end{array}$$

The difference is 1428 years.

74. 1550

$$\begin{array}{r} - 405 \\ \hline 1145 \end{array}$$

The difference is 1145 years.

75. 405

$$\begin{array}{r} - 195 \\ \hline 210 \end{array}$$

The extreme lifespan of a whale is 210 years.

76. 405

$$\begin{array}{r} - 328 \\ \hline 77 \end{array}$$

The extreme lifespan of a cockatoo is 77 years.

77. 122

$$\begin{array}{r} - 28 \\ \hline 94 \end{array}$$

The extreme lifespan of a dog is 94 years less than the extreme lifespan of a human.

78. 122

$$\begin{array}{r} - 38 \\ \hline 84 \end{array}$$

The extreme lifespan of a cat is 84 years less than the extreme lifespan of a human.

79.
$$\begin{aligned} \text{Balance} &= \overbrace{(1050 + 435)}^{\text{Deposits}} - \overbrace{(525 + 185 + 4 + 100 + 190)}^{\text{Withdrawals}} \\ &= 1485 - 1004 \\ &= 481 \end{aligned}$$

The balance after June 25 is \$481.

80.
$$\begin{aligned} \text{Balance} &= \overbrace{(1120 + 350)}^{\text{Deposits}} - \overbrace{(615 + 145 + 225 + 300 + 4)}^{\text{Withdrawals}} \\ &= 1470 - 1289 \\ &= 181 \end{aligned}$$

The balance after December 31 is \$181.

- 81.** Rectangle: Square:
 17 feet 14 feet
 13 feet 14 feet
 17 feet 14 feet
 +13 feet +14 feet

 60 feet 56 feet

Difference:

$$\begin{array}{r} 60 \text{ feet (Rectangle)} \\ - 56 \text{ feet (Square)} \\ \hline 4 \text{ feet} \end{array}$$

The rectangular garden requires 4 more feet of fencing than the square garden.

- 82.** Rectangle: Square:
 23 feet 16 feet
 11 feet 16 feet
 23 feet 16 feet
 +11 feet +16 feet

 68 feet 64 feet

Difference:

$$\begin{array}{r} 68 \text{ feet (Rectangle)} \\ - 64 \text{ feet (Square)} \\ \hline 4 \text{ feet} \end{array}$$

The rectangular garden requires 4 more feet of fencing than the square garden.

- 83. – 88.** Answers will vary.

- 89.** does not make sense; Explanations will vary.
 Sample explanation: To check a subtraction problem by add the difference to the subtrahend.

- 90.** does not make sense; Explanations will vary.
 Sample explanation: Borrowing is unnecessary because each digit in the subtrahend exceeds the corresponding digit in the minuend.

- 91.** makes sense

- 92.** makes sense

- 93.** true

- 94.** true

- 95.** false; Changes to make the statement true will vary.
 A sample change is: When 30 is subtracted from 50, 30 is the subtrahend.

- 96.** true

- 97.** 479
 -184

 295

- 98.** 849
 -355

 494

- 99.** No; the associative property cannot be applied to subtraction.

$$10 - (6 - 1) = 10 - 5 = 5$$

$$(10 - 6) - 1 = 4 - 1 = 3$$

- 100.** Answers will vary.

- 101.** eighty-nine thousand, one hundred sixty-two

- 102.** 35,287
 +4,956

 40,243

- 103.** Exact Estimate
 35,287 ≈ 35,000
 +4,956 ≈ +5,000

 40,000

- 104. a.** $5 \times 3 = 5 + 5 + 5 = 15$

- b.** $2 \times 4 = 2 + 2 + 2 + 2 = 8$

- c.** $6 \times 7 = 6 + 6 + 6 + 6 + 6 + 6 + 6 = 42$

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

- b.** $2 \times (3 \times 5) = 2 \times 15 = 30$

- c.** No; the grouping did not change the answer.

- 106. a.** $2839 \approx 3000$

- b.** $621 \approx 600$

- c.** $2839 \times 621 \approx 3000 \times 600$

1.4 Check Points

1. a. $73 \cdot 1 = 73$

b. $73 \times 0 = 0$

c. $0(14) = 0$

d. $1 \times 13 = 13$

2. a. associative property of multiplication

b. commutative property of multiplication

c. commutative property of multiplication

3. a. $10(4+5) = 10 \cdot 4 + 10 \cdot 5$

b. $10(4+5) = 10(9) = 90$

$10 \cdot 4 + 10 \cdot 5 = 40 + 50 = 90$

Yes, both methods give the same answer.

4. 243

$$\begin{array}{r} \times 2 \\ \hline 486 \end{array}$$

5. 823

$$\begin{array}{r} \times 7 \\ \hline 5761 \end{array}$$

6. 258

$$\begin{array}{r} \times 24 \\ \hline 1032 \\ + 5160 \\ \hline 6192 \end{array}$$

7. 437

$$\begin{array}{r} \times 253 \\ \hline 1311 \\ 21850 \\ + 87400 \\ \hline 110,561 \end{array}$$

8. 723

$$\begin{array}{r} \times 205 \\ \hline 3615 \\ + 144600 \\ \hline 148,215 \end{array}$$

9. a. $953 \cdot 1000 = 953,000$

b. $4026 \cdot 100 = 402,600$

10. $2 \cdot 7 \cdot 5 \cdot 3 = \overbrace{2 \cdot 5}^{10} \cdot \overbrace{7 \cdot 3}^{21}$
 $= 10 \cdot 21$
 $= 210$

11. a. 28

$$\begin{array}{r} \times 7 \\ \hline 196 \end{array}$$

Attach 3 zeros to 196.

$28(7000) = 196,000$

b. $2 \times 8 = 16$

Attach 2 + 3, or 5 zeros to 16.

$200 \cdot 8000 = 1,600,000$

12. $4796 \times 817 \approx 5000 \times 800$

$= 4,000,000$

13. amount spent on housing and utilities $= (5 \cdot 126) + 35$

$= 630 + 35$

$= 665$

The amount spent on housing and utilities is \$665.

14. Total Sales = $\overbrace{83 \cdot 12}^{\text{Adult tickets}} + \overbrace{57 \cdot 5}^{\text{Child tickets}}$
 $= 996 + 285$
 $= 1281$

The total amount collected in ticket sales is \$1281.

15. a. 21

$$\begin{array}{r} \times 18 \\ \hline 168 \\ + 210 \\ \hline 378 \end{array}$$

The area of the floor is 378 square feet.

b. 378

$$\begin{array}{r} \times 7 \\ \hline 2646 \end{array}$$

The cost of the carpeting is \$2646.

1.4 Concept and Vocabulary Check

1. $6 + 6 + 6$

2. factors; product

3. 0

4. identity

5. commutative

6. associative
7. distributive; distributes
8. five
9. length; width; square

b. $3(4 + 5) = 3(9) = 27$
 $3 \cdot 4 + 3 \cdot 5 = 12 + 15 = 27$
 Yes, both methods give the same answer.

1.4 Exercise Set

1. $27 \cdot 1 = 27$
2. $39 \cdot 1 = 39$
3. $0 \cdot 27 = 0$
4. $0 \cdot 39 = 0$
5. $(1)(1205) = 1205$
6. $(1)(1372) = 1372$
7. $7 \cdot 0 \cdot 3 = 0$
8. $7 \cdot 0 \cdot 5 = 0$
9. commutative property of multiplication
10. commutative property of multiplication
11. associative property of multiplication
12. associative property of multiplication
13. distributive property
14. distributive property
15. commutative property of addition
16. commutative property of addition
17. commutative property of multiplication
18. commutative property of multiplication
19. **a.** $4(3 + 5) = 4 \cdot 3 + 4 \cdot 5$
b. $4(3 + 5) = 4(8) = 32$
 $4 \cdot 3 + 4 \cdot 5 = 12 + 20 = 32$
 Yes, both methods give the same answer.
20. **a.** $3(4 + 5) = 3 \cdot 4 + 3 \cdot 5$

21.
$$\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

22.
$$\begin{array}{r} 41 \\ \times 2 \\ \hline 82 \end{array}$$

23.
$$\begin{array}{r} 62 \\ \times 4 \\ \hline 248 \end{array}$$

24.
$$\begin{array}{r} 73 \\ \times 2 \\ \hline 146 \end{array}$$

25.
$$\begin{array}{r} 402 \\ \times 3 \\ \hline 1206 \end{array}$$

26.
$$\begin{array}{r} 503 \\ \times 3 \\ \hline 1509 \end{array}$$

27.
$$\begin{array}{r} 52 \\ \times 8 \\ \hline 416 \end{array}$$

28.
$$\begin{array}{r} 48 \\ \times 3 \\ \hline 144 \end{array}$$

29.
$$\begin{array}{r} 56 \\ \times 9 \\ \hline 504 \end{array}$$

30.
$$\begin{array}{r} 38 \\ \times 9 \\ \hline 342 \end{array}$$

31.
$$\begin{array}{r} 614 \\ \times 6 \\ \hline 3684 \end{array}$$

$$\begin{array}{r} 32. \quad 613 \\ \times 7 \\ \hline 4291 \end{array}$$

$$\begin{array}{r} 33. \quad 277 \\ \times 8 \\ \hline 2216 \end{array}$$

$$\begin{array}{r} 34. \quad 488 \\ \times 6 \\ \hline 2928 \end{array}$$

$$\begin{array}{r} 35. \quad 3074 \\ \times 5 \\ \hline 15,370 \end{array}$$

$$\begin{array}{r} 36. \quad 4038 \\ \times 5 \\ \hline 20,190 \end{array}$$

$$\begin{array}{r} 37. \quad 19 \\ \times 18 \\ \hline 152 \\ + 190 \\ \hline 342 \end{array}$$

$$\begin{array}{r} 38. \quad 23 \\ \times 15 \\ \hline 115 \\ + 230 \\ \hline 345 \end{array}$$

$$\begin{array}{r} 39. \quad 53 \\ \times 53 \\ \hline 159 \\ + 2650 \\ \hline 2809 \end{array}$$

$$\begin{array}{r} 40. \quad 64 \\ \times 64 \\ \hline 256 \\ + 3840 \\ \hline 4096 \end{array}$$

$$\begin{array}{r} 41. \quad 163 \\ \times 23 \\ \hline 489 \\ + 3260 \\ \hline 3749 \end{array}$$

$$\begin{array}{r} 42. \quad 136 \\ \times 32 \\ \hline 272 \\ + 4080 \\ \hline 4352 \end{array}$$

$$\begin{array}{r} 43. \quad 706 \\ \times 83 \\ \hline 2118 \\ + 56480 \\ \hline 58,598 \end{array}$$

$$\begin{array}{r} 44. \quad 807 \\ \times 46 \\ \hline 4842 \\ + 32280 \\ \hline 37,122 \end{array}$$

$$\begin{array}{r} 45. \quad 2357 \\ \times 79 \\ \hline 21213 \\ + 164990 \\ \hline 186,203 \end{array}$$

$$\begin{array}{r} 46. \quad 5732 \\ \times 97 \\ \hline 40124 \\ + 515880 \\ \hline 556,004 \end{array}$$

$$\begin{array}{r} 47. \quad 135 \\ \times 112 \\ \hline 270 \\ 1350 \\ + 13500 \\ \hline 15,120 \end{array}$$

$$\begin{array}{r} 48. \quad 351 \\ \times 114 \\ \hline 1404 \\ 3510 \\ + 35100 \\ \hline 40,014 \end{array}$$

$$\begin{array}{r} 49. \quad 3427 \\ \times 828 \\ \hline 27416 \\ 68540 \\ + 2741600 \\ \hline 2,837,556 \end{array}$$

$$\begin{array}{r} 50. \quad 4372 \\ \times 288 \\ \hline 34976 \\ 349760 \\ + 874400 \\ \hline 1,259,136 \end{array}$$

$$\begin{array}{r} 51. \quad 324 \\ \times 609 \\ \hline 2916 \\ + 194400 \\ \hline 197,316 \end{array}$$

$$\begin{array}{r} 52. \quad 721 \\ \times 807 \\ \hline 5047 \\ + 576800 \\ \hline 581,847 \end{array}$$

$$\begin{array}{r} 53. \quad 985 \\ \times 230 \\ \hline 29550 \\ + 197000 \\ \hline 226,550 \end{array}$$

$$\begin{array}{r} 54. \quad 658 \\ \times 320 \\ \hline 13160 \\ + 197400 \\ \hline 210,560 \end{array}$$

$$\begin{array}{r} 55. \quad 332 \\ \times 2400 \\ \hline 13280 \\ + 664000 \\ \hline 796,800 \end{array}$$

$$\begin{array}{r} 56. \quad 234 \\ \times 4200 \\ \hline 46800 \\ + 936000 \\ \hline 982,800 \end{array}$$

$$57. (749)(58)(0) = 0$$

$$58. (972)(85)(0) = 0$$

$$59. 157 \cdot 10 = 1570$$

$$60. 238 \cdot 10 = 2380$$

$$61. 8 \times 100 = 800$$

$$62. 7 \times 100 = 700$$

$$63. 22(1000) = 22,000$$

$$64. 37(1000) = 37,000$$

$$65. 4207 \times 10,000 = 42,070,000$$

$$66. 5306 \times 10,000 = 53,060,000$$

$$\begin{array}{l} 67. \quad 4 \cdot 6 \cdot 25 = \overbrace{4 \cdot 25}^{100} \cdot 6 \\ \quad \quad \quad = 100 \cdot 6 \\ \quad \quad \quad = 600 \end{array}$$

$$\begin{array}{l} 68. \quad 4 \cdot 7 \cdot 25 = \overbrace{4 \cdot 25}^{100} \cdot 7 \\ \quad \quad \quad = 100 \cdot 7 \\ \quad \quad \quad = 700 \end{array}$$

$$\begin{array}{l} 69. \quad 2 \cdot 9 \cdot 5 \cdot 3 = \overbrace{2 \cdot 5}^{10} \cdot \overbrace{9 \cdot 3}^{27} \\ \quad \quad \quad = 10 \cdot 27 \\ \quad \quad \quad = 270 \end{array}$$

$$\begin{array}{l} 70. \quad 5 \cdot 9 \cdot 3 \cdot 2 = \overbrace{5 \cdot 2}^{10} \cdot \overbrace{9 \cdot 3}^{27} \\ \quad \quad \quad = 10 \cdot 27 \\ \quad \quad \quad = 270 \end{array}$$

$$71. 7 \times 4000 = 28,000$$

$$72. 3 \times 8000 = 24,000$$

$$\begin{array}{l} 73. \quad 53 \\ \quad \times 7 \\ \quad \hline 371 \\ \text{Attach 4 zeros to 371.} \\ 53(70,000) = 3,710,000 \end{array}$$

$$\begin{array}{l} 74. \quad 47 \\ \quad \times 8 \\ \quad \hline 376 \\ \text{Attach 4 zeros to 376.} \\ 47(80,000) = 3,760,000 \end{array}$$

$$\begin{array}{l} 75. \quad 7 \times 9 = 63 \\ \text{Attach 1 + 2, or 3 zeros to 63.} \\ 70 \times 900 = 63,000 \end{array}$$

76. $9 \times 4 = 36$

Attach 1 + 2, or 3 zeros to 36.

$90 \times 400 = 36,000$

77. $2 \cdot 16 = 32$

Attach 3 + 3, or 6 zeros to 32.

$2000 \times 16,000 = 32,000,000$

78. $3 \cdot 12 = 36$

Attach 3 + 3, or 6 zeros to 36.

$3000 \times 12,000 = 36,000,000$

79. $83 \times 29 \approx 80 \times 30$

$= 2400$

Yes, an exact product of 2407 seems reasonable.

80. $48 \times 33 \approx 50 \times 30$

$= 1500$

Yes, an exact product of 1584 seems reasonable.

81. $312 \times 58 \approx 300 \times 60$

$= 18,000$

Yes, an exact product of 18,906 seems reasonable.

82. $519 \times 38 \approx 500 \times 40$

$= 20,000$

Yes, an exact product of 19,722 seems reasonable.

83. $273 \times 114 \approx 300 \times 100$

$= 30,000$

No, an exact product of 311,222 does not seem reasonable.

84. $386 \times 217 \approx 400 \times 200$

$= 80,000$

No, an exact product of 837,622 does not seem reasonable.

85. $(4826)(523) \approx (5000)(500)$

$= 2,500,000$

Yes, an exact product of 2,523,998 seems reasonable.

86. $(3906)(517) \approx (4000)(500)$

$= 2,000,000$

Yes, an exact product of 2,019,402 seems reasonable.

87. $90 \cdot 4 = 360$

88. $60 \cdot 7 = 420$

89. $18 \cdot 9 = 162$

90. $26 \cdot 5 = 130$

91. $4 \cdot 800 = 3200$

92. $3 \cdot 900 = 2700$

93. $2 \cdot 307 = 614$

94. $2 \cdot 408 = 816$

95. $2 \cdot 1873 = 3746$

96. $2 \cdot 2946 = 5892$

97. $3 \cdot 3240 = 9720$

98. $3 \cdot 4320 = 12,960$

99. $6 \times 9 = 54$

The area is 54 square feet.

$$\begin{array}{r} 20 \\ \times 24 \\ \hline 80 \\ + 400 \\ \hline 480 \end{array}$$

The area is 480 square feet.

$$\begin{array}{r} 30 \\ \times 15 \\ \hline 150 \\ + 300 \\ \hline 450 \end{array}$$

The area is 450 square yards.

$$\begin{array}{r} 14 \\ \times 3 \\ \hline 42 \end{array}$$

The area is 42 square yards.

$$\begin{array}{r} 528 \\ \times 603 \\ \hline 1584 \\ + 316800 \\ \hline 318,384 \end{array}$$

three hundred eighteen thousand, three hundred eighty-four

$$\begin{array}{r} 528 \\ \times 603 \\ \hline 2562 \\ + 341600 \\ \hline 344,162 \end{array}$$

three hundred forty-four thousand, one hundred sixty-two

$$105. \quad \overbrace{64 \cdot 8 - 300}^{212} < \overbrace{3 \cdot 79 - 10}^{227}$$

$$106. \quad \overbrace{87 \cdot 6 - 200}^{322} < \overbrace{53 \cdot 7 - 40}^{331}$$

$$107. \quad \overbrace{59 \cdot 6 - 3 \cdot 58}^{180} > \overbrace{39 \cdot 8 - 52 \cdot 4}^{104}$$

$$108. \quad \overbrace{12(4+3)}^{84} < \overbrace{2 \cdot 41 + 3}^{85}$$

$$109. \quad 3 \cdot 486 - 232 = 1458 - 232 \\ = 1226$$

There were 1226 billionaires in 2012.

$$110. \quad 7 \cdot 140 - 34 = 980 - 34 \\ = 946$$

There were 946 billionaires in 2007.

$$111. \quad \begin{array}{r} 485 \\ \times 12 \\ \hline 970 \\ + 4850 \\ \hline 5820 \end{array}$$

It will travel 5820 miles.

$$112. \quad \begin{array}{r} 38 \\ \times 12 \\ \hline 76 \\ + 380 \\ \hline 456 \end{array}$$

You can travel 456 miles.

$$113. \quad \begin{array}{r} 12 \\ \times 18 \\ \hline 96 \\ + 120 \\ \hline 216 \end{array}$$

It will take 216 minutes.

$$114. \quad \begin{array}{r} 28 \\ \times 31 \\ \hline 28 \\ + 840 \\ \hline 868 \end{array}$$

You use 868 gallons.

$$115. \quad \text{Total cost} = \overbrace{16 \cdot 378}^{\text{airfare}} + \overbrace{16 \cdot 260}^{\text{food/lodging}} \\ = 6048 + 4160 \\ = 10,208$$

The total cost is \$10,208.

$$116. \quad \text{Total} = \overbrace{17 \cdot 14}^{\text{novels}} + \overbrace{13 \cdot 23}^{\text{biographies}} \\ = 238 + 299 \\ = 537$$

They took in \$537.

$$117. \quad 9 \text{ A.M. to } 5 \text{ P.M. is } 8 \text{ hours.} \\ 7 \cdot 2 + 5 = 14 + 5 \\ = 19$$

The total cost is \$19.

$$118. \quad \text{Cost if using monthly payments} = 14 \cdot 50 + 100 \\ = 700 + 100 \\ = 800$$

$$\text{Savings: } \begin{array}{r} 800 \\ - 750 \\ \hline 50 \end{array}$$

Paying the total amount at the time of the purchase will save \$50.

$$119. \quad \text{a. } \begin{array}{r} 18 \\ \times 14 \\ \hline 72 \\ + 180 \\ \hline 252 \end{array}$$

The area of the floor is 252 square feet.

$$\text{b. } \begin{array}{r} 252 \\ \times 8 \\ \hline 2016 \end{array}$$

The cost of the carpeting is \$2016.

$$120. \quad \text{a. } \begin{array}{r} 19 \\ \times 15 \\ \hline 95 \\ + 190 \\ \hline 285 \end{array}$$

The area of the floor is 285 square feet.

$$\text{b. } \begin{array}{r} 285 \\ \times 8 \\ \hline 2280 \end{array}$$

The cost of the carpeting is \$2280.

$$\begin{array}{r} 121. \text{ a. } \quad 50 \\ \quad \times 94 \\ \hline \quad 200 \\ + 4500 \\ \hline \quad 4700 \end{array}$$

The area of the court is 4700 square feet.

$$\begin{array}{r} \text{b. } \quad 400 \\ \quad \times 12 \\ \hline \quad 800 \\ + 4000 \\ \hline \quad 4800 \end{array}$$

12 gallons will cover 4800 square feet.

c. Yes; 12 gallons are enough to refinish the court.

$$\begin{array}{r} 122. \text{ a. } \quad 50 \\ \quad \times 84 \\ \hline \quad 200 \\ + 4000 \\ \hline \quad 4200 \end{array}$$

The area of the court is 4200 square feet.

$$\begin{array}{r} \text{b. } \quad 400 \\ \quad \times 9 \\ \hline \quad 3600 \end{array}$$

9 gallons will cover 3600 square feet.

c. No; 9 gallons are not enough to refinish the court.

123. – 132. Answers will vary.

133. makes sense

134. makes sense

135. does not make sense; Explanations will vary.
Sample explanation: You must attach 2 + 3, or 5 zeros.

136. does not make sense; Explanations will vary.
Sample explanation: The area of a regulation tennis court is 2808 square feet.

137. false; Changes to make the statement true will vary.
A sample change is: Deleting 0 as a factor might change the product from being 0 to being non-zero.

138. false; Changes to make the statement true will vary.
A sample change is: The distributive property states that multiplication distributes over addition .

139. true

140. true

$$\begin{array}{r} 141. \quad 613 \\ \quad \times 6 \\ \hline \quad 3678 \end{array}$$

$$\begin{array}{r} 142. \quad 32 \\ \quad \times 14 \\ \hline \quad 128 \\ + 320 \\ \hline \quad 448 \end{array}$$

$$\begin{array}{l} 143. \text{ a. } 5(7-3) = 5(4) = 20 \\ \quad \quad 5 \cdot 7 - 5 \cdot 3 = 35 - 15 = 20 \end{array}$$

$$\begin{array}{l} \text{b. } 10(8-2) = 10(6) = 60 \\ \quad 10 \cdot 8 - 10 \cdot 2 = 80 - 20 = 60 \end{array}$$

c. yes

144. Answers will vary.

145. 305,640

$$\begin{array}{r} 146. \quad 863 \\ \quad + 7697 \\ \hline \quad 8560 \end{array}$$

$$\begin{array}{r} 147. \quad 9002 \\ \quad + 897 \\ \hline \quad 8105 \end{array}$$

$$148. 21 \div 3 = 7 \text{ because } 7 \times 3 = 21.$$

149. Yes, the product is 1206.

$$\begin{array}{r} \quad 67 \\ \quad \times 18 \\ \hline \quad 536 \\ + 670 \\ \hline \quad 1206 \end{array}$$

$$\begin{array}{l} 150. (502 \times 47) + 15 = 23,594 + 15 \\ \quad \quad = 23,609 \end{array}$$

Mid-Chapter Check Point – Chapter 1

1. eight billion, sixty-three million, five hundred sixty-one thousand, four

2. 54,302,628

3. a. nearest hundred:
64,517 \approx 64,500

- b. nearest thousand:
64,517 \approx 65,000

4. $18 > 0$

5. $18 < 19$

6.
$$\begin{array}{r} 5809 \\ + 3762 \\ \hline 9571 \end{array}$$

7.
$$\begin{array}{r} 652 \\ - 378 \\ \hline 274 \end{array}$$

8.
$$\begin{array}{r} 876 \\ \times 4 \\ \hline 3504 \end{array}$$

9.
$$\begin{array}{r} 87 \\ \times 36 \\ \hline 522 \\ + 2610 \\ \hline 3132 \end{array}$$

10.
$$\begin{array}{r} 324 \\ \times 162 \\ \hline 648 \\ 19440 \\ + 32400 \\ \hline 52,488 \end{array}$$

11. $4 \times 9 = 36$
Attach 2 + 3, or 5 zeros to 36.
 $400 \cdot 9000 = 3,600,000$

12. $57 \cdot 93 \cdot 0 = 0$

13.
$$\begin{array}{r} 17 \\ + 96 \\ \hline 113 \end{array}$$

14.
$$\begin{array}{r} 8000 \\ - 57 \\ \hline 7943 \end{array}$$

15.
$$\begin{array}{r} 52 \\ - 38 \\ \hline 14 \end{array}$$

16. $(8 \cdot 3) - 6 = 24 - 6 = 18$

17. $2 \cdot 15 - 7 = 30 - 7 = 23$

18.
$$\begin{array}{rcl} \text{Exact} & & \text{Estimate} \\ 876 & \approx & 900 \\ 337 & \approx & 300 \\ + 1058 & & + 100 \\ \hline & & 2300 \end{array}$$

19.
$$\begin{array}{rcl} \text{Exact} & & \text{Estimate} \\ 9846 & \approx & 10,000 \\ - 2317 & \approx & - 2000 \\ \hline & & 8000 \end{array}$$

20.
$$\begin{array}{l} \text{Exact} \qquad \qquad \text{Estimate} \\ (2893)(648) \approx (3000)(600) \\ = 1,800,000 \end{array}$$

21. associative property of multiplication

22. distributive property

23. commutative property of addition

24. Perimeter:
4 yards
13 yards
4 yards
$$\begin{array}{r} + 13 \text{ yards} \\ \hline 34 \text{ yards} \end{array}$$

Area:
13 yards
$$\begin{array}{r} \times 4 \text{ yards} \\ \hline 52 \text{ square yards} \end{array}$$

25. a. The James Bond franchise had the greatest number of movies.
The total world gross for this franchise was \$5,116,147,171.
- b. three billion, two hundred eighty-seven million, two hundred eighty-five thousand, five dollars
- c. Star Wars had 7 movies.
\$4,279,632,749 \approx \$4,000,000,000
- d. Shrek and Lord of the Rings each had total world gross less than \$3,500,000,000.

26. a.
$$\begin{array}{r} 61 \\ - 28 \\ \hline 33 \end{array}$$
 (1980) (Ancient Greece and Rome)
People born in 1980 are expected to live 33 years more than people born in ancient Greece and Rome.
- b. Average life expectancy was 48 years in 1950.
- c. The following life expectancies round to 30.
Stone Age: 25 \approx 30
Ancient Greece and Rome: 28 \approx 30
Middle Ages: 30 \approx 30
1900: 31 \approx 30
- d. life expectancy 1950: 48
life expectancy Middle Ages: 30
$$\begin{array}{l} ? \\ 48 = 2 \cdot 30 - 12 \\ ? \\ 48 = 60 - 12 \\ ? \\ 48 = 48 \text{ true} \end{array}$$

27.
$$\begin{array}{r} \text{Deposits} \qquad \qquad \text{Withdrawals} \\ \text{Balance} = (730 + 250) - (29 + 156 + 347) \\ = 980 - 532 \\ = 448 \end{array}$$

The balance is \$448.

28.
$$\begin{array}{r} 58,952 \\ - 51,723 \\ \hline 7,229 \end{array}$$

The change in the city's population was 7229.

29.
$$\begin{aligned} (8)(1480) + (5)(1245) &= 11,840 + 6225 \\ &= 996 + 285 \\ &= 18,065 \end{aligned}$$

The total cost is \$18,065.

30.
$$\begin{array}{r} 14 \\ \times 12 \\ \hline 28 \\ + 140 \\ \hline 168 \end{array}$$

The area of the floor is 378 square feet.

$$168 \times 10 = 1680$$

The cost of the carpeting is \$1680.

1.5 Check Points

1. a. $56 \div 7 = 8$ because $8 \cdot 7 = 56$.
- b. $\frac{27}{9} = 3$ because $3 \cdot 9 = 27$.
- c. $3 \overline{)27}$ because $9 \cdot 3 = 27$.
2. a. $13 \div 1 = 13$ because $13 \cdot 1 = 13$.
- b. $13 \div 13 = 1$ because $1 \cdot 13 = 13$.
- c. $17 \overline{)17}$ because $1 \cdot 17 = 17$.
- d. $1 \overline{)17}$ because $17 \cdot 1 = 17$.
- e. $\frac{2306}{1} = 2306$ because $2306 \cdot 1 = 2306$.
- f. $2306 \overline{)2306}$ because $1 \cdot 2306 = 2306$.
3. a. $9 \overline{)0}$ because $0 \cdot 9 = 0$.
- b. $0 \div 253 = 0$ because $0 \cdot 253 = 0$.
- c. $\frac{0}{8} = 0$ because $0 \cdot 8 = 0$.

d. $\frac{8}{0} = \text{undefined}$

e. $\frac{0}{0} = \text{undefined}$

4.
$$\begin{array}{r} 171 \\ 3 \overline{)513} \\ \underline{3} \\ 21 \\ \underline{21} \\ 03 \\ \underline{3} \\ 0 \end{array}$$

Check:
$$\begin{array}{r} 171 \\ \times 3 \\ \hline 513 \end{array}$$

5.
$$\begin{array}{r} 748 \\ 6 \overline{)4488} \\ \underline{42} \\ 28 \\ \underline{24} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

Check:
$$\begin{array}{r} 748 \\ \times 6 \\ \hline 4488 \end{array}$$

6.
$$\begin{array}{r} 7086 \\ 6 \overline{)42520} \\ \underline{42} \\ 05 \\ \underline{0} \\ 52 \\ \underline{48} \\ 40 \\ \underline{36} \\ 4 \end{array}$$

$42,520 \div 6 = 7086 \text{ R } 4$

Check:
$$\begin{array}{r} 7086 \\ \times 6 \\ \hline 42516 \\ + 4 \\ \hline 42520 \end{array}$$

7.
$$\begin{array}{r} 83 \\ 29 \overline{)2407} \\ \underline{232} \\ 87 \\ \underline{87} \\ 0 \end{array}$$

Check:
$$\begin{array}{r} 83 \\ \times 29 \\ \hline 747 \\ + 1660 \\ \hline 2407 \end{array}$$

8.
$$\begin{array}{r} 415 \\ 32 \overline{)13292} \\ \underline{128} \\ 49 \\ \underline{32} \\ 172 \\ \underline{160} \\ 12 \end{array}$$

$13,292 \div 32 = 415 \text{ R } 12$

Check:
$$\begin{array}{r} 415 \\ \times 32 \\ \hline 830 \\ + 12450 \\ \hline 13280 \\ + 12 \\ \hline 13292 \end{array}$$

9.
$$\begin{array}{r} 12 \\ 1386 \overline{)16649} \\ \underline{1386} \\ 2789 \\ \underline{2772} \\ 17 \end{array}$$

$16,649 \div 1386 = 12 \text{ R } 17$

Check:
$$\begin{array}{r} 1386 \\ \times 12 \\ \hline 2772 \\ + 13860 \\ \hline 16632 \\ + 17 \\ \hline 16649 \end{array}$$

10. a. $240 \div 60 = 2\cancel{40} \div 6\cancel{0} = 24 \div 6 = 4$

b. $\frac{53,000}{100} = \frac{530\cancel{00}}{1\cancel{00}} = \frac{530}{1} = 530$

c. $5000 \overline{)15,000,000} = 5\cancel{000} \overline{)15000\cancel{000}} = 5 \overline{)15000} \frac{3000}{}$

11. a. $47,869 \div 62 \approx 48,000 \div 60$

$$= 48000 \div 60$$

$$= 4800 \div 6 = 800$$

b. $718,403 \div 879 \approx 720,000 \div 900$

$$= 720000 \div 900$$

$$= 7200 \div 9 = 800$$

12. a. The amount that Shaq still needs to raise is the difference of what he asked for and the amount he has already raised.

$$450,000 - 112,000 = 338,000$$

Shaq still needs to raise \$338,000 to reach his goal.

b.
$$\begin{array}{r} 2704 \\ 125 \overline{)338000} \\ \underline{250} \\ 880 \\ \underline{875} \\ 50 \\ \underline{0} \\ 500 \\ \underline{500} \\ 0 \end{array}$$

Each fan will need to contribute \$2704.

13. a. The number of boats needed is the quotient of the number of people on the cruise and the number of people who can be seated on each boat.

$$\begin{array}{r} 12 \\ 19 \overline{)243} \\ \underline{19} \\ 53 \\ \underline{38} \\ 15 \end{array}$$

There are enough people to fill 12 riverboats, with 15 people left over. So, 13 boats are needed.

- b. Using a 13th boat means that there will be empty seats. There are 19 seats per boat and 15 leftover people. Thus, there will be $19 - 15 = 4$ empty seats on the boat.

14. Mean = $\frac{\text{sum of values}}{\text{number of values}}$

$$= \frac{83 + 86 + 79 + 100 + 90 + 84}{6} = \frac{522}{6}$$

$$\begin{array}{r} 87 \\ 6 \overline{)522} \\ \underline{48} \\ 42 \\ \underline{42} \\ 0 \end{array}$$

The mean score for the six tests is 87.

1.5 Concept and Vocabulary Check

1. dividend; divisor; quotient

2. $4 \overline{)20}^5$

3. $9 \cdot 4$

4. 1

5. 0

6. 0; 0

7. 360; 0

8. divided by

1.5 Exercise Set

1. $20 \div 4 = 5$ because $5 \cdot 4 = 20$.

2. $72 \div 9 = 8$ because $8 \cdot 9 = 72$.

3. $\frac{36}{3} = 12$ because $12 \cdot 3 = 36$.

4. $\frac{24}{3} = 8$ because $8 \cdot 3 = 24$.

5. $9 \overline{)45}^5$ because $5 \cdot 9 = 45$.

6. $6 \overline{)48}^8$ because $8 \cdot 6 = 48$.

7. $7 \overline{)28}^4$ because $4 \cdot 7 = 28$.

$$8. \quad 7 \overline{)35} \text{ because } 5 \cdot 7 = 35.$$

$$9. \quad 5 \overline{)35} \text{ because } 7 \cdot 5 = 35.$$

$$10. \quad 8 \overline{)64} \text{ because } 8 \cdot 8 = 64.$$

$$11. \quad 19 \div 1 = 19$$

$$12. \quad 23 \div 1 = 23$$

$$13. \quad 19 \div 19 = 1$$

$$14. \quad 23 \div 23 = 1$$

$$15. \quad 1 \overline{)31}$$

$$16. \quad 1 \overline{)37}$$

$$17. \quad \frac{1507}{1} = 1507$$

$$18. \quad \frac{1608}{1} = 1608$$

$$19. \quad 0 \div 12 = 0$$

$$20. \quad 0 \div 15 = 0$$

$$21. \quad 12 \div 0 = \text{undefined}$$

$$22. \quad 15 \div 0 = \text{undefined}$$

$$23. \quad 16 \overline{)0}$$

$$24. \quad 26 \overline{)0}$$

$$25. \quad 0 \overline{)16} = \text{undefined}$$

$$26. \quad 0 \overline{)26} = \text{undefined}$$

$$27. \quad 16 \overline{)16}$$

$$28. \quad 26 \overline{)26}$$

$$29. \quad 0 \overline{)0} = \text{undefined}$$

$$30. \quad 0 \div 0 = \text{undefined}$$

$$31. \quad \begin{array}{r} 31 \\ 3 \overline{)93} \\ \underline{9} \\ 03 \\ \underline{3} \\ 0 \end{array}$$

$$32. \quad \begin{array}{r} 19 \\ 5 \overline{)95} \\ \underline{5} \\ 45 \\ \underline{45} \\ 0 \end{array}$$

$$33. \quad \begin{array}{r} 74 \\ 7 \overline{)518} \\ \underline{49} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

$$34. \quad \begin{array}{r} 63 \\ 6 \overline{)441} \\ \underline{42} \\ 21 \\ \underline{21} \\ 0 \end{array}$$

$$35. \quad \begin{array}{r} 25 \\ 6 \overline{)150} \\ \underline{12} \\ 30 \\ \underline{30} \\ 0 \end{array}$$

$$36. \quad \begin{array}{r} 35 \\ 6 \overline{)210} \\ \underline{18} \\ 30 \\ \underline{30} \\ 0 \end{array}$$

$$37. \quad \begin{array}{r} 672 \\ 4 \overline{)2688} \\ \underline{24} \\ 28 \\ \underline{28} \\ 08 \\ \underline{8} \\ 0 \end{array}$$

$$\begin{array}{r} 738 \\ 4 \overline{)2952} \\ \underline{28} \\ 15 \\ \underline{12} \\ 32 \\ \underline{32} \\ 0 \end{array}$$

$$\begin{array}{r} 7095 \\ 125 \overline{)56760} \\ \underline{56} \\ 07 \\ \underline{0} \\ 76 \\ \underline{72} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

$$\begin{array}{r} 6059 \\ 8 \overline{)48472} \\ \underline{48} \\ 04 \\ \underline{0} \\ 47 \\ \underline{40} \\ 72 \\ \underline{72} \\ 0 \end{array}$$

$$\begin{array}{r} 32 \\ 9 \overline{)291} \\ \underline{27} \\ 21 \\ \underline{18} \\ 3 \end{array}$$

$291 \div 9 = 32 \text{ R } 3$

$$\begin{array}{r} 37 \\ 9 \overline{)338} \\ \underline{27} \\ 68 \\ \underline{63} \\ 5 \end{array}$$

$338 \div 9 = 37 \text{ R } 5$

$$\begin{array}{r} 321 \\ 6 \overline{)1930} \\ \underline{18} \\ 13 \\ \underline{12} \\ 10 \\ \underline{6} \\ 4 \end{array}$$

$1930 \div 6 = 321 \text{ R } 4$

$$\begin{array}{r} 413 \\ 6 \overline{)2480} \\ \underline{24} \\ 08 \\ \underline{6} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

$2480 \div 6 = 413 \text{ R } 2$

$$\begin{array}{r} 5062 \\ 7 \overline{)35438} \\ \underline{35} \\ 04 \\ \underline{0} \\ 43 \\ \underline{42} \\ 18 \\ \underline{14} \\ 4 \end{array}$$

$35,438 \div 7 = 5062 \text{ R } 4$

$$\begin{array}{r} 4073 \\ 7 \overline{)28516} \\ \underline{28} \\ 05 \\ \underline{0} \\ 51 \\ \underline{49} \\ 26 \\ \underline{21} \\ 5 \end{array}$$

$28,516 \div 7 = 4073 \text{ R } 5$

$$\begin{array}{r} 53 \\ 17 \overline{)901} \\ \underline{85} \\ 51 \\ \underline{51} \\ 0 \end{array}$$

$$\begin{array}{r} 58 \\ 17 \overline{)986} \\ \underline{85} \\ 136 \\ \underline{136} \\ 0 \end{array}$$

$$\begin{array}{r} 57 \\ 23 \overline{)1311} \\ \underline{115} \\ 161 \\ \underline{161} \\ 0 \end{array}$$

$$\begin{array}{r} 75 \\ 23 \overline{)1725} \\ \underline{161} \\ 115 \\ \underline{115} \\ 0 \end{array}$$

$$\begin{array}{r} 907 \\ 12 \overline{)10884} \\ \underline{108} \\ 08 \\ \underline{0} \\ 84 \\ \underline{84} \\ 0 \end{array}$$

$$\begin{array}{r} 903 \\ 12 \overline{)10836} \\ \underline{108} \\ 03 \\ \underline{0} \\ 36 \\ \underline{36} \\ 0 \end{array}$$

$$\begin{array}{r} 37 \\ 15 \overline{)560} \\ \underline{45} \\ 110 \\ \underline{105} \\ 5 \end{array}$$

$560 \div 15 = 37 \text{ R } 5$

$$\begin{array}{r} 28 \\ 15 \overline{)426} \\ \underline{30} \\ 126 \\ \underline{120} \\ 6 \end{array}$$

$426 \div 15 = 28 \text{ R } 6$

$$\begin{array}{r} 31 \\ 42 \overline{)1312} \\ \underline{126} \\ 52 \\ \underline{42} \\ 10 \end{array}$$

$1312 \div 42 = 31 \text{ R } 10$

$$\begin{array}{r} 51 \\ 42 \overline{)2148} \\ \underline{210} \\ 48 \\ \underline{42} \\ 6 \end{array}$$

$2148 \div 42 = 51 \text{ R } 6$

$$\begin{array}{r} 806 \\ 47 \overline{)37902} \\ \underline{376} \\ 30 \\ \underline{0} \\ 302 \\ \underline{282} \\ 20 \end{array}$$

$37,902 \div 47 = 806 \text{ R } 20$

$$\begin{array}{r} 801 \\ 47 \overline{)37677} \\ \underline{376} \\ 07 \\ \underline{0} \\ 77 \\ \underline{47} \\ 30 \end{array}$$

$37,677 \div 47 = 801 \text{ R } 30$

$$\begin{array}{r} 16 \\ 128 \overline{)2048} \\ \underline{128} \\ 768 \\ \underline{768} \\ 0 \end{array}$$

$$\begin{array}{r} 25 \\ 321 \overline{)8025} \\ \underline{642} \\ 1605 \\ \underline{1605} \\ 0 \end{array}$$

$$\begin{array}{r} 97 \\ 601 \overline{)58297} \\ \underline{5409} \\ 4207 \\ \underline{4207} \\ 0 \end{array}$$

$$\begin{array}{r} 86 \\ 701 \overline{)60286} \\ \underline{5608} \\ 4206 \\ \underline{4206} \\ 0 \end{array}$$

$$\begin{array}{r} 107 \\ 218 \overline{)23376} \\ \underline{218} \\ 157 \\ \underline{0} \\ 1576 \\ \underline{1526} \\ 50 \end{array}$$

$$23,376 \div 218 = 107 \text{ R } 50$$

$$\begin{array}{r} 102 \\ 348 \overline{)35596} \\ \underline{348} \\ 79 \\ \underline{0} \\ 796 \\ \underline{696} \\ 100 \end{array}$$

$$35,596 \div 348 = 102 \text{ R } 100$$

$$\begin{array}{r} 311 \\ 413 \overline{)128449} \\ \underline{1239} \\ 454 \\ \underline{413} \\ 419 \\ \underline{413} \\ 6 \end{array}$$

$$128,449 \div 413 = 311 \text{ R } 6$$

$$\begin{array}{r} 411 \\ 513 \overline{)210848} \\ \underline{2052} \\ 564 \\ \underline{513} \\ 518 \\ \underline{513} \\ 5 \end{array}$$

$$210,848 \div 513 = 411 \text{ R } 5$$

$$67. \quad 260 \div 20 = 2\cancel{6}\cancel{0} \div 2\cancel{0} = 26 \div 2 = 13$$

$$68. \quad 280 \div 20 = 2\cancel{8}\cancel{0} \div 2\cancel{0} = 28 \div 2 = 14$$

$$69. \quad \frac{28,000}{400} = \frac{28\cancel{0}\cancel{0}\cancel{0}}{4\cancel{0}\cancel{0}} = \frac{280}{4} = 70$$

$$70. \quad \frac{32,000}{400} = \frac{32\cancel{0}\cancel{0}\cancel{0}}{4\cancel{0}\cancel{0}} = \frac{320}{4} = 80$$

$$71. \quad 3000 \overline{)12,000,000} = 3\cancel{0}\cancel{0}\cancel{0} \overline{)12000\cancel{0}\cancel{0}\cancel{0}} = 3 \overline{)12000} \frac{4000}{}$$

$$72. \quad 3000 \overline{)18,000,000} = 3\cancel{000} \overline{)18000\cancel{000}} = 3 \overline{)18000} \overset{6000}{}$$

$$73. \quad \frac{83,000,000}{10,000} = \frac{8300\cancel{0000}}{1\cancel{0000}} = \frac{8300}{1} = 8300$$

$$74. \quad \frac{97,000,000}{10,000} = \frac{9700\cancel{0000}}{1\cancel{0000}} = \frac{9700}{1} = 9700$$

$$75. \quad 2622 \div 23 \approx 2600 \div 20 = 260\cancel{0} \div 2\cancel{0} = 260 \div 2 = 130$$

Yes 114 seems reasonable.

$$76. \quad 2016 \div 42 \approx 2000 \div 40 = 200\cancel{0} \div 4\cancel{0} = 200 \div 4 = 50$$

Yes 48 seems reasonable.

$$77. \quad 20,928 \div 327 \approx 21,000 \div 300 = 210\cancel{00} \div 3\cancel{00} = 210 \div 3 = 70$$

Yes 64 seems reasonable.

$$78. \quad 13,688 \div 236 \approx 14,000 \div 200 = 140\cancel{00} \div 2\cancel{00} = 140 \div 2 = 70$$

Yes 58 seems reasonable.

$$79. \quad 2806 \div 67 \approx 2800 \div 70 = 280\cancel{0} \div 7\cancel{0} = 280 \div 7 = 40$$

Yes 41 R 59 seems reasonable.

$$80. \quad 1804 \div 58 \approx 1800 \div 60 = 180\cancel{0} \div 6\cancel{0} = 180 \div 6 = 30$$

Yes 31 R 6 seems reasonable.

$$81. \quad 362,517 \div 879 \approx 360,000 \div 900 = 3600\cancel{00} \div 9\cancel{00} = 3600 \div 9 = 400$$

No 42 R 369 does not seem reasonable.

$$82. \quad 561,917 \div 693 \approx 560,000 \div 700 = 5600\cancel{00} \div 7\cancel{00} = 5600 \div 7 = 800$$

No 81 R 587 does not seem reasonable.

$$83. \quad \begin{array}{r} 13 \\ 7 \overline{)91} \\ \underline{7} \\ 21 \\ \underline{21} \\ 0 \end{array}$$

$$84. \quad \begin{array}{r} 19 \\ 4 \overline{)76} \\ \underline{4} \\ 36 \\ \underline{36} \\ 0 \end{array}$$

$$85. \quad \begin{array}{r} 33 \\ 18 \overline{)594} \\ \underline{54} \\ 54 \\ \underline{54} \\ 0 \end{array}$$

$$\begin{array}{r} 73 \\ 12 \overline{)876} \\ \underline{84} \\ 36 \\ \underline{36} \\ 0 \end{array}$$

$$\begin{array}{r} 212 \\ 13 \overline{)2756} \\ \underline{26} \\ 15 \\ \underline{13} \\ 26 \\ \underline{26} \\ 0 \end{array}$$

$$\begin{array}{r} 93 \\ 14 \overline{)1302} \\ \underline{126} \\ 42 \\ \underline{42} \\ 0 \end{array}$$

$$89. \text{ Mean} = \frac{\text{sum of values}}{\text{number of values}} = \frac{9 + 36 + 11 + 18 + 24 + 22}{6} = \frac{120}{6} = 20$$

The mean score for the six tests is 20.

$$90. \text{ Mean} = \frac{\text{sum of values}}{\text{number of values}} = \frac{27 + 14 + 28 + 52 + 37 + 22}{6} = \frac{180}{6} = 30$$

The mean score for the six tests is 20.

$$91. \text{ Mean} = \frac{\text{sum of values}}{\text{number of values}} = \frac{81 + 87 + 92 + 84 + 91}{5} = \frac{435}{5}$$

$$\begin{array}{r} 87 \\ 5 \overline{)435} \\ \underline{40} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

The mean score for the five tests is 87.

$$92. \text{ Mean} = \frac{\text{sum of values}}{\text{number of values}} = \frac{76 + 94 + 92 + 71 + 82}{5} = \frac{415}{5}$$

$$\begin{array}{r} 83 \\ 5 \overline{)415} \\ \underline{40} \\ 15 \\ \underline{15} \\ 0 \end{array}$$

The mean score for the five tests is 83.

$$\begin{array}{r} 1059 \\ 93. \quad 34 \overline{)36006} \\ \underline{34} \\ 20 \\ \underline{0} \\ 200 \\ \underline{170} \\ 306 \\ \underline{306} \\ 0 \end{array}$$

The answer is 1059, which in words is one thousand fifty-nine.

$$\begin{array}{r} 4334 \\ 94. \quad 12 \overline{)52008} \\ \underline{48} \\ 40 \\ \underline{36} \\ 40 \\ \underline{36} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

The answer is 4334, which in words is four thousand three hundred thirty-four.

$$95. \quad \overbrace{736 \div 23 - 10}^{22} < \overbrace{715 \div 55 + 14}^{27}$$

$$96. \quad \overbrace{876 \div 12 - 40}^{33} < \overbrace{594 \div 18 + 2}^{35}$$

$$97. \quad \overbrace{(600 \div 3) - (200 \div 4)}^{150} < \overbrace{800 \div 5}^{160}$$

$$98. \quad \overbrace{(700 \div 5) - (360 \div 3)}^{20} < \overbrace{225 \div 9}^{25}$$

$$\begin{array}{r} 29 \\ 99. \quad 4 \overline{)116} \\ \underline{8} \\ 36 \\ \underline{36} \\ 0 \end{array}$$

$$116 \div 4 = 29 \text{ pizzas}$$

$$\begin{array}{r} 240 \\ 100. \quad 4 \overline{)960} \\ \underline{8} \\ 16 \\ \underline{16} \\ 00 \\ \underline{0} \\ 0 \end{array}$$

$$960 \div 4 = 240 \text{ cups}$$

$$\begin{array}{r} 503 \\ 101. \quad 36 \overline{)18108} \\ \underline{180} \\ 10 \\ \underline{0} \\ 108 \\ \underline{108} \\ 0 \end{array}$$

$$\$18,108 \div 36 = \$503$$

$$\begin{array}{r} 408 \\ 102. \quad 36 \overline{)14688} \\ \underline{144} \\ 28 \\ \underline{0} \\ 288 \\ \underline{288} \\ 0 \end{array}$$

$$\$14,688 \div 36 = \$408$$

$$103. \text{ a. } \$480,000 \div 6 = \$80,000 \text{ per person}$$

$$\begin{aligned} \text{b. } & \$480,000 \div 10 = \$48,000 \div 1 \text{ per person} \\ & = \$48,000 \div 1 \\ & = \$48,000 \end{aligned}$$

$$\text{c. } \$80,000 - \$48,000 = \$32,000 \text{ per person}$$

$$\begin{array}{r} 12500 \\ 104. \text{ a. } 4 \overline{)50000} \\ \underline{4} \\ 10 \\ \underline{8} \\ 20 \\ \underline{20} \\ 00 \\ \underline{0} \\ 00 \\ \underline{0} \\ 0 \end{array}$$

$$\$50,000 \div 4 = \$12,500 \text{ per person}$$

$$\text{b. } \$50,000 \div 5 = \$10,000 \text{ per person}$$

$$\text{c. } \$12,500 - \$10,000 = \$2,500 \text{ per person}$$

$$\begin{array}{r} 114 \\ 12 \overline{)1368} \\ \underline{12} \\ 16 \\ \underline{12} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

$$\$1368 \div 12 = \$114 \text{ per month}$$

$$\begin{array}{r} 7 \\ 114 \overline{)798} \\ \underline{798} \\ 0 \end{array}$$

$$\$798 \div \$114 = 7 \text{ months}$$

$$\begin{array}{r} 235 \\ 12 \overline{)2820} \\ \underline{24} \\ 42 \\ \underline{36} \\ 60 \\ \underline{60} \\ 0 \end{array}$$

$$\$2820 \div 12 = \$235 \text{ per month}$$

$$\begin{array}{r} 7 \\ 235 \overline{)1645} \\ \underline{1645} \\ 0 \end{array}$$

$$\$1645 \div \$235 = 7 \text{ months}$$

107. a. $\$23,000 - \$2700 = \$20,300$ depreciation in 7 years.

$$\begin{array}{r} 2900 \\ 7 \overline{)20300} \\ \underline{14} \\ 63 \\ \underline{63} \\ 00 \\ \underline{0} \\ 00 \\ \underline{0} \\ 0 \end{array}$$

$$\$20,300 \div 7 = \$2900 \text{ depreciation per year.}$$

b. $\$23,000 - (\$2900 \cdot 3) = \$14,300$

108. a. $\$34,800 - \$8550 = \$26,250$ depreciation in 7 years.

$$\begin{array}{r} 3750 \\ 7 \overline{)26250} \\ \underline{21} \\ 52 \\ \underline{49} \\ 35 \\ \underline{35} \\ 00 \\ \underline{0} \\ 0 \end{array}$$

$$\$26,250 \div 7 = \$3750 \text{ depreciation per year.}$$

b. $\$34,800 - (\$3750 \cdot 3) = \$23,550$

$$\begin{array}{r} 14 \\ 28 \overline{)403} \\ \underline{28} \\ 123 \\ \underline{112} \\ 11 \end{array}$$

$$403 \div 28 = 14 \text{ R } 11$$

So, 15 buses are needed.

- b. Using a 15th bus means that there will be empty seats. There are 28 seats per bus and 11 leftover people. Thus, there will be $28 - 11 = 17$ empty seats on the bus.

$$\begin{array}{r} 12 \\ 23 \overline{)286} \\ \underline{23} \\ 56 \\ \underline{46} \\ 10 \end{array}$$

$$286 \div 23 = 12 \text{ R } 10$$

So, 13 buses are needed.

- b. Using a 13th bus means that there will be empty seats. There are 23 seats per bus and 10 leftover people. Thus, there will be $23 - 10 = 13$ empty seats on the bus.

111. a. $\text{Mean} = \frac{86 + 84 + 78 + 72 + 50}{5} = \frac{370}{5} = 74$

$$\begin{array}{r} 74 \\ 5 \overline{)370} \\ \underline{35} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

- b. C

c. Mean = $\frac{86+84+78+72}{4} = \frac{320}{4} = 80$

$$\begin{array}{r} 80 \\ 4 \overline{)320} \\ \underline{32} \\ 00 \\ \underline{0} \\ 0 \end{array}$$

The grade now would be B.

- d. The mean score is pulled down enough to lower the final course grade by one letter.

112. a. Mean = $\frac{98+94+92+80+56}{5} = \frac{420}{5} = 84$

$$\begin{array}{r} 84 \\ 5 \overline{)420} \\ \underline{40} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

b. B

c. Mean = $\frac{98+94+92+80}{4} = \frac{364}{4} = 91$

$$\begin{array}{r} 91 \\ 4 \overline{)364} \\ \underline{36} \\ 04 \\ \underline{4} \\ 0 \end{array}$$

The grade now would be A.

- d. The mean score is pulled down enough to lower the final course grade by one letter.

113. $568,158 \div 97,814 \approx 600,000 \div 100,000$
 $= 6000000 \div 1000000$
 $= 6 \div 1$
 $= 6$

6 people per square mile

114. $37,691,912 \div 158,633 \approx 38,000,000 \div 160,000$
 $= 38000000 \div 160000$
 $= 3800 \div 16$
 $= 237 \text{ R } 80,000$

There are approximately 237 or 238 people per square mile.

115. – 122. Answers will vary.

123. makes sense

124. does not make sense; Explanations will vary.
 Sample explanation: Any whole number divided by zero is undefined.

125. does not make sense; Explanations will vary.
 Sample explanation: The remainder is always less than the divisor.

126. does not make sense; Explanations will vary.
 Sample explanation: The mean must be between the highest and lowest score.

127. false; Changes to make the statement true will vary.
 A sample change is: When 20 is divided by 5, the result is 4.

128. false; Changes to make the statement true will vary.
 A sample change is: The quotient of any number and 1 is the number itself.

129. true

130. true

131. The number of acres is missing.

132. The total number of bushels of wheat is missing.

133. a. $(12 \div 6) \div 2 = 2 \div 2 = 1$

b. $12 \div (6 \div 2) = 12 \div 3 = 4$

c. No, the associative property cannot be applied to division because the answers are different.

134. Answers will vary.

135. ten-thousands

136. 23,753; twenty three thousand, seven hundred fifty-three

137. 8500

$$\begin{array}{r} - 796 \\ 8500 \\ \hline 7704 \end{array}$$

138. 743

$$\begin{array}{r} \times 96 \\ 743 \\ \hline 4,458 \\ + 66,870 \\ \hline 71,328 \end{array}$$

139. $6^2 = 6 \cdot 6 = \underline{36}$

140. $4^3 = 4 \cdot 4 \cdot 4 = \underline{64}$

141. $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = \underline{32}$

1.6 Check Points

1. a. $5 \cdot 5 \cdot 5 = 5^3$; five to the third power or five cubed
- b. $6 \cdot 6 = 6^2$; six to the second power or six squared
- c. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^6$; two to the sixth power
- d. $7 \cdot 7 \cdot 3 \cdot 3 \cdot 3 = 7^2 \cdot 3^3$; seven to the second power times three to the third power or seven squared times three cubed

2. a. $6^2 = 6 \cdot 6 = 36$
- b. $2^3 = 2 \cdot 2 \cdot 2 = 8$
- c. $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$
- d. $2 \cdot 7^2 = 2 \cdot 7 \cdot 7 = 98$

$$\begin{aligned} 3. \quad 20 + 4 \cdot 3 - 17 &= 20 + 12 - 17 \\ &= 32 - 17 \\ &= 15 \end{aligned}$$

$$\begin{aligned} 4. \quad 20 - 8 \cdot 4 \div 2 &= 20 - 32 \div 2 \\ &= 20 - 16 \\ &= 4 \end{aligned}$$

$$\begin{aligned} 5. \quad 7^2 - 48 \div 2^4 &= 49 - 48 \div 16 \\ &= 49 - 3 \\ &= 46 \end{aligned}$$

$$6. \quad \text{a. } (3 \cdot 2)^2 = 6^2 = 36$$

$$\text{b. } 3 \cdot 2^2 = 3 \cdot 4 = 12$$

$$\begin{aligned} 7. \quad (9 - 6)^4 + 4 \cdot 5^2 &= 3^4 + 4 \cdot 5^2 \\ &= 81 + 4 \cdot 25 \\ &= 81 + 100 \\ &= 181 \end{aligned}$$

$$\begin{aligned} 8. \quad 4[3(11 - 6) + 5] &= 4[3(5) + 5] \\ &= 4[15 + 5] \\ &= 4[20] \\ &= 80 \end{aligned}$$

$$\begin{aligned} 9. \quad 25 \div 5 + 3[4 + 2(9 - 7)^3] &= 25 \div 5 + 3[4 + 2(2)^3] \\ &= 25 \div 5 + 3[4 + 2(8)] \\ &= 25 \div 5 + 3[4 + 16] \\ &= 25 \div 5 + 3[20] \\ &= 5 + 60 \\ &= 65 \end{aligned}$$

$$\begin{aligned} 10. \quad \frac{5(9 - 4) + 10 \cdot 3}{4^2 - 5} &= \frac{5(5) + 10 \cdot 3}{16 - 5} \\ &= \frac{25 + 30}{11} \\ &= \frac{55}{11} \\ &= 5 \end{aligned}$$

11. a. Males 19-30 are in Group 4
Substitute 4 for x .
 $590 + 998x - 120x^2 = 590 + 998(4) - 120(4)^2$
 $= 590 + 3992 - 1920$
 $= 2662$

According to the model, males between the ages of 19 and 30 with this lifestyle need 2662 calories per day.

- b. This underestimates the actual value shown in the bar graph by 38 calories.

1.6 Concept and Vocabulary Check

1. $4 \cdot 4 \cdot 4 \cdot 4$
2. base; exponent
3. multiply
4. add
5. divide
6. subtract
7. multiply

1.6 Exercise Set

1. $5 \cdot 5 = 5^2$; five to the second power or five squared
2. $4 \cdot 4 = 4^2$; four to the second power or four squared

3. $2 \cdot 2 \cdot 2 = 2^3$; two to the third power or two cubed
4. $4 \cdot 4 \cdot 4 = 4^3$; four to the third power or four cubed
5. $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^5$; three to the fifth power
6. $6 \cdot 6 \cdot 6 \cdot 6 \cdot 6 = 6^5$; six to the fifth power
7. $9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 = 9^8$; nine to the eighth power
8. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 = 7^8$; seven to the eighth power
9.
 $10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10^{13}$;
ten to the thirteenth power
10. $10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10^{12}$; ten
to the twelfth power
11. $4 \cdot 4 \cdot 2 \cdot 2 \cdot 2 = 4^2 \cdot 2^3$; four to the second power times
two to the third power or four squared times two
cubed
12. $5 \cdot 5 \cdot 3 \cdot 3 \cdot 3 = 5^2 \cdot 3^3$; five to the second power times
three to the third power or five squared times three
cubed
13. $9^2 = 9 \cdot 9 = 81$
14. $5^2 = 5 \cdot 5 = 25$
15. $4^3 = 4 \cdot 4 \cdot 4 = 64$
16. $5^3 = 5 \cdot 5 \cdot 5 = 125$
17. $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$
18. $2^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$
19. $1^7 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$
20. $1^8 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$
21. $10^4 = 10 \cdot 10 \cdot 10 \cdot 10 = 10,000$
22. $10^5 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 100,000$
23. $15^1 = 15$
24. $17^1 = 17$
25. $3 \cdot 2^3 = 3 \cdot 2 \cdot 2 \cdot 2 = 24$
26. $3 \cdot 2^4 = 3 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 48$
27. $5 \cdot 3^4 = 5 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 405$
28. $2 \cdot 3^4 = 2 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 162$
29. $7 + 6 \cdot 3 = 7 + 18$
 $= 25$
30. $3 + 4 \cdot 5 = 3 + 20$
 $= 23$
31. $45 \div 5 \cdot 3 = 9 \cdot 3$
 $= 27$
32. $40 \div 4 \cdot 2 = 10 \cdot 2$
 $= 20$
33. $6 \cdot 8 \div 4 = 48 \div 4$
 $= 12$
34. $8 \cdot 6 \div 2 = 48 \div 2$
 $= 24$
35. $14 - 2 \cdot 6 + 3 = 14 - 12 + 3$
 $= 2 + 3$
 $= 5$
36. $36 - 12 \div 4 + 2 = 36 - 3 + 2$
 $= 33 + 2$
 $= 35$
37. $4 \cdot 3^2 - 3 \cdot 2^2 = 4 \cdot 9 - 3 \cdot 4$
 $= 36 - 12$
 $= 24$
38. $5 \cdot 3^2 - 2 \cdot 4^2 = 5 \cdot 9 - 2 \cdot 16$
 $= 45 - 32$
 $= 13$
39. $(4 \cdot 5)^2 - 4 \cdot 5^2 = 20^2 - 4 \cdot 5^2$
 $= 400 - 4 \cdot 25$
 $= 400 - 100$
 $= 300$

$$\begin{aligned} 40. \quad (3 \cdot 5)^2 - 3 \cdot 5^2 &= 15^2 - 3 \cdot 5^2 \\ &= 225 - 3 \cdot 25 \\ &= 225 - 75 \\ &= 150 \end{aligned}$$

$$\begin{aligned} 41. \quad 8^2 - 16 \div 2^2 \cdot 4 - 3 &= 64 - 16 \div 4 \cdot 4 - 3 \\ &= 64 - 4 \cdot 4 - 3 \\ &= 64 - 16 - 3 \\ &= 45 \end{aligned}$$

$$\begin{aligned} 42. \quad 10^2 - 100 \div 5^2 \cdot 2 - 1 &= 100 - 100 \div 25 \cdot 2 - 1 \\ &= 100 - 4 \cdot 2 - 1 \\ &= 100 - 8 - 1 \\ &= 91 \end{aligned}$$

$$\begin{aligned} 43. \quad (6-2)^2 - (7-3)^2 &= 4^2 - 4^2 \\ &= 16 - 16 \\ &= 0 \end{aligned}$$

$$\begin{aligned} 44. \quad (8-3)^2 - (11-6)^2 &= 5^2 - 5^2 \\ &= 25 - 25 \\ &= 0 \end{aligned}$$

$$\begin{aligned} 45. \quad 3(5-3)^3 - 2(7-6)^5 &= 3(2)^3 - 2(1)^5 \\ &= 3 \cdot 8 - 2 \cdot 1 \\ &= 24 - 2 \\ &= 22 \end{aligned}$$

$$\begin{aligned} 46. \quad 4(7-5)^3 - 4(9-8)^6 &= 4(2)^3 - 4(1)^6 \\ &= 4 \cdot 8 - 4 \cdot 1 \\ &= 32 - 4 \\ &= 28 \end{aligned}$$

$$\begin{aligned} 47. \quad [2(6-2)]^2 &= [2(4)]^2 \\ &= [8]^2 \\ &= 64 \end{aligned}$$

$$\begin{aligned} 48. \quad [3(6-4)]^2 &= [3(2)]^2 \\ &= [6]^2 \\ &= 36 \end{aligned}$$

$$\begin{aligned} 49. \quad 2[5 + 2(9-4)] &= 2[5 + 2(5)] \\ &= 2[5 + 10] \\ &= 2[15] \\ &= 30 \end{aligned}$$

$$\begin{aligned} 50. \quad 3[4 + 3(10-8)] &= 3[4 + 3(2)] \\ &= 3[4 + 6] \\ &= 3[10] \\ &= 30 \end{aligned}$$

$$\begin{aligned} 51. \quad 3^4 - [28 - (13-7)] &= 3^4 - [28-6] \\ &= 3^4 - 22 \\ &= 81 - 22 \\ &= 59 \end{aligned}$$

$$\begin{aligned} 52. \quad 4^3 - [58 - (15-7)] &= 4^3 - [58-8] \\ &= 4^3 - 50 \\ &= 64 - 50 \\ &= 14 \end{aligned}$$

$$\begin{aligned} 53. \quad 5 \cdot [2^2 + (8-3) \cdot 2] - 10 \cdot 6 &= 5 \cdot [4 + (8-3) \cdot 2] - 10 \cdot 6 \\ &= 5 \cdot [4 + 5 \cdot 2] - 10 \cdot 6 \\ &= 5 \cdot [4 + 10] - 10 \cdot 6 \\ &= 5 \cdot 14 - 10 \cdot 6 \\ &= 70 - 60 \\ &= 10 \end{aligned}$$

$$\begin{aligned} 54. \quad 4[3^2 + (6-1) \cdot 2] - 10 \cdot 3 &= 4[9 + (6-1) \cdot 2] - 10 \cdot 3 \\ &= 4[9 + 5 \cdot 2] - 10 \cdot 3 \\ &= 4[9 + 10] - 10 \cdot 3 \\ &= 4 \cdot 19 - 10 \cdot 3 \\ &= 76 - 30 \\ &= 46 \end{aligned}$$

$$\begin{aligned} 55. \quad \frac{(18+32) \div 5}{48 \div 2 - 11 \cdot 2} &= \frac{50 \div 5}{48 \div 2 - 11 \cdot 2} \\ &= \frac{10}{24 - 22} \\ &= \frac{10}{2} \\ &= 5 \end{aligned}$$

$$\begin{aligned}
 56. \quad \frac{(9-7)(12+18)}{144 \div (100-76)} &= \frac{(2)(30)}{144 \div 24} \\
 &= \frac{60}{6} \\
 &= 10
 \end{aligned}$$

$$\begin{aligned}
 57. \quad \frac{23+(17-14)^3}{135-5^3} &= \frac{23+3^3}{135-5^3} \\
 &= \frac{23+27}{135-125} \\
 &= \frac{50}{10} \\
 &= 5
 \end{aligned}$$

$$\begin{aligned}
 58. \quad \frac{5^2-(8-6)^3+1^6}{[40-(9-3)]-2^5} &= \frac{5^2-2^3+1^6}{[40-6]-2^5} \\
 &= \frac{5^2-2^3+1^6}{34-2^5} \\
 &= \frac{25-8+1}{34-32} \\
 &= \frac{18}{2} \\
 &= 9
 \end{aligned}$$

$$\begin{aligned}
 59. \quad \frac{3^2-2 \cdot 3+7}{5(4-3)} + 42 + 3(8-4) + 5^2 &= \frac{9-2 \cdot 3+7}{5(1)} + 42 + 3(4) + 5^2 \\
 &= \frac{9-6+7}{5} + 42 + 3(4) + 5^2 \\
 &= \frac{10}{5} + 42 + 3(4) + 25 \\
 &= 2 + 42 + 12 + 25 \\
 &= 81
 \end{aligned}$$

$$\begin{aligned}
 60. \quad \frac{5 \cdot 2^4 + 5 - 1^3}{2(7-6)} + 18 - 6 \cdot 2 + (4+2)^2 &= \frac{5 \cdot 16 + 5 - 1}{2(1)} + 18 - 6 \cdot 2 + (6)^2 \\
 &= \frac{80+5-1}{2} + 18 - 6 \cdot 2 + (6)^2 \\
 &= \frac{84}{2} + 18 - 6 \cdot 2 + 36 \\
 &= 42 + 18 - 12 + 36 \\
 &= 84
 \end{aligned}$$

$$\begin{aligned}
 61. \quad 10-2^3 &= 10-8 \\
 &= 2
 \end{aligned}$$

$$62. \quad 200 - 5^3 = 200 - 125 \\ = 75$$

$$63. \quad \frac{5^2 + 7}{2^3 \cdot 4} = \frac{25 + 7}{8 \cdot 4} \\ = \frac{32}{32} \\ = 1$$

$$64. \quad \frac{18 + 6}{2^4 - 2^2} = \frac{18 + 6}{16 - 4} \\ = \frac{24}{12} \\ = 2$$

$$65. \quad 3 \cdot 2^3 - \frac{100}{10} = 3 \cdot 8 - 10 \\ = 24 - 10 \\ = 14$$

$$66. \quad (5 + 3)^2 + \frac{20}{5} = 8^2 + 4 \\ = 64 + 4 \\ = 68$$

$$67. \quad [2(10 - 7)]^2 = [2(3)]^2 \\ = 6^2 \\ = 36$$

$$68. \quad [2(11 - 9)]^4 = [2(2)]^4 \\ = 4^4 \\ = 256$$

69. a. Females between the ages of 19 and 30 are in group 4; let $x = 4$.

$$620 + 654x - 82x^2 = 620 + 654(4) - 82(4)^2 \\ = 620 + 2616 - 1312 \\ = 1924$$

They will need 1924 calories.

- b. underestimates by 76 calories

70. a. Males between the ages of 19 and 30 are in group 4; let $x = 4$.

$$660 + 802x - 96x^2 = 660 + 802(4) - 96(4)^2 \\ = 660 + 3208 - 1536 \\ = 2332$$

They will need 2332 calories.

- b. underestimates by 68 calories

71. a. $s^2 = 10^2 = 100$ square feet

b. $100 \cdot \$15 = \1500

c. $100 \cdot \$12 = \1200

d. $\$1500 - \$1200 = \$300$

72. a. $s^2 = 20^2 = 400$ square feet

b. $400 \cdot \$16 = \6400

c. $400 \cdot \$13 = \5200

d. $\$6400 - \$5200 = \$1200$

73. – 75. Answers will vary.

76. makes sense

77. does not make sense; Explanations will vary.

Sample explanation: $10^4 = 10,000$.

78. does not make sense; Explanations will vary.

Sample explanation: One to any power equals one.

79. makes sense

80. false; Changes to make the statement true will vary.

A sample change is: $14 \div 7 \cdot 2 = 2 \cdot 2 = 4$.

81. false; Changes to make the statement true will vary.

A sample change is: $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$.

82. false; Changes to make the statement true will vary.

A sample change is: $5 \cdot 2^2 = 5 \cdot 4 = 20$.

83. false; Changes to make the statement true will vary.

A sample change is: $\frac{15 + 13}{9 - 2} < \frac{3^2 + 5 - 2^2}{10 \div 5}$.

84. $3 \cdot (6 - 2) + 8 = 3 \cdot 4 + 8 = 12 + 8 = 20$

85. $(2 \cdot 3 + 3) \cdot 5 = (6 + 3) \cdot 5 = 9 \cdot 5 = 45$

86. Answer will vary.

87. $412 \times 58 \approx 400 \times 60 = 24,000$

88. $412 \times 58 = 23,896$ Yes this answer seems reasonable.

89.
$$\begin{array}{r} 532 \\ 22 \overline{) 11712} \\ \underline{110} \\ 71 \\ \underline{66} \\ 52 \\ \underline{44} \\ 8 \end{array}$$

$11,712 \div 22 = 532 \text{ R } 8$

90. a. $5x + 3 = 5(4) + 3$
 $= 20 + 3$
 $= 23$

b. $5(x + 3) = 5(4 + 3)$
 $= 5(7)$
 $= 35$

91. $2(8) - 6 = 16 - 6 = 10$

92. $\frac{18}{6} + 5 = 3 + 5 = 8$

b.
$$\begin{aligned} \frac{6x - y}{2y - x - 8} &= \frac{6(3) - 8}{2(8) - 3 - 8} \\ &= \frac{18 - 8}{16 - 3 - 8} \\ &= \frac{10}{5} \\ &= 2 \end{aligned}$$

3. a. The algebraic expression for “the product of 6 and a number” is $6 \cdot x$ or $6x$.
 b. The algebraic expression for “a number added to 4” is $4 + x$.
 c. The algebraic expression for “three times a number, increased by 5” is $3x + 5$.
 d. The algebraic expression for “twice a number subtracted from 12” is $12 - 2x$.
 e. The algebraic expression for “the quotient of 15 and a number” is $\frac{15}{x}$.

4. a. To determine whether 6 is a solution, substitute 6 for x .
 $9x - 3 = 42$
 $9(6) - 3 = 42$
 $54 - 3 = 42$
 $51 \neq 42$

Because the values on both sides of the equation are not the same, the number 6 is not a solution of the equation.

- b. To determine whether 3 is a solution, substitute 3 for y .
 $2(y + 3) = 5y - 3$
 $2(3 + 3) = 5(3) - 3$
 $2(6) = 15 - 3$
 $12 = 12$

Because the values on both sides of the equation are the same, the number 3 is a solution of the equation.

5. a. The equation for “the quotient of a number and 6 is 5” is $\frac{x}{6} = 5$.

- b. The equation for “seven decreased by twice a number yields 1” is $7 - 2x = 1$.

1.7 Check Points

1. a. We begin by substituting 10 for x . Then we follow the order of operations: Multiply first, and then add.
 $6 + 2x = 6 + 2(10)$
 $= 6 + 20$
 $= 26$
 b. We begin by substituting 10 for x . Then we follow the order of operations: Parentheses first, and then multiply.
 $2(x + 6) = 2(10 + 6)$
 $= 2(16)$
 $= 32$
2. a. $7x + 2y = 7(3) + 2(8)$
 $= 21 + 16$
 $= 37$

6. a. $P = 2l + 2w$

$$P = 2(10) + 2(3)$$

$$P = 20 + 6$$

$$P = 26$$

The perimeter of the rectangle is 26 inches.

b. $A = lw$

$$A = (10)(3)$$

$$A = 30$$

The area of the rectangle is 30 square inches.

7. a. Because 2010 is 10 years after 2000, we substitute 10 for x in the given formula. Then we use the order of operations to find T , the average cost of tuition and fees for the school year ending in 2010.

$$T = 6x^2 + 319x + 3234$$

$$T = 6(10)^2 + 319(10) + 3234$$

$$T = 6(100) + 319(10) + 3234$$

$$T = 600 + 3190 + 3234$$

$$T = 7024$$

The formula indicates that for the school year ending in 2014, the average cost of tuition and fees at public U.S. colleges was \$7024.

- b. The actual cost shown in the figure is \$7020. Using subtraction: $7024 - 7020 = 4$, the mathematical model overestimates the actual cost by \$4.

3. $12 - x = 12 - 4 = 8$

4. $16 - x = 16 - 4 = 12$

5. $5x = 5 \cdot 4 = 20$

6. $6x = 6 \cdot 4 = 24$

7. $\frac{28}{x} = \frac{28}{4} = 7$

8. $\frac{36}{x} = \frac{36}{4} = 9$

9. $5 + 3x = 5 + 3 \cdot 4 = 5 + 12 = 17$

10. $3 + 5x = 3 + 5 \cdot 4 = 3 + 20 = 23$

11. $2(x + 5) = 2(4 + 5) = 2(9) = 18$

12. $5(x + 3) = 5(4 + 3) = 5(7) = 35$

13. $\frac{12x - 8}{2x} = \frac{12 \cdot 4 - 8}{2 \cdot 4} = \frac{48 - 8}{8} = \frac{40}{8} = 5$

14. $\frac{5x + 52}{3x} = \frac{5 \cdot 4 + 52}{3 \cdot 4} = \frac{20 + 52}{12} = \frac{72}{12} = 6$

15. $2x + y = 2 \cdot 7 + 5 = 14 + 5 = 19$

16. $3x + y = 3 \cdot 7 + 5 = 21 + 5 = 26$

17. $2(x + y) = 2(7 + 5) = 2(12) = 24$

18. $3(x + y) = 3(7 + 5) = 3(12) = 36$

19. $4x - 3y = 4 \cdot 7 - 3 \cdot 5 = 28 - 15 = 13$

20. $5x - 4y = 5 \cdot 7 - 4 \cdot 5 = 35 - 20 = 15$

21. $\frac{21}{x} + \frac{35}{y} = \frac{21}{7} + \frac{35}{5} = 3 + 7 = 10$

22. $\frac{50}{y} - \frac{14}{x} = \frac{50}{5} - \frac{14}{7} = 10 - 2 = 8$

23. $\frac{2x - y + 6}{2y - x} = \frac{2 \cdot 7 - 5 + 6}{2 \cdot 5 - 7} = \frac{14 - 5 + 6}{10 - 7} = \frac{15}{3} = 5$

24. $\frac{2y - x + 24}{2x - y} = \frac{2 \cdot 5 - 7 + 24}{2 \cdot 7 - 5} = \frac{10 - 7 + 24}{14 - 5} = \frac{27}{9} = 3$

1.7 Concept and Vocabulary Check

- variable
- expression
- substituting; evaluating
- equation; solution
- formula
- modeling; models

1.7 Exercise Set

1. $x + 8 = 4 + 8 = 12$

2. $x + 10 = 4 + 10 = 14$

25. $x + 4$

26. $x + 6$

27. $x - 4$

28. $x - 6$

29. $x + 4$

30. $x + 6$

31. $x - 9$

32. $x - 3$

33. $9 - x$

34. $3 - x$

35. $3x - 5$

36. $5x - 3$

37. $12x - 1$

38. $13x - 3$

39. $\frac{10}{x} + \frac{x}{10}$

40. $\frac{20}{x} + \frac{x}{20}$

41. $\frac{x}{30} + 6$

42. $\frac{30}{x} + 4$

43. $x + 14 = 20$

$6 + 14 = 20$

$20 = 20$, true

The number is a solution.

44. $x + 17 = 22$

$5 + 17 = 22$

$22 = 22$, true

The number is a solution.

45. $30 - y = 10$

$30 - 20 = 10$

$10 = 10$, true

The number is a solution.

46. $50 - y = 20$

$50 - 30 = 20$

$20 = 20$, true

The number is a solution.

47. $4z = 20$

$4(10) = 20$

$40 = 20$, false

The number is not a solution.

48. $5z = 30$

$5(8) = 30$

$40 = 30$, false

The number is not a solution.

49. $\frac{r}{6} = 8$

$\frac{48}{6} = 8$

$8 = 8$, true

The number is a solution.

50. $\frac{r}{9} = 7$

$\frac{63}{9} = 7$

$7 = 7$, true

The number is a solution.

51. $4m + 3 = 23$

$4(6) + 3 = 23$

$24 + 3 = 23$

$27 = 23$, false

The number is not a solution.

52. $3m + 4 = 19$

$3(6) + 4 = 19$

$18 + 4 = 19$

$22 = 19$, false

The number is not a solution.

53. $5a - 4 = 2a + 5$

$$5(3) - 4 = 2(3) + 5$$

$$15 - 4 = 6 + 5$$

$$11 = 11, \text{ true}$$

The number is a solution.

54. $5a - 3 = 2a + 6$

$$5(3) - 3 = 2(3) + 6$$

$$15 - 3 = 6 + 6$$

$$12 = 12, \text{ true}$$

The number is a solution.

55. $6(p - 4) = 3p$

$$6(8 - 4) = 3(8)$$

$$6(4) = 24$$

$$24 = 24, \text{ true}$$

The number is a solution.

56. $4(p + 3) = 6p$

$$4(6 + 3) = 6(6)$$

$$4(9) = 36$$

$$36 = 36, \text{ true}$$

The number is a solution.

57. $2(w + 1) = 3(w - 1)$

$$2(7 + 1) = 3(7 - 1)$$

$$2(8) = 3(6)$$

$$16 = 18, \text{ false}$$

The number is not a solution.

58. $3(w + 2) = 4(w - 3)$

$$3(10 + 2) = 4(10 - 3)$$

$$3(12) = 4(7)$$

$$36 = 28, \text{ false}$$

The number is not a solution.

59. $4x = 28$

60. $5x = 35$

61. $\frac{14}{x} = 2$

62. $\frac{x}{8} = 3$

63. $20 - x = 5$

64. $40 - x = 10$

65. $2x + 6 = 16$

66. $2x + 9 = 29$

67. $3x - 5 = 7$

68. $4x - 3 = 29$

69. $4x + 5 = 33$

70. $6x + 3 = 33$

71. $4(x + 5) = 33$

72. $6(x + 3) = 33$

73. $5x = 24 - x$

74. $4x = 25 - x$

75. First find x .

$$x = 7y + 2$$

$$x = 7(5) + 2 = 37$$

Evaluate the expression.

$$\frac{x - y}{4} = \frac{37 - 5}{4} = \frac{32}{4} = 8$$

76. First find x .

$$x = 5y + 2$$

$$x = 5(4) + 2 = 22$$

Evaluate the expression.

$$\frac{x - y}{3} = \frac{22 - 4}{3} = \frac{18}{3} = 6$$

77. First find x .

$$x = \frac{y}{4} - 1$$

$$x = \frac{12}{4} - 1 = 3 - 1 = 2$$

Evaluate the expression.

$$\begin{aligned} 4x + 3(y + 5) &= 4(2) + 3(12 + 5) \\ &= 8 + 3(17) \\ &= 8 + 51 \\ &= 59 \end{aligned}$$

78. First find
- x
- .

$$x = \frac{y}{3} - 1$$

$$x = \frac{15}{3} - 1 = 5 - 1 = 4$$

Evaluate the expression.

$$\begin{aligned} 3x + 4(y + 6) &= 3(4) + 4(15 + 6) \\ &= 12 + 4(21) \\ &= 12 + 84 \\ &= 96 \end{aligned}$$

79. a.
- $2(x + 3y) = 2(4 + 3 \cdot 1) = 2(7) = 14$

b. $5z - 30 = 40$

$5(14) - 30 = 40$

$70 - 30 = 40$

$40 = 40$, true

Yes, it is a solution.

80. a.
- $3(2x + y) = 3(2 \cdot 1 + 5) = 3(7) = 21$

b. $4z - 30 = 54$

$4(21) - 30 = 54$

$84 - 30 = 54$

$54 = 54$, true

Yes, it is a solution.

81. a. $H = \frac{4(200 - A)}{5}$

$H = \frac{4(200 - 145)}{5}$

$H = \frac{4(55)}{5}$

$H = \frac{220}{5}$

$H = 44$

b. $120 + 44 = 164$

82. a. $H = \frac{4(200 - A)}{5}$

$H = \frac{4(200 - 165)}{5}$

$H = \frac{4(35)}{5}$

$H = \frac{140}{5}$

$H = 28$

b. $140 + 28 = 168$

83. $h = 4 + 60t - 16t^2$

$h = 4 + 60(2) - 16(2)^2$

$h = 4 + 120 - 64$

$h = 60$

60 feet

84. $h = 4 + 60t - 16t^2$

$h = 4 + 60(3) - 16(3)^2$

$h = 4 + 180 - 144$

$h = 40$

40 feet

85. a. $T = 21x^2 + 862x + 15,552$

$T = 21(10)^2 + 862(10) + 15,552$

$T = 2100 + 8620 + 15,552$

$T = 26,272$

\$26,272 tuition in 2010

b. underestimates by \$1

c. $T = 21x^2 + 862x + 15,552$

$T = 21(20)^2 + 862(20) + 15,552$

$T = 8400 + 17,240 + 15,552$

$T = 41,192$

\$41,192 tuition in 2020

86. a. $T = 21x^2 + 862x + 15,552$

$T = 21(14)^2 + 862(14) + 15,552$

$T = 4116 + 12,068 + 15,552$

$T = 31,736$

\$31,736 tuition in 2014

b. overestimates by \$35

c. $T = 21x^2 + 862x + 15,552$

$T = 21(22)^2 + 862(22) + 15,552$

$T = 10,164 + 18,964 + 15,552$

$T = 44,680$

\$44,680 tuition in 2022

87. – 96. Answers will vary.

97. does not make sense; Explanations will vary.
Sample explanation: Equations have solutions, not expressions.

98. makes sense
99. makes sense
100. makes sense
101. true
102. false; Changes to make the statement true will vary.
A sample change is: Only equations contain the equality symbol, =.
103. true
104. false; Changes to make the statement true will vary.
A sample change is: The algebraic expression for “the quotient of a number and 6” is not the same as the algebraic expression for “the quotient of 6 and a number.”
105. eight billion, seventy-five million, three hundred twenty-one thousand, six

$$\begin{array}{r}
 426 \\
 19 \overline{)8100} \\
 \underline{76} \\
 50 \\
 \underline{38} \\
 120 \\
 \underline{114} \\
 6
 \end{array}$$

$$8100 \div 19 = 426 \text{ R } 6$$

$$\begin{array}{r}
 \text{Check: } 426 \\
 \times 19 \\
 \hline
 3834 \\
 + 4260 \\
 \hline
 8094 \\
 + 6 \\
 \hline
 8100
 \end{array}$$

$$107. \frac{73+85+88}{3} = \frac{246}{3} = 82$$

$$108. 3$$

$$109. 0$$

$$110. -2$$

Chapter 1 Review Exercises

Note that exercises #1 - 6 use the following table:

Millions Period			Thousands Period			Ones Period		
Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

- hundred-thousands
- ten-millions
- nine thousand, five hundred seventy
- seventy-eight million, three hundred thousand, one hundred fifty
- The standard form is 64,005.
- The standard form is 35,042,106.
- The expanded form is $4000 + 200 + 60 + 7$.
- The expanded form is $40,000,000 + 3,000,000 + 200,000 + 20,000 + 60$.
- $0 < 17$ because 0 is to the left of 17 on the number line.
- $23 > 17$ because 23 is to the right of 17 on the number line.
- 847 rounded to the nearest ten is 850.
- 356,294 rounded to the nearest thousand is 356,000.
- 65,599 rounded to the nearest ten-thousand is 70,000.
- 359,863,217 rounded to the nearest million is 360,000,000.
- English and Arabic
- 223,000,000; two hundred twenty-three million
- Hindi; 4 countries
- 406,000,000
- Chinese; 1,197,000,000; one billion, one hundred ninety-seven million

$$\begin{array}{r} 20. \quad 35 \\ + 42 \\ \hline 77 \end{array}$$

$$\begin{array}{r} 21. \quad 29 \\ + 56 \\ \hline 85 \end{array}$$

$$\begin{array}{r} 22. \quad 3407 \\ + 2695 \\ \hline 6102 \end{array}$$

$$\begin{array}{r} 23. \quad 843 \\ 326 \\ + 892 \\ \hline 2061 \end{array}$$

$$\begin{array}{r} 24. \quad 804,325 \\ 19,207 \\ + 6,003 \\ \hline 829,535 \end{array}$$

25.	Exact		Estimate
	39	≈	40
	18	≈	20
	<u>+ 51</u>	≈	<u>+ 50</u>
			110

26.	Exact		Estimate
	6893	≈	6900
	537	≈	500
	<u>+ 1784</u>	≈	<u>+ 1800</u>
			9200

27. associative property of addition

28. identity property of addition

29. commutative property of addition

$$\begin{aligned} 30. \quad 11 + 8 + 9 + 2 &= \overbrace{11 + 9}^{20} + \overbrace{8 + 2}^{10} \\ &= 20 + 10 \\ &= 30 \end{aligned}$$

$$\begin{aligned} 31. \quad 86 + 7 + 14 + 193 &= \overbrace{86 + 14}^{100} + \overbrace{7 + 193}^{200} \\ &= 100 + 200 \\ &= 300 \end{aligned}$$

$$32. \quad 23,976 + 234 = 24,210$$

$$33. \quad 12,715 + 796 = 13,511$$

$$34. \quad 82 + 2657 + 231 = 2970$$

$$\begin{array}{r} 35. \quad 36 \text{ feet} \\ 36 \text{ feet} \\ 25 \text{ feet} \\ + 41 \text{ feet} \\ \hline 138 \text{ feet} \end{array}$$

The perimeter is 138 feet.

$$\begin{array}{r} 36. \quad 16 \text{ yards} \\ 10 \text{ yards} \\ + 9 \text{ yards} \\ \hline 35 \text{ yards} \end{array}$$

The perimeter is 35 yards.

$$\begin{array}{r} 37. \quad 48 \text{ inches} \\ 96 \text{ inches} \\ 48 \text{ inches} \\ + 96 \text{ inches} \\ \hline 288 \text{ inches} \end{array}$$

The perimeter is 288 inches.

$$\begin{array}{r} 38. \quad 33 \\ 31 \\ 101 \\ 4 \\ + 59 \\ \hline 228 \end{array}$$

The world's top-five languages are spoken in 228 countries.

$$\begin{array}{r} 39. \quad 467 \\ - 52 \\ \hline 415 \end{array}$$

$$\begin{array}{r} 40. \quad 83 \\ - 59 \\ \hline 24 \end{array}$$

$$\begin{array}{r} 41. \quad 826 \\ - 297 \\ \hline 529 \end{array}$$

$$\begin{array}{r} 42. \quad 7000 \\ - 46 \\ \hline 6954 \end{array}$$

$$\begin{array}{r} 43. \quad 8203 \\ - 2479 \\ \hline 5724 \end{array}$$

$$44. \quad 5913 - 5271 \approx 5900 - 5300 \\ = 600$$

$$45. \quad 29,673 - 14,218 \approx 30,000 - 14,000 \\ = 16,000$$

$$46. \quad 103 - 79 = 24$$

$$47. \quad 29,006 - 5394 = 23,612$$

$$48. \quad 649 - 226 = 423$$

$$49. \quad 4300 - 31 = 4269$$

$$50. \quad 1565 - 360 = 1205$$

$$51. \quad 1326 - (133 + 101 + 39) = 1326 - 273 \\ = 1053$$

$$\begin{array}{r} 52. \quad 74,608 \\ - 40,500 \\ \hline 34,108 \end{array}$$

There were 34,108 more pages in 2014 than in 1995.

$$53. \quad 2005$$

$$54. \quad 2012$$

$$55. \quad 12 - 3 = 9$$

There were 9 more hurricanes in 2010 than 2009.

$$56. \quad 12 - 7 = 5$$

There were 5 less hurricanes in 2010 than 2011.

$$57. \quad 2008$$

$$58. \quad \text{commutative property of multiplication}$$

$$59. \quad \text{distributive property}$$

$$60. \quad \text{associative property of multiplication}$$

$$\begin{array}{r} 61. \quad 62 \\ \times 4 \\ \hline 248 \end{array}$$

$$\begin{array}{r} 62. \quad 46 \\ \times 9 \\ \hline 414 \end{array}$$

$$\begin{array}{r} 63. \quad 849 \\ \times 5 \\ \hline 4245 \end{array}$$

$$\begin{array}{r} 64. \quad 97 \\ \times 63 \\ \hline 291 \\ + 5820 \\ \hline 6111 \end{array}$$

$$65. \quad 37 \cdot 1000 = 37,000$$

$$\begin{array}{r} 66. \quad 705 \\ \times 26 \\ \hline 4230 \\ + 14100 \\ \hline 18,330 \end{array}$$

$$\begin{array}{r} 67. \quad 3275 \\ \times 87 \\ \hline 22925 \\ + 262000 \\ \hline 284,925 \end{array}$$

$$68. \quad 63 \cdot 48 \cdot 0 = 0$$

$$\begin{array}{r} 69. \quad 743 \\ \times 126 \\ \hline 4458 \\ 14860 \\ + 74300 \\ \hline 93,618 \end{array}$$

$$\begin{array}{r} 70. \quad 3025 \\ \times 401 \\ \hline 3025 \\ + 121000 \\ \hline 1,213,025 \end{array}$$

71. $8 \times 3 = 24$
 Attach 2 + 3, or 5 zeros to 24.
 $800 \cdot 3000 = 2,400,000$

72.
$$\begin{array}{r} 438 \\ \times 230 \\ \hline 13140 \\ + 87600 \\ \hline 100,740 \end{array}$$

73. $3 \times 15 = 45$
 Attach 3 + 3, or 6 zeros to 45.
 $3000 \cdot 15,000 = 45,000,000$

74. $73 \times 38 \approx 70 \times 40$
 $= 2800$

75. $479 \times 72 \approx 500 \times 70$
 $= 35,000$

76. $(517)(652) \approx 500 \times 700$
 $= 35,000$

77. $73 \cdot 12 = 876$

78. $688 \cdot 0 = 0$

79. $6 \cdot 740 = 4440$

80. $2(129) = 258$

81. $3(908) = 2724$

82.
$$\begin{array}{r} 12 \\ \times 5 \\ \hline 60 \end{array}$$

 The area is 60 square feet.

83.
$$\begin{array}{r} 25 \\ \times 25 \\ \hline 125 \\ + 500 \\ \hline 625 \end{array}$$

 The area is 625 square inches.

84. Total cost = $\overbrace{23 \cdot 115}^{\text{orchestra}} + \overbrace{17 \cdot 86}^{\text{balcony}}$
 $= 2645 + 1462$
 $= 4107$
 The total cost is \$4107.

85. a. Cost if using monthly payments = $12 \cdot 84$
 $= 1008$
 The total cost under the installment plan is \$1008.

b. Savings:
$$\begin{array}{r} 1008 \\ - 925 \\ \hline 83 \end{array}$$

 Paying the total amount at the time of the purchase will save \$83.

86.
$$\begin{array}{r} 18 \\ \times 11 \\ \hline 18 \\ + 180 \\ \hline 198 \end{array}$$

The area of the floor is 198 square feet.

$$\begin{array}{r} 198 \\ \times 10 \\ \hline 1980 \end{array}$$

The cost of the carpeting is \$1980.

87. $24 \div 6 = 4$ because $4 \cdot 6 = 24$.

88. $\frac{42}{7} = 6$ because $6 \cdot 7 = 42$.

89. $28 \div 1 = 28$ because $28 \cdot 1 = 28$.

90. $9 \overline{)1}$ because $1 \cdot 9 = 9$.

91. $0 \div 8 = 0$ because $0 \cdot 8 = 0$.

92. $9 \div 0 = \text{undefined}$

93.
$$\begin{array}{r} 47 \\ 5 \overline{)235} \\ \underline{20} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

94.
$$\begin{array}{r} 73 \\ 8 \overline{)589} \\ \underline{56} \\ 29 \\ \underline{24} \\ 5 \end{array}$$

$$\begin{array}{r} 962 \\ 7 \overline{)6734} \\ \underline{63} \\ 43 \\ \underline{42} \\ 14 \\ \underline{14} \\ 0 \end{array}$$

$$\begin{array}{r} 6092 \\ 3 \overline{)18278} \\ \underline{18} \\ 02 \\ \underline{0} \\ 27 \\ \underline{27} \\ 08 \\ \underline{6} \\ 2 \end{array}$$

$$18,278 \div 3 = 6092 \text{ R } 2$$

$$\begin{array}{r} 74 \\ 26 \overline{)1924} \\ \underline{182} \\ 104 \\ \underline{104} \\ 0 \end{array}$$

$$\begin{array}{r} 1 \\ 1924 \overline{)1924} \end{array}$$

$$\begin{array}{r} 0 \\ 1924 \overline{)0} \end{array}$$

$$100. \quad 0 \overline{)1924} = \text{undefined}$$

$$\begin{array}{r} 706 \\ 43 \overline{)30379} \\ \underline{301} \\ 27 \\ \underline{0} \\ 279 \\ \underline{258} \\ 21 \end{array}$$

$$30,379 \div 43 = 706 \text{ R } 21$$

$$\begin{array}{r}
 2614 \\
 307 \overline{)802538} \\
 \underline{614} \\
 1885 \\
 \underline{1842} \\
 433 \\
 \underline{307} \\
 1268 \\
 \underline{1228} \\
 40
 \end{array}$$

$$802,538 \div 307 = 2614 \text{ R } 40$$

$$103. \frac{36,000}{400} = \frac{360\cancel{00}}{4\cancel{00}} = \frac{360}{4} = 90$$

$$104. 18,000,000 \div 3000 = 18000\cancel{000} \div 3\cancel{000} = 18000 \div 3 = 6000$$

$$105. 1508 \div 29 \approx 1500 \div 30 = 150\cancel{0} \div 3\cancel{0} = 150 \div 3 = 50$$

$$106. 24,762 \div 47 \approx 25,000 \div 50 = 2500\cancel{0} \div 5\cancel{0} = 2500 \div 5 = 500$$

$$107. 83,509 \div 407 \approx 84,000 \div 400 = 840\cancel{00} \div 4\cancel{00} = 840 \div 4 = 210$$

$$\begin{array}{r}
 108. \quad \frac{735}{7} \qquad 7 \overline{)735} \\
 \underline{7} \\
 03 \\
 \underline{0} \\
 35 \\
 \underline{35} \\
 0
 \end{array}$$

$$\begin{array}{r}
 109. \quad 459 \div 9 \qquad 9 \overline{)459} \\
 \underline{45} \\
 09 \\
 \underline{9} \\
 0
 \end{array}$$

$$\begin{array}{r}
 110. \quad 798 \div 21 \qquad 21 \overline{)798} \\
 \underline{63} \\
 168 \\
 \underline{168} \\
 0
 \end{array}$$

$$111. \text{ Mean} = \frac{\text{sum of values}}{\text{number of values}} = \frac{74 + 76 + 88 + 94}{4} = \frac{332}{4}$$

$$\begin{array}{r} 83 \\ 4 \overline{)332} \\ \underline{32} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

The mean score for the four tests is 83.

$$112. \text{ Mean} = \frac{\text{sum of values}}{\text{number of values}} = \frac{42 + 79 + 87 + 91 + 96}{5} = \frac{395}{5}$$

$$\begin{array}{r} 79 \\ 5 \overline{)395} \\ \underline{35} \\ 45 \\ \underline{45} \\ 0 \end{array}$$

The mean score for the five tests is 79.

$$113. \begin{array}{r} 702 \\ 36 \overline{)25272} \\ \underline{252} \\ 07 \\ \underline{0} \\ 72 \\ \underline{72} \\ 0 \end{array}$$

Each monthly payment will be \$702.

$$114. \text{ a. } \begin{array}{r} 3600 \\ 5 \overline{)18000} \\ \underline{15} \\ 30 \\ \underline{30} \\ 00 \\ \underline{0} \\ 00 \\ \underline{0} \\ 0 \end{array}$$

$$\$18,000 \div 5 = \$3600 \text{ per person}$$

$$\text{b. } \begin{array}{r} 2250 \\ 8 \overline{)18000} \\ \underline{16} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 00 \\ \underline{0} \\ 0 \end{array}$$

$$\$18,000 \div 8 = \$2250 \text{ per person}$$

$$\text{c. } \$3600 - \$2250 = \$1350 \text{ per person}$$

$$115. \text{ a. } \begin{array}{r} 17 \\ 46 \overline{)802} \\ \underline{46} \\ 342 \\ \underline{322} \\ 20 \end{array}$$

$$802 \div 46 = 17 \text{ R } 20$$

So, 18 buses are needed.

- b. Using an 18th bus means that there will be empty seats. There are 46 seats per bus and 20 leftover people. Thus, there will be $46 - 20 = 26$ empty seats on the bus.

$$116. 7^2 = 7 \cdot 7 = 49$$

$$117. 5^3 = 5 \cdot 5 \cdot 5 = 125$$

$$118. 3 \cdot 2^4 = 3 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 48$$

$$119. 40 \div 5 \cdot 2 = 8 \cdot 2 \\ = 16$$

$$120. 6 + 2 \cdot 5 = 6 + 10 \\ = 16$$

$$121. 2 \cdot 5^2 - 4 \cdot 3^2 = 2 \cdot 25 - 4 \cdot 9 \\ = 50 - 36 \\ = 14$$

$$122. (2 \cdot 3)^2 - 2 \cdot 3^2 = 6^2 - 2 \cdot 3^2 \\ = 36 - 2 \cdot 9 \\ = 36 - 18 \\ = 18$$

$$123. 28 \div (4^2 - 2) = 28 \div (16 - 2) \\ = 28 \div 14 \\ = 2$$

$$124. 36 - 24 \div 4 \cdot 3 - 1 = 36 - 6 \cdot 3 - 1 \\ = 36 - 18 - 1 \\ = 17$$

$$125. 4[6 + 2(11 - 6)] = 4[6 + 2(5)] \\ = 4[6 + 10] \\ = 4[16] \\ = 64$$

$$126. 3(7 - 5)^3 - 2(8 - 7)^4 = 3(2)^3 - 2(1)^4 \\ = 3 \cdot 8 - 2 \cdot 1 \\ = 24 - 2 \\ = 22$$

$$127. \frac{6(10 - 3)}{2 \cdot 15 - 9 \cdot 3} = \frac{6(7)}{2 \cdot 15 - 9 \cdot 3} \\ = \frac{42}{30 - 27} \\ = \frac{42}{3} \\ = 14$$

$$128. \frac{2(5^2 - 10) + 10(4 - 1)}{2^3 + 4} = \frac{2(25 - 10) + 10(4 - 1)}{2^3 + 4} \\ = \frac{2(15) + 10(3)}{8 + 4} \\ = \frac{60}{12} \\ = 5$$

$$129. 10 + 5x = 10 + 5 \cdot 6 = 10 + 30 = 40$$

$$130. 8(x - 2) + 3x = 8(6 - 2) + 3 \cdot 6 \\ = 8(4) + 18 \\ = 32 + 18 \\ = 50$$

$$131. \frac{40}{x} - \frac{y}{5} = \frac{40}{8} - \frac{10}{5} = 5 - 2 = 3$$

$$132. 3(2y + x) = 3(2 \cdot 10 + 8) = 3(28) = 84$$

$$133. 7x - 6$$

$$134. \frac{x}{5} - 2 = 18$$

$$135. 9 - 2x = 14$$

$$136. 3(x + 7)$$

$$137. 4x + 5 = 13 \\ 4(3) + 5 = 13 \\ 12 + 5 = 13 \\ 17 = 13, \text{ false}$$

The number is not a solution.

$$138. \quad 2y + 7 = 4y - 5$$

$$2(6) + 7 = 4(6) - 5$$

$$12 + 7 = 24 - 5$$

$$19 = 19, \text{ true}$$

The number is a solution.

$$139. \quad 3(w + 1) + 11 = 2(w + 8)$$

$$3(2 + 1) + 11 = 2(2 + 8)$$

$$3 \cdot 3 + 11 = 2 \cdot 10$$

$$9 + 11 = 20$$

$$20 = 20, \text{ true}$$

The number is a solution.

$$140. \text{ a. } C = \frac{400x + 500,000}{x}$$

$$C = \frac{400(10,000) + 500,000}{10,000}$$

$$C = \frac{4,000,000 + 500,000}{10,000}$$

$$C = \frac{4,500,000}{10,000}$$

$$C = 450$$

To manufacture 10,000 bikes per month the average cost per bike is \$450.

$$\text{b. } C = \frac{400x + 500,000}{x}$$

$$C = \frac{400(50,000) + 500,000}{50,000}$$

$$C = \frac{20,000,000 + 500,000}{50,000}$$

$$C = \frac{20,500,000}{50,000}$$

$$C = 410$$

To manufacture 50,000 bikes per month the average cost per bike is \$410.

$$\text{c. } C = \frac{400x + 500,000}{x}$$

$$C = \frac{400(100,000) + 500,000}{100,000}$$

$$C = \frac{40,000,000 + 500,000}{100,000}$$

$$C = \frac{40,500,000}{100,000}$$

$$C = 405$$

To manufacture 100,000 bikes per month the average cost per bike is \$405.

d. The average cost decreases.

141. a. Formula 1

$$I = 65,482 + 4002x - 312x^2$$

$$I = 65,482 + 4002(0) - 312(0)^2$$

$$I = 65,482 + 0 + 0$$

$$I = 65,482$$

Formula 1 describes the median income for Asians.

Formula 2

$$I = 54,403 + 2771x - 213x^2$$

$$I = 54,403 + 2771(0) - 213(0)^2$$

$$I = 54,403 + 0 + 0$$

$$I = 54,403$$

Formula 2 describes the median income for white, non-Hispanics.

$$\text{b. } I = 54,403 + 2771x - 213x^2$$

$$I = 54,403 + 2771(10) - 213(10)^2$$

$$I = 54,403 + 27,710 - 21,300$$

$$I = 60,813$$

The median household income is \$60,813.

c. underestimates by \$18

Chapter 1 Test

1. sixty-two thousand, eight hundred seventy-five
2. 23,502,439
3. 74,000
4. distributive property

$$\begin{array}{r} 5. \quad 893 \\ + 58 \\ \hline 951 \end{array}$$

$$\begin{array}{r} 6. \quad 625 \\ - 297 \\ \hline 328 \end{array}$$

$$\begin{array}{r} 7. \quad 491 \\ \times 36 \\ \hline 2946 \\ + 14730 \\ \hline 17,676 \end{array}$$

$$\begin{array}{l} 8. \quad 5 \times 9 = 45 \\ \text{Attach } 2 + 3, \text{ or } 5 \text{ zeros to } 45. \\ 500 \cdot 9000 = 4,500,000 \end{array}$$

$$\begin{array}{r} 9. \quad \begin{array}{r} 536 \\ 7 \overline{)3757} \\ \underline{35} \\ 25 \\ \underline{21} \\ 47 \\ \underline{42} \\ 5 \end{array} \end{array}$$

$$3757 \div 7 = 536 \text{ R } 5$$

$$\begin{array}{r} 10. \quad \begin{array}{r} 93 \\ 37 \overline{)3441} \\ \underline{333} \\ 111 \\ \underline{111} \\ 0 \end{array} \end{array}$$

$$\begin{array}{l} 11. \quad 60 \div 10 \cdot 2 = 6 \cdot 2 \\ = 12 \end{array}$$

$$\begin{array}{l} 12. \quad 35 - 20 \div 5 \cdot 3 - 1 = 35 - 4 \cdot 3 - 1 \\ = 35 - 12 - 1 \\ = 22 \end{array}$$

$$\begin{array}{l} 13. \quad (2 \cdot 5)^2 - 2 \cdot 5^2 = 10^2 - 2 \cdot 5^2 \\ = 100 - 2 \cdot 25 \\ = 100 - 50 \\ = 50 \end{array}$$

$$\begin{array}{l} 14. \quad \frac{3[(7-5)^2 + (20-18)^3]}{5^2 - 13} = \frac{3[2^2 + 2^3]}{5^2 - 13} \\ = \frac{3[4+8]}{25-13} \\ = \frac{3[12]}{25-13} \\ = \frac{36}{12} \\ = 3 \end{array}$$

$$\begin{array}{r} 15. \quad 307 \\ + 21 \\ \hline 328 \end{array}$$

$$\begin{array}{r} 16. \quad 800 \\ - 563 \\ \hline 237 \end{array}$$

$$\begin{array}{r} 17. \quad 14 \\ \times 206 \\ \hline 84 \\ + 2800 \\ \hline 2884 \end{array}$$

$$18. \quad 80,000 \div 200 = 800\cancel{00} \div 2\cancel{00} = 800 \div 2 = 400$$

$$\begin{array}{l} 19. \quad 2^3 \cdot 4 - 5 = 8 \cdot 4 - 5 \\ = 32 - 5 \\ = 27 \end{array}$$

$$\begin{array}{l} 20. \quad 5874 + 1142 + 459 \approx 5900 + 1100 + 500 \\ = 7500 \end{array}$$

21. $24,809 \div 407 \approx 24,800 \div 400 = 248\cancel{00} \div 4\cancel{00} = 248 \div 4 = 62$

22. Perimeter:

$$\begin{array}{r} 30 \text{ yards} \\ 10 \text{ yards} \\ 30 \text{ yards} \\ + 10 \text{ yards} \\ \hline 80 \text{ yards} \end{array}$$

Area:

$$\begin{array}{r} 30 \text{ yards} \\ \times 10 \text{ yards} \\ \hline 300 \text{ square yards} \end{array}$$

23. Mean = $\frac{\text{sum of values}}{\text{number of values}} = \frac{70 + 78 + 96 + 100}{4} = \frac{344}{4}$

$$\begin{array}{r} 86 \\ 4 \overline{)344} \\ \underline{32} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

The mean score for the four tests is 86.

24. 26,513

$$\begin{array}{r} 423 \\ 316 \\ + 150 \\ \hline 27,402 \end{array}$$

The odometer reading was 27,402 miles.

25. Total cost = $\overbrace{4 \cdot 35}^{\text{adult}} + \overbrace{3 \cdot 18}^{\text{child}}$
 $= 140 + 54$
 $= 194$

The total cost is \$194.

26. The total cost = $157 + 25 = 182$

$$\begin{array}{r} 26 \\ 7 \overline{)182} \\ \underline{14} \\ 42 \\ \underline{42} \\ 0 \end{array}$$

Each person's share is \$26.

27. a. $6 \cdot 20 = 120$
 Plan A costs \$120.

b. $5 \cdot 15 + 40 = 75 + 40 = 115$

Plan B costs \$115.

c. 120

$$\begin{array}{r} -115 \\ \hline \end{array}$$

$$5$$

Plan B is the better deal by \$5.

28. $5(x-7) + 3x = 5(13-7) + 3(13) = 5(6) + 3(13) = 30 + 39 = 69$

29. $2l + 2w = 2(8) + 2(3) = 16 + 6 = 22$

30. $x + 5 = 13$

31. $9x - 4$

32. $5x + 2 = 19$

$$5(3) + 2 = 19$$

$$15 + 2 = 19$$

$$17 = 19, \text{ false}$$

The number is not a solution.

33. $3(x+2) = 5x-2$

$$3(4+2) = 5(4)-2$$

$$3(6) = 20-2$$

$$18 = 18, \text{ true}$$

The number is a solution.

34. a. $I = 31,806 + 4019x - 324x^2$

$$I = 31,806 + 4019(10) - 324(10)^2$$

$$I = 31,806 + 40,190 - 32,400$$

$$I = 39,596$$

The median income for African-Americans in 2000 is \$39,596.

b. overestimates by \$40

c. $I = 38,029 + 1099x - 48x^2$

$$I = 38,029 + 1099(22) - 48(22)^2$$

$$I = 38,029 + 24,178 - 23,232$$

$$I = 38,975$$

The median income for Hispanics in 2012 is \$38,975. This model underestimates the actual median income by \$30.

