Table of Contents

CHAPTER 1 Whole Numbers

Section 1.1: An Introduction to the Whole Numbers

VOCABULARY

1. The numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are the digits.

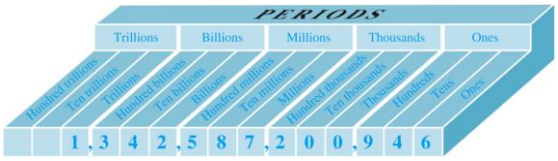
3. When we write five thousand eighty-nine as 5,089, we are writing the number in standard form.

5. When 297 is written as 200 + 90 + 7, we are writing 297 in expanded form.

7. The symbols < and > are inequality symbols.

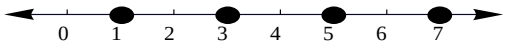
CONCEPTS

9.



11. a. forty
b. ninety
c. sixty-eight
d. fifteen

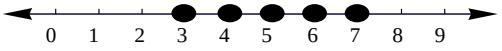
13.



15.

17.

19.



NOTATION

21. The symbols { }, called braces, are used when writing a set.

GUIDED PRACTICE

23. a. 3 tens
b. 7
c. 6 hundreds
d. 5

25. a. 6 millions
b. 7
c. 3 ten millions
d. 9

27. 93 = ninety-three

29. 732 = seven hundred thirty-two

31. 154,302 = one hundred fifty-four thousand, three hundred two

33. 14,432,500 = fourteen million, four hundred thirty-two thousand, five hundred

35. 970,031,500,104 = nine hundred seventy billion, thirty-one million, five hundred thousand, one hundred four

37. 82,000,415 = eighty-two million, four hundred fifteen

39. 3,737

41. 930

43. 7,021

45. 26,000,432

47. 245 = 200 + 40 + 5

49. 3,609 = 3,000 + 600 + 9

51. 72,533 = 70,000 + 2,000 + 500 + 30 +3

53 104,401 = 100,000 + 4,000 + 400 + 1

55. 8,403,613 = 8,000,000 + 400,000 + 3,000 + 600 + 10 + 3

57. 26,000,156 = 20,000,000 + 6,000,000 + 100 + 50 + 6

59. a. $11 > 8$ b. $29 < 54$

61. a. $12,321 > 12,209$ b. $23,223 < 23,231$

63. 98,150, since $4 < 5$

65. 512,970, since $7 \geq 5$

67. 8,400, since $5 \geq 5$

69. 32,400, since $3 < 5$

71. 66,000, (since $8 \geq 5$, 981 rounds to 1,000)

73. 2,581,000, (since $5 \geq 5$, 952 rounds to 1,000)

75. 53,000 ; 50,000

77. 77,000 ; 80,000

79. 816,000 ; 820,000

81. 297,000 ; 300,000

83. a. 79,590 b. 79,600
c. 80,000 d. 80,000

85. a. $419,160 b. $419,200
c. $419,000 d. $420,000

87. 40,025

89. 202,036

91. 27,598

93. 10,700,506

LOOK ALIKES

95. a. 1,000,600,000,000
b. 1,000,600,000
c. 1,000,600

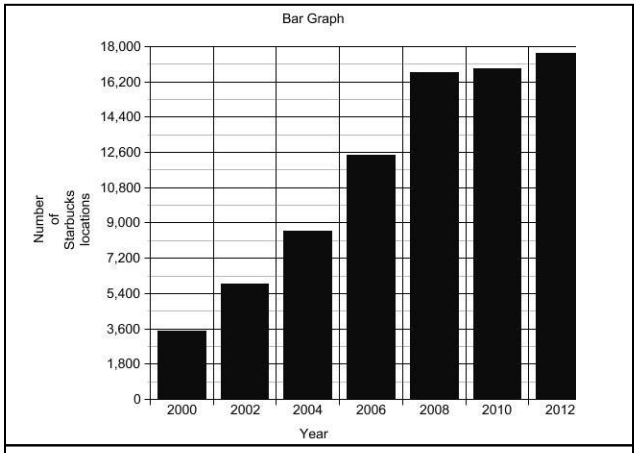
97. a. 9,000,000,000
b. 9,000,000,000

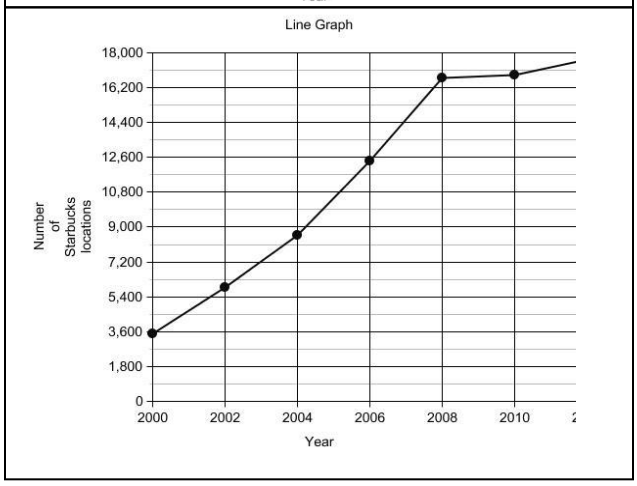
APPLICATIONS

99. Aisha is the closest to $4,745 without being over.

101. a. Under $25,000
b. $100,000 and Over
c. 17 million renter households
d. 5 million renter households

103.





105. Fifteen thousand, six hundred one
Three thousand, four hundred thirty-three

107. 1,865,593 ; 482,880; 1,503; 269; 43,449

109. a. hundred thousands
b. 980,000,000; 900,000,000+80,000,000
c. 1,000,000,000; one billion

WRITING

111. To round 687 to the nearest ten, look to the right of the tens place. Since this digit is 7, increase the 8 in the tens place to 9 and make the ones place a zero. So, to the nearest ten, 687 is approximately 690.

113. Because **1**,000 (3 zeros) is a thousand 1s, so **1,000**,000 is a thousand thousands.

115. 2 , 10 , 0 , 1,000 , 80
12 , 3 , 100 , 2 , 0

117. Two hours is too long to wait!

Section 1.2: Adding and Subtracting Whole Numbers

VOCABULARY

1. $\underset{addend}{10} + \underset{addend}{15} = \underset{sum}{25}$

3. The commutative property of addition states that the order in which whole numbers are added does not change their sum.

5. To see whether the result of an addition is reasonable, we can round the addends and estimate the sum.

7. The figure on the left is an example of a rectangle. The figure on the right is an example of a square.

9. When all the sides of a rectangle are the same length, we call the rectangle a square.

CONCEPTS

11. a. commutative property of addition

b. associative property of addition

c. associative property of addition

d. commutative property of addition

13. Fill in the blank: Any number added to 0 stays the same.

NOTATION

15. The addition symbol + is read as "plus."

17. 33 + 12 = 45

19. $(36+11)+5=47+5$
$=52$

GUIDED PRACTICE

21.
$$\begin{array}{r} 25 \\ +13 \\ \hline 38 \end{array}$$

23.
$$\begin{array}{r} 406 \\ +283 \\ \hline 689 \end{array}$$

25.
$$\begin{array}{r} 21 \\ 31 \\ +24 \\ \hline 76 \end{array}$$

27.
$$\begin{array}{r} 603 \\ 152 \\ +121 \\ \hline 876 \end{array}$$

29.
$$\begin{array}{r} {\scriptstyle 1\ \ } \\ 19 \\ +16 \\ \hline 35 \end{array}$$

31.
$$\begin{array}{r} {\scriptstyle 1\ \ } \\ 45 \\ +47 \\ \hline 92 \end{array}$$

33.
$$\begin{array}{r} {\scriptstyle 1\ \ } \\ 52 \\ +18 \\ \hline 70 \end{array}$$

35.
$$\begin{array}{r} {\scriptstyle 1\ \ } \\ 28 \\ +47 \\ \hline 75 \end{array}$$

37.
$$\begin{array}{r} {\scriptstyle 1\ \ } \\ 156 \\ +305 \\ \hline 461 \end{array}$$

39.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 4,301 \\ 789 \\ +3,847 \\ \hline 8,937 \end{array}$$

41.
$$\begin{array}{r} {\scriptstyle 2\ 2\ 2} \\ 9,758 \\ 586 \\ +7,799 \\ \hline 18,143 \end{array}$$

43.
$$\begin{array}{r} {\scriptstyle 2\ 3\ \ } \\ 346 \\ 217 \\ 568 \\ +679 \\ \hline 1,810 \end{array}$$

45.
$$\begin{aligned} (9+3)+7 &= 9+(3+7) \\ &= 9+10 \\ &= 19 \end{aligned}$$

47.
$$\begin{aligned} (13+8)+12 &= 13+(8+12) \\ &= 13+20 \\ &= 33 \end{aligned}$$

49.
$$\begin{aligned} 94+(6+37) &= (94+6)+37 \\ &= 100+37 \\ &= 137 \end{aligned}$$

51.
$$\begin{aligned} 125+(75+41) &= (125+75)+41 \\ &= 200+41 \\ &= 241 \end{aligned}$$

53.
$$\begin{aligned} 4+8+16+1+1 &= (4+16)+(8+1+1) \\ &= 20+10 \\ &= 30 \end{aligned}$$

55.
$$\begin{aligned} 23+5+7+15+10 &= (23+7)+(5+15)+10 \\ &= 30+20+10 \\ &= 60 \end{aligned}$$

57. $624+905+86=(624+86)+905$
$=710+905$
$=1,615$

59. $457+97+653=457+(97+653)$
$=457+750$
$=1,207$

61.
$$\begin{array}{r} {\scriptstyle 1}\\ 700\\ 800\\ 10,000\\ 20,000\\ +\ \ 6,000\\ \hline 37,500 \end{array}$$

63.
$$\begin{array}{r} 600,000\\ 20,000\\ 300,000\\ +\ 100,000\\ \hline 1,020,000 \end{array}$$

65. 32 + 12 + 32 + 12 = 88 ft.

67. 17 + 17 + 17 + 17 = 68 in.

69. 94 + 94 + 94 + 94 = 376 mi.

71. 87 + 6 + 87 + 6 = 186 cm.

TRY IT YOURSELF

73.
$$\begin{array}{r} 8,539\\ +\ 7,368\\ \hline 15,907 \end{array}$$

75.
$$\begin{array}{r} 51,246\\ 578\\ 37\\ +\ 4,599\\ \hline 56,460 \end{array}$$

77. $(45+16)+4=45+20$
$=65$

79.
$$\begin{array}{r} 632\\ +347\\ \hline 979 \end{array}$$

81. $16,427+13,573=30,000$

83.
$$\begin{array}{r} {\scriptstyle 1}\\ 76\\ +45\\ \hline 121 \end{array}$$

85. $3,156+1,578+6,578=11,312$

87. $12+1+8+4+9+16$
$=(12+8)+(1+9)+(4+16)$
$=20+10+20$
$=50$

LOOK ALIKES

89. a. 299 + 99 = 398

b. 99 + 299 = 398

91. a. 747 + 252 = 999
b. 252 + 747 = 999

APPLICATIONS

93. 24 + 35 + 16 + 16 = 91 ft.

95. 540 + 230 + 150 + 170 = 990 calories

97. 308,058,000 – 64,511,000 = 243,547,000 visitors

99.

Number of safe bridges	Number of bridges that need repair	Number of outdated bridges that should be replaced	Total number of bridges
464,859	61,365	84,525	610,749

101. \$1,947 + 5,358 + 4,442 + 712 + 5,871 + 12,540 + 3,882

= \$34,752

103. \$681,386,586 + 1,228,600,498 + 547,887,386 + 1,049,539,593
= \$3,507,414,063

105. 64 + 34 + 64 + 34 = 196 inches of fringe

107. **Floor Mats** Estimate the amount of plastic trim used around the floor mat shown below.

$50+50+46+46+6+6+6+6=216$ inches

109. Traffic Accidents Police used an entire roll of yellow "DO NOT CROSS" barricade tape to seal off a rectangular region around an automobile accident, as shown below. The width of the rectangle was 50 feet and the length was 25 feet more than that. How long was the roll of yellow tape?

$50+50+(50+25)+(50+25)=250$ feet

111. Explain why the operation of addition is commutative.

Addition is commutative because the addends can be added in any order without changing the sum.

WRITING

113. Benefit : faster ; Tradeoff : less accurate

REVIEW

115. a. 3,000 + 100 + 20 + 5

b. 60,000 + 30 + 7

Section 1.3: Multiplying Whole Numbers

VOCABULARY

1. $\underset{\text{minuend}}{25} - \underset{\text{subtrahend}}{10} = \underset{\text{difference}}{15}$

3. The words *fall*, *lose*, *reduce*, and *decrease* often indicate the operation of subtraction.

5. To see whether the result of a subtraction is reasonable, we can round the minuend and subtrahend and estimate the difference

CONCEPTS

7. The subtraction 7 – 3 = 4 is related to the addition statement 4 + 3 = 7.

9. To *evaluate* (find the value of) an expression that contains both addition and subtraction, we perform the operations as they occur from left to right.

11. The subtraction symbol – is read as "minus."

NOTATION

13. 83 – 30 is correct.

15.
$$\begin{array}{r} 37 \\ -14 \\ \hline 23 \end{array}$$

GUIDED PRACTICE

17.
$$\begin{array}{r} 89 \\ -28 \\ \hline 61 \end{array}$$

19.
$$\begin{array}{r} 596 \\ -372 \\ \hline 224 \end{array}$$

21.
$$\begin{array}{r} 674 \\ -371 \\ \hline 303 \end{array}$$

23.
$$\begin{array}{r} 7,989 \\ -347 \\ \hline 7,642 \end{array}$$

25.
$$\begin{array}{r} 2,967 \\ -405 \\ \hline 2,562 \end{array}$$

27.
$$\begin{array}{r} {\scriptstyle 4\ 13} \\ \cancel{5}\ \cancel{3} \\ -1\ 7 \\ \hline 3\ 6 \end{array}$$

29.
$$\begin{array}{r} {\scriptstyle 8\ 16} \\ \cancel{9}\ \cancel{6} \\ -4\ 8 \\ \hline 4\ 8 \end{array}$$

31.
$$\begin{array}{r} {\scriptstyle 6\ \ 13\ \ 16} \\ 8,\cancel{7}\ \cancel{4}\ \cancel{6} \\ -\ \ 2\ 8\ 9 \\ \hline 8,4\ 5\ 7 \end{array}$$

33.
$$\begin{array}{r} {\scriptstyle 8\ \ 15\ \ 11} \\ 6,\not{9}\ \not{5}\ \not{1} \\ -\quad 4\ 7\ 8 \\ \hline 6,4\ 8\ 3 \end{array}$$

35.
$$\begin{array}{r} {\scriptstyle 3\ \ 14\ \ 9\ \ 16} \\ 5\not{4},\not{3}\ \not{0}\ \not{6} \\ -\quad 2,8\ 2\ 9 \\ \hline 5\ 1,6\ 7\ 7 \end{array}$$

37.
$$\begin{array}{r} {\scriptstyle 7\ \ 13\ \ 9\ \ 12} \\ 4\not{8},\not{4}\ \not{0}\ \not{2} \\ -\quad 3,9\ 5\ 8 \\ \hline 4\ 4,4\ 4\ 4 \end{array}$$

39. $123+175=298$ correct

41. $1{,}364+3{,}275=4{,}629$ incorrect

43.
$$\begin{array}{r} 70,000 \\ -\quad 4,000 \\ \hline 66,000 \end{array}$$

45.
$$\begin{array}{r} 80,000 \\ -30,000 \\ \hline 50,000 \end{array}$$

47. $35-12+6=23+6$
$=29$

49. $56-31+12=25+12$
$=37$

51. $574+47-13=621-13$
$=608$

53. $966+143-61=1{,}109-61$
$=1{,}048$

55.
$$\begin{array}{r} {\scriptstyle 3\ \ 10\ \ 16} \\ \not{4}\ \not{1}\ \not{6} \\ -3\ 5\ 7 \\ \hline 5\ 9 \end{array}$$

TRY IT YOURSELF

57.
$$\begin{array}{r} 3,430 \\ -\quad 529 \\ \hline 2,901 \end{array}$$

59.
$$\begin{array}{r} {\scriptstyle 2\ \ 9\ \ 11} \\ \not{3}\ \not{0}\ \not{1} \\ -\ 1\ 9\ 9 \\ \hline 1\ 0\ 2 \end{array}$$

61.
$$\begin{array}{r} 367 \\ -\quad 347 \\ \hline 20 \end{array}$$

63. $633-598+30=35+30$
$=65$

65. $420-390=30$

67. $20{,}007-78=19{,}929$

69. $852-695+40=157+40$
$=197$

71.
$$\begin{array}{r} {\scriptstyle 6\ \ 11\ \ 13\ \ 16} \\ 1\not{7},\not{2}\ \not{4}\ \not{6} \\ -\ 6,7\ 8\ 9 \\ \hline 1\,0,4\ 5\ 7 \end{array}$$

73.
$$\begin{array}{r} 15,700 \\ -15,397 \\ \hline 303 \end{array}$$

75.
$$\begin{array}{r} 50,009 \\ -\quad 1,249 \\ \hline 48,760 \end{array}$$

77. $120+30-40=150-40$
$=110$

79.
$$\begin{array}{r} {\scriptstyle 6\ \ 12\ \ 9\ \ 15} \\ 16\not{7},\not{3}\ \not{0}\ \not{5} \\ -\ 23,7\ 4\ 6 \\ \hline 14\,3,5\ 5\ 9 \end{array}$$

LOOK ALIKES

81.

$$\begin{array}{r} \scriptstyle 2\ \ \overset{9}{\cancel{10}}\ \ 17 \\ 29,\cancel{3}\,\cancel{0}\,\cancel{7} \\ -\ 10,0\,0\ \ 8 \\ \hline 19,2\,9\ \ 9 \end{array}$$

83. a. 299 + 99 = 398

b. 99 + 299 = 398

APPLICATIONS

85. a. 747 + 252 = 999
b. 252 + 747 = 999

87. 2,623 – 351 = 2,272 lbs.

89. **Farmer's Markets** See the graph below. How many more farmer's markets were there in 2012 compared to 2008?

$$7,864 - 4,685 = 3,179 \text{ more markets}$$

91. 71,649 – 70,154 = 1,495 miles

93. 510 – 85 = $425

95. **The Stock Market** How many points did the Dow Jones Industrial Average gain on the day described by the graph?

$$14,005 - 13,972 = 33 \text{ points}$$

97. $1,947 - 183 = 1,764°F$

99. **Telephones** As of 2013, the state of Florida has 14 fewer area codes than California. If California has 31 area codes, how many does Florida have?

$$31 - 14 = 17$$

101. **Banking** A savings account contained $1,370. After a withdrawal of $197 and a deposit of $340, how much was left in the account?

$$\begin{aligned} 1,370 - 197 + 340 &= 1,173 + 340 \\ &= \$1,513 \end{aligned}$$

103. a. $49,565

b. 50,887 – 49,565 = $1,322

105. Because taking 2 things from 3 things is not equivalent to taking 3 things from 2 things.

107. By adding the difference to the subtrahend, you should get the minuend.

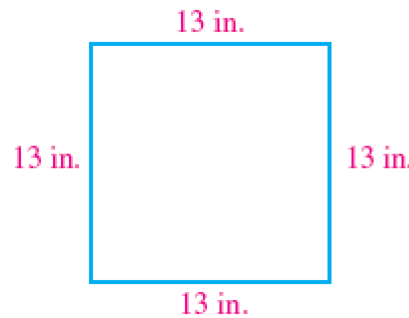
109. a. 5,370,650

b. 5,370,000

c. 5,400,000

WRITING

111.



$$13 + 13 + 13 + 13 = 52 \text{ inches}$$

REVIEW

113.

$$\begin{array}{r} \scriptstyle 1\ 1\ \ \\ 345 \\ 4,672 \\ +\quad 513 \\ \hline 5,530 \end{array}$$

Section 1.4: Dividing Whole Numbers

VOCABULARY

1. $\underset{factor}{5} \cdot \underset{factor}{10} = \underset{product}{50}$

3. The <u>commutative</u> property of multiplication states that the order in which whole numbers are multiplied does not change their product. The <u>associative</u> property of multiplication states that the way in which whole numbers are grouped does not change their product.

5. If a square measures 1 inch on a side, its area is 1 <u>square</u> inch.

7. a. $4 \cdot 8$

b. $15 + 15 + 15 + 15 + 15 + 15 + 15$

9. a. 3

b. 5

11. **a. area**

b. perimeter

c. area

d. perimeter

13. $\times$, $\cdot$, $(\ )$

15. $A = l \cdot w$ or $A = lw$

NOTATION

17.
$$\begin{array}{r} {}^{3}15 \\ \times\ \ 7 \\ \hline 105 \end{array}$$

GUIDED PRACTICE

19.
$$\begin{array}{r} {}^{3}34 \\ \times\ \ 8 \\ \hline 272 \end{array}$$

21. 100 has 2 zeros : attach 2 zeros : 3,700

23. 10 has 1 zero : attach 1 zero : 750

25. 10,000 has 4 zeros : attach 4 zeros : 1,070,000

27. 1,000 has 3 zeros : attach 3 zeros : 512,000

29. $68 \cdot 4 = 272$

$68 \cdot 40 = 2,720$

31. $56 \cdot 2 = 112$

$56 \cdot 200 = 11,200$

33. $13 \cdot 3 = 39$

$130(3,000) = 390,000$

35. $27 \cdot 4 = 108$

$2,700(40,000) = 108,000,000$

37.
$$\begin{array}{r} 128 \\ \times\ \ 73 \\ \hline 384 \\ 8,960 \\ \hline 9,344 \end{array}$$

39.
$$\begin{array}{r} 287 \\ \times\ \ 64 \\ \hline 1,148 \\ 17,220 \\ \hline 18,368 \end{array}$$

41. $602 \cdot 679 = 600 \cdot 679 + 2 \cdot 679$

$= 407,400 + 1,358$

$= 408,758$

43. $3,002(5,619) = 3,000(5,619) + 2(5,619)$

$= 16,857,000 + 11,238$

$= 16,868,238$

45. $(18 \cdot 20) \cdot 5 = 18 \cdot (20 \cdot 5) = 18 \cdot 100$

$= 1,800$

47. $250 \cdot (4 \cdot 135) = (250 \cdot 4) \cdot 135$

$= 1000 \cdot 135$

$= 135,000$

49. $90 \cdot 200 = 18,000$

51. $200 \cdot 2,000 = 400,000$

53. $6 \cdot 14 = 84$ in^2.

55. $12 \cdot 12 = 144$ in^2.

57.
$$\begin{array}{r} {}^{2}213 \\ \times\ \ 7 \\ \hline 1,491 \end{array}$$

59.
$$\begin{array}{r} {\scriptstyle 1}\\ 34,474\\ \times\quad 2\\ \hline 68,948 \end{array}$$

61.
$$\begin{array}{r} 99\\ \times\quad 77\\ \hline 693\\ 6,930\\ \hline 7,623 \end{array}$$

TRY IT YOURSELF

63. $44(55)(0)=0$

65. $53\cdot 3=159$

$53\cdot 30=1,590$

67.
$$\begin{array}{r} 754\\ \times\quad 59\\ \hline 6\,786\\ +37\,700\\ \hline 44,486 \end{array}$$

69.
$$\begin{array}{r} 2978\\ \times 3004\\ \hline 11\,912\\ 00\,000\\ 000\,000\\ +8\,934\,000\\ \hline 8,945,912 \end{array}$$

71.
$$\begin{array}{r} 916\\ \times\quad 409\\ \hline 8\,244\\ 00\,000\\ +366\,400\\ \hline 374,644 \end{array}$$

73. $25\cdot(4\cdot 99)=(25\cdot 4)\cdot 99=100\cdot 99$

$=9,900$

75. $48\cdot 5=240$

$4,800\cdot 500=2,400,000$

77.
$$\begin{array}{r} 2,779\\ \times\quad 128\\ \hline 22\,232\\ 55\,580\\ +277\,900\\ \hline 355,712 \end{array}$$

79.
$$\begin{array}{r} 370\\ \times 450\\ \hline 000\\ 18\,500\\ +148\,000\\ \hline 166,500 \end{array}$$

81. a. 16 + 9 = 25

b. 16 – 9 = 7

c. 16 · 9 = 144

83. a. 405 + 57 = 462

b. 405 – 57 = 348

c. 405 · 57 = 23,085

85. $2\cdot 36=72$ cups of raisins

LOOK ALIKES

87. $12\cdot 17=204$ grams of fat

89. $60\cdot 65=3,900$ times per minute

APPLICATIONS

91. 12 · 5,280 = 63,360 in. in a mile

93. $250\cdot 308=77,000$ words

95. 36 · 174,000 = $6,264,000 per year

97. $8\cdot 9=72$ entries

99. $17\cdot 33=561$: There are 561 students and 1 instructor, so since 562 < 570 they are O.K.

101. $3\cdot 6=18$ hours asleep

103. $6 \cdot 27{,}000 = 162{,}000$ attacks

105. $2 \cdot 3 \cdot 14 = 6 \cdot 14$

$= 84$ pills

107. $3 \cdot 18 = 54$ ft^2.

109. Perimeter: $360 + 270 + 360 + 270 = 1{,}260$ mi.

Area: $360 \cdot 270 = 97{,}200$ mi^2.

WRITING

111. 1 foot is a unit of length, while 1 square foot is a unit of area.

113. $10{,}357 + 9{,}809 + 476 = 20{,}642$

Section 1.5: Prime Factors and Exponents

1. $\underset{\textit{dividend}}{12} \div \underset{\textit{divisor}}{4} = \underset{\textit{quotient}}{3}$

$$\textit{divisor} \rightarrow 4\overline{)12}\ \frac{3 \leftarrow \textit{quotient}}{\leftarrow \textit{dividend}}$$

$$\frac{\textit{dividend} \rightarrow 12}{\textit{divisor} \rightarrow\ 4} = 3 \leftarrow \textit{quotient}$$

3. The problem $6\overline{)246}$ is written in long division form.

5. One number is divisible by another number if, when we divide them, the remainder is 0.

CONCEPTS

7. a. 7 groups of 3

b. 5 groups of 4, 2 left over

9. a. $\frac{25}{25} = 1$ b. $\frac{6}{1} = 6$

c. $\frac{100}{0}$ is undefined d. $\frac{0}{12} = 0$

11. a. $5\overline{)1147}$ b. $9\overline{)587}$

c. $23\overline{)7501}$ d. $16\overline{)892}$

13.
$$\begin{array}{r} 37 \\ \times\ \ 9 \\ \hline 333 \end{array}$$

15. a. 0 or 5

b. 2 and 3

c. sum

d. 10

NOTATION

17. $\div$, $\overline{)}$, $-$

GUIDED PRACTICE

19. $9\overline{)45}$ because $5 \cdot 9 = 45$.

21. $44 \div 11 = 4$ because $4 \cdot 11 = 44$.

23. $7 \cdot 3 = 21$

25. $6 \cdot 12 = 72$

27.
$$\begin{array}{r} 16 \\ 6\overline{)96} \\ -\underline{6} \\ 36 \\ -\underline{36} \\ 0 \end{array}$$

Check: $6(16) = 96$

29.
$$\begin{array}{r} 29 \\ 3\overline{)87} \\ -\underline{6} \\ 27 \\ -\underline{27} \\ 0 \end{array}$$

Check: $3(29) = 87$

31.
$$\begin{array}{r} 325 \\ 7\overline{)2275} \\ -\underline{21} \\ 17 \\ -\underline{14} \\ 35 \\ -\underline{35} \\ 0 \end{array}$$
Check: $7(325) = 2275$

33.
$$\begin{array}{r} 218 \\ 9\overline{)1962} \\ -\underline{18} \\ 16 \\ -\underline{9} \\ 72 \\ -\underline{72} \\ 0 \end{array}$$
Check: $9(218) = 1962$

35.
$$\begin{array}{r} 504 \\ 62\overline{)31248} \\ -\underline{310} \\ 24 \\ -\underline{0} \\ 248 \\ -\underline{248} \\ 0 \end{array}$$
Check: $62(504) = 31,248$

37.
$$\begin{array}{r} 602 \\ 37\overline{)22274} \\ -\underline{222} \\ 07 \\ -\underline{0} \\ 74 \\ -\underline{74} \\ 0 \end{array}$$
Check: $37(602) = 22,274$

39.
$$\begin{array}{r} 39 \\ 24\overline{)951} \\ -\underline{72} \\ 231 \\ -\underline{216} \\ 15 \end{array}$$
39 R 15

Check: $39 \cdot 24 + 15 = 951$

41.
$$\begin{array}{r} 21 \\ 46\overline{)999} \\ -\underline{92} \\ 79 \\ -\underline{46} \\ 33 \end{array}$$
21 R 33

Check: $21 \cdot 46 + 33 = 999$

43.
$$\begin{array}{r} 47 \\ 524\overline{)24714} \\ -\underline{2096} \\ 3754 \\ -\underline{3668} \\ 86 \end{array}$$
Check: $47 \cdot 524 + 86 = 24,714$

45.
$$\begin{array}{r} 19 \\ 178\overline{)3514} \\ -\underline{178} \\ 1734 \\ -\underline{1602} \\ 132 \end{array}$$
Check: $19 \cdot 178 + 132 = 3,514$

	Divisible by	**2**	**3**	**4**	**5**	**6**	**9**	**10**
47.	2,940	Y	Y	Y	Y	Y		Y
49.	43,785		Y		Y		Y	
51.	181,223							
53.	9,499,200	Y	Y	Y	Y	Y		Y

55. 10 has 1 zero : take away 1 zero : 70

57. Begin by cancelling a zero from each.

$$\begin{array}{r} 22 \\ 45\overline{)990} \\ \underline{-90} \\ 90 \\ \underline{-90} \\ 0 \end{array}$$

59. $360,000 \div 40 = 9,000$

61. $50,000 \div 1,000 = 50$

TRY IT YOURSELF

63.
$$\begin{array}{r} 4325 \\ 6\overline{)25950} \\ \underline{-24} \\ 19 \\ \underline{-18} \\ 15 \\ \underline{-12} \\ 30 \\ \underline{-30} \\ 0 \end{array}$$

65.
$$\begin{array}{r} 6 \\ 9\overline{)54} \\ \underline{-54} \\ 0 \end{array}$$

67.
$$\begin{array}{r} 8 \\ 31\overline{)273} \\ \underline{-248} \\ 25 \end{array}$$

8 R 25

69. Begin by cancelling 2 zeros from each.

$$\begin{array}{r} 160 \\ 4\overline{)640} \\ \underline{-4} \\ 24 \\ \underline{-24} \\ 0 \end{array}$$

71.
$$\begin{array}{r} 106 \\ 7\overline{)745} \\ \underline{-7} \\ 04 \\ \underline{-0} \\ 45 \\ \underline{-42} \\ 3 \end{array}$$

106 R 3

73.
$$\begin{array}{r} 509 \\ 29\overline{)14761} \\ \underline{-145} \\ 26 \\ \underline{-0} \\ 261 \\ \underline{-261} \\ 0 \end{array}$$

75.
$$\begin{array}{r} 3080 \\ 175\overline{)539000} \\ \underline{-525} \\ 140 \\ \underline{-0} \\ 1400 \\ \underline{-1400} \\ 0 \end{array}$$

77.
$$\begin{array}{r} 5 \\ 15\overline{)75} \\ \underline{-75} \\ 0 \end{array}$$

79.
$$\begin{array}{r} 23 \\ 212\overline{)5087} \\ \underline{-424} \\ 847 \\ \underline{-636} \\ 211 \end{array}$$
23 R 211

81.
$$\begin{array}{r} 30 \\ 42\overline{)1273} \\ \underline{-126} \\ 13 \\ \underline{-0} \\ 13 \end{array}$$
30 R 13

83. 1,000 has 3 zeros : remove 3 zeros : 89

85.
$$\begin{array}{r} 7 \\ 8\overline{)57} \\ \underline{-56} \\ 1 \end{array}$$
7 R 1

LOOK ALIKES

87. a. 368,000 ÷ 10 = 36,800
b. 368,000 ÷ 100 = 3,680
c. 368,000 ÷ 1,000 = 368

89. a. 607 ÷ 12 = 50 R 7
b. 608 ÷ 12 = 50 R 8
c. 606 ÷ 12 = 50 R 6

APPLICATIONS

91. $2500 \div 4 = 625$ tickets

93. $405 \div 15 = 27$ trips

95. $50 \div 23 = 2R4$ Each student got 2 cartons, with 4 left over.

97. $640 \div 68 = 9R28$ It can be filled 9 times with 28 oz. left.

99. $58,000 \div 4 = 14,500$ There are 14,500 lbs. on each jack.

101. $25,200 \div 240 = \$105$ per book

103. $700 \div 140 = 5$ miles per gallon

105. $156 \div 12 = 13$ They should order 13 dozen donuts.

107. $216 \div 7 \approx 30.86$ - teams won't have the same number

$216 \div 8 = 27$ - not an even number of teams

$216 \div 9 = 24$ GOOD CHOICE

$216 \div 10 = 21.6$ - teams won't have the same number

There are 24 teams with 9 girls each.

109. Divide each by 12: Health Sciences: $4,059; Business: $4,353; Social Sciences: $3,882

WRITING

111. Find out how many times you must subtract 6 from 24 to get 0.

113. $30 - 2 \cdot 8 = 30 - 16 = 14$

Since 14 is divisible by 7, 308 is also.

LOOK ALIKES

115. a. 272 + 4 = 276
b. 272 – 4 = 268
c. 272 · 4 = 1,088
d. 272 ÷ 4 = 68

117. a. 1,104 + 46 = 1,150
b. 1,104 – 46 = 1,058
c. 1,104 · 46 = 50,784
d. 1,104 ÷ 46 = 24

Section 1.6: The Least Common Multiple and the Greatest Common Factor

VOCABULARY

1. A strategy is a careful plan or method.

3. reduced

subtraction

5. triple

multiplication

7. gained

addition

9. rectangular array

multiplication

11. how many does each

division

CONCEPTS

13. Write the following steps of the problem-solving strategy in the correct order:

Analyze, Form, Calculate, State, Check

15. Multiply 15 and 8. Then divide that result by 3.

$$(15 \cdot 8) \div 3 = 120 \div 3 = 40$$

GUIDED PRACTICE

17. **Trucking.** An automobile transport is loaded with 9 new Chevrolet Malibu sedans, each valued at $21,605. What is the total value of the cars carried by the transport?

The total value of the cars	is	the number of cars	times	the value per car.

$$\text{Total value} = 9 \cdot \$21{,}605 = \$194{,}445$$

The total value of the cars is $194,445.

19. **TV history.** There were 95 fewer episodes of *I Love Lucy* made than episodes of *The Beverly Hillbillies.* If there are 274 episodes of *The Beverly Hillbillies,* how many episodes of *I Love Lucy* are there?

The episodes of *I Love Lucy*	are	95 less than	The episodes of *The Beverly Hillbillies.*

$$\text{ILL episodes} = \text{THB episodes} - 95$$
$$\text{ILL episodes} = 274 - 95$$
$$= 179$$

There were 179 episodes of *I Love Lucy.*

21. **Chocolate.** A study found that 7 grams of dark chocolate per day is the ideal amount to protect again the risk of a heart attack. How many daily servings a there in a bar of dark chocolate weighing 98 grams? (Source: ScienceDaily.com)

The number of daily servings	is equal to	the total amount of dark chocolate	divided by	the grams per day.

$$\text{Daily servings} = 98 \div 7$$
$$= 14$$

There are 14 daily servings in the bar of chocolate.

23. **Theater.** The play *Romeo and Juliet* by William Shakespeare has five acts. The first act has 5 scenes. The second act has 6 scenes. The third and fourth acts each have 5 scenes, and the last act has 3 scenes. In all, how many scenes are there in the play?

Act	Number of Scenes
1	5
2	6
3	5
4	5
5	3

The total number of scenes	is	scenes in act 1	plus	scenes in act 2	plus	scenes in act 3	plus	scenes in act 4	plus	scenes in act 5.

$$\text{Total scenes} = 5 + 6 + 5 + 5 + 3$$
$$= 24$$

There are 24 scenes in the play.

25. **Baking.** A baker uses 3-ounce pieces of bread dough to make dinner rolls. How many dinner rolls can he make from 5 pounds of dough? (*Hint:* There are 16 ounces in one pound.)

$$5 \text{ pounds} = 5 \cdot 16$$
$$= 80 \text{ ounces}$$

The number of dinner rolls	is	the total amount of dough	divided by	the amount of dough in each roll.

$$\text{Number of rolls} = 80 \div 3$$
$$= 26R.2$$

The baker can make 26 rolls with 2 ounces of dough left over to make one small roll.

27. **Laptops.** A folder named "Vacation" on a student's Sony Vaio contained 81 HD video files. To free up 15 gigabytes of storage space, he deleted 26 of the files from that folder. Then, 48 hours later, he added 13 new HD video files (2 gigabytes) into it. How many HD video files are now in the student's "Vacation" folder?

The number of files after changes	is	the original number of files	minus	the number of files removed

plus | the new files. |

$$\text{New files} = 81 - 26 + 13$$
$$= 68$$

The student has 68 files after the changes.

TRY IT YOURSELF

29. **Forests**. Canada has 2,342,949 fewer square miles of forest than Russia. The United States has 71,730 fewer square miles of forest than Canada. If Russia has 3,287,243 square miles of forest (the most of any country in the world), how many square miles does the United States have?

(Source: mapsofworld.com)

$$\text{Russia} = 3{,}287{,}243 \text{ square miles}$$
$$\text{Canada} = \text{Russia} - 2{,}342{,}949$$
$$= 944{,}294 \text{ square miles}$$

$$\text{U.S.} = \text{Canada} - 71{,}730 = 944{,}294 - 71{,}730$$
$$= 872{,}564 \text{ square miles}$$

The Unites States has 872,564 square miles of forest.

31. **Batman.** As of 2012, the worldwide box office revenue for the following Batman films were *The Dark Knight Rises* (2012): $1,081 million, *The Dark Knight* (2008): $1,004 million, *Batman* (1989): $411 million, *Batman Forever* (1995): $337 million, *Batman Begins* (2005): $374 million, *Batman Returns* (1992): $267 million, and *Batman & Robin* (1997): $238 million. What is the total box office revenue for the films? (Source: www.boxofficemojo.com)

$$\text{Total revenue} = \text{sum of revenues from the 7 films}$$
$$\text{Total revenue} = \$1{,}081 + 1{,}004 + 411 + 337 + 374 + 267 + 238$$
$$= \$3{,}712 \text{ million}$$

The seven Batman films had $3,712 million in revenue.

33. **Med school**. In 2012, exactly 3,416 fewer women than men applied to U.S. medical schools. If 24,338 men applied, what was the *total* number of people who applied to U.S. medical schools in 2012? (Source: AAMC)

$$\text{Applications from men} = 24{,}338$$
$$\text{Applications from women} = \text{Men} - 3{,}416$$
$$= 24{,}338 - 3{,}416 = 20{,}922$$
$$\text{Total applications} = \text{Men} + \text{women}$$
$$= 24{,}338 + 20{,}922$$
$$= 45{,}260$$

A total of 45,260 people applied to medical schools.

35. **Travel.** How much money will a family of six save on airfare if they take advantage of the offer shown in the advertisement?

$$\text{Savings per fare} = \text{Old fare} - \text{new fare}$$
$$= \$593 - 516$$
$$= \$77$$
$$\text{Savings for family} = 6 \cdot \$77$$
$$= \$462$$

The family will save $462.

37. **Painting.** One gallon of latex paint covers 350 square feet. How many gallons are needed if the total area of walls and ceilings to be painted is 9,800 square feet, and if two coats must be applied?

Two coats will cover 9,800 square feet twice or 19,600 square feet.

$$\text{Gallons needed} = \frac{\text{Total area}}{\text{Area covered per gallon}}$$
$$= \frac{19,600}{350}$$
$$= 56 \text{ gallons}$$

56 gallons of paint will be needed.

39. **iPods.** The iPod Touch shown has 32 gigabytes (GB) of storage space. From the information in the screen, determine how many gigabytes of storage space are used and how many are available.

$$\text{Number of GB used} = \text{Songs} + \text{Videos} + \text{Photos}$$
$$= 10 + 5 + 6$$
$$= 21 \text{ GB}$$
$$\text{Available space} = \text{GB capacity} - \text{GB used}$$
$$= 32 - 21$$
$$= 11 \text{ GB}$$

There are 11 GB of storage available and 21 GB have been used.

41. **Trees.** The height of the tallest known tree (a California coastal redwood) is 379 feet. Some scientists believe the tallest a tree can grow is 47 feet more than this because it is difficult for water to be raised from the ground any more than that to support further growth. What do the scientists believe to be the maximum height that a tree can reach? (Source: BBC News)

$$\text{Max height} = \text{Redwood height} + 47$$
$$= 379 + 47$$
$$= 426 \text{ feet}$$

The maximum height is believed to be 426 feet.

43. **Time.** There are 60 minutes in an hour, 24 hours in a day, and 7 days in a week. How many minutes are there in a week?

Minutes in a week
$= (\text{Minutes per hour})(\text{Hours per day})(\text{Days per week})$
$= (60)(24)(7)$
$= 10,080$ minutes

There are 10,080 minutes in a week.

45. **Fireplaces.** A contractor ordered 12 pallets of fireplace brick. Each pallet holds 516 bricks. If it takes 430 bricks to build a fireplace, how many fireplaces can be built from this order? How many bricks will be left over?

Bricks available
$= (\text{number of pallets})(\text{bricks per pallet})$
$= (12)(516)$
$= 6,192$ bricks

$$\text{Fireplaces possible} = \frac{\text{available bricks}}{\text{bricks per fireplace}}$$
$$= \frac{6,192}{430}$$
$$= 14 \; R.172$$

It will be possible to build 14 fireplaces with 172 bricks left over.

47. **Crossword puzzles**. A crossword puzzle is made up of 15 rows and 15 columns of small squares. Forty-six of the squares are blacked out. When completed, how many squares in the crossword puzzle will contain letters?

$$\text{Total squares in the puzzle} = \text{Rows} \cdot \text{Columns}$$
$$= 15 \cdot 15$$
$$= 225 \text{ squares}$$
$$\text{Letter squares} = \text{Total squares} - \text{black squares}$$
$$= 225 - 46$$
$$= 179$$

There will be 179 squares with letters.

49. **Credit cards.** The balance on 10/23/17 on Visa account number 623415 was $1,989. If purchases of $125 and $296 were charged to the card on 10/24/17, a payment of $1,680 was credited on 10/31/17, and no other charges or payments were made, what is the new balance on 11/1/17?

New balance
$= \text{Beginning balance} + \text{purchases} - \text{payments}$
$= \$1,989 + 125 + 296 - 1,680$
$= \$730$

The new balance is $730.

51. **Running.** Matt Savage has run at least 5 miles every day since September 1, 1979—Including January 3, 1997, the day he got married, and every day on the cruise ship during the honeymoon. The total distance he has run is approximately 9 times around the Earth. If one trip around the Earth is 7,926 miles, how far has Matt Savage run over the years? (Source: nydailynews.com)

$$\text{Total distance} = 3 \cdot \text{Distance around Earth}$$
$$= 3 \cdot 7,926$$
$$= 23,778 \text{ miles}$$

He has run at least 23,778 miles.

53. **Blu-rays.** A shopper purchased six Blu-ray discs: *Sing* ($16), *Fantastic Beasts and Where to Find Them* ($27), *Doctor Strange* ($19), *Moana* ($22), *The Secret Life of Pets* ($18), and *Trolls* ($24). There was $11 sales tax. If she paid for the DVDs with $20 bills, how many bills were needed? How much did she receive back in change?

$$\begin{aligned}\text{Total purchase} &= \text{Sum of DVDs + tax}\\ &= 29 + 30 + 26 + 23 + 37 + 11\\ &= \$156\end{aligned}$$

$$\frac{156}{20} = 7 \text{ R } 16$$

He will need eight $20 bills to cover the purchase and he will receive $4 in change.

55. **Women's basketball.** On February 1, 2006, Epiphanny Prince, of New York, broke a national prep record that was held by Cheryl Miller. Prince made 50 two-point baskets, 4 three-point baskets, and 1 free throw. How many points did she score in the game?

$$\begin{aligned}\text{Total points} &= 2(\text{two-point baskets})\\ &\quad + 3(\text{three-point baskets})\\ &\quad + 1(\text{free throws})\\ &= 2(50) + 3(4) + 1(1)\\ &= 113\end{aligned}$$

She scored 113 points.

57. A 27-foot-long by 19-foot-wide rectangular garden is one feature of a landscape design for a community park. A concrete walkway is to run through the garden and will occupy 125 square feet of space. How many square feet are left for planting in the garden?

$$\begin{aligned}\text{Area of garden} &= \text{length} \cdot \text{width}\\ &= 27 \cdot 19\\ &= 513 \text{ square feet}\end{aligned}$$

$$\begin{aligned}\text{Planting area} &= \text{Garden area} - \text{walking area}\\ &= 513 - 125\\ &= 388 \text{ square feet}\end{aligned}$$

There will be 388 square feet available for planting.

59. **Drug testing.** During a drug trial last year, researchers gave two dozen mice identical doses of a medication. A total of 840 grams of the medication was used. This year, they will perform the same trial with 28 mice. If the medication costs 5 cents per gram, and they plan to give the same-size doses as last time, how much should the researchers expect to spend on the medication this year?

$$\begin{aligned}\text{Medication per mouse} &= \frac{\text{Total medication}}{\text{Number of mice}}\\ &= \frac{840}{24}\\ &= 35 \text{ grams}\end{aligned}$$

$$\begin{aligned}&\text{Medication needed this year}\\ &\quad = (\text{Med. per mouse})(\text{number of mice})\\ &\quad = (35)(28)\\ &\quad = 980 \text{ grams}\end{aligned}$$

Total cost

$$\begin{aligned}\text{Medication per mouse} &= \frac{\text{Total medication}}{\text{Number of mice}}\\ &= \frac{840}{24}\\ &= 35 \text{ grams}\end{aligned}$$

$$\begin{aligned}&\text{Medication needed this year}\\ &\quad = (\text{Med. per mouse})(\text{number of mice})\\ &\quad = (35)(28)\\ &\quad = 980 \text{ grams}\end{aligned}$$

$$\begin{aligned}&\text{Total cost}\\ &\quad = (\text{Total grams medication})(\text{cost/gram})\\ &\quad = (980)(5)\\ &\quad = 4900 \text{ cents}\\ &\quad = \$49\end{aligned}$$

The researchers should expect to spend $49.

WRITING

61. Write an application problem that would have the following solution. Use the phrase *less than* in the problem.

$$\begin{array}{r} 25,500\\ +\ 6,200\\ \hline 19,300 \end{array}$$

The price of a used car is $6,200 less than the price of the car when it was new. The new car price was $25,500. What is the used car price?

63. Write an application problem that would have the following solution. Use the phrase *how much does each* in the problem.

$$6\overline{)2,460,000}\quad 410,000$$

Six people pooled their money to buy a lottery ticket. They won $2,460,000. How much does each person get from the jackpot?

REVIEW

65. Check the following addition by adding upward. Is the sum correct?

$$\begin{array}{r} 3,714 \\ 2,489 \\ 781 \\ 5,500 \\ +\ 303 \\ \hline 12,987 \end{array}$$

Adding upward yields a sum of 12,787. The sum shown is not correct.

67. Check the following multiplication using estimation. Does the product seem reasonable?

$$\begin{array}{r} 73 \\ \times\ 59 \\ \hline 6,407 \end{array}$$

Estimate: (70)(60 = 4,200

The product shown does not seem reasonable.

Section 1.7: Order of Operations

VOCABULARY

1. Numbers that are multiplied together are called factors.

3. A prime number is a whole number greater than 1 that has only 1 and itself as factors.

5. To prime factor a number means to write it as a product of only prime numbers.

7. In the exponential expression 6^4, the number 6 is the base and 4 is the exponent.

CONCEPTS

9. $1 \cdot 45 = 45 \quad 3 \cdot 15 = 45 \quad 5 \cdot 9 = 45$

The factors of 45, in order from least to greatest, are 1, 3, 5, 9, 15, 45.

11. yes

13. a. even, odd

b. 0, 2, 4, 6, 8, 10, 12, 14, 16, 18

c. 1, 3 , 5, 7, 9, 11, 13, 15, 17, 19

15. The blank should be a 6.

The prime factorization of 150 is $2 \cdot 3 \cdot 5 \cdot 5$.

17.

$$\begin{array}{r|l} 2 & 150 \\ 3 & 75 \\ 5 & 25 \\ & 5 \end{array}$$

The prime factorization of 150 is $2 \cdot 3 \cdot 5 \cdot 5$.

NOTATION

19. a. base 7; exponent 6

b. base 15; exponent 1

GUIDED PRACTICE

21. 1, 2, 5, 10

23. 1, 2, 4, 5, 8, 10, 20, 40

25. 1, 2, 3, 6, 9, 18

27. 1, 2, 4, 11, 22, 44

29. 1, 7, 11, 77

31. 1, 2, 4, 5, 10, 20, 25, 50, 100

33. $2 \cdot 4$

35. $3 \cdot 9$

37. $7 \cdot 7$

39. $2 \cdot 10$ or $4 \cdot 5$

41. $30 = 2 \cdot 15$
$= 2 \cdot 3 \cdot 5$

43. $63 = 3 \cdot 21$
$= 3 \cdot 3 \cdot 7$

45. $54 = 6 \cdot 9$
$= 2 \cdot 3 \cdot 9$ or $3 \cdot 3 \cdot 6$

47. $60 = 2 \cdot 3 \cdot 10$
$= 2 \cdot 5 \cdot 6$
$= 2 \cdot 2 \cdot 15$
$= 3 \cdot 4 \cdot 5$

49. 11 : 1 and 11

51. 37 : 1 and 37

53. Yes

55. No $(3\cdot 3\cdot 11)$

57. No $(3\cdot 17)$

59. Yes

61. $30 = 6\cdot 5$
$= 2\cdot 3\cdot 5$

63. $39 = 3\cdot 13$

65. $99 = 9\cdot 11$
$= 3\cdot 3\cdot 11$
$= 3^2\cdot 11$

67. $162 = 2\cdot 81$
$= 2\cdot 9\cdot 9$
$= 2\cdot 3\cdot 3\cdot 3\cdot 3$
$= 2\cdot 3^4$

69. $64 = 8\cdot 8$
$= 2\cdot 4\cdot 2\cdot 4$
$= 2\cdot 2\cdot 2\cdot 2\cdot 2\cdot 2$
$= 2^6$

71. $147 = 3\cdot 49$
$= 3\cdot 7\cdot 7$
$= 3\cdot 7^2$

73. $220 = 22\cdot 10$
$= 2\cdot 11\cdot 2\cdot 5$
$= 2^2\cdot 5\cdot 11$

75. $102 = 2\cdot 51$
$= 2\cdot 3\cdot 17$

77. $2\cdot 2\cdot 2\cdot 2\cdot 2 = 2^5$

79. $5\cdot 5\cdot 5\cdot 5 = 5^4$

81. $4(4)(8)(8)(8) = 4^2(8^3)$

83. $7\cdot 7\cdot 7\cdot 9\cdot 9\cdot 7\cdot 7\cdot 7\cdot 7 = 7^7\cdot 9^2$

85. a. $3^4 = 3\cdot 3\cdot 3\cdot 3$
$= 81$

b. $4^3 = 4\cdot 4\cdot 4$
$= 64$

87. a. $2^5 = 2\cdot 2\cdot 2\cdot 2\cdot 2$
$= 32$

b. $5^2 = 5\cdot 5$
$= 25$

89. a. $7^3 = 7\cdot 7\cdot 7$
$= 343$

b. $3^7 = 3\cdot 3\cdot 3\cdot 3\cdot 3\cdot 3\cdot 3$
$= 2{,}187$

91. a. $9^1 = 9$

b. $1^9 = 1$

93. $2\cdot 3\cdot 3\cdot 5 = 90$

95. $7\cdot 11^2 = 7\cdot 121$
$= 847$

97. $3^2\cdot 5^2 = 9\cdot 25$
$= 225$

99. $2^3\cdot 3^3\cdot 13 = 8\cdot 27\cdot 13$
$= 2{,}808$

APPLICATIONS

101. Factors of 28: 1, 2, 4, 7, 14, 28

1 + 2 + 4 + 7 + 14 = 28

103. 2^2 square units, 3^2 square units, 4^2 square units

WRITING

105. Multiply the factors together to verify you get the original number.

107. $1^2 = 1^3 = 1^4 = 1$. Any power of 1 is 1.

REVIEW

109. $8 \cdot 15 + 5 = 120 + 5$

$= 125$ band members

Section 1.8: Solving Equations Using Addition and Subtraction

VOCABULARY

1. The multiples of a number are the products of that number and 1, 2, 3, 4, 5, and so on.

3. One number is divisible by another number if, when dividing them, we get a remainder of 0.

CONCEPTS

5. a.12

b. In general, the LCM of two whole numbers is the smallest whole number that is divisible by both numbers.

7. a. 20

b. 20

9. a. 2 appears twice with 36.

b. 3 appears twice with 90 and with 36.

c. 5 appears once with 90.

d. $\text{LCM} = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$

$= 180$

11. a. 2 appears twice with 12.

b. 3 appears three times with 54.

c. $\text{LCM} = 2^2 \cdot 3^3$

$= 108$

13. a. 2, 3, and 5 are common to both.

b. $\text{GCF} = 2 \cdot 3 \cdot 5$

$= 30$

NOTATION

15. a. The abbreviation for the greatest common factor is GCF.

b. The abbreviation for the least common multiple is LCM.

GUIDED PRACTICE

17. 4, 8, 12, 16, 20, 24, 28, 32

19. 11, 22, 33, 44, 55, 66, 77, 88

21. 8, 16, 24, 32, 40, 48, 56, 64

23. 20, 40, 60, 80, 100, 120, 140, 160

25. 5 is not divisible by 3.

10 is not divisible by 3.

15 is divisible by 3.

LCM(3,5) = 15

27. 12 is not divisible by 8.

24 is divisible by 8.

LCM(8,12)=24

29. 11 is not divisible by 5.

22 is not divisible by 5.

33 is not divisible by 5.

44 is not divisible by 5.

55 is divisible by 5.

LCM(5,11) = 55

31. 7 is not divisible by 4.

14 is not divisible by 4.

21 is not divisible by 4.

28 is divisible by 4.

LCM(4,7) = 28

33. 6 is not divisible by 3 and 4.

12 is divisible by 3 and 4.

LCM(3,4,6) = 12

35. 10 is not divisible by 2 and 3.

20 is not divisible by 2 and 3.

30 is divisible by 2 and 3.

LCM(2,3,10) = 30

37.
$$16 = 2^4$$
$$20 = 2^2 \cdot 5$$
$$LCM = 2^4 \cdot 5$$
$$= 16 \cdot 5$$
$$= 80$$

39.
$$30 = 2 \cdot 3 \cdot 5$$
$$50 = 2 \cdot 5^2$$
$$LCM = 2 \cdot 3 \cdot 5^2$$
$$= 6 \cdot 25$$
$$= 150$$

41.
$$35 = 5 \cdot 7$$
$$45 = 3^2 \cdot 5$$
$$LCM = 3^2 \cdot 5 \cdot 7$$
$$= 9 \cdot 35$$
$$= 315$$

43.
$$100 = 2^2 \cdot 5^2$$
$$120 = 2^3 \cdot 3 \cdot 5$$
$$LCM = 2^3 \cdot 3 \cdot 5^2$$
$$= 600$$

45.
$$6 = 2 \cdot 3$$
$$24 = 2^3 \cdot 3$$
$$36 = 2^2 \cdot 3^2$$
$$LCM = 2^3 \cdot 3^2$$
$$= 72$$

47.
$$5 = 5$$
$$12 = 2^2 \cdot 3$$
$$15 = 3 \cdot 5$$
$$LCM = 2^2 \cdot 3 \cdot 5$$
$$= 60$$

49.
$$4 = \underline{2} \cdot 2$$
$$6 = \underline{2} \cdot 3$$
$$GCF = 2$$

51.
$$9 = 3 \cdot \underline{3}$$
$$12 = 2 \cdot 2 \cdot \underline{3}$$
$$GCF = 3$$

53.
$$22 = 2 \cdot \underline{11}$$
$$33 = 3 \cdot \underline{11}$$
$$GCF = 11$$

55.
$$15 = \underline{3} \cdot \underline{5}$$
$$30 = 2 \cdot \underline{3} \cdot \underline{5}$$
$$GCF = 3 \cdot 5$$
$$= 15$$

57.
$$18 = \underline{2} \cdot \underline{3} \cdot 3$$
$$96 = \underline{2} \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot \underline{3}$$
$$GCF = 2 \cdot 3$$
$$= 6$$

59.
$$28 = \underline{2} \cdot 2 \cdot \underline{7}$$
$$42 = \underline{2} \cdot 3 \cdot \underline{7}$$
$$GCF = 2 \cdot 7$$
$$= 14$$

61.
$$16 = 2 \cdot 2 \cdot 2 \cdot 2$$
$$51 = 3 \cdot 17$$
$$GCF = 1$$

63.
$$81 = 3 \cdot 3 \cdot 3 \cdot 3$$
$$125 = 5 \cdot 5 \cdot 5$$
$$GCF = 1$$

65.
$$12 = 2 \cdot 2 \cdot 3$$
$$68 = 2 \cdot 2 \cdot 17$$
$$92 = 2 \cdot 2 \cdot 23$$
$$GCF = 2 \cdot 2$$
$$= 4$$

67.
$$72 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$$
$$108 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3$$
$$144 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$$
$$GCF = 2 \cdot 2 \cdot 3 \cdot 3$$
$$= 36$$

TRY IT YOURSELF

69.
$$100 = 2 \cdot 2 \cdot 5 \cdot 5$$
$$120 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5$$
$$LCM = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5$$
$$= 600$$
$$GCF = 2 \cdot 2 \cdot 5$$
$$= 20$$

71.
$$14 = 2 \cdot 7$$
$$140 = 2 \cdot 2 \cdot 5 \cdot 7$$
$$LCM = 2 \cdot 2 \cdot 5 \cdot 7$$
$$= 140$$
$$GCF = 2 \cdot 7$$
$$= 14$$

73.
$$66 = 2 \cdot 3 \cdot 11$$
$$198 = 2 \cdot 3 \cdot 3 \cdot 11$$
$$242 = 2 \cdot 11 \cdot 11$$
$$LCM = 2 \cdot 3 \cdot 3 \cdot 11 \cdot 11$$
$$= 2{,}178$$
$$GCF = 2 \cdot 11$$
$$= 22$$

75.
$$8 = 2 \cdot 2 \cdot 2$$
$$9 = 3 \cdot 3$$
$$49 = 7 \cdot 7$$
$$LCM = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 7 \cdot 7$$
$$= 3{,}538$$
$$GCF = 1$$

77.
$$120 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5$$
$$125 = 5 \cdot 5 \cdot 5$$
$$LCM = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot 5$$
$$= 3{,}000$$
$$GCF = 5$$

79.
$$34 = 2 \cdot 17$$
$$68 = 2 \cdot 2 \cdot 17$$
$$102 = 2 \cdot 3 \cdot 17$$
$$LCM = 2 \cdot 2 \cdot 3 \cdot 17$$
$$= 204$$
$$GCF = 2 \cdot 17$$
$$= 34$$

81.
$$46 = 2 \cdot 23$$
$$69 = 3 \cdot 23$$
$$LCM = 2 \cdot 3 \cdot 23$$
$$= 138$$
$$GCF = 23$$

83.
$$50 = 2 \cdot 5 \cdot 5$$
$$81 = 3 \cdot 3 \cdot 3 \cdot 3$$
$$LCM = 2 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 5 \cdot 5$$
$$= 4{,}050$$
$$GCF = 1$$

LOOK ALIKES

85. a. $6 = 2 \cdot 3$
$8 = 2 \cdot 2 \cdot 2$
GCF = 2
b. GCF = $2 \cdot 10$
= 20

87. a. $4 = 2 \cdot 2$
$6 = 2 \cdot 3$
GCF = 2
b. GCF = 2

APPLICATIONS

89.

1st	2nd	3rd
7,500 mi	15,000 mi	22,500 mi
4th	**5th**	**6th**
30,000 mi	37,500 mi	45,000 mi

91. LCM(45,60) = 180 minutes, or 3 hours

93. LCM of 10 and 12 = 60
5 packs of buns, 6 packs of hot dogs

95. LCM(6,8) = 24
s4 sheets wide by 3 sheets tall = 12 sheets

97. a. GCF(28,21,63) = 7

The most that the art supplies cost a student is $7.

b. 4 students, 3 students, 9 students

WRITING

99. Find the prime factorization of both 8 and 28, then multiply each factor present the largest number of times it appears.

101. Since each factor has only one 3, the LCM should only have one 3.

REVIEW

103. $9,999+1,111=11,110$

105. $305\cdot 50=15,250$

Section 1.9: Solving Equations Using Multiplication and Division

VOCABULARY

1. Numbers are combined with the operations of addition, subtraction, multiplication, and division to create expressions.

3. The grouping symbols ( ) are called parentheses, and the symbols [ ] are called brackets.

5. In the expression $9+6\left[8+6(4-1)\right]$, the parentheses are the inner most grouping symbols and the brackets are the outer most grouping symbols.

CONCEPTS

7. a. $5(2)^2-1$: square, multiply, subtract

b. $15+90-(2\cdot 2)^3$: multiply, cube, add, subtract

c. $7\cdot 4^2$: square, multiply

d. $(7\cdot 4)^2$: multiply, square

9. multiply; square

NOTATION

11. The fraction bar groups the numerator and denominator.

13. We read the expression $16-(4+9)$ as "16 minus the quantity of 4 plus 9."

15.
$$\begin{aligned}7\cdot 4-5(2)^2 &= 7\cdot 4-5(4)\\ &= 28-20\\ &= 8\end{aligned}$$

17.
$$\begin{aligned}\left[4(2+7)\right]-4^2 &= \left[4(9)\right]-4^2\\ &= 36-4^2\\ &= 36-16\\ &= 20\end{aligned}$$

GUIDED PRACTICE

19.
$$\begin{aligned}3\cdot 5^2-28 &= 3\cdot 25-28\\ &= 75-28\\ &= 47\end{aligned}$$

21.
$$\begin{aligned}6\cdot 3^2-41 &= 6\cdot 9-41\\ &= 54-41\\ &= 13\end{aligned}$$

23.
$$\begin{aligned}52-6\cdot 3+4 &= 52-18+4\\ &= 34+4\\ &= 38\end{aligned}$$

25.
$$\begin{aligned}32-9\cdot 3+31 &= 32-27+31\\ &= 5+31\\ &= 36\end{aligned}$$

27.
$$\begin{aligned}192\div 4-4(2)3 &= 48-24\\ &= 24\end{aligned}$$

29.
$$\begin{aligned}252\div 3-6(2)6 &= 84-72\\ &= 12\end{aligned}$$

31. a.
$$\begin{aligned}26-2+9 &= 24+9\\ &= 33\end{aligned}$$

b.
$$\begin{aligned}26-(2+9) &= 26-11\\ &= 15\end{aligned}$$

33. a.
$$\begin{aligned}51-16+8 &= 35+8\\ &= 43\end{aligned}$$

b.
$$\begin{aligned}51-(16+8) &= 51-24\\ &= 27\end{aligned}$$

35. $(4+6)^2 = 10^2$
$= 100$

37. $(3+5)^3 = 8^3$
$= 512$

39. $8+4(29-5\cdot 3) = 8+4(29-15)$
$= 8+4(14)$
$= 8+56$
$= 64$

41. $77+9(38-4\cdot 6) = 77+9(38-24)$
$= 77+9(14)$
$= 77+126$
$= 203$

43. $46+3\left[5^2-4(9-5)\right] = 46+3\left[25-4(4)\right]$
$= 46+3[25-16]$
$= 46+3[9]$
$= 46+27$
$= 73$

45. $81+9\left[7^2-7(11-4)\right] = 81+9\left[49-7(7)\right]$
$= 81+9[49-49]$
$= 81+9[0]$
$= 81$

47. $\dfrac{2(50)-4}{2(4^2)} = \dfrac{100-4}{2\cdot 16}$
$= \dfrac{96}{32}$
$= 3$

49. $\dfrac{25(8)-8}{6(2^3)} = \dfrac{200-8}{6\cdot 8}$
$= \dfrac{192}{48}$
$= 4$

51. $\dfrac{6+9+4+3+8}{5} = \dfrac{30}{5}$
$= 6$

53. $\dfrac{3+5+9+1+7+5}{6} = \dfrac{30}{6}$
$= 5$

55. $\dfrac{19+15+17+13}{4} = \dfrac{64}{4}$
$= 16$

57. $\dfrac{5+8+7+0+3+1}{6} = \dfrac{24}{6}$
$= 4$

TRY IT YOURSELF

59. $(8-6)^2+(4-3)^2 = 2^2+1^2$
$= 4+1$
$= 5$

61. $2\cdot 3^4 = 2\cdot 81$
$= 162$

63. $7+4\cdot 5 = 7+20$
$= 27$

65. $(7-4)^2+1 = 3^2+1$
$= 9+1$
$= 10$

67. $\dfrac{10+5}{52-47} = \dfrac{15}{5}$
$= 3$

69. $5\cdot 10^3+2\cdot 10^2+3\cdot 10^1+9$
$= 5\cdot 1000+2\cdot 100+3\cdot 10+9$
$= 5,000+200+30+9$
$= 5,239$

71. $20-10+5 = 10+5$
$= 15$

73. $25\div 5\cdot 5 = 5\cdot 5$
$= 25$

75. $150-2\left(2\cdot 6-4\right)^2=150-2\left(12-4\right)^2$
$=150-2\cdot 8^2$
$=150-2\cdot 64$
$=150-128$
$=22$

77. $190-2\left[10^2-\left(5+2^2\right)\right]+45$
$=190-2\left[100-\left(5+4\right)\right]+45$
$=190-2\left[100-9\right]+45$
$=190-2\left[91\right]+45$
$=190-182+45$
$=53$

79. $2+3\left(0\right)=2$

81. $\dfrac{\left(5-3\right)^2+2}{4^2-\left(8+2\right)}=\dfrac{2^2+2}{4^2-10}$
$=\dfrac{4+2}{16-10}$
$=\dfrac{6}{6}$
$=1$

83. $4^2+3^2=16+9$
$=25$

85. $3+2\cdot 3^4\cdot 5=3+2\cdot 81\cdot 5$
$=3+810$
$=813$

87. $60-\left(6+\dfrac{40}{2^3}\right)=60-\left(6+\dfrac{40}{8}\right)$
$=60-\left(6+5\right)$
$=60-11$
$=49$

89. $\dfrac{\left(3+5\right)^2+2}{2\left(8-5\right)}=\dfrac{8^2+2}{2\left(3\right)}$
$=\dfrac{64+2}{6}$
$=\dfrac{66}{6}$
$=11$

91. $\left(18-12\right)^3-5^2=6^3-5^2$
$=216-25$
$=191$

93. $30\left(1\right)^2-4\left(2\right)+12=30-8+12$
$=34$

95. $16^2-\dfrac{25}{5}+6\left(3\right)4=256-5+72$
$=323$

97. $\dfrac{3^2-2^2}{\left(3-3\right)^2}=\dfrac{9-4}{0^2}$
$=\dfrac{5}{0}$: undefined

99. $3\left(\dfrac{18}{3}\right)-2\left(2\right)=18-4$
$=14$

101. $4\left[50-\left(3^3-5^2\right)\right]=4\left[50-\left(27-25\right)\right]$
$=4\left[50-2\right]$
$=4\left[48\right]$
$=192$

103. $80-2\left[12-\left(5+4\right)\right]=80-2\left[12-9\right]$
$=80-2\left[3\right]$
$=80-6$
$=74$

LOOK ALIKES

105. a. $50 \div 5 \div 5 = 10 \div 5$
$= 2$
b. $50 \div (5 \div 5) = 50 \div 1$
$= 50$
c. $50 \div 5 \cdot 5 = 10 \cdot 5$
$= 50$

d. $50 \div (5 \cdot 5) = 50 \div 25$
$= 2$

107. a. $(4 - 2^2)/(50 - 32) = (4 - 4)/18 = 0/18$
$= 0$

b. $(50 - 32)/(4 - 2^2) = 18/(4 - 4)$
$= 18/0$
$=$ Undefined

APPLICATIONS

109. $3 \cdot 7 + 4 \cdot 4 + 2 \cdot 3 = 21 + 16 + 6$
$= \$43$

111. $3(8 + 7 + 8 + 8 + 7) = 3(38)$
$= 114$

113. brick: $3 \cdot 3 + 1 + 1 + 3 + 3 \cdot 5 = 29$

aphid: $3[1 + 2(3) + 4 + 1 + 2] = 42$

115. $2^2 + 3^2 + 5^2 + 7^2 = 4 + 9 + 25 + 49$
$= 87$

117. $\dfrac{75 + 80 + 83 + 80 + 77 + 72 + 86}{7}$

$= \dfrac{553}{7}$

$= 79°$

119. $\dfrac{39 + 40 + \cdots + 42}{12} = \dfrac{372}{12}$
$= 31 \text{ therms}$

121. $\dfrac{230 + 280 + \cdots 375}{8} = \dfrac{2400}{8}$
$= 300 \text{ calories}$

123. a. $1 + 4 + 35 + 85 = 125$

b. $1 \cdot 2{,}500 + 4 \cdot 500 + 35 \cdot 150 + 85 \cdot 25$
$= 2{,}500 + 2{,}000 + 5{,}250 + 2{,}125$
$= 11{,}875$

c. $\dfrac{11{,}875}{125} = \$95$

WRITING

125. Order of operations is necessary so that different people don't come up with different answers to the same problem.

127. The multiplication of 2 and 3 takes precedence over the addition.

REVIEW

129. Two hundred fifty-four thousand, three hundred nine

Chapter 1 Review

1. 6

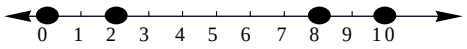
3. 1 billion

5. a. ninety-seven thousand, two hundred eighty – three

b. five billion, four hundred forty-four million, sixty thousand, seventeen

7. 500,000+70,000+300+2

9.



11. $9 > 7$

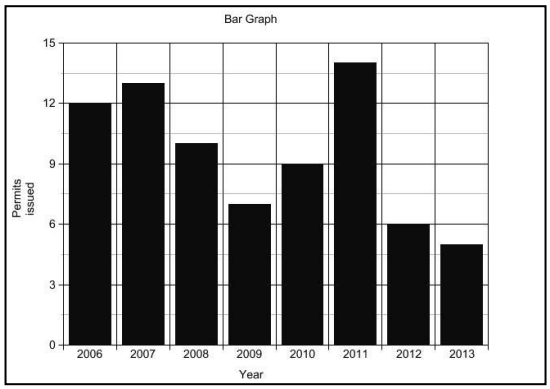
13. a. 2,507,300

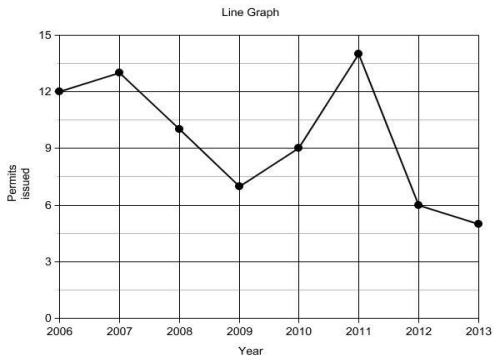
b. 2,510,000

c. 2,507,350

d. 3,000,000

15.





17.
$$\begin{array}{r} {\scriptstyle 1} \\ 436 \\ +27 \\ \hline 463 \end{array}$$

19.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 5,345 \\ +\ 655 \\ \hline 6,000 \end{array}$$

21.
$$\begin{array}{r} {\scriptstyle 1\ 2\ 2} \\ 4,447 \\ 7,478 \\ +\ 676 \\ \hline 12,601 \end{array}$$

23.
$$\begin{aligned} &600+800+10,000+40,000+8,000 \\ &=1,400+50,000+8,000 \\ &=51,400+8,000 \\ &=59,400 \end{aligned}$$

25. 101,491,106 + 76,949,504 + 74,937,004

= 253,377,614 passengers

27.
$$\begin{array}{r} {\scriptstyle 1\ \ 1} \\ 10,955 \\ +3,706 \\ \hline 14,661 \end{array}$$

29. 1,695 + 772 = 2,467 sq ft

31.
$$\begin{array}{r} 148 \\ -87 \\ \hline 61 \end{array}$$

33.
$$\begin{aligned} 750-259+14 &= 491+14 \\ &= 505 \end{aligned}$$

35.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1} \\ 1,168 \\ +6,949 \\ \hline 8,117 \end{array}$$

The subtraction is incorrect.

37. $200,000-40,000=160,000$

39.
$$\begin{aligned} 12,975-3,800+4,270 &= 9,175+4,270 \\ &= \$13,445 \end{aligned}$$

41.
$$\begin{array}{r} {\scriptstyle 6} \\ 47 \\ \times 9 \\ \hline 423 \end{array}$$

43. $72\cdot 10,000$: Since there are 4 zeros, move the decimal point 4 units to the right: 720,000

45.
$$\begin{array}{r} 5,624 \\ \times 281 \\ \hline 5,624 \\ 449,920 \\ +1,124,800 \\ \hline 1,580,344 \end{array}$$

47. $7,000\cdot 400=2,800,000$

49. a. $8\cdot 0=0$ b. $7\cdot 1=7$

51. $A=l\cdot w$

$A=8\cdot 4$

$A=32\text{ cm}^2.$

53. a. $365\cdot 7=2,555\text{ hr.}$

b. $365\cdot 9=3,285\text{ hr.}$

55. Sarah: $12\cdot 9=\$108$

Santiago: $14\cdot 8=\$112$

Santiago earned more money.

57. $\frac{72}{4} = \frac{4 \cdot 18}{4} = 18$

59.
$$\begin{array}{r} 307 \\ 68\overline{)20876} \\ \underline{-204} \\ 47 \\ \underline{-0} \\ 476 \\ \underline{-476} \\ 0 \end{array}$$

61. $\frac{0}{10} = 0$

63.
$$\begin{array}{r} 42 \\ 127\overline{)5347} \\ \underline{-508} \\ 267 \\ \underline{-254} \\ 13 \end{array}$$
$42R13$

65. $40 \cdot 4 = 160$

67. 364,545 is divisible by 3, 5, and 9.

69.
$$\begin{array}{r} 16 \\ 45\overline{)745} \\ \underline{-45} \\ 295 \\ \underline{-270} \\ 25 \end{array}$$
Each child will get 16 candies, with 25 left over.

71. **Sausage.** To make smoked sausage, the sausage is first dried at a temperature of 130°F. Then the temperature is raised 20° to smoke the meat. The temperature is raised another 20° to cook the meat. In the last stage, the temperature is raised another 15°. What is the final temperature in the process?

Final temp = Initial temp + raises
=130 + 20 + 20 + 15 = 185°
The final temperature is 185°F.

73. **Weight Training.** For part of a woman's upper body workout, she does one set of 12 repetitions of 75 pounds on a bench press machine. How many total pounds does she lift in that set?

Total pounds lifted
= (Number of reps)(pounds per rep)
=12(75) = 900
She lifts a total of 900 pounds.

75. **Production**. A manufacturer produces 15,000 light bulbs a day. The bulbs are packaged six to a box. How many boxes of light bulbs are produced each day?

$$\text{Total boxes of bulbs} = \frac{\text{Total bulbs produced}}{\text{Bulbs per box}}$$
$$= \frac{15{,}000}{6} = 2{,}500 \text{ boxes}$$
There are 2,500 boxes of bulbs produced each day.

77. **Farming**. In a shipment of 350 animals, 124 were hogs, 79 were sheep, and the rest were cattle. Find the number of cattle in the shipment.

Number of cattle = Total animals - hogs - shee
= 350 - 124 - 79 = 147
There are 147 head of cattle in the shipment.

79. $1, 2, 3, 6, 9, 18$

81 $20 = 2 \cdot 10$
$= 4 \cdot 5$

83 a. prime

b. composite

c. neither

d. neither

e. composite

f. prime

85. $42 = 2 \cdot 21$
$= 2 \cdot 3 \cdot 7$

87. $220 = 10 \cdot 22$
$= 2 \cdot 5 \cdot 2 \cdot 11$
$= 2^2 \cdot 5 \cdot 11$

89. $6 \cdot 6 \cdot 6 \cdot 6 = 6^4$

91. $5^3 = 5 \cdot 5 \cdot 5$
$= 25 \cdot 5$
$= 125$

93. $2^4 \cdot 7^2 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 7 \cdot 7$
$= 4 \cdot 4 \cdot 49$
$= 16 \cdot 49$
$= 784$

95. $9, 18, 27, 36, 45, 54, 63, 72, 81, 90$

97. $4 = 2 \cdot 2$
$6 = 2 \cdot 2 \cdot 3$
$LCM(4, 6) = 2 \cdot 2 \cdot 3$
$= 12$

99. $9 = 3 \cdot 3$
$15 = 3 \cdot 5$
$LCM(9, 15) = 3 \cdot 3 \cdot 5$
$= 45$

101. $18 = 2 \cdot 3 \cdot 3$
$21 = 3 \cdot 7$
$LCM(18, 21) = 2 \cdot 3 \cdot 3 \cdot 7$
$= 126$

103. $4 = 2 \cdot 2$
$14 = 2 \cdot 7$
$20 = 2 \cdot 2 \cdot 5$
$LCM(4, 14, 20) = 2 \cdot 2 \cdot 5 \cdot 7$
$= 140$

105. $8 = 2 \cdot 2 \cdot 2$
$12 = 2 \cdot 2 \cdot 3$
$GCF(8, 12) = 2 \cdot 2$
$= 4$

107. $30 = 2 \cdot 3 \cdot 5$
$40 = 2 \cdot 2 \cdot 2 \cdot 5$
$GCF(30, 40) = 2 \cdot 5$
$= 10$

109. $63 = 3 \cdot 3 \cdot 7$
$84 = 2 \cdot 2 \cdot 3 \cdot 7$
$GCF(63, 84) = 3 \cdot 7$
$= 21$

111. $48 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$
$72 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$
$120 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5$
$GCF(48, 72, 120) = 2 \cdot 2 \cdot 2 \cdot 3$
$= 24$

113. $14 = 2 \cdot 7$
$21 = 3 \cdot 7$
$LCM(14, 21) = 2 \cdot 3 \cdot 7$
$= 42$
They will meet on the same day 42 days later.

115. $3^2 + 12 \cdot 3 = 9 + 36$
$= 45$

117. $(6 \div 2 \cdot 3)^2 \cdot 3 = (3 \cdot 3)^2 \cdot 3$
$= 9^2 \cdot 3$
$= 81 \cdot 3$
$= 243$

119. $2^3 \cdot 5 - 4 \div 2 \cdot 4 = 8 \cdot 5 - 2 \cdot 4$
$= 40 - 8$
$= 32$

121.
$$2+3\left(\frac{100}{10}-2^2\cdot 2\right)=2+3(10-4\cdot 2)$$
$$=2+3(10-8)$$
$$=2+3(2)$$
$$=2+6=8$$

123.
$$\frac{4(6)-6}{2(3^2)}=\frac{24-6}{2(9)}$$
$$=\frac{18}{18}$$
$$=1$$

125.
$$7+3\left[3^3-10(4-2)\right]=7+3\left[27-10(2)\right]$$
$$=7+3[27-20]$$
$$=7+3[7]$$
$$=7+21$$
$$=28$$

127.
$$\frac{80+74+66+88}{4}=\frac{308}{4}$$
$$=77$$

Chapter 1 Test

1. a. The set of <u>whole</u> numbers is $\{0,1,2,3,4,5,\ldots\}$.

b. The symbols $>$ and $<$ are <u>inequality</u> symbols.

c. To *evaluate* an expression such as 58 – 33 means to find its <u>value</u>.

d. The <u>area</u> of a rectangle is a measure of the amount of surface it encloses.

e. One number is <u>divisible</u> by another if, when we divide them, the remainder is 0.

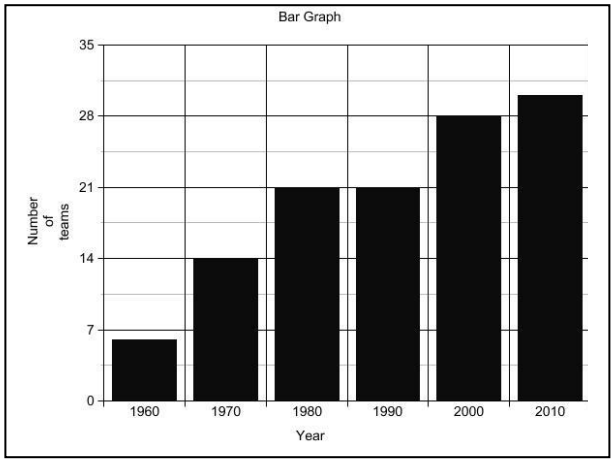
f. The grouping symbols ( ) are called <u>parentheses</u>, and the symbols [ ] are called <u>brackets</u>.

g. A <u>prime</u> number is a whole number greater than 1 that has only 1 and itself as factors.

3. a. 1 hundred b. 0

5. a. $15>10$ b. $1,247<1,427$

7.



9.
$$\begin{array}{r} {\scriptstyle 1\,1\,1\;\;1\,1} \\ 136,231 \\ 82,574 \\ +\;\;6,359 \\ \hline 225,164 \end{array}$$

11.
$$\begin{array}{r} {\scriptstyle 2} \\ 53 \\ \times\;\;8 \\ \hline 424 \end{array}$$

13.
$$\begin{array}{r} 72 \\ 6\overline{)432} \\ \underline{-42} \\ 12 \\ \underline{-12} \\ 0 \end{array}$$

15. $23\cdot 6=138$, now attach 5 zeros: $13,800,000$

17. $50,000-7,000=43,000$

19. $23\cdot 23=529 in^2$

21. $1260=10\cdot 126=2\cdot 5\cdot 9\cdot 14$
$=2\cdot 5\cdot 3\cdot 3\cdot 2\cdot 7=2^2\cdot 3^2\cdot 5\cdot 7$

23. $10,000-5,067=4,933$ tails

25. $12,255\div 3=4,085\, ft^2$

27. $\dfrac{1,350,000-26,000}{4}=\dfrac{1,324,000}{4}=\$331,000$

29. a. 0 b. 0 c. 1 d. undefined

31.
$$\begin{aligned} 8&=2\cdot 2\cdot 2\\ 9&=3\cdot 3\\ 12&=2\cdot 2\cdot 3\\ LCM\left(8,9,12\right)&=2\cdot 2\cdot 2\cdot 3\cdot 3\\ &=72\end{aligned}$$

33.
$$\begin{aligned} 24&=2\cdot 2\cdot 2\cdot 3\\ 28&=2\cdot 2\cdot 7\\ 36&=2\cdot 2\cdot 3\cdot 3\\ GCF\left(24,28,36\right)&=2\cdot 2\\ &=4\end{aligned}$$

35. It is divisible by 2, 3, 4, 5, 6, and 10.

37. $9+4\cdot 5=9+20=29$

39.
$$\begin{aligned} 20+2\left[4^2-2\left(6-2^2\right)\right]&=20+2\left[16-2\left(6-4\right)\right]\\ &=20+2\left[16-2\left(2\right)\right]\\ &=20+2\left[16-4\right]\\ &=20+2\left[12\right]\\ &=20+24\\ &=44\end{aligned}$$

47. x = the size of the class

$$\begin{aligned} \frac{x}{6}&=12\\ 6\cdot\frac{x}{6}&=6\cdot 12\\ x&=72\end{aligned}$$

There are 72 students in the class.