Chapter 2   Integers and Algebraic Expressions

Are You Prepared?

A. $12 - 10 - 1 + 4 = 2 - 1 + 4 = 1 + 4 = 5$

B. $22 - 3 \square 6 - 1 = 22 - 18 - 1 = 4 - 1 = 3$

C. $24 \div 8 \square 2 = 3 \square 2 = 6$

D. $2^2 = 4$

E. $32 \div 4 \div 2 = 8 \div 2 = 4$

F. $9^2 - 4(30 - 2 \square 5) = 9^2 - 4(30 - 10)$

$$= 9^2 - 4(20)$$
$$= 81 - 4(20)$$
$$= 81 - 80$$
$$= 1$$

G. $13 - 8 \div 2 \square 3 = 13 - 4 \square 3 = 13 - 12 = 1$

H. $\sqrt{16 - 3 \square 4} = \sqrt{16 - 12} = \sqrt{4} = 2$

I. $\sqrt{10^2 - 8^2} = \sqrt{100 - 64} = \sqrt{36} = 6$

J. $50 \div 2 \div 5 = 25 \div 5 = 5$

K. $18 \div 9 \square 3 = 2 \square 3 = 6$

L. $\dfrac{50 - 40}{5 - 3} = \dfrac{10}{2} = 5$

M. $\sqrt{5^2 - 3^2} = \sqrt{25 - 9} = \sqrt{16} = 4$

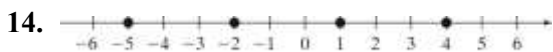|					
1	^{A}5	2	^{B}3	6	4
^{C}6	3	^{D}4	2	5	1
^{E}4	2	3	5	^{F}1	6
5	^{G}1	6	4	3	^{H}2
3	4	1	^{I}6	2	^{J}5
2	^{K}6	^{L}5	1	^{M}4	3

Section 2.1   Integers, Absolute Value, and Opposite

Section 2.1   Practice Exercises

1. Answers will vary.

2. (a) The distance between a number and zero on the number line is called its **absolute value**.

(b) The numbers … , –3, –2, –1, 0, 1, 2, 3, … and so on are called **integers**.

(c) Negative numbers lie to the left of zero on a number line.

(d) Two numbers that are the same distance from zero on the number line, but on opposite sides of zero are called **opposites**.

(e) Positive numbers lie to the right of zero on the number line.

3. –86 m

4. –$45

5. $3800

6. 5

7. –$500

8. $23

9. –14 lb

10. –2000 ft

11. 1,400,000

12. –$20,000

13.

14.

15. -2

16. 8

17. $0 > -3$

18. $-1 < 0$

19. $-8 > -9$

20. $-5 < -2$

21. $8 < 9$

22. $5 > 2$

23. $-226 < 198$

24. $408 > -416$

25. $|-2| = 2$

26. $|-9| = 9$

27. $|2| = 2$

28. $|9| = 9$

29. $|-427| = 427$

30. $|-615| = 615$

31. $|100,000| = 100,000$

32. $|64,000| = 64,000$

33. (a) -8
    (b) $|-12|$

34. (a) -14
    (b) $|-20|$

35. (a) 7
    (b) $|7|$

36. (a) 4
    (b) $|4|$

37. $|-5|$

38. $|-9|$

39. Neither, they are equal.

40. Neither, they are equal.

41. -5

42. -31

43. 12

44. 25

45. 0

46. -1

47. 1

48. 612

49. $-(-15) = 15$

50. $-(-4) = 4$

51. $-|-15| = -(15) = -15$

52. $-|-4| = -(4) = -4$

53. $-|15| = -(15) = -15$

54. $-|4| = -(4) = -4$

55. $|-15| = 15$

56. $|-4| = 4$

57. $-(-36) = 36$

58. $-(-19) = 19$

59. $-|-107| = -(107) = -107$

60. $-|-26|=-(26)=-26$

61. (a) $|-6|=6$
(b) $-(-6)=6$
(c) $-|6|=-(6)=-6$
(d) $|6|=6$
(e) $-|-6|=-(6)=-6$

62. (a) $-(-12)=12$
(b) $|12|=12$
(c) $|-12|=12$
(d) $-|-12|=-(12)=-12$
(e) $-|12|=-(12)=-12$

63. (a) $-|8|=-(8)=-8$
(b) $|8|=8$
(c) $-|-8|=-(8)=-8$
(d) $-(-8)=8$
(e) $|-8|=8$

64. (a) $-|-1|=-(1)=-1$
(b) $-(-1)=1$
(c) $|1|=1$
(d) $|-1|=1$
(e) $-|1|=-(1)=-1$

65. -6

66. -23

67. $-(-2)$

68. $-(-9)$

69. $|7|$

70. $|11|$

71. $|-3|$

72. $|-10|$

73. $-|14|$

74. $-|42|$

75. $|-12|=12$; $|12|=12$; so $|-12|=|12|$

76. $-(-4)=4$; $-|-4|=-4$;
so $-(-4)>-|-4|$

77. $|-22|=22$; $-(22)=-22$;
so $|-22|>-(22)$

78. $-8>-10$

79. $-44>-54$

80. $-|0|=0$; $-|1|=-1$; so $-|0|>-|1|$

81. $|-55|=55$; $-(-65)=65$;
so $|-55|<-(-65)$

82. $-(82)=-82$; $|46|=46$;
so $-(82)<|46|$

83. $-|32|=-32$; $|0|=0$; so $-|32|<|0|$

84. $-|22|=-22$; $0=0$; so $-|22|<0$

85. Portland is between 20º and 30º; about 25ºF

86. Atlanta is between 40º and 50º; about 42ºF

87. Bismarck is between –20º and –30º; about –22ºF

88. Denver is between 0º and –10º; about –8ºF

89. Eugene is between 0º and –10º; about –2ºF

90. Orlando is about 50ºF

91. Dallas is between 40º and 50º; about 44ºF

92. June is the greatest amount below average; –6 in.

93. September is the greatest amount above average.

94. August had the average amount of rainfall.

95. $-|-46|=-46$

$-(-24)=24$

-60

$5^2=25$

$|-12|=12$

$-60, -|-46|, |-12|, -(-24), 5^2$

96. -15

$-(-18)=18$

$-|20|=-20$

$4^2=16$

$|-3|^2=3^2=9$

$-|20|, -15, |-3|^2, 4^2, -(-18)$

97. Positive

98. Positive

99. Negative

100. Negative

Section 2.2   Addition of Integers

Section 2.2   Practice Exercises

1. Answers will vary.

2. $-6<-5$

3. $-33>-44$

4. $|-4|=4;\ -|4|=-4;$ so $|-4|>-|4|$

5. $|6|=6;\ |-6|=6;$ so $|6|=|-6|$

6. $0>-6$

7. $-|-10|=-10;\ 10=10;$ so $-|-10|<10$

8. $-(-2)=2;\ 2=2;$ so $-(-2)=2$

9. $-3+5=2$

10. $-6+3=-3$

11. $2+(-4)=-2$

12. $5+(-1)=4$

13. $-4+(-4)=-8$

14. $-2+(-5)=-7$

15. $-3+9=6$

16. $-1+5=4$

17. $0+(-7)=-7$

18. $(-5)+0=-5$

19. $-1+(-3)=-4$

20. $-4+(-3)=-7$

21. To add two numbers with the same sign, add their absolute values and apply the common sign.

22. $23+12=35$

23. $12+3=15$

24. $-8+(-3)=-11$

25. $-10+(-6)=-16$

26. $-7+(-9)=-16$

27. $-100+(-24)=-124$

28. $23 + 50 = 73$

29. $44 + 45 = 89$

30. To add two numbers with different signs, subtract the smaller absolute value from the larger absolute value. Then apply the sign of the number having the larger absolute value.

31. $7 + (-10) = -3$

32. $-8 + 2 = -6$

33. $12 + (-7) = 5$

34. $-3 + 9 = 6$

35. $-90 + 66 = -24$

36. $-23 + 49 = 26$

37. $78 + (-33) = 45$

38. $10 + (-23) = -13$

39. $2 + (-2) = 0$

40. $-6 + 6 = 0$

41. $-13 + 13 = 0$

42. $45 + (-45) = 0$

43. $12 + (-3) = 9$

44. $-33 + (-1) = -34$

45. $-23 + (-3) = -26$

46. $-5 + 15 = 10$

47. $4 + (-45) = -41$

48. $-13 + (-12) = -25$

49. $(-103) + (-47) = -150$

50. $119 + (-59) = 60$

51. $0 + (-17) = -17$

52. $-29 + 0 = -29$

53. $-19 + (-22) = -41$

54. $-300 + (-24) = -324$

55. $6 + (-12) + 8 = -6 + 8 = 2$

56. $20 + (-12) + (-5) = 8 + (-5) = 3$

57. $-33 + (-15) + 18 = -48 + 18 = -30$

58. $3 + 5 + (-1) = 8 + (-1) = 7$

59. $7 + (-3) + 6 = 4 + 6 = 10$

60. $12 + (-6) + (-9) = 6 + (-9) = -3$

61. $-10 + (-3) + 5 = -13 + 5 = -8$

62. $-23 + (-4) + (-12) + (-5)$
$$= -27 + (-12) + (-5)$$
$$= -39 + (-5)$$
$$= -44$$

63. $-18 + (-5) + 23 = -23 + 23 = 0$

64. $14 + (-15) + 20 + (-42) = -1 + 20 + (-42)$
$$= 19 + (-42)$$
$$= -23$$

65. $4 + (-12) + (-30) + 16 + 10$
$$= -8 + (-30) + 16 + 10$$
$$= -38 + 16 + 10$$
$$= -22 + 10$$
$$= -12$$

66. $24 + (-5) + (-19) = 19 + (-19) = 0$

67. $-23 + 49 = 26$

68. $89 + (-11) = 78$

69. $3+(-10)+5=-7+5=-2$

70. $-2+(-4)+14+20=-6+14+20$
$$=8+20$$
$$=28$$

71. $(-8+6)+(-5)=-2+(-5)=-7$

72. $(-25+7)+(-15)=-18+(-15)=-33$

73. $-6+(-1)+10+6+(-2)$
$$=-7+10+6+(-2)$$
$$=3+6+(-2)$$
$$=9+(-2)$$
$$=7 \text{ in.}$$
Marquette had above average snowfall.

74. $1+(-3)+2+5+(-4)=-2+2+5+(-4)$
$$=0+5+(-4)$$
$$=5+(-4)$$
$$=1 \text{ in.}$$
Hilo had above average rainfall.

75. $1+(-7)+(-1)+(-1)=-6+(-1)+(-1)$
$$=-7+(-1)$$
$$=-8$$

76. $-2+0+(-1)+(-3)=-2+(-1)+(-3)$
$$=-3+(-3)$$
$$=-6$$

77. $-4+12=8°\text{F}$

78. $-14+10=-4°\text{F}$

79. $-\$56+\$389=\$333$

80. $\$23+(-\$40)=-\$17$

81. $-200+(-400)+1000+(-400)+600$
$$=-\$600+\$1000+(-\$400)+\$600$$
$$=\$400+(-\$400)+\$600$$
$$=\$0+\$600$$
$$=\$600$$

82. $3+2+(-8)+5+(-2)+4+21$
$$=5+(-8)+5+(-2)+4+21$$
$$=-3+5+(-2)+4+21$$
$$=2+(-2)+4+21$$
$$=0+4+21$$
$$=4+21$$
$$=25 \text{ yd}$$

83. $0+2+(-1)+(-1)+0+(-1)+1+0+0$
$$=2+(-1)+(-1)+0+(-1)+1+0+0$$
$$=1+(-1)+0+(-1)+1+0+0$$
$$=0+0+(-1)+1+0+0$$
$$=0+(-1)+1+0+0$$
$$=-1+1+0+0$$
$$=0+0+0$$
$$=0$$

84. $1+1+0+0+(-1)+(-1)+0+0+2$
$$=2+0+0+(-1)+(-1)+0+0+2$$
$$=2+(-1)+(-1)+0+0+2$$
$$=1+(-1)+0+0+2$$
$$=0+0+0+2$$
$$=2$$

85. For example: $-12+2$

86. For example: $-6+(-8)$

87. For example: $-1+(-1)$

88. For example: $5+(-5)$

89. $302+(-422)=-120$

90. $-900+334=-566$

91. $-23,991+(-4423)=-28,414$

92. $-1034+(-23,291)=-24,325$

93. $23+(-125)+912+(-99)$
$$= -102+912+(-99)$$
$$= 810+(-99)$$
$$= 711$$

94. $891+12+(-223)+(-341)$
$$= 903+(-223)+(-341)$$
$$= 680+(-341)$$
$$= 339$$

Section 2.3   Subtraction of Integers

Section 2.3   Practice Exercises

1. Answers will vary.

2. $34+(-13)=21$

3. $-34+(-13)=-47$

4. $-34+13=-21$

5. $-|-26|=-(26)=-26$

6. $-(-32)=32$

7. $-9+(-8)+5+(-3)+7$
$$= -17+5+(-3)+7$$
$$= -12+(-3)+7$$
$$= -15+7$$
$$= -8$$

8. To subtract two integers, add the opposite of the second number to the first number.

9. $2-9=2+(-9)=-7$

10. $5-11=5+(-11)=-6$

11. $4-(-3)=4+3=7$

12. $12-(-8)=12+8=20$

13. $-3-15=-3+(-15)=-18$

14. $-7-21=-7+(-21)=-28$

15. $-11-(-13)=-11+13=2$

16. $-23-(-9)=-23+9=-14$

17. $35-(-17)=35+17=52$

18. $23-(-12)=23+12=35$

19. $-24-9=-24+(-9)=-33$

20. $-5-15=-5+(-15)=-20$

21. $50-62=50+(-62)=-12$

22. $38-46=38+(-46)=-8$

23. $-17-(-25)=-17+25=8$

24. $-2-(-66)=-2+66=64$

25. $-8-(-8)=-8+8=0$

26. $-14-(-14)=-14+14=0$

27. $120-(-41)=120+41=161$

28. $91-(-62)=91+62=153$

29. $-15-19=-15+(-19)=-34$

30. $-82-44=-82+(-44)=-126$

31. $3-25=3+(-25)=-22$

32. $6-33=6+(-33)=-27$

33. $-13-13=-13+(-13)=-26$

34. $-43-43=-43+(-43)=-86$

35. $24 - 25 = 24 + (-25) = -1$

36. $43 - 98 = 43 + (-98) = -55$

37. $-6 - (-38) = -6 + 38 = 32$

38. $-75 - (-21) = -75 + 21 = -54$

39. $-48 - (-33) = -48 + 33 = -15$

40. $-29 - (-32) = -29 + 32 = 3$

41. $2 + 5 - (-3) - 10 = 2 + 5 + 3 + (-10)$
$$= 7 + 3 + (-10)$$
$$= 10 + (-10)$$
$$= 0$$

42. $4 - 8 + 12 - (-1) = 4 + (-8) + 12 + 1$
$$= -4 + 12 + 1$$
$$= 8 + 1$$
$$= 9$$

43. $-5 + 6 + (-7) - 4 - (-9)$
$$= -5 + 6 + (-7) + (-4) + 9$$
$$= 1 + (-7) + (-4) + 9$$
$$= -6 + (-4) + 9$$
$$= -10 + 9$$
$$= -1$$

44. $-2 - 1 + (-11) + 6 - (-8)$
$$= -2 + (-1) + (-11) + 6 + 8$$
$$= -3 + (-11) + 6 + 8$$
$$= -14 + 6 + 8$$
$$= -8 + 8$$
$$= 0$$

45. $25 - 13 - (-40) = 25 + (-13) + 40$
$$= 12 + 40$$
$$= 52$$

46. $-35 + 15 - (-28) = -35 + 15 + 28$
$$= -20 + 28$$
$$= 8$$

47. minus, difference, decreased, less than, subtract from

48. Subtraction is not commutative.
$3 - 7 \neq 7 - 3$

49. $14 - 23 = 14 + (-23) = -9$

50. $27 - 40 = 27 + (-40) = -13$

51. $105 - 110 = 105 + (-110) = -5$

52. $70 - 98 = 70 + (-98) = -28$

53. $320 - (-20) = 320 + 20 = 340$

54. $150 - 75 = 150 + (-75) = 75$

55. $5 - 12 = 5 + (-12) = -7$

56. $16 - 10 = 16 + (-10) = 6$

57. $-34 - 21 = -34 + (-21) = -55$

58. $-90 - 22 = -90 + (-22) = -112$

59. $-35 - 24 = -35 + (-24) = -59$

60. $175 - 189 = 175 + (-189) = -14$

61. $6000 - (-423) = 6000 + 423 = 6423° \text{F}$

62. $214 - (-184) = 214 + 184 = 398° \text{C}$

63. $-\$320 - \$55 = -\$320 + (-\$55) = -\$375$
His balance is $-\$375$.

64. $-\$210 + \$25 = -\$185$
His balance is $-\$185$.

65. $17,476+1786-2342-754+321+1597$

$\quad\quad = 19,262-2342-754+321+1597$

$\quad\quad = 16,920-754+321+1597$

$\quad\quad = 16,166+321+1597$

$\quad\quad = 16,487+1597$

$\quad\quad = 18,084$

The balance is $18,084.

66. $2036-150-25+480-200+80$

$\quad\quad\quad = 1886-25+480-200+80$

$\quad\quad\quad = 1861+480-200+80$

$\quad\quad\quad = 2341-200+80$

$\quad\quad\quad = 2141+80$

$\quad\quad\quad = 2221$

The balance is $2221.

67. $66-(-98)=66+98=164$

68. $16-(-40)=16+40=56$

69. $-56+66+(-98)+16+(-40)$

$\quad\quad = 10+(-98)+16+(-40)$

$\quad\quad = -88+16+(-40)$

$\quad\quad = -72+(-40)$

$\quad\quad = -112$

70. Because the total change is negative, the Dow was down for the week.

71. The range is $3°-(-8°)=3°+8°=11°$.

72. The range is $-1°-(-12°)=-1°+12°=11°$.

73. For example: $4-10$

74. For example: $10-30$

75. 5, 1, –3, –7, –11, –15, –19

76. –13, –18, –23, –28, –33, –38, –43

77. Positive

78. Negative

79. Positive

80. Positive or zero

81. Negative

82. Negative

83. Negative

84. Positive

85. $-190-223=-413$

86. $-288-145=-433$

87. $-23,624-(-9001)=-14,623$

88. $-14,593-(-34,499)=19,906$

89. $892,904-(-23,546)=916,450$

90. $104,839-(-24,938)=129,777$

91. $29,029-(-35,798)=64,827$ ft

92. $4392-(-86)=4478$ m

Section 2.4   Multiplication and Division of Integers

Section 2.4   Practice Exercises

1. $-2+(-4)=-6$

$\quad -(-5)=5$

$\quad -|-10|=-(10)=-10$

$\quad (-3)(-6)=18$

When multiplying two numbers with the same sign, the product is positive.

2. (a) $|-5|=5$

$\quad$ (b) $|5|=5$

$\quad$ (c) $-|5|=-5$

$\quad$ (d) $-|-5|=-(5)=-5$

$\quad$ (e) $-(-5)=5$

3. $14 - (-5) = 14 + 5 = 19$

4. $-24 - 50 = -24 + (-50) = -74$

5. $-33 + (-11) = -44$

6. $-7 - (-23) = -7 + 23 = 16$

7. $23 - 12 + (-4) - (-10)$
$$= 23 + (-12) + (-4) + 10$$
$$= 11 + (-4) + 10$$
$$= 7 + 10$$
$$= 17$$

8. $9 + (-12) - 17 - 4 - (-15)$
$$= 9 + (-12) + (-17) + (-4) + 15$$
$$= -3 + (-17) + (-4) + 15$$
$$= -20 + (-4) + 15$$
$$= -24 + 15$$
$$= -9$$

9. $-3(5) = -15$

10. $-2(13) = -26$

11. $-5(-8) = 40$

12. $-12(-2) = 24$

13. $7(-3) = -21$

14. $5(-12) = -60$

15. $-12(-4) = 48$

16. $-6(-11) = 66$

17. $-15(3) = -45$

18. $-3(25) = -75$

19. $9(-8) = -72$

20. $8(-3) = -24$

21. $-14(0) = 0$

22. $-8(0) = 0$

23. $-95(-1) = 95$

24. $-144(-1) = 144$

25. $-3(-1) = 3$

26. $-12(-4) = 48$

27. $-5(3) = -15$

28. $9(-2) = -18$

29. $3(-5) = -15$

30. $-3(6) = -18$

31. $(-5)(-2)(-4)(-10) = 10(-4)(-10)$
$$= -40(-10)$$
$$= 400$$

32. $(-3)(-5)(-2)(-4) = 15(-2)(-4)$
$$= -30(-4)$$
$$= 120$$

33. $(-11)(-4)(-2) = 44(-2) = -88$

34. $(-20)(-3)(-1) = 60(-1) = -60$

35. $(24)(-2)(0)(-3) = -48(0)(-3)$
$$= 0(-3)$$
$$= 0$$

36. $(3)(0)(-13)(22) = 0(-13)(22)$
$$= 0(22)$$
$$= 0$$

37. $(-1)(-1)(-1)(-1)(-1)(-1)$
$$= 1(-1)(-1)(-1)(-1)$$
$$= -1(-1)(-1)(-1)$$
$$= 1(-1)(-1)$$
$$= -1(-1)$$
$$= 1$$

38. $(-1)(-1)(-1)(-1)(-1)(-1)(-1)$
$$= 1(-1)(-1)(-1)(-1)(-1)$$
$$= -1(-1)(-1)(-1)(-1)$$
$$= 1(-1)(-1)(-1)$$
$$= -1(-1)(-1)$$
$$= 1(-1)$$
$$= -1$$

39. $(-2)(2)(2)(-2)(2) = -4(2)(-2)(2)$
$$= -8(-2)(2)$$
$$= 16(2)$$
$$= 32$$

40. $(2)(-2)(2)(2) = -4(2)(2)$
$$= -8(2)$$
$$= -16$$

41. $-10^2 = -(10)(10) = -10(10) = -100$

42. $-8^2 = -(8)(8) = -8(8) = -64$

43. $(-10)^2 = (-10)(-10) = 100$

44. $(-8)^2 = (-8)(-8) = 64$

45. $-10^3 = -(10)(10)(10)$
$$= -10(10)(10)$$
$$= -100(10)$$
$$= -1000$$

46. $-8^3 = -(8)(8)(8)$
$$= -8(8)(8)$$
$$= -64(8)$$
$$= -512$$

47. $(-10)^3 = (-10)(-10)(-10)$
$$= 100(-10)$$
$$= -1000$$

48. $(-8)^3 = (-8)(-8)(-8) = 64(-8) = -512$

49. $-5^4 = -(5)(5)(5)(5)$
$$= -5(5)(5)(5)$$
$$= -25(5)(5)$$
$$= -125(5)$$
$$= -625$$

50. $-4^4 = -(4)(4)(4)(4)$
$$= -4(4)(4)(4)$$
$$= -16(4)(4)$$
$$= -64(4)$$
$$= -256$$

51. $(-5)^4 = (-5)(-5)(-5)(-5)$
$$= 25(-5)(-5)$$
$$= -125(-5)$$
$$= 625$$

52. $(-4)^4 = (-4)(-4)(-4)(-4)$
$$= 16(-4)(-4)$$
$$= -64(-4)$$
$$= 256$$

53. $(-1)^2 = (-1)(-1) = 1$

54. $(-1)^3 = (-1)(-1)(-1) = 1(-1) = -1$

55. $-1^4 = -(1)(1)(1)(1)$
$$= -1(1)(1)(1)$$
$$= -1(1)(1)$$
$$= -1(1)$$
$$= -1$$

56. $-1^5 = -(1)(1)(1)(1)(1)$
$\qquad = -(1)(1)(1)(1)$
$\qquad = -1(1)(1)(1)$
$\qquad = -1(1)(1)$
$\qquad = -1(1)$
$\qquad = -1$

57. $60 \div (-3) = -20$

58. $46 \div (-2) = -23$

59. $\dfrac{-56}{-8} = 7$

60. $\dfrac{-48}{-3} = 16$

61. $\dfrac{-15}{5} = -3$

62. $\dfrac{30}{-6} = -5$

63. $-84 \div (-4) = 21$

64. $-48 \div (-6) = 8$

65. $\dfrac{-13}{0} = \text{Undefined}$

66. $\dfrac{-41}{0} = \text{Undefined}$

67. $\dfrac{0}{-18} = 0$

68. $\dfrac{0}{-6} = 0$

69. $(-20) \div (-5) = 4$

70. $(-10) \div (-2) = 5$

71. $\dfrac{204}{-6} = -34$

72. $\dfrac{300}{-2} = -150$

73. $(-100) \div (20) = -5$

74. $(46) \div (-23) = -2$

75. $(-64) \div (-32) = 2$

76. $(-108) \div (-4) = 27$

77. $(-52) \div (13) = -4$

78. $(-45) \div (-15) = 3$

79. $(-60) \div (10) = -6 \text{ ft/min}$

80. $(-27) \div (3) = -9°\,\text{F}$

81. $-25 - 40 = -65$
$\qquad (-65) \div (5) = -13°\,\text{F}$

82. $-1804 - (-528) = -1804 + 528 = -1276$
$\qquad (-1276) \div (2) = -638 \text{ m}$

83. $5(225) = 1125$
$\qquad 890 - 1125 = -\$235$

84. $2(150) + 82 = 300 + 82 = 382$
$\qquad 320 - 382 = -\$62$

85. $-3(6) = -18 \text{ ft}$

86. $-9(5) = -45 \text{ in}$

87. $18(-6) = -108$

88. $24(-2) = -48$

89. $18 \div (-6) = -3$

90. $24 \div (-2) = -12$

91. $(-9)(-12) = 108$

92. $-36 \div (-12) = 3$

93. $-90 \div (-6) = 15$

94. $(-5)(-4) = 20$

95. $\dfrac{0}{-2} = 0$

96. $-24 \div 0 = $ Undefined

97. $-90 \div 0 = $ Undefined

98. $\dfrac{0}{-5} = 0$

99. $(-2)(-5)(4) = 10(4) = 40$

100. $(10)(-2)(-3)(-5) = -20(-3)(-5)$
$$= 60(-5)$$
$$= -300$$

101. $(-7)^2 = (-7)(-7) = 49$

102. $-7^2 = -(7)(7) = -7(7) = -49$

103. (a) $-35 \div (-5) = 7$
  (b) $35 \div (-5) = -7$

104. (a) $-36 \div (-4) = 9$

(b) $36 \div (-4) = -9$

105. $1(+1) + 0(-1) = 1 + 0 = +1$

106. $17(+1) + 18(-1) = 17 + (-18) = -1$

107. $8(+1) + 10(-1) = 8 + (-10) = -2$

108. $20(+1) + 18(-1) = 20 + (-18) = +2$

109. $a \square b = (\text{positive})(\text{negative}) = \text{negative}$

110. $b \div a = (\text{negative}) \div (\text{positive}) = \text{negative}$

111. $|a| \div b = (\text{positive}) \div (\text{negative}) = \text{negative}$

112. $a \square |b| = (\text{positive})(\text{positive}) = \text{positive}$

113. $-a \div b = (\text{negative}) \div (\text{negative}) = \text{positive}$

114. $a(-b) = (\text{positive})(\text{positive}) = \text{positive}$

115. $(-413)(871) = -359,723$

116. $(-6125)(-97) = 594,125$

117. $\dfrac{-576,828}{-10,682} = 54$

118. $5,945,308 \div (-9452) = -629$

Problem Recognition Exercises: Operations on Integers

1. (a) $(-24)(-2) = 48$
  (b) $(-24) - (-2) = -24 + 2 = -22$
  (c) $(-24) + (-2) = -26$
  (d) $(-24) \div (-2) = 12$

2. (a) $12(-3) = -36$
  (b) $12 - (-3) = 12 + 3 = 15$
  (c) $12 + (-3) = 9$
  (d) $12 \div (-3) = -4$

3. $-5 + (-3) = -8$

4. $9(-5) = -45$

5. $-3 - (-7) = -3 + 7 = 4$

6. $\dfrac{28}{-4} = -7$

7. $-23(-2) = 46$

8. $-4 - 18 = -4 + (-18) = -22$

9. $\dfrac{42}{-2} = -21$

10. $-18 + (-13) = -31$

11. $10 - (-12) = 10 + 12 = 22$

12. $\dfrac{-21}{-7} = 3$

13. $-6(-9) = 54$

14. $-7 + 4 + 8 + (-16) + (-5)$
$$= -3 + 8 + (-16) + (-5)$$
$$= 5 + (-16) + (-5)$$
$$= -11 + (-5)$$
$$= -16$$

15. **(a)** $15 - (-5) = 15 + 5 = 20$
　　(b) $15(-5) = -75$
　　(c) $15 + (-5) = 10$
　　(d) $15 \div (-5) = -3$

16. **(a)** $-36(-2) = 72$
　　(b) $-36 - (-2) = -36 + 2 = -34$
　　(c) $\dfrac{-36}{-2} = 18$
　　(d) $-36 + (-2) = -38$

17. **(a)** $20(-4) = -80$
　　(b) $-20(-4) = 80$
　　(c) $-20(4) = -80$
　　(d) $20(4) = 80$

18. **(a)** $-5 - 9 - 2 = -5 + (-9) + (-2)$
$$= -14 + (-2)$$
$$= -16$$

　　(b) $-5(-9)(-2) = 45(-2) = -90$

19. **(a)** $10 + (-3) + (-12) = 7 + (-12) = -5$

(b) $10 - (-3) - (-12) = 10 + 3 + 12$
$$= 13 + 12$$
$$= 25$$

20. **(a)** $(-1)(-2)(-3)(-4) = 2(-3)(-4)$
$$= -6(-4)$$
$$= 24$$
　　(b) $(-1)(-2)(3)(4) = 2(3)(4)$
$$= 6(4)$$
$$= 24$$
　　(c) $(-1)(-2)(-3)(4) = 2(-3)(4)$
$$= -6(4)$$
$$= -24$$
　　(d) $(-1)(2)(3)(4) = -2(3)(4)$
$$= -6(4)$$
$$= -24$$

21. **(a)** $|-50| = 50$
　　(b) $-(-50) = 50$
　　(c) $|50| = 50$
　　(d) $-|-50| = -(50) = -50$

22. $\dfrac{0}{-8} = 0$

23. $-55 \div 0 =$ Undefined

24. $-615 - (-705) = -615 + 705 = 90$

25. $-184 - 409 = -184 + (-409) = -593$

26. $420 \div (-14) = -30$

27. $-3600 \div (-90) = 40$

28. $-44 - (-44) = -44 + 44 = 0$

29. $-37 - (-37) = -37 + 37 = 0$

30. $(-9)^2 = (-9)(-9) = 81$

31. $(-2)^5 = (-2)(-2)(-2)(-2)(-2)$
$\qquad = 4(-2)(-2)(-2)$
$\qquad = -8(-2)(-2)$
$\qquad = 16(-2)$
$\qquad = -32$

32. $-9^2 = -(9)(9) = -9(9) = -81$

33. $-2^5 = -(2)(2)(2)(2)(2)$
$\qquad = -2(2)(2)(2)(2)$
$\qquad = -4(2)(2)(2)$
$\qquad = -8(2)(2)$
$\qquad = -16(2)$
$\qquad = -32$

34. $\dfrac{-46}{0} = \text{Undefined}$

35. $0 \div (-16) = 0$

36. $-15,042 + 4893 = -10,149$

37. $-84,506 + (-542) = -85,048$

Section 2.5   Order of Operations and Algebraic Expressions

Section 2.5   Practice Exercises

1. Answers will vary.

2. **Variables** are used to represent quantities that are subject to change.

3. $-100 \div (-4) = 25$

4. $-100 - (-4) = -100 + 4 = -96$

5. $-100(-4) = 400$

6. $-100 + (-4) = -104$

7. $(-12)^2 = (-12)(-12) = 144$

8. $-12^2 = -(12)(12) = -12(12) = -144$

9. $-1 - 5 - 8 - 3 = -1 + (-5) + (-8) + (-3)$
$\qquad = -6 + (-8) + (-3)$
$\qquad = -14 + (-3)$
$\qquad = -17$

10. $-2 - 6 - 3 - 10 = -2 + (-6) + (-3) + (-10)$
$\qquad = -8 + (-3) + (-10)$
$\qquad = -11 + (-10)$
$\qquad = -21$

11. $(-1)(-5)(-8)(-3) = 5(-8)(-3)$
$\qquad = -40(-3)$
$\qquad = 120$

12. $(-2)(-6)(-3)(-10) = 12(-3)(-10)$
$\qquad = -36(-10)$
$\qquad = 360$

13. $5 + 2(3 - 5) = 5 + 2(3 + (-5))$
$\qquad = 5 + 2(-2)$
$\qquad = 5 + (-4)$
$\qquad = 1$

14. $6 - 4(8 - 10) = 6 + (-4)(8 + (-10))$
$= 6 + (-4)(-2)$
$= 6 + 8$
$= 14$

15. $-2(3 - 6) + 10 = -2(3 + (-6)) + 10$
$= -2(-3) + 10$
$= 6 + 10$
$= 16$

16. $-4(1 - 3) - 8 = -4(1 + (-3)) + (-8)$
$= -4(-2) + (-8)$
$= 8 + (-8)$
$= 0$

17. $-8 - 6^2 = -8 - 36 = -8 + (-36) = -44$

18. $-10 - 5^2 = -10 - 25 = -10 + (-25) = -35$

19. $120 \div (-4)(5) = -30(5) = -150$

20. $36 \div (-2)(3) = -18(3) = -54$

21. $40 - 32 \div (-4)(2) = 40 - (-8)(2)$
$= 40 - (-16)$
$= 40 + 16$
$= 56$

22. $48 - 36 \div (6)(-2) = 48 - 6(-2)$
$= 48 - (-12)$
$= 48 + 12$
$= 60$

23. $100 - 2(3 - 8) = 100 - 2(3 + (-8))$
$= 100 - 2(-5)$
$= 100 - (-10)$
$= 100 + 10$
$= 110$

24. $55 - 3(2 - 6) = 55 - 3(2 + (-6))$
$= 55 - 3(-4)$
$= 55 - (-12)$
$= 55 + 12$
$= 67$

25. $|-10 + 13| - |-6| = |3| - |-6|$
$= 3 - 6$
$= 3 + (-6)$
$= -3$

26. $|4 - 9| - |-10| = |-5| - |-10|$
$= 5 - 10$
$= -5$

27. $\sqrt{100 - 36} - 3\sqrt{16} = \sqrt{64} - 3\sqrt{16}$
$= 8 - 3(4)$
$= 8 - 12$
$= -4$

28. $\sqrt{36 - 11} + 2\sqrt{9} = \sqrt{25} + 2\sqrt{9}$
$= 5 + 2(3)$
$= 5 + 6$
$= 11$

29. $5^2 - (-3)^2 = 5 \cdot 5 - (-3)(-3) = 25 - 9 = 16$

30. $(6)^2 - (-4)^2 = 36 - (-4)(-4)$
$= 36 - 16$
$= 20$

31. $-3 + (5 - 9)^2 = -3 + (-4)^2$
$= -3 + (-4)(-4)$
$= -3 + 16$
$= 13$

32. $-5 + (3 - 10)^2 = -5 + (-7)^2$
$= -5 + (-7)(-7)$
$= -5 + 49$
$= 44$

33. $12+(14-16)^2 \div(-4)=12+(-2)^2 \div(-4)$
$$=12+(-2)(-2)\div(-4)$$
$$=12+4\div(-4)$$
$$=12+(-1)$$
$$=11$$

34. $-7+(1-5)^2 \div 4 = -7+(-4)^2 \div 4$
$$=-7+(-4)(-4)\div 4$$
$$=-7+16\div 4$$
$$=-7+4$$
$$=-3$$

35. $-48\div 12 \div(-2)=-4\div(-2)=2$

36. $-100\div(-5)\div(-5)=20\div(-5)=-4$

37. $90\div(-3)\cdot(-1)\div(-6)=-30\cdot(-1)\div(-6)$
$$=30\div(-6)$$
$$=-5$$

38. $64\div(-4)\cdot2\div(-16)=-16\cdot2\div(-16)$
$$=-32\div(-16)$$
$$=2$$

39. $\left[7^2-9^2\right]\div(-5+1)$
$$=[49-81]\div(-5+1)$$
$$=-32\div(-4)$$
$$=8$$

40. $\left[(-8)^2-5^2\right]\div(-4+1)$
$$=[64-25]\div(-4+1)$$
$$=39\div(-3)$$
$$=-13$$

41. $2+2^2-10-12=2+4-10-12$
$$=2+4+(-10)+(-12)$$
$$=6+(-10)+(-12)$$
$$=-4+(-12)$$
$$=-16$$

42. $14-4^2+2-10=14-16+2-10$
$$=14+(-16)+2+(-10)$$
$$=-2+2+(-10)$$
$$=0+(-10)$$
$$=-10$$

43. $\dfrac{3^2-27}{-9+6}=\dfrac{9-27}{-9+6}=\dfrac{-18}{-3}=6$

44. $\dfrac{8+(-2)^2}{-5+(-1)}=\dfrac{8+4}{-5+(-1)}=\dfrac{12}{-6}=-2$

45. $\dfrac{13-(2)(4)}{-1-2^2}=\dfrac{13-(2)(4)}{-1-4}$
$$=\dfrac{13-8}{-1-4}$$
$$=\dfrac{5}{-5}$$
$$=-1$$

46. $\dfrac{10-(-3)(5)}{-9-4^2}=\dfrac{10-(-3)(5)}{-9-16}$
$$=\dfrac{10-(-15)}{-9-16}$$
$$=\dfrac{10+15}{-9-16}$$
$$=\dfrac{25}{-25}$$
$$=-1$$

47. $\dfrac{|-23+7|}{5^2-(-3)^2}=\dfrac{|-23+7|}{25-9}=\dfrac{|-16|}{16}=\dfrac{16}{16}=1$

48. $\dfrac{|10-50|}{6^2-(-4)^2}=\dfrac{|10-50|}{36-16}=\dfrac{|-40|}{20}=\dfrac{40}{20}=2$

49. $21-\left[4-(5-8)\right]=21-\left[4-(-3)\right]$
$$=21-[4+3]$$
$$=21-7$$
$$=14$$

50.
$$15 - \left[10 - (20 - 25)\right] = 15 - \left[10 - (-5)\right]$$
$$= 15 - \left[10 + 5\right]$$
$$= 15 - 15$$
$$= 0$$

51.
$$-17 - 2\left[18 \div (-3)\right] = -17 - 2\left[-6\right]$$
$$= -17 - (-12)$$
$$= -17 + 12$$
$$= -5$$

52.
$$-8 - 5(-45 \div 15) = -8 - 5(-3)$$
$$= -8 - (-15)$$
$$= -8 + 15$$
$$= 7$$

53.
$$4 + 2\left[9 + (-4 + 12)\right] = 4 + 2\left[9 + 8\right]$$
$$= 4 + 2\left[17\right]$$
$$= 4 + 34$$
$$= 38$$

54.
$$-13 + 3\left[11 + (-15 + 10)\right]$$
$$= -13 + 3\left[11 + (-5)\right]$$
$$= -13 + 3\left[6\right]$$
$$= -13 + 18$$
$$= 5$$

55. $\$15x$

56. $\$12p$

57. $(t + 4)$ in.

58. $(h + 1)$ hr

59. $(v - 6)$ mph

60. $(A - 30)$ yr

61. $2g$

62. $2t$

63. $-12n$

64. $-3z$

65. $-9 - x$

66. $-18 - p$

67. $\dfrac{t}{-2}$

68. $\dfrac{-10}{w}$

69. $y + (-14)$

70. $c + (-150)$

71. $2(c + d)$

72. $2(a + b)$

73. $x - (-8)$

74. $m - (-5)$

75. $x + 9z = -10 + 9(-3) = -10 + (-27) = -37$

76. $a + 7b = -3 + 7(-6) = -3 + (-42) = -45$

77.
$$x + 5y + z = -10 + 5(5) + 2$$
$$= -10 + 25 + 2$$
$$= 15 + 2$$
$$= 17$$

78.
$$9p + 4t + w = 9(2) + 4(6) + (-50)$$
$$= 18 + 24 + (-50)$$
$$= 42 + (-50)$$
$$= -8$$

79.
$$a - b + 3c = -7 - (-2) + 3(4)$$
$$= -7 + 2 + 12$$
$$= -5 + 12$$
$$= 7$$

80. $w + 2y - z = -9 + 2(10) - (-3)$

$\qquad = -9 + 20 + 3$

$\qquad = 11 + 3$

$\qquad = 14$

81. $-3mn = -3(-8)(-2) = 24(-2) = -48$

82. $-5pq = -5(-4)(-2) = 20(-2) = -40$

83. $|-y| = |-(-9)| = |9| = 9$

84. $|-z| = |-(-18)| = |18| = 18$

85. $-|-w| = -|-(-4)| = -|4| = -4$

86. $-|-m| = -|-(-15)| = -|15| = -15$

87. $x^2 = (-3)^2 = (-3)(-3) = 9$

88. $n^2 = (-9)^2 = (-9)(-9) = 81$

89. $-x^2 = -(-3)^2 = -(-3)(-3) = 3(-3) = -9$

90. $-n^2 = -(-9)^2 = -(-9)(-9) = 9(-9) = -81$

91. $-4|x + 3y| = -4|5 + 3(-6)|$

$\qquad = -4|5 + (-18)|$

$\qquad = -4|-13|$

$\qquad = -4(13)$

$\qquad = -52$

92. $-2|4a - b| = -2|4(-8) - (-2)|$

$\qquad = -2|-32 + 2|$

$\qquad = -2|-30|$

$\qquad = -2(30)$

$\qquad = -60$

93. $6 - |m - n^2| = 6 - |-2 - 3^2|$

$\qquad = 6 - |-2 - 9|$

$\qquad = 6 - |-11|$

$\qquad = 6 - 11$

$\qquad = -5$

94. $4 - |c^2 - d^2| = 4 - |3^2 - (-5)^2|$

$\qquad = 4 - |9 - 25|$

$\qquad = 4 - |9 + (-25)|$

$\qquad = 4 - |-16|$

$\qquad = 4 - 16$

$\qquad = -12$

95. $\dfrac{-8 + (-11) + (-4) + 1 + 9 + 4 + (-5)}{7}$

$\qquad = \dfrac{-19 + (-4) + 1 + 9 + 4 + (-5)}{7}$

$\qquad = \dfrac{-23 + 1 + 9 + 4 + (-5)}{7}$

$\qquad = \dfrac{-22 + 9 + 4 + (-5)}{7}$

$\qquad = \dfrac{-13 + 4 + (-5)}{7}$

$\qquad = \dfrac{-9 + (-5)}{7}$

$\qquad = \dfrac{-14}{7}$

$\qquad = -2^\circ$

96. $\dfrac{15+12+10+3+0+(-2)+(-3)}{7}$

$= \dfrac{27+10+3+0+(-2)+(-3)}{7}$

$= \dfrac{37+3+0+(-2)+(-3)}{7}$

$= \dfrac{40+0+(-2)+(-3)}{7}$

$= \dfrac{38+(-3)}{7}$

$= \dfrac{35}{7}$

$= 5°$

97. $\dfrac{-8+(-8)+(-6)+(-5)+(-2)+(-3)+3+3+0+(-4)}{10}$

$= \dfrac{-16+(-6)+(-5)+(-2)+(-3)+3+3+0+(-4)}{10}$

$= \dfrac{-22+(-5)+(-2)+(-3)+3+3+0+(-4)}{10}$

$= \dfrac{-27+(-2)+(-3)+3+3+0+(-4)}{10}$

$= \dfrac{-29+(-3)+3+3+0+(-4)}{10}$

$= \dfrac{-32+3+3+0+(-4)}{10}$

$= \dfrac{-29+3+0+(-4)}{10}$

$= \dfrac{-26+0+(-4)}{10}$

$= \dfrac{-30}{10}$

$= -3$

98. $\dfrac{-6+(-2)+5+1+0+(-3)+4+2+(-7)+(-4)}{10}$

$= \dfrac{-8+5+1+0+(-3)+4+2+(-7)+(-4)}{10}$

$= \dfrac{-3+1+0+(-3)+4+2+(-7)+(-4)}{10}$

$= \dfrac{-2+0+(-3)+4+2+(-7)+(-4)}{10}$

$= \dfrac{-5+4+2+(-7)+(-4)}{10}$

$= \dfrac{-1+2+(-7)+(-4)}{10}$

$= \dfrac{1+(-7)+(-4)}{10}$

$= \dfrac{-6+(-4)}{10}$

$= \dfrac{-10}{10}$

$= -1$

Chapter 2   Review Exercises

Section 2.1

1. -4250 ft

2. $-\$3,000,000$

3 – 6.
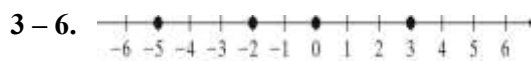
7. Opposite: 4; Absolute value: 4

8. Opposite: –6; Absolute value: 6

9. $\left|-3\right|=3$

10. $\left|-1000\right|=1000$

11. $\left|74\right|=74$

12. $\left|0\right|=0$

13. $-\left(-9\right)=9$

14. $-\left(-28\right)=28$

15. $-\left|-20\right|=-\left(20\right)=-20$

16. $-\left|-45\right|=-\left(45\right)=-45$

17. $-7=-7;$
$\quad\left|-7\right|=7;$
$\quad-7<\left|-7\right|$

18. $-12<-5$

19. $-\left(-4\right)=4;$
$\quad-\left|-4\right|=-\left(4\right)=-4;$
$\quad-\left(-4\right)>-\left|-4\right|$

20. $-20=-20;$
$\quad-\left|-20\right|=-\left(20\right)=-20;$
$\quad-20=-\left|-20\right|$

Section 2.2

21. $6+\left(-2\right)=4$

22. $-3+6=3$

23. $-3+\left(-2\right)=-5$

24. $-3+0=-3$

25. To add two numbers with the same sign, add their absolute values and apply the common sign.

26. To add two numbers with different signs, subtract the smaller absolute value from the larger absolute value. Then apply the

sign of the number having the larger absolute value.

27. $35+\left(-22\right)=13$

28. $-105+90=-15$

29. $-29+\left(-41\right)=-70$

30. $-98+\left(-42\right)=-140$

31. $-3+\left(-10\right)+12+14+\left(-10\right)$
$\qquad\qquad =-13+12+14+\left(-10\right)$
$\qquad\qquad =-1+14+\left(-10\right)$
$\qquad\qquad =13+\left(-10\right)$
$\qquad\qquad =3$

32. $9+\left(-15\right)+2+\left(-7\right)+\left(-4\right)$
$\qquad\qquad =-6+2+\left(-7\right)+\left(-4\right)$
$\qquad\qquad =-4+\left(-7\right)+\left(-4\right)$
$\qquad\qquad =-11+\left(-4\right)$
$\qquad\qquad =-15$

33. $23+\left(-35\right)=-12$

34. $57+\left(-10\right)=47$

35. $-5+\left(-13\right)+20=-18+20=2$

36. $-42+12=-30$

37. $-12+3=-9$

38. $-89+\left(-22\right)=-111$

39. $-4+9+\left(-3\right)+1+\left(-5\right)$
$\qquad\qquad =5+\left(-3\right)+1+\left(-5\right)$
$\qquad\qquad =2+1+\left(-5\right)$
$\qquad\qquad =3+\left(-5\right)$
$\qquad\qquad =-2$ in.
Caribou had below average snowfall.

40. $2+\left(-2\right)+\left(-1\right)+\left(-4\right)=0+\left(-1\right)+\left(-4\right)$
$\qquad\qquad =-1+\left(-4\right)$
$\qquad\qquad =-5$

Section 2.3

41. To subtract two integers, add the opposite of the second number to the first number.

42. $4 - (-23) = 4 + 23 = 27$

43. $19 - 44 = 19 + (-44) = -25$

44. $-2 - (-24) = -2 + 24 = 22$

45. $-289 - 130 = -289 + (-130) = -419$

46. $2 - 7 - 3 = 2 + (-7) + (-3)$
$$= -5 + (-3)$$
$$= -8$$

47. $-45 - (-77) + 8 = -45 + 77 + 8$
$$= 32 + 8$$
$$= 40$$

48. $-16 - 4 - (-3) = -16 + (-4) + 3$
$$= -20 + 3$$
$$= -17$$

49. $99 - (-7) - 6 = 99 + 7 + (-6)$
$$= 106 + (-6)$$
$$= 100$$

50. **(a)** $8 - 10 = 8 + (-10) = -2$
(b) $10 - 8 = 10 + (-8) = 2$

51. For example: 14 subtracted from –2

52. For example: Subtract –7 from –25

53. $-1 - (-6) = -1 + 6 = 5$
The temperature rose 5°F.

54. $-40 + 132 = 92$
Sam's new balance is $92.

55. $\dfrac{-3 + 4 + 0 + 9 + (-2) + (-1) + 0 + 5 + (-3)}{9}$
$$= \frac{1 + 0 + 9 + (-2) + (-1) + 0 + 5 + (-3)}{9}$$
$$= \frac{10 + (-2) + (-1) + 0 + 5 + (-3)}{9}$$
$$= \frac{8 + (-1) + 0 + 5 + (-3)}{9}$$
$$= \frac{7 + 0 + 5 + (-3)}{9}$$
$$= \frac{12 + (-3)}{9}$$
$$= \frac{9}{9}$$
$$= 1$$
The average is 1 above par.

56. $2400 - (-1050) = 2400 + 1050 = 3450$ ft

Section 2.4

57. $6(-3) = -18$

58. $\dfrac{-12}{4} = -3$

59. $\dfrac{-900}{-60} = 15$

60. $(-7)(-8) = 56$

61. $-36 \div 9 = -4$

62. $60 \div (-5) = -12$

63. $(-12)(-4)(-1)(-2) = 48(-1)(-2)$
$$= -48(-2)$$
$$= 96$$

64. $(-1)(-8)(2)(1)(-2) = 8(2)(1)(-2)$
$$= 16(1)(-2)$$
$$= 16(-2)$$
$$= -32$$

65. $-15 \div 0 =$ Undefined

Section 2.5

66. $\dfrac{0}{-5} = 0$

67. $-5^3 = -(5)(5)(5) = -5(5)(5)$
$\quad\quad = -25(5) = -125$

68. $(-5)^3 = (-5)(-5)(-5) = 25(-5) = -125$

69. $(-6)^2 = (-6)(-6) = 36$

70. $-6^2 = -(6)(6) = -6(6) = -36$

71. $(-1)^{10}$
$\quad = -1(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)$
$\quad = 1(-1)(-1)(-1)(-1)(-1)(-1)(-1)(-1)$
$\quad = -1(-1)(-1)(-1)(-1)(-1)(-1)$
$\quad = 1(-1)(-1)(-1)(-1)(-1)(-1)$
$\quad = -1(-1)(-1)(-1)(-1)$
$\quad = 1(-1)(-1)(-1)(-1)$
$\quad = -1(-1)(-1)$
$\quad = 1(-1)(-1)$
$\quad = -1(-1)$
$\quad = 1$

72. $(-1)^{21} = -1$

73. Negative

74. Positive

75. $-45 \div (-15) = 3$

76. $\square 4 g 9 = -76$

77. $\dfrac{-12}{4} = -3^\circ \text{F}$

78. $550 - 4(160) = 550 - 640$
$\quad\quad\quad = 550 + (-640)$
$\quad\quad\quad = -\$90$

79. $50 - 3(6 - 2) = 50 - 3(4)$
$\quad\quad\quad\quad\quad = 50 - 12$
$\quad\quad\quad\quad\quad = 50 + (-12)$
$\quad\quad\quad\quad\quad = 38$

80. $48 - 8 \div (-2) + 5 = 48 - (-4) + 5$
$\quad\quad\quad\quad\quad\quad = 48 + 4 + 5$
$\quad\quad\quad\quad\quad\quad = 52 + 5$
$\quad\quad\quad\quad\quad\quad = 57$

81. $28 \div (-7) \square 3 - (-1) = -4 \square 3 - (-1)$
$\quad\quad\quad\quad\quad\quad\quad = -12 + 1$
$\quad\quad\quad\quad\quad\quad\quad = -11$

82. $(-4)^2 \div 8 - (-6) = 16 \div 8 - (-6)$
$\quad\quad\quad\quad\quad\quad = 2 + 6$
$\quad\quad\quad\quad\quad\quad = 8$

83. $\left[10 - (-3)^2\right](-11) + 4 = [10 - 9](-11) + 4$
$\quad\quad\quad\quad\quad\quad\quad\quad = 1(-11) + 4$
$\quad\quad\quad\quad\quad\quad\quad\quad = -11 + 4$
$\quad\quad\quad\quad\quad\quad\quad\quad = -7$

84. $\left[-9 - (-7)\right]^2 \square 3 \div (-6) = (-2)^2 \square 3 \div (-6)$
$\quad\quad\quad\quad\quad\quad\quad\quad = 4 \square 3 \div (-6)$
$\quad\quad\quad\quad\quad\quad\quad\quad = 12 \div (-6)$
$\quad\quad\quad\quad\quad\quad\quad\quad = -2$

85. $\dfrac{100 - 4^2}{(-7)(6)} = \dfrac{100 - 16}{(-7)(6)} = \dfrac{84}{-42} = -2$

86. $\dfrac{18 - 3(-2)}{4^2 - 8} = \dfrac{18 - 3(-2)}{16 - 8} = \dfrac{18 - (-6)}{16 - 8}$
$\quad\quad\quad\quad = \dfrac{18 + 6}{16 - 8} = \dfrac{24}{8} = 3$

87. $5 - 2[-3 + (2 - 5)] = 5 - 2[-3 + (-3)]$
$$= 5 - 2[-6]$$
$$= 5 - (-12)$$
$$= 5 + 12$$
$$= 17$$

88. $-10 + 3[4 - (-2 + 7)] = -10 + 3[4 - 5]$
$$= -10 + 3[-1]$$
$$= -10 + (-3)$$
$$= -13$$

89. $(a + 8)$ yr

90. $3n$

91. $-5x$

92. $p - 12$

93. $(a + b) + 2$

94. $\dfrac{w}{4}$

95. $y - (-8)$

96. $2(5 + z)$

97. $3x - 2y = 3(-5) - 2(4)$
$$= -15 - 8$$
$$= -15 + (-8)$$
$$= -23$$

98. $5(a - 4b) = 5(-3 - 4(2))$
$$= 5(-3 - 8)$$
$$= 5(-3 + (-8))$$
$$= 5(-11)$$
$$= -55$$

99. $-2(x + y)^2 = -2(6 + (-9))^2$
$$= -2(-3)^2$$
$$= -2(9)$$
$$= -18$$

100. $-3w^2 - 2z = -3(-4)^2 - 2(-9)$
$$= -3(16) - 2(-9)$$
$$= -48 - (-18)$$
$$= -48 + 18$$
$$= -30$$

101. $-|x| = -|-2| = -(2) = -2$

102. $-|-x| = -|-(-5)| = -|5| = -(5) = -5$

103. $-(-x) = -(-(-10)) = -(10) = -10$

104. $-(-x) = -(-5) = 5$

Chapter 2   Test

1. $-\$220$

2. 26

3. $-5 < -2$

4. $|-5| = 5$;
$|-2| = 2$;
$|-5| > |-2|$

5. $0 = 0$;
$-(-2) = 2$;
$0 < -(-2)$

6. $-|-12| = -(12) = -12$;
$-12 = -12$;
$-|-12| = -12$

7. $-|-9|=-(9)=-9;$

   $9=9;$

   $-|-9|<9$

8. $-5^2=-(5)(5)=-5(5)=-25;$

   $(-5)^2=(-5)(-5)=25;$

   $-5^2<(-5)^2$

9. $|-10|=10$

10. $-(-10)=10$

11. $9+(-14)=-5$

12. $-23+(-5)=-28$

13. $-4-(-13)=-4+13=9$

14. $-30-11=-30+(-11)=-41$

15. $-15+21=6$

16. $5-28=5+(-28)=-23$

17. $6(-12)=-72$

18. $(-11)(-8)=88$

19. $\dfrac{-24}{-12}=2$

20. $\dfrac{54}{-3}=-18$

21. $\dfrac{-44}{0}=$ Undefined

22. $(-91)(0)=0$

23. $-3(-7)=21$

24. $-13+8=-5$

25. $18-(-4)=18+4=22$

26. $6\div(-2)=-3$

27. $-8+5=-3$

28. $-3+15+(-6)+(-1)=12+(-6)+(-1)$

   $\qquad\qquad\qquad\qquad=6+(-1)$

   $\qquad\qquad\qquad\qquad=5$

29. $-1+2+(-4)+(-2)+(-2)$

   $\qquad\qquad=1+(-4)+(-2)+(-2)$

   $\qquad\qquad=-3+(-2)+(-2)$

   $\qquad\qquad=-5+(-2)$

   $\qquad\qquad=-7$ in

   Atlanta had below average rainfall.

30. $\dfrac{-35}{5}=-7°\,\text{F}$

31. **(a)** $(-8)^2=(-8)(-8)=64$

   (b) $-8^2=-(8)(8)=-8(8)=-64$

   (c) $(-4)^3=(-4)(-4)(-4)$

   $\qquad\quad=16(-4)=-64$

   (d) $-4^3=-(4)(4)(4)=-4(4)(4)$

   $\qquad\quad=-16(4)=-64$

32. $-14+22-(-5)+(-10)$

   $\qquad\quad=-14+22+5+(-10)$

   $\qquad\quad=8+5+(-10)$

   $\qquad\quad=13+(-10)$

   $\qquad\quad=3$

33. $(-3)(-1)(-4)(-1)(-5)$

   $\qquad\quad=3(-4)(-1)(-5)$

   $\qquad\quad=-12(-1)(-5)$

   $\qquad\quad=12(-5)$

   $\qquad\quad=-60$

34. $16-2[5-(1-4)]=16-2[5-(-3)]$

   $\qquad\qquad\qquad=16-2[5+3]$

   $\qquad\qquad\qquad=16-2[8]$

   $\qquad\qquad\qquad=16-16$

   $\qquad\qquad\qquad=0$

35. $-20 \div (-2)^2 + (-14) = -20 \div 4 + (-14)$
$$= -5 + (-14)$$
$$= -19$$

36. $12 \cdot (-6) + [20 - (-12)] - 15$
$$= 12 \cdot (-6) + 32 - 15$$
$$= -72 + 32 - 15$$
$$= -40 - 15 = -55$$

37. $\dfrac{24 - 2|3 - 9|}{8 - 2^2} = \dfrac{24 - 2|-6|}{8 - 2^2}$
$$= \dfrac{24 - 2(6)}{8 - 4}$$
$$= \dfrac{24 - 12}{8 - 4}$$
$$= \dfrac{12}{4}$$
$$= 3$$

38. $\$18m$

39. $-x^2 + y^2 = -(4)^2 + (-1)^2 = -16 + 1 = -15$

40. $-4m - 3n = -4(-6) - 3(4) = 24 - 12 = 12$

Chapters 1–2   Cumulative Review Exercises

1. Ten-thousands place

2. One hundred thirty is less than two hundred forty-four.

3. 132   100
    589   600
    490   500
        1200 ft

4. $73 + 41 = 114$

5. $71 + (-4) + 81 + (-106) = 67 + 81 + (-106)$
$$= 148 + (-106)$$
$$= 42$$

6. $284 - 171 - (-84) - 393$
$$= 284 + (-171) + 84 + (-393)$$
$$= 113 + 84 + (-393)$$
$$= 197 + (-393)$$
$$= -196$$

7.
```
    9 9
  10 10 11
  1 0 0 1
  − 2 3 5
    7 6 6
```

8. $-386 \div (-2) = 193$

9. $-386 \div (-2) = 193$

10.
```
      105 R 2
  7) 737
     −7
      03
     −0
      37
     −35
       2
```

11.
```
       409
     × 228
     1 1
   1 3 272
     8 180
  + 81 800
    93,252
```

12. $\dfrac{0}{-61} = 0$

13. $0\overline{)341}$ Undefined

14. $5(28) = 140$ m^2

15. (a) $-|-4| = -(4) = -4$
    (b) $-(-4) = 4$

(c) $-4^2 = -(4)(4) = -4(4) = -16$

(d) $(-4)^2 = (-4)(-4) = 16$

16. $-14 - 2(9 - 5^2) = -14 - 2(9 - 25)$

$$= -14 - 2(9 + (-25))$$
$$= -14 - 2(-16)$$
$$= -14 - (-32)$$
$$= -14 + 32$$
$$= 18$$

17. $x^2 - x + y = (-4)^2 - (-4) + 1$

$$= 16 + 4 + 1 = 20 + 1 = 21$$

18. $|x - y| = |-4 - 1| = |-5| = 5$

19. (a) $30 \cdot 4 = 120$

$120 \div 3 = 40$ days

Torie can take the herb for 40 days if she takes 3 a day

(b) $120 \div 2 = 60$ days

Torie can take the herb for 60 days if she takes 2 a day.

20. $\dfrac{-8 + (-11) + 3 + 6 + 0 + (-8) + (-10)}{7}$

$$= \frac{-19 + 3 + 6 + 0 + (-8) + (-10)}{7}$$

$$= \frac{-16 + 6 + 0 + (-8) + (-10)}{7}$$

$$= \frac{-10 + 0 + (-8) + (-10)}{7}$$

$$= \frac{-18 + (-10)}{7} = \frac{-28}{7} = -4°\text{F}$$