Chapter 2

Integers

Exercise Set 2.1

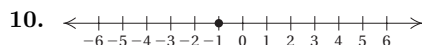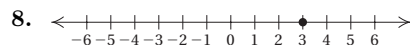**RC2.** $|0| = 0$; this is point C.

RC4. E

RC6. F lies to the right of E on the number line, so it is true that $F > E$.

RC8. A lies to the left of B on the number line, so it is false that $A > B$.

2. $750; -125$

4. $-58.5; 56.5$

6. -35

8.

10.

12. $3 > 0$

14. $6 > -6$

16. $0 > -9$

18. $-4 < -3$

20. $-3 > -4$

22. $-10 > -14$

24. $-3 < -2$

26. $2 > -12$

28. The distance of -6 from 0 is 6, so $|-6| = 6$.

30. The distance of 0 from 0 is 0, so $|0| = 0$.

32. The distance of -4 from 0 is 4, so $|-4| = 4$.

34. The distance of 217 from 0 is 217, so $|217| = 217$.

36. The distance of 47 from 0 is 47, so $|47| = 47$.

38. The distance of -76 from 0 is 76, so $|-76| = 76$.

40.
$$\begin{array}{r} \overset{1}{} \; \overset{1}{} \\ 2\,7\,8 \\ +\,8\,2\,9 \\ \hline 1\,1\,0\,7 \end{array}$$

42.
$$\begin{array}{r} \overset{4}{} \; \overset{11}{} \\ 6\,\cancel{5}\,\cancel{1} \\ -\,4\,3\,2 \\ \hline 2\,1\,9 \end{array}$$

44.
$$\begin{array}{r} \overset{12}{} \\ \overset{3}{}\;\overset{\cancel{2}}{}\;9\;9\;14 \\ \cancel{4}\,\cancel{3,0\,0\,4} \\ -\,3\,4,2\,2\,6 \\ \hline 8\,7\,7\,8 \end{array}$$

46. $|4| = 4$, and $|-7| = 7$. Since 4 is to the left of 7 we have $|4| < |-7|$.

48. Note that $|-6| = 6$, $2^2 = 4$, $|3| = 3$, and $1^6 = 1$. Then we have
$$-10, \ -6, \ -5, \ 0, \ 1^6, \ |3|, \ 2^2, \ |-6|, \ 7.$$

Exercise Set 2.2

RC2. To add $-3 + (-5)$, start at 0, move <u>left</u> to -3, and then move 5 units <u>left</u>. The sum is -8.

RC4. To add $-8 + 3$, start at 0, move <u>left</u> to -8, and then move 3 units <u>right</u>. The sum is -5.

2. -3

4. 1

6. 0

8. -14

10. -10

12. -36

14. 0

16. -37

18. 0

20. 0

22. 1

24. -2

26. 11

28. 0

30. 20

32. -1

34. -13

36. 16

38. $-10 + (-8) + 3 = -18 + 3 = -15$

40. $-1 + 20 + (-1) = 19 + (-1) = 18$

42. $28 + (-44) + 17 + 31 + (-94) = 76 + (-138) = -62$

44. $24 + 3 + (-44) + (-8) + 63 = 90 + (-52) = 38$

46. $-455 + (-123) + 1026 + (-919) + 213 + 111 + (-874) = -2371 + 1350 = -1021$

48. 84

50. -36

52. 26

54. -52

56. 31

58. -18

60. -33

62. 17

64.
$$
\begin{array}{r}
\scriptstyle 3\ 2 \\
\scriptstyle 5\ 3 \\
2\ 6\ 4 \\
\times\ 5\ 1\ 9 \\
\hline
2\ 3\ 7\ 6 \\
2\ 6\ 4\ 0 \\
1\ 3\ 2\ 0\ 0\ 0 \\
\hline
1\ 3\ 7,0\ 1\ 6
\end{array}
$$

66.
$$
\begin{array}{r}
4\ 0\ 8 \\
6\,\overline{\smash{\big)}\,2\ 4\ 5\ 1} \\
2\ 4\ 0\ 0 \\
\hline
5\ 1 \\
4\ 8 \\
\hline
3
\end{array}
$$

The answer is 408 R 3.

68.
$$
\begin{array}{r}
2\ 2\ 1 \\
4\ 0\ 4\,\overline{\smash{\big)}\,8\ 9,6\ 1\ 5} \\
8\ 0\ 8\ 0\ 0 \\
\hline
8\ 8\ 1\ 5 \\
8\ 0\ 8\ 0 \\
\hline
7\ 3\ 5 \\
4\ 0\ 4 \\
\hline
3\ 3\ 1
\end{array}
$$

The answer is 221 R 331.

70. 641,500

72. When x is negative, the inverse of x, $-x$, is positive.

74. If $n = m$ and n is negative, then m is also negative and $-n$ and $-m$ are both positive. Thus, $-n + (-m)$, the sum of two positive numbers, is <u>positive</u>.

Exercise Set 2.3

RC2. $-18 - (-6) = -18 + 6$; the correct choice is (b).

RC4. $18 - (-6) = 18 + 6$; the correct choice is (a).

2. -5

4. -8

6. 2

8. 0

10. -5

12. 19

14. 3

16. 0

18. -11

20. 16

22. -16

24. -6

26. -10

28. -2

30. -45

32. -81

34. -52

36. 121

38. -7

40. -4

42. -8

44. -13

46. 22

48. 6

50. -16

52. -6

54. -21

56. 17

58. -26

60. 0

62. 24

64. 41

66. -22

68. 22

70. 4

72. 116

74. 190

76. Let $D =$ the difference in elevations.
$$D = 29,035 \text{ ft} - (-1348 \text{ ft}) = 30,383 \text{ ft}$$

78. Let A = the amount owed on the account.

$A = \$327 - \$200 + \$48 = \$175$

80. Let S = the final value of the stock.

$S = \$61 + \$5 - \$7 + \$3 = \$62$

82. Let B = the balance after the check is written.

$B = \$825 - \$920 = -\$95$

84. Let D = the difference in elevation.

$D = -131 \text{ ft} - (-512 \text{ ft}) = 381 \text{ ft}$

86. $5^3 = 5 \cdot 5 \cdot 5 = 125$

88. $3 \cdot 16 - (7 - 1) \div 6 - (10 - 4)$

$= 3 \cdot 16 - 6 \div 6 - 6$

$= 48 - 1 - 6$

$= 47 - 6$

$= 41$

90. $27 - 2^3 \cdot 3 = 27 - 8 \cdot 3 = 27 - 24 = 3$

92. $24 \cdot 12 \text{ oz} = 288 \text{ oz}$

94. False; $5 - 0 = 5$, but $0 - 5 = -5$.

96. True

98. False; $3 - 3 = 0$, but $3 \neq -3$.

100. True

Chapter 2 Mid-Chapter Review

1. The statement is true. See page 86 in the text.

2. If $a > b$, then a lies to the right of b on the number line. Thus, the given statement is false.

3. The absolute value of a number is its distance from zero on the number line. Since distance is always nonnegative, the absolute value of a number is always nonnegative. The given statement is true.

4. $-x = -(-4) = 4$

$-(-x) = -(-(-4)) = -(4) = -4$

5. $5 - 13 = 5 + (-13) = -8$

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

7. The integer 450 corresponds to a $450 deposit; the integer -79 corresponds to writing a check for $79.

8. The integer 20 corresponds to a 20° increase in temperature; the integer -23 corresponds to a 23° drop in temperature.

9. We locate the point -3 on the number line and mark it with a dot.

10. We locate the point 0 on the number line and mark it with a dot.
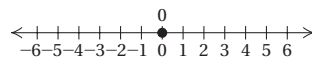
11. Since -6 is to the left of 6, we have $-6 < 6$.

12. Since -5 is to the left of -3, we have $-5 < -3$.

13. Since -9 is to the right of -10, we have $-9 > -10$.

14. Since 5 is to the right of 0, we have $5 > 0$.

15. The distance of 15 from 0 is 15, so $|15| = 15$.

16. The distance of -18 from 0 is 18, so $|-18| = 18$.

17. The distance of 0 from 0 is 0, so $|0| = 0$.

18. The distance of -12 from 0 is 12, so $|-12| = 12$.

19. The additive inverse of -5 is 5 because $-5 + 5 = 0$.

20. The additive inverse of 7 is -7 because $7 + (-7) = 0$.

21. The additive inverse of 0 is 0 because $0 + 0 = 0$.

22. The additive inverse of -49 is 49 because $-49 + 49 = 0$.

23. If $x = -19$, then $-x = -(-19) = 19$.

24. If $x = 2$, then $-(-x) = -(-2) = 2$.

25. $7 + (-9)$ The absolute values are 7 and 9. The difference is $9 - 7$, or 2. The negative number has the larger absolute value, so the answer is negative. $7 + (-9) = -2$

26. $-3 + 1$ The absolute values are 3 and 1. The difference is $3 - 1$, or 2. The negative number has the larger absolute value, so the answer is negative. $-3 + 1 = -2$

27. $3 + (-3)$ A positive and a negative number. The numbers have the same absolute value. The sum is 0. $3 + (-3) = 0$

28. $-8 + (-9)$ Two negative numbers. Add the absolute values, 8 and 9, getting 17. Make the answer negative. $-8 + (-9) = -17$

29. $2 + (-12)$ The absolute values are 2 and 12. The difference is $12 - 2$, or 10. The negative number has the larger absolute value, so the answer is negative. $2 + (-12) = -10$

30. $-4 + (-3)$ Two negative numbers. Add the absolute values, 4 and 3, getting 7. Make the answer negative. $-4 + (-3) = -7$

31. $-14 + 5$ The absolute values are 14 and 5. The difference is $14 - 5$, or 9. The negative number has the larger absolute value, so the answer is negative. $-14 + 5 = -9$
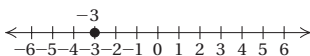
32. $19 + (-21)$ The absolute values are 19 and 21. The difference is $21 - 19$, or 2. The negative number has the larger absolute value, so the answer is negative. $19 + (-21) = -2$
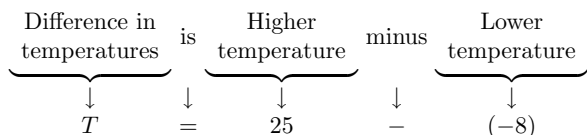
33. $-4 - 6 = -4 + (-6) = -10$

34. $5 - (-11) = 5 + 11 = 16$

35. $-1 - (-3) = -1 + 3 = 2$

36. $12 - 24 = 12 + (-24) = -12$

37. $-8 - (-4) = -8 + 4 = -4$

38. $-1 - 5 = -1 + (-5) = -6$

39. $12 - 14 = 12 + (-14) = -2$

40. $6 - (-7) = 6 + 7 = 13$

41. $16 - (-9) - 20 - (-4) = 16 + 9 + (-20) + 4 = 9$

42. $-4 + (-10) - (-3) - 12 = -4 + (-10) + 3 + (-12) = -23$

43. $17 - (-25) + 15 - (-18) = 17 + 25 + 15 + 18 = 75$

44. $-9 + (-3) + 16 - (-10) = -9 + (-3) + 16 + 10 = 14$

45. Let T = the difference in the temperatures, in degrees Celsius.

$$\underbrace{\text{Difference in temperatures}}_{\downarrow \atop T} \;\; \underset{\underset{=}{\downarrow}}{\text{is}} \;\; \underbrace{\text{Higher temperature}}_{\downarrow \atop 25} \;\; \underset{\underset{-}{\downarrow}}{\text{minus}} \;\; \underbrace{\text{Lower temperature}}_{\downarrow \atop (-8)}$$

We carry out the subtraction.

$T = 25 - (-8) = 25 + 8 = 33$

The difference in the two temperature is 33°C.

46. Let S = the final value of the stock.

$$\underbrace{\text{Final value}}_{\downarrow \atop S} \underset{\underset{=}{\downarrow}}{=} \underbrace{\text{Beginning price}}_{\downarrow \atop 56} \underset{\underset{+}{\downarrow}}{+} \underbrace{\text{First change}}_{\downarrow \atop (-3)} \underset{\underset{+}{\downarrow}}{+} \underbrace{\text{Second change}}_{\downarrow \atop 1} \underset{\underset{+}{\downarrow}}{+} \underbrace{\text{Third change}}_{\downarrow \atop (-6)}$$

We carry out the addition.

$S = 56 + (-3) + 1 + (-6) = 48$

The final value of the stock was $48.

47. Answers will vary.

48. The absolute value of a number is its distance from 0, and distance is always nonnegative.

49. Answers may vary. If we think of the addition on the number line, we start at a negative number and move to the left. This always brings us to a point on the negative portion of the number line.

50. Yes; consider $m - (-n)$ where both m and n are positive. Then $m - (-n) = m + n$. Now $m + n$, the sum of two positive numbers, is positive.

Exercise Set 2.4

RC2. To multiply two negative numbers, we multiply their absolute values. The answer is <u>positive</u>.

RC4. The product of an odd number of negative numbers is <u>negative</u>.

2. -15

4. -10

6. -60

8. 20

10. 18

12. 110

14. 195

16. -1677

18. -194

20. -66

22. 30

24. 128

26. -63

28. 200

30. -48

32. -72

34. 756

36. -96

38. -70

40. 30

42. 70

44. -5712

46. -120

48. -70

50. 120

52. -5184

54. 48

56. 5040

58. 237,500

60. 13

62. $3 + 6[18 - (12 + 3)] = 3 + 6[18 - 15]$
$= 3 + 6[3]$
$= 3 + 18$
$= 21$

Exercise Set 2.5

RC2. True; see page 110 in the text.

RC4. False; see page 111 in the text.

2. -6

4. -2

6. 9

8. 8

10. -2

12. -25

14. 8

16. 30

18. 0

20. 29

22. Let $l =$ the amount of juice left in the container at the end of the week, in ounces.

$l = 64 - 7 \cdot 8 = 64 - 56 = 8$ oz

24. Decrease in population: $4 \cdot 380 = 1520$

Population after 4 years: $12,500 - 1520 = 10,980$

26. Total amount of purchases: $7 \cdot \$39 = \$273$

New balance: $\$234 - \$273 = -\$39$

28. $\begin{aligned} 8 - (2 \cdot 3 - 9) &= 8 - (6 - 9) \\ &= 8 - (-3) \\ &= 11 \end{aligned}$

30. $\begin{aligned} (8 - 2)(3 - 9) &= 6(-6) \\ &= -36 \end{aligned}$

32. $\begin{aligned} 10 \cdot 20 - 15 \cdot 24 &= 200 - 360 \\ &= -160 \end{aligned}$

34. $\begin{aligned} 40 - 3^2 - 2^3 &= 40 - 9 - 8 \\ &= 31 - 8 \\ &= 23 \end{aligned}$

36. $\begin{aligned} 4^3 + 10 \cdot 20 + 8^2 - 23 &= 64 + 10 \cdot 20 + 64 - 23 \\ &= 64 + 200 + 64 - 23 \\ &= 264 + 64 - 23 \\ &= 328 - 23 \\ &= 305 \end{aligned}$

38. $\begin{aligned} 4 \cdot (6 + 8) \div (4 + 3) &= 4 \cdot 14 \div 7 \\ &= 56 \div 7 \\ &= 8 \end{aligned}$

40. $\begin{aligned} 5^3 - 7^2 &= 125 - 49 \\ &= 76 \end{aligned}$

42. $\begin{aligned} 10(-5) + 1(-1) &= -50 - 1 \\ &= -51 \end{aligned}$

44. $\begin{aligned} 14 - 2(-6) + 7 &= 14 + 12 + 7 \\ &= 26 + 7 \\ &= 33 \end{aligned}$

46. $\begin{aligned} -32 - 8 \div 4 - (-2) &= -32 - 2 - (-2) \\ &= -34 - (-2) \\ &= -32 \end{aligned}$

48. $-5^2 + 7 = -25 + 7 = -18$

50. $-9^2 - 11 = -81 - 11 = -92$

52. $\begin{aligned} 20 + 4^3 \div (-8) &= 20 + 64 \div (-8) \\ &= 20 - 8 \\ &= 12 \end{aligned}$

54. $\begin{aligned} -7(3^4) + 18 &= -7(81) + 18 \\ &= -567 + 18 \\ &= -549 \end{aligned}$

56. $\begin{aligned} 8[(6 - 13) - 11] &= 8[-7 - 11] \\ &= 8[-18] \\ &= -144 \end{aligned}$

58. $\begin{aligned} 256 \div (-32) \div (-4) &= -8 \div (-4) \\ &= 2 \end{aligned}$

60. $\begin{aligned} (8 - 7) - 9 &= 1 - 9 \\ &= -8 \end{aligned}$

62. $\begin{aligned} &(-3 - 5^3 - 4^3) \div (6^2 - 10^2) \\ &= (-3 - 125 - 64) \div (36 - 100) \\ &= -192 \div (-64) \\ &= 3 \end{aligned}$

64. $\begin{aligned} &\frac{(3 - 5)^2 - 4(5 - 13)}{(12 - 9)^2 + (11 - 14)^2} \\ &= \frac{(-2)^2 - 4(-8)}{3^2 + (-3)^2} \\ &= \frac{4 - 4(-8)}{9 + 9} \\ &= \frac{4 + 32}{18} \\ &= \frac{36}{18} \\ &= 2 \end{aligned}$

66. 8,473,901

The digit 8 means 8 millions.

68. 23,803

The digit 8 means 8 hundreds.

70.
$$\begin{array}{r} \overset{\scriptstyle 12}{} \\ \overset{\scriptstyle 1\ 9\ \not{2}\ 17}{\not{2}\,\not{0}\,\not{3}\,\not{7}} \\ -\ 1\ 1\ 8\ 9 \\ \hline 8\ 4\ 8 \end{array}$$

72.
$$\begin{array}{r} \overset{\scriptstyle 12}{} \\ \overset{\scriptstyle 1\ \not{2}\ 12}{1\ \not{2},\ \not{3}\ \not{2}\ 7} \\ -\quad\ 4\ 7\ 6 \\ \hline 1\ 1,\ 8\ 5\ 1 \end{array}$$

74. Maple trees: $13 \cdot \$23 = \$299$
Oak trees: $17 \cdot \$37 = \$629$
Total cost: $\$299 + \$629 = \$928$

76. Use a calculator.
$\begin{aligned} \frac{19 - 17^2}{13^2 - 34} &= \frac{19 - 289}{169 - 34} \\ &= \frac{-270}{135} \\ &= -2 \end{aligned}$

78. $-n$ and m are negativee, so $\dfrac{-n}{m}$ is the quotient of two negative numbers and, thus, is positive.

80. $\dfrac{-n}{m}$ is positive (see Exercise 78), so $-\left(\dfrac{-n}{m}\right)$ is the opposite of a positive number and, thus, is negative.

Chapter 2 Vocabulary Reinforcement

1. The <u>integers</u> are $\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots$.

2. The <u>absolute</u> value of a number is its distance from zero on the number line.

3. Numbers such as -3 and 3 are called <u>opposites</u>, or <u>additive</u> inverses.

4. The <u>difference</u> $a - b$ is the number c for which $a = b + c$.

5. The <u>quotient</u> $a \div b$, where $b \neq 0$, is the unique number c for which $a = b \cdot c$.

6. The product of two negative numbers is <u>positive</u>.

Chapter 2 Concept Reinforcement

1. False; see page 93 in the text.

2. True; see pages 94 and 95 in the text.

3. True; see page 107 in the text.

4. For a number n, $-(-n) = n \neq \dfrac{1}{n}$. The given statement is false.

Chapter 2 Study Guide

1. Locate the point 4 on the number line and mark it with a dot.

2. Since -7 is to the left of 1 on the number line, we have $-7 < 1$.

3. a) The number is negative, so we make it positive.
$|-17| = 17$
b) The number is positive, so the absolute value is the same as the number. $|14| = 14$

4. $6 + (-9)$ The absolute values are 6 and 9. The difference is $9 - 6$, or 3. The negative number has the larger absolute value, so the answer is negative. $6 + (-9) = -3$

5. $-5 + (-3)$ Two negative numbers. We add the absolute values, 5 and 3, getting 8. Make the answer negative. $-5 + (-3) = -8$

6. $6 - (-8) = 6 + 8 = 14$

7. $-9(-8) = 72$

8. $6(-15) = -90$

9. $-32 \div (-8) = 4$ Check: $4(-8) = -32$

10. $48 \div (-12) = -4$ Check: $-4(-12) = 48$

Chapter 2 Review Exercises

1. The integer 620 corresponds to earning \$620; the integer -125 corresponds to getting a speeding ticket for \$125.

2. The distance of -38 from 0 is 38, so $|-38| = 38$.

3. The distance of 7 from 0 is 7, so $|7| = 7$.

4. The distance of 0 from 0 is 0, so $|0| = 0$.

5. The distance of -2 from 0 is 2, so $|-2| = 2$. Then $-|-2| = -(2) = -2$.

6. Since -3 is to the left of 10, we have $-3 < 10$.

7. Since -1 is to the right of -6, we have $-1 > -6$.

8. Since 11 is to the right of -12, we have $11 > -12$.

9. Since -2 is to the left of -1, we have $-2 < -1$.

10.

11.

12. The opposite of 8 is -8 because $8 + (-8) = 0$.

13. The opposite of -14 is 14 because $-14 + 14 = 0$.

14. The opposite of 0 is 0 because $0 + 0 = 0$.

15. The opposite of -23 is 23 because $-23 + 23 = 0$.

16. If $x = -34$, then $-x = -(-34) = 34$.

17. If $x = 5$, then $-(-x) = -(-5) = 5$.

18. $4 + (-7)$

The absolute values are 4 and 7. The difference is $7 - 4$, or 3. The negative number has the larger absolute value, so the answer is negative. $4 + (-7) = -3$

19. $-8 + 1$

The absolute values are 8 and 1. The difference is $8 - 1$, or 7. The negative number has the larger absolute value, so the answer is negative. $-8 + 1 = -7$

20. $6 + (-9) + (-8) + 7$
a) Add the negative numbers: $-9 + (-8) = -17$
b) Add the positive numbers: $6 + 7 = 13$
c) Add the results: $-17 + 13 = -4$

21. $-4 + 5 + (-12) + (-4) + 10$
a) Add the negative numbers: $-4 + (-12) + (-4) = -20$
b) Add the positive numbers: $5 + 10 = 15$
c) Add the results: $-20 + 15 = -5$

22. $-3 - (-7) = -3 + 7 = 4$

23. $-9 - 5 = -9 + (-5) = -14$

24. $-4 - 4 = -4 + (-4) = -8$

25. $-9 \cdot (-6) = 54$

26. $-3(13) = -39$

27. $7 \cdot (-8) = -56$

28. $3 \cdot (-7) \cdot (-2) \cdot (-5) = -21 \cdot 10 = -210$

29. $35 \div (-5) = -7$ Check: $-7 \cdot (-5) = 35$

30. $-51 \div 17 = -3$ Check: $-3 \cdot (17) = -51$

31. $-42 \div (-7) = 6$ Check: $6 \cdot (-7) = -42$

32.
$$\begin{aligned}
&[-12(-3) - 2^3] - (-9)(-10) \\
&= [-12(-3) - 8] - (-9)(-10) \\
&= [36 - 8] - (-9)(-10) \\
&= 28 - (-9)(-10) \\
&= 28 - 90 \\
&= -62
\end{aligned}$$

33.
$$\begin{aligned}
2(-3 - 12) - 8(-7) &= 2(-15) - 8(-7) \\
&= -30 + 56 \\
&= 26
\end{aligned}$$

34. $625 \div (-25) \div 5 = -25 \div 5 = -5$

35.
$$\begin{aligned}
-16 \div 4 - 30 \div (-5) &= -4 - (-6) \\
&= -4 + 6 \\
&= 2
\end{aligned}$$

36. $9[(7 - 14) - 13] = 9[-7 - 13] = 9[-20] = -180$

37. Let a = Chang's total assets after he borrows \$2500.

$$\underbrace{\text{Total assets}}_{\substack{\downarrow \\ a}} \; \overset{\text{is}}{\underset{=}{\downarrow}} \; \underbrace{\text{Initial assets}}_{\substack{\downarrow \\ 2140}} \; \overset{\text{minus}}{\underset{-}{\downarrow}} \; \underbrace{\text{Amount of loan}}_{\substack{\downarrow \\ 2500}}$$

We carry out the subtraction.
$$a = 2140 - 2500 = -360$$

Chang's total assets were $-\$360$.

38. First we multiply to find the total drop d in the price:
$$d = 8(-\$2) = -\$16$$

Now we add this number to the opening price to find the price p after 8 hr:
$$p = \$78 + (-\$16) = \$62$$

After 8 hr the price of the stock was \$62 per share.

39. Let t = the total gain or loss. We represent the gains as positive numbers and the loss as a negative number. We add the gains and the loss to find t.
$$t = 5 + (-12) + 15 = -7 + 15 = 8$$

There is a total gain of 8 yd.

40. Let p = the price of each tee shirt.

$$\underbrace{\substack{\text{Original} \\ \text{balance}}}_{\substack{\downarrow \\ 68}} \; \overset{\text{minus 7 times}}{\substack{\downarrow \;\; \downarrow \;\; \downarrow \\ - \;\; 7 \;\; \cdot}} \; \underbrace{\substack{\text{price of} \\ \text{each} \\ \text{shirt}}}_{\substack{\downarrow \\ p}} \; \overset{\text{is}}{\substack{\downarrow \\ =}} \; \underbrace{\substack{\text{New} \\ \text{balance}}}_{\substack{\downarrow \\ -65}}$$

We solve the equation.
$$\begin{aligned}
68 - 7p &= -65 \\
68 - 7p - 68 &= -65 - 68 \\
-7p &= -133 \\
\frac{-7p}{-7} &= \frac{-133}{-7} \\
p &= 19
\end{aligned}$$

Each tee shirt cost \$19.

41.
$$\begin{aligned}
8 - (-5) - 7 - (-9) &= 8 + 5 + (-7) + 9 \\
&= 13 + (-7) + 9 \\
&= 6 + 9 \\
&= 15
\end{aligned}$$

Answer C is correct.

42. $-3 \cdot 4 - 12 \div 4 = -12 - 3 = -12 + (-3) = -15$

Answer B is correct.

43. a) $-7 + (-6) + (-5) + (-4) + (-3) + (-2) + (-1) + 0 + 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 8$

b) Since one of the factors is 0, the product is 0.

44. $9 - (3 - 4) + 5 = 15$

45.
$$\begin{aligned}
-|8 - (-4 \div 2) - 3 \cdot 5| &= -|8 - (-2) - 3 \cdot 5| \\
&= -|8 + 2 - 3 \cdot 5| \\
&= -|8 + 2 - 15| \\
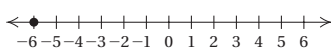&= -|10 - 15| \\
&= -|-5| \\
&= -5
\end{aligned}$$

46.
$$\begin{aligned}
&(|-6 - 3| + 3^2 - |-3|) \div (-3) \\
&= (|-6 - 3| + 9 - |-3|) \div (-3) \\
&= (|-9| + 9 - |-3|) \div (-3) \\
&= (9 + 9 - 3) \div (-3) \\
&= (18 - 3) \div (-3) \\
&= 15 \div (-3) \\
&= -5
\end{aligned}$$

Chapter 2 Discussion and Writing Exercises

1. We know that the product of an even number of negative numbers is positive, and the product of an odd number of negative numbers is negative. Since $(-7)^8$ is equivalent to the product of eight negative numbers, it will be a positive number. Similarly, since $(-7)^{11}$ is equivalent to the product of eleven negative numbers, it will be a negative number.

2. If the negative integer has the larger absolute value, the answer is negative.

3. Jake is expecting the multiplication to be performed before the division.

4. At 4 p.m. the temperature in Circle City was 23°. By 11 p.m. the temperature had dropped 32°. What was the temperature at 11 p.m.?

Chapter 2 Test

1. Since -4 is to the left of 0 on the number line, we have $-4 < 0$.

2. Since -3 is to the right of -8 on the number line, we have $-3 > -8$.

3. Since -7 is to the right of -8 on the number line, we have $-7 > -8$.

4. Since -1 is to the left of 1 on the number line, we have $-1 < 1$.

5. The distance of -7 from 0 is 7, so $|-7| = 7$.

6. The distance of 94 from 0 is 94, so $|94| = 94$.

7. The distance of -27 from 0 is 27, so $|-27| = 27$.
Then $-|-27| = -27$.

8. The opposite of 23 is -23 because $23 + (-23) = 0$.

9. The opposite of -14 is 14 because $-14 + 14 = 0$.

10. If $x = -8$, then $-x = -(-8) = 8$.

11.

12. $31 - (-47) = 31 + 47 = 78$

13. $\begin{aligned} -8 + 4 + (-7) + 3 &= -4 + (-7) + 3 \\ &= -11 + 3 \\ &= -8 \end{aligned}$

14. $-13 + 15 = 2$

15. $2 - (-8) = 2 + 8 = 10$

16. $32 - 57 = 32 + (-57) = -25$

17. $18 + (-3) = 15$

18. $4 \cdot (-12) = -48$

19. $-8 \cdot (-3) = 24$

20. $-45 \div 5 = -9$ Check: $-9 \cdot 5 = -45$

21. $-63 \div (-7) = 9$ Check: $9 \cdot (-7) = -63$

22. $64 \div (-16) = -4$ Check: $-4 \cdot (-16) = 64$

23. $\begin{aligned} -2(16) - [2(-8) - 5^3] &= -2(16) - [2(-8) - 125] \\ &= -2(16) - [-16 - 125] \\ &= -2(16) - [-141] \\ &= -2(16) + 141 \\ &= -32 + 141 \\ &= 109 \end{aligned}$

24. Let D = the difference in elevations.

$$\underbrace{\text{Difference in elevation}}_{\displaystyle D} \; \underbrace{\text{is}}_{\displaystyle =} \; \underbrace{\text{Higher elevation}}_{\displaystyle 2229} \; \underbrace{\text{minus}}_{\displaystyle -} \; \underbrace{\text{Lower elevation}}_{\displaystyle (-15)}$$

We carry out the subtraction.

$$D = 2229 - (-15) = 2229 + 15 = 2244$$

The difference in elevations is 2244 m.

25. Let P = the number of points by which the market has changed over the five week period.

$$\underbrace{\text{Total change}}_{\displaystyle P} \; \underbrace{=}_{\displaystyle =} \; \underbrace{\text{Week 1 change}}_{\displaystyle -13} \; \underbrace{+}_{\displaystyle +} \; \underbrace{\text{Week 2 change}}_{\displaystyle (-16)} \; \underbrace{+}_{\displaystyle +} \; \underbrace{\text{Week 3 change}}_{\displaystyle 36} \; +$$

$$\underbrace{\text{Week 4 change}}_{\displaystyle (-11)} \; \underbrace{+}_{\displaystyle +} \; \underbrace{\text{Week 5 change}}_{\displaystyle 19}$$

We carry out the computation.

$$\begin{aligned} P &= -13 + (-16) + 36 + (-11) + 19 \\ &= -29 + 36 + (-11) + 19 \\ &= 7 + (-11) + 19 \\ &= -4 + 19 \\ &= 15 \end{aligned}$$

The market rose 15 points.

26. First we multiply to find the total decrease d in the population.

$$d = 6 \cdot 420 = 2520$$

The population decreased by 2520 over the six year period.

Now we subtract to find the new population p.

$$18,600 - 2520 = 16,080$$

After 6 yr the population was 16,080.

27. First we subtract to find the total drop in temperature t.

$$t = 17°\text{C} - (-17°\text{C}) = 17°\text{C} + 17°\text{C} = 34°\text{C}$$

Then we divide to find by how many degrees d the temperature dropped each minute in the 17 minutes from 11:08 A.M. to 11:25 A.M.

$$d = 34 \div 17 = 2$$

The temperature dropped 2°C each minute.

28. If $x = 14$, then $-(-x) = -(-14) = 14$. (The opposite of the opposite of 14 is 14.)

Answer D is correct.

29. $|-27-3(4)|-|-36|+|-12|$

$= |-27-12|-|-36|+|-12|$

$= |-39|-|-36|+|-12|$

$= 39 - 36 + 12$

$= 3 + 12$

$= 15$

30. Let $d = $ the difference in the depths. We represent the depth of the Marianas Trench as $-11,033$ m and the depth of the Puerto Rico Trench are -8648 m.

$$\underbrace{\text{Difference in depths}}_{\downarrow \atop d} \quad \underset{\downarrow \atop =}{\text{is}} \quad \underbrace{\text{Higher depth}}_{\downarrow \atop -8648} \quad \underset{\downarrow \atop -}{\text{minus}} \quad \underbrace{\text{Lower depth}}_{\downarrow \atop (-11,033)}$$

We carry out the subtraction.

$d = -8648 - (-11,033) = -8648 + 11,033 = 2385$

The Puerto Rico Trench is 2385 m higher than the Marianas Trench.

31. a) 6, 5, 3, 0, ___, ___, ___

Observe that $5 = 6 - \boxed{1}$, $3 = 5 - \boxed{2}$, and $0 = 3 - \boxed{3}$.

To find the next three numbers in the sequence we subtract 4, 5, and 6, in order, from the preceding number. We have

$0 - 4 = -4,$
$-4 - 5 = -9,$
$-9 - 6 = -15.$

b) 14, 10, 6, 2, ___, ___, ___

Observe that each number is 4 less than the one that precedes it. Then we find the next three numbers as follows:

$2 - 4 = -2,$
$-2 - 4 = -6,$
$-6 - 4 = -10.$

c) $-4, -6, -9, -13,$ ___, ___, ___

Observe that $-6 = -4 - \boxed{2}$, $-9 = -6 - \boxed{3}$, and $-13 = -9 - \boxed{4}$. To find the next three numbers in the sequence we subtract 5, 6, and 7, in order, from the preceding number. We have

$-13 - 5 = -18,$
$-18 - 6 = -24,$
$-24 - 7 = -31.$

d) 64, -32, 16, -8, ___, ___, ___

Observe that we find each number by dividing the preceding number by -2. Then we find the next three numbers as follows:

$\dfrac{-8}{-2} = 4,$

$\dfrac{4}{-2} = -2,$

$\dfrac{-2}{-2} = 1.$

Basic College Mathematics with Early Integers 3rd Edition Bittinger Solutions Manual