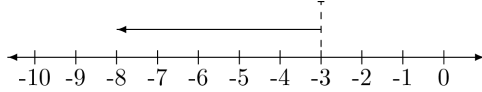
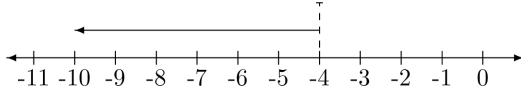


13. Start at -3 . Move 5 units to the left.



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

14. Start at -4 . Move 6 units to the left.



$$-4 + (-6) = -10$$

15. $-6 + (-5)$. Two negatives. Add their absolute values. Make the answer negative.

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

16. $-8 + (-12)$. Two negatives. Add their absolute values. Make the answer negative.

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

17. $10 + (-15)$. The absolute values are 10 and 15. Their difference is $15 - 10 = 5$. The negative number has the larger absolute value, so the answer is negative.

$$10 + (-15) = -(15 - 10) = -5$$

18. $12 + (-22)$. The absolute values are 12 and 22. Their difference is $22 - 12 = 10$. The negative number has the larger absolute value, so the answer is negative.

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

19. $12 + (-12)$. The numbers have the same absolute value and their difference is 0.

$$12 + (-12) = 0$$

20. $17 + (-17)$. The numbers have the same absolute value and their difference is 0.

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

21. $-24 + (-17)$. Two negatives. Add their absolute values. Make the answer negative.

$$-24 + (-17) = -(24 + 17) = -41$$

22. $-17 + (-25)$. Two negatives. Add their absolute values. Make the answer negative.

$$-17 + (-25) = -(17 + 25) = -42$$

23. $-13 + 13$. The numbers have the same absolute value and their difference is 0.
 $-13 + 13 = 0$

24. $-18 + 18$. The numbers have the same absolute value and their difference is 0.
 $-18 + 18 = 0$

25. $18 + (-11)$. The absolute values are 18 and 11. Their difference is $18 - 11 = 7$. The positive number has the greater absolute value, so the answer is positive.
 $18 + (-11) = 18 - 11 = 7$

26. $8 + (-5)$. The absolute values are 8 and 5. Their difference is $8 - 5 = 3$. The positive number has the greater absolute value, so the answer is positive.
 $8 + (-5) = 8 - 5 = 3$

27. $-36 + 0$. 0 is the additive identity.
 $-36 + 0 = -36$

28. $0 + (-74)$. 0 is the additive identity.
 $0 + (-74) = -74$

29. $-3 + 14$. The absolute values are 3 and 14. Their difference is $14 - 3 = 11$. The positive number has the larger absolute value, so the answer is positive.
 $-3 + 14 = 14 - 3 = 11$

30. $13 + (-6)$. The absolute values are 13 and 6. Their difference is $13 - 6 = 7$. The positive number has the larger absolute value, so the answer is positive.
 $13 + (-6) = 13 - 6 = 7$

31. $-14 + (-19)$. Two negatives. Add their absolute values. Make the answer negative.
 $-14 + (-19) = -(14 + 19) = -33$

32. $11 + (-9)$. The absolute values are 11 and 9. Their difference is $11 - 9 = 2$. The positive number has the larger absolute value, so the answer is positive.
 $11 + (-9) = 11 - 9 = 2$

33. $19 + (-19)$. The numbers have the same absolute value and their difference is 0.
 $19 + (-19) = 0$
34. $-20 + (-6)$. Two negatives. Add their absolute values. Make the answer negative.
 $-20 + (-6) = -(20 + 6) = -26$
35. $23 + (-5)$. The absolute values are 23 and 5. Their difference is $23 - 5$ or 18. The positive number has the larger absolute value, so the answer is positive.
 $23 + (-5) = 23 - 5 = 18$
36. $-15 + (-7)$. Two negatives. Add their absolute values. Make the answer negative.
 $-15 + (-7) = -(15 + 7) = -22$
37. $-31 + (-14)$. Two negatives. Add their absolute values. Make the answer negative.
 $-31 + (-14) = -(31 + 14) = -45$
38. $40 + (-8)$. The absolute values are 40 and 8. Their difference is $40 - 8 = 32$. The positive number has the larger absolute value, so the answer is positive.
 $40 + (-8) = 40 - 8 = 32$
39. $40 + (-40)$. The numbers have the same absolute value and their difference is 0.
 $40 + (-40) = 0$
40. $-25 + 25$. The numbers have the same absolute value and their difference is 0.
 $-25 + 25 = 0$
41. $85 + (-65)$. The absolute values are 85 and 65. Their difference is $85 - 65 = 20$. The positive number has the larger absolute value, so the answer is positive.
 $85 + (-65) = 85 - 65 = 20$
42. $63 + (-18)$. The absolute values are 63 and 18. Their difference is $63 - 18 = 45$. The positive number has the larger absolute value, so the answer is positive.
 $63 + (-18) = 63 - 18 = 45$
43. $-3.6 + 1.9$. The absolute values are 3.6 and 1.9. Their difference is $3.6 - 1.9 = 1.7$. The negative number has the larger absolute value, so the answer is negative.
 $-3.6 + 1.9 = -(3.6 - 1.9) = -1.7$
44. $-6.5 + 4.7$. The absolute values are 6.5 and 4.7. Their difference is $6.5 - 4.7 = 1.8$. The negative number has the larger absolute value, so the answer is negative.
 $-6.5 + 4.7 = -(6.5 - 4.7) = -1.8$
45. $-5.4 + (-3.7)$. Two negatives. Add their absolute values. Make the answer negative.
 $-5.4 + (-3.7) = -(5.4 + 3.7) = -9.1$
46. $-3.8 + (-9.4)$. Two negatives. Add their absolute values. Make the answer negative.
 $-3.8 + (-9.4) = -(3.8 + 9.4) = -13.2$
47. $\frac{-3}{5} + \frac{4}{5}$. The absolute values are $\frac{3}{5}$ and $\frac{4}{5}$. Their difference is $\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$. The positive number has the larger absolute value, so the answer is positive.
 $\frac{-3}{5} + \frac{4}{5} = \frac{4}{5} - \frac{3}{5} = \frac{1}{5}$
48. $\frac{-2}{7} + \frac{3}{7}$. The absolute values are $\frac{2}{7}$ and $\frac{3}{7}$. Their difference is $\frac{3}{7} - \frac{2}{7} = \frac{1}{7}$. The positive number has the larger absolute value, so the answer is positive.
 $\frac{-2}{7} + \frac{3}{7} = \frac{3}{7} - \frac{2}{7} = \frac{1}{7}$
49. $\frac{-4}{7} + \frac{-2}{7}$. Two negatives. Add their absolute values. Make the answer negative.
 $\frac{-4}{7} + \frac{-2}{7} = -\left(\frac{4}{7} + \frac{2}{7}\right) = -\frac{6}{7}$
50. $\frac{-5}{9} + \frac{-2}{9}$. Two negatives. Add their absolute values. Make the answer negative.
 $\frac{-5}{9} + \frac{-2}{9} = -\left(\frac{5}{9} + \frac{2}{9}\right) = -\frac{7}{9}$

51. $-\frac{2}{5} + \frac{1}{3}$. The absolute values are $\frac{2}{5}$ and $\frac{1}{3}$.
 Their difference is $\frac{6}{15} - \frac{5}{15} = \frac{1}{15}$. The negative number has the larger absolute value, so the answer is negative.

$$\frac{-2}{5} + \frac{1}{3} = \frac{-6}{15} + \frac{5}{15} = -\left(\frac{6}{15} - \frac{5}{15}\right) = -\frac{1}{15}$$

52. $\frac{-4}{13} + \frac{1}{2}$. The absolute values are $\frac{4}{13}$ and $\frac{1}{2}$.
 Their difference is $\frac{13}{26} - \frac{8}{26} = \frac{5}{26}$. The positive number has the larger absolute value, so the answer is positive.

$$\frac{-4}{13} + \frac{1}{2} = \frac{-8}{26} + \frac{13}{26} = \frac{13}{26} - \frac{8}{26} = \frac{5}{26}$$

53. $\frac{-4}{9} + \frac{2}{3}$. The absolute values are $\frac{4}{9}$ and $\frac{2}{3}$.
 Their difference is $\frac{6}{9} - \frac{4}{9} = \frac{2}{9}$. The positive number has the larger absolute value, so the answer is positive.

$$\frac{-4}{9} + \frac{2}{3} = \frac{-4}{9} + \frac{6}{9} = \frac{6}{9} - \frac{4}{9} = \frac{2}{9}$$

54. $\frac{-1}{6} + \frac{1}{3}$. The absolute values are $\frac{1}{6}$ and $\frac{1}{3}$.
 The difference is $\frac{2}{6} - \frac{1}{6} = \frac{1}{6}$. The positive number has the larger absolute values, so the answer is positive.

$$\frac{-1}{6} + \frac{1}{3} = \frac{-1}{6} + \frac{2}{6} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$$

55. $35 + (-14) + (-19) + (-5)$
 $= 35 + [(-14) + (-19) + (-5)]$ Using the associative law of addition
 $= 35 + (-38)$ Adding the negatives
 $= -3$ Adding a positive and a negative

56. $28 + (-44) + 17 + 31 + (-94)$
 $= [28 + 17 + 31] + [(-44) + (-94)]$ Using the commutative and associative laws of addition
 $= 76 + (-138)$ Adding the positives and adding the negatives
 $= -62$ Adding a positive and a negative

57. $-4.9 + 8.5 + 4.9 + (-8.5)$ Note that we have two pairs of numbers with different signs and the same absolute value: -4.9 and 4.9 , 8.5 and -8.5 . The sum of each pair is 0, so the result is $0 + 0$, or 0.

58. $24 + 3.1 + (-44) + (-8.2) + 63$
 $= [24 + 3.1 + 63] + [(-44) + (-8.2)]$ Using the commutative and associative laws of addition
 $= 90.1 + (-52.2)$ Adding the positives and adding the negatives
 $= 37.9$ Adding a positive and a negative

59. Rewording:

First change	plus	second change	plus
↓		↓	↓
Translating: -0.05	+	(-0.03)	+
third change	is	total change	
↓	↓	↓	
0.07	=	total change	

Since $-0.05 + (-0.03) + 0.07 = -0.01$, the price dropped 1¢, or the cost changed $-\$0.01$.

60. Rewording:

First change	plus	second change	plus
↓		↓	↓
Translating: (-0.06)	+	0.12	+
third change	is	total change	
↓	↓	↓	
(-0.04)	=	total change	

Since $-0.06 + 0.12 + (-0.04) = 0.02$, the price rose 2¢, or the cost changed $\$0.02$.

61. Rewording: First change plus second change plus

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ & (-\frac{1}{2}) & + & (\frac{6}{5}) & + & & \end{array}$$

third change plus fourth change is level change

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ & (\frac{3}{4}) & + & (-\frac{3}{2}) & = & \text{total change} & \end{array}$$

$$\begin{aligned} \text{Since } & \left(-\frac{1}{2}\right) + \left(\frac{6}{5}\right) + \left(\frac{3}{4}\right) + \left(-\frac{3}{2}\right) \\ & = \left(-\frac{10}{20}\right) + \left(\frac{24}{20}\right) + \left(\frac{15}{20}\right) + \left(-\frac{30}{20}\right) \\ & = \left(\frac{-10+24+15-30}{20}\right) = \left(-\frac{1}{20}\right) \end{aligned}$$

the lake level dropped by $\left(\frac{1}{20}\right)$ of a foot.

62. Rewording: 2002 loss plus 2003 loss plus

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ \text{Translating: } & -26,500 & + & (-10,200) & + & & \end{array}$$

2004 profit is total profit or loss

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ 32,400 & = & \text{total profit or loss} & & & & \end{array}$$

$$\begin{aligned} \text{Since } & -26,500 + (-10,200) + 32,400 \\ & = -36,700 + 32,400 \\ & = -4300, \end{aligned}$$

the loss was \$4300, or the profit was -\$4300.

63. Rewording: First try plus second try plus third try is Total gain

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ \text{Translating: } & 13 & + & (-12) & + & 21 & = \text{Total gain} \end{array}$$

Since $13 + (-12) + 21 = 22$, the total gain was 22 yd.

64. Rewording: Original balance plus change from writing first check plus

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ \text{Translating: } & 350 & + & (-530) & + & & \end{array}$$

deposit plus change from writing second check is new balance

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ & 75 & + & (-90) & = & \text{new balance} & \end{array}$$

$$\begin{aligned} \text{Since } & 350 + (-530) + (75) + (-90) \\ & = (350 + 75) + [-530 + (-90)] \\ & = 425 + (-620) \\ & = -195 \end{aligned}$$

The balance is -\$195.

65. Rewording: Original balance plus change from check plus

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ \text{Translating: } & 82 & + & (-50) & + & & \end{array}$$

Change from August charges is New balance

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ & 63 & = & \text{New balance} & & & \end{array}$$

Since $82 + (-50) + 63 = 95$, his new balance is \$95.

66. Rewording: Original balance plus change from check plus

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ \text{Translating: } & 470 & + & (-45) & + & & \end{array}$$

new charges plus change from check is total change

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ & 160 & + & (-500) & = & \text{new balance} & \end{array}$$

Since $470 + (-45) + 160 + (-500) = 85$, Ian still owes \$85.

67. Rewording: base plus rise is elevation

$$\begin{array}{ccccccc} & \downarrow & & \downarrow & & \downarrow & \\ \text{Translating: } & (-19,684) & + & 33,480 & = & \text{elevation} & \end{array}$$

Since $(-19,684) + 33,480 = 13,796$, the elevation of the peak is 13,796 ft above sea level.

68. Rewording: $\underbrace{\text{Change from withdrawals}}_{\downarrow -5} \text{ plus } \underbrace{\text{change from additions}}_{\downarrow +8}$

Translating: $\underbrace{\text{plus "no shows"}}_{\downarrow +} \text{ is } \underbrace{\text{change in original size}}_{\downarrow =}$

\downarrow \downarrow \downarrow \downarrow

$+ \quad (-4) \quad = \quad \text{change in original size}$

$$\begin{aligned} \text{Since } -5 + 8 + (-4) \\ = 3 + (-4) \\ = -1, \end{aligned}$$

the class lost 1 student, or the class size changed by -1 .

$$69. 5a + (-8a) = -(8-5)a = -3a$$

$$70. -3x + 8x = (8-3)x = 5x$$

$$71. -3x + 12x = (12-3)x = 9x$$

$$72. 2m + (-7m) = -(7-2)m = -5m$$

$$73. -5a + -2a = -(5+2)a = -7a$$

$$74. 10n + (-17n) = -(17-10)n = -7n$$

$$\begin{aligned} 75. -3 + 8x + 4 + (-10x) \\ = -3 + 4 + 8x + (-10x) & \text{ Using the commutative law of addition} \\ = (-3 + 4) + [8 + (-10)]x & \text{ Using the distributive law} \\ = 1 - 2x & \text{ Adding} \end{aligned}$$

$$\begin{aligned} 76. 8a + 5 + (-a) + (-3) \\ = 8a + (-a) + 5 + (-3) & \text{ Using the commutative law of addition} \\ = [8 + (-1)]a + [5 + (-3)] & \text{ Using the distributive law} \\ = 7a + 2 & \text{ Adding} \end{aligned}$$

$$\begin{aligned} 77. 6m + 9n + (-9n) + (-10m) \\ = -(10-6)m + (9-9)n = -4m \end{aligned}$$

$$\begin{aligned} 78. -11s + (-8t) + (-3s) + 8t \\ = [-11 + (-3)]s + (-8 + 8)t \\ = -14s \end{aligned}$$

$$\begin{aligned} 79. -4x + 6.3 + (-x) + (-10.2) \\ = [(-4) + (-1)]x - (10.2 - 6.3) \\ = -5x - 3.9 \end{aligned}$$

$$\begin{aligned} 80. -7 + 10.5y + 13 + (-11.5y) \\ = -(11.5 - 10.5)y + (13 - 7) \\ = -1y + 6 \\ = -y + 6, \text{ or } 6 - y \end{aligned}$$

$$\begin{aligned} 81. \text{ Perimeter} &= 8 + 5x + 9 + 7x \\ &= 8 + 9 + 5x + 7x \\ &= (8 + 9) + (5 + 7)x \\ &= 12x + 17 \end{aligned}$$

$$\begin{aligned} 82. \text{ Perimeter} &= 8 + 4a + 5 + 6a \\ &= (8 + 5) + (4a + 6a) \\ &= (8 + 5) + (4 + 6)a \\ &= 10a + 13 \end{aligned}$$

$$\begin{aligned} 83. \text{ Perimeter} &= 3t + 3r + 7 + 5t + 9 + 4r \\ &= (3t + 5t) + (3r + 4r) + (7 + 9) \\ &= (3 + 5)t + (3 + 4)r + (7 + 9) \\ &= 8t + 7r + 16 \end{aligned}$$

$$\begin{aligned} 84. \text{ Perimeter} &= 2x + 7 + 5z + 3x + 8 + 4z \\ &= (2x + 3x) + (5z + 4z) + (7 + 8) \\ &= (2 + 3)x + (5 + 4)z + (7 + 8) \\ &= 5x + 9z + 15 \end{aligned}$$

$$\begin{aligned} 85. \text{ Perimeter} &= 9 + 6n + 7 + 8n + 4n \\ &= 9 + 7 + 6n + 8n + 4n \\ &= (9 + 7) + (6 + 8 + 4)n \\ &= 18n + 16 \end{aligned}$$

$$\begin{aligned} 86. \text{ Perimeter} &= 2 + 6 + 5n + 7n + 3 + 7n \\ &= (5n + 7n + 7n) + (2 + 6 + 3) \\ &= (5 + 7 + 7)n + (2 + 6 + 3) \\ &= 19n + 11 \end{aligned}$$

87. *Thinking and Writing Exercise.* Answer may vary. One possible explanation follows.

Consider performing the addition on a number line. We start to the left of 0 and then move farther left, so the result must be a negative number.

88. *Thinking and Writing Exercise.* Each nonzero integer from -10 to 10 can be added to its opposite with the sum of each pair being 0. When this is added to the remaining integer sums, the total is 0.

$$89. 7(3z + y + 2) = 7 \cdot 3z + 7 \cdot y + 7 \cdot 2 \\ = 21z + 7y + 14$$

$$90. \frac{7}{2} \div \frac{3}{8} = \frac{7}{2} \cdot \frac{8}{3} \\ = \frac{7 \cdot 8}{2 \cdot 3} \\ = \frac{7 \cdot \cancel{2} \cdot 4}{\cancel{2} \cdot 3} \\ = \frac{28}{3}$$

91. *Thinking and Writing Exercise.* The sum will be positive when the positive number is greater than the sum of the absolute values of the negative numbers.

92. *Thinking and Writing Exercise.* No; when we add real numbers with different signs, we must know how to subtract absolute values. That is, we must be able to calculate $a - b$ where a and b are both nonnegative with $a \geq b$.

93. We're looking for the difference between the amount in Travis's account after the deposit and his eventual overdrawn amount.

Rewording:	Original amount	plus	deposit	minus
	↓		↓	↓
Translating:	257.33	+	(152)	-
	overdrawn amount		check amount	
	↓		↓	
	-42.37	=	check amount	

Since $257.33 + 152 - (-42.37) = 451.70$, the check's amount \$451.70.

94. Rewording:	Final value	plus	opposite of drop	plus
	↓		↓	↓
Translating:	61	+	12	+
	opposite of rise		original value	
	↓		↓	
	(-17.50)	=	original value	

Since $61 + 12 + (-17.50) = 55.50$, the original value was \$55.50.

$$95. 4x + \underline{\hspace{1cm}} + (-9x) + (-2y) = -5x - 7y$$

Simplify the left side of the equation.

$$4x + \underline{\hspace{1cm}} + (-9x) + (-2y) \\ = [4x + (-9x)] + \underline{\hspace{1cm}} + (-2y) \\ = [4 + (-9)]x + \underline{\hspace{1cm}} + (-2y) \\ = -5x + \underline{\hspace{1cm}} + (-2y)$$

We now have:

$$-5x + \underline{\hspace{1cm}} + (-2y) = -5x - 7y \\ -5x = -5x, \text{ so } \underline{\hspace{1cm}} + (-2y) = -7y \\ \text{The missing term is } -5y, \text{ since} \\ -5y + (-2y) = -7y$$

$$96. -3a + 9b + \underline{\hspace{1cm}} + 5a = 2a - 6b$$

Simplify the left side of the equation.

$$-3a + 9b + \underline{\hspace{1cm}} + 5a \\ = (-3a + 5a) + 9b + \underline{\hspace{1cm}} \\ = (-3 + 5)a + 9b + \underline{\hspace{1cm}} \\ = 2a + 9b + \underline{\hspace{1cm}}$$

We now have:

$$2a + 9b + \underline{\hspace{1cm}} = 2a - 6b \\ 2a = 2a, \text{ so } 9b + \underline{\hspace{1cm}} = -6b$$

The missing term is $-15b$, since $9b + (-15b) = -6b$

97. $3m + 2n + \underline{\hspace{1cm}} + (-2m) = 2n + (-6m)$
 Simplify the left side of the equation.
 $3m + 2n + \underline{\hspace{1cm}} + (-2m)$
 $= [3m + (-2m)] + 2n + \underline{\hspace{1cm}}$
 $= [3 + (-2)]m + 2n + \underline{\hspace{1cm}}$
 $= m + 2n + \underline{\hspace{1cm}}$
 $= 2n + m + \underline{\hspace{1cm}}$
 We now have:
 $2n + m + \underline{\hspace{1cm}} = 2n + (-6m)$
 $2n = 2n$, so $m + \underline{\hspace{1cm}} = -6m$
 The missing term is $-7m$, since
 $m + (-7m) = -6m$
98. $\underline{\hspace{1cm}} + 9x + (-4y) + x = 10x - 7y$
 $(9x + x) + (-4y) + \underline{\hspace{1cm}} = 10x - 7y$
 $10x + (-4y) + \underline{\hspace{1cm}} = 10x - 7y$
 $10x = 10x$, so $(-4y) + \underline{\hspace{1cm}} = -7y$
 The missing term is $-3y$, since
 $-4y + (-3y) = -7y$
99. Note that, in order for the sum to be 0, the two missing terms must be the opposites of the given terms. Thus, the missing terms are $-7t$ and -23 .
100. $p = 2l + 2w = 7x + 10$
 We know $2l = 2 \cdot 5 = 10$, so $2w$ is $7x$. Then the width is a number which yields $7x$ when added to itself. Since $3.5x + 3.5x = 7x$, the width is $3.5x$, or $\frac{7}{2}x$.
101. $-3 + (-3) + 2 + (-2) + 1 = -5$
 Since the total is 5 under par after the five rounds and
 $-5 = -1 + (-1) + (-1) + (-1) + (-1)$, the golfer was 1 under par on average.
5. a
6. c
7. b
8. e
9. four minus ten
10. five minus thirteen
11. two minus negative nine
12. four minus negative one
13. the negative/opposite of x minus y
14. the negative/opposite of a minus b
15. negative three minus the negative/opposite of n
16. negative seven minus the negative/opposite of m
17. The additive inverse of 39 is -39 because $39 + (-39) = 0$
18. The additive inverse of -17 is 17 because $-17 + 17 = 0$
19. The additive inverse of $-\frac{11}{2}$ is $\frac{11}{2}$, because
 $-\frac{11}{2} + \frac{11}{2} = 0$
20. The additive inverse of $\frac{7}{2}$ is $-\frac{7}{2}$ because
 $\frac{7}{2} + \left(-\frac{7}{2}\right) = 0$
21. The additive inverse of -3.14 is 3.14 because $-3.14 + 3.14 = 0$
22. The additive inverse of 48.2 is -48.2 because $48.2 + -48.2 = 0$
23. If $x = -45$, then $-x = -(-45) = 45$.
24. If $x = 13$, then $-x = -13$.
25. If $x = -\frac{14}{3}$, then $-x = -\left(-\frac{14}{3}\right) = \frac{14}{3}$.

Exercise Set 1.6

1. d
2. g
3. f
4. h

26. If $x = \frac{1}{328}$, then $-x = -\frac{1}{328}$.

27. If $x = 0.101$, then $-x = -0.101$.

28. If $x = 0$, then $-x = -0 = 0$.

29. If $x = 72$, then $-(-x) = x = 72$.

30. If $x = 29$, then $-(-x) = x = 29$.

31. If $x = -\frac{2}{5}$, then $-(-x) = x = -\frac{2}{5}$.

32. If $x = -9.1$, then $-(-x) = x = -9.1$.

33. $-(-1) = 1$

34. $-(-7) = 7$

35. $-(7) = -7$

36. $-(10) = -10$

37. $6 - 8 = -(8 - 6) = -2$

38. $4 - 13 = -(13 - 4) = -9$

39. $0 - 5 = 0 + (-5) = -5$

40. $0 - 8 = 0 + (-8) = -8$

41. $-4 - 3 = -(4 + 3) = -7$

42. $-5 - 6 = -(5 + 6) = -11$

43. $-9 - (-3) = -9 + 3 = -6$

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

45. Note that we are subtracting a number from itself. The result is 0. We could also do this exercise as follows:

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

46. $-10 - (-10) = -10 + 10 = 0$

See exercise 45.

47. $30 - 40 = 30 + (-40) = -10$

48. $20 - 27 = 20 + (-27) = -7$

49. $-7 - (-9) = -7 + 9 = 2$

50. $-8 - (-3) = -8 + 3 = -5$

51. $-9 - (-9) = -9 + 9 = 0$

52. $-40 - (-40) = -40 + 40 = 0$

53. $5 - 5 = 5 + (-5) = 0$

54. $7 - 7 = 7 + (-7) = 0$

55. $4 - (-4) = 4 + 4 = 8$

56. $6 - (-6) = 6 + 6 = 12$

57. $-7 - 4 = -7 + (-4) = -11$

58. $-6 - 8 = -6 + (-8) = -14$

59. $6 - (-10) = 6 + 10 = 16$

60. $3 - (-12) = 3 + 12 = 15$

61. $-6 - (-5) = -6 + 5 = -1$

62. $-4 - (-7) = -4 + 7 = 3$

63. $5 - (-12) = 5 + 12 = 17$

64. $5 - (-6) = 5 + 6 = 11$

65. $0 - (-10) = 0 + 10 = 10$

66. $0 - (-1) = 0 + 1 = 1$

67. $-5 - (-2) = -5 + 2 = -3$

68. $-3 - (-1) = -3 + 1 = -2$

69. $-7 - 14 = -7 + (-14) = -21$

70. $-9 - 16 = -9 + (-16) = -25$

71. $-8 - 0 = -8 + 0 = -8$

72. $-9 - 0 = -9 + 0 = -9$
73. $0 - 11 = 0 + (-11) = -11$
74. $0 - 31 = 0 + (-31) = -31$
75. $2 - 25 = 2 + (-25) = -23$
76. $18 - 63 = 18 + (-63) = -45$
77. $-4.2 - 3.1 = -(4.2 + 3.1) = -7.3$
78. $-10.1 - 2.6 = -(10.1 + 2.6) = -12.7$
79. $-1.8 - (-2.4) = -1.8 + 2.4 = 2.4 - 1.8 = 0.6$
80. $-5.8 - (-7.3) = -5.8 + 7.3 = 7.3 - 5.8 = 1.5$
81. $3.2 - 8.7 = 3.2 + (-8.7) = -5.5$
82. $1.5 - 9.4 = 1.5 + (-9.4) = -7.9$
83. $0.072 - 1 = 0.072 + (-1) = -0.928$
84. $0.825 - 1 = 0.825 + (-1) = -0.175$
85. $\frac{2}{11} - \frac{9}{11} = -\left(\frac{9}{11} - \frac{2}{11}\right) = -\frac{7}{11}$
86. $\frac{3}{7} - \frac{5}{7} = -\left(\frac{5}{7} - \frac{3}{7}\right) = -\frac{2}{7}$
87. $\frac{-1}{5} - \frac{3}{5} = -\left(\frac{1}{5} + \frac{3}{5}\right) = -\frac{4}{5}$
88. $\frac{-2}{9} - \frac{5}{9} = -\left(\frac{2}{9} + \frac{5}{9}\right) = -\frac{7}{9}$
89. $\frac{-4}{17} - \left(-\frac{9}{17}\right) = -\frac{4}{17} + \frac{9}{17} = \frac{5}{17}$
90. $-\frac{2}{13} - \left(-\frac{5}{13}\right) = -\frac{2}{13} + \frac{5}{13} = -\left(\frac{5}{13} - \frac{2}{13}\right) = \frac{3}{13}$
91. $-21 - 37 = -21 + (-37) = -58$
92. $-7 - 19 = -7 + (-19) = -26$
93. $9 - (-25) = 9 + 25 = 34$
94. $-5 - (-31) = -5 + 31 = 26$
95. We subtract (difference) the lesser number from the greater.
 $3.8 - (-5.2) = 3.8 + 5.2 = 9$
96. We subtract the lesser number from the greater.
 $-2.1 - (-5.9) = -2.1 + 5.9 = 3.8$
97. We subtract the lesser number from the greater.
 $114 - (-79) = 114 + 79 = 193$
98. We subtract the lesser number from the greater
 $23 - (-17) = 23 + 17 = 40$
99. $25 - (-12) - 7 - (-2) + 9$
 $= 25 + 12 + (-7) + 2 + 9 = 41$
100. $22 - (-18) + 7 + (-42) - 27$
 $= 22 + 18 + 7 + (-42) + (-27) = -22$
101. $-31 + (-28) - (-14) - 17$
 $= (-31) + (-28) + 14 + (-17) = -62$
102. $-43 - (-19) - (-21) + 25$
 $= -43 + 19 + 21 + 25 = 22$
103. $-34 - 28 + (-33) - 44$
 $= (-34) + (-28) + (-33) + (-44) = -139$
104. $39 + (-88) - 29 - (-83)$
 $= 39 + (-88) + (-29) + 83 = 5$
105. $-93 + (-84) - (-93) - (-84)$
Note that we are subtracting -93 from -93 and -84 from -84 . Thus, the result will be 0.
106. $84 + (-99) + 44 - (-99) - 43$
 $= 84 + (-99) + 44 + 99 + (-43) = 85$

107. $-7x - 4y = -7x + (-4y)$, so the terms are $-7x$ and $-4y$

108. $7a - 9b = 7a + (-9b)$, so the terms are $7a$ and $-9b$

109. $9 - 5t - 3st = 9 + (-5t) + (-3st)$, so the terms are $9, -5t$, and $-3st$

110. $-4 - 3x + 2xy = -4 + (-3x) + (2xy)$, so the terms are $-4, -3x, 2xy$

111. $4x - 7x = 4x + (-7x)$ Adding the opposite
 $= (4 + (-7))x$ Using the distributive law
 $= -3x$

112. $3a - 14a = 3a + (-14a)$ Adding the opposite
 $= (3 + (-14))a$ Using the distributive law
 $= -11a$

113. $7a - 12a + 4$
 $= 7a + (-12a) + 4$ Adding the opposite
 $= (7 + (-12))a + 4$ Using the distributive law
 $= -5a + 4$

114. $-9x - 13x + 7$
 $= -9x + (-13x) + 7$ Adding the opposite
 $= (-9 + (-13))x + 7$ Using the distributive law
 $= -22x + 7$

115. $-8n - 9 + 7n$
 $= (-8 + 7)n - 9$ Using the distributive law
 $= -n - 9$

116. $-7 + 9n - 8n$
 $= (9 - 8)n - 7$ Using the distributive law
 $= n - 7$

117. $2 - 6t - 9 + t = (-6 + 1)t + (2 - 9)$
 $= -5t + (-7)$
 $= -5t - 7$

118. $-5 + b - 7 - 5b = (1 - 5)b + (-5) + (-7)$
 $= -4b + (-12)$
 $= -4b - 12$

119. $5y + (-3x) - 9x + 1 - 2y + 8$
 $= 5y + (-3x) + (-9x) + 1 + (-2y) + 8$
 $= 5y + (-2y) + (-3x) + (-9x) + 1 + 8$
 $= 3y - 12x + 9$
 or $-12x + 3y + 9$

120. $14 - (-5x) + 2z - (-32) + 4z - 2x$
 $= 14 + 5x + 2z + 32 + 4z + (-2x)$
 $= 5x + (-2x) + 2z + 4z + 14 + 32$
 $= 3x + 6z + 46$

121. $13x - (-2x) + 45 - (-21) - 7x$
 $= 13x + 2x + 45 + 21 + (-7x)$
 $= 13x + 2x + (-7x) + 45 + 21$
 $= 8x + 66$

122. $8t - (-2t) - 14 - (-5t) + 53 - 9t$
 $= 8t + 2t + (-14) + 5t + 53 + (-9t)$
 $= (8 + 2 + 5 - 9)t + (-14) + 53$
 $= 6t + 39$

123. We subtract the lower elevation from the higher elevation:
 $102,880 \text{ ft} - (-35,797 \text{ ft})$
 $= 102,880 \text{ ft} + 35,797 \text{ ft}$
 $= 138,677 \text{ ft}$
 The difference in elevations is 138,677 ft.

124. We subtract the lower elevation from the higher elevation:
 $29,035 - (-1340) = 29,035 + 1340 = 30,375$
 The difference in elevation is 30,375 ft.

125. We subtract the lower temperature from the higher temperature:
 $15 - (-32) = 15 + 32 = 47$
 The temperature rose 47°F .

126. Highest Temp minus Lowest Temp is Range of Temp
 $134 - -79.8 = 213.8$

127. We subtract the lesser differential from the greater:
 $8.5 - (-0.4) = 8.5 + 0.4 = 8.9$
 The Cavaliers improved 8.9 points.
128. We subtract the lesser depth from the greater:
 $10,911.5 \text{ m} - 8530 \text{ m} = 2381.5 \text{ m}.$
129. *Thinking and Writing Exercise.* Yes. You can rewrite subtraction as addition of the opposite.
130. *Thinking and Writing Exercise.* $-a + b$ is the opposite of $a + (-b)$ since
 $a + (-b) + (-a + b) = a + (-a) + (-b) + b = 0.$
131. $\text{Area} = lw = (36\text{ft})(12\text{ft}) = 432 \text{ ft}^2$
132. $864 = 2 \cdot 432 = 2 \cdot 2 \cdot 216 = 2 \cdot 2 \cdot 2 \cdot 108$
 $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 54 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 27$
 $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 9$
 $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3$
133. *Thinking and Writing Exercise.* The "-" symbol can be used to designate the opposite of a number, as a negative sign, or to indicate subtraction. Examples may vary.
134. *Thinking and Writing Exercise.* For two negative numbers a and b , $a - b$ is negative when $|a| > |b|$.
135. Rewrite: Actual time minus Clock time is Time power was out
 Translate: $3:00 \text{ pm} - 8:00 \text{ am} = \text{Time power was out}$
 $3:00 \text{ pm (our 15:00 hrs)} - 8:00 \text{ am} = 7 \text{ hrs}.$
 Since the power was restored 7 hrs after it was lost, $4:00 \text{ pm} + 7 \text{ hrs} = 11:00 \text{ pm}.$ The power was restored at 11:00 pm on August 14.
136. True. For example, for $m = 5$ and $n = 3$, $5 > 3$ and $5 - 3 > 0$, or $2 > 0$. For $m = -4$ and $n = -9$, $-4 > -9$ and $-4 - (-9) > 0$, or $5 > 0$.
137. False. For example, let $m = -3$ and $n = -5$. Then $-3 > -5$, but $-3 + (-5) = -8 \neq 0$.
138. False. For example, let $m = 2$ and $n = -2$. Then 2 and -2 are opposites, but $2 - (-2) = 4 \neq 0$.
139. True. For example, for $m = 4$ and $n = -4$, $4 = -(-4)$ and $4 + (-4) = 0$; for $m = -3$ and $n = 3$, $-3 = -(3)$ and $-3 + 3 = 0$.
140. *Thinking and Writing Exercise.* After the second "double or nothing" wager, the debt was \$20, so the debt before that wager (that is, after the first "double or nothing" wager) was \$10. Then the debt before the first "double or nothing" wager (that is, after the original wager) was \$5. Thus, the gambler originally bet \$5, this debt was doubled to \$10, and that debt was doubled to \$20.
141. $(-)\boxed{9}\boxed{-}\boxed{(-)}\boxed{7}\boxed{\text{Enter}}$
142. *Thinking and Writing Exercise.* If n is positive and m is negative, then $-m$ is positive and $n + (-m)$ is positive.

 Exercise Set 1.7

1. 1

2. 0

3. 0

4. 1

5. 0

6. 1

7. 1

8. 0

9. 1

10. 0

11. $-3 \cdot 8 = -24$ Multiply the absolute values, $3 \cdot 8$; the product is negative.12. $-3 \cdot 7 = -21$ Multiply the absolute values, $3 \cdot 7$; the product is negative.

13. $-8 \cdot 7 = -56$ Multiply the absolute values, $8 \cdot 7$; the product is negative.

14. $-9 \cdot 2 = -18$ Multiply the absolute values, $9 \cdot 2$; the product is negative.

15. $8 \cdot (-3) = -(8 \cdot 3) = -24$

16. $9 \cdot (-5) = -(9 \cdot 5) = -45$

17. $-6 \cdot (-7) = 42$ Multiply the absolute values, $6 \cdot 7$; the product of two negative numbers is positive.

18. $-2 \cdot (-5) = 10$ Multiply the absolute values, $2 \cdot 5$; the product of two negative numbers is positive.

19. $19 \cdot (-10) = -190$

20. $12 \cdot (-10) = -120$

21. $-12 \cdot 12 = -144$

22. $-13 \cdot (-15) = 195$

23. $-25 \cdot (-48) = 1200$

24. $15 \cdot (-43) = -645$

25. $4.5 \cdot (-28) = -126$

26. $-49 \cdot (-2.1) = 102.9$

27. $-5 \cdot (-2.3) = 11.5$

28. $-6 \cdot 4.8 = -28.8$

29. $-25 \cdot 0 = 0$

30. $0 \cdot (-4.7) = 0$

31. $\frac{2}{3} \cdot \left(-\frac{3}{5}\right) = -\left(\frac{2}{3} \cdot \frac{3}{5}\right) = -\left(\frac{2 \cdot \cancel{3}}{\cancel{3} \cdot 5}\right) = -\frac{2}{5}$

32. $\frac{5}{7} \cdot \left(-\frac{2}{3}\right) = -\left(\frac{5}{7} \cdot \frac{2}{3}\right) = -\left(\frac{5 \cdot 2}{7 \cdot 3}\right) = -\frac{10}{21}$

33. $-\frac{3}{8} \cdot \left(-\frac{2}{9}\right) = \frac{3}{8} \cdot \frac{2}{9} = \frac{3 \cdot 2}{8 \cdot 9} = \frac{\cancel{3} \cdot \cancel{2}}{\cancel{2} \cdot 4 \cdot \cancel{3} \cdot 3} = \frac{1}{12}$

34. $-\frac{5}{8} \cdot \left(-\frac{2}{5}\right) = \frac{5}{8} \cdot \frac{2}{5} = \frac{5 \cdot 2}{8 \cdot 5} = \frac{\cancel{5} \cdot \cancel{2}}{\cancel{2} \cdot 4 \cdot \cancel{5}} = \frac{1}{4}$

35. $(-5.3)(2.1) = -11.13$

36. $(-4.3)(9.5) = -40.85$

37. $-\frac{5}{9} \cdot \frac{3}{4} = -\left(\frac{5}{9} \cdot \frac{3}{4}\right) = -\left(\frac{5 \cdot \cancel{3}}{\cancel{3} \cdot 3 \cdot 4}\right) = -\frac{5}{12}$

38. $-\frac{8}{3} \cdot \frac{9}{4} = -\left(\frac{8}{3} \cdot \frac{9}{4}\right) = -\left(\frac{2 \cdot \cancel{4} \cdot \cancel{3} \cdot 3}{\cancel{3} \cdot \cancel{4}}\right) = -6$

39. $3 \cdot (-7) \cdot (-2) \cdot 6$
 $= -21 \cdot -12$ Multiplying the first two numbers and the last two numbers
 $= 252$

40. $9 \cdot (-2) \cdot (-6) \cdot 7$
 $= -18 \cdot -42$ Multiplying the first two numbers and the last two numbers.
 $= 756$

41. $\frac{-1}{3} \cdot \frac{1}{4} \cdot \left(-\frac{3}{7}\right) = \frac{-1}{12} \cdot \left(-\frac{3}{7}\right)$
 $= \frac{1 \cdot \cancel{3}}{\cancel{3} \cdot 4 \cdot 7} = \frac{1}{28}$

42. $\frac{-1}{2} \cdot \frac{3}{5} \cdot \left(-\frac{2}{7}\right) = \frac{-3}{10} \cdot \left(-\frac{2}{7}\right)$
 $= \frac{3 \cdot \cancel{2}}{5 \cdot \cancel{2} \cdot 7} = \frac{3}{35}$

43. $-2 \cdot (-5) \cdot (-3) \cdot (-5) = 10 \cdot 15 = 150$

44. $-3 \cdot (-5) \cdot (-2) \cdot (-1) = 15 \cdot 2 = 30$

45. $(-31) \cdot (-27) \cdot 0 = 0.$

46. $7 \cdot (-6) \cdot 5 \cdot (-4) \cdot 3 \cdot (-2) \cdot 1 \cdot 0 = 0$

$$47. (-8)(-9)(-10) = 72 \cdot (-10) \\ = -720$$

$$48. (-7)(-8)(-9)(-10) = 56 \cdot 90 \\ = 5040$$

$$49. (-6)(-7)(-8)(-9)(-10) = 42 \cdot 72 \cdot (-10) \\ = 3024 \cdot (-10) \\ = -30,240$$

$$50. (-5)(-6)(-7)(-8)(-9)(-10) \\ = -5 \cdot -30,240 \quad \text{From Exercise 49} \\ = 151,200$$

$$51. 14 \div (-2) = -7 \quad \text{Check: } -7 \cdot (-2) = 14$$

$$52. 24 \div (-3) = -8 \quad \text{Check: } -8 \cdot (-3) = 24$$

$$53. -26 \div (-13) = 2 \quad \text{Check: } 2 \cdot (-13) = -26$$

$$54. -32 \div (-4) = 8 \quad \text{Check: } 8 \cdot (-4) = -32$$

$$55. -50 \div 5 = -10 \quad \text{Check: } -10 \cdot 5 = -50$$

$$56. -50 \div 25 = -2 \quad \text{Check: } -2 \cdot 25 = -50$$

$$57. -10.2 \div (-2) = 5.1 \quad \text{Check: } 5.1 \cdot (-2) = -10.2$$

$$58. -2 \div 0.8 = -2.5 \quad \text{Check: } -2.5 \cdot 0.8 = -2$$

$$59. -100 \div (-11) = \frac{100}{11}$$

$$60. \frac{-64}{-7} = \frac{\cancel{-1} \cdot 64}{\cancel{-1} \cdot 7} = \frac{64}{7}$$

$$61. \frac{400}{-50} = -\frac{\cancel{50} \cdot 8}{\cancel{50}} = -8$$

$$62. -300 \div (-13) = \frac{300}{13}$$

$$63. \frac{28}{0} \text{ is undefined}$$

$$64. \frac{0}{-5} = 0 \div -5 = 0$$

$$65. -4.8 \div 1.2 = -4 \quad \text{Check: } -4 \cdot 1.2 = -4.8$$

$$66. -3.9 \div 1.3 = -3 \quad \text{Check: } -3 \cdot 1.3 = -3.9$$

$$67. \frac{0}{-9} = 0 \quad \text{Check: } 0 \cdot (-9) = 0$$

$$68. 0 \div (-47) = 0 \quad \text{Check: } 0 \cdot (-47) = 0$$

$$69. \frac{9.7(-2.8)0}{4.3} = \frac{0}{4.3} = 0 \quad \text{Check: } 0 \cdot 4.3 = 0$$

$$70. \frac{(-4.9)(7.2)}{0} \text{ is undefined.}$$

$$71. \frac{-8}{3} = \frac{8}{-3} \quad \text{and} \quad \frac{-8}{3} = -\frac{8}{3}$$

$$72. \frac{-12}{7} = \frac{12}{-7} \quad \text{and} \quad \frac{-12}{7} = -\frac{12}{7}$$

$$73. \frac{29}{-35} = -\frac{29}{35} \quad \text{and} \quad \frac{29}{-35} = \frac{-29}{35}$$

$$74. \frac{9}{-14} = -\frac{9}{14} \quad \text{and} \quad \frac{9}{-14} = \frac{-9}{14}$$

$$75. -\frac{7}{3} = \frac{-7}{3} \quad \text{and} \quad -\frac{7}{3} = \frac{7}{-3}$$

$$76. -\frac{4}{15} = \frac{-4}{15} \quad \text{and} \quad -\frac{4}{15} = \frac{4}{-15}$$

$$77. \frac{-x}{2} = -\frac{x}{2} \quad \text{and} \quad \frac{-x}{2} = \frac{x}{-2}$$

$$78. \frac{9}{-a} = -\frac{9}{a} \quad \text{and} \quad \frac{9}{-a} = \frac{-9}{a}$$

$$79. -\frac{5}{4}, \text{ since } \left(-\frac{5}{4}\right) \cdot \left(-\frac{4}{5}\right) = 1$$

$$80. -\frac{11}{13}, \text{ since } -\frac{11}{13} \cdot \left(-\frac{13}{11}\right) = 1$$

$$81. -\frac{10}{51}; \text{ since } -\frac{10}{51} \cdot \left(\frac{51}{-10}\right) = 1$$

$$82. -\frac{24}{43}, \text{ since } -\frac{24}{43} \cdot \left(\frac{43}{-24}\right) = 1$$

$$83. -\frac{1}{10}, \text{ since } -\frac{1}{10} \cdot (-10) = 1$$

$$84. \frac{1}{34}, \text{ since } \frac{1}{34} \cdot 34 = 1$$

$$85. \frac{1}{4.3}, \text{ since } \frac{1}{4.3} \cdot 4.3 = 1.$$

$$\text{This can also be written as } \frac{1}{4.3} \cdot \frac{10}{10} = \frac{10}{43}$$

$$86. -\frac{1}{1.7}, \text{ or } -\frac{1}{1.7} \cdot \frac{10}{10} = -\frac{10}{17}$$

$$87. -4, \text{ since } -4 \cdot \left(\frac{-1}{4}\right) = \frac{-4 \cdot (-1)}{4} = \frac{4}{4} = 1$$

$$88. -11, \text{ since } -11 \cdot \left(\frac{-1}{11}\right) = \frac{-11 \cdot (-1)}{11} = \frac{11}{11} = 1$$

89. Does not exist

$$90. -1, \text{ since } -1 \cdot (-1) = 1$$

$$91. \left(\frac{-7}{4}\right) \left(\frac{-3}{5}\right) = \frac{7 \cdot 3}{4 \cdot 5} = \frac{21}{20}$$

$$92. \left(\frac{-5}{6}\right) \left(\frac{-1}{3}\right) = \frac{5 \cdot 1}{6 \cdot 3} = \frac{5}{18}$$

$$93. \frac{-3}{8} + \frac{-5}{8} = \frac{-3 + (-5)}{8} = \frac{-8}{8} = -1$$

$$94. \frac{-4}{5} + \frac{7}{5} = \frac{-4 + 7}{5} = \frac{3}{5}$$

$$95. \left(\frac{-9}{5}\right) \left(\frac{5}{-9}\right) = 1$$

Note: This is the product of reciprocals.

$$96. \left(\frac{-2}{7}\right) \left(\frac{5}{-8}\right) = \frac{2 \cdot 5}{7 \cdot 8} = \frac{\cancel{2} \cdot 5}{7 \cdot \cancel{2} \cdot 4} = \frac{5}{28}$$

$$97. \left(-\frac{3}{11}\right) - \left(-\frac{6}{11}\right) = \frac{-3 - (-6)}{11} = \frac{-3 + 6}{11} = \frac{3}{11}$$

$$98. \left(-\frac{4}{7}\right) - \left(-\frac{2}{7}\right) = \frac{-4 - (-2)}{7} = \frac{-4 + 2}{7} = \frac{-2}{7} = -\frac{2}{7}$$

$$99. \frac{7}{8} \div \left(-\frac{1}{2}\right) = \frac{7}{8} \cdot \left(\frac{-2}{1}\right) = -\left(\frac{7 \cdot 2}{8 \cdot 1}\right) = -\left(\frac{\cancel{7} \cdot \cancel{2}}{\cancel{2} \cdot 4}\right) = -\frac{7}{4}$$

$$100. \frac{3}{4} \div \left(-\frac{2}{3}\right) = \frac{3}{4} \cdot \left(-\frac{3}{2}\right) = -\left(\frac{3 \cdot 3}{4 \cdot 2}\right) = -\frac{9}{8}$$

$$101. \frac{9}{5} \cdot \frac{-20}{3} = -\left(\frac{9 \cdot 20}{5 \cdot 3}\right) = -\left(\frac{\cancel{3} \cdot 3 \cdot 4 \cdot \cancel{5}}{\cancel{5} \cdot \cancel{3}}\right) = -12$$

$$102. \frac{-5}{12} \cdot \frac{7}{15} = -\left(\frac{5 \cdot 7}{12 \cdot 15}\right) = -\left(\frac{\cancel{5} \cdot 7}{12 \cdot 3 \cdot \cancel{5}}\right) = -\frac{7}{36}$$

$$103. \left(-\frac{18}{7}\right) + \left(-\frac{3}{7}\right) = \frac{-18 + (-3)}{7} = \frac{-21}{7} = -3$$

$$104. \left(-\frac{12}{5}\right) + \left(-\frac{3}{5}\right) = \frac{-12 + (-3)}{5} = \frac{-15}{5} = -3$$

$$105. -\frac{5}{9} \div \left(-\frac{5}{9}\right) = 1$$

Any non-zero number divided by itself equals 1.

$$106. -\frac{5}{12} \div \left(\frac{15}{7}\right) = -\frac{5}{12} \cdot \frac{7}{15} = -\frac{\cancel{5} \cdot 7}{12 \cdot 3 \cdot \cancel{5}} = -\frac{7}{36}$$

$$107. \frac{5}{9} - \frac{7}{9} = \frac{5 - 7}{9} = \frac{-2}{9}, \text{ or } -\frac{2}{9}$$

$$108. \frac{2}{7} - \frac{6}{7} = \frac{2 - 6}{7} = \frac{-4}{7}, \text{ or } -\frac{4}{7}$$

$$109. \frac{-3}{10} + \frac{2}{5} = \frac{-3}{10} + \frac{4}{10} = \frac{-3 + 4}{10} = \frac{1}{10}$$

$$110. \frac{-5}{9} + \frac{2}{3} = \frac{-5}{9} + \frac{6}{9} = \frac{-5 + 6}{9} = \frac{1}{9}$$

$$111. \frac{7}{10} \div \left(\frac{-3}{5}\right) = -\left(\frac{7}{10} \cdot \frac{5}{3}\right) = -\left(\frac{7 \cdot 5}{10 \cdot 3}\right) \\ = -\left(\frac{7 \cdot \cancel{5}}{\cancel{5} \cdot 2 \cdot 3}\right) = -\frac{7}{6}$$

$$112. \left(\frac{-3}{5}\right) \div \frac{6}{15} = -\left(\frac{3}{5} \cdot \frac{15}{6}\right) = -\left(\frac{3 \cdot 15}{5 \cdot 6}\right) \\ = -\left(\frac{\cancel{3} \cdot 3 \cdot \cancel{5}}{\cancel{3} \cdot 2 \cdot \cancel{5}}\right) = -\frac{3}{2}$$

$$113. \frac{14}{-9} \div \frac{0}{3} = -\frac{14}{9} \cdot \frac{3}{0} \text{ is undefined.}$$

$$114. \frac{0}{-10} \div \frac{-3}{8} = 0 \cdot \left(-\frac{8}{3}\right) = 0$$

$$115. \frac{-4}{15} + \frac{2}{-3} = -\frac{4}{15} + \left(-\frac{10}{15}\right) = \frac{-4 + (-10)}{15} = -\frac{14}{15}$$

$$116. \frac{3}{-10} + \frac{-1}{5} = \frac{-3}{10} + \frac{-2}{10} = \frac{-3 + (-2)}{10} = \frac{-5}{10} = -\frac{1}{2}$$

117. *Thinking and Writing Exercise.* You get the original number. The reciprocal of the reciprocal of a number is the original number.

118. *Thinking and Writing Exercise.* Think of $3 \cdot (-5)$ as $-5 + (-5) + (-5)$. Start at -5 and move the left 5 units to -10 ; then move to the left another 5 units to -15 . Thus, $3 \cdot (-5) = -15$.

$$119. \frac{264}{468} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot \cancel{3} \cdot 11}{\cancel{2} \cdot \cancel{2} \cdot \cancel{3} \cdot 3 \cdot 13} = \frac{22}{39}$$

$$120. \begin{array}{r} 35 - a = 13 \\ 35 - 12 \stackrel{?}{=} 13 \\ 23 \mid 13 \quad 23 = 13 \text{ is FALSE.} \end{array}$$

No, 12 is not a solution.

121. *Thinking and Writing Exercise.* Yes; consider n ($n \neq 0$) and its opposite $-n$. The reciprocals of these numbers are $\frac{1}{n}$ and $\frac{1}{-n}$. Now $\frac{1}{n} + \frac{1}{-n} = \frac{1}{n} + \frac{-1}{n} = 0$, so the reciprocals are also opposites.

122. *Thinking and Writing Exercise.* Yes, consider n and its reciprocal $\frac{1}{n}$. The opposites of these numbers are $-n$ and $-\frac{1}{n}$. Now $(-n)\left(-\frac{1}{n}\right) = 1$, so the opposites are also reciprocals.

$$123. \frac{1}{a+b} \text{ Answers may vary.}$$

$$124. \frac{1}{a} + \frac{1}{b} \text{ Answers may vary.}$$

$$125. -(a+b) \text{ Answers may vary.}$$

$$126. (-a) + (-b) \text{ Answers may vary.}$$

$$127. x = -x$$

$$128. x = \frac{1}{x}$$

129. Consider the sum $2 + 3$. Its reciprocal is $\frac{1}{2+3}$, or $\frac{1}{5}$, but $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$. Answers may vary.

130. -1 and 1 are their own reciprocals.
 $[-1(-1) = 1 \text{ and } 1 \cdot 1 = 1]$

131. When n is negative, $-n$ is positive, so $\frac{m}{-n}$ is the quotient of a negative number and a positive number, which is negative.

132. When n is negative, $-n$ is positive; similarly, $-m$ is positive. The quotient of two positive numbers is positive.

133. When n is negative, $-n$ is positive, so $\frac{-n}{m}$ is the quotient of a positive and a negative number and, thus, is negative. When m is negative, $-m$ is positive, so $-m \cdot \left(\frac{-n}{m}\right)$ is the product of a positive and a negative number and, thus, is negative.

134. When m is negative, $-m$ is positive, so $\frac{n}{-m}$ is the quotient of a negative and positive number and is negative. The opposite of a negative number is positive.
135. $m + n$ is the sum of two negative numbers, so it is negative; $\frac{m}{n}$ is the quotient of two negative numbers, so it is positive. Then $(m + n) \cdot \frac{m}{n}$ is the product of a negative and a positive number and, thus, is negative.
136. $-n$ and $-m$ are both positive, so $-n - m$, or $-n + (-m)$ is positive; $\frac{n}{m}$ is also positive, so $(-n - m) \frac{n}{m}$ is positive.
137. a) m and n have different signs;
b) either m or n is zero;
c) m and n have the same sign.
138. The temperature is -3°F at 6:00 am.
rise 2° per hour for 3 hr = $2 \cdot 3 = 6$
rise 3° per hour for 6 hr = $3 \cdot 6 = 18$
fall 2° per hour for 3 hr = $-2 \cdot 3 = -6$
fall 5° per hour for 2 hr = $-5 \cdot 2 = -10$
 $6 + 18 - 6 - 10 = 24 - 6 - 10 = 18 - 10 = 8$
The temperature at 8:00 pm will be $-3 + 8 = 5^\circ\text{F}$.
139. $a(-b) + ab = a[-b + b]$ Distributive law
 $= a(0)$ Law of opposites
 $= 0$ Multiplicative property of 0
 Therefore $a(-b)$ is the opposite of ab by the law of opposites.
140. *Thinking and Writing Exercise.* No; if $a > 0$ and $b < 0$, then $a > b$ but since $\frac{1}{a} > 0$ and $\frac{1}{b} < 0$, $\frac{1}{a} > \frac{1}{b}$.

 Exercise Set 1.8

1. a) Division
b) Subtraction
c) Addition
d) Multiplication
- e) Subtraction
f) Multiplication
2. a) Multiplication
b) Subtraction
c) Addition
d) Subtraction
e) Division
f) Multiplication
3. $\underbrace{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}_{7 \text{ factors}} = x^7$
4. $\underbrace{y \cdot y \cdot y \cdot y \cdot y \cdot y}_{6 \text{ factors}} = y^6$
5. $(-5)(-5)(-5) = (-5)^3$
6. $(-7)(-7)(-7)(-7) = (-7)^4$
7. $\underbrace{3t \cdot 3t \cdot 3t \cdot 3t \cdot 3t}_{5 \text{ factors}} = (3t)^5$
8. $\underbrace{5m \cdot 5m \cdot 5m \cdot 5m \cdot 5m}_{5 \text{ factors}} = (5m)^5$
9. $2 \cdot n \cdot n \cdot n \cdot n = 2n^4$
10. $8 \cdot a \cdot a \cdot a = 8a^3$
11. $3^2 = 3 \cdot 3 = 9$
12. $5^3 = 5 \cdot 5 \cdot 5 = 125$
13. $(-4)^2 = -4 \cdot (-4) = 16$
14. $(-9)^2 = (-9) \cdot (-9) = 81$
15. $-4^2 = -4 \cdot 4 = -16$
16. $-9^2 = -9 \cdot 9 = -81$

17. $4^3 = 4 \cdot 4 \cdot 4 = 64$

18. $9^1 = 9$ (1 factor of 9)

19. $(-5)^4 = -5 \cdot (-5) \cdot (-5) \cdot (-5) = 625$

20. $5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$

21. $7^1 = 7$ (1 factor of 7)

22. $(-1)^7 = -1 \cdot (-1) \cdot (-1) \cdot (-1) \cdot (-1) \cdot (-1) \cdot (-1)$
 $= -1$

23. $(-2)^5 = (-2)(-2)(-2)(-2)(-2) = -32$

24. $-2^5 = -2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = -32$

25. $(3t)^4 = 3t \cdot 3t \cdot 3t \cdot 3t$
 $= 3 \cdot 3 \cdot 3 \cdot 3 \cdot t \cdot t \cdot t \cdot t$
 $= 81t^4$

26. $(5t)^2 = 5t \cdot 5t = 5 \cdot 5 \cdot t \cdot t = 25t^2$

27. $(-7x)^3 = -7x \cdot (-7x) \cdot (-7x)$
 $= -7 \cdot (-7) \cdot (-7) \cdot x \cdot x \cdot x$
 $= -343x^3$

28. $(-5x)^4 = -5x \cdot (-5x) \cdot (-5x) \cdot (-5x)$
 $= -5 \cdot (-5) \cdot (-5) \cdot (-5) \cdot x \cdot x \cdot x \cdot x$
 $= 625x^4$

Exercises 29–56. Review the “Rules for Order of Operations” on Page 65.

29. $5 + 3 \cdot 7 = 5 + 21 = 26$

30. $3 - 4 \cdot 2 = 3 - 8 = -5$

31. $8 \cdot 7 + 6 \cdot 5 = 56 + 30 = 86$

32. $10 \cdot 5 + 1 \cdot 1 = 50 + 1 = 51$

33. $9 \div 3 + 16 \div 8 = 3 + 2 = 5$

34. $32 - 8 \div 4 - 2 = 32 - 2 - 2 = 28$

35. $14 \cdot 19 \div (19 \cdot 14) = 1$ Note: we are dividing a number by itself.

36. $18 - 6 \div 3 \cdot 2 + 7 = 18 - 2 \cdot 2 + 7$
 $= 18 - 4 + 7 = 21$

37. $3(-10)^2 - 8 \div 2^2$
 $= 3 \cdot 100 - 8 \div 4$ Simplifying the exponential expressions
 $= 300 - 2$ Multiplying and dividing from left to right
 $= 298$ Subtracting

38. $9 - 3^2 \div 9(-1)$
 $= 9 - 9 \div 9(-1)$ Simplifying the exponential expression
 $= 9 - 1(-1)$ Dividing and multiplying from left to right
 $= 9 + 1$ Adding
 $= 10$

39. $8 - (2 \cdot 3 - 9)$
 $= 8 - (6 - 9)$ Multiplying inside the parentheses
 $= 8 - (-3)$ Subtracting inside the parentheses
 $= 11$ Subtracting

40. $(8 - 2 \cdot 3) - 9 = (8 - 6) - 9$ Multiplying inside the parentheses
 $= 2 - 9$ Subtracting inside the parentheses
 $= -7$ Subtracting

41. $(8 - 2)(3 - 9) = 6 \cdot (-6) = -36$

42. $32 \div (-2)^2 \cdot 4 = 32 \div 4 \cdot 4$
 $= 8 \cdot 4 = 32$

$$43. \quad 5 \cdot 3^2 - 4^2 \cdot 2 = 5 \cdot 9 - 16 \cdot 2 \\ = 45 - 32 = 13$$

$$44. \quad 112 \div 28 - 112 \div 28 = 0 \quad \text{Note: we are subtracting a number from itself.}$$

$$45. \quad 5 + 3(2 - 9)^2 = 5 + 3(-7)^2 = 5 + 3 \cdot 49 \\ = 5 + 147 = 152$$

$$46. \quad 9 - (3 - 5)^3 - 4 = 9 - (-2)^3 - 4 = 9 - (-8) - 4 \\ = 17 - 4 = 13$$

$$47. \quad [2 \cdot (5 - 8)]^2 - 12 = [2 \cdot (-3)]^2 - 12 \\ = (-6)^2 - 12 = 36 - 12 = 24$$

$$48. \quad 2^3 + 2^4 - 5[8 - 4(9 - 10)^2] \\ = 8 + 16 - 5[8 - 4(-1)^2] \\ = 24 - 5[8 - 4 \cdot 1] = 24 - 5[8 - 4] \\ = 24 - 5(4) = 24 - 20 = 4$$

$$49. \quad \frac{7+2}{5^2-4^2} = \frac{9}{25-16} = \frac{9}{9} = 1$$

$$50. \quad \frac{5^2-3^2}{2 \cdot 6-4} = \frac{25-9}{12-4} = \frac{16}{8} = 2$$

$$51. \quad 8(-7) + |6(-5)| = -56 + |-30| \\ = -56 + 30 = -26$$

$$52. \quad |10(-5)| + 1(-1) = |-50| - 1 = 50 - 1 = 49$$

$$53. \quad \frac{(-2)^3+4^2}{3-5^2+3 \cdot 6} = \frac{-8+16}{3-25+3 \cdot 6} = \frac{8}{3-25+18} \\ = \frac{8}{-22+18} = \frac{8}{-4} = -2$$

$$54. \quad \frac{7^2-(-1)^5}{3-2 \cdot 3^2+5} = \frac{49-(-1)}{3-2 \cdot 9+5} = \frac{50}{3-18+5} \\ = \frac{50}{-15+5} = \frac{50}{-10} = -5$$

$$55. \quad \frac{-3^3-2 \cdot 3^2}{8 \div 2^2-(6-|2-15|)} = \frac{-27-2 \cdot 9}{8 \div 4-(6-|-13|)} \\ = \frac{-27-18}{2-(6-13)} = \frac{-45}{2-(-7)} = \frac{-45}{2+7} = \frac{-45}{9} = -5$$

$$56. \quad \frac{(-5)^2-3 \cdot 5}{3^2+4 \cdot |6-7| \cdot (-1)^5} = \frac{25-15}{9+4 \cdot |-1| \cdot (-1)} \\ = \frac{10}{9+4(1)(-1)} = \frac{10}{9+(-4)} = \frac{10}{9-4} = \frac{10}{5} = 2$$

57. This expression is equivalent to expression (a).

$$\frac{5(3-7)+4^3}{(-2-3)^2} = \frac{5(-4)+4^3}{(-5)^2} \\ = \frac{5(-4)+64}{25} \\ = \frac{-20+64}{25} \\ = \frac{44}{25}$$

TI-84 Plus calculator screen showing the calculation: $(5(3-7)+4^3)/(-2-3)^2 = 44/25$

58. This expression is equivalent to expression (c).

$$(5(3-7)+4)^3 \div (-2) - 3^2 \\ = (5(-4)+4)^3 \div (-2) - 3^2 \\ = (-20+4)^3 \div (-2) - 3^2 \\ = (-16)^3 \div (-2) - 3^2 \\ = -4096 \div (-2) - 9 \\ = 2048 - 9 \\ = 2039$$

TI-84 Plus calculator screen showing the calculation: $(5(3-7)+4)^3/-2-3^2 = 2039$

59. This expression is equivalent to expression (d).

$$\begin{aligned}
 5(3-7) + 4^3 \div (-2-3)^2 &= 5(-4) + 4^3 \div (-5)^2 \\
 &= 5(-4) + 64 \div 25 \\
 &= -20 + 2.56 \\
 &= -17.44
 \end{aligned}$$

60. This expression is equivalent to expression (b).

$$\begin{aligned}
 \frac{5(3-7) + 4^3}{(-2)-3^2} &= \frac{5(-4) + 64}{(-2)-9} \\
 &= \frac{-20 + 64}{-11} \\
 &= \frac{44}{-11} \\
 &= -4
 \end{aligned}$$

61.

Rounded to the nearest thousandth, the answer is 21.563.

62.

Rounded to the nearest thousandth, the answer is -2.948.

63.

Rounded to the nearest thousandth, the answer is -1.026.

64.

Rounded to the nearest thousandth, the answer is 13,997.521.

65. $9 - 4x = 9 - 4 \cdot 5$ Substituting 5 for x
 $= 9 - 20$ Multiplying
 $= -11$ Subtracting

66. $1 + x^3 = 1 + (-2)^3$ Substituting -2 for x
 $= 1 + (-8)$ Simplifying the exponential expression
 $= -7$ Adding

67. $24 \div t^3 = 24 \div (-2)^3$ Substituting -2 for t
 $= 24 \div (-8)$ Simplifying the exponential expression
 $= -3$ Dividing

68. $20 \div a \cdot 4 = 20 \div 5 \cdot 4$ Substituting 5 for a
 $= 4 \cdot 4$ Dividing
 $= 16$ Multiplying

69. $45 \div 3 \cdot a = 45 \div 3 \cdot (-1)$ Substituting -1 for a
 $= 15 \cdot (-1)$ Dividing
 $= -15$ Multiplying

70. $50 \div 2 \cdot t = 50 \div 2 \cdot (-5)$ Substituting -5 for t
 $= 25 \cdot (-5)$ Dividing
 $= -125$ Multiplying

$$\begin{aligned}
 71. \quad & 5x \div 15x^2 \\
 &= 5 \cdot 3 \div 15(3)^2 \\
 &= 5 \cdot 3 \div 15 \cdot 9 \\
 &= 15 \div 15 \cdot 9 \\
 &= 1 \cdot 9 \\
 &= 9
 \end{aligned}$$

Substituting 3 for x

Simplifying the exponential expression

Dividing and multiplying in order from left to right

$$\begin{aligned}
 72. \quad & 6a \div 12a^3 \\
 &= 6 \cdot 2 \div 12 \cdot 2^3 \\
 &= 6 \cdot 2 \div 12 \cdot 8 \\
 &= 12 \div 12 \cdot 8 \\
 &= 1 \cdot 8 \\
 &= 8
 \end{aligned}$$

Substituting 2 for a

Simplifying the exponential expression

Dividing and multiplying in order from left to right

$$\begin{aligned}
 73. \quad & 45 \div 3^2 x(x-1) \\
 &= 45 \div 3^2 \cdot 3(3-1) \\
 &= 45 \div 3^2 \cdot 3 \cdot 2 \\
 &= 45 \div 9 \cdot 3 \cdot 2 \\
 &= 5 \cdot 3 \cdot 2 \\
 &= 15 \cdot 2 \\
 &= 30
 \end{aligned}$$

Substituting 3 for x

Simplifying inside the parentheses

Simplifying the exponential expression

Dividing and multiplying

in order from

left to right.

$$\begin{aligned}
 74. \quad & -30 \div t(t+4)^2 = -30 \div (-6)((-6)+4)^2 \\
 &= -30 \div (-6)(-2)^2 \\
 &= -30 \div (-6) \cdot 4 = 5 \cdot 4 = 20
 \end{aligned}$$

$$\begin{aligned}
 75. \quad & -x^2 - 5x = -(-3)^2 - 5(-3) \\
 &= -9 - 5(-3) \\
 &= -9 + 15 = 6
 \end{aligned}$$

$$\begin{aligned}
 76. \quad & (-x)^2 - 5x = -(-3))^2 - 5(-3) \\
 &= (3)^2 - 5(-3) \\
 &= 9 - 5(-3) \\
 &= 9 + 15 = 24
 \end{aligned}$$

$$\begin{aligned}
 77. \quad & \frac{3a - 4a^2}{a^2 - 20} = \frac{3 \cdot 5 - 4(5)^2}{(5)^2 - 20} = \frac{3 \cdot 5 - 4 \cdot 25}{25 - 20} \\
 &= \frac{15 - 100}{5} = \frac{-85}{5} = -17
 \end{aligned}$$

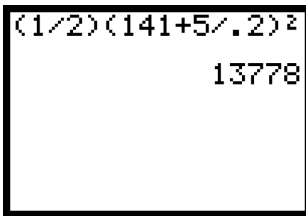
$$\begin{aligned}
 78. \quad & \frac{a^3 - 4a}{a(a-3)} = \frac{(2)^3 - 4(-2)}{-2(-2-3)} = \frac{-8 - 4(-2)}{-2(-5)} \\
 &= \frac{-8 + 8}{10} = \frac{0}{10} = 0
 \end{aligned}$$

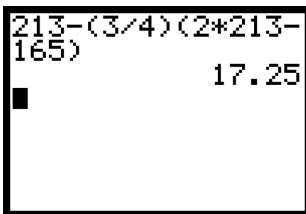
$$79. \quad 13 - (6 - 4)^3 + 10 = 15$$

$$80. \quad (5+4)^2 - 12 \div (19-17) + 68 = 143$$

$$81. \quad 3(1.6 + 2 \cdot 5.9) \div 1.6 = 25.125$$

$$82. \quad \frac{1}{2} \cdot 5 + (2 \cdot 9.25 - 1.7) = 283.74$$

83. 

84. 

85. $-(9x+1) = -9x-1$ Removing parenthesis and changing the sign of each term.

86. $-(3x+5) = -3x-5$ Removing parenthesis and changing the sign of each term.

87. $-[5-6x] = -5+6x$ Removing parenthesis and changing the sign of each term

88. $-(6x-7) = -6x+7$ Removing parenthesis and changing the sign of each term.

89. $-(4a-3b+7c) = -4a+3b-7c$

90. $-[5x-2y-3z] = -5x+2y+3z$

91. $-(3x^2+5x-1) = -3x^2-5x+1$

92. $-(8x^3-6x+5) = -8x^3+6x-5$

93. $8x-(6x+7) = 8x-6x-7 = 2x-7$

94. $2a-(5a-9) = 2a-5a+9 = -3a+9$

95. $2x-7x-(4x-6) = 2x-7x-4x+6 = -9x+6$

96. $2a+5a-(6a+8) = 2a+5a-6a-8 = a-8$

97. $9t-5r+2(3r+6t) = 9t-5r+6r+12t = 21t+r$

98. $4m-9n+3(2m-n) = 4m-9n+6m-3n = 10m-12n$

99. $15x-y-5(3x-2y+5z)$
 $= 15x-y-15x+10y-25z$ Multiplying each term in parentheses by -5
 $= 9y-25z$

100. $4a-b-4(5a-7b+8c)$
 $= 4a-b-20a+28b-32c$
 $= -16a+27b-32c$

101. $3x^2+7-(2x^2+5) = 3x^2+7-2x^2-5 = x^2+2$

102. Note that the expression $5x^4+3x$ is being subtracted from itself. The result is 0.

103. $5t^3+t+3(t-2t^3) = 5t^3+t+3t-6t^3 = -t^3+4t$

104. $8n^2-3n+2(n-4n^2) = 8n^2-3n+2n-8n^2 = -n$

105. $12a^2-3ab+5b^2-5(-5a^2+4ab-6b^2)$
 $= 12a^2-3ab+5b^2+25a^2-20ab+30b^2$
 $= 37a^2-23ab+35b^2$

106. $-8a^2+5ab-12b^2-6(2a^2-4ab-10b^2)$
 $= -8a^2+5ab-12b^2-12a^2+24ab+60b^2$
 $= -20a^2+29ab+48b^2$

107. $-7t^3-t^2-3(5t^3-3t) = -7t^3-t^2-15t^3+9t = -22t^3-t^2+9t$

108. $9t^4+7t-5(9t^3-2t) = 9t^4+7t-45t^3+10t = 9t^4-45t^3+17t$

109. $5(2x-7)-[4(2x-3)+2]$
 $= 5(2x-7)-[8x-12+2]$
 $= 5(2x-7)-[8x-10]$
 $= 10x-35-8x+10$
 $= 2x-25$

$$\begin{aligned}
 110. \quad & 3(6x-5) - [3(1-8x) + 5] \\
 &= 3(6x-5) - [3-24x+5] \\
 &= 3(6x-5) - [8-24x] \\
 &= 18x-15-8+24x \\
 &= 42x-23
 \end{aligned}$$

111. *Thinking and Writing Exercise.* Operations should be performed in the following order.
- Parentheses: Perform all calculations within parentheses (and other grouping symbols) first.
 - Exponents: Evaluate all exponential expressions, and roots.
 - Multiply and Divide in order from left to right.
 - Add and Subtract in order from left to right.

If a student does not recognize that M and D are equivalent operations, they might incorrectly do all the multiplications before division. Similarly, A and S are equivalent operations and should be done left to right at the same time. (This could be avoided by using PEDMSA, since doing all the divisions before multiplication, and all the subtractions before addition would not lead to errors.)

112. *Thinking and Writing Exercise.* Jake probably intends to perform the calculation $18 \div (2 \cdot 3) = 18 \div 6 = 3$. Instead, the calculator will use the rules for order of operations, dividing and multiplying from left to right: $18 / 2 \cdot 3 = 9 \cdot 3 = 27$.

113. Let n represent "a number." Then we have $2n+9$.

114. Let m and n represent the numbers; $\frac{1}{2}(m+n)$.

115. *Thinking and Writing Exercise.* Finding the opposite of a number and then squaring it is not equivalent to squaring the number and then finding the opposite of the result.

$$\begin{aligned}
 (-x)^2 &= (-1 \cdot x)^2 = (-1 \cdot x)(-1 \cdot x) \\
 &= (-1)(-1)(x)(x) \\
 &= x^2 \neq -x^2 \text{ for } x \neq 0.
 \end{aligned}$$

116. *Thinking and Writing Exercise.* The opposite of the absolute value of a number is not equivalent to the opposite of the number. If $x < 0$ then $-|x| = -(-x) = x \neq -x$.

$$\begin{aligned}
 117. \quad & 5t - \{7t - [4r - 3(t-7)] + 6r\} - 4r \\
 &= 5t - \{7t - [4r - 3t + 21] + 6r\} - 4r \\
 &= 5t - \{7t - 4r + 3t - 21 + 6r\} - 4r \\
 &= 5t - \{10t + 2r - 21\} - 4r \\
 &= 5t - 10t - 2r + 21 - 4r \\
 &= -6r - 5t + 21
 \end{aligned}$$

$$\begin{aligned}
 118. \quad & z - \{2z - [3z - (4z - 5z) - 6z] - 7z\} - 8z \\
 &= z - \{2z - [3z - (-z) - 6z] - 7z\} - 8z \\
 &= z - \{2z - [3z + z - 6z] - 7z\} - 8z \\
 &= z - \{2z - [-2z] - 7z\} - 8z \\
 &= z - \{2z + 2z - 7z\} - 8z \\
 &= z - \{-3z\} - 8z \\
 &= z + 3z - 8z \\
 &= -4z
 \end{aligned}$$

$$\begin{aligned}
 119. \quad & \{x - [f - (f - x)] + [x - f]\} - 3x \\
 &= \{x - [f - f + x] + [x - f]\} - 3x \\
 &= \{x - [x] + [x - f]\} - 3x \\
 &= \{x - x + x - f\} - 3x \\
 &= x - f - 3x \\
 &= -2x - f
 \end{aligned}$$

120. *Thinking and Writing Exercise.* Yes; $ab = 1 \cdot ab = (-1)(-1)(ab) = (-1) \cdot a \cdot (-1) \cdot b = (-a)(-b)$.

121. *Thinking and Writing Exercise.* No; let $a = 2, b = 3$, and $c = 5$

$$\begin{aligned}
 2|3-5| &\stackrel{?}{=} 2 \cdot 3 - 2 \cdot 5 \\
 2|-2| &\stackrel{?}{=} 6 - 10 \\
 2 \cdot 2 &\stackrel{?}{=} -4 \\
 4 &\neq -4
 \end{aligned}$$

122. False; let $m = 1$ and $n = 2$. Then $-2 + 1 = -(2 - 1) = -1$, but $-(2 + 1) = -3$.

123. True; $m - n = -n + m = -(n - m)$

124. False; let $m = 2$ and $n = 3$. Then

$$3(-3 - 2) = 3(-5) = -15, \text{ but}$$

$$-3^2 + 3 \cdot 2 = -9 + 6 = -3.$$

125. False; let $m = 2$ and $n = 1$. Then

$$-2(1 - 2) = -2(-1) = 2, \text{ but}$$

$$-(2 \cdot 1 + 2^2) = -(2 + 4) = -6.$$

126. True; $-n(-n - m) = n^2 + nm = n(n + m)$

127. $[x + 3(2 - 5x) \div 7 + x](x - 3)$. When $x = 3$, the factor $x - 3$ is 0, so the product is 0.

128. $[x + 2 \div 3x] \div [x + 2 \div 3x]$

Note that we have the expression $x + 2 \div 3x$ divided by itself, so the result is 1.

$$\begin{aligned} 129. \frac{x^2 + 2^x}{x^2 - 2^x} &= \frac{3^2 + 2^3}{3^2 - 2^3} \text{ for } x = 3 \\ &= \frac{9 + 8}{9 - 8} = \frac{17}{1} = 17 \end{aligned}$$

$$\begin{aligned} 130. \frac{x^2 + 2^x}{x^2 - 2^x} &= \frac{2^2 + 2^2}{2^2 - 2^2} \text{ for } x = 2 \\ &= \frac{4 + 4}{4 - 4} = \frac{8}{0} \text{ is undefined} \end{aligned}$$

$$\begin{aligned} 131. 4 \cdot 20^3 + 17 \cdot 20^2 + 10 \cdot 20 + 0 \cdot 20^0 \\ &= 4 \cdot 8000 + 17 \cdot 400 + 10 \cdot 20 + 0 \cdot 1 \\ &= 32,000 + 6800 + 200 + 0 \\ &= 39,000 \end{aligned}$$

132. These symbols represent 1, 5, and 0, respectively.

133. There are 6 tiers | rows of blocks, each have dimension of $x \cdot x \cdot x = x^3$. The topmost tier has 5; the second tier has $5 + 1$, or 6; the third tier has $6 + 1$, or 7; the fourth tier has $7 + 1$, or 8; the bottom two tiers both have $8 + 1$ or 9. $5 + 6 + 7 + 8 + 9 + 9 = 44$. The volume is $44x^3$.

$$2. A = lw = (8 \text{ ft})\left(\frac{1}{2} \text{ ft}\right) = 4 \text{ ft}^2$$

3. Let n = the unknown number.

$$78 = n - 92$$

4. $29 + t = 29 + 13 = 42 \neq 43$, so $t = 13$ is NOT a solution to the equation $29 + t = 43$.

$$5. 6 + 10n = 10n + 6$$

$$6. 3(ab) = (3a)b$$

$$\begin{aligned} 7. 10(5m + 9n + 1) &= 10 \cdot 5m + 10 \cdot 9n + 10 \cdot 1 \\ &= 50m + 90n + 10 \end{aligned}$$

$$8. 26x + 13 = 13 \cdot 2x + 13 \cdot 1 = 13(2x + 1)$$

9. Whole numbers are numbers in the set: $\{0, 1, 2, 3, \dots\}$. Only 7 and 0 are in this set.

10. $15 = 3 \cdot 5$. It is a composite number.

$$11. 84 = 2 \cdot 42 = 2 \cdot 2 \cdot 21 = 2 \cdot 2 \cdot 3 \cdot 7$$

12. If $t \neq 0$, then $\frac{t}{t} = 1$. $\frac{t}{t}$ is undefined at $t = 0$.

$$13. \frac{9}{10} \cdot \frac{13}{13} = \frac{9}{10} \cdot 1 = \frac{9}{10}$$

$$\begin{aligned} 14. \frac{2}{3} + \frac{5}{6} &= \frac{2}{3} \cdot \frac{2}{2} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} \\ &= \frac{4+5}{6} = \frac{9}{6} = \frac{3 \cdot \cancel{3}}{2 \cdot \cancel{3}} = \frac{3}{2} \end{aligned}$$

$$\begin{aligned} 15. \frac{3}{4} - \frac{3}{10} &= \frac{3}{4} \cdot \frac{5}{5} - \frac{3}{10} \cdot \frac{2}{2} \\ &= \frac{15}{20} - \frac{6}{20} = \frac{15-6}{20} = \frac{9}{20} \end{aligned}$$

$$16. \frac{15}{14} \cdot \frac{35}{9} = \frac{\cancel{5} \cdot 5}{2 \cdot \cancel{7}} \cdot \frac{5 \cdot \cancel{7}}{\cancel{3} \cdot 3} = \frac{5 \cdot 5}{2 \cdot 3} = \frac{25}{6}$$

$$17. 15 \div \frac{3}{5} = \frac{15}{1} \cdot \frac{5}{3} = \frac{\cancel{3} \cdot 5}{1 \cdot \cancel{3}} = 25$$

$$1. 3 + 5c - d = 3 + 5 \cdot 3 - 10 = 3 + 15 - 10 = 8$$

18. Integers are numbers in the set:

$$\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}.$$

$$0, -15, \text{ and } \frac{30}{3} = \frac{\cancel{3} \cdot 10}{\cancel{3}} = 10 \text{ are in this set.}$$

$$19. \frac{10}{9} = 9 \overline{)10.000}, \text{ so } -\frac{10}{9} = -1.\overline{1}$$

$$\begin{array}{r} 9 \\ 10 \end{array}$$

- 20.
- -15
- is to the right of
- -16
- on the number line, so
- $-15 > -16$
- . The statement is FALSE.

21. $|-1.5| = 1.5$

$$22. -15 + (-10) + 20$$

$$= -(15 + 10) + 20$$

$$= -25 + 20 = -(25 - 20) = -5$$

23. $-2.9 + 0 = -2.9$

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

25. $6 - (-9) = 6 + 9 = 15$

$$26. 3c + d - 10c - 2 + 8d$$

$$= (3 - 10)c + (1 + 8)d - 2$$

$$= -(10 - 3)c + 9d - 2$$

$$= -7c + 9d - 2$$

27. The product of two negative numbers is positive:
- $-3(-7) = 21$

$$28. 10 \div (-2.5) = \frac{10}{-2.5} = -\frac{10}{2.5} \cdot \frac{10}{10} = -\frac{100}{25} = -4$$

29. $-10^2 = -10 \cdot 10 = -100$

$$30. 120 \div (-10) \cdot 2 - 3(4 - 5)$$

$$= [120 \div (-10)] \cdot 2 - 3(-1)$$

$$= -12 \cdot 2 - (-3)$$

$$= -24 + 3 = -(24 - 3) = -21$$

$$31. -(-a + 2b - 3c)$$

$$= -1 \cdot (-a) + (-1) \cdot (2b) - (-1) \cdot (3c)$$

$$= a + (-2b) - (-3c) = a - 2b + 3c$$

$$32. 2m + n - 3(5 - m - 2n) - 12$$

$$= 2m + n + (-3)(5 - m - 2n) - 12$$

$$= 2m + n + (-3) \cdot 5 - (-3) \cdot m - (-3) \cdot 2n - 12$$

$$= 2m + n + (-15) - (-3m) - (-6n) - 12$$

$$= 2m + n - 15 + 3m + 6n - 12$$

$$= (2 + 3)m + (1 + 6)n - 15 - 12$$

$$= 5m + 7n - 27$$

Chapter 1 Review Exercises

1. True

2. True

3. False

4. True

5. False

6. False

7. True

8. False

9. False

10. True

11. $5t$; substitute 3 for t ; $5 \cdot 3 = 15$

$$12. 9 - y^2 = 9 - (-5)^2$$

$$= 9 - (25)$$

$$= -(25 - 9) = -16$$

$$13. -10 + a^2 \div (b + 1) = -10 + (5)^2 \div (-6 + 1)$$

$$= -10 + 25 \div (-5) = -10 + (-5) = -15$$

14. 7 less than $z \rightarrow z - 7$

15. Ten more than the product of x and z is:
 $xz + 10$, or $10 + xz$.16. Let b be Brent's speed and w be the wind's speed. Then fifteen times the difference of Brent's speed and the wind's speed is:
 $15(b - w)$.

17. Substitute 35 for
- x
- into the equation

$$\frac{x}{5} = 8$$

$$\frac{35}{5} = 8$$

$$7 \neq 8$$

No; 35 is not a solution.

18. Let b represent the number of calories burned per hour backpacking and h represent the number of calories burned per hour housecleaning. Then saying, "Backpacking burns twice as many calories per hour as cleaning" is equivalent to saying: $b = 2h$. Thus if Katie burns 237 calories cleaning, the number of calories she would burn per hour backpacking could be represented by the equation: $b = 2 \cdot 237$.

19. Note that each value of
- c
- is 200 times the corresponding value of
- t
- ,

$$\begin{array}{ccccccc} c & \text{is} & 200 & \text{times} & t \\ \text{or} & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ c & = & 200 & \cdot & t \end{array}$$

20. $3t + 5 = t \cdot 3 + 5$

21. $(2x + y) + z = 2x + (y + z)$

22. Answers may vary.

$$4(xy) = (4x)y$$

$$4(xy) = 4(yx)$$

$$4(xy) = 4(yx) = (4y)x$$

23. $6(3x + 5y) = 6 \cdot 3x + 6 \cdot 5y$

$$= 18x + 30y$$

24. $8(5x + 3y + 2) = 8 \cdot 5x + 8 \cdot 3y + 8 \cdot 2$

$$= 40x + 24y + 16$$

25. $21x + 15y = 3 \cdot 7x + 3 \cdot 5y$

$$= 3(7x + 5y)$$

26. $35x + 77y + 7 = 7 \cdot 5x + 7 \cdot 11y + 7 \cdot 1$

$$= 7(5x + 11y + 1)$$

27. $52 = 2 \cdot 26 = 2 \cdot 2 \cdot 13$

28. $\frac{20}{48} = \frac{\cancel{2} \cdot \cancel{2} \cdot 5}{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2 \cdot 3} = \frac{5}{12}$

29. $\frac{18}{8} = \frac{\cancel{2} \cdot 3 \cdot 3}{\cancel{2} \cdot 2 \cdot 2} = \frac{9}{4}$

30. $\frac{5}{12} + \frac{4}{9}$ Use 36 as the common denominator

$$= \frac{3}{3} \cdot \frac{5}{12} + \frac{4}{4} \cdot \frac{4}{9}$$

$$= \frac{15}{36} + \frac{16}{36}$$

$$= \frac{15+16}{36} = \frac{31}{36}$$

31. $\frac{9}{16} \div 3 = \frac{9}{16} \cdot \frac{1}{3}$ Multiply by the reciprocal of the divisor

$$= \frac{\cancel{3} \cdot 3 \cdot 1}{16 \cdot \cancel{3}}$$

$$= \frac{3}{16}$$

32. $\frac{2}{3} - \frac{1}{15} = \frac{5}{5} \cdot \frac{2}{3} - \frac{1}{15}$ Use 15 as the common denominator

$$= \frac{5 \cdot 2}{15} - \frac{1}{15}$$

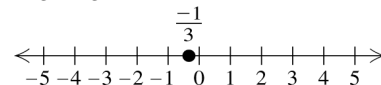
$$= \frac{10-1}{15} = \frac{9}{15}$$

$$= \frac{\cancel{3} \cdot 3}{\cancel{3} \cdot 5} = \frac{3}{5}$$

33. $\frac{9}{10} \cdot \frac{16}{5} = \frac{9 \cdot 16}{10 \cdot 5} = \frac{9 \cdot \cancel{2} \cdot 8}{\cancel{2} \cdot 5 \cdot 5} = \frac{72}{25}$

34. 172 corresponds to the highest dive. -820 corresponds to the deepest free dive.

35. $-\frac{1}{3}$ is $\frac{1}{3}$ of a unit to the left of zero:



36. $-3 < x$ has the same meaning as $x > -3$.

37. $0 \leq -1$. False; 0 is *not* left of -1.

38. $-\frac{7}{8} = -\left(\frac{7}{8}\right) = -(7 \div 8)$, so we divide.

$$\begin{array}{r} 0.875 \\ 8 \overline{) 7.000} \\ \underline{64} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

$\frac{7}{8} = 0.875$, so $-\frac{7}{8} = -0.875$

39. $|-1| = 1$, since -1 is 1 unit from 0.

40. $-(-x) = x = -9$

41. $-3 + (-7) = -10$

42. $-\frac{2}{3} + \frac{1}{12} = \frac{-8}{12} + \frac{1}{12}$ The absolute values are $\frac{8}{12}$ and $\frac{1}{12}$. The difference is $\frac{8}{12} - \frac{1}{12}$, or $\frac{8-1}{12} = \frac{7}{12}$. The negative number has the greater absolute value, so the answer is negative. $-\frac{2}{3} + \frac{1}{12} = -\frac{7}{12}$

43. $10 + (-9) + (-8) + 7 = (10 + 7) + [(-9) + (-8)]$
Using the commutative and associative laws of addition.
 $= 17 + (-17) = 0$. The numbers have the same absolute value.

44. $-3.8 + 5.1 + (-12) + (-4.3) + 10$
 $= (5.1 + 10) + [(-3.8) + (-12) + (-4.3)]$
 $= 15.1 + [-20.1]$ Adding positive nos. and adding negative nos.
 $= -5$ Adding a positive and a negative nos.

45. $-2 - (-7) = -2 + 7 = 5$

46. $\frac{1}{2} - \frac{9}{10} = \frac{1}{2} \cdot \frac{5}{5} - \frac{9}{10}$
 $= \frac{5}{10} - \frac{9}{10} = \frac{5-9}{10}$
 $= \frac{-4}{10} = -\frac{4}{10} = -\frac{2}{5}$

47. $-3.8 - 4.1 = -3.8 + (-4.1) = -7.9$

48. $-9 \cdot (-6) = 9 \cdot 6 = 54$

49. $-2.7(3.4) = -(2.7 \cdot 3.4) = -9.18$

50. $\frac{2}{3} \cdot \left(-\frac{3}{7}\right) = -\left(\frac{2}{3} \cdot \frac{3}{7}\right) = -\left(\frac{2 \cdot \cancel{3}}{\cancel{3} \cdot 7}\right) = -\frac{2}{7}$

51. $2 \cdot (-7) \cdot (-2) \cdot (-5) = -14 \cdot 10 = -140$

52. $35 \div (-5) = -7$

53. $-5.1 \div 1.7 = -3$

54. $-\frac{3}{5} \div \left(-\frac{4}{5}\right) = \frac{3}{5} \cdot \frac{5}{4} = \frac{3 \cdot \cancel{5}}{\cancel{5} \cdot 4} = \frac{3}{4}$

55. $|-3 \cdot 4 - 12 \cdot 2| - 8(-7) = |-12 - 24| - (-56)$
 $= |-36| + 56$
 $= 36 + 56$
 $= 92$

56. $16 \div (-2)^3 - 5[3 - 1 + 2(4 - 7)]$
 $= 16 \div (-8) - 5[2 + 2(-3)]$
 $= -2 - 5[2 + (-6)] = -2 - 5(-4)$
 $= -2 - (-20) = -2 + 20 = 18$

57. $120 - 6^2 \div 4 \cdot 8 = 120 - 36 \div 4 \cdot 8$
 $= 120 - 9 \cdot 8$
 $= 120 - 72$
 $= 48$

58. $(120 - 6^2) \div 4 \cdot 8 = (120 - 36) \div 4 \cdot 8$
 $= 84 \div 4 \cdot 8$
 $= 21 \cdot 8$
 $= 168$

$$\begin{aligned}
 59. (120 - 6^2) \div (4 \cdot 8) &= (120 - 36) \div (4 \cdot 8) \\
 &= 84 \div 32 \\
 &= \frac{84}{32} = \frac{\cancel{4} \cdot 21}{\cancel{4} \cdot 8} = \frac{21}{8}
 \end{aligned}$$

$$\begin{aligned}
 60. \frac{4(18-8)+7 \cdot 9}{9^2-8^2} &= \frac{4(18-8)+7 \cdot 9}{81-64} \\
 &= \frac{4(10)+7 \cdot 9}{81-64} \\
 &= \frac{40+63}{81-64} \\
 &= \frac{103}{17}
 \end{aligned}$$

$$\begin{aligned}
 61. 11a + 2b + (-4a) + (-5b) \\
 &= 11a + (-4a) + 2b + (-5b) \\
 &= [11 + (-4)]a + [2 + (-5)]b \\
 &= 7a - 3b
 \end{aligned}$$

$$\begin{aligned}
 62. 7x - 3y - 9x + 8y \\
 &= 7x + (-3y) + (-9x) + 8y \\
 &= 7x + (-9x) + (-3y) + 8y \\
 &= [7 + (-9)]x + (-3 + 8)y \\
 &= -2x + 5y
 \end{aligned}$$

$$63. \text{The opposite of } -7 \text{ is } 7, \text{ since } 7 + (-7) = 0$$

$$64. \text{The reciprocal of } -7 \text{ is } -\frac{1}{7}, \text{ since } -\frac{1}{7} \cdot -7 = 1$$

$$65. \underbrace{2x \cdot 2x \cdot 2x \cdot 2x}_{4 \text{ Factors}} = (2x)^4$$

$$\begin{aligned}
 66. (-5x)^3 &= -5x \cdot (-5x) \cdot (-5x) \\
 &= -5 \cdot (-5) \cdot (-5) \cdot x \cdot x \cdot x \\
 &= -125x^3
 \end{aligned}$$

$$\begin{aligned}
 67. 2a - (5a - 9) &= 2a + (-5a) + 9 \\
 &= [2 + (-5)]a + 9 = -3a + 9
 \end{aligned}$$

$$\begin{aligned}
 68. 11x^4 + 2x + 8(x - x^4) &= 11x^4 + 2x + 8x - 8x^4 \\
 &= (11 - 8)x^4 + (2 + 8)x = 3x^4 + 10x
 \end{aligned}$$

$$\begin{aligned}
 69. 2n^2 - 5(-3n^2 + m^2 - 4mn) + 6m^2 \\
 &= 2n^2 - 5 \cdot (-3n^2) - 5 \cdot m^2 - 5 \cdot (-4mn) + 6m^2 \\
 &= 2n^2 + 15n^2 - 5m^2 + 20mn + 6m^2 \\
 &= (2 + 15)n^2 + (-5 + 6)m^2 + 20mn \\
 &= 17n^2 + m^2 + 20mn
 \end{aligned}$$

$$\begin{aligned}
 70. 8(x + 4) - 6 - [3(x - 2) + 4] \\
 &= 8x + 32 - 6 - [3x - 6 + 4] \\
 &= 8x + 26 - [3x - 2] \\
 &= 8x + 26 - 3x + 2 \\
 &= (8 - 3)x + 28 = 5x + 28
 \end{aligned}$$

71. *Thinking and Writing Exercise.* The value of a constant never varies. A variable can represent a variety of numbers.

72. *Thinking and Writing Exercise.* A term is one of the parts of an expression that is separated from the other parts by plus signs. A factor is part of a product, or term.

73. *Thinking and Writing Exercise.* The distributive law is used in factoring algebraic expressions, multiplying algebraic expressions, combining like terms, finding the opposite of a sum, and subtracting algebraic expressions.

74. *Thinking and Writing Exercise.* A negative number raised to an even exponent is positive; a negative number raised to an odd exponent is negative.

75. Substitute 1 for a , 2 for b , and evaluate:

$$\begin{aligned}
 a^{50} - 20a^{25}b^4 + 100b^8 \\
 &= 1^{50} - 20 \cdot 1^{25}2^4 + 100 \cdot 2^8 \\
 &= 1 - 20 \cdot 1 \cdot 16 + 100 \cdot 256 \\
 &= 1 - 320 + 25,600 \\
 &= 25,281
 \end{aligned}$$

76. a. Since $0.090909\ldots + 0.181818\ldots =$

$$\text{we have } \frac{1}{11} + \frac{2}{11} = \frac{3}{11}; 0.272727\ldots = \frac{3}{11}$$

b. Since $10 \cdot 0.090909\ldots = 0.909090\ldots$,

$$\text{we have } 10 \cdot \frac{1}{11} = \frac{10}{11}; 0.909090\ldots = \frac{10}{11}$$

$$77. -\left|\frac{7}{8}-\left(-\frac{1}{2}\right)-\frac{3}{4}\right| \quad \text{Use 8: the common denominator}$$

$$-\left|\frac{7}{8}-\left(-\frac{4}{8}\right)-\frac{6}{8}\right| = -\left|\frac{7}{8}+\frac{4}{8}-\frac{6}{8}\right|$$

$$= -\left|\frac{5}{8}\right| = -\frac{5}{8}$$

$$78. (|2.7-3|+3^2-|-3|)\div(-3)$$

$$= (|2.7-3|+9-|-3|)\div(-3)$$

$$= (|-0.3|+9-|-3|)\div(-3)$$

$$= (0.3+9-3)\div(-3)$$

$$= 6.3\div(-3)$$

$$= -2.1$$

79. i

80. j

81. a

82. h

83. k

84. b

85. c

86. e

87. d

88. f

89. g

$$3. A = \frac{1}{2} \cdot b \cdot h$$

$$= \frac{1}{2} \cdot (16 \text{ ft}) \cdot (30 \text{ ft})$$

$$= \frac{1}{2} \cdot 16 \cdot 30 \cdot \text{ft} \cdot \text{ft}$$

$$= 8 \cdot 30 \text{ ft} \cdot \text{ft}$$

$$= 240 \text{ ft}^2, \text{ or } 240 \text{ square feet}$$

$$4. 3p + q = q + 3p$$

$$5. x \cdot (4 \cdot y) = (x \cdot 4) \cdot y$$

$$6. \text{Substitute 7 for } x \text{ into the equation.}$$

$$65 - x = 69$$

$$65 - 7 \stackrel{?}{=} 69$$

$$58 \neq 69$$

No; 7 is not a solution.

$$7. \text{Let } x = \text{the number of tamarins that live in zoos. Then translate, "The number of tamarins that live in the wild equals the number of tamarins that live in zoos plus 1050."}$$

$$1500 = x + 1050$$

$$8. 7(5+x) = 7 \cdot 5 + 7 \cdot x = 35 + 7x$$

$$9. -5(y-2) = -5 \cdot y - 5(-2) = -5y + 10$$

$$10. 11+44x = 11 \cdot 1 + 11 \cdot 4x = 11(1+4x)$$

$$11. 7x+7+14y = 7 \cdot x + 7 \cdot 1 + 7 \cdot 2y$$

$$= 7(x+1+2y)$$

$$12. 300 = 2 \cdot 150 = 2 \cdot 2 \cdot 75$$

$$= 2 \cdot 2 \cdot 3 \cdot 25 = 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5$$

$$13. \frac{10}{35} = \frac{2 \cdot \cancel{5}}{\cancel{5} \cdot 7} = \frac{2}{7}$$

$$14. -4 < 0, \text{ since } -4 \text{ is left of } 0.$$

$$15. -3 > -8, \text{ since } -3 \text{ is right of } -8.$$

$$16. \left|\frac{9}{4}\right| = \frac{9}{4}, \text{ since } \frac{9}{4} \text{ is } \frac{9}{4} \text{ units from } 0.$$

Chapter 1 Test

1. Substitute 10 for x and 5 for y .

$$\frac{2x}{y} = \frac{2 \cdot 10}{5} = \frac{2 \cdot \cancel{2} \cdot \cancel{5}}{\cancel{5}} = 4$$

2. Let x and y represent the numbers: $xy - 9$

$$17. |-3.8| = 3.8$$

$$18. \frac{2}{3}, \text{ since } \frac{2}{3} + \left(-\frac{2}{3}\right) = 0$$

$$19. -\frac{7}{4}, \text{ since } \left(-\frac{7}{4}\right) \cdot \left(-\frac{4}{7}\right) = 1$$

$$20. \text{ Let } -x = -(-10) = 10$$

$$21. x \leq -5 \text{ has the same meaning as } -5 \geq x.$$

$$22. 3.1 - (-4.7) = 3.1 + 4.7 = 7.8$$

$$23. -8 + 4 + (-7) + 3 = [-8 + (-7)] + [4 + 3] \\ = -15 + 7 = -8$$

$$24. 3.2 - 5.7 = 3.2 + (-5.7) = -2.5$$

$$25. -\frac{1}{8} - \frac{3}{4} = -\frac{1}{8} - \frac{3}{4} \cdot \frac{2}{2} = -\frac{1}{8} - \frac{6}{8} \\ = \frac{-1 + (-6)}{8} = -\frac{7}{8}$$

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

$$27. -\frac{1}{2} \cdot \left(-\frac{4}{9}\right) = \frac{1}{2} \cdot \frac{4}{9} = \frac{1 \cdot 4}{2 \cdot 9} = \frac{1 \cdot \cancel{2} \cdot 2}{\cancel{2} \cdot 9} = \frac{2}{9}$$

$$28. -66 \div 11 = -6$$

$$29. -\frac{3}{5} \div \left(-\frac{4}{5}\right) = \frac{3}{5} \cdot \frac{5}{4} = \frac{3 \cdot \cancel{5}}{\cancel{5} \cdot 4} = \frac{3}{4}$$

$$30. 4.864 \div (-0.5) = -9.728$$

$$31. 10 - 2(-16) \div 4^2 + |2 - 10| \\ = 10 - 2(-16) \div 16 + |-8| \\ = 10 + 32 \div 16 + 8 \\ = 10 + 2 + 8 = 20$$

$$32. 256 \div (-16) \cdot 4 = -256 \div 16 \cdot 4 = -16 \cdot 4 = -64$$

$$33. 2^3 - 10[4 - (-2 + 18)3] \\ = 8 - 10[4 - (-2 + 18)3] \\ = 8 - 10[4 - 16 \cdot 3] \\ = 8 - 10[4 - 48] \\ = 8 - 10[4 + (-48)] \\ = 8 - 10[-44] \\ = 8 - (-440) = 8 + 440 = 448$$

$$34. -18y + 30a - 9a + 4y \\ = (30 - 9)a + (-18 + 4)y \\ = 21a + (-14)y \\ = 21a - 14y$$

$$35. (-2x)^4 = -2x \cdot (-2x) \cdot (-2x) \cdot (-2x) \\ = -2 \cdot (-2) \cdot (-2) \cdot (-2) \cdot x \cdot x \cdot x \cdot x \\ = 16x^4$$

$$36. 4x - (3x - 7) = 4x - 3x + 7 \\ = (4 - 3)x + 7 = x + 7$$

$$37. 4(2a - 3b) + a - 7 = 8a - 12b + a - 7 \\ = (8a + a) - 12b - 7 \\ = (8 + 1)a - 12b - 7 \\ = 9a - 12b - 7$$

$$38. 3[5(y - 3) + 9] - 2(8y - 1) \\ = 3[5y - 15 + 9] - 16y + 2 \\ = 3[5y - 6] - 16y + 2 \\ = 15y - 18 - 16y + 2 \\ = (15 - 16)y - 18 + 2 \\ = (-1)y - 16 = -y - 16$$

39. y is 4 less than half of x

Rewording: half of x less 4 is y

Translating: $\frac{1}{2}x$ -4 $=$ y

Since $x = 20$, $\frac{1}{2}(20) - 4 = y$

$$10 - 4 = y$$

$$y = 6$$

Substitute 20 for x and 6 for y .

$$\begin{aligned}\frac{5y - x}{2} &= \frac{5 \cdot 6 - 20}{2} \\ &= \frac{30 - 20}{2} = \frac{10}{2} = 5\end{aligned}$$

40. $9 - (3 - 4) + 5 = 15$

41. $\begin{aligned} &|-27 - 3(4)| - |-36| + |-12| \\ &= |-27 - 12| - |-36| + |-12| \\ &= |-27 + (-12)| - |-36| + |-12| \\ &= |-39| - |-36| + |-12| \\ &= 39 - 36 + 12 \\ &= 15 \end{aligned}$

42. $\begin{aligned} &a - \{3a - [4a - (2a - 4a)]\} \\ &= a - \{3a - [4a - (-2a)]\} \\ &= a - \{3a - [4a + 2a]\} \\ &= a - \{3a - 6a\} \\ &= a - \{-3a\} \\ &= a + 3a = 4a \end{aligned}$

43. Let $a = 2$, $b = 3$, $c = 4$.

$$a|b - c| = |ab| - |ac|$$

$$2|3 - 4| \stackrel{?}{=} |2 \cdot 3| - |2 \cdot 4|$$

$$2|-1| \stackrel{?}{=} |6| - |8|$$

$$2 \cdot 1 \stackrel{?}{=} 6 - 8$$

$$2 \neq -2$$

False.