

84.  $\blacklozenge \cdot \blacksquare + \blacktriangle = \bullet$   
 $\blacklozenge \cdot \blacksquare = \bullet - \blacktriangle$   
 $\blacksquare = \frac{\bullet - \blacktriangle}{\blacklozenge}$

86.  $\frac{20 \text{ inches}}{1 \text{ day}} \cdot \frac{1 \text{ foot}}{12 \text{ inches}} \cdot \frac{365 \text{ days}}{1 \text{ year}}$   
 $= \frac{20 \cdot 365 \text{ feet}}{12 \text{ year}}$   
 $\approx 608.33 \text{ feet/year}$   
 The glacier moves 608.33 feet per year.

88. Use  $I = PRT$  when  $I = 3750$ ,  $P = 25,000$  and  $R = 0.05$ .  
 $I = PRT$   
 $3750 = 25,000(0.05)T$   
 $3750 = 1250T$   
 $\frac{3750}{1250} = \frac{1250T}{1250}$   
 $3 = T$

90. Use  $V = \frac{1}{3}\pi r^2 h$  when  $V = 565.2$  and  $r = 6$ .  
 $V = \frac{1}{3}\pi r^2 h$   
 $565.2 = \frac{1}{3}\pi \cdot 6^2 h$   
 $\frac{3}{\pi \cdot 6^2} \cdot 565.2 = \frac{3}{\pi \cdot 6^2} \cdot \frac{1}{3}\pi \cdot 6^2 h$   
 $15 \approx h$

## Section 2.6 Practice

1. Let  $x$  be the unknown percent.  
 $22 = x \cdot 40$   
 $22 = 40x$   
 $\frac{22}{40} = \frac{40x}{40}$   
 $0.55 = x$   
 $55\% = x$   
 The number 22 is 55% of 40.

2. Let  $x$  be the unknown number.

$$150 = 40\% \cdot x$$

$$150 = 0.4x$$

$$\frac{150}{0.4} = \frac{0.4x}{0.4}$$

$$375 = x$$

The number 150 is 40% of 375.

3. a. From the graph, we see 66% are for solely pleasure.  
 b. From the graph, 66% are for pleasure and 4% are for combined business/pleasure. The sum is  $66\% + 4\% = 70\%$ .  
 c. Find 66% of 250.  
 $0.66(250) = 165$   
 We expect 165 people to be traveling solely for pleasure.

4. discount = percent  $\cdot$  original price  
 $= 40\% \cdot \$400$   
 $= 0.40 \cdot \$400$   
 $= \$160$

$$\begin{aligned} \text{new price} &= \text{original price} - \text{discount} \\ &= \$400 - \$160 \\ &= \$240 \end{aligned}$$

The discount in price is \$160 and the new price is \$240.

5. increase = new  $-$  old =  $200 - 120 = 80$   
 Let  $x$  be the percent increase.  
 $80 = x \cdot 120$   
 $\frac{80}{120} = \frac{120x}{120}$   
 $0.667 \approx x$   
 $66.7\% \approx x$   
 The percent increase is 66.7%.

6. Let  $x$  be the original price.

$$x - 0.20x = 46$$

$$0.8x = 46$$

$$\frac{0.8x}{0.8} = \frac{46}{0.8}$$

$$x = 57.5$$

The original price is \$57.50.

7. Let  $x$  represent the liters of 20% solution.

	Number of Liters	Dye Strength	Amount
20% solution	$x$	20%	$0.2x$
50% solution	$6 - x$	50%	$0.5(6 - x)$
40% solution	6	40%	$0.4(6)$

$$0.2x + 0.5(6 - x) = 0.4(6)$$

$$0.2x + 3 - 0.5x = 2.4$$

$$-0.3x + 3 = 2.4$$

$$-0.3x + 3 - 3 = 2.4 - 3$$

$$-0.3x = -0.6$$

$$\frac{-0.3x}{-0.3} = \frac{-0.6}{-0.3}$$

$$x = 2$$

$$6 - x = 6 - 2 = 4$$

If 2 liters of 20% solution are mixed with 4 liters of 50% solution, the result is 6 liters of 40% solution.

### Vocabulary and Readiness Check

- no;  $25\% + 25\% + 40\% \neq 100\%$
- no;  $30\% + 30\% + 30\% \neq 100\%$
- yes;  $25\% + 25\% + 25\% + 25\% = 100\%$
- yes;  $40\% + 50\% + 10\% = 100\%$

### Exercise Set 2.6

- Let  $x$  be the unknown number.  
 $x = 88\% \cdot 1000$   
 $x = 0.88 \cdot 1000$   
 $x = 880$   
 880 is 88% of 1000.
- Let  $x$  be the unknown percent.  
 $87.2 = x \cdot 436$   
 $\frac{87.2}{436} = \frac{436x}{436}$   
 $0.2 = x$   
 $20\% = x$   
 The number 87.2 is 20% of 436.
- Let  $x$  be the unknown number.  
 $126 = 35\% \cdot x$   
 $126 = 0.35 \cdot x$   
 $\frac{126}{0.35} = \frac{0.35x}{0.35}$   
 $360 = x$   
 126 is 35% of 360.

8. From the graph, 3% of adults spend 0 minutes on the phone each day.

10. 8% of adults talk 61–120 minutes on the phone each day.

$$8\% \cdot 29,250 = 0.08 \cdot 29,250 = 2340$$

You would expect 2340 of the adults in Columbus to talk 61–120 minutes each day.

12. discount = percent · original price

$$= 25\% \cdot \$12.50$$

$$= 0.25 \cdot \$12.50$$

$$\approx \$3.13$$

$$\text{new price} = \text{original price} - \text{discount}$$

$$= \$12.50 - \$3.13$$

$$= \$9.37$$

The discount is \$3.13 and the new price is \$9.37.

14.  $20\% \cdot 65.40 = 0.20 \cdot 65.4 = 13.08$

The tip is \$13.08.

$$65.4 + 13.08 = 78.48$$

The total cost of the dinner is \$78.48.

16. percent increase =  $\frac{\text{amount of increase}}{\text{original amount}}$

$$= \frac{1100 - 996}{996}$$

$$= 996$$

$$\approx 0.10$$

The number of text messages increased by 10%.

18. percent decrease =  $\frac{\text{amount of decrease}}{\text{original amount}}$

$$= \frac{100 - 81}{100}$$

$$= \frac{19}{100}$$

$$= 0.19$$

The area decreased by 19%.

20. Let  $x$  represent the original price.

$$x + 25\% \cdot x = 80$$

$$x + 0.25x = 80$$

$$1.25x = 80$$

$$\frac{1.25x}{1.25} = \frac{80}{1.25}$$

$$x = 64$$

The original price of the shoes was \$65.

22. Let
- $x$
- represent last year's salary.

$$x + 3\% \cdot x = 55,620$$

$$x + 0.03x = 55,620$$

$$1.03x = 55,620$$

$$\frac{1.03x}{1.03} = \frac{55,620}{1.03}$$

$$x = 54,000$$

Last year's salary was \$54,000.

24. Let
- $x$
- represent the cubic centimeters of 25% solution.

	Number of Cubic cm	Antibiotic Strength	= Amount of Antibiotic
25% Antibiotic Solution	$x$	25%	$0.25x$
60% Antibiotic Solution	10	60%	$0.6(10)$
30% Antibiotic Solution Needed	$x + 10$	30%	$0.3(x + 10)$

The amount of antibiotic being combined must be the same as that in the mixture.

$$0.25x + 0.6(10) = 0.3(x + 10)$$

$$0.25x + 6 = 0.3x + 3$$

$$0.25x + 6 - 3 = 0.3x + 3 - 3$$

$$0.25x + 3 = 0.3x$$

$$0.25x + 3 - 0.25x = 0.3x - 0.25x$$

$$3 = 0.05x$$

$$\frac{3}{0.05} = \frac{0.05x}{0.05}$$

$$60 = x$$

Thus, 60 cubic centimeters should be used.

26. Let
- $x$
- represent the number of pounds of cashews.

	Number of pounds	Cost per pound	= Value
\$3 per lb Peanuts	20	3	$3 \cdot 20 = 60$
\$5 per lb Cashews	$x$	5	$5x$
\$3.50 per lb Mixture Wanted	$20 + x$	3.5	$3.5(20 + x)$

The value of the nuts being combined must be the same as the value of the mixture.

$$\begin{aligned}
 60 + 5x &= 3.5(20 + x) \\
 60 + 5x &= 70 + 3.5x \\
 60 + 5x - 3.5x &= 70 + 3.5x - 3.5x \\
 60 + 1.5x &= 70 \\
 60 + 1.5x - 60 &= 70 - 60 \\
 1.5x &= 10 \\
 \frac{1.5x}{1.5} &= \frac{10}{1.5} \\
 x &= 6\frac{2}{3}
 \end{aligned}$$

Mix  $6\frac{2}{3}$  pounds of cashews with the peanuts.

28.  $140\% \cdot 86 = 1.4 \cdot 86 = 120.4$

30. Let  $x$  represent the unknown number.

$$56.25 = 45\% \cdot x$$

$$56.25 = 0.45 \cdot x$$

$$\frac{56.25}{0.45} = \frac{0.45x}{0.45}$$

$$125 = x$$

56.25 is 45% of 125.

32. Let  $x$  represent the unknown percent.

$$42 = x \cdot 35$$

$$\frac{42}{35} = \frac{35x}{35}$$

$$1.2 = x$$

$$120\% = x$$

42 is 120% of 35.

34. From the graph, it appears that 65% of the population of Charlottesville, Virginia shops by catalog.

36.  $81\% \text{ of } 30,700 = 0.81 \cdot 30,700 = 24,867$

We predict 24,867 catalog shoppers live in Juneau.

38.

The Gap, Inc. Brands North American Stores in 2008		
Store Brand/Location	Number of Stores	Percent of Total (round to nearest percent)
The Gap U.S.	1136	$\frac{1136}{2876} \approx 0.39499 \approx 39\%$
The Gap Canada	91	$\frac{91}{2876} \approx 0.03164 \approx 3\%$
Banana Republic U.S.	540	$\frac{540}{2876} \approx 19\%$
Banana Republic Canada	33	$\frac{33}{2876} \approx 0.01147 \approx 1\%$
Old Navy-U.S.	1012	$\frac{1012}{2876} \approx 0.35188 \approx 35\%$
Old Navy-Canada	64	$\frac{64}{2876} \approx 0.02225 \approx 2\%$
Total	2876	

$$\begin{aligned}
 40. \text{ percent decrease} &= \frac{\text{amount of decrease}}{\text{original amount}} \\
 &= \frac{31.5 - 29.5}{31.5} \\
 &= \frac{2}{31.5} \\
 &\approx 0.063
 \end{aligned}$$

The percent decrease is 6.3%.

42. Let  $x$  represent the number of registered vehicles in 2002.

$$x + 0.03x = 246,000,000$$

$$1.03x = 246,000,000$$

$$\frac{1.03x}{1.03} = \frac{246,000,000}{1.03}$$

$$x \approx 239,000,000$$

There were about 239 million registered vehicles in 2002.

$$\begin{aligned}
 44. \text{ percent increase} &= \frac{\text{amount of increase}}{\text{original amount}} \\
 &= \frac{24 - 6}{6} \\
 &= \frac{18}{6} \\
 &= 3
 \end{aligned}$$

The area increased by 300%.

$$46. \text{ Markup} = 10\% \cdot 89.90 = 0.10 \cdot 89.9 = 8.99$$

$$\text{New price} = 89.90 + 8.99 = 98.89$$

The markup is \$8.99 and the new price is \$98.89.

48. Let  $x$  be the gallons of water.

	gallons	concentration	amount
water	$x$	0%	$0x = 0$
70% antifreeze	30	70%	$0.7(30)$
60% antifreeze	$x + 30$	60%	$0.6(x + 30)$

The amount of antifreeze being combined must be the same as that in the mixture.

$$0 + 0.7(30) = 0.6(x + 30)$$

$$21 = 0.6x + 18$$

$$21 - 18 = 0.6x + 18 - 18$$

$$3 = 0.6x$$

$$\frac{3}{0.6} = \frac{0.6x}{0.6}$$

$$5 = x$$

Thus, 5 gallons of water should be used.

$$\begin{aligned} 50. \text{ percent decrease} &= \frac{\text{amount of decrease}}{\text{original amount}} \\ &= \frac{6.3 - 2.1}{6.3} \\ &= \frac{4.2}{6.3} \\ &\approx 0.667 \end{aligned}$$

The percent decrease in the number of farms is 66.7%.

52. Let  $x$  be the average number of children per woman in 1920.

$$x - 0.44x = 1.9$$

$$0.56x = 1.9$$

$$\frac{0.56x}{0.56} = \frac{1.9}{0.56}$$

$$x \approx 3.4$$

There were 3.4 children per woman in 1920.

54. decrease =  $15\% \cdot 0.95 = 0.15 \cdot 0.95 \approx 0.14$

$$0.95 - 0.14 = 0.81$$

The decrease in price was \$0.14. The new price was \$0.81.

56. Let  $x$  be the length of Christian's throw.

$$x = 148.00 + 0.689(148.00)$$

$$= 148.00 + 101.972$$

$$= 249.972$$

$$\approx 250$$

Christian Sandstrom's world record throw was 250 meters.

58.  $64\% \cdot 9800 = 0.64 \cdot 9800 = 6272$

You would expect 6272 post-secondary institutions to have Internet access in their classrooms.

60. Let  $x$  be the pounds of chocolate-covered peanuts.

	pounds	cost (\$)	value
chocolate-covered	$x$	5	$5x$
granola bites	10	2	$2(10)$
trail mix	$x + 10$	3	$3(x + 10)$

The value of those being combined must be the same as the value as the mixture.

$$5x + 2(10) = 3(x + 10)$$

$$5x + 20 = 3x + 30$$

$$5x + 20 - 3x = 3x + 30 - 3x$$

$$2x + 20 = 30$$

$$2x + 20 - 20 = 30 - 20$$

$$2x = 10$$

$$\frac{2x}{2} = \frac{10}{2}$$

$$x = 5$$

Therefore, 5 pounds of chocolate-covered peanuts should be used.

62.  $\frac{12}{3} = 4, 2^2 = 4$

$$\frac{12}{3} = 2^2 \text{ since } 4 = 4.$$

64.  $-3^3 = -3 \cdot 3 \cdot 3 = -27$

$$(-3)^3 = (-3)(-3)(-3) = -27$$

$$-3^3 = (-3)^3 \text{ since } -27 = -27.$$

66.  $|-2| = 2$

$$-|-2| = -2$$

$$|-2| > -|-2| \text{ since } 2 \text{ is to the right of } -2 \text{ on a number line.}$$

68. yes; answers may vary

70. 23 g is what percent of 300 g? Let  $y$  represent the unknown percent.

$$y \cdot 300 = 23$$

$$\frac{300y}{300} = \frac{23}{300}$$

$$y \approx 0.07\overline{6}$$

This food contains 7.7% of the daily value of total carbohydrate in one serving.

72.  $6g \cdot 9 \text{ calories/gram} = 54 \text{ calories}$

54 of the 280 calories come from fat.

$$\frac{54}{280} \approx 0.193$$

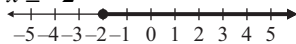
19.3% of the calories in this food come from fat.

74. answers may vary

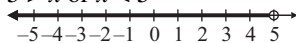


## Section 2.7 Practice

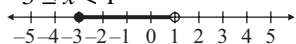
1.  $x \geq -2$



2.  $5 > x$  or  $x < 5$



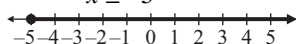
3.  $-3 \leq x < 1$



4.  $x - 6 \geq -11$

$x - 6 + 6 \geq -11 + 6$

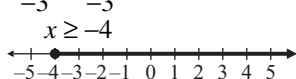
$x \geq -5$



5.  $-3x \leq 12$

$\frac{-3x}{-3} \geq \frac{12}{-3}$

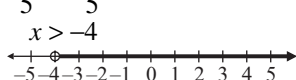
$x \geq -4$



6.  $5x > -20$

$\frac{5x}{5} > \frac{-20}{5}$

$x > -4$



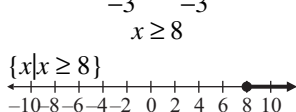
7.  $-3x + 11 \leq -13$

$-3x + 11 - 11 \leq -13 - 11$

$-3x \leq -24$

$\frac{-3x}{-3} \geq \frac{-24}{-3}$

$x \geq 8$



8.  $2x - 3 > 4(x - 1)$

$2x - 3 > 4x - 4$

$2x - 3 - 4x > 4x - 4 - 4x$

$-2x - 3 > -4$

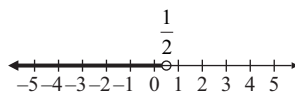
$-2x - 3 + 3 > -4 + 3$

$-2x > -1$

$\frac{-2x}{-2} < \frac{-1}{-2}$

$x < \frac{1}{2}$

$\left\{x \mid x < \frac{1}{2}\right\}$



9.  $3(x + 5) - 1 \geq 5(x - 1) + 7$

$3x + 15 - 1 \geq 5x - 5 + 7$

$3x + 14 \geq 5x + 2$

$3x + 14 - 5x \geq 5x + 2 - 5x$

$-2x + 14 \geq 2$

$-2x + 14 - 14 \geq 2 - 14$

$-2x \geq -12$

$\frac{-2x}{-2} \leq \frac{-12}{-2}$

$x \leq 6$

$\{x \mid x \leq 6\}$

10. Let  $x$  be the unknown number.

$35 - 2x > 15$

$35 - 2x - 35 > 15 - 35$

$-2x > -20$

$\frac{-2x}{-2} < \frac{-20}{-2}$

$x < 10$

$x < 10$

All numbers less than 10 make the statement true.

11. Let  $x$  represent the minimum sales.

$600 + 0.04x \geq 3000$

$0.04x \geq 2400$

$x \geq 60,000$

Alex must have minimum sales of \$60,000.

## Vocabulary and Readiness Check

1.  $6x - 7(x + 9)$  is an expression.

2.  $6x = 7(x + 9)$  is an equation.

3.  $6x < 7(x + 9)$  is an inequality.

4.  $5y - 2 \geq -38$  is an inequality.

5.  $\frac{9}{7} = \frac{x+2}{14}$  is an equation.

6.  $\frac{9}{7} - \frac{x+2}{14}$  is an expression.

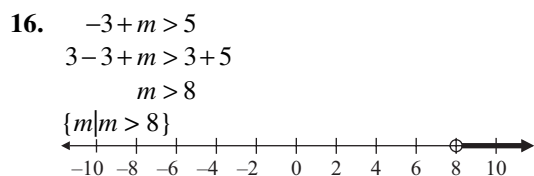
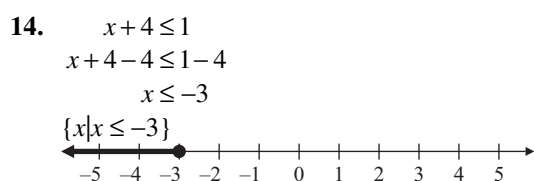
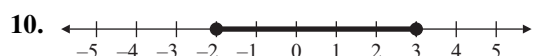
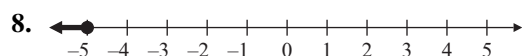
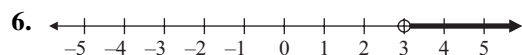
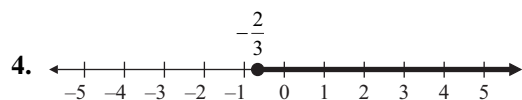
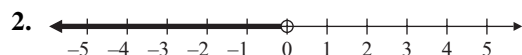
7.  $x \geq -3$   
 $-5$  is not a solution.

8.  $x < 6$   
 $|-6| = 6$  is not a solution.

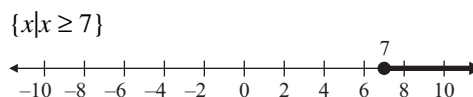
9.  $x < 4.01$   
 $4.1$  is not a solution.

10.  $x \geq -3$   
 $-4$  is not a solution.

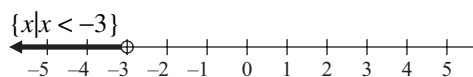
## Exercise Set 2.7

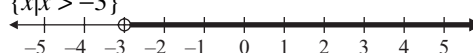


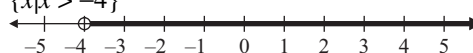
18.  $3 - 7x \geq 10 - 8x$   
 $3 - 7x + 8x \geq 10 - 8x + 8x$   
 $3 + x \geq 10$   
 $3 + x - 3 \geq 10 - 3$   
 $x \geq 7$




20.  $7x + 3 < 9x - 3x$   
 $7x + 3 < 6x$   
 $7x + 3 - 7x < 6x - 7x$   
 $3 < -x$   
 $\frac{3}{-1} > \frac{-x}{-1}$   
 $-3 > x$  or  $x < -3$

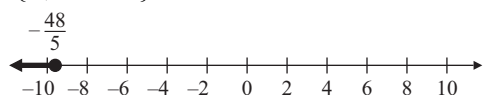


22.  $3x > -9$   
 $\frac{3x}{3} > \frac{-9}{3}$   
 $x > -3$   
 $\{x|x > -3\}$   


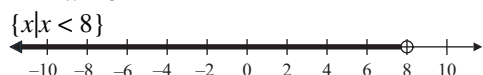
24.  $-5x < 20$   
 $\frac{-5x}{-5} > \frac{20}{-5}$   
 $x > -4$   
 $\{x|x > -4\}$   


26.  $-y \geq 0$   
 $(-1)(-y) \leq (-1)(0)$   
 $y \leq 0$   
 $\{y|y \leq 0\}$   


$$\begin{aligned}
 28. \quad & \frac{5}{6}x \leq -8 \\
 & \frac{6}{5} \cdot \frac{5}{6}x \leq \frac{6}{5} \cdot (-8) \\
 & x \leq -\frac{48}{5} \\
 & \left\{x \mid x \leq -\frac{48}{5}\right\}
 \end{aligned}$$



$$\begin{aligned}
 30. \quad & -0.3x > -2.4 \\
 & \frac{-0.3x}{-0.3} < \frac{-2.4}{-0.3} \\
 & x < 8 \\
 & \{x \mid x < 8\}
 \end{aligned}$$



$$\begin{aligned}
 32. \quad & -11 > x + 4 \\
 & -11 - 4 > x + 4 - 4 \\
 & -15 > x \\
 & \{x \mid x < -15\}
 \end{aligned}$$

$$\begin{aligned}
 34. \quad & 10(x + 2) - 9x \leq -1 \\
 & 10x + 20 - 9x \leq -1 \\
 & x + 20 \leq -1 \\
 & x + 20 - 20 \leq -1 - 20 \\
 & x \leq -21 \\
 & \{x \mid x \leq -21\}
 \end{aligned}$$

$$\begin{aligned}
 36. \quad & 6x < 5 \\
 & \frac{6x}{6} < \frac{5}{6} \\
 & x < \frac{5}{6} \\
 & \left\{x \mid x < \frac{5}{6}\right\}
 \end{aligned}$$

$$\begin{aligned}
 38. \quad & -\frac{3}{4}y \geq 9 \\
 & -\frac{4}{3} \left(-\frac{3}{4}y\right) \leq -\frac{4}{3} \cdot 9 \\
 & y \leq -12 \\
 & \{y \mid y \leq -12\}
 \end{aligned}$$

$$\begin{aligned}
 40. \quad & 6(2 - z) \geq 12 \\
 & 12 - 6z \geq 12 \\
 & 12 - 6z - 12 \geq 12 - 12 \\
 & -6z \geq 0 \\
 & \frac{-6z}{-6} \leq \frac{0}{-6} \\
 & z \leq 0 \\
 & \{z \mid z \leq 0\}
 \end{aligned}$$

$$\begin{aligned}
 42. \quad & 2x - 1 \geq 4x - 5 \\
 & 2x - 1 - 4x \geq 4x - 5 - 4x \\
 & -2x - 1 \geq -5 \\
 & -2x - 1 + 1 \geq -5 + 1 \\
 & -2x \geq -4 \\
 & \frac{-2x}{-2} \leq \frac{-4}{-2} \\
 & x \leq 2 \\
 & \{x \mid x \leq 2\}
 \end{aligned}$$

$$\begin{aligned}
 44. \quad & 4 - x < 8x + 2x \\
 & 4 - x < 10x \\
 & 4 - x + x < 10x + x \\
 & 4 < 11x \\
 & \frac{4}{11} < \frac{11x}{11} \\
 & \frac{4}{11} < x \\
 & \left\{x \mid x > \frac{4}{11}\right\}
 \end{aligned}$$

$$\begin{aligned}
 46. \quad & -7x + 4 > 3(4 - x) \\
 & -7x + 4 > 12 - 3x \\
 & -7x + 4 + 3x > 12 - 3x + 3x \\
 & -4x + 4 > 12 \\
 & -4x + 4 - 4 > 12 - 4 \\
 & -4x > 8 \\
 & \frac{-4x}{-4} < \frac{8}{-4} \\
 & x < -2 \\
 & \{x \mid x < -2\}
 \end{aligned}$$

$$\begin{aligned}
 48. \quad & 5(x - 2) \leq 3(2x - 1) \\
 & 5x - 10 \leq 6x - 3 \\
 & 5x - 10 - 5x \leq 6x - 3 - 5x \\
 & -10 \leq x - 3 \\
 & -10 + 3 \leq x - 3 + 3 \\
 & -7 \leq x \\
 & \{x \mid x \geq -7\}
 \end{aligned}$$

$$\begin{aligned}
 50. \quad & 3(5x-4) \leq 4(3x-2) \\
 & 15x-12 \leq 12x-8 \\
 & 15x-12-12x \leq 12x-8-12x \\
 & 3x-12 \leq -8 \\
 & 3x-12+12 \leq -8+12 \\
 & 3x \leq 4 \\
 & \frac{3x}{3} \leq \frac{4}{3} \\
 & x \leq \frac{4}{3} \\
 & \left\{ x \mid x \leq \frac{4}{3} \right\}
 \end{aligned}$$

$$\begin{aligned}
 52. \quad & 7(x-2)+x \leq -4(5-x)-12 \\
 & 7x-14+x \leq -20+4x-12 \\
 & 8x-14 \leq 4x-32 \\
 & 8x-14-4x \leq 4x-32-4x \\
 & 4x-14 \leq -32 \\
 & 4x-14+14 \leq -32+14 \\
 & 4x \leq -18 \\
 & \frac{4x}{4} \leq \frac{-18}{4} \\
 & x \leq -\frac{9}{2} \\
 & \left\{ x \mid x \leq -\frac{9}{2} \right\}
 \end{aligned}$$

$$\begin{aligned}
 54. \quad & -2(x-4)-3x < -(4x+1)+2x \\
 & -2x+8-3x < -4x-1+2x \\
 & -5x+8 < -2x-1 \\
 & -5x+8+2x < -2x-1+2x \\
 & -3x+8 < -1 \\
 & -3x+8-8 < -1-8 \\
 & -3x < -9 \\
 & \frac{-3x}{-3} > \frac{-9}{-3} \\
 & x > 3 \\
 & \{x \mid x > 3\}
 \end{aligned}$$

$$\begin{aligned}
 56. \quad & \frac{1}{2}(x-5) < \frac{1}{3}(2x-1) \\
 & 6 \cdot \frac{1}{2}(x-5) < 6 \cdot \frac{1}{3}(2x-1) \\
 & 3(x-5) < 2(2x-1) \\
 & 3x-15 < 4x-2 \\
 & 3x-15-3x < 4x-2-3x \\
 & -15 < x-2 \\
 & -15+2 < x-2+2 \\
 & -13 < x \\
 & \{x \mid x > -13\}
 \end{aligned}$$

$$\begin{aligned}
 58. \quad & -6x+2 < -3(x+4) \\
 & -6x+2 < -3x-12 \\
 & -6x+2+3x < -3x-12+3x \\
 & -3x+2 < -12 \\
 & -3x+2-2 < -12-2 \\
 & -3x < -14 \\
 & \frac{-3x}{-3} > \frac{-14}{-3} \\
 & x > \frac{14}{3} \\
 & \left\{ x \mid x > \frac{14}{3} \right\}
 \end{aligned}$$

$$\begin{aligned}
 60. \quad & \text{Let } x \text{ be the number.} \\
 & 5x+1 \leq 10 \\
 & 5x+1-1 \leq 10-1 \\
 & 5x \leq 9 \\
 & \frac{5x}{5} \leq \frac{9}{5} \\
 & x \leq \frac{9}{5}
 \end{aligned}$$

All numbers less than or equal to  $\frac{9}{5}$  make this statement true.

$$\begin{aligned}
 62. \quad & \text{Use } P = a + b + c \text{ when } a = x, b = 3x, c = 12, \text{ and } P \leq 32. \\
 & x+3x+12 \leq 32 \\
 & 4x+12 \leq 32 \\
 & 4x+12-12 \leq 32-12 \\
 & 4x \leq 20 \\
 & \frac{4x}{4} \leq \frac{20}{4} \\
 & x \leq 5 \\
 & 3x \leq 3(5) = 15 \\
 & \text{The maximum lengths of the other two sides are 5 inches and 15 inches.}
 \end{aligned}$$

64. Convert heights to inches.

$$6'8" = 6 \cdot 12 + 8 = 80$$

$$6'6" = 6 \cdot 12 + 6 = 78$$

$$6'0" = 6 \cdot 12 + 0 = 72$$

$$5'9" = 5 \cdot 12 + 9 = 69$$

$$6'5" = 6 \cdot 12 + 5 = 77$$

Let  $x$  be the height of the center.

$$\frac{x + 80 + 78 + 72 + 69}{5} \geq 77$$

$$\frac{x + 299}{5} \geq 77$$

$$5 \cdot \frac{x + 299}{5} \geq 5 \cdot 77$$

$$x + 299 \geq 385$$

$$x + 299 - 299 \geq 385 - 299$$

$$x \geq 86$$

$$86" = 7'2"$$

The center should be at least 7'2".

66. Let
- $x$
- represent the number of people. Then the cost is
- $40 + 15x$
- .

$$40 + 15x \leq 860$$

$$40 + 15x - 40 \leq 860 - 40$$

$$15x \leq 820$$

$$\frac{15x}{15} \leq \frac{820}{15}$$

$$x \leq \frac{820}{15} \approx 54$$

They can invite at most 54 people.

68. Let
- $x$
- represent the number of minutes.

$$5.3x \geq 200$$

$$\frac{5.3x}{5.3} \geq \frac{200}{5.3}$$

$$x \geq \frac{200}{5.3} \approx 38$$

The person must bicycle at least 38 minutes.

70.  $4^3 = 4 \cdot 4 \cdot 4 = 64$

72.  $0^7 = 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 \cdot 0 = 0$

74.  $\left(\frac{2}{3}\right)^3 = \left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right) = \frac{8}{27}$

76. There were about 6800 Starbucks locations in 2007.

78. There were approximately 4900 Starbucks locations in 2005.

80. The number of Starbucks locations rose above 6000 in 2006.

82. Since
- $m \leq n$
- , then
- $2m \leq 2n$
- .

84. If
- $-x < y$
- , then
- $x > -y$
- .

86. No; answers may vary

88. Let
- $x$
- be the score on her final exam. Since the final counts as two tests, her final course average

is  $\frac{85 + 95 + 92 + 3x}{6}$ .

$$\frac{85 + 95 + 92 + 3x}{6} \geq 90$$

$$\frac{272 + 3x}{6} \geq 90$$

$$6\left(\frac{272 + 3x}{6}\right) \geq 6(90)$$

$$272 + 3x \geq 540$$

$$272 + 2x - 272 \geq 540 - 272$$

$$3x \geq 268$$

$$\frac{3x}{3} \geq \frac{268}{3}$$

$$x \geq 89.3$$

Her final exam score must be at least 89.3 for her to get an A.

### Chapter 2 Vocabulary Check

1. A linear equation in one variable can be written in the form  $ax + b = c$ .
2. Equations that have the same solution are called equivalent equations.
3. An equation that describes a known relationship among quantities is called a formula.
4. A linear inequality in one variable can be written in the form  $ax + b < c$ , (or  $>$ ,  $\leq$ ,  $\geq$ ).
5. The solutions to the equation  $x + 5 = x + 5$  are all real numbers.
6. The solution to the equation  $x + 5 = x + 4$  is no solution.
7. If both sides of an inequality are multiplied or divided by the same positive number, the direction of the inequality symbol is the same.
8. If both sides of an inequality are multiplied by the same negative number, the direction of the inequality symbol is reversed.

## Chapter 2 Review

$$\begin{aligned} 1. \quad & 8x + 4 = 9x \\ & 8x + 4 - 8x = 9x - 8x \\ & 4 = x \end{aligned}$$

$$\begin{aligned} 2. \quad & 5y - 3 = 6y \\ & 5y - 3 - 5y = 6y - 5y \\ & -3 = y \end{aligned}$$

$$\begin{aligned} 3. \quad & \frac{2}{7}x + \frac{5}{7}x = 6 \\ & \frac{7}{7}x = 6 \\ & 1x = 6 \\ & x = 6 \end{aligned}$$

$$\begin{aligned} 4. \quad & 3x - 5 = 4x + 1 \\ & 3x - 5 - 3x = 4x + 1 - 3x \\ & -5 = x + 1 \\ & -5 - 1 = x + 1 - 1 \\ & -6 = x \end{aligned}$$

$$\begin{aligned} 5. \quad & 2x - 6 = x - 6 \\ & 2x - 6 - x = x - 6 - x \\ & x - 6 = -6 \\ & x - 6 + 6 = -6 + 6 \\ & x = 0 \end{aligned}$$

$$\begin{aligned} 6. \quad & 4(x + 3) = 3(1 + x) \\ & 4x + 12 = 3 + 3x \\ & 4x + 12 - 3x = 3 + 3x - 3x \\ & 12 + x = 3 \\ & -12 + 12 + x = -12 + 3 \\ & x = -9 \end{aligned}$$

$$\begin{aligned} 7. \quad & 6(3 + n) = 5(n - 1) \\ & 18 + 6n = 5n - 5 \\ & 18 + 6n - 5n = 5n - 5 - 5n \\ & 18 + n = -5 \\ & -18 + 18 + n = -18 - 5 \\ & n = -23 \end{aligned}$$

$$\begin{aligned} 8. \quad & 5(2 + x) - 3(3x + 2) = -5(x - 6) + 2 \\ & 10 + 5x - 9x - 6 = -5x + 30 + 2 \\ & -4x + 4 = -5x + 32 \\ & 5x - 4x + 4 = 5x - 5x + 32 \\ & x + 4 = 32 \\ & x + 4 - 4 = 32 - 4 \\ & x = 28 \end{aligned}$$

9. If the sum is 10 and one number is  $x$ , then the other number is  $10 - x$ . The choice is b.

10. Since Mandy is 5 inches taller than Melissa, and  $x$  represents Mandy's height, then  $x - 5$  represents Melissa's height. The choice is a.

11. Complementary angles sum to  $90^\circ$ . The complement of angle  $x$  is  $90 - x$ . The choice is b.

12. Supplementary angles sum to  $180^\circ$ . The supplement to  $(x + 5)^\circ$  is  $180 - (x + 5) = 180 - x - 5 = 175 - x$ . The choice is c.

$$\begin{aligned} 13. \quad & \frac{3}{4}x = -9 \\ & \frac{4}{3} \cdot \frac{3}{4}x = \frac{4}{3} \cdot (-9) \\ & x = -12 \end{aligned}$$

$$\begin{aligned} 14. \quad & \frac{x}{6} = \frac{2}{3} \\ & 6 \cdot \frac{x}{6} = 6 \cdot \frac{2}{3} \\ & x = 4 \end{aligned}$$

$$\begin{aligned} 15. \quad & -5x = 0 \\ & \frac{-5x}{-5} = \frac{0}{-5} \\ & x = 0 \end{aligned}$$

$$\begin{aligned} 16. \quad & -y = 7 \\ & \frac{-y}{-1} = \frac{7}{-1} \\ & y = -7 \end{aligned}$$

$$\begin{aligned} 17. \quad & 0.2x = 0.15 \\ & 20x = 15 \\ & \frac{20x}{20} = \frac{15}{20} \\ & x = 0.75 \end{aligned}$$

$$\begin{aligned} 18. \quad & \frac{-x}{3} = 1 \\ & -3 \left( \frac{-x}{3} \right) = -3(1) \\ & x = -3 \end{aligned}$$

$$\begin{aligned}
 19. \quad & -3x + 1 = 19 \\
 & -3x + 1 - 1 = 19 - 1 \\
 & -3x = 18 \\
 & \frac{-3x}{-3} = \frac{18}{-3} \\
 & x = -6
 \end{aligned}$$

$$\begin{aligned}
 20. \quad & 5x + 25 = 20 \\
 & 5x + 25 - 25 = 20 - 25 \\
 & 5x = -5 \\
 & \frac{5x}{5} = \frac{-5}{5} \\
 & x = -1
 \end{aligned}$$

$$\begin{aligned}
 21. \quad & 7(x-1) + 9 = 5x \\
 & 7x - 7 + 9 = 5x \\
 & 7x + 2 = 5x \\
 & -7x + 7x + 2 = -7x + 5x \\
 & 2 = -2x \\
 & \frac{2}{-2} = \frac{-2x}{-2} \\
 & -1 = x
 \end{aligned}$$

$$\begin{aligned}
 22. \quad & 7x - 6 = 5x - 3 \\
 & 7x - 6 - 5x = 5x - 3 - 5x \\
 & 2x - 6 = -3 \\
 & 2x - 6 + 6 = -3 + 6 \\
 & 2x = 3 \\
 & \frac{2x}{2} = \frac{3}{2} \\
 & x = \frac{3}{2} \text{ or } 1\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 23. \quad & -5x + \frac{3}{7} = \frac{10}{7} \\
 & 7\left(-5x + \frac{3}{7}\right) = 7 \cdot \frac{10}{7} \\
 & -35x + 3 = 10 \\
 & -35x + 3 - 3 = 10 - 3 \\
 & -35x = 7 \\
 & \frac{-35x}{-35} = \frac{7}{-35} \\
 & x = -\frac{1}{5}
 \end{aligned}$$

$$\begin{aligned}
 24. \quad & 5x + x = 9 + 4x - 1 + 6 \\
 & 6x = 4x + 14 \\
 & 6x - 4x = 4x + 14 - 4x \\
 & 2x = 14 \\
 & \frac{2x}{2} = \frac{14}{2} \\
 & x = 7
 \end{aligned}$$

25. Let  $x$  be the first integer. Then  $x + 1$  and  $x + 2$  are the next two consecutive integers. Their sum is  $x + x + 1 + x + 2 = 3x + 3$ .

26. Let  $x$  be the first even integer. Then  $x + 2$ ,  $x + 4$ , and  $x + 6$  are the 2nd, 3rd, and 4th consecutive even integers. The sum of the first and fourth is  $x + x + 6 = 2x + 6$ .

$$\begin{aligned}
 27. \quad & \frac{5}{3}x + 4 = \frac{2}{3}x \\
 & 3\left(\frac{5}{3}x + 4\right) = 3\left(\frac{2}{3}x\right) \\
 & 5x + 12 = 2x \\
 & 5x + 12 - 5x = 2x - 5x \\
 & 12 = -3x \\
 & \frac{12}{-3} = \frac{-3x}{-3} \\
 & -4 = x
 \end{aligned}$$

$$\begin{aligned}
 28. \quad & \frac{7}{8}x + 1 = \frac{5}{8}x \\
 & 8\left(\frac{7}{8}x + 1\right) = 8\left(\frac{5}{8}x\right) \\
 & 7x + 8 = 5x \\
 & 7x + 8 - 7x = 5x - 7x \\
 & 8 = -2x \\
 & \frac{8}{-2} = \frac{-2x}{-2} \\
 & -4 = x
 \end{aligned}$$

$$\begin{aligned}
 29. \quad & -(5x + 1) = -7x + 3 \\
 & -5x - 1 = -7x + 3 \\
 & -5x - 1 + 7x = -7x + 3 + 7x \\
 & 2x - 1 = 3 \\
 & 2x - 1 + 1 = 3 + 1 \\
 & 2x = 4 \\
 & \frac{2x}{2} = \frac{4}{2} \\
 & x = 2
 \end{aligned}$$

$$\begin{aligned}
 30. \quad & -4(2x+1) = -5x+5 \\
 & -8x-4 = -5x+5 \\
 & -8x-4+8x = -5x+5+8x \\
 & -4 = 3x+5 \\
 & -4-5 = 3x+5-5 \\
 & -9 = 3x \\
 & \frac{-9}{3} = \frac{3x}{3} \\
 & -3 = x
 \end{aligned}$$

$$\begin{aligned}
 31. \quad & -6(2x-5) = -3(9+4x) \\
 & -12x+30 = -27-12x \\
 & 12x-12x+30 = 12x-27-12x \\
 & 30 = -27
 \end{aligned}$$

Since the statement  $30 = -27$  is false, the equation has no solution.

$$\begin{aligned}
 32. \quad & 3(8y-1) = 6(5+4y) \\
 & 24y-3 = 30+24y \\
 & 24y-3-24y = 30+24y-24y \\
 & -3 = 30
 \end{aligned}$$

Since the statement  $-3 = 30$  is false, the equation has no solution.

$$\begin{aligned}
 33. \quad & \frac{3(2-z)}{5} = z \\
 & 5\left[\frac{3(2-z)}{5}\right] = 5 \cdot z \\
 & 3(2-z) = 5z \\
 & 6-3z = 5z \\
 & 6-3z+3z = 5z+3z \\
 & 6 = 8z \\
 & \frac{6}{8} = \frac{8z}{8} \\
 & \frac{3}{4} = z
 \end{aligned}$$

$$\begin{aligned}
 34. \quad & \frac{4(n+2)}{5} = -n \\
 & 5\left[\frac{4(n+2)}{5}\right] = 5(-n) \\
 & 4(n+2) = -5n \\
 & 4n+8 = -5n \\
 & 4n+8-4n = -5n-4n \\
 & 8 = -9n \\
 & \frac{8}{-9} = \frac{-9n}{-9} \\
 & -\frac{8}{9} = n
 \end{aligned}$$

$$\begin{aligned}
 35. \quad & 0.5(2n-3) - 0.1 = 0.4(6+2n) \\
 & 5(2n-3) - 1 = 4(6+2n) \\
 & 10n-15-1 = 24+8n \\
 & 10n-16 = 24+8n \\
 & 10n-16-8n = 24+8n-8n \\
 & 2n-16 = 24 \\
 & 2n-16+16 = 24+16 \\
 & 2n = 40 \\
 & \frac{2n}{2} = \frac{40}{2} \\
 & n = 20
 \end{aligned}$$

$$\begin{aligned}
 36. \quad & -9-5a = 3(6a-1) \\
 & -9-5a = 18a-3 \\
 & 9-5a+5a = 18a-3+5a \\
 & -9 = 23a-3 \\
 & -9+3 = 23a-3+3 \\
 & -6 = 23a \\
 & \frac{-6}{23} = \frac{23a}{23} \\
 & -\frac{6}{23} = a
 \end{aligned}$$

$$\begin{aligned}
 37. \quad & \frac{5(c+1)}{6} = 2c-3 \\
 & 6\left[\frac{5(c+1)}{6}\right] = 6(2c-3) \\
 & 5(c+1) = 6(2c-3) \\
 & 5c+5 = 12c-18 \\
 & 5c+5-5c = 12c-18-5c \\
 & 5 = 7c-18 \\
 & 5+18 = 7c-18+18 \\
 & 23 = 7c \\
 & \frac{23}{7} = \frac{7c}{7} \\
 & \frac{23}{7} = c
 \end{aligned}$$



$$\begin{aligned}
 38. \quad & \frac{2(8-a)}{3} = 4 - 4a \\
 & 3 \left[ \frac{2(8-a)}{3} \right] = 3(4 - 4a) \\
 & 2(8-a) = 3(4 - 4a) \\
 & 16 - 2a = 12 - 12a \\
 & 16 - 2a + 12a = 12 - 12a + 12a \\
 & 16 + 10a = 12 \\
 & 16 + 10a - 16 = 12 - 16 \\
 & 10a = -4 \\
 & \frac{10a}{10} = \frac{-4}{10} \\
 & a = -\frac{2}{5}
 \end{aligned}$$

$$\begin{aligned}
 39. \quad & 200(70x - 3560) = -179(150x - 19,300) \\
 & 14,000x - 712,000 = -26,850x + 3,454,700 \\
 & 14,000x - 712,000 + 26,850x = -26,850x + 3,454,700 + 26,850x \\
 & 40,850x - 712,000 = 3,454,700 \\
 & 40,850x - 712,000 + 712,000 = 3,454,700 + 712,000 \\
 & 40,850x = 4,166,700 \\
 & \frac{40,850x}{40,850} = \frac{4,166,700}{40,850} \\
 & x = 102
 \end{aligned}$$

$$\begin{aligned}
 40. \quad & 1.72y - 0.04y = 0.42 \\
 & 172y - 4y = 42 \\
 & 168y = 42 \\
 & \frac{168y}{168} = \frac{42}{168} \\
 & y = 0.25
 \end{aligned}$$

$$\begin{aligned}
 41. \quad & \text{Let } x \text{ be the length of the side of the square base. Then the height is } 10x + 50.5. \text{ The sum is } 7327. \\
 & x + 10x + 50.5 = 7327 \\
 & 11x + 50.5 = 7327 \\
 & 11x + 50.5 - 50.5 = 7327 - 50.5 \\
 & 11x = 7276.5 \\
 & \frac{11x}{11} = \frac{7276.5}{11} \\
 & x = 661.5 \\
 & 10x + 50.5 = 10(661.5) + 50.5 \\
 & = 6615 + 50.5 \\
 & = 6665.5 \\
 & \text{The height is } 6665.5 \text{ inches.}
 \end{aligned}$$

42. Let  $x$  be the length of the short piece. Then  $2x$  is the length of the long piece. The lengths sum to 12.

$$x + 2x = 12$$

$$3x = 12$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

$$2x = 2(4) = 8$$

The short piece is 4 feet and the long piece is 8 feet.

43. Let  $x$  be the number of Cornell library sites. Then  $2x + 2$  is the number of Harvard library sites. The total number of library sites is 119.

$$x + 2x + 2 = 119$$

$$3x + 2 = 119$$

$$3x + 2 - 2 = 119 - 2$$

$$3x = 117$$

$$\frac{3x}{3} = \frac{117}{3}$$

$$x = 39$$

$$2x + 2 = 2(39) + 2 = 78 + 2 = 80$$

Cornell has 39 library sites and Harvard has 80 library sites.

44. Let  $x$  be the first integer. Then  $x + 1$  and  $x + 2$  are the next two consecutive integers. Their sum is  $-114$ .

$$x + x + 1 + x + 2 = -114$$

$$3x + 3 = -114$$

$$3x + 3 - 3 = -114 - 3$$

$$3x = -117$$

$$\frac{3x}{3} = \frac{-117}{3}$$

$$x = -39$$

$$x + 1 = -39 + 1 = -38$$

$$x + 2 = -39 + 2 = -37$$

The integers are  $-39$ ,  $-38$ , and  $-37$ .

45.  $\frac{x}{3} = x - 2$

$$3 \cdot \frac{x}{3} = 3(x - 2)$$

$$x = 3x - 6$$

$$x - 3x = 3x - 6 - 3x$$

$$-2x = -6$$

$$\frac{-2x}{-2} = \frac{-6}{-2}$$

$$x = 3$$

The number is 3.

46.  $2(x + 6) = -x$

$$2x + 12 = -x$$

$$-2x + 2x + 12 = -2x - x$$

$$12 = -3x$$

$$\frac{12}{-3} = \frac{-3x}{-3}$$

$$-4 = x$$

The number is  $-4$ .

47. Use  $P = 2l + 2w$  when  $P = 46$  and  $l = 14$ .

$$P = 2l + 2w$$

$$46 = 2(14) + 2w$$

$$46 = 28 + 2w$$

$$46 - 28 = 28 + 2w - 28$$

$$18 = 2w$$

$$\frac{18}{2} = \frac{2w}{2}$$

$$9 = w$$

48. Use  $V = lwh$  when  $V = 192$ ,  $l = 8$ , and  $w = 6$ .

$$V = lwh$$

$$192 = 8 \cdot 6 \cdot h$$

$$192 = 48h$$

$$\frac{192}{48} = \frac{48h}{48}$$

$$4 = h$$

49.  $y = mx + b$

$$y - b = mx + b - b$$

$$y - b = mx$$

$$\frac{y - b}{x} = \frac{mx}{x}$$

$$\frac{y - b}{x} = m$$

50.  $r = vst - 5$

$$r + 5 = vst - 5 + 5$$

$$r + 5 = vst$$

$$\frac{r + 5}{vt} = \frac{vst}{vt}$$

$$\frac{r + 5}{vt} = s$$

51.  $2y - 5x = 7$

$$-2y + 2y - 5x = -2y + 7$$

$$-5x = -2y + 7$$

$$\frac{-5x}{-5} = \frac{-2y + 7}{-5}$$

$$x = \frac{2y - 7}{5}$$

$$\begin{aligned}
 52. \quad & 3x - 6y = -2 \\
 & -3x + 3x - 6y = -3x - 2 \\
 & -6y = -3x - 2 \\
 & \frac{-6y}{-6} = \frac{-3x - 2}{-6} \\
 & y = \frac{3x + 2}{6}
 \end{aligned}$$

$$\begin{aligned}
 53. \quad & C = \pi D \\
 & \frac{C}{D} = \frac{\pi D}{D} \\
 & \frac{C}{D} = \pi
 \end{aligned}$$

$$\begin{aligned}
 54. \quad & C = 2\pi r \\
 & \frac{C}{2r} = \frac{2\pi r}{2r} \\
 & \frac{C}{2r} = \pi
 \end{aligned}$$

$$\begin{aligned}
 55. \quad & \text{Use } V = lwh \text{ when } V = 900, l = 20 \text{ and } h = 3. \\
 & V = lwh \\
 & 900 = 20 \cdot w \cdot 3 \\
 & 900 = 60w \\
 & \frac{900}{60} = \frac{60w}{60} \\
 & 15 = w \\
 & \text{The width is 15 meters.}
 \end{aligned}$$

$$\begin{aligned}
 56. \quad & \text{Let } x \text{ be the width. Then the length is } x + 6. \text{ Use} \\
 & P = 2 \cdot \text{length} + 2 \cdot \text{width} \text{ when } P = 60. \\
 & P = 2 \cdot \text{length} + 2 \cdot \text{width} \\
 & 60 = 2(x + 6) + 2x \\
 & 60 = 2x + 12 + 2x \\
 & 60 = 4x + 12 \\
 & 60 - 12 = 4x + 12 - 12 \\
 & 48 = 4x \\
 & \frac{48}{4} = \frac{4x}{4} \\
 & 12 = x \\
 & x + 6 = 12 + 6 = 18 \\
 & \text{The dimensions of the billboard are 12 feet by 18 feet.}
 \end{aligned}$$

$$\begin{aligned}
 57. \quad & \text{Use } d = rt \text{ when } d = 10K \text{ or } 10,000 \text{ m and} \\
 & r = 125.
 \end{aligned}$$

$$\begin{aligned}
 & d = rt \\
 & 10,000 = 125t \\
 & \frac{10,000}{125} = \frac{125t}{125} \\
 & 80 = t
 \end{aligned}$$

The time is 80 minutes or  $\frac{80}{60} = 1\frac{1}{3}$  hours or 1 hour and 20 minutes.

$$58. \quad \text{Use } F = \frac{9}{5}C + 32 \text{ when } F = 104.$$

$$\begin{aligned}
 & F = \frac{9}{5}C + 32 \\
 & 104 = \frac{9}{5}C + 32 \\
 & 104 - 32 = \frac{9}{5}C + 32 - 32 \\
 & 72 = \frac{9}{5}C \\
 & \frac{5}{9} \cdot 72 = \frac{5}{9} \cdot \frac{9}{5}C \\
 & 40 = C
 \end{aligned}$$

Thus, 104°F is equivalent to 40°C.

$$59. \quad \text{Let } x \text{ be the unknown percent.}$$

$$\begin{aligned}
 & 9 = x \cdot 45 \\
 & \frac{9}{45} = \frac{45x}{45} \\
 & 0.2 = x \\
 & 20\% = x \\
 & 9 \text{ is } 20\% \text{ of } 45.
 \end{aligned}$$

$$60. \quad \text{Let } x \text{ be the unknown percent.}$$

$$\begin{aligned}
 & 59.5 = x \cdot 85 \\
 & \frac{59.5}{85} = \frac{85x}{85} \\
 & 0.7 = x \\
 & 70\% = x \\
 & 59.5 \text{ is } 70\% \text{ of } 85.
 \end{aligned}$$

$$61. \quad \text{Let } x \text{ be the unknown number.}$$

$$\begin{aligned}
 & 137.5 = 125\% \cdot x \\
 & 137.5 = 1.25x \\
 & \frac{137.5}{1.25} = \frac{1.25x}{1.25} \\
 & 110 = x \\
 & 137.5 \text{ is } 125\% \text{ of } 110.
 \end{aligned}$$

62. Let
- $x$
- be the unknown number.

$$768 = 60\% \cdot x$$

$$768 = 0.6x$$

$$\frac{768}{0.6} = \frac{0.6x}{0.6}$$

$$1280 = x$$

768 is 60% of 1280.

63. increase =
- $11\% \cdot 1900 = 0.11 \cdot 1900 = 209$

$$\text{new price} = 1900 + 209 = 2109$$

The mark-up is \$209 and the new price is \$2109.

64. Find 66.9% of 76,000.

$$66.9\% \cdot 76,000 = 0.669 \cdot 76,000 = 50,844$$

You would expect 50,844 to use the Internet.

65. Let
- $x$
- be the number of gallons of 40% solution. Then
- $30 - x$
- is the number of gallons of 10% solution.

	gallons	concentration	amount
40% solution	$x$	40%	$0.4x$
10% solution	$30 - x$	10%	$0.1(30 - x)$
20% solution	30	20%	$0.2(30)$

The amount of acid in the combined solutions must be the same as in the mixture.

$$0.4x + 0.1(30 - x) = 0.2(30)$$

$$0.4x + 3 - 0.1x = 6$$

$$3 + 0.3x = 6$$

$$3 + 0.3x - 3 = 6 - 3$$

$$0.3x = 3$$

$$\frac{0.3x}{0.3} = \frac{3}{0.3}$$

$$x = 10$$

$$30 - x = 30 - 10 = 20$$

Mix 10 gallons of 40% solution with 20 gallons of 10% solution.

66. percent increase =  $\frac{\text{amount of increase}}{\text{original amount}}$
- $$= \frac{21.1 - 20.7}{20.7}$$
- $$= \frac{0.4}{20.7}$$
- $$\approx 0.0193$$

The percent increase is 1.9%.

67. From the graph, 18% of motorists who use a cell phone while driving have almost hit another car.

68. The tallest bar represents the most common effect. Therefore, swerving is the most common effect of cell phone use on driving.

69. 21% of drivers cut off someone. Find 21% of 4600.

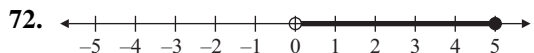
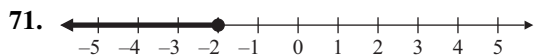
$$21\% \cdot 4600 = 0.21 \cdot 4600 = 966$$

You expect 966 customers to cut someone off while driving and talking on their cell phones.

70.  $46\% + 41\% + 21\% + 18\% = 126\%$

No, the percents do not sum to 100%.

Answers may vary.



73.  $x - 5 \leq -4$

$$x - 5 + 5 \leq -4 + 5$$

$$x \leq 1$$

$$\{x|x \leq 1\}$$

74.  $x + 7 > 2$

$$x + 7 - 7 > 2 - 7$$

$$x > -5$$

$$\{x|x > -5\}$$

75.  $-2x \geq -20$

$$\frac{-2x}{-2} \leq \frac{-20}{-2}$$

$$x \leq 10$$

$$\{x|x \leq 10\}$$

76.  $-3x > 12$

$$\frac{-3x}{-3} < \frac{12}{-3}$$

$$x < -4$$

$$\{x|x < -4\}$$

77.  $5x - 7 > 8x + 5$

$$5x - 7 - 8x > 8x + 5 - 8x$$

$$-3x - 7 > 5$$

$$-3x - 7 + 7 > 5 + 7$$

$$-3x > 12$$

$$\frac{-3x}{-3} < \frac{12}{-3}$$

$$x < -4$$

$$\{x|x < -4\}$$

$$\begin{aligned}
 78. \quad & x + 4 \geq 6x - 16 \\
 & x + 4 - 6x \geq 6x - 16 - 6x \\
 & -5x + 4 \geq -16 \\
 & -5x + 4 - 4 \geq -16 - 4 \\
 & -5x \geq -20 \\
 & \frac{-5x}{-5} \leq \frac{-20}{-5} \\
 & x \leq 4 \\
 & \{x|x \leq 4\}
 \end{aligned}$$

$$\begin{aligned}
 79. \quad & \frac{2}{3}y > 6 \\
 & \frac{3}{2} \cdot \frac{2}{3}y > \frac{3}{2} \cdot 6 \\
 & y > 9 \\
 & \{y|y > 9\}
 \end{aligned}$$

$$\begin{aligned}
 80. \quad & -0.5y \leq 7.5 \\
 & \frac{-0.5y}{-0.5} \geq \frac{7.5}{-0.5} \\
 & y \geq -15 \\
 & \{y|y \geq -15\}
 \end{aligned}$$

$$\begin{aligned}
 81. \quad & -2(x-5) > 2(3x-2) \\
 & -2x+10 > 6x-4 \\
 & -2x+10-6x > 6x-4-6x \\
 & -8x+10 > -4 \\
 & -8x+10-10 > -4-10 \\
 & -8x > -14 \\
 & \frac{-8x}{-8} < \frac{-14}{-8} \\
 & x < \frac{7}{4} \\
 & \left\{x \left| x < \frac{7}{4} \right. \right\}
 \end{aligned}$$

$$\begin{aligned}
 82. \quad & 4(2x-5) \leq 5x-1 \\
 & 8x-20 \leq 5x-1 \\
 & 8x-20-5x \leq 5x-1-5x \\
 & 3x-20 \leq -1 \\
 & 3x-20+20 \leq -1+20 \\
 & 3x \leq 19 \\
 & \frac{3x}{3} \leq \frac{19}{3} \\
 & x \leq \frac{19}{3} \\
 & \left\{x \left| x \leq \frac{19}{3} \right. \right\}
 \end{aligned}$$

$$\begin{aligned}
 83. \quad & \text{Let } x \text{ be the sales. Her weekly earnings are } 175 + 0.05x. \\
 & 175 + 0.05x \geq 300 \\
 & 175 + 0.05x - 175 \geq 300 - 175 \\
 & 0.05x \geq 125 \\
 & \frac{0.05x}{0.05} \geq \frac{125}{0.05} \\
 & x \geq 2500
 \end{aligned}$$

She must have weekly sales of at least \$2500.

$$\begin{aligned}
 84. \quad & \text{Let } x \text{ be his score on the fourth round.} \\
 & \frac{76+82+79+x}{4} < 80 \\
 & \frac{237+x}{4} < 80 \\
 & 4 \cdot \frac{237+x}{4} < 4 \cdot 80 \\
 & 237+x < 320 \\
 & 237+x-237 < 320-237 \\
 & x < 83
 \end{aligned}$$

His score must be less than 83.

$$\begin{aligned}
 85. \quad & 6x+2x-1=5x+11 \\
 & 8x-1=5x+11 \\
 & 8x-1-5x=5x+11-5x \\
 & 3x-1=11 \\
 & 3x-1+1=11+1 \\
 & 3x=12 \\
 & \frac{3x}{3}=\frac{12}{3} \\
 & x=4
 \end{aligned}$$

$$\begin{aligned}
 86. \quad & 2(3y-4)=6+7y \\
 & 6y-8=6+7y \\
 & 6y-8-6y=6+7y-6y \\
 & -8=6+y \\
 & -8-6=6+y-6 \\
 & -14=y
 \end{aligned}$$

$$\begin{aligned}
 87. \quad & 4(3-a)-(6a+9)=-12a \\
 & 12-4a-6a-9=-12a \\
 & 3-10a=-12a \\
 & 3-10a+10a=-12a+10a \\
 & 3=-2a \\
 & \frac{3}{-2}=\frac{-2a}{-2} \\
 & -\frac{3}{2}=a
 \end{aligned}$$

$$88. \quad \frac{x}{3} - 2 = 5$$

$$\frac{x}{3} - 2 + 2 = 5 + 2$$

$$\frac{x}{3} = 7$$

$$3 \cdot \frac{x}{3} = 3 \cdot 7$$

$$x = 21$$

$$89. \quad 2(y+5) = 2y+10$$

$$2y+10 = 2y+10$$

Since both sides of the equation are identical, the equation is an identity and every real number is a solution.

$$90. \quad 7x - 3x + 2 = 2(2x - 1)$$

$$4x + 2 = 4x - 2$$

$$4x + 2 - 4x = 4x - 2 - 4x$$

$$2 = -2$$

Since the statement  $2 = -2$  is false, there is no solution.

$$91. \quad \text{Let } x \text{ be the number.}$$

$$6 + 2x = x - 7$$

$$6 + 2x - x = x - 7 - x$$

$$6 + x = -7$$

$$6 + x - 6 = -7 - 6$$

$$x = -13$$

The number is  $-13$ .

$$92. \quad \text{Let } x \text{ be the length of the shorter piece. Then } 4x + 3 \text{ is the length of the longer piece. The lengths sum to 23.}$$

$$x + 4x + 3 = 23$$

$$5x + 3 = 23$$

$$5x + 3 - 3 = 23 - 3$$

$$5x = 20$$

$$\frac{5x}{5} = \frac{20}{5}$$

$$x = 4$$

$$4x + 3 = 4(4) + 3 = 16 + 3 = 19$$

The shorter piece is 4 inches and the longer piece is 19 inches.

$$93. \quad V = \frac{1}{3}Ah$$

$$3V = 3 \cdot \frac{1}{3}Ah$$

$$3V = Ah$$

$$\frac{3V}{A} = \frac{Ah}{A}$$

$$\frac{3V}{A} = h$$

$$94. \quad \text{Let } x \text{ be the number.}$$

$$x = 26\% \cdot 85$$

$$x = 0.26 \cdot 85$$

$$x = 22.1$$

$$22.1 \text{ is } 26\% \text{ of } 85.$$

$$95. \quad \text{Let } x \text{ be the unknown number.}$$

$$72 = 45\% \cdot x$$

$$72 = 0.45x$$

$$\frac{72}{0.45} = \frac{0.45x}{0.45}$$

$$160 = x$$

$$72 \text{ is } 45\% \text{ of } 160.$$

$$96. \quad \text{percent increase} = \frac{\text{amount of increase}}{\text{original amount}}$$

$$= \frac{282 - 235}{235}$$

$$= \frac{47}{235}$$

$$= 0.2$$

The percent increase is 20%.

$$97. \quad 4x - 7 > 3x + 2$$

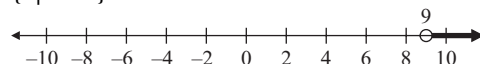
$$4x - 7 - 3x > 3x + 2 - 3x$$

$$x - 7 > 2$$

$$x - 7 + 7 > 2 + 7$$

$$x > 9$$

$$\{x | x > 9\}$$

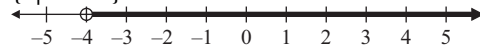


$$98. \quad -5x < 20$$

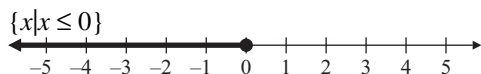
$$\frac{-5x}{5} > \frac{20}{-5}$$

$$x > -4$$

$$\{x | x > -4\}$$



$$\begin{aligned}
 99. \quad & -3(1+2x)+x \geq -(3-x) \\
 & -3-6x+x \geq -3+x \\
 & -3-5x \geq -3+x \\
 & -3-5x-x \geq -3+x-x \\
 & -3-6x \geq -3 \\
 & -3-6x+3 \geq -3+3 \\
 & -6x \geq 0 \\
 & \frac{-6x}{-6} \leq \frac{0}{-6} \\
 & x \leq 0
 \end{aligned}$$



## Chapter 2 Test

$$\begin{aligned}
 1. \quad & -\frac{4}{5}x = 4 \\
 & -\frac{5}{4}\left(-\frac{4}{5}x\right) = -\frac{5}{4}(4) \\
 & x = -5
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & 4(n-5) = -(4-2n) \\
 & 4n-20 = -4+2n \\
 & 4n-20-2n = -4+2n-2n \\
 & 2n-20 = -4 \\
 & 2n-20+20 = -4+20 \\
 & 2n = 16 \\
 & \frac{2n}{2} = \frac{16}{2} \\
 & n = 8
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & 5y-7+y = -(y+3y) \\
 & 6y-7 = -y-3y \\
 & 6y-7 = -4y \\
 & 6y-7-6y = -4y-6y \\
 & -7 = -10y \\
 & \frac{-7}{-10} = \frac{-10y}{-10} \\
 & \frac{7}{10} = y
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & 4z+1-z = 1+z \\
 & 3z+1 = 1+z \\
 & 3z+1-z = 1+z-z \\
 & 2z+1 = 1 \\
 & 2z+1-1 = 1-1 \\
 & 2z = 0 \\
 & \frac{2z}{2} = \frac{0}{2} \\
 & z = 0
 \end{aligned}$$

$$\begin{aligned}
 5. \quad & \frac{2(x+6)}{3} = x-5 \\
 & 3\left(\frac{2(x+6)}{3}\right) = 3(x-5) \\
 & 2(x+6) = 3(x-5) \\
 & 2x+12 = 3x-15 \\
 & 2x+12-2x = 3x-15-2x \\
 & 12 = x-15 \\
 & 12+15 = x-15+15 \\
 & 27 = x
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & \frac{4(y-1)}{5} = 2y+3 \\
 & 5\left[\frac{4(y-1)}{5}\right] = 5(2y+3) \\
 & 4(y-1) = 5(2y+3) \\
 & 4y-4 = 10y+15 \\
 & 4y-4-10y = 10y+15-10y \\
 & -6y-4 = 15 \\
 & -6y-4+4 = 15+4 \\
 & -6y = 19 \\
 & \frac{-6y}{-6} = \frac{19}{-6} \\
 & y = -\frac{19}{6}
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & \frac{1}{2}-x+\frac{3}{2} = x-4 \\
 & -x+\frac{4}{2} = x-4 \\
 & -x+2 = x-4 \\
 & -x+2+x = x-4+x \\
 & 2 = 2x-4 \\
 & 2+4 = 2x-4+4 \\
 & 6 = 2x \\
 & \frac{6}{2} = \frac{2x}{2} \\
 & 3 = x
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & \frac{1}{3}(y+3) = 4y \\
 & 3 \cdot \frac{1}{3}(y+3) = 3 \cdot 4y \\
 & y+3 = 12y \\
 & y+3-y = 12y-y \\
 & 3 = 11y \\
 & \frac{3}{11} = \frac{11y}{11} \\
 & \frac{3}{11} = y
 \end{aligned}$$



$$\begin{aligned}
 9. \quad & -0.3(x-4) + x = 0.5(3-x) \\
 & -0.3(x-4) + 1.0x = 0.5(3-x) \\
 & -3(x-4) + 10x = 5(3-x) \\
 & -3x + 12 + 10x = 15 - 5x \\
 & 7x + 12 = 15 - 5x \\
 & 7x + 12 + 5x = 15 - 5x + 5x \\
 & 12x + 12 = 15 \\
 & 12x + 12 - 12 = 15 - 12 \\
 & 12x = 3 \\
 & \frac{12x}{12} = \frac{3}{12} \\
 & x = \frac{1}{4} = 0.25
 \end{aligned}$$

$$\begin{aligned}
 10. \quad & -4(a+1) - 3a = -7(2a-3) \\
 & -4a - 4 - 3a = -14a + 21 \\
 & -4 - 7a = -14a + 21 \\
 & -4 - 7a + 14a = -14a + 21 + 14a \\
 & -4 + 7a = 21 \\
 & -4 + 7a + 4 = 21 + 4 \\
 & 7a = 25 \\
 & \frac{7a}{7} = \frac{25}{7} \\
 & a = \frac{25}{7}
 \end{aligned}$$

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

Since the statement  $6 = 5$  is false, there is no solution.

12. Let  $x$  be the number.

$$\begin{aligned}
 & x + \frac{2}{3}x = 35 \\
 & \frac{3}{3}x + \frac{2}{3}x = 35 \\
 & \frac{5}{3}x = 35 \\
 & \frac{3}{5} \cdot \frac{5}{3}x = \frac{3}{5} \cdot 35 \\
 & x = 21
 \end{aligned}$$

The number is 21.

$$\begin{aligned}
 13. \quad & A = lw = (35)(20) = 700 \\
 & \text{The area of the deck is 700 square feet. To paint} \\
 & \text{two coats of water seal means covering} \\
 & 2 \cdot 700 = 1400 \text{ square feet.}
 \end{aligned}$$

$$1400 \text{ sq ft} \cdot \frac{1 \text{ gal}}{200 \text{ sq ft}} = 7 \text{ gal}$$

7 gallons of water seal are needed.

$$14. \text{ Use } y = mx + b \text{ when } y = -14, m = -2, \text{ and } b = -2.$$

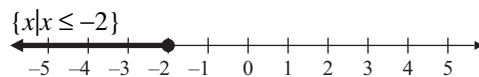
$$\begin{aligned}
 & y = mx + b \\
 & -14 = -2x + (-2) \\
 & -14 + 2 = -2x + (-2) + 2 \\
 & -12 = -2x \\
 & \frac{-12}{-2} = \frac{-2x}{-2} \\
 & 6 = x
 \end{aligned}$$

$$15. \quad V = \pi r^2 h$$

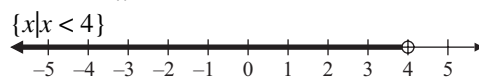
$$\begin{aligned}
 \frac{V}{\pi r^2} &= \frac{\pi r^2 h}{\pi r^2} \\
 \frac{V}{\pi r^2} &= h
 \end{aligned}$$

$$\begin{aligned}
 16. \quad & 3x - 4y = 10 \\
 & 3x - 4y - 3x = 10 - 3x \\
 & -4y = 10 - 3x \\
 & \frac{-4y}{-4} = \frac{10 - 3x}{-4} \\
 & y = \frac{3x - 10}{4}
 \end{aligned}$$

$$\begin{aligned}
 17. \quad & 3x - 5 \geq 7x + 3 \\
 & 3x - 5 - 3x \geq 7x + 3 - 3x \\
 & -5 \geq 4x + 3 \\
 & -5 - 3 \geq 4x + 3 - 3 \\
 & -8 \geq 4x \\
 & \frac{-8}{4} \geq \frac{4x}{4} \\
 & -2 \geq x
 \end{aligned}$$



$$\begin{aligned}
 18. \quad & x + 6 > 4x - 6 \\
 & x + 6 - 4x > 4x - 6 - 4x \\
 & -3x + 6 > -6 \\
 & -3x + 6 - 6 > -6 - 6 \\
 & -3x > -12 \\
 & \frac{-3x}{-3} < \frac{-12}{-3} \\
 & x < 4
 \end{aligned}$$



$$19. \quad -0.3x \geq 2.4$$

$$\frac{-0.3x}{-0.3} \leq \frac{2.4}{-0.3}$$

$$x \leq -8$$

$$\{x|x \leq -8\}$$

$$20. \quad -5(x-1)+6 \leq -3(x+4)+1$$

$$-5x+5+6 \leq -3x-12+1$$

$$-5x+11 \leq -3x-11$$

$$-5x+11+3x \leq -3x-11+3x$$

$$-2x+11 \leq -11$$

$$-2x+11-11 \leq -11-11$$

$$-2x \leq -22$$

$$\frac{-2x}{-2} \geq \frac{-22}{-2}$$

$$x \geq 11$$

$$\{x|x \geq 11\}$$

$$21. \quad \frac{2(5x+1)}{3} > 2$$

$$3 \cdot \frac{2(5x+1)}{3} > 3(2)$$

$$2(5x+1) > 6$$

$$10x+2 > 6$$

$$10x+2-2 > 6-2$$

$$10x > 4$$

$$\frac{10x}{10} > \frac{4}{10}$$

$$x > \frac{2}{5}$$

$$\left\{x|x > \frac{2}{5}\right\}$$

22. From the graph, 69% are classified as weak.  
Find 69% of 800.  
 $69\% \cdot 800 = 0.69 \cdot 800 = 552$   
You would expect 552 of the 800 to be classified as weak.

23. Let  $x$  be the unknown percent.  
 $72 = x \cdot 180$   
 $\frac{72}{180} = \frac{180x}{180}$   
 $0.4 = x$   
72 is 40% of 180.

24. Let  $x$  = area code 1, then  $2x$  = area code 2.  
 $x + 2x = 1203$   
 $3x = 1203$   
 $\frac{3x}{3} = \frac{1203}{3}$   
 $x = 401$   
 $2x = 2(401) = 802$   
The area codes are 401 and 802.

25. Let  $x$  represent the number of public libraries in Georgia. Then there are  $x + 696$  public libraries in New York.

$$x + x + 696 = 812$$

$$2x + 696 = 812$$

$$2x + 696 - 696 = 812 - 696$$

$$2x = 116$$

$$\frac{2x}{2} = \frac{116}{2}$$

$$x = 58$$

$$x + 696 = 58 + 696 = 754$$

Georgia has 58 public libraries and New York has 754.

### Cumulative Review Chapters 1–2

- Since  $8 = 8$ , the statement  $8 \geq 8$  is true.
- Since  $-4$  is to the right of  $-6$  on the number line, the statement  $-4 < -6$  is false.
- Since  $8 = 8$ , the statement  $8 \leq 8$  is true.
- Since  $3$  is to the right of  $-3$  on the number line, the statement  $3 > -3$  is true.
- Since neither  $23 < 0$  nor  $23 = 0$  is true, the statement  $23 \leq 0$  is false.
- Since  $-8 = -8$ , the statement  $-8 \geq -8$  is true.
- Since  $0 < 23$  is true, the statement  $0 \leq 23$  is true.
- Since  $-8 = -8$ , the statement  $-8 \leq -8$  is true.
- $|0| < 2$  since  $|0| = 0$  and  $0 < 2$ .
  - $|-5| = 5$
  - $|-3| > |-2|$  since  $3 > 2$ .
  - $|-9| < |-9.7|$  since  $9 < 9.7$ .
  - $\left|-7\frac{1}{6}\right| > |7|$  since  $7\frac{1}{6} > 7$ .
- $|5| = 5$  since  $5$  is  $5$  units from  $0$  on the number line.
  - $|-8| = 8$  since  $-8$  is  $8$  units from  $0$  on the number line.

c.  $\left|-\frac{2}{3}\right| = \frac{2}{3}$  since  $-\frac{2}{3}$  is  $\frac{2}{3}$  unit from 0 on the number line.

$$\begin{aligned} 11. \quad \frac{3+|4-3|+2^2}{6-3} &= \frac{3+|1|+2^2}{6-3} \\ &= \frac{3+1+2^2}{3} \\ &= \frac{3+1+4}{3} \\ &= \frac{8}{3} \end{aligned}$$

$$\begin{aligned} 12. \quad 1+2(9-7)^3+4^2 &= 1+2(2)^3+4^2 \\ &= 1+2(8)+16 \\ &= 1+16+16 \\ &= 33 \end{aligned}$$

$$13. \quad (-8) + (-11) = -19$$

$$14. \quad -2 + (-8) = -10$$

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

$$16. \quad -10 + 20 = 10$$

$$17. \quad 0.2 + (-0.5) = -0.3$$

$$18. \quad 1.2 + (-1.2) = 0$$

$$\begin{aligned} 19. \quad \text{a.} \quad -3+[-(-2-5)-2] &= -3+[-(-2+(-5))-2] \\ &= -3+[-(-7)-2] \\ &= -3+[-7+(-2)] \\ &= -3+[-9] \\ &= -12 \end{aligned}$$

$$\begin{aligned} \text{b.} \quad 2^3-10+[-6-(-5)] &= 2^3-10+[-6+5] \\ &= 2^3-10+[-1] \\ &= 8-10+(-1) \\ &= 8+(-10)+(-1) \\ &= -2+(-1) \\ &= -3 \end{aligned}$$

$$20. \quad \text{a.} \quad -(-5) = 5$$

$$\text{b.} \quad -\left(-\frac{2}{3}\right) = \frac{2}{3}$$

$$\text{c.} \quad -(-a) = a$$

$$\text{d.} \quad -|-3| = -3$$

$$21. \quad \text{a.} \quad 7(0)(-6) = 0(-6) = 0$$

$$\text{b.} \quad (-2)(-3)(-4) = (6)(-4) = -24$$

$$\begin{aligned} \text{c.} \quad (-1)(-5)(-9)(-2) &= 5(-9)(-2) \\ &= (-45)(-2) \\ &= 90 \end{aligned}$$

$$22. \quad \text{a.} \quad -2.7 - 8.4 = -2.7 + (-8.4) = -11.1$$

$$\text{b.} \quad -\frac{4}{5} - \left(-\frac{3}{5}\right) = -\frac{4}{5} + \frac{3}{5} = -\frac{1}{5}$$

$$\text{c.} \quad \frac{1}{4} - \left(-\frac{1}{2}\right) = \frac{1}{4} + \frac{1}{2} = \frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

$$23. \quad \text{a.} \quad -18 \div 3 = -18 \cdot \frac{1}{3} = -6$$

$$\text{b.} \quad \frac{-14}{-2} = -14 \cdot -\frac{1}{2} = 7$$

$$\text{c.} \quad \frac{20}{-4} = 20 \cdot -\frac{1}{4} = -5$$

$$24. \quad \text{a.} \quad (4.5)(-0.08) = -0.36$$

$$\text{b.} \quad -\frac{3}{4} \cdot -\frac{8}{17} = \frac{3 \cdot 8}{4 \cdot 17} = \frac{6}{17}$$

$$25. \quad -5(-3+2z) = -5(-3) + (-5)(2z) = 15 - 10z$$

$$\begin{aligned} 26. \quad 2(x^2-3x+4) &= 2(x^2) - 2(3x) + 2(4) \\ &= 2x^2 - 6x + 8 \end{aligned}$$

$$\begin{aligned} 27. \quad \frac{1}{2}(6x+14)+10 &= \frac{1}{2}(6x) + \frac{1}{2}(14) + 10 \\ &= 3x + 7 + 10 \\ &= 3x + 17 \end{aligned}$$

$$\begin{aligned} 28. \quad -(x+4)+3(x+4) &= -1(x+4)+3(x+4) \\ &= -1 \cdot x + (-1)(4) + 3 \cdot x + 3 \cdot 4 \\ &= -x - 4 + 3x + 12 \\ &= -x + 3x - 4 + 12 \\ &= 2x + 8 \end{aligned}$$

$$29. \quad \text{a.} \quad 2x \text{ and } 3x^2 \text{ are unlike terms, since the exponents on } x \text{ are not the same.}$$

$$\text{b.} \quad 4x^2y, \quad xy^2, \text{ and } -2x^2y \text{ are like terms, since each variable and its exponent match.}$$

- c.  $-2yz$  and  $-3zy$  are like terms, since  $zy = yz$  by the commutative property.
- d.  $-x^4$  and  $x^4$  are like terms. The variable and its exponent match.
- e.  $-8a^5$  and  $8a^5$  are like terms. The variable and its exponent match.

30. a.  $\frac{-32}{8} = -4$

b.  $\frac{-108}{-12} = 9$

c.  $\frac{-5}{7} \div \left(\frac{-9}{2}\right) = \frac{-5}{7} \cdot \left(\frac{2}{-9}\right) = \frac{5 \cdot 2}{7 \cdot 9} = \frac{10}{63}$

31.  $(2x - 3) - (4x - 2) = 2x - 3 - 4x + 2 = -2x - 1$

32.  $(-5x + 1) - (10x + 3) = -5x + 1 - 10x - 3$   
 $= -15x - 2$

33.  $x - 7 = 10$   
 $x - 7 + 7 = 10 + 7$   
 $x = 17$

34.  $\frac{5}{6} + x = \frac{2}{3}$   
 $\frac{5}{6} + x - \frac{5}{6} = \frac{2}{3} - \frac{5}{6}$   
 $x = \frac{4}{6} - \frac{5}{6}$   
 $x = -\frac{1}{6}$

35.  $-z - 4 = 6$   
 $-z - 4 + 4 = 6 + 4$   
 $-z = 10$   
 $\frac{-z}{-1} = \frac{10}{-1}$   
 $z = -10$

36.  $-3x + 1 - (-4x - 6) = 10$   
 $-3x + 1 + 4x + 6 = 10$   
 $x + 7 = 10$   
 $x + 7 - 7 = 10 - 7$   
 $x = 3$

37.  $\frac{2(a+3)}{3} = 6a + 2$   
 $3 \cdot \frac{2(a+3)}{3} = 3(6a + 2)$   
 $2(a+3) = 3(6a + 2)$   
 $2a + 6 = 18a + 6$   
 $2a + 6 - 18a = 18a + 6 - 18a$   
 $-16a + 6 = 6$   
 $-16a + 6 - 6 = 6 - 6$   
 $-16a = 0$   
 $\frac{-16a}{-16} = \frac{0}{-16}$   
 $a = 0$

38.  $\frac{x}{4} = 18$   
 $4 \cdot \frac{x}{4} = 4 \cdot 18$   
 $x = 72$

39. Let  $x$  be the number of Republicans. Then  $x + 78$  is the number of Democrats. The total number is 434.

$$\begin{aligned} x + x + 78 &= 434 \\ 2x + 78 &= 434 \\ 2x + 78 - 78 &= 434 - 78 \\ 2x &= 356 \\ \frac{2x}{2} &= \frac{356}{2} \\ x &= 178 \end{aligned}$$

$$x + 78 = 178 + 78 = 256$$

There were 256 Democrats and 178 Republicans.

40.  $6x + 5 = 4(x + 4) - 1$   
 $6x + 5 = 4x + 16 - 1$   
 $6x + 5 = 4x + 15$   
 $6x + 5 - 4x = 4x + 15 - 4x$   
 $2x + 5 = 15$   
 $2x + 5 - 5 = 15 - 5$   
 $2x = 10$   
 $\frac{2x}{2} = \frac{10}{2}$   
 $x = 5$

41. Use  $d = rt$  when  $d = 31,680$  and  $r = 400$ .

$$\begin{aligned} d &= rt \\ 31,680 &= 400t \\ \frac{31,680}{400} &= \frac{400t}{400} \\ 79.2 &= t \end{aligned}$$

It will take the ice 79.2 years to reach the lake.

$$\begin{aligned}
 42. \quad x + 4 &= 3x - 8 \\
 x + 4 - 3x &= 3x - 8 - 3x \\
 -2x + 4 &= -8 \\
 -2x + 4 - 4 &= -8 - 4 \\
 -2x &= -12 \\
 \frac{-2x}{-2} &= \frac{-12}{-2} \\
 x &= 6
 \end{aligned}$$

The number is 6.

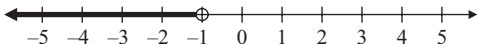
43. Let  $x$  be the unknown percent.

$$\begin{aligned}
 63 &= x \cdot 72 \\
 \frac{63}{72} &= \frac{72x}{72} \\
 0.875 &= x \\
 87.5\% &= x \\
 63 &\text{ is } 87.5\% \text{ of } 72.
 \end{aligned}$$

$$\begin{aligned}
 44. \quad C &= 2\pi r \\
 \frac{C}{2\pi} &= \frac{2\pi r}{2\pi} \\
 \frac{C}{2\pi} &= r \text{ or } r = \frac{C}{2\pi}
 \end{aligned}$$

$$\begin{aligned}
 45. \quad 5(2x + 3) &= -1 + 7 \\
 5(2x) + 5(3) &= -1 + 7 \\
 10x + 15 &= 6 \\
 10x + 15 - 15 &= 6 - 15 \\
 10x &= -9 \\
 \frac{10x}{10} &= \frac{-9}{10} \\
 x &= -\frac{9}{10}
 \end{aligned}$$

$$\begin{aligned}
 46. \quad x - 3 &> 2 \\
 x - 3 + 3 &> 2 + 3 \\
 x &> 5 \\
 \{x | x > 5\}
 \end{aligned}$$

$$\begin{aligned}
 47. \quad -1 > x \text{ or } x < -1
 \end{aligned}$$


$$\begin{aligned}
 48. \quad 3x - 4 &\leq 2x - 14 \\
 3x - 4 - 2x &\leq 2x - 14 - 2x \\
 x - 4 &\leq -14 \\
 x - 4 + 4 &\leq -14 + 4 \\
 x &\leq -10 \\
 \{x | x \leq -10\}
 \end{aligned}$$

$$\begin{aligned}
 49. \quad 2(x - 3) - 5 &\leq 3(x + 2) - 18 \\
 2x - 6 - 5 &\leq 3x + 6 - 18 \\
 2x - 11 &\leq 3x - 12 \\
 -x - 11 &\leq -12 \\
 -x &\leq -1 \\
 \frac{-x}{-1} &\geq \frac{-1}{-1} \\
 x &\geq 1 \\
 \{x | x \geq 1\}
 \end{aligned}$$

$$\begin{aligned}
 50. \quad -3x &\geq 9 \\
 \frac{-3x}{-3} &\leq \frac{9}{-3} \\
 x &\leq -3 \\
 \{x | x \leq -3\}
 \end{aligned}$$