

## Chapter 2

### 2.1 Exercises

2.  $2x + 12 = 2(21) + 12 = 54 \neq -30$

No; 21 is not a root since replacing  $x$  with 21 does not give a true statement.

4.  $5y + 9 = 5\left(\frac{3}{5}\right) + 9 = 3 + 9 = 12$

Yes: when you replace  $y$  by  $\frac{3}{5}$  in the equation, you get a true statement.

6. Multiply each term of the equation by 100 to clear the decimals.

8. No; it would be easier to add  $\frac{1}{4}$  to both sides of the equation since the coefficient of  $x$  is 1.

10.  $26 + x = -35$   
 $26 + x - 26 = -35 - 26$   
 $x = -61$   
 Check:  $26 + (-61) \stackrel{?}{=} -35$   
 $-35 = -35$

12.  $-16x = -64$   
 $\frac{-16x}{-16} = \frac{-64}{-16}$   
 $x = 4$   
 Check:  $-16(4) \stackrel{?}{=} -64$   
 $-64 = -64$

14.  $-15x = 75$   
 $\frac{-15x}{-15} = \frac{75}{-15}$   
 $x = -5$   
 Check:  $-15(-5) \stackrel{?}{=} 75$   
 $75 = 75$

16.  $10x + 3 = 15$   
 $10x + 3 - 3 = 15 - 3$   
 $10x = 12$   
 $\frac{10x}{10} = \frac{12}{10}$   
 $x = \frac{6}{5}$  or  $1\frac{1}{5}$  or 1.2  
 Check:  $10\left(\frac{6}{5}\right) + 3 \stackrel{?}{=} 15$   
 $15 = 15$

18.  $16x + 5 = 10x - 1$   
 $16x - 10x + 5 = 10x - 10x - 1$   
 $6x + 5 = -1$   
 $6x + 5 - 5 = -1 - 5$   
 $6x = -6$   
 $\frac{6x}{6} = \frac{-6}{6}$   
 $x = -1$   
 Check:  $16(-1) + 5 \stackrel{?}{=} 10(-1) - 1$   
 $-16 + 5 \stackrel{?}{=} -10 - 1$   
 $-11 = -11$

20.  $-11x - 8 = 2x + 5$   
 $-11x - 2x - 8 = 2x - 2x + 5$   
 $-13x - 8 = 5$   
 $-13x - 8 + 8 = 5 + 8$   
 $-13x = 13$   
 $\frac{-13x}{-13} = \frac{13}{-13}$   
 $x = -1$   
 Check:  $-11(-1) - 8 \stackrel{?}{=} 2(-1) + 5$   
 $11 - 8 \stackrel{?}{=} -2 + 5$   
 $3 = 3$

22.  $6a + 5 - a = 3a - 9$   
 $5a + 5 = 3a - 9$   
 $5a - 3a + 5 = 3a - 3a - 9$   
 $2a + 5 = -9$   
 $2a + 5 - 5 = -9 - 5$   
 $2a = -14$   
 $\frac{2a}{2} = \frac{-14}{2}$   
 $a = -7$   
 Check:  $6(-7) + 5 - (-7) \stackrel{?}{=} 3(-7) - 9$   
 $-42 + 5 + 7 \stackrel{?}{=} -21 - 9$   
 $-30 = -30$

24.  $3(5 - y) = 3(y + 4)$   
 $15 - 3y = 3y + 12$   
 $15 - 3y - 3y = 3y - 3y + 12$   
 $15 - 6y = 12$   
 $15 - 15 - 6y = 12 - 15$   
 $-6y = -3$   
 $\frac{-6y}{-6} = \frac{-3}{-6}$   
 $y = \frac{1}{2}$  or 0.5

$$\begin{aligned}\text{Check: } 3\left(5 - \frac{1}{2}\right) &\stackrel{?}{=} 3\left(\frac{1}{2} + 4\right) \\ 3\left(\frac{9}{2}\right) &\stackrel{?}{=} 3\left(\frac{9}{2}\right) \\ \frac{27}{2} &= \frac{27}{2}\end{aligned}$$

$$\begin{aligned}26. \quad 4y + 5 &= 6(y + 3) - y \\ 4y + 5 &= 6y + 18 - y \\ 4y + 5 &= 5y + 18 \\ 4y - 5y + 5 &= 5y - 5y + 18 \\ -y + 5 &= 18 \\ -y + 5 - 5 &= 18 - 5 \\ -y &= 13 \\ y &= -13 \\ \text{Check: } 4(-13) + 5 &\stackrel{?}{=} 6(-13 + 3) - (-13) \\ -52 + 5 &\stackrel{?}{=} 6(-10) + 13 \\ -47 &\stackrel{?}{=} -60 + 13 \\ -47 &= -47\end{aligned}$$

$$\begin{aligned}28. \quad -\frac{5}{6}x &= 5 \\ -\frac{5}{6}x\left(-\frac{6}{5}\right) &= 5\left(-\frac{6}{5}\right) \\ x &= -6 \\ \text{Check: } -\frac{5}{6}(-6) &\stackrel{?}{=} 5 \\ 5 &= 5\end{aligned}$$

$$\begin{aligned}30. \quad \frac{y}{3} + 2 &= \frac{4}{5} \\ 15\left(\frac{y}{3} + 2\right) &= 15\left(\frac{4}{5}\right) \\ 5y + 30 &= 12 \\ 5y + 30 - 30 &= 12 - 30 \\ 5y &= -18 \\ \frac{5y}{5} &= \frac{-18}{5} \\ y &= -\frac{18}{5} \text{ or } -3\frac{3}{5} \text{ or } -3.6 \\ \text{Check: } \frac{-3.6}{3} + 2 &\stackrel{?}{=} \frac{4}{5} \\ -1.2 + 2 &\stackrel{?}{=} 0.8 \\ 0.8 &= 0.8\end{aligned}$$

$$\begin{aligned}32. \quad \frac{4x}{5} + \frac{3}{2} &= 2x \\ 10\left(\frac{4x}{5} + \frac{3}{2}\right) &= 2x(10) \\ 8x + 15 &= 20x \\ 8x - 8x + 15 &= 20x - 8x \\ 15 &= 12x \\ \frac{15}{12} &= \frac{12x}{12} \\ x &= \frac{5}{4} \text{ or } 1\frac{1}{4} \text{ or } 1.25 \\ \text{Check: } \frac{4\left(\frac{5}{4}\right)}{5} + \frac{3}{2} &\stackrel{?}{=} 2\left(\frac{5}{4}\right) \\ 1 + \frac{3}{2} &\stackrel{?}{=} \frac{5}{2} \\ \frac{5}{2} &= \frac{5}{2}\end{aligned}$$

$$\begin{aligned}34. \quad 5 - \frac{2}{3}(x + 2) &= 3 \\ 3\left(5 - \frac{2}{3}(x + 2)\right) &= 3(3) \\ 15 - 2(x + 2) &= 9 \\ 15 - 2x - 4 &= 9 \\ -2x + 11 &= 9 \\ -2x + 11 - 11 &= 9 - 11 \\ -2x &= -2 \\ \frac{-2x}{-2} &= \frac{-2}{-2} \\ x &= 1 \\ \text{Check: } 5 - \frac{2}{3}(1 + 2) &\stackrel{?}{=} 3 \\ 5 - \frac{2}{3}(3) &\stackrel{?}{=} 3 \\ 5 - 2 &\stackrel{?}{=} 3 \\ 3 &= 3\end{aligned}$$

$$36. \quad 6 + 2(x-1) = \frac{3x}{5} + 4$$

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

$$2x + 4 = \frac{3x}{5} + 4$$

$$5(2x + 4) = 5\left(\frac{3x}{5} + 4\right)$$

$$10x + 20 = 3x + 20$$

$$10x - 3x + 20 = 3x - 3x + 20$$

$$7x + 20 = 20$$

$$7x + 20 - 20 = 20 - 20$$

$$7x = 0$$

$$\frac{7x}{7} = \frac{0}{7}$$

$$x = 0$$

$$\text{Check: } 6 + 2(0-1) \stackrel{?}{=} \frac{3(0)}{5} + 4$$

$$6 + (-2) \stackrel{?}{=} 0 + 4$$

$$4 = 4$$

$$38. \quad 0.8x - 0.1 = 0.4x + 0.7$$

$$10(0.8x - 0.1) = 10(0.4x + 0.7)$$

$$8x - 1 = 4x + 7$$

$$8x - 4x - 1 = 4x - 4x + 7$$

$$4x - 1 = 7$$

$$4x - 1 + 1 = 7 + 1$$

$$4x = 8$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$x = 2$$

$$\text{Check: } 0.8(2) - 0.1 \stackrel{?}{=} 0.4(2) + 0.7$$

$$1.6 - 0.1 \stackrel{?}{=} 0.8 + 0.7$$

$$1.5 = 1.5$$

$$40. \quad 0.1x - 0.12 = 0.04x + 0.03$$

$$100(0.1x - 0.12) = 100(0.04x + 0.03)$$

$$10x - 12 = 4x + 3$$

$$10x - 4x - 12 = 4x - 4x + 3$$

$$6x - 12 = 3$$

$$6x - 12 + 12 = 3 + 12$$

$$6x = 15$$

$$\frac{6x}{6} = \frac{15}{6}$$

$$x = 2.5 \text{ or } 2\frac{1}{2} \text{ or } \frac{5}{2}$$

$$\text{Check: } 0.1(2.5) - 0.12 \stackrel{?}{=} 0.04(2.5) + 0.03$$

$$0.25 - 0.12 \stackrel{?}{=} 0.1 + 0.03$$

$$0.13 = 0.13$$

$$42. \quad 0.5(3x + 5) = 1$$

$$1.5x + 2.5 = 1$$

$$10(1.5x + 2.5) = 10(1)$$

$$15x + 25 = 10$$

$$15x + 25 - 25 = 10 - 25$$

$$15x = -15$$

$$\frac{15x}{15} = \frac{-15}{15}$$

$$x = -1$$

$$\text{Check: } 0.5[3(-1) + 5] \stackrel{?}{=} 1$$

$$0.5[-3 + 5] \stackrel{?}{=} 1$$

$$0.5[2] \stackrel{?}{=} 1$$

$$1 = 1$$

$$44. \quad 0.3(x + 2) - 2 = 0.05x$$

$$0.3x + 0.6 - 2 = 0.05x$$

$$100(0.3x + 0.6 - 2) = 100(0.05x)$$

$$30x + 60 - 200 = 5x$$

$$30x - 140 = 5x$$

$$30x - 140 + 140 = 5x + 140$$

$$30x - 5x = 5x - 5x + 140$$

$$25x = 140$$

$$\frac{25x}{25} = \frac{140}{25}$$

$$x = 5.6 \text{ or } \frac{28}{5} \text{ or } 5\frac{3}{5}$$

$$\text{Check: } 0.3(5.6 + 2) - 2 \stackrel{?}{=} 0.05(5.6)$$

$$2.28 - 2 \stackrel{?}{=} 0.28$$

$$0.28 = 0.28$$

$$46. \quad 8y + 15 - 4y = 20 - 13$$

$$4y + 15 = 7$$

$$4y + 15 - 15 = 7 - 15$$

$$4y = -8$$

$$\frac{4y}{4} = \frac{-8}{4}$$

$$y = -2$$

$$48. \quad \frac{1}{2} - \frac{x}{8} = \frac{x-3}{4}$$

$$8\left(\frac{1}{2} - \frac{x}{8}\right) = 8\left(\frac{x-3}{4}\right)$$

$$4 - x = 2(x - 3)$$

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

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

$$4 = 3x - 6$$

$$4 + 6 = 3x - 6 + 6$$

$$10 = 3x$$

$$\frac{10}{3} = x \text{ or } x = 3\frac{1}{3}$$

$$\begin{aligned}
 50. \quad \frac{y+5}{12} &= \frac{3}{4} - \frac{y+1}{8} \\
 24\left(\frac{y+5}{12}\right) &= 24\left(\frac{3}{4} - \frac{y+1}{8}\right) \\
 2(y+5) &= 6(3) - 3(y+1) \\
 2y+10 &= 18-3y-3 \\
 2y+10 &= 15-3y \\
 2y+3y+10 &= 15-3y+3y \\
 5y+10 &= 15 \\
 5y+10-10 &= 15-10 \\
 5y &= 5 \\
 \frac{5y}{5} &= \frac{5}{5} \\
 y &= 1
 \end{aligned}$$

$$\begin{aligned}
 52. \quad 1.7+3(0.2x-0.3) &= 0.2(4-x) \\
 1.7+0.6x-0.9 &= 0.8-0.2x \\
 10(1.7+0.6x-0.9) &= 10(0.8-0.2x) \\
 17+6x-9 &= 8-2x \\
 8+6x &= 8-2x \\
 8+6x+2x &= 8-2x+2x \\
 8+8x &= 8 \\
 8-8+8x &= 8-8 \\
 8x &= 0 \\
 \frac{8x}{8} &= \frac{0}{8} \\
 x &= 0
 \end{aligned}$$

$$\begin{aligned}
 54. \quad 7x-5 &= -2x-15+10x+6 \\
 7x-5 &= 8x-9 \\
 7x-8x-5 &= 8x-8x-9 \\
 -x-5 &= -9 \\
 -x-5+5 &= -9+5 \\
 -x &= -4 \\
 x &= 4
 \end{aligned}$$

$$\begin{aligned}
 56. \quad 3x-17 &= 8x-5(x-2) \\
 3x-17 &= 8x-5x+10 \\
 3x-17 &= 3x+10 \\
 3x-3x-17 &= 3x-3x+10 \\
 -17 &= 10 \Rightarrow \text{since } -17 \neq 10, \\
 &\text{no solution}
 \end{aligned}$$

$$\begin{aligned}
 58. \quad 8(x+2)-7 &= 3(x+3)+5x \\
 8x+16-7 &= 3x+9+5x \\
 8x+9 &= 8x+9 \\
 8x-8x+9 &= 8x-8x+9 \\
 9 &= 9
 \end{aligned}$$

Any real number is a solution.

$$\begin{aligned}
 60. \quad 2x+4(x-5) &= -x+7(x-1)+3 \\
 2x+4x-20 &= -x+7x-7+3 \\
 6x-20 &= 6x-4 \\
 6x-6x-20 &= 6x-6x-4 \\
 -20 &= -4 \Rightarrow \text{since } -20 \neq -4, \\
 &\text{no solution.}
 \end{aligned}$$

$$\begin{aligned}
 62. \quad x + \frac{2x+8}{3} &= \frac{5x+5}{3} + 1 \\
 3\left(x + \frac{2x+8}{3}\right) &= 3\left(\frac{5x+5}{3} + 1\right) \\
 3x+2x+8 &= 5x+5+3 \\
 5x+8 &= 5x+8 \\
 5x-5x+8 &= 5x-5x+8 \\
 8 &= 8
 \end{aligned}$$

Any real number is a solution.

### Cumulative Review

$$\begin{aligned}
 63. \quad 5-(4-2)^2+3(-2) &= 5-(2)^2+(-6) \\
 &= 5-4+(-6) \\
 &= 1+(-6) \\
 &= -5
 \end{aligned}$$

$$\begin{aligned}
 64. \quad (-2)^4-12-6(-2) &= 16-12+(-6)(-2) \\
 &= 16-12+12 \\
 &= 4+12 \\
 &= 16
 \end{aligned}$$

$$\begin{aligned}
 65. \quad \left(\frac{3xy^2}{2x^2y}\right)^3 &= \frac{3^3x^3y^{2\cdot3}}{2^3x^{2\cdot3}y^3} \\
 &= \frac{27x^3y^6}{8x^6y^3} \\
 &= \frac{27y^{6-3}}{8x^{6-3}} \\
 &= \frac{27y^3}{8x^3}
 \end{aligned}$$

$$\begin{aligned}
 66. \quad & (2x^{-2}y^{-3})^2(4xy^{-2})^{-2} \\
 & = 2^2x^{-2 \cdot 2}y^{-3 \cdot 2} \cdot 4^{-2}x^{-2}y^{-2(-2)} \\
 & = 4x^{-4}y^{-6} \cdot \frac{1}{16} \cdot x^{-2}y^4 \\
 & = \frac{4}{16}x^{-4-2}y^{-6+4} \\
 & = \frac{1}{4}x^{-6}y^{-2} \\
 & = \frac{1}{4x^6y^2}
 \end{aligned}$$

## Classroom Quiz 2.1

$$\begin{aligned}
 1. \quad & 3(8-2x) = 10-4(x-3) \\
 & 24-6x = 10-4x+12 \\
 & 24-6x = 22-4x \\
 & 24-6x+4x = 22-4x+4x \\
 & 24-2x = 22 \\
 & 24-24-2x = 22-24 \\
 & -2x = -2 \\
 & \frac{-2x}{-2} = \frac{-2}{-2} \\
 & x = 1
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & \frac{3}{4}(x-1)+2 = 2(x-4) \\
 & 4\left[\frac{3}{4}(x-1)+2\right] = 4[2(x-4)] \\
 & 3(x-1)+4 \cdot 2 = 8(x-4) \\
 & 3x-3+8 = 8x-32 \\
 & 3x+5 = 8x-32 \\
 & 3x-8x+5 = 8x-8x-32 \\
 & -5x+5 = -32 \\
 & -5x+5-5 = -32-5 \\
 & -5x = -37 \\
 & \frac{-5x}{-5} = \frac{-37}{-5} \\
 & x = \frac{37}{5} \text{ or } 7\frac{2}{5} \text{ or } 7.4
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & 0.6x+1.2 = 4x-3.56 \\
 & 100(0.6x+1.2) = 100(4x-3.56) \\
 & 60x+120 = 400x-356 \\
 & 60x-400x+120 = 400x-400x-356 \\
 & -340x+120 = -356 \\
 & -340x+120-120 = -356-120 \\
 & -340x = -476 \\
 & \frac{-340x}{-340} = \frac{-476}{-340} \\
 & x = 1.4 \text{ or } \frac{7}{5} \text{ or } 1\frac{2}{5}
 \end{aligned}$$

## 2.2 Exercises

$$\begin{aligned}
 2. \quad & 9x+y = 4 \\
 & 9x = 4-y \\
 & x = \frac{4-y}{9}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & 7x-9 = 6y-x \\
 & 7x+x = 6y+9 \\
 & 8x = 6y+9 \\
 & x = \frac{6y+9}{8}
 \end{aligned}$$

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

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

$$\begin{aligned}
 10. \quad & V = lwh \\
 & \frac{V}{lh} = \frac{lwh}{lh} \\
 & \frac{V}{lh} = w \text{ or } w = \frac{V}{lh}
 \end{aligned}$$

$$\begin{aligned}
 12. \quad C &= \frac{5}{9}(F - 32) \\
 9C &= 5(F - 32) \\
 9C &= 5F - 160 \\
 9C + 160 &= 5F \\
 \frac{9C + 160}{5} &= F
 \end{aligned}$$

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

$$\begin{aligned}
 16. \quad H &= \frac{3}{4}(5a + b) \\
 4H &= 3(5a + b) \\
 4H &= 15a + 3b \\
 4H - 3b &= 15a \\
 \frac{4H - 3b}{15} &= a
 \end{aligned}$$

$$\begin{aligned}
 18. \quad 4(-ax + 2y) &= 5ax + y \\
 -4ax + 8y &= 5ax + y \\
 -4ax - 5ax &= y - 8y \\
 -9ax &= -7y \\
 x &= \frac{-7y}{-9a} = \frac{7y}{9a}
 \end{aligned}$$

$$\begin{aligned}
 20. \text{ a.} \quad F &= \frac{9}{5}C + 32 \\
 5F &= 5\left(\frac{9}{5}C + 32\right) \\
 5F &= 9C + 160 \\
 5F - 160 &= 9C \\
 C &= \frac{5F - 160}{9}
 \end{aligned}$$

$$\text{b.} \quad C = \frac{5F - 160}{9} = \frac{5(23) - 160}{9} = -5^\circ$$

$$\begin{aligned}
 22. \text{ a.} \quad V &= \frac{1}{3}\pi r^2 h \\
 3V &= \pi r^2 h \\
 \frac{3V}{\pi r^2} &= h
 \end{aligned}$$

$$\text{b.} \quad h = \frac{3V}{\pi r^2} \approx \frac{3(6.28)}{3.14(3)^2} = \frac{2}{3}$$

$$\begin{aligned}
 24. \quad y &= 0.27x + 72 \\
 y - 72 &= 0.27x \\
 \frac{y - 72}{0.27} &= x \text{ or } x = \frac{100y - 7200}{27} \\
 y = 87: \quad x &= \frac{100(87) - 7200}{27} = \frac{1500}{27} \approx 55.6 \\
 1970 + 55.6 &= 2025.6 \\
 \text{Life expectancy in Japan is expected to be} \\
 &87 \text{ years in 2025.}
 \end{aligned}$$

$$\begin{aligned}
 26. \text{ a.} \quad ND &= 0.95T \\
 N &= \frac{0.95T}{D}
 \end{aligned}$$

$$\begin{aligned}
 \text{b.} \quad D &= 30, T = 6 \cdot 60 = 360 \\
 N &= \frac{0.95(360)}{30} = 11.4 \approx 11 \\
 \text{She should schedule 11 patient} \\
 &\text{appointments.}
 \end{aligned}$$

$$\begin{aligned}
 28. \text{ a.} \quad C &= 0.7649D + 6.1275 \\
 C - 6.1275 &= 0.7649D \\
 D &= \frac{C - 6.1275}{0.7649}
 \end{aligned}$$

$$\begin{aligned}
 \text{b.} \quad D &= \frac{12.48 - 6.1275}{0.7649} \approx 8.3 \\
 \text{The disposable income is \$8.3 billion.}
 \end{aligned}$$

## Cumulative Review

$$\begin{aligned}
 29. \quad (2x^{-3}y)^{-2} &= 2^{-2}x^{-3(-2)}y^{-2} \\
 &= 2^{-2}x^6y^{-2} \\
 &= \frac{x^6}{2^2y^2} \\
 &= \frac{x^6}{4y^2}
 \end{aligned}$$

$$\begin{aligned}
 30. \left( \frac{5x^2y^{-3}}{x^{-4}y^2} \right)^{-3} &= \frac{5^{-3}x^{2(-3)}y^{-3(-3)}}{x^{-4(-3)}y^{2(-3)}} \\
 &= \frac{5^{-3}x^{-6}y^9}{x^{12}y^{-6}} \\
 &= \frac{y^{9+6}}{5^3x^{12+6}} \\
 &= \frac{y^{15}}{125x^{18}}
 \end{aligned}$$

$$\begin{aligned}
 31. 1 + 16 \div (2 - 4)^3 - 3 &= 1 + 16 \div (-2)^3 - 3 \\
 &= 1 + 16 \div (-8) - 3 \\
 &= 1 + (-2) - 3 \\
 &= -1 - 3 \\
 &= -4
 \end{aligned}$$

$$\begin{aligned}
 32. 2[a - (3 - 2b)] + 5a &= 2(a - 3 + 2b) + 5a \\
 &= 2a - 6 + 4b + 5a \\
 &= 7a + 4b - 6
 \end{aligned}$$

$$\begin{aligned}
 33. \$5000 \text{ investment: } I &= prt = 5000(0.05)(1) = 250 \\
 \$4000 \text{ investment: } I &= prt = 4000(0.09)(1) = 360 \\
 \text{Total} &= \$5000 + \$250 + \$4000 + \$360 = \$9610 \\
 \text{They would have } \$9610 &\text{ after 1 year.}
 \end{aligned}$$

$$\begin{aligned}
 34. \frac{46,622.1 - 45,711.3}{9.9 + 11.7 + 10.6 + 5.8 + 8} &= \frac{910.8}{46} = 19.8 \\
 \text{The car got 19.8 miles per gallon.}
 \end{aligned}$$

## Classroom Quiz 2.2

$$\begin{aligned}
 1. \quad A &= 3b + 6(x - 2) \\
 A &= 3b + 6x - 12 \\
 A - 3b + 12 &= 6x \\
 \frac{A - 3b + 12}{6} &= \frac{6x}{6} \\
 x &= \frac{A - 3b + 12}{6}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad M &= \frac{2}{3}gh \\
 \frac{3}{2}M &= gh \\
 \frac{3M}{2g} &= h \text{ or } h = \frac{3M}{2g}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad B &= 3a + \frac{3}{4}w - \frac{1}{8} \\
 8B &= 8\left(3a + \frac{3}{4}w - \frac{1}{8}\right) \\
 8B &= 24a + 6w - 1 \\
 8B - 24a + 1 &= 6w \\
 \frac{8B - 24a + 1}{6} &= \frac{6w}{6} \\
 w &= \frac{8B - 24a + 1}{6}
 \end{aligned}$$

## 2.3 Exercises

2. It could happen if  $b = 0$ . Then  $-b$  and  $b$  would be the same number.

4. You must first isolate the absolute value expression. To do this you add  $-5$  to each side of the equation. The result will be  $|3x - 1| = 9$ . then you solve the two equations  $3x - 1 = 9$  and

$$3x - 1 = -9. \text{ The final answer is } x = \frac{10}{3},$$

$$x = -\frac{8}{3}.$$

$$\begin{aligned}
 6. \quad |x| &= 14 \\
 x &= 14 \text{ or } x = -14 \\
 \text{Check: } |14| &\stackrel{?}{=} 14 & |-14| &\stackrel{?}{=} 14 \\
 14 &= 14 & 14 &= 14
 \end{aligned}$$

$$\begin{aligned}
 8. \quad |x + 6| &= 13 \\
 x + 6 &= 13 \text{ or } x + 6 = -13 \\
 x &= 7 & x &= -19 \\
 \text{Check: } |7 + 6| &\stackrel{?}{=} 13 & |-19 + 6| &\stackrel{?}{=} 13 \\
 |13| &\stackrel{?}{=} 13 & |-13| &\stackrel{?}{=} 13 \\
 13 &= 13 & 13 &= 13
 \end{aligned}$$

$$\begin{aligned}
 10. \quad |4x - 7| &= 9 \\
 4x - 7 &= 9 \text{ or } 4x - 7 = -9 \\
 4x &= 16 & 4x &= -2 \\
 x &= 4 & x &= -\frac{2}{4} = -\frac{1}{2} \\
 \text{Check: } |4(4) - 7| &\stackrel{?}{=} 9 & \left|4\left(-\frac{1}{2}\right) - 7\right| &\stackrel{?}{=} 9 \\
 |16 - 7| &\stackrel{?}{=} 9 & |-2 - 7| &\stackrel{?}{=} 9 \\
 |9| &\stackrel{?}{=} 9 & |-9| &\stackrel{?}{=} 9 \\
 9 &= 9 & 9 &= 9
 \end{aligned}$$

$$\begin{aligned}
 12. \quad |3 - x| &= 7 \\
 3 - x &= 7 \quad \text{or} \quad 3 - x = -7 \\
 -x &= 4 \quad \quad \quad -x = -10 \\
 x &= -4 \quad \quad \quad x = 10
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } |3 - (-4)| &\stackrel{?}{=} 7 & |3 - 10| &\stackrel{?}{=} 7 \\
 |3 + 4| &\stackrel{?}{=} 7 & |-7| &\stackrel{?}{=} 7 \\
 |7| &\stackrel{?}{=} 7 & 7 &= 7 \\
 7 &= 7 & &
 \end{aligned}$$

$$\begin{aligned}
 14. \quad \left| \frac{1}{4}x + 5 \right| &= 3 \\
 \frac{1}{4}x + 5 &= 3 \quad \text{or} \quad \frac{1}{4}x + 5 = -3 \\
 x + 20 &= 12 \quad \quad \quad x + 20 = -12 \\
 x &= -8 \quad \quad \quad x = -32
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } \left| \frac{1}{4}(-8) + 5 \right| &\stackrel{?}{=} 3 & \left| \frac{1}{4}(-32) + 5 \right| &\stackrel{?}{=} 3 \\
 |-2 + 5| &\stackrel{?}{=} 3 & |-8 + 5| &\stackrel{?}{=} 3 \\
 |3| &\stackrel{?}{=} 3 & |-3| &\stackrel{?}{=} 3 \\
 3 &= 3 & 3 &= 3
 \end{aligned}$$

$$\begin{aligned}
 16. \quad |2.4 - 0.8x| &= 2 \\
 2.4 - 0.8x &= 2 \quad \text{or} \quad 2.4 - 0.8x = -2 \\
 24 - 8x &= 20 \quad \quad \quad 24 - 8x = -20 \\
 -8x &= -4 \quad \quad \quad -8x = -44 \\
 x &= \frac{-4}{-8} = \frac{1}{2} \quad \quad \quad x = \frac{-44}{-8} = \frac{11}{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } \left| 2.4 - 0.8\left(\frac{1}{2}\right) \right| &\stackrel{?}{=} 2 & \left| 2.4 - 0.8\left(\frac{11}{2}\right) \right| &\stackrel{?}{=} 2 \\
 |2.4 - 0.4| &\stackrel{?}{=} 2 & |2.4 - 4.4| &\stackrel{?}{=} 2 \\
 |2| &\stackrel{?}{=} 2 & |-2| &\stackrel{?}{=} 2 \\
 2 &= 2 & 2 &= 2
 \end{aligned}$$

$$\begin{aligned}
 18. \quad |x + 3| - 4 &= 8 \\
 |x + 3| &= 12 \\
 x + 3 &= 12 \quad \text{or} \quad x + 3 = -12 \\
 x &= 9 \quad \quad \quad x = -15
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } |9 + 3| - 4 &\stackrel{?}{=} 8 & |-15 + 3| - 4 &\stackrel{?}{=} 8 \\
 |12| - 4 &\stackrel{?}{=} 8 & |-12| - 4 &\stackrel{?}{=} 8 \\
 12 - 4 &\stackrel{?}{=} 8 & 12 - 4 &\stackrel{?}{=} 8 \\
 8 &= 8 & 8 &= 8
 \end{aligned}$$

$$\begin{aligned}
 20. \quad \left| \frac{2}{3} - \frac{1}{2}x \right| - 2 &= -1 \\
 \left| \frac{2}{3} - \frac{1}{2}x \right| &= 1
 \end{aligned}$$

$$\begin{aligned}
 \frac{2}{3} - \frac{1}{2}x &= 1 \quad \text{or} \quad \frac{2}{3} - \frac{1}{2}x = -1 \\
 4 - 3x &= 6 \quad \quad \quad 4 - 3x = -6 \\
 -3x &= 2 \quad \quad \quad -3x = -10 \\
 x &= -\frac{2}{3} \quad \quad \quad x = \frac{10}{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } \left| \frac{2}{3} - \frac{1}{2} \cdot \frac{-2}{3} \right| - 2 &\stackrel{?}{=} -1 & \left| \frac{2}{3} - \frac{1}{2} \cdot \frac{10}{3} \right| - 2 &\stackrel{?}{=} -1 \\
 \left| \frac{2}{3} + \frac{1}{3} \right| - 2 &\stackrel{?}{=} -1 & \left| \frac{2}{3} - \frac{5}{3} \right| - 2 &\stackrel{?}{=} -1 \\
 |1| - 2 &\stackrel{?}{=} -1 & |-1| - 2 &\stackrel{?}{=} -1 \\
 1 - 2 &\stackrel{?}{=} -1 & 1 - 2 &\stackrel{?}{=} -1 \\
 -1 &= -1 & -1 &= -1
 \end{aligned}$$

$$\begin{aligned}
 22. \quad \left| 5 - \frac{7}{2}x \right| + 1 &= 11 \\
 \left| 5 - \frac{7}{2}x \right| &= 10
 \end{aligned}$$

$$\begin{aligned}
 5 - \frac{7}{2}x &= 10 \quad \text{or} \quad 5 - \frac{7}{2}x = -10 \\
 -\frac{7}{2}x &= 5 \quad \quad \quad -\frac{7}{2}x = -15 \\
 x &= -\frac{10}{7} \quad \quad \quad x = \frac{30}{7}
 \end{aligned}$$

$$\begin{aligned}
 \text{Check: } \left| 5 - \frac{7}{2} \left( -\frac{10}{7} \right) \right| + 1 &\stackrel{?}{=} 11 \\
 |5 + 5| + 1 &\stackrel{?}{=} 11 \\
 |10| + 1 &\stackrel{?}{=} 11 \\
 10 + 1 &\stackrel{?}{=} 11 \\
 11 &= 11
 \end{aligned}$$

$$\begin{aligned}
 \left| 5 - \frac{7}{2} \left( \frac{30}{7} \right) \right| + 1 &\stackrel{?}{=} 11 \\
 |5 - 15| + 1 &\stackrel{?}{=} 11 \\
 |-10| + 1 &\stackrel{?}{=} 11 \\
 10 + 1 &\stackrel{?}{=} 11 \\
 11 &= 11
 \end{aligned}$$



$$24. \left| \frac{2x-1}{4} \right| = \frac{1}{3}$$

$$\frac{2x-1}{4} = \frac{1}{3} \quad \text{or} \quad \frac{2x-1}{4} = -\frac{1}{3}$$

$$6x-3=4 \quad 6x-3=-4$$

$$6x=7 \quad 6x=-1$$

$$x=\frac{7}{6} \quad x=-\frac{1}{6}$$

$$\text{Check: } \left| \frac{2\left(\frac{7}{6}\right)-1}{4} \right| \stackrel{?}{=} \frac{1}{3} \quad \left| \frac{2\left(-\frac{1}{6}\right)-1}{4} \right| \stackrel{?}{=} \frac{1}{3}$$

$$\left| \frac{1}{3} \right| \stackrel{?}{=} \frac{1}{3} \quad \left| -\frac{1}{3} \right| \stackrel{?}{=} \frac{1}{3}$$

$$\frac{1}{3} = \frac{1}{3} \quad \frac{1}{3} = \frac{1}{3}$$

$$26. |x-7| = |3x-1|$$

$$x-7=3x-1 \quad \text{or} \quad x-7=-(3x-1)$$

$$-2x-7=-1 \quad x-7=-3x+1$$

$$-2x=6 \quad 4x-7=1$$

$$x=-3 \quad 4x=8$$

$$x=2$$

$$28. \left| \frac{2x+3}{3} \right| = |x+4|$$

$$\frac{2x+3}{3} = x+4 \quad \text{or} \quad \frac{2x+3}{3} = -(x+4) = -x-4$$

$$2x+3=3x+12 \quad 2x+3=-3x-12$$

$$-x+3=12 \quad 5x+3=-12$$

$$-x=9 \quad 5x=-15$$

$$x=-9 \quad x=-3$$

$$30. |2.2x+2| = |1-2.8x|$$

$$2.2x+2=1-2.8x \quad \text{or} \quad 2.2x+2=-1+2.8x$$

$$22x+20=10-28x \quad 22x+20=-10+28x$$

$$50x=-10 \quad -6x=-30$$

$$x=-\frac{1}{5} \quad x=5$$

$$32. \left| \frac{2x}{5} + 1 \right| = |1-x|$$

$$\frac{2x}{5} + 1 = 1-x \quad \text{or} \quad \frac{2x}{5} + 1 = -(1-x)$$

$$\frac{2x}{5} = -x \quad \frac{2x}{5} + 1 = -1+x$$

$$\frac{7}{5}x = 0 \quad -\frac{3x}{5} = -2$$

$$x = 0 \quad x = \frac{10}{3}$$

$$34. |-0.74x - 8.26| = 5.36$$

$$-0.74x - 8.26 = 5.36$$

$$-0.74x = 13.62$$

$$x \approx -18.41$$

$$\text{or}$$

$$-0.74x - 8.26 = -5.36$$

$$-0.74x = 2.9$$

$$x \approx -3.92$$

$$36. |4(x-1)| + 5 = 15$$

$$|4x-4| = 10$$

$$4x-4=10 \quad \text{or} \quad 4x-4=-10$$

$$4x=14 \quad 4x=-6$$

$$x=\frac{14}{4}=\frac{7}{2} \quad x=\frac{-6}{4}=-\frac{3}{2}$$

$$\text{Check: } \left| 4\left(\frac{7}{2}-1\right) \right| + 5 \stackrel{?}{=} 15$$

$$\left| 4\left(\frac{5}{2}\right) \right| + 5 \stackrel{?}{=} 15$$

$$|10| + 5 \stackrel{?}{=} 15$$

$$10+5 \stackrel{?}{=} 15$$

$$15=15$$

$$\left| 4\left(-\frac{3}{2}-1\right) \right| + 5 \stackrel{?}{=} 15$$

$$\left| 4\left(-\frac{5}{2}\right) \right| + 5 \stackrel{?}{=} 15$$

$$|-10| + 5 \stackrel{?}{=} 15$$

$$10+5 \stackrel{?}{=} 15$$

$$15=15$$

$$38. \left| \frac{3}{4}x + 9 \right| = 0$$

$$\frac{3}{4}x + 9 = 0$$

$$3x + 36 = 0$$

$$3x = -36$$

$$x = -12$$

$$\text{Check: } \left| \frac{3}{4}(-12) + 9 \right| \stackrel{?}{=} 0$$

$$|-9+9| \stackrel{?}{=} 0$$

$$|0| \stackrel{?}{=} 0$$

$$0=0$$

$$40. \left| \frac{3}{4}x - \frac{2}{3} \right| = -8 \quad \text{has no solution because absolute value is } \geq 0.$$

$$\begin{aligned}
 42. \quad \left| \frac{5x+1}{2} \right| &= \frac{3}{4} \\
 \frac{5x+1}{2} &= \frac{3}{4} \quad \text{or} \quad \frac{5x+1}{2} = -\frac{3}{4} \\
 2(5x+1) &= 3 & 2(5x+1) &= -3 \\
 10x+2 &= 3 & 10x+2 &= -3 \\
 10x &= 1 & 10x &= -5 \\
 x &= \frac{1}{10} & x &= \frac{-5}{10} = -\frac{1}{2}
 \end{aligned}$$

Check:

$$\begin{aligned}
 \left| \frac{5\left(\frac{1}{10}\right)+1}{2} \right| &\stackrel{?}{=} \frac{3}{4} & \left| \frac{5\left(-\frac{1}{2}\right)+1}{2} \right| &\stackrel{?}{=} \frac{3}{4} \\
 \left| \frac{\frac{1}{2}+1}{2} \right| &\stackrel{?}{=} \frac{3}{4} & \left| \frac{-\frac{5}{2}+1}{2} \right| &\stackrel{?}{=} \frac{3}{4} \\
 \left| \frac{\frac{3}{2}}{2} \right| &\stackrel{?}{=} \frac{3}{4} & \left| \frac{-\frac{3}{2}}{2} \right| &\stackrel{?}{=} \frac{3}{4} \\
 \frac{3}{4} &= \frac{3}{4} & \frac{3}{4} &= \frac{3}{4}
 \end{aligned}$$

## Cumulative Review

$$43. (3x^{-3}yz^0)\left(\frac{5}{3}x^4y^2\right) = 5x^{-3+4}y^{1+2} \cdot 1 = 5xy^3$$

$$\begin{aligned}
 44. \quad \frac{\sqrt{3-2 \cdot 1^2} + 5}{4^2 - 2 \cdot 3} &= \frac{\sqrt{3-2} + 5}{16-6} \\
 &= \frac{\sqrt{1} + 5}{10} \\
 &= \frac{1+5}{10} \\
 &= \frac{6}{10} \\
 &= \frac{3}{5}
 \end{aligned}$$

## Classroom Quiz 2.3

$$\begin{aligned}
 1. \quad |2x+5| &= 55 \\
 2x+5 &= 55 \quad \text{or} \quad 2x+5 = -55 \\
 2x &= 50 & 2x &= -60 \\
 x &= 25 & x &= -30
 \end{aligned}$$

$$\begin{aligned}
 2. \quad \left| \frac{3}{4}x - 2 \right| + 3 &= 10 \\
 \left| \frac{3}{4}x - 2 \right| &= 7 \\
 \frac{3}{4}x - 2 &= 7 \quad \text{or} \quad \frac{3}{4}x - 2 = -7 \\
 \frac{3}{4}x &= 9 & \frac{3}{4}x &= -5 \\
 x &= 12 & x &= -\frac{20}{3}
 \end{aligned}$$

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

## 2.4 Exercises

2. Let
- $x$
- = the number.

$$\begin{aligned}
 \frac{5}{8}x &= -75 \\
 5x &= -600 \\
 x &= -120
 \end{aligned}$$

The number is  $-120$ .

4. Let
- $x$
- = the monthly fee last year.

$$\begin{aligned}
 98 &= \frac{3}{2}x - 10 \\
 196 &= 3x - 20 \\
 216 &= 3x \\
 72 &= x
 \end{aligned}$$

Last year's monthly parking fee was \$72.

6. Let
- $x$
- = the number of days the car has been parked.

$$\begin{aligned}
 78 + 24(x-2) &= 174 \\
 78 + 24x - 48 &= 174 \\
 30 + 24x &= 174 \\
 24x &= 144 \\
 x &= 6
 \end{aligned}$$

The car has been parked for 6 days.

8. Let
- $x$
- = the number of bills paid.

$$\begin{aligned}
 5.00(6) + 0.50x &= 48.50 \\
 30 + 0.50x &= 48.50 \\
 0.50x &= 18.50 \\
 x &= 37
 \end{aligned}$$

He paid 37 bills.

10. Profit = Revenue – Cost.  
For one year the profit must be  
 $120,000 \cdot 3 = 360,000$ .  
 The revenue for one week is  
 $(5000 \cdot 4 \cdot 18) = 360,000$ .  
 The cost for one week is  
 $55,000 \cdot 4 + 110,000 = 330,000$ .  
 The profit for one week is  
 $360,000 - 330,000 = 30,000$ .  
 Let  $x$  = the number of weeks on tour, then  
 $30,000x = 360,000$   
 $x = 12$   
 They need to be on tour 12 weeks each year.
12. Let  $x$  = the width of the driveway.  
 Then  $2x + 15$  = the length of the driveway.  
 $2W + 2L = P$   
 $2x + 2(2x + 15) = 120$   
 $2x + 4x + 30 = 120$   
 $6x = 90$   
 $x = 15$   
 $2x + 15 = 2(15) + 15 = 45$   
 The width of the driveway is 15 feet and the length is 45 feet.
14. Let  $x$  = the length of equal sides.  
 $x + x + 1.5x - 3 = 28.5$   
 $3.5x = 31.5$   
 $x = 9$   
 $1.5x - 3 = 1.5(9) - 3 = 10.5$   
 The equal sides are each 9 centimeters and the third side is 10.5 centimeters.

**Cumulative Review**

15.  $57 + 0 = 57$   
 Identity property of addition
16.  $(2 \cdot 3) \cdot 9 = 2 \cdot (3 \cdot 9)$   
 Associative property of multiplication
17.  $7(-2) \div 7(-3) - 3 = -14 \div 7(-3) - 3$   
 $= (-2)(-3) - 3$   
 $= 6 - 3$   
 $= 3$
18.  $(7 - 12)^3 - (-4) + 3^3 = (-5)^3 + (4) + 27$   
 $= -125 + 4 + 27$   
 $= -94$

**Classroom Quiz 2.4**

1. Let  $x$  = the number.  
 $\frac{3}{5}x = -81$   
 $\frac{5}{3} \cdot \frac{3}{5}x = \frac{5}{3} \cdot (-81)$   
 $x = -135$   
 The number is  $-135$ .
2. Let  $x$  = length of second side.  
 $3x$  = length of first side.  
 $x + 16$  = length of third side.  
 $3x + x + x + 16 = 66$   
 $5x + 16 = 66$   
 $5x = 50$   
 $x = 10$   
 $3x = 3(10) = 30$   
 $x + 16 = 10 + 16 = 26$   
 The first side is 30 meters, the second side is 10 meters, and the third side is 26 meters.
3. Let  $x$  = number of hours she parked in the garage.  
 $7 + 2.50(x - 1) = 44.50$   
 $7 + 2.5x - 2.5 = 44.5$   
 $2.5x + 4.5 = 44.5$   
 $2.5x = 40$   
 $x = 16$   
 She parked in the garage for 16 hours.

**Use Math to Save Money**

1. Apartment 1:  
 $\$800 + \$110 + \$90 + \$90 + \$25 = \$1115$   
 Apartment 2:  $\$850 + \$90 + \$90 + \$25 = \$1055$   
 Apartment 3:  $\$900 + \$110 + \$25 = \$1035$
2. Annual cost without free rent:  
 $\$1115 \times 12 = \$13,380$   
 Subtract one month's rent to find annual cost with free rent:  $\$13,380 - \$800 = \$12,580$   
 Divide by 12 to find monthly cost:  
 $\frac{\$12,580}{12} \approx \$1048.33$
3. They should rent Apartment 3 since it has the lowest monthly expenses.
4. Divide the monthly expenses for Apartment 3 by 2.  
 $\frac{\$1035}{2} = \$517.50$   
 Each person's share is  $\$517.50$ .

**How Am I Doing? Sections 2.1–2.4**

(Available online through MyMathLab or from the Instructor's Resource Center.)

$$\begin{aligned}
 1. \quad & 2x - 1 = 12x + 36 \\
 & 2x - 12x - 1 = 12x - 12x + 36 \\
 & -10x - 1 = 36 \\
 & -10x - 1 + 1 = 36 + 1 \\
 & -10x = 37 \\
 & \frac{-10x}{-10} = \frac{37}{-10} \\
 & x = -3.7 \text{ or } -\frac{37}{10} \text{ or } -3\frac{7}{10}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & \frac{x-2}{4} = \frac{1}{2}x + 4 \\
 & 4\left(\frac{x-2}{4}\right) = 4\left(\frac{1}{2}x + 4\right) \\
 & x - 2 = 2x + 16 \\
 & x - 2x - 2 = 2x - 2x + 16 \\
 & -x - 2 = 16 \\
 & -x - 2 + 2 = 16 + 2 \\
 & -x = 18 \\
 & x = -18
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & 4(x-3) = x + 2(5x-1) \\
 & 4x - 12 = x + 10x - 2 \\
 & 4x - 12 = 11x - 2 \\
 & 4x - 11x - 12 = 11x - 11x - 2 \\
 & -7x - 12 = -2 \\
 & -7x - 12 + 12 = -2 + 12 \\
 & -7x = 10 \\
 & x = -\frac{10}{7} = -1\frac{3}{7}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & 0.6x + 3 = 0.5x - 7 \\
 & 10(0.6x + 3) = 10(0.5x - 7) \\
 & 6x + 30 = 5x - 70 \\
 & 6x - 5x + 30 = 5x - 5x - 70 \\
 & x + 30 = -70 \\
 & x + 30 - 30 = -70 - 30 \\
 & x = -100
 \end{aligned}$$

$$\begin{aligned}
 5. \quad & -5x + 9y = 18 \\
 & -5x + 5x + 9y = 5x + 18 \\
 & 9y = 5x + 18 \\
 & \frac{9y}{9} = \frac{5x + 18}{9} \\
 & y = \frac{5x + 18}{9} \text{ or } y = \frac{5}{9}x + 2
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & 5ab - 2b = 16ab - 3(8 + b) \\
 & 5ab - 2b = 16ab - 24 - 3b \\
 & -11ab = -b - 24 \\
 & 11ab = b + 24 \\
 & a = \frac{b + 24}{11b}
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & A = P + Prt \\
 & Prt = A - P \\
 & \frac{Prt}{Pt} = \frac{A - P}{Pt} \\
 & r = \frac{A - P}{Pt}
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & r = \frac{A - P}{Pt} \\
 & r = \frac{118 - 100}{(100)3} = \frac{18}{300} = \frac{3}{50} \text{ or } 0.06
 \end{aligned}$$

$$\begin{aligned}
 9. \quad & |5x + 8| = 3 \\
 & 5x + 8 = 3 \quad \text{or} \quad 5x + 8 = -3 \\
 & 5x = -5 \quad \quad \quad 5x = -11 \\
 & x = -1 \quad \quad \quad x = -\frac{11}{5}
 \end{aligned}$$

$$\begin{aligned}
 10. \quad & |9 - x| + 2 = 5 \\
 & |9 - x| + 2 - 2 = 5 - 2 \\
 & |9 - x| = 3 \\
 & 9 - x = 3 \quad \text{or} \quad 9 - x = -3 \\
 & -x = -6 \quad \quad \quad -x = -12 \\
 & x = 6 \quad \quad \quad x = 12
 \end{aligned}$$

$$\begin{aligned}
 11. \quad & \left| \frac{2x + 3}{4} \right| = 2 \\
 & \frac{2x + 3}{4} = 2 \quad \quad \text{or} \quad \frac{2x + 3}{4} = -2 \\
 & 2x + 3 = 8 \quad \quad \quad 2x + 3 = -8 \\
 & 2x = 5 \quad \quad \quad x = -11 \\
 & x = \frac{5}{2} = 2.5 \quad \quad \quad x = -\frac{11}{2} = -5.5
 \end{aligned}$$

$$\begin{aligned}
 12. \quad & |5x - 8| = |3x + 2| \\
 & 5x - 8 = 3x + 2 \quad \text{or} \quad 5x - 8 = -3x - 2 \\
 & 2x = 10 \quad \quad \quad 8x = 6 \\
 & x = 5 \quad \quad \quad x = \frac{6}{8} = 0.75
 \end{aligned}$$

13. Let  $W$  = width, then  $W + 20$  = length.

$$P = 2L + 2W$$

$$280 = 2(W + 20) + 2W$$

$$280 = 2W + 40 + 2W$$

$$280 = 4W + 40$$

$$240 = 4W$$

$$60 = W$$

$$80 = W + 20$$

The dimensions are 60 in.  $\times$  80 in.

14. Let  $n$  = the number of checks.

$$6 + 0.12n = 9.12$$

$$0.12n = 3.12$$

$$n = 26$$

He used 26 checks.

15. Let  $x$  = number of lb Cindi picked up.

$$x + \frac{x}{2} + 80 = 455$$

$$2x + x + 160 = 910$$

$$3x = 750$$

$$x = 250$$

$$\frac{x}{2} + 80 = 205 \text{ pounds for Alan}$$

Cindi picked up 250 pounds and Alan picked up 205 pounds.

16. Let  $x$  = length of shortest side.

Then  $2x - 5$  = length of longest side and

$x + 9$  = length of third side.

$$2x - 5 + x + 9 + x = 62$$

$$4x + 4 = 62$$

$$4x = 58$$

$$x = 14.5$$

$$x + 9 = 14.5 + 9 = 23.5$$

$$2x - 5 = 2(14.5) - 5 = 24$$

The shortest side is 14.5 feet, the longest side is 24 feet, and the third side is 23.5 feet.

## 2.5 Exercises

2. Let  $x$  = debt in 2011.

$$x + 0.28x = 18.1$$

$$1.28x = 18.1$$

$$x \approx 14.1$$

The U.S. national debt on February 5, 2011, was approximately \$14.1 trillion.

4. Let  $x$  = members in 2000.

$$x + 0.61x = 52.9$$

$$1.61x = 52.9$$

$$x \approx 32.9$$

Approximately 32.9 million Americans were health club members in 2000.

6. Let  $x$  = the number of deer carrying infected ticks.

$$0.6x = 15$$

$$x = 25$$

The total number of deer carrying infected ticks is approximately 25.

8. Let  $x$  = Judy's cost.

Then  $2x - 250$  = Lynn's cost.

$$x + 2x - 250 = 950$$

$$3x = 1200$$

$$x = 400$$

$$2x - 250 = 550$$

Judy pays \$400 and Lynn pays \$550.

10. Let  $x$  = Grace's starting salary.

$1300 - x$  = Tony's starting salary.

$$2x + 3(1300 - x) = 3200$$

$$2x + 3900 - 3x = 3200$$

$$-x = -700$$

$$x = 700$$

$$1300 - x = 600$$

Grace earned \$700 per week ten years ago.

Tony earned \$600 per week ten years ago.

12. Let  $x$  = number of boxes Rockland sold.

$460 - x$  = number of boxes Harrisville sold.

$$\frac{1}{2}x + \frac{2}{5}(460 - x) = 205$$

$$5x + 4(460 - x) = 2050$$

$$5x + 1840 - 4x = 2050$$

$$x = 210$$

$$460 - x = 250$$

Rockland sold 210 boxes of cookies and Harrisville sold 250 boxes.

14.  $I = prt = 4800(0.11)(2)$

$$I = 1056$$

The interest was \$1056.

16.  $I = prt$

$$I = 4000(0.061)(0.25)$$

$$I = 61.00$$

The interest was \$61.

18. Let  $x$  = amount invested at 13%.

Then  $45,000 - x$  = amount invested at 16%.

$$0.13x + 0.16(45,000 - x) = 6570$$

$$0.13x + 7200 - 0.16x = 6570$$

$$-0.3x = -630$$

$$x = 21,000$$

$$45,000 - x = 24,000$$

She invested \$21,000 at 13% and \$24,000 at 16%.

20. Let  $x$  = amount invested at 5%.  
 Then  $8000 - x$  = amount invested at 7%.  
 $0.05x + 0.07(8000 - x) = 496$   
 $0.05x + 560 - 0.07x = 496$   
 $-0.02x = -64$   
 $x = 3200$   
 $8000 - x = 4800$   
 The amount invested at 5% was \$3200. The amount invested at 7% was \$4800.
22. Let  $x$  = milliliters of 16% solution.  
 Then  $350 - x$  = milliliters of 9% solution.  
 $0.16x + 0.09(350 - x) = 0.12(350)$   
 $0.16x + 31.5 - 0.09x = 42$   
 $0.07x = 10.5$   
 $x = 150$   
 $350 - x = 200$   
 She should use 150 milliliters of the 16% solution and 200 milliliters of the 9% solution.
24. Let  $x$  = the number of pounds of \$7 per pound tea. Then  $32 - x$  = the number of pounds of \$9 per pound tea.  
 $7x + 9(32 - x) = 8.50(32)$   
 $7x + 288 - 9x = 272$   
 $-2x = -16$   
 $x = 8$   
 $32 - x = 24$   
 He should use 8 pounds of the \$7/lb tea and 24 pounds of the \$9/lb tea.
26. Let  $x$  = number of oz of 90% DEET.  
 $10 - x$  = number of oz of 10% DEET.  
 $0.90x + 0.10(10 - x) = 0.3(10)$   
 $0.9x + 1 - 0.1x = 3$   
 $0.8x = 2$   
 $x = 2.5$   
 $10 - x = 10 - 2.5 = 7.5$   
 They need to mix 2.5 ounces of 90% DEET with 7.5 ounces of 10% DEET.
28. Let  $x$  = maximum flying speed.  
 Then  $x - 60$  = cruising speed.  
 $3x + 2(x - 60) = 930$   
 $3x + 2x - 120 = 930$   
 $5x = 1050$   
 $x = 210$   
 Maximum flying speed is 210 mph.

30. Let  $x$  = time of each trip.  
 $14x = 6x + 20$   
 $8x = 20$   
 $x = 2.5$   
 Each family spent 2.5 hours or  $2\frac{1}{2}$  hours.

## Cumulative Review

31.  $5a - 2b + c = 5(1) - 2(-3) + (-4)$   
 $= 5 + 6 - 4$   
 $= 11 - 4$   
 $= 7$
32.  $2x^2 - 3x + 1 = 2(-2)^2 - 3(-2) + 1$   
 $= 2 \cdot 4 + 6 + 1$   
 $= 8 + 6 + 1$   
 $= 14 + 1$   
 $= 15$
33.  $\frac{5 + 8(-2) + 2^4}{|2 - 7|} = \frac{5 + (-16) + 16}{|-5|} = \frac{5}{5} = 1$
34.  $\frac{\sqrt{7^2 - 24}}{2^3(-1) + 7(4)} = \frac{\sqrt{49 - 24}}{8(-1) + 7(4)}$   
 $= \frac{\sqrt{25}}{-8 + 28}$   
 $= \frac{5}{20}$   
 $= \frac{1}{4}$

## Classroom Quiz 2.5

1. Let  $x$  = price one month ago.  
 $x - 0.07x = 1302$   
 $0.93x = 1302$   
 $x = 1400$   
 The price was \$1400 a month ago.
2. Let  $x$  = amount of 45% fertilizer.  
 Then  $120 - x$  = amount of 18% fertilizer.  
 $0.45x + 0.18(120 - x) = 0.36(120)$   
 $0.45x + 21.6 - 0.18x = 43.2$   
 $0.27x + 21.6 = 43.2$   
 $0.27x = 21.6$   
 $x = 80$   
 $120 - x = 40$   
 They should mix 80 gallons of the 45% fertilizer and 40 gallons of the 18% fertilizer.

3. Let  $x$  = amount invested at 6%.  
 Then  $6000 - x$  = amount invested at 8%.  
 $0.06x + 0.08(6000 - x) = 450$   
 $0.06x + 480 - 0.08x = 450$   
 $480 - 0.02x = 450$   
 $-0.02x = -30$   
 $x = 1500$   
 $6000 - x = 4500$   
 He invested \$1500 at 6% and \$4500 at 8%.

## 2.6 Exercises

2. False, adding  $-5x$  to both sides of an inequality does not reverse the direction of the inequality.
4. True, the graph of  $x > -2$  is the set of all points to the right of  $-2$  on a number line.
6. False, the term  $-4$  must also be multiplied by the LCD.
8.  $-15 < 4$  because  $-15$  is to the left of  $4$  on a number line.
10.  $-5 > -9$  because  $-5$  is to the right of  $-9$  on a number line.
12.  $\frac{5}{6} > \frac{5}{7}$  because  $\frac{5}{6}$  is to the right of  $\frac{5}{7}$  on a number line.
14.  $-\frac{5}{12} = -0.41\overline{6} > -0.428571 = -\frac{3}{7}$
16.  $-2.69 > -2.7$  because  $-2.69$  is to the right of  $-2.7$  on a number line.
18.  $|8 - 13| = |-5| = 5$   
 $|-3 - 4| = |-7| = 7$   
 $|8 - 13| < |-3 - 4|$  since  $5 < 7$ .

20.  $x \geq -4$

22.  $x < 45$

24.  $3 + 5x \geq 18$   
 $3 - 3 + 5x \geq 15 - 3$   
 $5x \geq 15$   
 $\frac{5x}{5} \geq \frac{15}{5}$   
 $x \geq 3$

26.  $2x + 5 > 4x - 5$   
 $2x - 4x + 5 > 4x - 5 - 4x$   
 $-2x + 5 > -5$   
 $-2x + 5 - 5 > -5 - 5$   
 $-2x > -10$   
 $\frac{-2x}{-2} < \frac{-10}{-2}$   
 $x < 5$

28.  $1.7 - 0.6x \leq x + 0.1$   
 $1.7 - 0.6x - x \leq x - x + 0.1$   
 $1.7 - 1.6x \leq 0.1$   
 $1.7 - 1.7 - 1.6x \leq 0.1 - 1.7$   
 $-1.6x \leq -1.6$   
 $x \geq 1$

30.  $5x - 1 > 29$   
 $5x - 1 + 1 > 29 + 1$   
 $5x > 30$   
 $\frac{5x}{5} > \frac{30}{5}$   
 $x > 6$

32.  $8x - 7 \leq 4x - 19$   
 $8x - 4x - 7 \leq 4x - 4x - 19$   
 $4x - 7 \leq -19$   
 $4x - 7 + 7 \leq -19 + 7$   
 $4x \leq -12$   
 $\frac{4x}{4} \leq \frac{-12}{4}$   
 $x \leq -3$

34.  $2x + \frac{5}{2} > \frac{3}{2}x - 2$   
 $2\left(2x + \frac{5}{2}\right) > 2\left(\frac{3}{2}x - 2\right)$   
 $4x + 5 > 3x - 4$   
 $4x - 3x > -4 - 5$   
 $x > -9$

$$36. \quad 4x + 7 + 5(x - 5) < 0$$

$$4x + 7 + 5x - 25 < 0$$

$$9x - 18 < 0$$

$$9x < 18$$

$$\frac{9x}{9} < \frac{18}{9}$$

$$x < 2$$

$$38. \quad -3(x + 1) - \frac{x}{2} + \frac{3}{2} < 0$$

$$-3x - 3 - \frac{x}{2} + \frac{3}{2} < 0$$

$$2\left(-3x - 3 - \frac{x}{2} + \frac{3}{2}\right) < 2(0)$$

$$-6x - 6 - x + 3 < 0$$

$$-7x - 3 < 0$$

$$-7x < 3$$

$$\frac{-7x}{-7} > \frac{3}{-7}$$

$$x > -\frac{3}{7}$$

$$40. \quad 0.3x + 1.2 \geq 3.8 - x$$

$$10(0.3x + 1.2) \geq 10(3.8 - x)$$

$$3x + 12 \geq 38 - 10x$$

$$3x + 10x \geq 38 - 12$$

$$13x \geq 26$$

$$\frac{13x}{13} \geq \frac{26}{13}$$

$$x \geq 2$$

$$42. \quad 1.2 - 0.8x \leq 0.3(4 - x)$$

$$1.2 - 0.8x \leq 1.2 - 0.3x$$

$$-0.8x + 0.3x \leq 1.2 - 1.2$$

$$-0.5x \leq 0$$

$$\frac{-0.5x}{-0.5} \geq \frac{0}{-0.5}$$

$$x \geq 0$$

$$44. \quad \frac{3}{4} + \frac{1}{2}(x - 7) \leq 1 - \frac{x}{4}$$

$$4\left[\frac{3}{4} + \frac{1}{2}(x - 7)\right] \leq 4\left(1 - \frac{x}{4}\right)$$

$$3 + 2(x - 7) \leq 4 - x$$

$$3 + 2x - 14 \leq 4 - x$$

$$2x - 11 \leq 4 - x$$

$$2x + x \leq 4 + 11$$

$$3x \leq 15$$

$$\frac{3x}{3} \leq \frac{15}{3}$$

$$x \leq 5$$

$$46. \quad 1 - \frac{2x + 1}{2} > \frac{x}{4} + \frac{4}{3}$$

$$12\left(1 - \frac{2x + 1}{2}\right) > 12\left(\frac{x}{4} + \frac{4}{3}\right)$$

$$12 - 12x - 6 > 3x + 16$$

$$-12x + 6 > 3x + 16$$

$$-15x > 10$$

$$\frac{-15x}{-15} < \frac{10}{-15}$$

$$x < -\frac{2}{3}$$

$$48. \quad \text{Let } x = \text{number of new customers.}$$

$$(7.50)(20) + 25x > 600$$

$$150 + 25x > 600$$

$$25x > 450$$

$$\frac{25x}{25} > \frac{450}{25}$$

$$x > 18$$

She must sign up more than 18 customers.

$$50. \quad \text{Let } x = \text{the number of packages.}$$

$$180 + 160 + 68.5x \leq 2395$$

$$68.5x \leq 2055$$

$$x \leq 30$$

A maximum of thirty packages can be carried.

$$52. \quad \text{Let } x = \text{the number of additional ounces per package after the first ounce.}$$

$$0.50 + 0.25x \leq 8.00$$

$$0.25x \leq 7.50$$

$$\frac{0.25x}{0.25} \leq \frac{7.50}{0.25}$$

$$x \leq 30$$

A box could not weigh more than

$$30 + 1 = 31 \text{ ounces.}$$

### Cumulative Review

$$53. \quad 3xy(x + 2) - 4x^2(y - 1)$$

$$= 3x^2y + 6xy - 4x^2y + 4x^2$$

$$= 6xy - x^2y + 4x^2$$

$$54. \quad \frac{2}{3}ab(6a - 2b + 9)$$

$$= \frac{2}{3}ab(6a) - \frac{2}{3}ab(2b) + \frac{2}{3}ab(9)$$

$$= 4a^2b - \frac{4}{3}ab^2 + 6ab$$



$$55. \left( \frac{4x^2}{3yw^{-1}} \right)^3 = \frac{4^3 x^{2 \cdot 3}}{3^3 y^3 w^{-1(3)}} = \frac{64x^6}{27y^3 w^{-3}} = \frac{64x^6 w^3}{27y^3}$$

$$\begin{aligned} 56. (-3a^0 b^{-3} c^5)^{-2} &= (-3b^{-3} c^5)^{-2} \\ &= (-3)^{-2} b^{-3(-2)} c^{5(-2)} \\ &= \frac{1}{9} b^6 c^{-10} \\ &= \frac{b^6}{9c^{10}} \end{aligned}$$

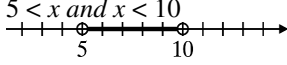
## Classroom Quiz 2.6

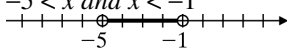
$$\begin{aligned} 1. \quad 9x - 2 &> 4x + 8 \\ 9x - 4x - 2 &> 4x - 4x + 8 \\ 5x - 2 &> 8 \\ 5x - 2 + 2 &> 8 + 2 \\ 5x &> 10 \\ \frac{5x}{5} &> \frac{10}{5} \\ x &> 2 \end{aligned}$$

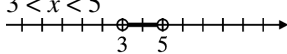
$$\begin{aligned} 2. \quad -6(x+3) &> -3x - 8 \\ -6x - 18 &> -3x - 8 \\ -6x + 3x - 18 &> -3x + 3x - 8 \\ -3x - 18 &> -8 \\ -3x - 18 + 18 &> -8 + 18 \\ -3x &> 10 \\ \frac{-3x}{-3} &< \frac{10}{-3} \\ x &< -\frac{10}{3} \end{aligned}$$

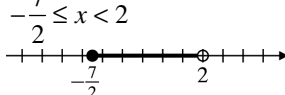
$$\begin{aligned} 3. \quad \frac{1}{3}(x-2) &\leq \frac{1}{7}(7x-14) - 2 \\ 21 \left[ \frac{1}{3}(x-2) \right] &\leq 21 \left[ \frac{1}{7}(7x-14) - 2 \right] \\ 7(x-2) &\leq 3(7x-14) - 42 \\ 7x - 14 &\leq 21x - 42 - 42 \\ 7x - 14 &\leq 21x - 84 \\ 7x - 21x &\leq -84 + 14 \\ -14x &\leq -70 \\ \frac{-14x}{-14} &\geq \frac{-70}{-14} \\ x &\geq 5 \end{aligned}$$

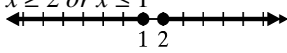
## 2.7 Exercises

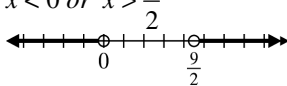
$$2. \quad 5 < x \text{ and } x < 10$$


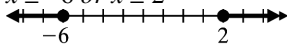
$$4. \quad -5 < x \text{ and } x < -1$$


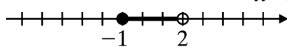
$$6. \quad 3 < x < 5$$


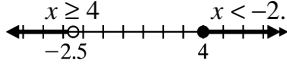
$$8. \quad -\frac{7}{2} \leq x < 2$$


$$10. \quad x \geq 2 \text{ or } x \leq 1$$


$$12. \quad x < 0 \text{ or } x > \frac{9}{2}$$


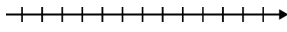
$$14. \quad x \leq -6 \text{ or } x \geq 2$$


$$\begin{aligned} 16. \quad 4x - 1 < 7 \quad \text{and} \quad x &\geq -1 \\ -1 \leq x \quad \text{and} \quad 4x - 1 < 7 \\ 4x &< 8 \\ x &< 2 \end{aligned}$$


$$18. \quad x + 1 \geq 5 \quad \text{or} \quad x + 5 < 2.5$$


$$20. \quad x < 6 \quad \text{and} \quad x > 9$$

These two graphs do not overlap.  
No solution



$$22. \quad s < 10 \text{ or } s > 12$$


$$24. \quad 490 \leq c \leq 2000$$

$$\begin{aligned} 26. \quad 16 &\leq C \leq 24 \\ 16 &\leq \frac{5}{9}(F - 32) \leq 24 \\ \frac{9}{5}(16) &\leq \frac{9}{5} \cdot \frac{5}{9}(F - 32) \leq \frac{9}{5}(24) \\ 28.8 &\leq F - 32 \leq 43.2 \\ 60.8^\circ &\leq F \leq 75.2^\circ \end{aligned}$$

28. Carrie will need between 69,000 yen and 84,000 yen for 3 weeks.

$$69,000 \leq Y \leq 84,000$$

$$69,000 \leq 119(d-5) \leq 84,000$$

$$579.83 \leq d-5 \leq 705.88$$

$$\$584.83 \leq d \leq \$710.88$$

30.  $x-2 < 9$  and  $x+3 < 6$

$$x < 11 \quad x < 3$$

$x < 3$  is the solution.

32.  $5x+6 \geq -9$  and  $10-x \geq 3$

$$5x \geq -15 \quad -x \geq -7$$

$$x \geq -3 \quad x \leq 7$$

$-3 \leq x \leq 7$  is the solution.

34.  $5x+1 < 1$  or  $3x-9 > 9$

$$5x < 0 \quad 3x > 18$$

$$x < 0 \quad x > 6$$

$x < 0$  or  $x > 6$  is the solution.

36.  $-0.3x - 0.4 \geq 0.1x$  or  $0.2x + 0.3 \leq -0.4x$

Multiply by 10 on both sides of both inequalities to clear decimals.

$$-3x - 4 \geq x \quad \text{or} \quad 2x + 3 \leq -4x$$

$$-4x \geq 4 \quad 6x \leq -3$$

$$x \leq -1 \quad x \leq -0.5$$

$x \leq -0.5$  contains  $x \leq -1$ .

$x \leq -0.5$  is the solution.

38.  $\frac{5x}{3} - 2 < \frac{14}{3}$  and  $3x + \frac{5}{2} < -\frac{1}{2}$

$$5x - 6 < 14 \quad 6x + 5 < -1$$

$$5x < 20 \quad 6x < -6$$

$$x < 4 \quad x < -1$$

$x < -1$  is the solution.

40.  $6x-10 < 8$  and  $2x+1 > 9$

$$6x < 18 \quad 2x > 8$$

$$x < 3 \quad x > 4$$

$x < 3$  and  $x > 4$  do not overlap.

No solution

42.  $7x+2 \geq 11x+14$  and  $x+9 \geq 6$

$$-4x \geq 12 \quad x \geq -3$$

$$x \leq -3$$

$x \leq -3$  and  $x \geq -3$  overlap at  $x = -3$ .  $x = -3$  is the solution.

$$44. \quad \frac{x-4}{6} - \frac{x-2}{9} \leq \frac{5}{18} \quad \text{or} \quad -\frac{2}{5}(x+3) < -\frac{6}{5}$$

$$3x-12-2x+4 \leq 5 \quad -2x-6 < -6$$

$$x-8 \leq 5 \quad -2x < 0$$

$$x \leq 13 \quad x > 0$$

The solution is all real numbers.

### Cumulative Review

45.  $-3(x+5) + 2(2x-1) = -3x-15+4x-2 = x-17$

46. Radius =  $r = \frac{d}{2} = \frac{6}{2} = 3$  in.

$$\text{Area} = \pi r^2 = \pi(3)^2 = 9\pi \approx 9(3.14) = 28.26 \text{ in.}^2$$

47.  $3y-5x=8$

$$-5x = 8-3y$$

$$(-1)(-5x) = (-1)(8-3y) = -8+3y$$

$$5x = 3y-8$$

$$x = \frac{3y-8}{5}$$

48.  $7x+6y=-12$

$$6y = -12-7x$$

$$y = \frac{-12-7x}{6}$$

### Classroom Quiz 2.7

1.  $2x-5 < 25$  and  $2x > -6$

$$2x < 30 \quad x > -3$$

$$x < 15$$

$-3 < x < 15$  is the solution.

2.  $x > 7$  and  $3x-1 < 29$

$$3x < 30$$

$$x < 10$$

$7 < x < 10$  is the solution.

3.  $x-2 \leq -20$  or  $4x+3 \geq 19$

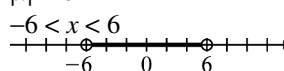
$$x \leq -18 \quad 4x \geq 16$$

$$x \geq 4$$

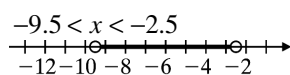
$x \leq -18$  or  $x \geq 4$  is the solution.

### 2.8 Exercises

2.  $|x| < 6$



$$4. \begin{aligned} |x+6| &< 3.5 \\ -3.5 &< x+6 < 3.5 \\ -9.5 &< x < -2.5 \end{aligned}$$



$$6. \begin{aligned} |x-8| &\leq 12 \\ -12 &\leq x-8 \leq 12 \\ -4 &\leq x \leq 20 \end{aligned}$$

$$8. \begin{aligned} |2x+3| &\leq 11 \\ -11 &\leq 2x+3 \leq 11 \\ -14 &\leq 2x \leq 8 \\ -7 &\leq x \leq 4 \end{aligned}$$

$$10. \begin{aligned} |2x-3| &\leq 1 \Leftrightarrow -1 \leq 2x-3 \leq 1 \\ 2 &\leq 2x \leq 4 \\ 1 &\leq x \leq 2 \end{aligned}$$

$$12. \begin{aligned} |0.6-0.3x| &< 9 \Leftrightarrow -9 < 0.6-0.3x < 9 \\ -9.6 &< -0.3x < 8.4 \\ 32 &> x > -28 \\ -28 &< x < 32 \end{aligned}$$

$$14. \begin{aligned} \left| \frac{1}{3}x+4 \right| &< 7 \\ -7 &< \frac{1}{3}x+4 < 7 \\ -21 &< x+12 < 21 \\ -33 &< x < 9 \end{aligned}$$

$$16. \begin{aligned} \left| \frac{3}{4}(x+1) \right| &< 2 \\ -2 &< \frac{3}{4}(x+1) < 2 \\ -\frac{8}{3} &< x+1 < \frac{8}{3} \\ -\frac{11}{3} &< x < \frac{5}{3} \end{aligned}$$

$$18. \begin{aligned} \left| \frac{5x-3}{2} \right| &< 4 \\ -4 &< \frac{5x-3}{2} < 4 \\ -8 &< 5x-3 < 8 \\ -5 &< 5x < 11 \\ -1 &< x < \frac{11}{5} \\ -1 &< x < 2\frac{1}{5} \end{aligned}$$

$$20. \begin{aligned} |x| &\geq 7 \\ x &\geq 7 \text{ or } x \leq -7 \end{aligned}$$

$$22. \begin{aligned} |x+4| &> 7 \\ x+4 &< -7 \quad \text{or} \quad x+4 > 7 \\ x &< -11 \quad \quad \quad x > 3 \\ x &< -11 \text{ or } x > 3 \end{aligned}$$

$$24. \begin{aligned} |x-6| &\geq 4 \\ x-6 &\leq -4 \quad \text{or} \quad x-6 \geq 4 \\ x &\leq 2 \quad \quad \quad x \geq 10 \\ x &\leq 2 \text{ or } x \geq 10 \end{aligned}$$

$$26. \begin{aligned} |6x-5| &\geq 7 \\ 6x-5 &\leq -7 \quad \text{or} \quad 6x-5 \geq 7 \\ 6x &\leq -2 \quad \quad \quad 6x \geq 12 \\ x &\leq -\frac{1}{3} \quad \quad \quad x \geq 2 \end{aligned}$$

$$x \leq -\frac{1}{3} \text{ or } x \geq 2$$

$$28. \begin{aligned} |0.5-0.1x| &> 6 \\ 0.5-0.1x &< -6 \quad \text{or} \quad 0.5-0.1x > 6 \\ -0.1x &< -6.5 \quad \quad \quad -0.1x > 5.5 \\ x &> 65 \quad \quad \quad x < -55 \\ x &< -55 \text{ or } x > 65 \end{aligned}$$

$$30. \begin{aligned} \left| \frac{1}{4}x - \frac{3}{8} \right| &> 1 \\ \frac{1}{4}x - \frac{3}{8} &< -1 \quad \text{or} \quad \frac{1}{4}x - \frac{3}{8} > 1 \\ 2x-3 &< -8 \quad \quad \quad 2x-3 > 8 \\ 2x &< -5 \quad \quad \quad 2x > 11 \\ x &< -\frac{5}{2} \quad \quad \quad x > \frac{11}{2} \\ x &< -2\frac{1}{2} \quad \quad \quad x > 5\frac{1}{2} \\ x &< -2\frac{1}{2} \text{ or } x > 5\frac{1}{2} \end{aligned}$$

$$32. \begin{aligned} \left| \frac{2}{5}(x-2) \right| &\leq 4 \\ -4 &\leq \frac{2}{5}(x-2) \leq 4 \\ -20 &\leq 2x-4 \leq 20 \\ -16 &\leq 2x \leq 24 \\ -8 &\leq x \leq 12 \end{aligned}$$

$$\begin{aligned}
 34. \quad & |2x + 3| < 5 \\
 & -5 < 2x + 3 < 5 \\
 & -8 < 2x < 2 \\
 & -4 < x < 1
 \end{aligned}$$

$$\begin{aligned}
 36. \quad & |4 - 3x| > 4 \\
 & 4 - 3x < -4 \quad \text{or} \quad 4 - 3x > 4 \\
 & -3x < -8 \quad \quad -3x > 0 \\
 & \quad \quad x > \frac{8}{3} \quad \quad x < 0 \\
 & x < 0 \text{ or } x > \frac{8}{3}
 \end{aligned}$$

$$\begin{aligned}
 38. \quad & |m - s| \leq 0.12 \\
 & |m - 17.48| \leq 0.12 \\
 & -0.12 \leq m - 17.48 \leq 0.12 \\
 & 17.36 \leq m \leq 17.60
 \end{aligned}$$

$$\begin{aligned}
 40. \quad & |n - p| \leq 0.03 \\
 & |n - 19.8| \leq 0.03 \\
 & -0.03 \leq n - 19.8 \leq 0.03 \\
 & 19.77 \leq n \leq 19.83
 \end{aligned}$$

**Cumulative Review**

$$41. \quad 0.000045 = 4.5 \times 10^{-5}$$

$$\begin{aligned}
 42. \quad & |2x - 1| = 8 \\
 & 2x - 1 = 8 \quad \text{or} \quad 2x - 1 = -8 \\
 & 2x = 9 \quad \quad 2x = -7 \\
 & x = \frac{9}{2} \quad \quad x = -\frac{7}{2}
 \end{aligned}$$

$$\begin{aligned}
 43. \quad \text{distance} &= 2 \left[ \frac{1}{8} \cdot \text{circumference} \right] \\
 &= 2 \left[ \frac{1}{8} (2\pi \cdot \text{radius}) \right] \\
 &\approx 2 \left[ \frac{1}{3} (2 \cdot 3.14 \cdot 19) \right] \\
 &\approx 29.83
 \end{aligned}$$

The end of the rope travels 29.83 meters.

$$\begin{aligned}
 44. \quad \text{distance} &= 2 \cdot \frac{1}{6} (2\pi \cdot 30) \\
 &\approx 2 \cdot \frac{1}{6} (2 \cdot 3.14 \cdot 30) \\
 &\approx 62.8
 \end{aligned}$$

The end of the wire travels 62.8 feet.

**Classroom Quiz 2.8**

$$\begin{aligned}
 1. \quad & \left| \frac{1}{3}x - \frac{1}{6} \right| < 2 \\
 & -2 < \frac{1}{3}x - \frac{1}{6} < 2 \\
 & 6(-2) < 6\left(\frac{1}{3}x - \frac{1}{6}\right) < 6(2) \\
 & -12 < 2x - 1 < 12 \\
 & -11 < 2x < 13 \\
 & -\frac{11}{2} < x < \frac{13}{2} \\
 & -5\frac{1}{2} < x < 6\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & |3x + 12| \leq 10 \\
 & -10 \leq 3x + 12 \leq 10 \\
 & -22 \leq 3x \leq -2 \\
 & -\frac{22}{3} \leq x \leq -\frac{2}{3} \\
 & -7\frac{1}{3} \leq x \leq -\frac{2}{3}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & |4x - 3| > 21 \\
 & 4x - 3 < -21 \quad \text{or} \quad 4x - 3 > 21 \\
 & 4x < -18 \quad \quad 4x > 24 \\
 & x < -\frac{18}{4} \quad \quad x > 6 \\
 & x < -4\frac{1}{2} \\
 & x < -4\frac{1}{2} \text{ or } x > 6
 \end{aligned}$$

**Career Exploration Problems**

- Let  $x$  = liters of 60% solution used.  
Then  $14 - x$  = liters of 25% solution.  

$$0.60x + 0.25(14 - x) = 0.40(14)$$

$$0.6x + 3.5 - 0.25x = 5.6$$

$$0.35x = 2.1$$

$$x = 6$$

$$14 - x = 14 - 6 = 8$$
 6 liters of 60% solution should be mixed with 8 liters of 25% solution.

2. Let  $x$  = liters of 10% solution used.  
 Then  $15 - x$  = liters of 30% solution.  
 $0.10x + 0.30(15 - x) = 0.15(15)$   
 $0.1x + 4.5 - 0.3x = 2.25$   
 $-0.2x = -2.25$   
 $x = 11.25$   
 $15 - x = 15 - 11.25 = 3.75$   
 11.25 liters of 10% solution should be mixed  
 with 3.75 liters of 30% solution.
3. Let  $x$  be the actual alcohol content of the solution.  
 $|x - 40| \leq 1.3$   
 $-1.3 \leq x - 40 < 1.3$   
 $38.7 \leq x \leq 41.3$   
 The minimum alcohol content is 38.7% and the maximum alcohol content is 41.3%.
4. Let  $x$  be the actual alcohol content of the solution.  
 $|x - 15| \leq 0.7$   
 $-0.7 \leq x - 15 \leq 0.7$   
 $14.3 \leq x \leq 15.7$   
 The minimum alcohol content is 14.3% and the maximum alcohol content is 15.7%.

**You Try It**

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

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

$$12\left(\frac{1}{4}x\right) + 12\left(\frac{5}{4}\right) = 12(6) - 12\left(\frac{2}{3}x\right) + 12\left(\frac{5}{3}\right)$$

$$3x + 15 = 72 - 8x + 20$$

$$3x + 15 = 92 - 8x$$

$$11x = 77$$

$$x = 7$$

2. 
$$A = \frac{h}{2}(B+b)$$

$$2A = 2\left[\frac{h}{2}(B+b)\right]$$

$$2A = h(B+b)$$

$$2A = hB + hb$$

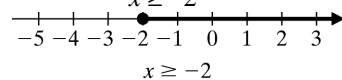
$$2A - hB = hb$$

$$\frac{2A - hB}{h} = b$$

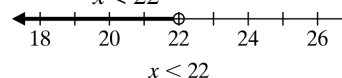
3.  $|3x + 5| = 11$   
 $3x + 5 = 11$  or  $3x + 5 = -11$   
 $3x = 6$   $3x = -16$   
 $x = 2$   $x = -\frac{16}{3}$

4. Let  $x$  = amount invested at 6%.  
 Then  $12,000 - x$  = amount invested at 9%.  
 $0.06x + 0.09(12,000 - x) = 960$   
 $0.06x + 1080 - 0.09x = 960$   
 $1080 - 0.03x = 960$   
 $-0.03x = -120$   
 $x = 4000$   
 $12,000 - x = 8000$   
 Therefore, \$4000 was invested at 6% and \$8000 at 9%.

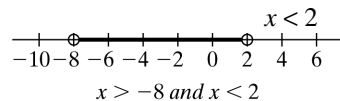
5. a.  $8 - 2(3x + 1) \leq 18$   
 $8 - 6x - 2 \leq 18$   
 $-6x + 6 \leq 18$   
 $-6x \leq 12$   
 $\frac{-6x}{-6} \geq \frac{12}{-6}$   
 $x \geq -2$



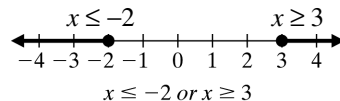
b.  $\frac{1}{2}(x-6) < \frac{2}{5}(x-2)$   
 $\frac{1}{2}x - 3 < \frac{2}{5}x - \frac{4}{5}$   
 $5x - 30 < 4x - 8$   
 $x - 30 < -8$   
 $x < 22$



6.  $x + 7 > -1$  and  $3x + 4 < 10$   
 $x > -8$   $3x < 6$   
 $x < 2$   
 $x > -8$  and  $x < 2$



7.  $5x + 2 \leq -8$  or  $4x - 3 \geq 9$   
 $5x \leq -10$   $4x \geq 12$   
 $x \leq -2$   $x \geq 3$   
 $x \leq -2$  or  $x \geq 3$



8.  $|2x + 7| < 17$

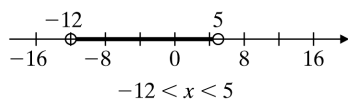
$-17 < 2x + 7 < 17$

$-17 - 7 < 2x + 7 - 7 < 17 - 7$

$-24 < 2x < 10$

$\frac{-24}{2} < \frac{2x}{2} < \frac{10}{2}$

$-12 < x < 5$



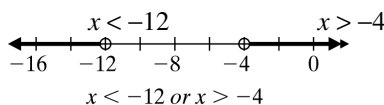
9.  $\left| \frac{1}{4}(x+8) \right| > 1$

$\frac{1}{4}(x+8) < -1 \quad \text{or} \quad \frac{1}{4}(x+8) > 1$

$\frac{1}{4}x + 2 < -1 \quad \frac{1}{4}x + 2 > 1$

$x + 8 < -4$

$x + 8 > 4$

**Chapter 2 Review Problems**

1.  $7x - 3 = -5x - 18$

$7x + 5x - 3 = -5x + 5x - 18$

$12x - 3 = -18$

$12x - 3 + 3 = -18 + 3$

$12x = -15$

$\frac{12x}{12} = \frac{-15}{12}$

$x = -\frac{5}{4} \text{ or } -1.25 \text{ or } -1\frac{1}{4}$

2.  $8 - 2(x+3) = 24 - (x-6)$

$8 - 2x - 6 = 24 - x + 6$

$2 - 2x = 30 - x$

$-2x + x = 30 - 2$

$-x = 28$

$x = -28$

3.  $5(x-2) + 4 = x + 9 - 2x$

$5x - 10 + 4 = -x + 9$

$5x - 6 = -x + 9$

$5x + x - 6 = -x + x + 9$

$6x - 6 = 9$

$6x - 6 + 6 = 9 + 6$

$6x = 15$

$\frac{6x}{6} = \frac{15}{6}$

$x = \frac{5}{2} \text{ or } 2\frac{1}{2} \text{ or } 2.5$

4.  $x - \frac{4}{3} = \frac{11}{12} + \frac{3}{4}x$

$12\left(x - \frac{4}{3}\right) = 12\left(\frac{11}{12} + \frac{3}{4}x\right)$

$12x - 16 = 11 + 9x$

$12x - 9x = 11 + 16$

$3x = 27$

$x = 9$

5.  $\frac{1}{9}x - 1 = \frac{1}{2}\left(x + \frac{1}{3}\right)$

$18\left(\frac{1}{9}x - 1\right) = 18\left[\frac{1}{2}\left(x + \frac{1}{3}\right)\right]$

$2x - 18 = 9x + 3$

$2x - 9x = 3 + 18$

$-7x = 21$

$x = -3$

6.  $5x = 3(1.6x - 4.2)$

$5x = 4.8x - 12.6$

$0.2x = -12.6$

$x = -63$

7.  $P = \frac{1}{2}ab$

$2P = ab$

$\frac{2P}{b} = \frac{ab}{b}$

$\frac{2P}{b} = a \text{ or } a = \frac{2P}{b}$

8.  $2(3ax - 2y) - 6ax = -3(ax + 2y)$

$6ax - 4y - 6ax = -3ax - 6y$

$-4y = -3ax - 6y$

$2y = -3ax$

$3ax = -2y$

$a = -\frac{2y}{3x}$

$$\begin{aligned}
 9. \quad a. \quad C &= \frac{5F - 160}{9} \\
 9C &= 5F - 160 \\
 5F - 160 &= 9C \\
 5F &= 9C + 160 \\
 F &= \frac{9C + 160}{5}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad F &= \frac{9(10) + 160}{5} = \frac{250}{5} = 50 \\
 F &= 50^\circ \text{ when } C = 10^\circ.
 \end{aligned}$$

$$\begin{aligned}
 10. \quad a. \quad P &= 2W + 2L \\
 P - 2L &= 2W \\
 2W &= P - 2L \\
 W &= \frac{P - 2L}{2}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad W &= \frac{100 - 2(20.5)}{2} \\
 &= \frac{100 - 41}{2} \\
 &= \frac{59}{2} \\
 &= 29.5 \\
 W &= 29.5 \text{ meters}
 \end{aligned}$$

$$\begin{aligned}
 11. \quad |2x - 7| &= 9 \\
 2x - 7 &= 9 \quad \text{or} \quad 2x - 7 = -9 \\
 2x &= 16 \quad \quad \quad 2x = -2 \\
 x &= 8 \quad \quad \quad x = -1
 \end{aligned}$$

$$\begin{aligned}
 12. \quad |5x + 2| &= 7 \\
 5x + 2 &= 7 \quad \text{or} \quad 5x + 2 = -7 \\
 5x &= 5 \quad \quad \quad 5x = -9 \\
 x &= 1 \quad \quad \quad x = -\frac{9}{5}
 \end{aligned}$$

$$\begin{aligned}
 13. \quad |3 - x| &= |5 - 2x| \\
 3 - x &= 5 - 2x \quad \text{or} \quad 3 - x = -(5 - 2x) \\
 x &= 2 \quad \quad \quad 3 - x = -5 + 2x \\
 & \quad \quad \quad -3x = -8 \\
 & \quad \quad \quad x = \frac{8}{3}
 \end{aligned}$$

$$\begin{aligned}
 14. \quad |x + 8| &= |2x - 4| \\
 x + 8 &= 2x - 4 \quad \text{or} \quad x + 8 = -2x + 4 \\
 -x &= -12 \quad \quad \quad 3x = -4 \\
 x &= 12 \quad \quad \quad x = -\frac{4}{3}
 \end{aligned}$$

$$\begin{aligned}
 15. \quad \left| \frac{1}{4}x - 3 \right| &= 8 \\
 \frac{1}{4}x - 3 &= 8 \quad \text{or} \quad \frac{1}{4}x - 3 = -8 \\
 x - 12 &= 32 \quad \quad \quad x - 12 = -32 \\
 x &= 44 \quad \quad \quad x = -20
 \end{aligned}$$

$$\begin{aligned}
 16. \quad |2x - 8| + 7 &= 12 \\
 |2x - 8| &= 5 \\
 2x - 8 &= 5 \quad \text{or} \quad 2x - 8 = -5 \\
 2x &= 13 \quad \quad \quad 2x = 3 \\
 x &= \frac{13}{2} \quad \quad \quad x = \frac{3}{2}
 \end{aligned}$$

$$\begin{aligned}
 17. \quad P &= 2L + 2W \\
 42 &= 2(2W + 3) + 2W \\
 21 &= 2W + 3 + W \\
 3W &= 18 \\
 W &= 6 \\
 2W + 3 &= 15 \\
 \text{The width is 6 feet and the length is 15 feet.}
 \end{aligned}$$

$$\begin{aligned}
 18. \quad \text{Let } x &= \text{the number of women.} \\
 \text{Then } 2x - 200 &= \text{the number of men.} \\
 2x - 200 + x &= 280 \\
 3x - 200 &= 280 \\
 3x &= 480 \\
 x &= 160 \\
 2x - 200 &= 120 \\
 \text{There are 160 women and 120 men attending} \\
 &\text{Western Tech.}
 \end{aligned}$$

$$\begin{aligned}
 19. \quad \text{Let } x &= \text{miles she drove.} \\
 3(38) + 0.15x &= 150 \\
 114 + 0.15x &= 150 \\
 0.15x &= 36 \\
 x &= 240 \\
 \text{She drove 240 miles.}
 \end{aligned}$$

$$\begin{aligned}
 20. \quad \text{Let } x &= \text{the amount withheld for retirement.} \\
 \text{Then } x + 13 &= \text{the amount withheld for state tax,} \\
 \text{and } 3(x + 13) &= \text{the amount withheld for federal} \\
 &\text{tax.} \\
 x + x + 13 + 3(x + 13) &= 102 \\
 2x + 13 + 3x + 39 &= 102 \\
 5x + 52 &= 102 \\
 5x &= 50 \\
 x &= 10 \\
 x + 13 &= 23 \\
 3(x + 13) &= 69 \\
 \$10 &\text{ is withheld for retirement, \$23 for state tax,} \\
 \text{and \$69 for federal tax.}
 \end{aligned}$$

21. Let  $x$  = the number of tickets Nicholas sold.  
Then  $2x - 5$  = the number of tickets Emma sold,  
and  $2x + 10$  = the number of tickets Jackson  
sold.

$$x + 2x - 5 + 2x + 10 = 180$$

$$5x = 175$$

$$x = 35$$

$$2x - 5 = 65$$

$$2x + 10 = 80$$

Nicholas sold 35 tickets, Emma sold 65 tickets,  
and Jackson sold 80 tickets.

22. Let  $x$  = the number of students enrolled five  
years ago.

$$x + 0.15x = 2415$$

$$1.15x = 2415$$

$$x = 2100$$

2100 students were enrolled five years ago.

23. Let  $x$  = amount invested at 11%.

Then  $9000 - x$  = the amount invested at 6%.

$$0.11x + 0.06(9000 - x) = 815$$

$$0.11x + 540 - 0.06x = 815$$

$$540 + 0.05x = 815$$

$$0.05x = 275$$

$$x = 5500$$

$$9000 - x = 3500$$

He invested \$5500 at 11% and \$3500 at 6%.

24. Let  $x$  = the number of liters of 2% acid.

Then  $24 - x$  = the number of liters of 5% acid.

$$0.02x + 0.05(24 - x) = 0.04(24)$$

$$0.02x + 1.2 - 0.05x = 0.96$$

$$-0.03x = -0.24$$

$$x = 8$$

$$24 - x = 16$$

He should use 8 liters of the 2% acid and 16  
liters of the 5% acid.

25. Let  $x$  = the number of pounds of the \$4.25 a  
pound coffee.

Then  $30 - x$  = the number of pounds of the \$4.50  
a pound coffee.

$$4.25x + 4.50(30 - x) = 4.40(30)$$

$$4.25x + 135 - 4.5x = 132$$

$$-0.25x = -3$$

$$x = 12$$

$$30 - x = 18$$

12 pounds of \$4.25 and 18 pounds of \$4.50  
should be used.

26. Let  $x$  = current full-time students.

$$\frac{1}{2}x + \frac{1}{3}(890 - x) = 380$$

$$3x + 1780 - 2x = 2280$$

$$x = 500$$

$$890 - 500 = 390$$

The present number of students is 500 full-time  
and 390 part-time.

27.  $7x + 8 < 5x$

$$2x < -8$$

$$\frac{2x}{2} < \frac{-8}{2}$$

$$x < -4$$

28.  $9x + 3 < 12x$

$$-3x < -3$$

$$\frac{-3x}{-3} > \frac{-3}{-3}$$

$$x > 1$$

29.  $3(3x - 2) \leq 4x - 16$

$$9x - 6 \leq 4x - 16$$

$$9x - 4x \leq -16 + 6$$

$$5x \leq -10$$

$$\frac{5x}{5} \leq \frac{-10}{5}$$

$$x \leq -2$$

30.  $\frac{5}{3} - x \geq -\frac{1}{6}x + \frac{5}{6}$

$$6\left(\frac{5}{3} - x\right) \geq 6\left(-\frac{1}{6}x + \frac{5}{6}\right)$$

$$10 - 6x \geq -x + 5$$

$$-6x + x \geq 5 - 10$$

$$-5x \geq -5$$

$$\frac{-5x}{-5} \leq \frac{-5}{-5}$$

$$x \leq 1$$

31.  $\frac{1}{3}(x - 2) < \frac{1}{4}(x + 5) - \frac{5}{3}$

$$12\left[\frac{1}{3}(x - 2)\right] < 12\left[\frac{1}{4}(x + 5) - \frac{5}{3}\right]$$

$$4(x - 2) < 3(x + 5) - 20$$

$$4x - 8 < 3x + 15 - 20$$

$$4x - 8 < 3x - 5$$

$$4x - 3x < -5 + 8$$

$$x < 3$$



$$\begin{aligned}
 32. \quad & \frac{1}{3}(x+2) > 3x-5(x-2) \\
 & 3\left[\frac{1}{3}(x+2)\right] > 3[3x-5(x-2)] \\
 & x+2 > 9x-15(x-2) \\
 & x+2 > 9x-15x+30 \\
 & x+2 > -6x+30 \\
 & x+6x > 30-2 \\
 & 7x > 28 \\
 & x > 4
 \end{aligned}$$

$$33. \quad -3 \leq x < 2$$

$$34. \quad -8 \leq x \leq -4$$

$$35. \quad x < -2 \text{ or } x \geq 5$$

$$36. \quad x > -5 \text{ and } x < -1$$

$$37. \quad x > -8 \text{ and } x < -3$$

$$38. \quad x+3 > 8 \text{ or } x+2 < 6$$

$$x > 5 \quad x < 4$$

$$39. \quad x-2 > 7 \text{ or } x+3 < 2$$

$$x > 9 \quad x < -1$$

$$40. \quad x+3 > 8 \text{ and } x-4 < -2$$

$$x > 5 \quad x < 2$$

Since  $x$  cannot be both  $> 5$  and  $< 2$ , there is no solution.

$$41. \quad -1 < x+5 < 8$$

$$-6 < x < 3$$

$$42. \quad 0 \leq 5-3x \leq 17$$

$$-5 \leq -3x \leq 12$$

$$\frac{5}{3} \geq x \geq -4$$

$$-4 \leq x \leq \frac{5}{3}$$

$$-4 \leq x \leq 1\frac{2}{3}$$

$$43. \quad 2x-7 < 3 \text{ and } 5x-1 \geq 8$$

$$2x < 10 \quad 5x \geq 9$$

$$x < 5 \quad x \geq \frac{9}{5}$$

$$\frac{9}{5} \leq x < 5$$

$$1\frac{4}{5} \leq x < 5$$

$$44. \quad 4x-2 < 8 \text{ or } 3x+1 > 4$$

$$4x < 10 \quad 3x > 3$$

$$x < \frac{5}{2} \quad x > 1$$

The solution is all real numbers.

$$45. \quad |x+7| < 15$$

$$-15 < x+7 < 15$$

$$-22 < x < 8$$

$$46. \quad |x+9| < 18$$

$$-18 < x+9 < 18$$

$$-27 < x < 9$$

$$47. \quad \left|\frac{1}{2}x+2\right| < \frac{7}{4}$$

$$-\frac{7}{4} < \frac{1}{2}x+2 < \frac{7}{4}$$

$$-7 < 2x+8 < 7$$

$$-15 < 2x < -1$$

$$-\frac{15}{2} < x < -\frac{1}{2}$$

$$-7\frac{1}{2} < x < -\frac{1}{2}$$

$$48. \quad |2x-1| \geq 9$$

$$2x-1 \leq -9 \text{ or } 2x-1 \geq 9$$

$$2x \leq -8 \quad 2x \geq 10$$

$$x \leq -4 \quad x \geq 5$$

$$49. \quad |3x-1| \geq 2$$

$$3x-1 \leq -2 \text{ or } 3x-1 \geq 2$$

$$3x \leq -1 \quad 3x \geq 3$$

$$x \leq -\frac{1}{3} \quad x \geq 1$$

$$50. \quad |2(x-5)| \geq 2$$

$$2(x-5) \leq -2 \text{ or } 2(x-5) \geq 2$$

$$2x-10 \leq -2 \quad 2x-10 \geq 2$$

$$2x \leq 8 \quad 2x \geq 12$$

$$x \leq 4 \quad x \geq 6$$

51. Let
- $x$
- = the number of minutes he talks.

$$3.95 + 0.65(x - 1) \leq 13.05$$

$$3.95 + 0.65x - 0.65 \leq 13.05$$

$$0.65x \leq 9.75$$

$$x \leq 15$$

He can talk for a maximum of 15 minutes.

52. Let
- $x$
- = the number of packages.

$$170 + 200 + 77.5x \leq 1765$$

$$77.5x \leq 1395$$

$$x \leq 18$$

A maximum of eighteen packages can be carried.

53. Let
- $x$
- = number of cubic yards.

$$40 + 28x \leq 250$$

$$28x \leq 210$$

$$x \leq 7.5$$

He can order a maximum of 7 cubic yards.

- 54.
- $1.04(2,312,000) \leq x \leq 1.06(2,854,000)$

$$2,404,480 \leq x \leq 3,025,240$$

- 55.
- $4 - 7x = 3(x + 3)$

$$4 - 7x = 3x + 9$$

$$-7x - 3x = 9 - 4$$

$$-10x = 5$$

$$\frac{-10x}{-10} = \frac{5}{-10}$$

$$x = -\frac{1}{2} \text{ or } -0.5$$

- 56.
- $H = \frac{3}{4}B - 16$

$$\frac{3}{4}B = H + 16$$

$$B = \frac{4}{3}(H + 16)$$

$$B = \frac{4H + 64}{3}$$

57. Let
- $x$
- = number of grams of 77% copper.

Then  $100 - x$  = number of grams of 92% copper.

$$0.77x + 0.92(100 - x) = 0.80(100)$$

$$0.77x + 92 - 0.92x = 80$$

$$-0.15x = -12$$

$$x = 80$$

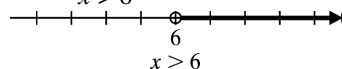
$$100 - x = 20$$

She should use 80 grams of 77% copper and 20 grams of 92% copper.

- 58.
- $7x + 12 < 9x$

$$-2x < -12$$

$$x > 6$$



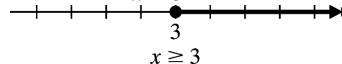
- 59.
- $\frac{2}{3}x - \frac{5}{6}x - 3 \leq \frac{1}{2}x - 5$

$$4x - 5x - 18 \leq 3x - 30$$

$$-x - 18 \leq 3x - 30$$

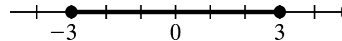
$$-4x \leq -12$$

$$x \geq 3$$



- 60.
- $-2 \leq x + 1 \leq 4$

$$-3 \leq x \leq 3$$

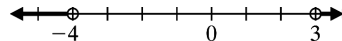


- 61.
- $2x + 3 < -5$
- or
- $x - 2 > 1$

$$2x < -8$$

$$x > 3$$

$$x < -4$$



- 62.
- $|2x - 7| + 4 = 5$

$$|2x - 7| = 1$$

$$2x - 7 = -1 \text{ or } 2x - 7 = 1$$

$$2x = 6$$

$$2x = 8$$

$$x = 3$$

$$x = 4$$

- 63.
- $\left| \frac{2}{3}x - \frac{1}{2} \right| \leq 3$

$$-3 \leq \frac{2}{3}x - \frac{1}{2} \leq 3$$

$$-18 \leq 4x - 3 \leq 18$$

$$-15 \leq 4x \leq 21$$

$$-\frac{15}{4} \leq x \leq \frac{21}{4}$$

- 64.
- $|2 - 5x - 4| > 13$

$$2 - 5x - 4 > 13 \text{ or } 2 - 5x - 4 < -13$$

$$-5x > 15$$

$$-5x < -11$$

$$x < -3$$

$$x > \frac{11}{5}$$

## How Am I Doing? Chapter 2 Test

$$\begin{aligned}
 1. \quad & 5x - 8 = -6x - 10 \\
 & 5x + 6x - 8 = -6x + 6x - 10 \\
 & 11x - 8 = -10 \\
 & 11x - 8 + 8 = -10 + 8 \\
 & 11x = -2 \\
 & \frac{11x}{11} = \frac{-2}{11} \\
 & x = -\frac{2}{11}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & 3(7 - 2x) = 14 - 8(x - 1) \\
 & 21 - 6x = 14 - 8x + 8 \\
 & 21 - 6x = 22 - 8x \\
 & 21 - 6x + 8x = 22 - 8x + 8x \\
 & 21 + 2x = 22 \\
 & 21 - 21 + 2x = 22 - 21 \\
 & 2x = 1 \\
 & x = \frac{1}{2} \text{ or } 0.5
 \end{aligned}$$

$$\begin{aligned}
 3. \quad & \frac{1}{3}(-x + 1) + 4 = 4(3x - 2) \\
 & 3\left[\frac{1}{3}(-x + 1) + 4\right] = 3[4(3x - 2)] \\
 & 1(-x + 1) + 12 = 12(3x - 2) \\
 & -x + 1 + 12 = 36x - 24 \\
 & -x + 13 = 36x - 24 \\
 & -x - 36x = -24 - 13 \\
 & -37x = -37 \\
 & x = 1
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & 0.5x + 1.2 = 4x - 3.05 \\
 & 100(0.5x + 1.2) = 100(4x - 3.05) \\
 & 50x + 120 = 400x - 305 \\
 & 120 + 305 = 400x - 50x \\
 & 425 = 350x \Rightarrow 350x = 425 \\
 & x = \frac{425}{350} = \frac{17(25)}{14(25)} = \frac{17}{14} \\
 & x = \frac{17}{14} \text{ or } 1\frac{3}{14}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad & L = a + d(n - 1) \\
 & L = a + dn - d \\
 & L - a + d = dn \\
 & n = \frac{L - a + d}{d}
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & A = \frac{1}{2}bh \\
 & 2A = bh \\
 & bh = 2A \\
 & b = \frac{2A}{h}
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & b = \frac{2A}{h} \\
 & b = \frac{2(15) \text{ cm}^2}{10 \text{ cm}} \\
 & b = 3 \text{ cm}
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & H = \frac{1}{2}r + 3b - \frac{1}{4} \\
 & 4H = 2r + 12b - 1 \\
 & 2r = 4H - 12b + 1 \\
 & r = \frac{4H - 12b + 1}{2}
 \end{aligned}$$

$$\begin{aligned}
 9. \quad & |5x - 2| = 37 \\
 & 5x - 2 = 37 \quad \text{or} \quad 5x - 2 = -37 \\
 & 5x = 39 \quad \quad \quad 5x = -35 \\
 & x = \frac{39}{5} \quad \quad \quad x = -7
 \end{aligned}$$

$$\begin{aligned}
 10. \quad & \left|\frac{1}{2}x + 3\right| - 2 = 4 \\
 & \left|\frac{1}{2}x + 3\right| = 6 \\
 & \frac{1}{2}x + 3 = 6 \quad \text{or} \quad \frac{1}{2}x + 3 = -6 \\
 & x + 6 = 12 \quad \quad \quad x + 6 = -12 \\
 & x = 6 \quad \quad \quad x = -18
 \end{aligned}$$

$$\begin{aligned}
 11. \quad & \text{Let } x = \text{the length of first side.} \\
 & \text{Then } 2x = \text{the length of the second side,} \\
 & \text{and } x + 5 = \text{the length of the third side.} \\
 & x + 2x + x + 5 = 69 \\
 & 4x = 64 \\
 & x = 16 \\
 & 2x = 32 \\
 & x + 5 = 21 \\
 & \text{The first side is 16 meters, the second side is} \\
 & \text{32 meters, and the third side is 21 meters.}
 \end{aligned}$$

$$\begin{aligned}
 12. \quad & \text{Let } x = \text{electric bill for August.} \\
 & x - 0.05x = 2489 \\
 & 0.95x = 2489 \\
 & x = 2620 \\
 & \text{The electric bill for August was \$2620.}
 \end{aligned}$$

13. Let
- $x$
- = gallons of 50% antifreeze.

Then  $10 - x$  = gallons of 90% antifreeze.

$$0.50x + 0.90(10 - x) = 0.60(10)$$

$$0.5x + 9 - 0.9x = 6$$

$$-0.4x = -3$$

$$x = 7.5$$

$$10 - 7.5 = 2.5$$

She should use 2.5 gallons of 90% and 7.5 gallons of 50%.

14. Let
- $x$
- = amount invested at 6%.

Then  $5000 - x$  = amount invested at 10%.

$$0.06x + 0.10(5000 - x) = 428$$

$$0.06x + 500 - 0.1x = 428$$

$$-0.04x = -72$$

$$x = 1800$$

$$5000 - x = 3200$$

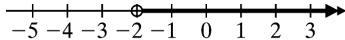
\$1800 was invested at 6% and \$3200 was invested at 10%.

- 15.
- $5 - 6x < 2x + 21$

$$-8x < 16$$

$$\frac{-8x}{-8} > \frac{16}{-8}$$

$$x > -2$$



- 16.
- $-\frac{1}{2} + \frac{1}{3}(2 - 3x) \geq \frac{1}{2}x + \frac{5}{3}$

$$6\left[-\frac{1}{2} + \frac{1}{3}(2 - 3x)\right] \geq 6\left(\frac{1}{2}x + \frac{5}{3}\right)$$

$$-3 + 4 - 6x \geq 3x + 10$$

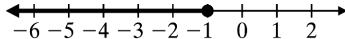
$$1 - 6x \geq 3x + 10$$

$$-6x - 3x \geq 10 - 1$$

$$-9x \geq 9$$

$$\frac{-9x}{-9} \leq \frac{9}{-9}$$

$$x \leq -1$$



- 17.
- $-11 < 2x - 1 \leq -3$

$$-10 < 2x \leq -2$$

$$-5 < x \leq -1$$

- 18.
- $x - 4 \leq -6$
- or
- $2x + 1 \geq 3$

$$x \leq -2$$

$$2x \geq 2$$

$$x \geq 1$$

- 19.
- $|7x - 3| \leq 18$

$$-18 \leq 7x - 3 \leq 18$$

$$-15 \leq 7x \leq 21$$

$$-\frac{15}{7} \leq x \leq 3$$

- 20.
- $|3x + 1| > 7$

$$3x + 1 < -7$$

$$\text{or } 3x + 1 > 7$$

$$3x < -8$$

$$3x > 6$$

$$x < -\frac{8}{3}$$

$$x > 2$$