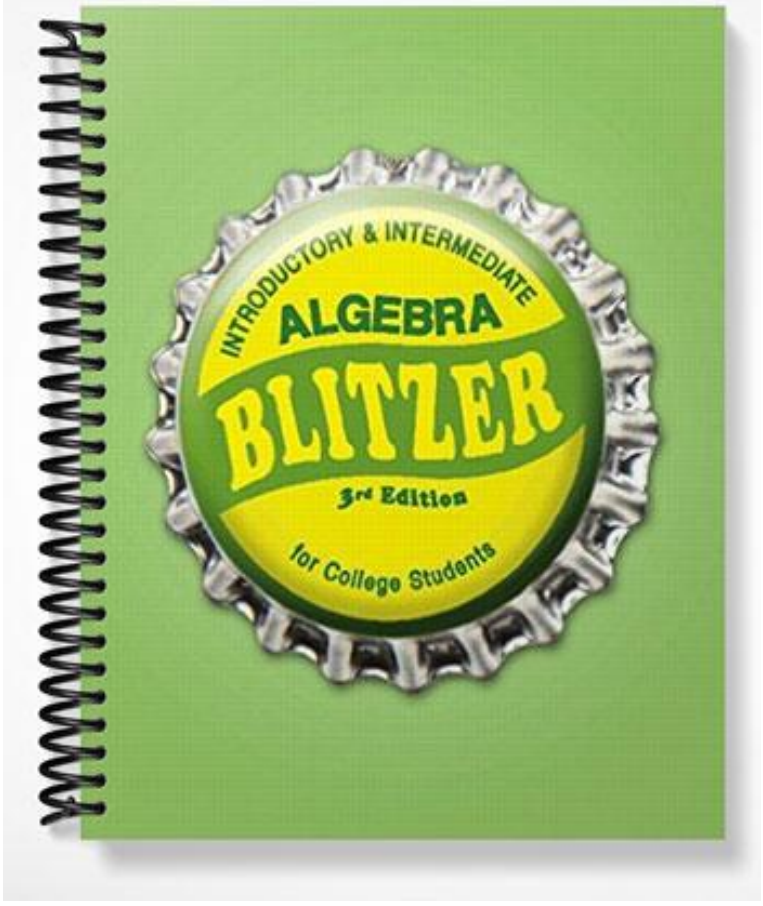
SOLUTIONS MANUAL



Chapter 2
Linear Equations and Inequalities in One Variable

2.1 Check Points

1. $x-5=12$

$x-5+5=12+5$

$x+0=17$

$x=17$

Check:

$x-5=12$

$17-5=12$

$12=12$

The solution set is $\{17\}$.

2. $z+2.8=5.09$

$z+2.8-2.8=5.09-2.8$

$z+0=2.29$

$z=2.29$

Check:

$z+2.8=5.09$

$2.29+2.8=5.09$

$5.09=5.09$

The solution set is $\{2.29\}$.

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

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

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

$\frac{1}{4}=x$

Check:

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

$-\frac{1}{2}=\frac{1}{4}-\frac{3}{4}$

$-\frac{1}{2}=-\frac{2}{4}$

$-\frac{1}{2}=-\frac{1}{2}$

The solution set is $\left\{\frac{1}{4}\right\}$.

4. $8y+7-7y-10=6+4$

$y-3=10$

$y-3+3=10+3$

$y=13$

Check:

$8y+7-7y-10=6+4$

$8(13)+7-7(13)-10=6+4$

$104+7-91-10=10$

$111-101=10$

$10=10$

The solution set is $\{13\}$.

5. $7x=12+6x$

$7x-6x=12+6x-6x$

$x=12$

Check:

$7(12)=12+6(12)$

$84=12+72$

$84=84$

The solution set is $\{12\}$.

6. $3x-6=2x+5$

$3x-2x-6=2x-2x+5$

$x-6=5$

$x-6+6=5+6$

$x=11$

Check:

$3x-6=2x+5$

$3(11)-6=2(11)+5$

$33-6=22+5$

$27=27$

The solution set is $\{11\}$.

7. $V+900=60A$

$V+900=60(50)$

$V+900=3000$

$V+900-900=3000-900$

$V=2100$

At 50 months, a child will have a vocabulary of 2100 words.

2.1 Exercise Set

2. linear

4. not linear

6. not linear

8. linear

10. not linear

12. $y-5=-18$

$y-5+5=-18+5$

$y=-13$

Check:

$-13-5=-18$

$-18=-18$

The solution set is $\{-13\}$.

14. $z+13=-15$

$z=-15-13$

$z=-28$

Check:

$-28+13=-15$

$-15=-15$

The solution set is $\{-28\}$.

16. $-13=x+11$

$-13-11=x$

$-24=x$

Check:

$-13=-24+11$

$-13=-13$

The solution set is $\{-24\}$.

18. $-21=y-4$

$-21+4=y$

$-17=y$

Check:

$-21=-17-4$

$-21=-21$

The solution set is $\{-17\}$.

20. $18+z=14$

$z=14-18$

$z=-4$

Check:

$18+(-4)=14$

$14=14$

The solution set is $\{-4\}$.

22. $-8+y=-29$

$y=-29+8$

$y=-21$

Check:

$-8+(-21)=-29$

$-29=-29$

The solution set is $\{-21\}$.

24. $x+\frac{7}{8}=\frac{9}{8}$

$x=\frac{9}{8}-\frac{7}{8}$

$x=\frac{2}{8}=\frac{1}{4}$

Check:

$\frac{1}{4}+\frac{7}{8}=\frac{9}{8}$

$\frac{2}{8}+\frac{7}{8}=\frac{9}{8}$

$\frac{9}{8}=\frac{9}{8}$

The solution set is $\left\{\frac{1}{4}\right\}$

26. $t+\frac{2}{3}=-\frac{7}{6}$

$t=-\frac{7}{6}-\frac{2}{3}$

$t=-\frac{7}{6}-\frac{4}{6}=-\frac{11}{6}$

Check:

$-\frac{11}{6}+\frac{2}{3}=-\frac{7}{6}$

$-\frac{11}{6}+\frac{4}{6}=-\frac{7}{6}$

$-\frac{7}{6}=-\frac{7}{6}$

The solution set is $\left\{-\frac{11}{6}\right\}$.

28. $x-\frac{3}{5}=\frac{7}{10}$

$x=\frac{7}{10}+\frac{3}{5}$

$x=\frac{7}{10}+\frac{6}{10}=\frac{13}{10}$

Check:

$\frac{13}{10}-\frac{3}{5}=\frac{7}{10}$

$\frac{13}{10}-\frac{6}{10}=\frac{7}{10}$

$\frac{7}{10}=\frac{7}{10}$

The solution set is $\left\{\frac{13}{10}\right\}$.

30. $-\frac{1}{8}+y=-\frac{1}{4}$

$y=-\frac{1}{4}+\frac{1}{8}$

$y=-\frac{2}{4}+\frac{1}{8}=-\frac{1}{8}$

Check:

$-\frac{1}{8}+\left(-\frac{1}{8}\right)=-\frac{1}{4}$

$-\frac{2}{8}=-\frac{1}{4}$

$-\frac{1}{4}=-\frac{1}{4}$

The solution set is $\left\{-\frac{1}{8}\right\}$.

32. $-2.7+w=-5.3$

$w=-5.3+2.7$

$w=-2.6$

Check:

$-2.7+(-2.6)=-5.3$

$-5.5=-5.3$

The solution set is $\{-2.6\}$.

34. $r+\frac{3}{5}=-\frac{7}{10}$

$r=-\frac{7}{10}-\frac{6}{10}$

$=-\frac{13}{10}$

Check:

$-\frac{13}{10}+\frac{3}{5}=-\frac{7}{10}$

$-\frac{13}{10}+\frac{6}{10}=-\frac{7}{10}$

$-\frac{7}{10}=-\frac{7}{10}$

The solution set is $\left\{-\frac{13}{10}\right\}$.

36. $-11=8+x$

$-11=8+x$

$-19=x$

Check:

$-11=8+(-19)$

$-11=-19$

The solution set is $\{-19\}$.

38. $\frac{7}{3}=-\frac{5}{2}+z$

$\frac{7}{3}+\frac{5}{2}=z$

$\frac{14+15}{6}=z$

$z=\frac{29}{6}$

Check:

$\frac{7}{3}=-\frac{5}{2}+\frac{29}{6}$

$\frac{14}{6}=-\frac{15}{6}+\frac{29}{6}$

$\frac{14}{6}=\frac{14}{6}$

The solution set is $\left\{\frac{29}{6}\right\}$.

40. $-90+t=-35$

$t=-35+90$

$t=55$

Check:

$-90+55=-35$

$-35=-35$

The solution set is $\{55\}$.

42. $x+10.6=-9$

$x=-9-10.6$

$x=-19.6$

Check:

$-19.6+10.6=-9$

$-9=-9$

The solution set is $\{-19.6\}$.

44. $y+\frac{7}{11}=\frac{7}{11}$

$y=\frac{7}{11}-\frac{7}{11}$

$y=0$

Check:

$0+\frac{7}{11}=\frac{7}{11}$

$\frac{7}{11}=\frac{7}{11}$

The solution set is $\{0\}$.

46. $-3x-5+4x=9$

$x-5=9$

$x=14$

Check:

$-3(14)-5+(14)=9$

$-42-5+56=9$

$-49+56=9$

$9=9$

The solution set is $\{14\}$.

48. $13-3r+2+6r-2r-1=3+2\cdot 9$

$(-3r+6r-2r)+(13+2-1)=3+18$

$r+14=21$

$r+14-14=21-14$

$r=7$

Check:

$13-3(7)+2+6(7)-2(7)-1=3+2\cdot 9$

$13-21+2+42-14-1=3+18$

$21=21$

The solution set is $\{7\}$.

50. $4r-3=5+3r$

$4r-3-3r=5+3r-3r$

$r-3=5$

$r-3+3=5+3$

$r=8$

Check:

$4(8)-3=5+3(8)$

$32-3=5+24$

$29=29$

The solution set is $\{8\}$.

52. $20-7s=26-8s$

$20-7s+8s=26-8s+8s$

$20+s=26$

$20-20+s=26-20$

$s=6$

Check:

$20-7(6)=26-8(6)$

$20-42=26-48$

$-22=-22$

The solution set is $\{6\}$.

54. $7x+3=6(x-1)+9$

$7x+3=6x-6+9$

$7x+3=6x+3$

$x+3=3$

$x=0$

Check:

$7(0)+3=6(0-1)+9$

$0+3=6(-1)+9$

$3=-6+9$

$3=3$

The solution set is $\{0\}$.

56. $x+\square=\triangle$

$x+\square-\square=\triangle-\square$

$x=\triangle-\square$

58. $6x-\triangle=7x-\square$

$6x-\triangle-6x=7x-\square-6x$

$-\triangle=x-\square$

$-\triangle+\square=x-\square+\square$

$\square-\triangle=x$

60. $x-23=-8$

$x-23+23=-8+23$

$x=15$

The number is 15.

62. $3-\frac{2}{7}x=\frac{5}{7}x$

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

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

$3=x$

The number is 3.

64. $C=520, S=650$

$C+M=S$

$520+M=650$

$M=650-520$

$M=130$

The markup is \$130.

66. $C-4.6x=25$

$C-4.6(5)=25$

$C-23=25$

$C-23+23=25+23$

$C=48$

According to the formula, 48 channels were received by the average U.S. home in 1995. This overestimates the value given in the bar graph by 7.

68. a. According to the line graph, about 52% of U.S. workers were satisfied with their jobs in 2000.

b. 2000 is 13 years after 1987.

$S+0.8x=62$

$S+0.8(13)=62$

$S+10.4=62$

$S+10.4-10.4=62-10.4$

$S=51.6$

According to the formula, 51.6% of U.S. workers were satisfied with their jobs in 2000. This matches the line graph very well.

70. Answers will vary.

72. The adjective linear means that the points lie on a line.

74. makes sense

76. makes sense

78. false; Changes to make the statement true will vary. A sample change is: If $y+7=0,$ then $y=-7.$

80. false; Changes to make the statement true will vary. A sample change is: If $3x=18,$ then $x=\frac{18}{3}=6.$

82. $x-7.0463=-9.2714$

$x=-9.2714+7.0463$

$x=-2.2251$

The solution set is $\{-2.2251\}$.

84. $\frac{9}{x}-4x$

85. $-16-8\div4\cdot(-2)=-16-2\cdot(-2)$

$=-16+(-2)(-2)$

$=-16+4$

$=-12$

86. $3\left[7x-2(5x-1)\right]=3\left[7x-10x+2\right]$

$=3\left[-3x+2\right]$

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

87. $5\cdot\frac{x}{5}=\frac{5}{1}\cdot\frac{x}{5}=x$

88. $\frac{-7y}{-7}=y$

89. $3x-14=-2x+6$

$3(4)-14=-2(4)+6$

$12-14=-8+6$

$-2=-2,$ true

Yes, 4 is a solution of the equation.

2.2 Check Points

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

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

$1x=36$

$x=36$

Check:

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

$\frac{36}{3}=12$

$12=12$

The solution set is $\{36\}$.

2. a. $4x=84$

$\frac{4x}{4}=\frac{84}{4}$

$1x=21$

$x=21$

The solution set is $\{21\}$.

b. $-11y=44$

$\frac{-11y}{-11}=\frac{44}{-11}$

$1x=-4$

$x=-4$

The solution set is $\{-4\}$.

c. $-15.5=5z$

$\frac{-15.5}{5}=\frac{5z}{5}$

$-3.1=1z$

$-3.1=z$

The solution set is $\{-3.1\}$.

3. a. $\frac{2}{3}y=16$

$\frac{3}{2}\left(\frac{2}{3}y\right)=\frac{3}{2}\cdot 16$

$1y=24$

$y=24$

The solution set is $\{24\}$.

b. $28=-\frac{7}{4}x$

$-\frac{4}{7}\cdot 28=-\frac{4}{7}\left(-\frac{7}{4}x\right)$

$-16=1x$

$-16=x$

The solution set is $\{-16\}$.

4. a. $-x=5$

$-1x=5$

$(-1)(-1x)=(-1)5$

$1x=-5$

$x=-5$

The solution set is $\{-5\}$.

b. $-x=-3$

$-1x=-3$

$(-1)(-1x)=(-1)(-3)$

$1x=3$

$x=3$

The solution set is $\{3\}$.

5. $4x+3=27$

$4x+3-3=27-3$

$4x=24$

$\frac{4x}{4}=\frac{24}{4}$

$x=6$

The solution set is $\{6\}$.

6. $-4y-15=25$

$-4y-15+15=25+15$

$-4y=40$

$\frac{-4y}{-4}=\frac{40}{-4}$

$y=-10$

The solution set is $\{-10\}$.

7. $2x-15=-4x+21$

$2x+4x-15=-4x+4x+21$

$6x-15=21$

$6x-15+15=21+15$

$6x=36$

$\frac{6x}{6}=\frac{36}{6}$

$x=6$

The solution set is $\{6\}$.

8. a. The bar graph indicates that there were 1.3 million pay phones in 2004. Since 2004 is 4 years after 2000, substitute 4 into the formula for n.

$P=-0.18n+2.1$

$P=-0.18(4)+2.1$

$P=-0.72+2.1$

$P=1.38$

The formula indicates that there were 1.38 million pay phones in 2004.
The formula overestimates by 0.08 million.

b. $P=-0.18n+2.1$

$0.3=-0.18n+2.1$

$0.3-2.1=-0.18n+2.1-2.1$

$-1.8=-0.18n$

$\frac{-1.8}{-0.18}=\frac{-0.18n}{-0.18}$

$10=n$

The formula estimates that there will be 0.3 million pay phones 10 years after 2000, or in 2010.

2.2 Exercise Set

2. $\frac{x}{7}=4$

$7\cdot\frac{x}{7}=7\cdot 4$

$x=28$

Check:

$\frac{28}{7}=4$

$4=4$

The solution set is $\{28\}$.

4. $\frac{x}{-5}=8$

$-5\cdot\frac{x}{-5}=8(-5)$

$x=-40$

Check:

$\frac{-40}{-5}=8$

$8=8$

The solution set is $\{-40\}$.

6. $6y=42$

$\frac{6y}{6}=\frac{42}{6}$

$y=7$

Check:

$6(7)=42$

$42=42$

The solution set is $\{7\}$.

8. $-4y=32$

$\frac{-4y}{-4}=\frac{32}{-4}$

$y=-8$

Check:

$-4(-8)=32$

$32=32$

The solution set is $\{-8\}$.

10. $-36=8z$

$\frac{-36}{8}=\frac{8z}{8}$

$-\frac{9}{2}=z$

Check:

$-36=8\left(-\frac{9}{2}\right)$

$-36=-36$

The solution set is $\left\{-\frac{9}{2}\right\}$.

12. $-54 = -9z$

$$\frac{-54}{-9} = \frac{-9z}{-9}$$

$$6 = z$$

Check:

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

$$-54 = -54$$

The solution set is $\{6\}$.

14. $-8x = 4$

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

$$x = -\frac{4}{8} = -\frac{1}{2}$$

Check:

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

$$4 = 4$$

The solution set is $\left\{-\frac{1}{2}\right\}$.

16. $-16y = 0$

$$\frac{-16y}{-16} = \frac{0}{-16}$$

$$y = 0$$

Check:

$$-16(0) = 0$$

$$0 = 0$$

The solution set is $\{0\}$.

18. $\frac{3}{4}y = 15$

$$\frac{4}{3}\left(\frac{3}{4}y\right) = \frac{4}{3}(15)$$

$$1y = \frac{4}{3}\cdot\frac{15}{1} = \frac{60}{3}$$

$$y = 20$$

Check:

$$\frac{3}{4}(20) = 15$$

$$\frac{3}{4}\cdot\frac{20}{1} - 15$$

$$\frac{60}{4} = 15$$

$$15 = 15$$

The solution set is $\{20\}$.

20. $20 = -\frac{5}{8}x$

$$-\frac{8}{5}(20) = -\frac{8}{5}\left(-\frac{5}{8}x\right)$$

$$-\frac{160}{5} = 1x$$

$$-32 = x$$

Check:

$$20 = -\frac{5}{8}(-32)$$

$$20 = \frac{160}{8}$$

$$20 = 20$$

The solution set is $\{-32\}$.

22. $-x = 23$

$$-1x = 23$$

$$-1(-1x) = -1(23)$$

$$x = -23$$

Check:

$$-(-23) = 23$$

$$23 = 23$$

The solution set is $\{-23\}$.

24. $-51 = -y$

$$\frac{-51}{-1} = \frac{-y}{-1}$$

$$51 = y$$

Check:

$$-51 = -51$$

The solution set is $\{51\}$.

26. $-\frac{x}{5} = -1$

$$-5\left(-\frac{x}{5}\right) = -5(-1)$$

$$x = 5$$

Check:

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

$$-1 = -1$$

The solution set is $\{5\}$.

28. $8x-3x=-45$

$8x+(-3x)=-45$

$5x=-45$

$\frac{5x}{5}=\frac{-45}{5}$

$x=-9$

Check:

$8(-9)-3(-9)=-45$

$-72+27=-45$

$-45=-45$

The solution set is $\{-9\}$.

30. $2x+5=13$

$2x+5-5=13-5$

$2x=8$

$\frac{2x}{2}=\frac{8}{2}$

$x=4$

Check:

$2(4)+5=13$

$8+5=13$

$13=13$

The solution set is $\{4\}$.

32. $3x-2=9$

$3x-2+2=9+2$

$3x=11$

$\frac{3x}{3}=\frac{11}{3}$

$x=\frac{11}{3}$

Check:

$3\left(\frac{11}{3}\right)=9$

$11-2=9$

$9=9$

The solution set is $\left\{\frac{11}{3}\right\}$.

34. $-3y+4=13$

$-3y+4-4=13-4$

$-3y=9$

$\frac{-3y}{-3}=\frac{9}{-3}$

$y=-3$

Check:

$-3(-3)+4=13$

$9+4=13$

$13=13$

The solution set is $\{-3\}$.

36. $-2y-5=7$

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

$-2y=12$

$\frac{-2y}{-2}=\frac{12}{-2}$

$y=-6$

Check:

$-2(-6)-5=7$

$12-5=7$

$7=7$

The solution set is $\{-6\}$.

38. $14=5z-21$

$14+21=5z-21+21$

$35=5z$

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

$7=z$

Check:

$14=5(7)-21$

$14=35-21$

$14=14$

The solution set is $\{7\}$.

40. $-x-5=5$

$-x-5+5=5+5$

$-x=10$

$x=-10$

Check:

$-(-10)-5=5$

$10-5=5$

$5=5$

The solution set is $\{-10\}$.

42. $8y = 3y - 10$

$8y - 3y = 3y - 10 - 3y$

$5y = -10$

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

$y = -2$

Check:

$8(-2) = 3(-2) - 10$

$-16 = -6 - 16$

$-16 = -16$

The solution set is $\{-2\}$.

44. $2z = -4z + 18$

$2z + 4z = -4z + 18 + 4z$

$6z = 18$

$\frac{6z}{6} = \frac{18}{6}$

$z = 3$

Check:

$2(3) = -4(3) + 18$

$6 = -12 + 18$

$6 = 6$

The solution set is $\{3\}$.

46. $-7x = -3x - 8$

$-7x + 3x = -3x - 8 + 3x$

$-4x = -8$

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

$x = 2$

Check:

$-7(2) = -3(2) - 8$

$-14 = -6 - 8$

$-14 = -14$

The solution set is $\{2\}$.

48. $5y + 6 = 3y - 6$

$5y + 6 - 3y = 3y - 6 - 3y$

$2y + 6 = -6$

$2y + 6 - 6 = -6 - 6$

$2y = -12$

$\frac{2y}{2} = \frac{-12}{2}$

$y = -6$

Check:

$5(-6) + 6 = 3(-6) - 6$

$-30 + 6 = -18 - 6$

$-24 = -24$

The solution set is $\{-6\}$.

50. $6z - 3 = z + 2$

$6z - 3 - z = z + 2 - z$

$5z - 3 = 2$

$5z - 3 + 3 = 2 + 3$

$5z = 5$

$\frac{5z}{5} = \frac{5}{5}$

$z = 1$

Check:

$6(1) - 3 = 1 + 2$

$6 - 3 = 3$

$3 = 3$

The solution set is $\{1\}$.

52. $9x + 2 = 6x - 4$

$9x + 2 - 6x = 6x - 4 - 6x$

$3x + 2 = -4$

$3x + 2 - 2 = -4 - 2$

$3x = -6$

$\frac{3x}{3} = \frac{-6}{3}$

$x = -2$

Check:

$9(-2) + 2 = 6(-2) - 4$

$-18 + 2 = -12 - 4$

$-16 = -16$

The solution set is $\{-2\}$.

54. $-3y-2=-5-4y$

$-3y-2+4y=-5-4y+4y$

$y-2=-5$

$y-2+2=-5+2$

$y=-3$

Check:

$-3(-3)-2=-5-4(-3)$

$9-2=-5+12$

$7=7$

The solution set is $\{-3\}$.

56. $\Delta=\square x$

$\frac{\Delta}{\square}=\frac{\square x}{\square}$

$\frac{\Delta}{\square}=x$

58. $\frac{-x}{\square}=\Delta$

$-\square\cdot\frac{-x}{\square}=-\square\cdot\Delta$

$x=-\square\cdot\Delta$

60. $-6\cdot x=20$

$\frac{-6x}{-6}=\frac{20}{-6}$

$x=-\frac{10}{3}$

The number is $-\frac{10}{3}$.

62. $\frac{x}{-7}=8$

$-7\cdot\frac{x}{-7}=-7\cdot 8$

$x=-56$

The number is -56.

64. $3x-10=23$

$3x-10+10=23+10$

$3x=33$

$\frac{3x}{3}=\frac{33}{3}$

$x=11$

The number is 11.

66. $-5x+11=-29$

$-5x+11-11=-29-11$

$-5x=-40$

$\frac{-5x}{-5}=\frac{-40}{-5}$

$x=8$

The number is 8.

68. $M=\frac{n}{5}$

$3=\frac{n}{5}$

$5(3)=5\left(\frac{n}{5}\right)$

$15=n$

If you are 3 miles away from the lightning flash, it will take 15 seconds for the sound of thunder to reach you.

70. $M=\frac{A}{740}$

$3.3=\frac{A}{740}$

$740(3.3)=740\cdot\frac{A}{740}$

$2442=A$

The speed of the SR-71 Blackbird is 2442 miles per hour.

72. **a.** The bar graph indicates that the debt limit was \$28,100 per citizen in 2004.
Since 2004 is 4 years after 2000, substitute 4 into the formula for n.

$D=1914n+19,371$

$D=1914(4)+19,371$

$D=7656+19,371$

$D=27,027$

The formula indicates that the debt limit was \$27,027 per citizen in 2004.
The formula underestimates by \$1073.

b. $D=1914n+19,371$

$44,253=1914n+19,371$

$44,253-19,371=1914n+19,371-19,371$

$24,882=1914n$

$\frac{24,882}{1914}=\frac{1914n}{1914}$

$13=n$

The formula estimates that the debt limit will be \$44,253 per citizen 13 years after 2000, or in 2013.

74. Answers will vary.

76. does not make sense; Explanations will vary.
Sample explanation: The addition property of equality is not necessary for this equation.

78. makes sense

80. false; Changes to make the statement true will vary.
A sample change is: If $7x = 21,$ then $\frac{7x}{7} = \frac{21}{7} = 3.$

82. false; Changes to make the statement true will vary.
A sample change is: If $3x + 7 = 0,$ then
$3x = -7$ and $x = \frac{-7}{3}.$

84. Answers will vary. Start by selecting the integer answer and set x equal to this value. Then, multiply both sides of this equation by -60 (since we will divide both sides of the equation by -60 to solve). For example, suppose we want the solution to be 3. We set x equal to this value and write $x = 3.$
Now multiply both sides of the equation by $-60.$

$$x = 3$$
$$-60 \cdot x = -60 \cdot 3$$
$$-60x = -180$$

So, our equation is $-60x = -180$ and the solution is 3 (an integer).

86.
$$3.7x - 19.46 = -9.988$$
$$3.7x = -9.988 + 19.46$$
$$3.7x = 9.472$$
$$\frac{3.7x}{3.7} = \frac{9.472}{3.7}$$
$$x = 2.56$$

The solution set is $\{2.56\}.$

88. $(-10)^2 = (-10)(-10) = 100$

89. $-10^2 = -1 \cdot 10^2 = -1(10)(10) = -100$

90.
$$x^3 - 4x = (-1)^3 - 4(-1)$$
$$= -1 + 4$$
$$= 3$$

91.
$$13 - 3(x + 2) = 13 - 3x - 6$$
$$= -3x + 7$$

92.
$$2(x - 3) - 17 = 13 - 3(x + 2)$$
$$2(6 - 3) - 17 = 13 - 3(6 + 2)$$
$$2(3) - 17 = 13 - 3(8)$$
$$6 - 17 = 13 - 24$$
$$-11 = -11, \text{ true}$$

Yes, 6 is a solution of the equation.

93.
$$10\left(\frac{x}{5} - \frac{39}{5}\right) = 10 \cdot \frac{x}{5} - 10 \cdot \frac{39}{5}$$
$$= 2x - 78$$

2.3 Check Points

1. Simplify the algebraic expression on each side.
$$-7x + 25 + 3x = 16 - 2x - 3$$
$$-4x + 25 = 13 - 2x$$

Collect variable terms on one side and constant terms on the other side.
$$-4x + 25 = 13 - 2x$$
$$-4x + 25 + 2x = 13 - 2x + 2x$$
$$-2x + 25 = 13$$
$$-2x + 25 - 25 = 13 - 25$$
$$-2x = -12$$

Isolate the variable and solve.
$$\frac{-2x}{-2} = \frac{-12}{-2}$$
$$x = 6$$

The solution set is $\{6\}.$

2. Simplify the algebraic expression on each side.
$$8x = 2(x + 6)$$
$$8x = 2x + 12$$

Collect variable terms on one side and constant terms on the other side.
$$8x - 2x = 2x - 2x + 12$$
$$6x = 12$$

Isolate the variable and solve.
$$\frac{6x}{6} = \frac{12}{6}$$
$$x = 2$$

The solution set is $\{2\}.$

3. Simplify the algebraic expression on each side.

$$4(2x+1)-29=3(2x-5)$$
$$8x+4-29=6x-15$$
$$8x-25=6x-15$$

Collect variable terms on one side and constant terms on the other side.

$$8x-6x-25=6x-6x-15$$
$$2x-25=-15$$
$$2x-25+25=-15+25$$
$$2x=10$$

Isolate the variable and solve.

$$\frac{2x}{2}=\frac{10}{2}$$
$$x=5$$

The solution set is $\{5\}$.

4. Begin by multiplying both sides of the equation by 12, the least common denominator.

$$\frac{x}{4}=\frac{2x}{3}+\frac{5}{6}$$
$$12\cdot\frac{x}{4}=12\left(\frac{2x}{3}+\frac{5}{6}\right)$$
$$12\cdot\frac{x}{4}=12\cdot\frac{2x}{3}+12\cdot\frac{5}{6}$$
$$3x=8x+10$$
$$3x-8x=8x-8x+10$$
$$-5x=10$$
$$\frac{-5x}{-5}=\frac{10}{-5}$$
$$x=-2$$

The solution set is $\{-2\}$.

5.
$$3x+7=3(x+1)$$
$$3x+7=3x+3$$
$$3x-3x+7=3x-3x+3$$
$$7=3$$

The original equation is equivalent to the false statement $7=3$.

The equation has no solution. The solution set is $\{\ \}$.

6.
$$3(x-1)+9=8x+6-5x$$
$$3x-3+9=3x+6$$
$$3x+6=3x+6$$
$$3x-3x+6=3x-3x+6$$
$$6=6$$

The original equation is equivalent to $6=6$, which is true for every value of x.

The equation's solution is all real numbers or $\{x\,|\,x \text{ is a real number}\}$.

7.
$$D=\frac{10}{9}x+\frac{53}{9}$$
$$10=\frac{10}{9}x+\frac{53}{9}$$
$$9\cdot 10=9\left(\frac{10}{9}x+\frac{53}{9}\right)$$
$$90=10x+53$$
$$90-53=10x+53-53$$
$$37=10x$$
$$\frac{37}{10}=\frac{10x}{10}$$
$$3.7=x$$
$$x=3.7$$

The formula indicates that if the low-humor group averages a level of depression of 10 in response to a negative life event, the intensity of that event is 3.7. This is shown as the point whose corresponding value on the vertical axis is 10 and whose value on the horizontal axis is 3.7.

2.3 Exercise Set

2.
$$4x+8x-2x=20-15$$
$$10x=5$$
$$x=\frac{5}{10}=\frac{1}{2}$$

The solution set is $\left\{\frac{1}{2}\right\}$.

4.
$$3x+2x+64=40-7x$$
$$5x+64=40-7x$$
$$12x+64=40$$
$$12x=-24$$
$$x=-2$$

The solution set is $\{-2\}$.

6. $3x+2-x=6+3x-8$
$2x+2=3x-2$
$2x+2-3x=3x-2-3x$
$-x+2=-2$
$-x+2-2=-2-2$
$-x=-4$
$x=4$
The solution set is $\{4\}$.

8. $3(x-2)=-6$
$3x-6=-6$
$3x=0$
$x=0$
The solution set is $\{0\}$.

10. $4(2x-3)=32$
$8x-12=32$
$8x=44$
$x=\frac{44}{8}=\frac{11}{2}$
The solution set is $\left\{\frac{11}{2}\right\}$.

12. $20=44-8(2-x)$
$20=44-16+8x$
$20=28+8x$
$-8=8x$
$-1=x$
The solution set is $\{-1\}$.

14. $3(3z+5)-7=89$
$9z+15-7=89$
$9z+8=89$
$9z=81$
$z=9$
The solution set is $\{9\}$.

16. $5x-(2x+14)=10$
$5x-2x-14=10$
$3x-14=10$
$3x=24$
$x=8$
The solution set is $\{8\}$.

18. $3(x+2)=x+30$
$3x+6=x+30$
$2x+6=30$
$2x=24$
$x=12$
The solution set is $\{12\}$.

20. $3(3x-1)=4(3+3x)$
$9x-3=12+12x$
$-3-3=12$
$-3x=15$
$x=-5$
The solution set is $\{-5\}$.

22. $8(y+3)=3(2y+12)$
$8y+24=6y+36$
$2y+24=36$
$2y=12$
$y=6$
The solution set is $\{6\}$.

24. $5x-4(x+9)=2x-3$
$5x-4x-36=2x-3$
$x-36=2x-3$
$x=2x+33$
$-x=33$
$x=-33$
The solution set is $\{-33\}$.

26. $7(3x-2)+5=6(2x-1)+24$
$21x-14+5=12x-6+24$
$21x-9=12x+18$
$21x=12x+27$
$9x=27$
$x=3$
The solution set is $\{3\}$.

28. $100=-(x-1)+4(x-6)$
$100=-x+1+4x-24$
$100=3x-23$
$123=3x$
$41=x$
The solution set is $\{41\}$.

30. $-2(z-4)-(3z-2)=-2-(6z-2)$

$$-2z+8-3z+2=-2-6z+2$$
$$-5z+10=-6z$$
$$z+10=0$$
$$z=-10$$

The solution set is $\{-10\}$.

32. $\frac{x}{2}+13=-22$

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 2.

$$\frac{x}{2}+13=-22$$
$$2\left(\frac{x}{2}+13\right)=2(-22)$$
$$2\cdot\frac{x}{2}+2\cdot 13=-44$$
$$x+26=-44$$
$$x+26-26=-44-26$$
$$x=-70$$

The solution set is $\{-70\}$.

34. $\frac{3x}{4}-9=-6$

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 4.

$$4\left(\frac{3x}{4}-9\right)=4(-6)$$
$$4\cdot\frac{3x}{4}-4\cdot 9=-24$$
$$3x-36=-24$$
$$3x=12$$
$$x=4$$

The solution set is $\{4\}$.

36. $\frac{3y}{4}-\frac{2}{3}=\frac{7}{12}$

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 12.

$$12\left(\frac{3y}{4}-\frac{2}{3}\right)=12\left(\frac{7}{12}\right)$$
$$12\left(\frac{3y}{4}\right)-12\left(\frac{2}{3}\right)=7$$
$$9y-8=7$$
$$9y=15$$
$$y=\frac{15}{9}=\frac{5}{3}$$

The solution set is $\left\{\frac{5}{3}\right\}$.

38. $\frac{x}{4}-\frac{x}{5}=1$

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 20.

$$20\left(\frac{x}{4}-\frac{x}{5}\right)=20(1)$$
$$5x-4x=20$$
$$x=20$$

The solution set is $\{20\}$.

40. $\frac{z}{5}-\frac{1}{2}=\frac{z}{6}$

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 30.

$$30\left(\frac{z}{5}-\frac{1}{2}\right)=30\left(\frac{z}{6}\right)$$
$$6z-15=5z$$
$$z-15=0$$
$$z=15$$

The solution set is $\{15\}$.

42. $\frac{y}{12}+\frac{1}{6}=\frac{y}{2}-\frac{1}{4}$

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 12.

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

The solution set is $\{1\}$.

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

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 15.

$$15\left(\frac{3x}{5}-\frac{2}{5}\right)=15\left(\frac{x}{3}+\frac{2}{5}\right)$$
$$9x-6=5x+6$$
$$4x-6=6$$
$$4x=12$$
$$x=3$$

The solution set is $\{3\}$.

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

To clear the equation of fractions, multiply both sides by the least common denominator (LCD), which is 12.

$$12\left(\frac{x-2}{3}\right)-12(4)=12\left(\frac{x+1}{4}\right)$$
$$4(x-2)-48=3(x+1)$$
$$4x-8-48=3x+3$$
$$4x-56=3x+3$$
$$x-56=3$$
$$x=59$$

The solution set is $\{59\}$.

48.
$$2(x-5)=2x+10$$
$$2x-10=2x+10$$
$$2x-10-2x=2x+10-2x$$
$$-10=10$$

The original equation is equivalent to the false statement $-10=10$, so the equation is inconsistent and has no solution.

The solution set is $\{\ \}$.

50.
$$3(x-1)=8x+6-5x-9$$
$$3x-3=3x-3$$
$$3x-3-3x=3x-3-3x$$
$$-3=-3$$

The original equation is equivalent to the true statement $-3=-3$, so the equation is an identity and the solution set is all real numbers $\{x\,|\,x \text{ is a real number}\}$.

52.
$$2+3(2x-7)=9-4(3x+1)$$
$$2+6x-21=9-12x-4$$
$$6x-19=-12x+5$$
$$18x-19=5$$
$$18x=24$$
$$x=\frac{24}{18}=\frac{4}{3}$$

The solution set is $\left\{\frac{4}{3}\right\}$.

54.
$$5x-5=3x-7+2(x+1)$$
$$5x-5=3x-7+2x+2$$
$$5x-5=5x-5$$
$$5x-5-5x=5x-5-5x$$
$$-5=-5$$

The original equation is equivalent to the true statement $-5=-5$, so the equation is an identity and the solution set is all real numbers $\{x\,|\,x \text{ is a real number}\}$.

56. $5x-3(x+1)=2(x+3)-5$

$5x-3x-3=2x+6-5$

$2x-3=2x+1$

$2x-3-2x=2x+1-2x$

$-3=1$

Since $-3=1$ is a false statement, the original equation is inconsistent and has no solution. The solution set is $\{\ \}$.

58. $5-x=4x+5$

$5-x-4x=4x+5-4x$

$-5x+5=5$

$-5x=0$

$\frac{-5x}{-5}=\frac{0}{-5}$

$x=0$

The solution set is $\{0\}$.

60. $\frac{x}{4}+3=\frac{x}{4}$

Multiply by the LCD, which is 4.

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

$x+12=x$

$x+12-x=x-x$

$12=0$

Since $12=0$ is a false statement, the original equation has no solution. The solution set is $\{\ \}$.

62. $\frac{x}{2}+\frac{2x}{3}+3=x+3$

Multiply both sides by the LCD which is 6.

$6\left(\frac{x}{2}+\frac{2x}{3}+3\right)=6(x+3)$

$3x+4x+18=6x+18$

$7x+18=6x+18$

$x+18=18$

$x=0$

The solution set is $\{0\}$.

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

Multiply both sides by the LCD which is 12.

$12\left(\frac{2}{3}x\right)=12\left(\frac{1}{4}x-8\right)$

$8x=3x-96$

$5x=-96$

$x=-\frac{96}{5}$

The solution set is $\left\{-\frac{96}{5}\right\}$.

66. $\frac{x}{\square}-\Delta=-\$$

$\frac{x}{\square}-\Delta+\Delta=-\$+\Delta$

$\frac{x}{\square}=-\$+\Delta$

$\square\cdot\frac{x}{\square}=\square\cdot(-\$+\Delta)$

$x=\square\cdot(-\$+\Delta)$

$x=-\square\$+\square\Delta$

$x=\square\Delta-\square\$$

68. First solve the equation for x.

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

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

$6x+3x=x-16$

$9x=x-16$

$8x=-16$

$x=-2$

Now evaluate the expression x^2-x for $x=-2$.

$x^2-x=(-2)^2-(-2)$

$=4+2$

$=6$

70.
$$\frac{2}{5}x+\frac{1}{4}x=13$$
$$20\left(\frac{2}{5}x+\frac{1}{4}x\right)=20(13)$$
$$8x+5x=260$$
$$13x=260$$
$$\frac{13x}{13}=\frac{260}{13}$$
$$x=20$$
The number is 20.

72.
$$\frac{7}{8}x-30=\frac{1}{2}x$$
$$8\left(\frac{7}{8}x-30\right)=8\left(\frac{1}{2}x\right)$$
$$7x-240=4x$$
$$-240=-3x$$
$$\frac{-240}{-3}=\frac{-3x}{-3}$$
$$80=x$$
The number is 80.

74.
$$F=10(x-65)+50$$
$$400=10x-650+50$$
$$400=10x-600$$
$$1000=10x$$
$$100=x$$

A person receiving a \$400 fine was driving 100 miles per hour.

76.
$$\frac{W}{2}-3H=53$$
$$\frac{W}{2}-3(12)=53$$
$$\frac{W}{2}-36=53$$
$$\frac{W}{2}-36+36=53+36$$
$$\frac{W}{2}=89$$
$$2\cdot\frac{W}{2}=2\cdot 89$$
$$W=178$$

According to the formula, the healthy weight of a person of height 6' is 178 pounds. This is 6 pounds below the upper end of the range shown in the bar graph.

78.
$$p=15+\frac{5d}{11}$$
$$20=15+\frac{5d}{11}$$
$$5=\frac{5d}{11}$$
$$11(5)=11\left(\frac{5d}{11}\right)$$
$$55=5d$$
$$11=d$$
The pressure is 20 pounds per square foot at a depth of 11 feet.

80. – 82. Answers will vary.

84. makes sense

86. makes sense

88. false; Changes to make the statement true will vary. A sample change is: The equation $2y+5=0$ is equivalent to $2y=-5$.

90. false; Changes to make the statement true will vary. A sample change is: The equation $x+\frac{1}{3}=\frac{1}{2}$ is equivalent to $6\cdot x+6\cdot\frac{1}{3}=6\cdot\frac{1}{2}$ or $6x+2=3$.

92.
$$\frac{2x-3}{9}+\frac{x-3}{2}=\frac{x+5}{6}-1$$
$$18\left(\frac{2x-3}{9}+\frac{x-3}{2}\right)=18\left(\frac{x+5}{6}-1\right)$$
$$18\left(\frac{2x-3}{9}\right)+18\left(\frac{x-3}{2}\right)=18\left(\frac{x+5}{6}\right)-18\cdot 1$$
$$2(2x-3)+9(x-3)=3(x+5)-18$$
$$4x-6+9x-27=3x+15-18$$
$$13x-33=3x-3$$
$$13x-33-3x=3x-3-3x$$
$$10x-33=-3$$
$$10x-33+33=-3+33$$
$$10x=30$$
$$\frac{10x}{10}=\frac{30}{10}$$
$$x=3$$
The solution set is $\{3\}$.

94. $2.24y - 9.28 = 5.74y + 5.42$

$2.24y - 9.28 - 5.74y = 5.74y + 5.42 - 5.74y$

$-3.5y - 9.25 = 5.42$

$-3.5y - 9.28 + 9.28 = 5.42 + 9.28$

$-3.5y = 14.7$

$\frac{-3.5y}{-3.5} = \frac{14.7}{-3.5}$

$y = -4.2$

The solution set is $\{-4.2\}$.

96. $-24 < -20$ because -24 lies further to the left on a number line.

97. $-\frac{1}{3} < -\frac{1}{5}$ because $-\frac{1}{3}$ lies further to the left on a number line.

98. $-9 - 11 + 7 - (-3) = -9 - 11 + 7 + 3$

$= -20 + 10$

$= -10$

99. a. $T = D + pm$

$T - D = pm$

b. $T - D = pm$

$\frac{T - D}{p} = \frac{pm}{p}$

$\frac{T - D}{p} = m$

100. $4 = 0.25B$

$\frac{4}{0.25} = \frac{0.25B}{0.25}$

$16 = B$

The solution set is $\{16\}$.

101. $1.3 = P \cdot 26$

$\frac{1.3}{26} = \frac{P \cdot 26}{26}$

$0.05 = P$

The solution set is $\{0.05\}$.

2.4 Check Points

1. $A = lw$

$\frac{A}{w} = \frac{lw}{w}$

$\frac{A}{w} = l$

2. $2l + 2w = P$

$2l + 2w - 2w = P - 2w$

$2l = P - 2w$

$\frac{2l}{2} = \frac{P - 2w}{2}$

$l = \frac{P - 2w}{2}$

3. $T = D + pm$

$T - D = pm$

$\frac{T - D}{p} = \frac{pm}{p}$

$\frac{T - D}{p} = m$

$m = \frac{T - D}{p}$

4. $\frac{x}{3} - 4y = 5$

$3\left(\frac{x}{3} - 4y\right) = 3 \cdot 5$

$3 \cdot \frac{x}{3} - 3 \cdot 4y = 3 \cdot 5$

$x - 12y = 15$

$x - 12y + 12y = 15 + 12y$

$x = 15 + 12y$

5. To change a percent to a decimal number, move the decimal point two places to the left and remove the percent sign.

a. $67\% = 0.67$

b. $250\% = 2.50$ or 2.5

6. To change a decimal number to a percent, move the decimal point two places to the right and add a percent sign.

$0.023 = 2.3\%$

7. Use the formula $A = PB$: A is P percent of B.

What is 9% of 50?

$A = 0.09 \cdot 50$

$A = 4.5$

8. Use the formula $A = PB$: A is P percent of B.

$$\begin{array}{l} \boxed{9}\ \boxed{\text{is}}\ \boxed{60\%}\ \boxed{\text{of}}\ \boxed{\text{what?}} \\ \overbrace{9}\ =\ \overbrace{0.60}\ \cdot\ \overbrace{B} \end{array}$$

$$\frac{9}{0.60} = \frac{0.60B}{0.60}$$

$$15 = B$$

9. Use the formula $A = PB$: A is P percent of B.

$$\begin{array}{l} \boxed{18}\ \boxed{\text{is}}\ \boxed{\text{what percent}}\ \boxed{\text{of}}\ \boxed{50?} \\ \overbrace{18}\ =\ \overbrace{P}\ \cdot\ \overbrace{50} \end{array}$$

$$18 = P \cdot 50$$

$$\frac{18}{50} = \frac{50P}{50}$$

$$0.36 = P$$

To change 0.36 to a percent, move the decimal point two places to the right and add a percent sign.

$$0.36 = 36\%$$

10. Use the formula $A = PB$: A is P percent of B.

Find the price decrease: $\$940 - \$611 = \$329$

$$\begin{array}{l} \boxed{\text{The price decrease}}\ \boxed{\text{is}}\ \boxed{\text{what percent}}\ \boxed{\text{of}}\ \boxed{\text{the original price?}} \\ \overbrace{329}\ =\ \overbrace{P}\ \cdot\ \overbrace{940} \end{array}$$

$$329 = P \cdot 940$$

$$\frac{329}{940} = \frac{940P}{940}$$

$$0.35 = P$$

To change 0.35 to a percent, move the decimal point two places to the right and add a percent sign.

$$0.35 = 35\%$$

11. a.

Year	Tax Paid the Year Before	increase/decrease	Taxes Paid This Year
1	\$1200	20% decrease: $0.20 \cdot \$1200 = \$240$	$\$1200 - \$240 = \$960$
2	\$960	20% increase: $0.20 \cdot \$960 = \$192$	$\$960 + \$192 = \$1152$

The taxes for year 2 will be \$1152.

b. The taxes for year 2 are less than those originally paid.

Find the tax decrease: $\$1200 - \$1152 = \$48$

$$\begin{array}{l} \text{The tax decrease}\ \ \text{is}\ \ \text{what percent}\ \ \text{of}\ \ \text{the original tax?} \\ \overbrace{48}\ =\ \overbrace{P}\ \cdot\ \overbrace{1200} \end{array}$$

$$48 = P \cdot 1200$$

$$\frac{48}{1200} = \frac{1200P}{1200}$$

$$0.04 = P$$

To change 0.04 to a percent, move the decimal point two places to the right and add a percent sign.

$$0.04 = 4\%$$

The overall tax decrease is 4%.

2.4 Exercise Set

2. $d = rt$ for t

$$\frac{d}{r} = \frac{rt}{r}$$

$$\frac{d}{r} = t \text{ or } t = \frac{d}{r}$$

This is the motion formula:
distance = rate · time.

4. $I = Prt$ for r

$$\frac{I}{Pt} = \frac{Prt}{PT}$$

$$\frac{I}{Pt} = r \text{ or } r = \frac{I}{Pt}$$

This is the formula for simple interest:
interest = principal · rate · time.

6. $C = \pi d$ for d

$$\frac{C}{\pi} = \frac{\pi d}{\pi}$$

$$\frac{C}{\pi} = d \text{ or } d = \frac{C}{\pi}$$

This is the formula for finding the circumference of a circle if you know its diameter.

8. $V = \pi r^2 h$ for h

$$\frac{V}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2}$$

$$\frac{V}{\pi r^2} = h \text{ or } h = \frac{V}{\pi r^2}$$

This is the volume of a cylinder.

10. $y = mx + b$ for x

$$y - b = mx$$

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

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

This is the slope-intercept formula for the equation of a line.

12. $P = C + MC$ for M

$$P - C = C + MC - C$$

$$P - C = MC$$

$$\frac{P-C}{C} = \frac{MC}{C}$$

$$\frac{P-C}{C} = M \text{ or } M = \frac{P-C}{C}$$

This is the business math formula for mark-up based on cost.

14. $A = \frac{1}{2}bh$ for h

$$2A = 2\left(\frac{1}{2}bh\right)$$

$$2A = bh$$

$$\frac{2A}{b} = \frac{bh}{b}$$

$$\frac{2A}{b} = h \text{ or } h = \frac{2A}{b}$$

This is the formula for the area of a triangle: area = $\frac{1}{2}$ · base · height.

16. $M = \frac{A}{740}$ for A

$$740M = 740\left(\frac{A}{740}\right)$$

$$740M = A \text{ or } A = 740M$$

18. $p = 15 + \frac{5d}{11}$ for d

$$11p = 11\left(15 + \frac{5d}{11}\right)$$

$$11p = 165 + 5d$$

$$11p - 165 = 5d$$

$$\frac{11p-165}{5} = d \text{ or } d = \frac{11p-165}{5}$$

20. $A = \frac{1}{2}(a+b)$ for b

$$2A = 2\left[\frac{1}{2}(a+b)\right]$$

$$2A = a + b$$

$$2A - a = b \text{ or } b = 2A - a$$

This is the formula for finding the average of two numbers.

22. $S = P + Prt$ for t

$S - P = Prt$

$\frac{S-P}{Pr} = \frac{Prt}{Pr}$

$\frac{S-P}{Pr} = t$ or $t = \frac{S-P}{Pr}$

This is the formula for finding the sum of principle and interest for simple interest problems.

24. $A = \frac{1}{2}h(a+b)$ for a

$2A = 2\left[\frac{1}{2}h(a+b)\right]$

$2A = h(a+b)$

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

$\frac{2A}{h} = a+b$

$\frac{2A}{h} - b = a + b - b$

$\frac{2A}{h} - b = a$ or $a = \frac{2A}{h} - b$

This is the formula for finding the area of a trapezoid.

26. $Ax + By = C$ for y

$Ax + By - Ax = C - Ax$

$By = C - Ax$

$\frac{By}{B} = \frac{C-Ax}{B}$

$y = \frac{C-Ax}{B}$

This is the standard form of the equation of a line.

28. To change a percent to a decimal number, move the decimal point two places to the left and remove the percent sign.

$83\% = 0.83$

30. $2.15\% = 0.0215$

32. $360\% = 3.6$

34. $8\% = 0.08$

36. $\frac{1}{4}\% = 0.25\% = 0.0025$

38. To change a decimal number to a percent, move the decimal point two places to the right and add a percent sign.

$0.16 = 16\%$

40. $0.008 = 0.8\%$

42. $5.38 = 538\%$

44. $85 = 8500\%$

46. $A = PB; P = 8\% = 0.08, B = 300$

$A = PB$

$A = 0.08(300) = 24$

48. $A = PB; P = 16\% = 0.16, B = 90$

$A = PB$

$A = 0.16(90) = 14.4$

16% of 90 is 14.4

50. $A = PB; A = 8, P = 40\% = 0.4$

$A = PB$

$8 = 0.4 \cdot B$

$\frac{8}{0.4} = \frac{0.4B}{0.4}$

$20 = B$

8 is 40% of 20.

52. $A = PB; A = 51.2, P = 32\% = 0.32$

$A = PB$

$51.2 = 0.32 \cdot B$

$\frac{51.2}{0.32} = \frac{0.32B}{0.32}$

$160 = B$

51.2 is 32% of 160.

54. $A = PB; A = 18; B = 90$

$A = PB$

$18 = P \cdot 90$

$\frac{18}{90} = \frac{P \cdot 90}{90}$

$0.2 = P$

$0.2 = 20\%$

18 is 20% of 90.

56. $A = PB; A = 0.6, B = 7.5$

$$A = PB$$
$$0.6 = P \cdot 7.5$$
$$\frac{0.6}{7.5} = \frac{P \cdot 7.5}{7.5}$$
$$0.08 = P$$
$$0.08 = 8\%$$

0.6 is 8% of 7.5.

58. The increase is $9 - 5 = 4$.

$$A = PB$$
$$4 = P \cdot 5$$
$$\frac{4}{5} = \frac{5P}{5}$$
$$0.80 = P$$

This is an 80% increase.

60. The decrease is $8 - 6 = 2$.

$$A = PB$$
$$2 = P \cdot 8$$
$$\frac{2}{8} = \frac{8P}{8}$$
$$0.25 = P$$

This is a 25% decrease.

62.
$$y = (a-b)x$$
$$\frac{y}{(a-b)} = \frac{(a-b)x}{(a-b)}$$
$$\frac{y}{a-b} = x \quad \text{or} \quad x = \frac{y}{a-b}$$

64.
$$y = (a+b)x - 8$$
$$y + 8 = (a+b)x - 8 + 8$$
$$y + 8 = (a+b)x$$
$$\frac{y+8}{(a+b)} = \frac{(a+b)x}{(a+b)}$$
$$\frac{y+8}{a+b} = x \quad \text{or} \quad x = \frac{y+8}{a+b}$$

66.
$$y = cx - dx$$
$$y = (c-d)x$$
$$\frac{y}{(c-d)} = \frac{(c-d)x}{(c-d)}$$
$$\frac{y}{c-d} = x \quad \text{or} \quad x = \frac{y}{c-d}$$

68.
$$y = Ax + Bx + C$$
$$y - C = Ax + Bx + C - C$$
$$y - C = Ax + Bx$$
$$y - C = (A+B)x$$
$$\frac{y-C}{(A+B)} = \frac{(A+B)x}{(A+B)}$$
$$\frac{y-C}{A+B} = x \quad \text{or} \quad x = \frac{y-C}{A+B}$$

70. a. $A = \frac{x+y+z+w}{4}$ for w

$$4A = 4\left(\frac{x+y+z+w}{4}\right)$$
$$4A = x + y + z + w$$
$$4A - x - y - z = x + y + z + w - x - y - z$$
$$4A - x - y - z = w$$

b. $w = 4A - xy - z; x = 76, y = 78, z = 79$

$$w = 4A - x - y - z$$
$$w = 4(80) - 76 - 78 - 79$$
$$w = 87$$

You need to get 87% on the fourth exam to have an average of 80%.

72. a. $F = \frac{9}{5}C + 32$ for C

$$5F = 5\left(\frac{9}{5}C + 32\right)$$
$$5F = 9C + 160$$
$$5F - 160 = 9C$$
$$\frac{5F-160}{9} = \frac{9C}{9}$$
$$\frac{5F-160}{9} = C$$

b. $C = \frac{5F-160}{9}; F = 59$

$$C = \frac{5F-160}{9}$$
$$C = \frac{5(59)-160}{9}$$
$$C = \frac{295-160}{9}$$
$$C = \frac{135}{9} = 15$$

$59°\text{F} = 15°\text{C}$

74. $0.41(1200) = 492$

492 of the single men would marry someone other than the perfect mate.

76. This is the equivalent of asking: 55 is 11% of what?

$$A = P \cdot B$$
$$55 = 0.11 \cdot B$$
$$\frac{55}{0.11} = \frac{0.11B}{0.11}$$
$$500 = B$$

Americans throw away 500 billion pounds of trash each year.

78. a. The total number of countries in 1974 was $41 + 48 + 63 = 152$.

$$A = P \cdot B$$
$$63 = P \cdot 152$$
$$\frac{63}{152} = \frac{152B}{152}$$
$$0.41 \approx B$$

About 41% of countries were not free in 1974.

b. The total number of countries in 2004 was $89 + 54 + 49 = 192$.

$$A = P \cdot B$$
$$49 = P \cdot 192$$
$$\frac{49}{192} = \frac{192B}{192}$$
$$0.26 \approx B$$

About 26% of countries were not free in 2004.

c. The decrease is $63 - 49 = 14$.

$$A = P \cdot B$$
$$14 = P \cdot 63$$
$$\frac{14}{63} = \frac{63B}{63}$$
$$0.22 \approx B$$

There was approximately a 22% decrease in the number of not free countries from 1974 to 2004.

80. This question is equivalent to, "225,000 is what percent of \$500,000?"

$$A = PB$$
$$225,000 = P \cdot 500,000$$
$$\frac{225,000}{500,000} = \frac{P \cdot 500,000}{500,000}$$
$$0.45 = P$$

The charity has raised 45% of the goal.

82. $\$3502 + 0.28(35,000 - \$23,000)$

$= \$3502 + 0.28(\$12,000)$

$= \$3502 + \$3360$

$= \$6862$

The income tax on a taxable income of \$35,000 is \$6862.

84. a. The sales tax is 7% of \$96.

$0.07(96) = 6.72$

The sales tax due on the graphing calculator is \$6.72.

b. The total cost is the sum of the price of the calculator and the sales tax.

$\$96 + \$6.72 = \$102.72$

The calculator's total cost is \$102.72.

86. a. The discount amount is 40% of \$16.50.

$0.4(16.50) = 6.60$

The discount amount is \$6.60.

b. The sale price is the regular price minus the discount amount.

$\$16.50 - \$6.60 = \$9.90$

The sale price is \$9.90.

88. The decrease is \$380 – \$266 = \$114.

$$A = P \cdot B$$
$$114 = P \cdot 380$$
$$\frac{114}{380} = \frac{P \cdot 380}{380}$$
$$0.30 = P$$

This is a 0.30 = 30% decrease.

90. No; the first sale price is 70% of the original amount and the second sale price is 80% of the *first sale price*. The second sale price would be obtained by the following computation:

$$A = P_2(P_1(B))$$
$$= 0.80(0.70B)$$
$$= 0.56B$$

The second sale price is 56% of the original price, so there is 44% reduction overall.

92. – 94. Answers will vary.

96. makes sense

98. does not make sense; Explanations will vary. Sample explanation: \$100 is more than enough because 20% of \$80 is $0.20 \cdot \$80 = \$16$.

100. false; Changes to make the statement true will vary. A sample change is: If $ax+b=0,$ then $ax=-b$ and $x=\dfrac{-b}{a}$.

102. false; Changes to make the statement true will vary. A sample change is: If $A=\dfrac{1}{2}bh,$ then $\dfrac{2A}{h}=b.$

104. $Q=\dfrac{100M}{C}$ for C

$$CQ=C\left(\frac{100M}{C}\right)$$
$$CQ=100M$$
$$\frac{CQ}{Q}=\frac{100M}{Q}$$
$$C=\frac{100M}{Q}$$

105.
$$5x+20=8x-16$$
$$5x+20-8x=8x-16-8x$$
$$-3x+20=-16$$
$$-3x+20-20=-16-20$$
$$-3x=-36$$
$$\frac{-3x}{-3}=\frac{-36}{-3}$$
$$x=12$$

Check:
$$5(12)+20=8(12)-16$$
$$60+20=96-16$$
$$80=80$$

The solution set is $\{12\}$.

106.
$$5(2y-3)-1=4(6+2y)$$
$$10y-15-1=24+8y$$
$$10y-16=24+8y$$
$$10y-16-8y=24+8y-8y$$
$$2y-16=24$$
$$2y-16+16=24+16$$
$$2y=40$$
$$\frac{2y}{2}=\frac{40}{2}$$
$$y=20$$

Check:
$$5(2\cdot 20-3)-1=4(6+2\cdot 20)$$
$$5(40-3)-1=4(6+40)$$
$$5(37)-1=4(46)$$
$$185-1=184$$
$$184=184$$

The solution set is $\{20\}$.

107. $x-0.3x=1x-0.3x=(1-0.3)x=0.7x$

108. $\dfrac{13}{x}-7x$

109. $8(x+14)$

110. $9(x-5)$

Chapter 2 Mid-Chapter Check Point

1. Begin by multiplying both sides of the equation by 4, the least common denominator.

$$\frac{x}{2}=12-\frac{x}{4}$$
$$4\left(\frac{x}{2}\right)=4(12)-4\left(\frac{x}{4}\right)$$
$$2x=48-x$$
$$2x+x=48-x+x$$
$$3x=48$$
$$\frac{3x}{3}=\frac{48}{3}$$
$$x=16$$

The solution set is $\{16\}$.

2. $5x-42=-57$

$5x-42+42=-57+42$

$5x=-15$

$\frac{5x}{5}=\frac{-15}{5}$

$x=-3$

The solution set is $\{-3\}$.

3. $H=\frac{EC}{825}$

$H\cdot 825=\frac{EC}{825}\cdot 825$

$825H=EC$

$\frac{825H}{E}=\frac{EC}{E}$

$\frac{825H}{E}=C$

4. $A=P\cdot B$

$A=0.06\cdot 140$

$A=8.4$

8.4 is 6% of 140.

5. $\frac{-x}{10}=-3$

$10\left(\frac{-x}{10}\right)=10(-3)$

$-x=-30$

$-1(-x)=-1(-30)$

$x=30$

The solution set is $\{30\}$.

6. $1-3(y-5)=4(2-3y)$

$1-3y+15=8-12y$

$-3y+16=8-12y$

$-3y+12y+16=8-12y+12y$

$9y+16=8$

$9y+16-16=8-16$

$9y=-8$

$\frac{9y}{9}=\frac{-8}{9}$

$y=-\frac{8}{9}$

The solution set is $\left\{-\frac{8}{9}\right\}$.

7. $S=2\pi rh$

$\frac{S}{2\pi h}=\frac{2\pi rh}{2\pi h}$

$\frac{S}{2\pi h}=r$

8. $A=P\cdot B$

$12=0.30\cdot B$

$\frac{12}{0.30}=\frac{0.30\cdot B}{0.30}$

$40=B$

12 is 30% of 40.

9. $\frac{3y}{5}+\frac{y}{2}=\frac{5y}{4}-3$

To clear fractions, multiply both sides by the LCD, 20.

$20\left(\frac{3y}{5}\right)+20\left(\frac{y}{2}\right)=20\left(\frac{5y}{4}\right)-20(3)$

$4(3y)+10y=5(5y)-60$

$12y+10y=25y-60$

$22y=25y-60$

$22y-25y=25y-25y-60$

$-3y=-60$

$\frac{-3y}{-3}=\frac{-60}{-3}$

$y=20$

The solution set is $\{20\}$.

10. $5z+7=6(z-2)-4(2z-3)$

$5z+7=6z-12-8z+12$

$5z+7=-2z$

$5z-5z+7=-2z-5z$

$7=-7z$

$\frac{7}{-7}=\frac{-7z}{-7}$

$-1=z$

The solution set is $\{-1\}$.

11. $Ax-By=C$

$Ax-By+By=C+By$

$Ax=C+By$

$\frac{Ax}{A}=\frac{C+By}{A}$

$x=\frac{C+By}{A}$ or $\frac{By+C}{A}$

12. $6y+7+3y=3(3y-1)$

$9y+7=9y-3$

$9y-9y+7=9y-9y-3$

$7=-3$

Since this is a false statement, there is no solution or $\{\ \}$.

13. $10\left(\frac{1}{2}x+3\right)=10\left(\frac{3}{5}x-1\right)$

$10\left(\frac{1}{2}x\right)+10(3)=10\left(\frac{3}{5}x\right)-10(1)$

$5x+30=6x-10$

$5x-5x+30=6x-5x-10$

$30=x-10$

$30+10=x-10+10$

$40=x$

The solution set is $\{40\}$.

14. $A=P\cdot B$

$50=P\cdot 400$

$\frac{50}{400}=\frac{P\cdot 400}{400}$

$0.125=P$

50 is 0.125 = 12.5% of 400.

15. $\frac{3(m+2)}{4}=2m+3$

$4\cdot\frac{3(m+2)}{4}=4(2m+3)$

$3(m+2)=4(2m+3)$

$3m+6=8m+12$

$3m-3m+6=8m-3m+12$

$6=5m+12$

$6-12=5m+12-12$

$-6=5m$

$\frac{-6}{5}=\frac{5m}{5}$

$-\frac{6}{5}=m$

The solution set is $\left\{-\frac{6}{5}\right\}$.

16. The increase is 50 – 40 = 10.

$A=P\cdot B$

$10=P\cdot 40$

$\frac{10}{40}=\frac{P\cdot 40}{40}$

$0.25=P$

This is a 0.25 = 25% increase.

17. $12w-4+8w-4=4(5w-2)$

$20w-8=20w-8$

$20w-20w-8=20w-20w-8$

$-8=-8$

Since –8 = –8 is a true statement, the solution is all real numbers or $\{x\,|\,x \text{ is a real number}\}$.

18. **a.** $G=-\frac{1}{2}n+47$

$G=-\frac{1}{2}(10)+47$

$=-5+47$

$=42$

According to the formula, 42% of Americans had guns in their homes in 1990.
This underestimates the actual percentage shown in the gar graph by 0.7%

b. $G=-\frac{1}{2}n+47$

$30=-\frac{1}{2}n+47$

$2\cdot 30=2\left(-\frac{1}{2}n+47\right)$

$60=-n+94$

$60-94=-n+94-94$

$-34=-n$

$n=34$

According to the formula, 30% of Americans will have guns in their homes 34 years after 1980, or 2014.

2.5 Check Points

1. Let x = the number.

$$6x - 4 = 68$$
$$6x - 4 + 4 = 68 + 4$$
$$6x = 72$$
$$x = 12$$

The number is 12.

2. Let x = the average salary for elementary school teachers.

Let $x + 54,890 =$ the average salary for lawyers

$$x + (x + 54,890) = 142,970$$
$$x + x + 54,890 = 142,970$$
$$2x + 54,890 = 142,970$$
$$2x + 54,890 - 54,890 = 142,970 - 54,890$$
$$2x = 88,080$$
$$x = 44,040$$

The average salary for elementary school teachers is \$44,040 and the average salary for lawyers is $\$44,040 + \$54,890 = \$98,930$.

3. Let x = the page number of the first facing page.

Let $x + 1 =$ the page number of the second facing page.

$$x + (x + 1) = 145$$
$$x + x + 1 = 145$$
$$2x + 1 = 145$$
$$2x + 1 - 1 = 145 - 1$$
$$2x = 144$$
$$x = 72$$
$$x + 1 = 73$$

The page numbers are 72 and 73.

4. Let x = the number of eighths of a mile traveled.

$$2 + 0.25x = 10$$
$$2 - 2 + 0.25x = 10 - 2$$
$$0.25x = 8$$
$$\frac{0.25x}{0.25} = \frac{8}{0.25}$$
$$x = 32$$

You can go 32 eighths of a mile. That is equivalent to $\frac{32}{8} = 4$ miles.

5. Let x = the width of the swimming pool.

Let $3x =$ the length of the swimming pool.

$$P = 2l + 2w$$
$$320 = 2 \cdot 3x + 2 \cdot x$$
$$320 = 6x + 2x$$
$$320 = 8x$$
$$\frac{320}{8} = \frac{8x}{8}$$
$$40 = x$$
$$x = 40$$
$$3x = 120$$

The pool is 40 feet wide and 120 feet long.

6. Let x = the original price.

$$\underbrace{\text{Original price}}_{x} \quad \underbrace{\text{minus}}_{-} \quad \underbrace{\text{the reduction (40\% of original price)}}_{0.4x} \quad \underbrace{\text{is}}_{=} \quad \underbrace{\text{the reduced price, \$564}}_{564}$$

$$x - 0.4x = 564$$
$$0.6x = 564$$
$$\frac{0.6x}{0.6} = \frac{564}{0.6}$$
$$x = 940$$

The original price was \$940.

2.5 Exercise Set

2. $x + 43 = 107$

$$x + 43 - 43 = 107 - 43$$
$$x = 64$$

The number is 64.

4. $x - 17 = 96$

$$x - 17 + 17 = 96 + 17$$
$$x = 113$$

The number is 113.

6. $8x = 272$

$$\frac{8x}{8} = \frac{272}{8}$$
$$x = 34$$

The number is 34.

8. $\frac{x}{14} = 8$

$14\left(\frac{x}{14}\right) = 14(8)$

$x = 112$

The number is 112.

10. $5 + 3x = 59$

$3x = 54$

$x = 18$

The number is 18.

12. $6x - 8 = 298$

$6x = 306$

$x = 51$

The number is 51.

14. $x + 12 = 4x$

$12 = 3x$

$4 = x$

The number is 4.

16. $3(5 + x) = 48$

$15 + 3x = 48$

$3x = 33$

$x = 11$

The number is 11.

18. $5 + 4x = x + 35$

$5 + 3x = 35$

$3x = 30$

$x = 10$

The number is 10.

20. $\frac{3x}{4} - 3 = 9$

$\frac{3x}{4} = 12$

$3x = 48$

$x = 16$

The number is 16.

22. Let x = number of weeks Americans spend on vacation.

Let $x + 4 =$ number of weeks Italians spend on vacation.

$x + (x + 4) = 11.8$

$x + x + 4 = 11.8$

$2x + 4 - 4 = 11.8 - 4$

$2x = 7.8$

$x = 3.9$

$x + 4 = 7.9$

Americans spend an average of 3.9 weeks on vacation and Italians spend an average of 7.9 weeks.

24. Let x = the average salary for janitors.

Let $3x - 3500 =$ the average salary for registered nurses.

$x + (3x - 3500) = 74,060$

$x + 3x - 3500 = 74,060$

$4x - 3500 = 74,060$

$4x - 3500 + 3500 = 74,060 + 3500$

$4x = 77,560$

$x = 19,390$

$3x - 3500 = 54,760$

The average salary for janitors is \$19,390 and the average salary for registered nurses is \$54,760.

26. Let x = the number of the left-hand page.

Let $x + 1$ = the number of the right-hand page.

$x + (x + 1) = 525$

$2x + 1 = 525$

$2x = 524$

$x = 262$

The smaller page number is 262. The larger page number is 262 + 1 = 263.

28. Let x = the first consecutive even integer (Hank Greenberg).

Let $x + 2 =$ the second consecutive even integer (Babe Ruth).

$x + (x + 2) = 118$

$x + x + 2 = 118$

$2x + 2 = 118$

$2x = 116$

$x = 58$

$x + 2 = 60$

Hank Greenberg had 58 home runs and Babe Ruth had 60.

30. Let x = the number of miles you can travel in one week for \$395.

$$180 + 0.25x = 395$$
$$180 + 0.25x - 180 = 395 - 180$$
$$0.25x = 215$$
$$\frac{0.25x}{0.25} = \frac{215}{0.25}$$
$$x = 860$$

You can travel 860 miles in one week for \$395.

32. Let x = the number of years after 2004.

$$630 + 1.40x = 651$$
$$630 - 630 + 1.40x = 651 - 630$$
$$1.40x = 21$$
$$\frac{1.40x}{1.40} = \frac{21}{1.40}$$
$$x = 15$$

Rent payments will average \$651 fifteen years after 2004, or 2019.

34. Let x = the width of the field.
Let $5x =$ the length of the field.

$$P = 2l + 2w$$
$$288 = 2 \cdot 5x + 2 \cdot x$$
$$288 = 10x + 2x$$
$$288 = 12x$$
$$\frac{288}{12} = \frac{12x}{12}$$
$$24 = x$$
$$x = 24$$
$$5x = 120$$

The field is 24 yards wide and 120 yards long.

36. Let x = the width of a basketball court.
Let $x + 13 =$ the length of a basketball court.

$$P = 2l + 2w$$
$$86 = 2(x + 13) + 2 \cdot x$$
$$86 = 2x + 26 + 2x$$
$$86 = 4x + 26$$
$$60 = 4x$$
$$15 = x$$
$$x = 15$$
$$x + 13 = 28$$

A basketball court is 15 meters wide and 28 meters long.

38. As shown in the diagram,
let x = the length of a shelf and $x + 3$ = the height of the bookcase,
4 shelves and 2 heights are needed.
Since 18 feet of lumber is available,

$$4x + 2(x + 3) = 18.$$
$$4x + 2x + 6 = 18$$
$$6x + 6 = 18$$
$$6x = 12$$
$$x = 2$$
$$x + 3 = 5$$

The length of each shelf is 2 feet and the height of the unit is 5 feet.

40. Let x = the price before the reduction.

$$x - 0.30x = 98$$
$$0.70x = 98$$
$$\frac{0.70x}{0.70} = \frac{98}{0.70}$$
$$x = 140$$

The VCR's price before the reduction was \$140.

42. Let x = the last year's salary.

$$x + 0.09x = 42,074$$
$$1.09x = 42,074$$
$$\frac{1.09x}{1.09} = \frac{42,074}{1.09}$$
$$x = 38,600$$

Last year's salary was \$38,600.

44. Let x = the nightly cost without tax.

$$x + 0.08x = 172.80$$
$$1.08x = 172.80$$
$$\frac{1.08x}{1.08} = \frac{172.80}{1.08}$$
$$x = 160$$

The nightly cost without tax is \$160.

46. Let x = the number of hours of labor.

$$532 + 63x = 1603$$
$$532 + 63x - 532 = 1603 - 532$$
$$63x = 1071$$
$$\frac{63x}{63} = \frac{1071}{63}$$
$$x = 17$$

It took 17 hours of labor to repair the sailboat.

48. – 50. Answers will vary.

52. makes sense

54. does not make sense; Explanations will vary. Sample explanation: It is correct to use $x+2$ for the second consecutive odd integer because any odd integer is 2 more than the previous odd integer. In other words, adding 2 to the first odd integer will skip over the even integer and take you to the next odd integer.

56. false; Changes to make the statement true will vary. A sample change is: This should be modeled by $x-0.35x=780$.

58. true

60. Let x = the number of minutes.
Note that \$0.55 is the cost of the first minute and $\$0.40(x-1)$ is the cost of the remaining minutes.

$$0.55+0.40(x-1)=6.95$$
$$0.55+0.4x-0.40=6.95$$
$$0.4x+0.15=6.95$$
$$0.4x+0.15-0.15=6.95-0.15$$
$$0.4x=6.80$$
$$\frac{0.4x}{0.4}=\frac{6.80}{0.4}$$
$$x=17$$

The phone call lasted 17 minutes.

62. Let x = weight of unpeeled bananas.
Let $\frac{1}{8}x$ = the weight of banana peel and $\frac{7}{8}x$ = the weight of peeled banana.
The information in the cartoon translates into the equation.

$$x=\frac{7}{8}x+\frac{7}{8}$$

To solve this equation, first eliminate fractions by multiplying both sides by the LCD, which is 8.

$$8x=8\left(\frac{7}{8}x+\frac{7}{8}\right)$$
$$8x=8\left(\frac{7}{8}x\right)+8\left(\frac{7}{8}\right)$$
$$8x=7x+7$$
$$8x-7x=7x+7-7x$$
$$x=7$$

The unpeeled banana weighs 7 ounces.

63.
$$\frac{4}{5}x=-16$$
$$\frac{5}{4}\left(\frac{4}{5}x\right)=\frac{5}{4}(-16)$$
$$x=-20$$

Check:
$$\frac{4}{5}(-20)=-16$$
$$\frac{4}{5}\cdot\frac{-20}{1}=-16$$
$$\frac{-80}{5}=-16$$
$$-16=-16$$

The solution set is $\{-20\}$.

64.
$$6(y-1)+7=9y-y+1$$
$$6y-6+7=9y-y+1$$
$$6y+1=8y+1$$
$$6y+1-1=8y+1-1$$
$$6y=8y$$
$$6y-8y=8y-8y$$
$$-2y=0$$
$$y=0$$

Check:
$$6(0-1)+7=9(0)-0+1$$
$$6-10+7=0-0+1$$
$$1=1$$

The solution set is $\{0\}$.

65. $V=\frac{1}{3}lwh$ for w

$$V=\frac{1}{3}lwh$$
$$3V=3\left(\frac{1}{3}lwh\right)$$
$$3V=lwh$$
$$\frac{3V}{lh}=\frac{lwh}{lh}$$
$$\frac{3V}{lh}=w \quad \text{or} \quad w=\frac{3V}{lh}$$

66. $A = \frac{1}{2}bh$

$30 = \frac{1}{2}(12)h$

$\frac{30}{6} = \frac{6h}{6}$

$5 = h$

67. $A = \frac{1}{2}h(a+b)$

$A = \frac{1}{2}\cdot 7\cdot(10+16) = \frac{1}{2}\cdot 7\cdot(26) = 91$

68. $x = 4(90-x)-40$

$x = 360-4x-40$

$x = 320-4x$

$x+4x = 320-4x+4x$

$5x = 320$

$\frac{5x}{5} = \frac{320}{5}$

$x = 64$

The solution set is $\{64\}$.

2.6 Check Points

1. $A = 24, b = 4$

$A = \frac{1}{2}bh$

$24 = \frac{1}{2}\cdot 4\cdot h$

$24 = 2h$

$12 = h$

The height of the sail is 12 ft.

2. Use the formulas for the area and circumference of a circle. The radius is 20 ft.

$A = \pi r^2$

$A = \pi(20)^2$

$= 400\pi$

≈ 1256 or 1257

The area is 400π ft^2 or approximately 1256 ft^2 or 1257 ft^2.

$C = 2\pi r$

$C = 2\pi(20)$

$= 40\pi$

≈ 126

The circumference is 40π ft or approximately 126 ft.

3. The radius of the large pizza is 9 inches, and the radius of the medium pizza is 7 inches.

large pizza:

$A = \pi r^2 = \pi(9 \text{ in.})^2 = 81\pi \text{ in.}^2 \approx 254 \text{ in.}^2$

medium pizza:

$A = \pi r^2 = \pi(7 \text{ in.})^2 = 49\pi \text{ in.}^2 \approx 154 \text{ in.}^2$

For each pizza, find the price per inch by dividing the price by the area.

Price per square inch for the large pizza

$= \frac{\$20.00}{81\pi \text{ in.}^2} \approx \frac{\$20.00}{254 \text{ in.}^2} \approx \frac{\$0.08}{\text{in.}^2}$

Price per square inch for the medium pizza

$= \frac{\$14.00}{49\pi \text{ in.}^2} \approx \frac{\$14.00}{154 \text{ in.}^2} \approx \frac{\$0.09}{\text{in.}^2}$.

The large pizza is the better buy.

4. Smaller cylinder: $r = 3$ in., $h = 5$ in.

$V = \pi r^2 h$

$V = \pi(3)^2\cdot 5$

$= 45\pi$

The volume of the smaller cylinder is $45\pi \text{ in.}^3$.

Larger cylinder: $r = 3$ in., $h = 10$ in.

$V = \pi r^2 h$

$V = \pi(3)^2\cdot 10$

$= 90\pi$

The volume of the smaller cylinder is $90\pi \text{ in.}^3$.

The ratio of the volumes of the two cylinders is

$\frac{V_{\text{larger}}}{V_{\text{smaller}}} = \frac{90\pi \text{ in.}^3}{45\pi \text{ in.}^3} = \frac{2}{1}$.

So, the volume of the larger cylinder is 2 times the volume of the smaller cylinder.

5. Use the formula for the volume of a sphere. The radius is 4.5 in.

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(4.5)^3$

$= 121.5\pi$

≈ 382

The volume is approximately 382 in.^3. Thus the 350 cubic inches will not be enough to fill the ball.

6. Let $3x$ = the measure of the first angle.
Let x = the measure of the second angle.
Let $x - 20$ = the measure of the third angle.

$$3x + x + (x - 20) = 180$$
$$5x - 20 = 180$$
$$5x = 200$$
$$x = 40$$
$$3x = 120$$
$$x - 20 = 20$$

The three angle measures are 120°, 40°, and 20°.

7. *Step 1* Let x = the measure of the angle.

Step 2 Let $90 - x$ = the measure of its complement.

Step 3 The angle's measure is twice that of its complement, so the equation is $x = 2 \cdot (90 - x)$.

Step 4 Solve this equation

$$x = 2 \cdot (90 - x)$$
$$x = 180 - 2x$$
$$x + 2x = 180 - 2x + 2x$$
$$3x = 180$$
$$x = 60$$

The measure of the angle is 60°.

Step 5 The complement of the angle is $90° - 60° = 30°$, and 60° is indeed twice 30°.

2.6 Exercise Set

2. Use the formulas for the perimeter and area of a rectangle. The length is 4 ft and the width is 3 ft.

$$P = 2l + 2w$$
$$P = 2(4) + 2(3)$$
$$P = 8 + 6 = 14$$

The perimeter is 14 ft.

$$A = lw$$
$$A = 4 \cdot 3 = 12$$

The area is 12 ft^2.

4. Use the formula for the area of a triangle. The base is 30 m and the height is 33 m.

$$A = \frac{1}{2}bh$$
$$A = \frac{1}{2}(30)(33) = 495$$

The area is 495 m^2.

6. Use the formula for the area of a trapezoid. The bases are 37 meters and 26 meters and the height is 18 meters.

$$A = \frac{1}{2}h(a + b)$$
$$A = \frac{1}{2}(18)(37 + 26)$$
$$A = \frac{1}{2} \cdot 18 \cdot 63 = 567$$

The area is 567 m^2.

8. $A = 2450; w = 35$

$$A = lw$$
$$2450 = l \cdot 35$$
$$70 = l$$

The length of the swimming pool is 70 ft.

10. $A = 30, b = 6$

$$A = \frac{1}{2}bh$$
$$30 = \frac{1}{2} \cdot 6 \cdot h$$
$$60 = 6h$$
$$10 = h$$

The height is 10 ft.

12. $P = 208, w = 46$

$P = 2l + 2w$

$208 = 2l + 2(46)$

$208 = 2l + 92$

$116 = 2l$

$58 = l$

The length of the rectangle is 58 cm.

14. Use the formula for the area and circumference of a circle. The radius is 9m.

$A = \pi r^2$

$A = \pi (9)^2$

$= 81\pi$

≈ 254

The area is 81π m^2 or approximately 254 m^2.

$C = 2\pi r$

$C = 2\pi (9)$

$= 18\pi$

≈ 57

The circumference is 18π m or approximately 57 m.

16. Since the diameter is 40 ft, the radius is $\frac{40}{2} = 20$ ft.

$A = \pi r^2$

$A = \pi (20)^2$

$= 400\pi$

≈ 1257

The area is 400π ft^2 or approximately 1257 ft^2.

$C = 2\pi r$

$C = 2\pi \cdot 20$

$= 40\pi$

≈ 126

The circumference is 40π ft or approximately 126 ft.

18. $C = 2\pi r$

$16\pi = 2\pi r$

$\frac{16\pi}{2\pi} = \frac{2\pi r}{2\pi}$

$8 = r$

The radius is 8 in. and the diameter is $2 \cdot 8 = 16$ in.

20. Use the formula for the volume of a rectangular solid. The length is 5 cm and width and height are each 3 cm.

$V = lwh$

$V = 5 \cdot 3 \cdot 3$

$= 45$

The volume is 45 cm^3.

22. Use the formula for the volume of a cylinder. The radius is 6 cm and the height is 8 cm.

$V = \pi r^2 h$

$V = \pi (6)^2 \cdot 8$

$= 288\pi$

≈ 905

The volume is 288π cm^3 or approximately 905 cm^3.

24. Use the formula for the volume of a sphere. The diameter is 24 in., so the radius is 12 in.

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi (12)^3$

$= 2304\pi$

≈ 7238

The volume is 2304π in^3 or approximately 7238 in^3.

26. Use the formula for the volume of a cone. The radius is 5 m and the height is 16 m.

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi (5)^2 \cdot 16$

$= \frac{400}{3}\pi$

≈ 419

The volume is $\frac{400}{3}\pi$ m^3 or approximately 419 m^3.

28. $V = \frac{1}{3}\pi r^2 h$

$3V = 3\left(\frac{1}{3}\pi r^2 h\right)$

$3V = \pi r^2 h$

$\frac{3V}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2}$

$\frac{3V}{\pi r^2} = h$ or $h = \frac{3V}{\pi r^2}$

30. Smaller cylinder; $r = 2$ in., $h = 3$ in.

$V = \pi r^2 h$

$V = \pi(2)^2 \cdot 3$

$V = 12\pi$

The volume of the smaller cylinder is 12π in^3.

Large cylinder: $r = 4(2 \text{ in.}) = 8$ in., $h = 3$ in.

$V = \pi r^2 h$

$V = \pi(8)^2 \cdot 3$

$V = 192\pi$

The volume of the larger cylinder is 192π in.^{3}.
The ratio of the volumes of the two cylinders is $\frac{V_{\text{Larger}}}{V_{\text{Smaller}}} = \frac{192\pi}{12\pi} = \frac{16}{1}$, so the volume of the larger cylinder is 16 times the volume of the smaller cylinder.

32. The sum of the measures of the three angles of a triangle is 180°.

$x + 3x + (x + 40) = 180$

$5x + 40 = 180$

$5x = 140$

$x = 28$

$3x = 84$

$x + 40 = 68$

The three angle measures are 28°, 84°, and 68°.

34. $x + 4x + 5x = 180$

$10x = 180$

$x = 18$

$4x = 72$

$5x = 90$

The three angle measures are 18°, 72°, and 90°.

36. Let x = the measure of the smallest angle.
Let $3x$ = the measure of the second angle.
Let $x + 30$ = the measure of the third angle.

$x + 3x + (x + 30) = 180$

$5x + 30 = 180$

$5x = 150$

$x = 30$

$3x = 90$

$x + 30 = 60$

The three angle measures are 30°, 90°, and 60°.

38. If the measure of an angle is 41°, the measure of its complement is 90° – 41° = 49°.

40. If the measure of an angle is 2°,the measure of its complement is 90° – 2° = 88°

42. If the measure of an angle is 93°, the measure of its supplement is 180° – 93° = 87°.

44. If the measure of an angle is 179.5°, the measure of its supplement is 180° – 179.5° = 0.5°

46. *Step 1* Let x = the measure of the angle.

Step 2 Then $90 - x$ = the measure of its complement.

Step 3 The angle's measure is 78° less than that of its complement, so the equation is $x = (90 - x) - 78$.

Step 4 Solve this equation

$x = 90 - x - 78$

$x = 12 - x$

$2x = 12$

$x = 6$

The measure of the angle is 6°.

Step 5 The complement of the angle is 90° - 6° = 84°, and 6° is 78° less than 84°.

48. *Step 1* Let x = the measure of the angle.

Step 2 Then $180 - x$ = the measure of its supplement.

Step 3 The angle's measure is 16° more than three times that of its supplement, so the equation is $x = 3(180 - x) + 16$.

Step 4 Solve this equation

$$x = 3(180 - x) + 16$$
$$x = 540 - 3x + 16$$
$$x = 556 - 3x$$
$$4x = 556$$
$$x = 139$$

The measure of the angle is 139°.

Step 5 The measure of its supplement is 180° - 139° = 41°, and 139° = 3(41°) + 16°, so the proposed solution checks.

50. *Step 1* Let x = the measure of the angle.

Step 2 Let $180 - x$ = the measure of its supplement, and, $90 - x$ = the measure of its complement.

Step 3 The measure of the angle's supplement is 10° more than three times that of its complement, so the equation is $180 - x = 3(90 - x) + 10$.

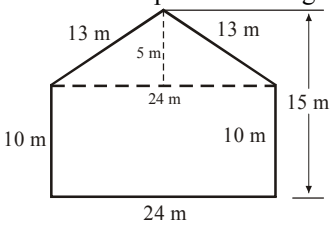
Step 4 Solve this equation

$$180 - x = 2(90 - x) + 52$$
$$180 - x = 180 - 2x + 52$$
$$180 - x = 232 - 2x$$
$$180 - x + 2x = 232 - 2x + 2x$$
$$180 + x = 232$$
$$x = 52$$

The measure of the angle is $52°$.

Step 5 The measure of its supplement is 128° and the measure of its complement is 38°. Since 128° = 2(38°) + 52°, the proposed solution checks.

52. Divide the shape into a triangle and a rectangle.



$$A_{\text{entire figure}} = A_{\text{rectangle}} + A_{\text{triangle}}$$
$$A_{\text{entire figure}} = lw + \frac{1}{2}bh$$
$$= 10(24) + \frac{1}{2}(24)(15 - 10)$$
$$= 240 + \frac{1}{2}(24)(5)$$
$$= 240 + 60 = 300$$

The area of the figure is 300 m^2.

54. Subtract the area of the two smaller circles from the area of the larger circle. Note that the radius of the large circle is 4 and note that the two smaller circles are the same size.

$$A_{\text{shaded}} = A_{\text{larger circle}} - 2 \cdot A_{\text{smaller circle}}$$
$$= \pi R^2 - 2 \cdot \pi r^2$$
$$= \pi(4)^2 - 2 \cdot \pi(2)^2$$
$$= \pi(16) - 2 \cdot \pi(4)$$
$$= 16\pi - 8\pi$$
$$= 8\pi$$

The shaded area is $8\pi \text{ cm}^2$.

56. Subtract the volume of the smaller cylinder from the volume of the larger cylinder.

$$V_{\text{shaded}} = V_{\text{larger cylinder}} - V_{\text{smaller cylinder}}$$
$$= \pi R^2 h - \pi r^2 h$$
$$= \pi\left(\frac{6}{2}\right)^2 \cdot 10 - \pi\left(\frac{2}{2}\right)^2 \cdot 10$$
$$= \pi(3)^2 \cdot 10 - \pi(1)^2 \cdot 10$$
$$= 90\pi - 10\pi$$
$$= 80\pi$$

The volume of the shaded region is 80π cubic inches.

58. a. The area of the lot is
$(500 \text{ ft})(200 \text{ ft}) = 100,000 \text{ ft}^2$.
The area of the house is
$(100 \text{ ft})(60 \text{ ft}) = 6000 \text{ ft}^2$.
The area of the shed is $(20 \text{ ft})(20 \text{ ft}) = 400 \text{ ft}^2$.
The area of the driveway is
$(20 \text{ ft})(100 \text{ ft}) = 2000 \text{ ft}^2$.
Therefore, the area of the lawn is
$100,000 - 6000 - 400 - 2000 = 91,600 \text{ ft}^2$.
Since each bag of fertilizer covers 4000 square feet and $\frac{91,600}{4000} = 22.9$, 23 bags of fertilizer will be needed.

b. The cost of the fertilizer is $23(\$25) = \$575$.

60. The radius of the large pizza is $\frac{1}{2} \cdot 16$ inches = 8 inches, and the radius of each small pizza is $\frac{1}{2} \cdot 10$ inches = 5 inches.
Large pizza:
$A = \pi r^2 = \pi(8 \text{ in.})^2 = 64\pi \text{ in.}^2 \approx 201 \text{ in.}^2$
Small pizza:
$A = \pi r^2 = \pi(5 \text{ in.})^2 = 25\pi \text{ in.}^2 \approx 79 \text{ in.}^2$
The area of one large pizza is about 201 in.^2 and the area of two small pizzas is about 2(79 in.^2) = 158 in.^2. Since the price of one large pizza is the same as the price of two small pizzas and the large pizza has the greater area, the large pizza is the better buy. (Because the prices are the same, it is not necessary to find the prices per square inch in this case.)

62. The area of the rectangular portion of the floor is (60 ft)(40 ft) = 2400 ft^2.
Since the radius of each semicircle is 20 ft and the two semicircles together make one circle, the area of the two semicircular portion of the floor is
$\pi(20 \text{ ft})^2 = 400\pi \text{ ft}^2$.
Therefore, the area of the dance floor is
$2400 \text{ ft}^2 + 400\pi \text{ ft}^2$.
Since the flooring costs \$10.00 per square foot, the cost of hardwood flooring for the dance floor will be about $\$10(2400 + 400\pi) = \$36,566$.

64. The circumference of the garden is
$2\pi(30 \text{ ft}) = 60\pi \text{ ft}$.
Since 6 in. = $\frac{1}{2}$ ft., the number of plants needed is
$\frac{60\pi}{\frac{1}{2}} = 2(60\pi) = 120\pi \approx 377$.
To the nearest whole number, 377 plants are needed.

66. The volume of the foundation is (4 yd)(3 yd). (2 yd) = 24 yd^3. Since each truck holds 6 yd^3 of dirt, $\frac{24}{6} = 4$ truckloads will be needed. Since the charge to remove the dirt is \$10 per load, the cost to have all the dirt hauled away is 4(\$10) = \$40.

68. The volume of each tunnel is $V = \frac{1}{2}\pi r^2 h$
$V = \frac{1}{2}\pi(4)^2 \cdot 50,000$
$V = 400,000\pi$
The volume of each tunnel is $400,000\pi \text{ m}^3$., so the volume of all three tunnels, which is the total amount of dirt that had to be removed, is
$3(400,000\pi) = 1,200,000\pi \text{ m}^3 \approx 3,769,900 \text{ m}^3$.

70. – 78. Answers will vary.

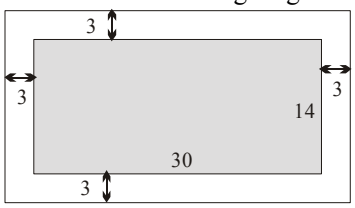
80. does not make sense; Explanations will vary. Sample explanation: The sum of the three angles of the triangle must be 180°, but these three values total 181°.

82. makes sense

84. true

86. true

88. Consider the following diagram:



The area of the outer rectangle (pool plus path) is (36 ft)(20 ft) = 720 ft^2. The area of the inner rectangle (pool only) is (30 ft)(14 ft) = 420 ft^2. Therefore, the area of the walk is $720\text{ft}^2 - 420\text{ft}^2 = 300\text{ft}^2$.
Since the cost to resurface the path is \$2 per square foot, the total cost of resurfacing the path is 300(\$2) = \$600.

90. If the length, width, and height of a rectangular solid are each multiplied by 10, the volume will be multiplied by $10 \cdot 10 \cdot 10 = 1000$. The volume of the car will be 1000 times that of the model.

92. $P = 2s + b$ for s

$$P - b = 2s$$
$$\frac{P-b}{2} = \frac{2s}{2}$$
$$\frac{P-b}{2} = s \quad \text{or} \quad s = \frac{P-b}{2}$$

93. $\frac{x}{2} + 7 = 13 - \frac{x}{4}$

Multiply both sides by the LCD, 4.

$$4\left(\frac{x}{2} + 7\right) = 4\left(13 - \frac{x}{4}\right)$$
$$2x + 28 = 52 - x$$
$$2x + 28 + x = 52 - x + x$$
$$3x + 28 = 52$$
$$3x + 28 - 28 = 52 - 28$$
$$3x = 24$$
$$\frac{3x}{3} = \frac{24}{3}$$
$$x = 8$$

The solution set is $\{8\}$.

94. $\left[3\left(12 \div 2^2 - 3\right)^2\right]^2$

$$= \left[3\left(12 \div 4 - 3\right)^2\right]^2$$
$$= \left[3\left(3 - 3\right)^2\right]^2 = \left(3 \cdot 0^2\right)^2 = 0^2 = 0$$

95. $x + 3 < 8$

$2 + 3 < 8$

$5 < 8$, true

2 is a solution to the inequality

96. $4y - 7 \geq 5$

$4(6) - 7 \geq 5$

$24 - 7 \geq 5$

$17 \geq 5$, true

6 is a solution to the inequality.

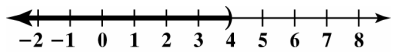
97. $2(x-3) + 5x = 8(x-1)$

$$2x - 6 + 5x = 8x - 8$$
$$7x - 6 = 8x - 8$$
$$7x - 8x - 6 = 8x - 8x - 8$$
$$-x - 6 + 6 = -8 + 6$$
$$-x = -2$$
$$x = 2$$

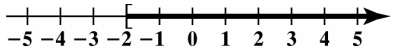
The solution set is $\{2\}$.

2.7 Check Points

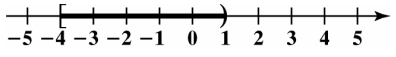
1. a.



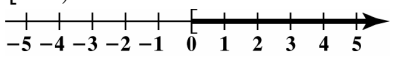
b.



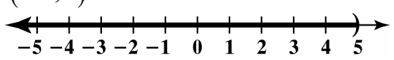
c.



2. a. $[0, \infty)$



b. $(-\infty, 5)$

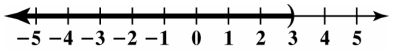


3. $x+6<9$

$x+6-6<9-6$

$x<3$

The solution set is $(-\infty,3)$ or $\{x|x<3\}$.



4. $8x-2\geq 7x-4$

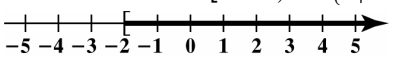
$8x-7x-2\geq 7x-7x-4$

$x-2\geq -4$

$x-2+2\geq -4+2$

$x\geq -2$

The solution set is $[-2,\infty)$ or $\{x|x\geq -2\}$.

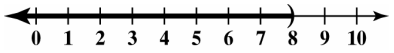


5. a. $\frac{1}{4}x<2$

$4\cdot\frac{1}{4}x<4\cdot 2$

$x<8$

The solution set is $(-\infty,8)$ or $\{x|x<8\}$.

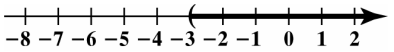


b. $-6x<18$

$\frac{-6x}{-6}>\frac{18}{-6}$

$x>-3$

The solution set is $(-3,\infty)$ or $\{x|x>-3\}$.



6. $5y-3\geq 17$

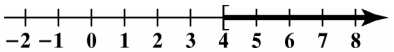
$5y-3+3\geq 17+3$

$5y\geq 20$

$\frac{5y}{5}\geq\frac{20}{5}$

$y\geq 4$

The solution set is $[4,\infty)$ or $\{y|y\geq 4\}$.



7. $6-3x\leq 5x-2$

$6-3x-5x\leq 5x-5x-2$

$6-8x\leq -2$

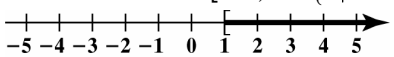
$6-6-8x\leq -2-6$

$-8x\leq -8$

$\frac{-8x}{-8}\geq\frac{-8}{-8}$

$x\geq 1$

The solution set is $[1,\infty)$ or $\{x|x\geq 1\}$.



8. $2(x-3)-1\leq 3(x+2)-14$

$2x-6-1\leq 3x+6-14$

$2x-7\leq 3x-8$

$2x-3x-7\leq 3x-3x-8$

$-x-7\leq -8$

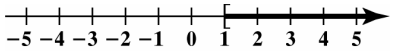
$-x-7+7\leq -8+7$

$-x\leq -1$

$\frac{-x}{-1}\geq\frac{-1}{-1}$

$x\geq 1$

The solution set is $[1,\infty)$ or $\{x|x\geq 1\}$.



9. $4(x+2)>4x+15$

$4x+8>4x+15$

$4x-4x+8>4x-4x+15$

$8>15,$ false

There is no solution or $\{\ \}$.

10. $3(x+1)\geq 2x+1+x$

$3x+3\geq 3x+1$

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

$3\geq 1,$ true

The solution is $(-\infty,\infty)$ or $\{x|x \text{ is a real number}\}$.

11. Let x = your grade on the final examination.

$$\frac{82+74+78+x+x}{5} \geq 80$$

$$\frac{234+2x}{5} \geq 80$$

$$5\left(\frac{234+2x}{5}\right) \geq 5 \cdot 80$$

$$234+2x \geq 400$$

$$234-234+2x \geq 400-234$$

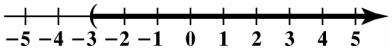
$$2x \geq 166$$

$$x \geq 83$$

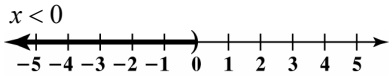
To earn a B you must get at least an 83% on the final examination.

2.7 Exercise Set

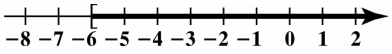
2. $x > -3$



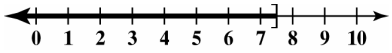
4. $x < 0$



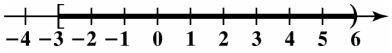
6. $x \geq -6$



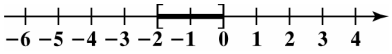
8. $x \leq 7.5$



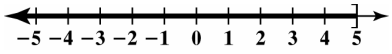
10. $-3 \leq x < 6$



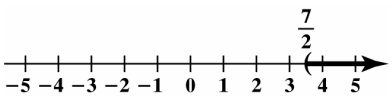
12. $-2 \leq x \leq 0$



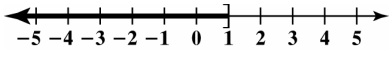
14. $(-\infty, 5]$



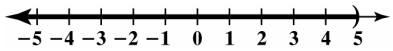
16. $\left(\frac{7}{2}, \infty\right)$



18. $(-\infty, 1]$



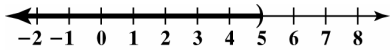
20. $(-\infty, 5)$



22. $x+1<6$

$x<5$

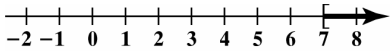
$(-\infty, 5)$



24. $x-5 \geq 2$

$x \geq 7$

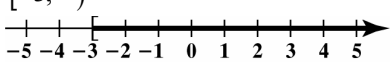
$[7, \infty)$



26. $y+3 \geq 0$

$y \geq -3$

$[-3, \infty)$

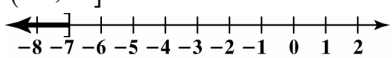


28. $2x+9 \leq x+2$

$2x-x \leq 2-9$

$x \leq -7$

$(-\infty, -7]$

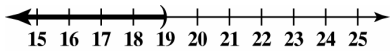


30. $3x-8<2x+11$

$3x-2x<11+8$

$x<19$

$(-\infty, 19)$

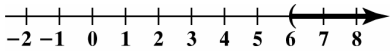


32. $8x-9>7x-3$

$8x-7x>-3+9$

$x>6$

$(6, \infty)$

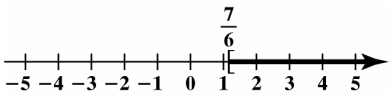


34. $x-\frac{1}{3}\geq\frac{5}{6}$

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

$x\geq\frac{7}{6}$

$\left[\frac{7}{6},\infty\right)$



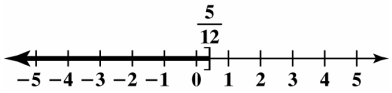
36. $y+\frac{1}{3}\leq\frac{3}{4}$

$y\leq\frac{3}{4}-\frac{1}{3}$

$y\leq\frac{9}{12}-\frac{4}{12}$

$y\leq\frac{5}{12}$

$\left(-\infty,\frac{5}{12}\right]$

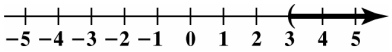


38. $-12+17>20-13y$

$-12+13y>20-17$

$y>3$

$(3,\infty)$

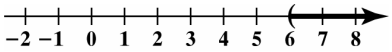


40. $\frac{1}{2}x>3$

$2\left(\frac{1}{2}x\right)>2(3)$

$x>6$

$(6,\infty)$

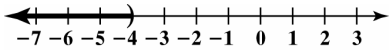


42. $\frac{x}{4}<-1$

$4\left(\frac{x}{4}\right)<4(-1)$

$x<-4$

$(-\infty,-4)$

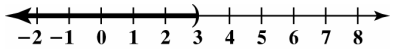


44. $6x<18$

$\frac{6x}{6}<\frac{18}{6}$

$x<3$

$(-\infty,3)$

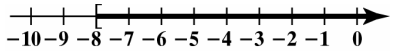


46. $7x\geq-56$

$\frac{7x}{7}\geq\frac{-56}{7}$

$x\geq-8$

$[-8,\infty)$

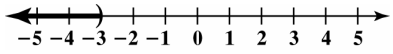


48. $-7x>21$

$\frac{-7x}{-7}<\frac{21}{-7}$

$x<-3$

$(-\infty,-3)$

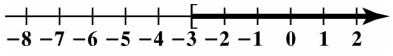


50. $-7x\leq21$

$\frac{-7x}{-7}\geq\frac{21}{-7}$

$x\geq-3$

$[-3,\infty)$

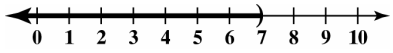


$-20x>-140$

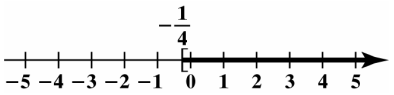
52. $\frac{-20x}{-20}<\frac{-140}{-20}$

$x<7$

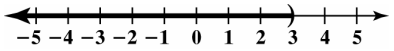
$(-\infty,7)$



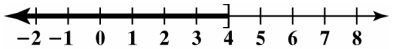
54.
$$-2y \le \frac{1}{2}$$
$$\left(-\frac{1}{2}\right)(-2y) \ge \left(-\frac{1}{2}\right)\left(\frac{1}{2}\right)$$
$$y \ge -\frac{1}{4}$$
$$\left[-\frac{1}{4}, \infty\right)$$



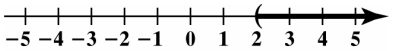
56.
$$-x > -3$$
$$-1(-x) < -1(-3)$$
$$x < 3$$
$$(-\infty, 3)$$



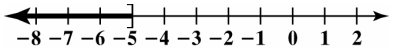
58.
$$3x + 2 \le 14$$
$$3x + 2 - 2 \le 14 - 2$$
$$3x \le 12$$
$$\frac{3x}{3} \le \frac{12}{3}$$
$$x \le 4$$
$$(-\infty, 4]$$



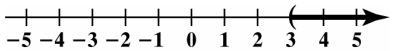
60.
$$8x - 4 > 12$$
$$8x - 4 + 4 > 12 + 4$$
$$8x > 16$$
$$\frac{8x}{8} > \frac{16}{8}$$
$$x > 2$$
$$(2, \infty)$$



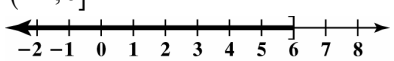
62.
$$5 - 3x \ge 20$$
$$5 - 3x - 5 \ge 20 - 5$$
$$-3x \ge 15$$
$$\frac{-3x}{-3} \le \frac{15}{-3}$$
$$x \le -5$$
$$(-\infty, -5]$$



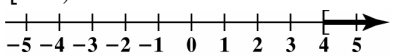
64.
$$-3x + 14 < 5$$
$$-3x + 14 - 14 < 5 - 14$$
$$-3x < -9$$
$$\frac{-3x}{-3} > \frac{-9}{-3}$$
$$x > 3$$
$$(3, \infty)$$



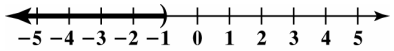
66.
$$3 - x \ge -3$$
$$3 - x - 3 \ge -3 - 3$$
$$-x \ge -6$$
$$-1(-x) \le -1(-6)$$
$$x \le 6$$
$$(-\infty, 6]$$



68.
$$6x - 2 \ge 4x + 6$$
$$6x - 2 - 4x \ge 4x + 6 - 4x$$
$$2x - 2 \ge 6$$
$$2x - 2 + 2 \ge 6 + 2$$
$$2x \ge 8$$
$$\frac{2x}{2} \ge \frac{8}{2}$$
$$x \ge 4$$
$$[4, \infty)$$



70.
$$4y - 7 > 9y - 2$$
$$4y - 7 - 9y > 9y - 2 - 9y$$
$$-5y - 7 > -2$$
$$-5y - 7 + 7 > -2 + 7$$
$$-5y > 5$$
$$\frac{-5y}{-5} < \frac{5}{-5}$$
$$y < -1$$
$$(-\infty, -1)$$



72. $4(2y-1)>12$

$8y-4>12$

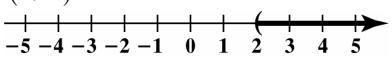
$8y-4+4>12+4$

$8y>16$

$\frac{8y}{8}>\frac{16}{8}$

$y>2$

$(2,\infty)$



74. $4(x+1)+2\geq 3x+6$

$4x+4+2\geq 3x+6$

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

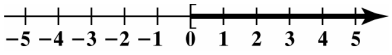
$4x+6-3x\geq 3x+6-3x$

$x+6\geq 6$

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

$x\geq 0$

$[0,\infty)$



76. $7-2(y-4)<5(1-2y)$

$7-2y+8<5-10y$

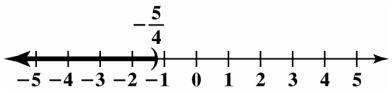
$15-2y<5-10y$

$-2y<-10-10y$

$8y<-10$

$y<-\frac{5}{4}$

$\left(-\infty,-\frac{5}{4}\right)$



78. $\frac{x}{4}-3\geq 1$

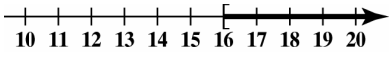
$\frac{x}{4}-3+3\geq 1+3$

$\frac{x}{4}\geq 4$

$4\left(\frac{x}{4}\right)\geq 4(4)$

$x\geq 16$

$[16,\infty)$



80. $1-\frac{x}{2}<5$

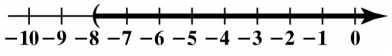
$1-\frac{x}{2}-1<5-1$

$-\frac{x}{2}<4$

$-2\left(-\frac{x}{2}\right)>-2(4)$

$x>-8$

$(-8,\infty)$



82. $3x-5<3(x-2)$

$3x-5<3x-6$

$3x-5-3x<3x-6-3x$

$-5<-6$

The original inequality is equivalent to the false statement $-5<-6$, so the inequality has no solution.

The solution set is $\{\ \}$.

84. $x+4<x+10$

$x+4-x<x+10-x$

$4<10$

The original inequality is equivalent to the true statement $4<10$

The solution is the set of all real numbers, written $\{x\,|\,x \text{ is a real number}\}$ or $(-\infty,\infty)$.

86. $3x+1\leq 3(x-2)$

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

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

$1\leq -6$

Since $1\leq -6$ is a false statement, the original inequality has no solution.

The solution set is $\{\ \}$.

88. $5(x+4)>5x+10$

$5x+20>5x+10$

$5x+20-5x>5x+10-5x$

$20>10$

Since $20>10$ is a true statement, the original inequality is true for all real numbers. The solution set is $\{x\,|\,x \text{ is a real number}\}$ or $(-\infty,\infty)$.

90.
$$\begin{aligned} 6x-3 &\le 3(x-1) \\ 6x-3 &\le 3x-3 \\ 6x-3+3 &\le 3x-3+3 \\ 6x &\le 3x \\ 3x &\le 0 \\ 6x-3x &\le 3x-3x \\ x &\le 0 \end{aligned}$$
$(-\infty, 0]$

92.
$$\begin{aligned} -2x-a &\le b \\ -2x-a+a &\le b+a \\ -2x &\le b+a \\ \frac{-2x}{-2} &\ge \frac{b+a}{-2} \\ x &\ge \frac{b+a}{-2} \end{aligned}$$

94.
$$\begin{aligned} y &> mx+b \\ y-b &> mx+b-b \\ y-b &> mx \\ \frac{y-b}{m} &> \frac{mx}{m} \\ \frac{y-b}{m} &> x \quad \text{or} \quad x < \frac{y-b}{m} \end{aligned}$$

96. x is between -3 and 3, so $|x| < 3$.

98. x is greater than 3 or less than -3, so $|x| > 3$.

100. Denmark, Netherlands

102. Spain, Japan, Mexico

104. Spain, Japan

106.
$$\begin{aligned} N &= 550-9x;\ N < 325 \\ 550-9x &< 325 \\ 550-9x-550 &< 325-550 \\ -9x &< -225 \\ \frac{-9x}{-9} &> \frac{-225}{-9} \\ x &> 25 \end{aligned}$$
Twenty-five years after 1998 is 1998 + 25 = 2013. According to the model, there will be 325 billion cigarettes consumed in 2013 and less than 325 billion after 2013 (from 2014 onward).

108. a. If you get 100 on the final, your average will be
$$\frac{88+78+86+100}{4} = \frac{354}{4} = 88.$$
Since $88 < 90$ and it is not possible to get more than 100 on the final, an A in the course is not possible.

b. Let x = your grade on the final exam.
$$\begin{aligned} \frac{88+78+86+100}{4} &\ge 80 \\ 4\left(\frac{88+78+86+100}{4}\right) &\ge 4(80) \\ 88+78+86+x &\ge 320 \\ 252+x &\ge 320 \\ 252+x-252 &\ge 320-252 \\ x &\ge 68 \end{aligned}$$
You must get at least 68% to get a B in the course.

110. Let x = the number of miles driven.
$$\begin{aligned} 60+0.50 &\le 600 \\ 60+0.50x-60 &\le 600-60 \\ 0.50 &\le 540 \\ \frac{0.50x}{0.50} &\le \frac{540}{0.50} \\ x &\le 1080 \end{aligned}$$
You can drive up to 1080 miles.

112. Let x = the number of cement bags.
$$\begin{aligned} 265+65x &\le 2800 \\ 265+65x-265 &\le 2800-265 \\ 65x &\le 2535 \\ \frac{65x}{65} &\le \frac{2535}{65} \\ x &\le 39 \end{aligned}$$
Up to 39 bags of cement can safely be lifted on the elevator in one trip.

114. – 116. Answers will vary.

118. makes sense

120. makes sense

122. false; Changes to make the statement true will vary. A sample change is: The statement "x is at most 5" is written $x \le 5$.

124. true

126. Let x = the number of hours a person works out at the fitness club yearly.
Yearly cost at first club (in dollars)
$= 500 + 1x = 500 + x$
Yearly cost at second club $= 440 + 1.75x$
The first club will be cheaper if
$500 + x < 440 + 1.75x$
Solve this inequality.

$$500 + x - 1.75x < 440 + 1.75x - 1.75x$$
$$500 - 0.75x < 440$$
$$500 - 0.75x - 500 < 440 - 500$$
$$-0.75x < -60$$
$$\frac{-0.75x}{-0.75} > \frac{-60}{-0.75}$$
$$x > 80$$

The first club will be cheaper if the person works out more than 80 hours a year.

128.

$$126.8 - 9.4y \le 4.8y - 34.5$$
$$126.8 - 9.4y - 4.8y \le 4.8y + 34.5 - 4.8y$$
$$126.8 - 14.2y \le 34.5$$
$$126.8 - 14.2y - 126.8 \le 34.5 - 126.8$$
$$-14.2y \le -92.3$$
$$\frac{-14.2y}{-14.2} \ge \frac{-92.3}{-14.2}$$
$$y \ge 6.5$$

$[6.5, \infty)$

129. $A = PB$, $A = 8$, $P = 40\% = 0.4$

$$A = PB$$
$$8 = 0.4B$$
$$\frac{8}{0.4} = \frac{0.4B}{0.4}$$
$$20 = B$$

8 is 40% of 20.

130. Let x = the width of the rectangle.
Let $x + 5$ = the length of the rectangle.

$$P = 2l + 2w$$
$$34 = 2(x + 5) + 2 \cdot x$$
$$34 = 2x + 10 + 2x$$
$$34 = 4x + 10$$
$$34 - 10 = 4x + 10 - 10$$
$$24 = 4x$$
$$6 = x$$
$$x = 6$$
$$x + 5 = 11$$

The width is 6 inches and the length is 11 inches.

131.

$$5x + 16 = 3(x + 8)$$
$$5x + 16 = 3x + 24$$
$$5x + 16 - 3x = 3x + 24 - 3x$$
$$2x + 16 = 24$$
$$2x + 16 - 16 = 24 - 16$$
$$2x = 8$$
$$\frac{2x}{2} = \frac{8}{2}$$
$$x = 4$$

Check: $5(4) + 16 = 3(4 + 8)$
$20 + 16 = 3(12)$
$36 = 36$, true

The solution is set is $\{4\}$.

132.

$$x - 4y = 14$$
$$2 - 4(-3) = 14$$
$$2 + 12 = 14$$
$$14 = 14, \text{ true}$$

Yes, the values make it a true statement.

133.

$$x - 4y = 14$$
$$12 - 4(1) = 14$$
$$12 - 4 = 14$$
$$8 = 14, \text{ false}$$

No, the values make it a false statement.

134.

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

Chapter 2 Review Exercises

1. $x-10=22$

$x-10+10=22+10$

$x=32$

The solution is set is $\{32\}$.

2. $-14=y+8$

$-14-8=y+8-8$

$-22=y$

The solution is set is $\{-22\}$.

3. $7z-3=6z+9$

$7z-3-6z=6z+9-6z$

$z-3=9$

$z-3+3=9+3$

$z=12$

The solution is set is $\{12\}$.

4. $4(x+3)=3x-10$

$4x+12=3x-10$

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

$x+12=-10$

$x+12-12=-10-12$

$x=-22$

The solution is set is $\{-22\}$.

5. $6x-3x-9+1=-5x+7x-3$

$3x-8=2x-3$

$3x-8-2x=2x-3-2x$

$x-8=-3$

$x-8+8=-3+8$

$x=5$

The solution is set is $\{5\}$.

6. $\frac{x}{8}=10$

$8\left(\frac{x}{8}\right)=8(10)$

$x=80$

The solution is set is $\{80\}$.

7. $\frac{y}{-8}=7$

$-8\left(\frac{y}{-8}\right)=-8(7)$

$y=-56$

The solution is set is $\{-56\}$.

8. $7z=77$

$\frac{7z}{7}=\frac{77}{7}$

$z=11$

The solution is set is $\{11\}$.

9. $-36=-9y$

$\frac{-36}{-9}=\frac{-9y}{-9}$

$4=y$

The solution is set is $\{4\}$.

10. $\frac{3}{5}x=-9$

$\frac{5}{3}\left(\frac{3}{5}x\right)=\frac{5}{3}(-9)$

$1x=-15$

$x=-15$

The solution is set is $\{-15\}$.

11. $30=-\frac{5}{2}y$

$-\frac{2}{5}(30)=-\frac{2}{5}\left(-\frac{5}{2}y\right)$

$-12=y$

The solution is set is $\{-12\}$.

12. $-x=25$

$-1(-x)=-1(25)$

$x=-25$

The solution is set is $\{-25\}$.

13. $\dfrac{-x}{10} = -1$

$10\left(\dfrac{-x}{10}\right) = 10(-1)$

$-x = -10$

$-1(-x) = -1(-10)$

$x = 10$

The solution is set is $\{10\}$.

14. $4x + 9 = 33$

$4x + 9 - 9 = 33 - 9$

$4x = 24$

$\dfrac{4x}{4} = \dfrac{24}{4}$

$x = 6$

The solution is set is $\{6\}$.

15. $-3y - 2 = 13$

$-3y - 2 + 2 = 13 + 2$

$-3y = 15$

$\dfrac{-3y}{-3} = \dfrac{15}{-3}$

$y = -5$

The solution is set is $\{-5\}$.

16. $5z + 20 = 3z$

$5z + 20 - 3z = 3z - 3z$

$2z + 20 = 0$

$2z + 20 - 20 = 0 - 20$

$2z = -20$

$\dfrac{2z}{2} = \dfrac{-20}{2}$

$z = -10$

The solution is set is $\{-10\}$.

17. $5x - 3 = x + 5$

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

$4x - 3 = 5$

$4x - 3 + 3 = 5 + 3$

$4x = 8$

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

$x = 2$

The solution is set is $\{2\}$.

18. $3 - 2x = 9 - 8x$

$3 - 2x + 8x = 9 - 8x + 8x$

$3 + 6x = 9$

$3 + 6x - 3 = 9 - 3$

$6x = 6$

$\dfrac{6x}{6} = \dfrac{6}{6}$

$x = 1$

The solution is set is $\{1\}$.

19. a. 2005 is 20 years after 1985.

$I = 12n + 151$

$I = 12(20) + 151 = 240 + 151 = 391$

According to the formula, the U.S. imported 391 million barrels of oil per month in 2005.
The formula underestimated the actual value given in the bar graph by 8 million barrels.

b. $I = 12n + 151$

$511 = 12n + 151$

$511 - 151 = 12n + 151 - 151$

$360 = 12n$

$\dfrac{360}{12} = \dfrac{12n}{12}$

$30 = n$

If trends continue, the U.S. will import an average of 511 million barrels of oil per month 30 years after 1985, or 2015.

20. $5x + 9 - 7x + 6 = x + 18$

$-2x + 15 = x + 18$

$-2x + 15 - x = x + 18 - x$

$-3x + 15 = 18$

$-3x + 15 - 15 = 18 - 15$

$-3x = 3$

$\dfrac{-3x}{-3} = \dfrac{3}{-3}$

$x = -1$

The solution is set is $\{-1\}$.

21. $3(x+4)=5x-12$

$3x+12=5x-12$

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

$-2x+12=-12$

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

$-2x=-24$

$\frac{-2x}{-2}=\frac{-24}{-2}$

$x=12$

The solution is set is $\{12\}$.

22. $1-2(6-y)=3y+2$

$1-12+2y=3y+2$

$2y-11=3y+2$

$2y-11-3y=3y+2-3y$

$-y-11=2$

$-y-11+11=2+11$

$-y=13$

$y=-13$

The solution is set is $\{-13\}$.

23. $2x-8+3x+15=2x-2$

$5x+7=2x-2$

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

$3x+7=-2$

$3x+7-7=-2-7$

$3x=-9$

$\frac{3x}{3}=\frac{-9}{3}$

$x=-3$

The solution is set is $\{-3\}$.

24. $-2(y-4)-(3y-2)=-2-(6y-2)$

$-2y+8-3y+2=-2-6y+2$

$-5y+10=-6y$

$-5y+10+6y=-6y+6y$

$10+y=0$

$10+y-10=0-10$

$y=-10$

The solution is set is $\{-10\}$.

25. $\frac{2x}{3}=\frac{x}{6}+1$

To clear fractions, multiply both sides by the LCD, which is 6.

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

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

$4x=x+6$

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

$3x=6$

$\frac{3x}{3}=\frac{6}{3}$

$x=2$

The solution is set is $\{2\}$.

26. $\frac{x}{2}-\frac{1}{10}=\frac{x}{5}+\frac{1}{2}$

Multiply both sides by the LCD, which is 10.

$10\left(\frac{x}{2}-\frac{1}{10}\right)=10\left(\frac{x}{5}+\frac{1}{2}\right)$

$10\left(\frac{x}{2}\right)-10\left(\frac{1}{10}\right)=10\left(\frac{x}{5}\right)+10\left(\frac{1}{2}\right)$

$5x-1=2x+5$

$5x-1-2x=2x+5-2x$

$3x-1=5$

$3x-1+1=5+1$

$3x=6$

$\frac{3x}{3}=\frac{6}{3}$

$x=2$

The solution is set is $\{2\}$.

27. $3(8x-1)=6(5+4x)$

$24x-3=30+24x$

$24x-3-24x=30+24x-24x$

$-3=30$

Since –3 = 30 is a false statement, the original equation is inconsistent and has no solution or $\{\ \}$.

28. $4(2x-3)+4=8x-8$

$8x-12+4=8x-8$

$8x-8=8x-8$

$8x-8-8x=8x-8-8x$

$-8=-8$

Since $-8=-8$ is a true statement, so the solution is the set of all real numbers, written $\{x \mid x \text{ is a real number}\}$.

29. $H=0.7(220-a)$

$133=0.7(220-a)$

$133-154=154-154-0.7a$

$-21=-0.7a$

$\frac{-21}{-0.7}=\frac{-0.7a}{-0.7}$

$30=a$

If the optimal heart rate is 133 beats per minute, the person is 30 years old.

30. $I=Pr$ for r

$\frac{I}{P}=\frac{Pr}{P}$

$\frac{I}{P}=r$ or $r=\frac{I}{P}$

31. $V=\frac{1}{3}Bh$ for h

$3V=3\left(\frac{1}{3}Bh\right)$

$3V=Bh$

$\frac{3V}{B}=\frac{Bh}{B}$

$\frac{3V}{B}=h$ or $h=\frac{3V}{B}$

32. $P=2l+2w$ for w

$P-2l=2l+2w-2l$

$P-2l=2w$

$\frac{P-2l}{2}=\frac{2w}{2}$

$\frac{P-2l}{2}=w$ or $w=\frac{P-2l}{2}$

33. $A=\frac{B+C}{2}$ for B

$2A=2\left(\frac{B+C}{2}\right)$

$2A=B+C$

$2A-C=B+C-C$

$2A-C=B$ or $B=2A-C$

34. $T=D+pm$ for m

$T-D=D+pm-D$

$T-D=pm$

$\frac{T-D}{p}=\frac{pm}{p}$

$\frac{T-D}{p}=m$ or $m=\frac{T-D}{p}$

35. 65% = 0.65

36. 150% = 1.50

37. 3% = 0.03

38. 0.72 = 72%

39. 0.0035 = 0.35%

40. $A=PB;\ P=8\%=0.08,\ B=120$

$A=0.08\cdot 120$

$A=9.6$

8% of 120 is 9.6

41. $A=PB;\ A=90,\ P=45\%=0.45$

$90=0.45B$

$\frac{90}{0.45}=\frac{0.45B}{0.45}$

$200=B$

90 is 45% of 200.

42. $A=PB;\ A=36,\ B=75$

$36=P\cdot 75$

$\frac{36}{75}=\frac{P\cdot 75}{75}$

$0.48=P$

36 is 48% of 75.

43. Increase = Percent · Original
First, find the increase: $12 - 6 = 6$

$$6 = P \cdot 6$$
$$\frac{6}{6} = \frac{P \cdot 6}{6}$$
$$1 = P$$

The percent increase is 100%.

44. Decrease = Percent · Original
First, find the decrease: $5 - 3 = 2$

$$2 = P \cdot 5$$
$$\frac{2}{5} = \frac{P \cdot 5}{5}$$
$$0.4 = P$$

The percent decrease is 40%.

45. Increase = Percent · Original
First, find the increase: $45 - 40 = 5$

$$5 = P \cdot 40$$
$$\frac{5}{40} = \frac{P \cdot 40}{40}$$
$$0.125 = P$$

The percent increase is 12.5%.

46. Investment dollars lost last year were $0.10 \cdot \$10,000 = \$1000$. This means that \$10,000 – \$1000 = \$9000 remains. Investment dollars gained this year are $0.10 \cdot \$9000 = \$900$. This means that \$9000 + \$900 = \$9900 of the original investment remains. This is an overall loss of \$100.
decrease = percent · original

$$100 = P \cdot 10,000$$
$$\frac{100}{10,000} = \frac{P \cdot 10,000}{10,000}$$
$$0.01 = P$$

The statement is not true. Instead of recouping losses, there is an overall 1% decrease in the portfolio.

47. a.
$$r = \frac{h}{7}$$
$$7r = 7\left(\frac{h}{7}\right)$$
$$7r = h \text{ or } h = 7r$$

b. $h = 7r;\ r = 9$
$h = 7(9) = 63$
The woman's height is 63 inches or 5 feet, 3 inches.

48.
$$A = P \cdot B$$
$$91 = 0.26 \cdot B$$
$$\frac{91}{0.26} = \frac{0.26 \cdot B}{0.26}$$
$$350 = B$$

The average U.S. household uses 350 gallons of water per day.

49. Let x = the unknown number.

$$6x - 20 = 4x$$
$$6x - 20 - 4x = 4x - 4x$$
$$2x - 20 = 0$$
$$2x - 20 + 20 = 0 + 20$$
$$2x = 20$$
$$x = 10$$

The number is 10.

50. Let x = the average amount spent on cat food.
Let $x + 2$ = the average amount spent on dog food.

$$x + (x + 29) = 405$$
$$x + x + 29 = 405$$
$$2x + 29 = 405$$
$$2x + 29 - 29 = 405 - 29$$
$$2x = 376$$
$$x = 188$$
$$x + 29 = 217$$

\$188 was spent on cats and \$217 was spent on dogs.

51. Let x = the smaller page number.
Let $x + 1$ = the larger page number.

$$x + (x + 1) = 93$$
$$2x + 1 = 93$$
$$2x = 92$$
$$x = 46$$

The page numbers are 46 and 47.

52. Let $x =$ the percentage of females.
Let $x + 2 =$ the percentage of males.

$$x + (x + 2) = 100$$
$$x + x + 2 = 100$$
$$2x + 2 = 100$$
$$2x + 2 - 2 = 100 - 2$$
$$2x = 98$$
$$x = 49$$
$$x + 2 = 51$$

For Americans under 20, 49% are female and 51% are male.

53. Let $x =$ number of years after 2003.

$$612 + 15x = 747$$
$$612 + 15x - 612 = 747 - 612$$
$$15x = 135$$
$$\frac{15x}{15} = \frac{135}{15}$$
$$x = 9$$

According to this model, the average weekly salary will reach \$747 in 9 years after 2003, or 2012.

54. Let $x =$ the number of checks written.

$$6 + 0.05x = 6.90$$
$$6 + 0.05x - 6 = 6.90 - 6$$
$$0.05x = 0.90$$
$$\frac{0.05x}{0.05} = \frac{0.90}{0.05}$$
$$x = 18$$

You wrote 18 checks that month.

55. Let $x =$ the width of the field.
Let $3x =$ the length of the field.

$$P = 2l + 2w$$
$$400 = 2 \cdot 3x + 2 \cdot x$$
$$400 = 6x + 2x$$
$$400 = 8x$$
$$\frac{400}{8} = \frac{8x}{8}$$
$$50 = x$$
$$x = 50$$
$$3x = 150$$

The field is 50 yards wide and 150 yards long.

56. Let $x =$ the original price of the table.

$$x - 0.25x = 180$$
$$0.75x = 180$$
$$\frac{0.75x}{0.75} = \frac{180}{0.75}$$
$$x = 240$$

The table's price before the reduction was \$240.

57. Find the area of a rectangle with length 6.5 ft and width 5 ft.

$$A = lw = (6.5)(5) = 32.5$$

The area is 32.5 ft^2.

58. Find the area of a triangle with base 20 cm and height 5 cm.

$$A = \frac{1}{2}bh = \frac{1}{2}(20)(5) = 50$$

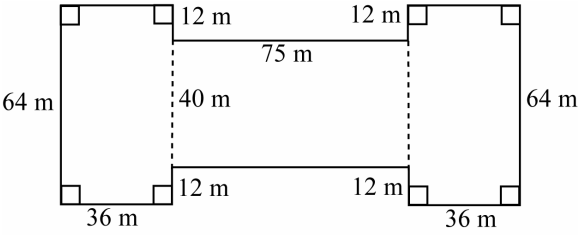
The area is 50 cm^2.

59. Find the area of a trapezoid with bases 22 yd and 5 yd and height 10 yd.

$$A = \frac{1}{2}h(a + b)$$
$$= \frac{1}{2}(10)(22 + 5)$$
$$= \frac{1}{2} \cdot 10 \cdot 27 = 135$$

The area is 135 yd^2.

60. Notice that the height of the middle rectangle is $64 - 12 - 12 = 40$ m.



Using $A = lw$ we must find the sum of areas of the middle rectangle and the two side rectangles.

$$\begin{aligned} A &= (40)(75) + 2 \cdot (64)(36) \\ &= 3000 + 2 \cdot 2304 \\ &= 3000 + 4608 \\ &= 7608 \end{aligned}$$

The area is 7608 m^2.

61. Since the diameter is 20 m, the radius is $\frac{20}{2} = 10$ m.

$$C = 2\pi = 2\pi(10) = 20\pi \approx 63$$

$$A = \pi r^2 = \pi(10)^2 = 100\pi \approx 314$$

The circumference is 20π m or approximately 63 m; the area is 100π m^2 or approximately 314 m^2.

62. $A = 42, b = 14$

$$A = \frac{1}{2}bh$$

$$42 = \frac{1}{2} \cdot 14 \cdot h$$

$$42 = 7h$$

$$6 = h$$

The height of the sail is 6 ft.

63. Area of floor:

$$A = bh = (12 \text{ ft})(15 \text{ ft}) = 180 \text{ ft}^2$$

Area of base of stove:

$$A = bh = (3 \text{ ft})(4 \text{ ft}) = 12 \text{ ft}^2$$

Area of bottom of refrigerator:

$$A = bh = (3 \text{ ft})(4 \text{ ft}) = 12 \text{ ft}^2$$

The area to be covered with floor tile is $180 \text{ ft}^2 - 12 \text{ ft}^2 - 12 \text{ ft}^2 = 156 \text{ ft}^2$.

64. First, find the area of a trapezoid with bases 80 ft and 100 ft and height 60 ft.

$$\begin{aligned} A &= \frac{1}{2}h(a+b) \\ &= \frac{1}{2}(60)(80+100) = 5400 \end{aligned}$$

The area of the yard is 5400 ft^2. The cost is \$0.35(5400) = \$1890.

65. The radius of the medium pizza is $\frac{1}{2}\cdot 14 \text{ inches} = 7 \text{ inches}$, and the radius of each small pizza is $\frac{1}{2}\cdot 8 \text{ inches} = 4 \text{ inches}$.

Medium pizza:

$A = \pi r^2 = \pi(7 \text{ in.})^2$

$= 49\pi \text{ in.}^2 \approx 154 \text{ in.}^2$

Small pizza:

$A = \pi r^2 = \pi(4 \text{ in.})^2$

$= 16\pi \text{ in.}^2 \approx 50 \text{ in.}^2$

The area of one medium pizza is approximately 154 in.^2 and the area of two small pizzas is approximately $2(50) = 100 \text{ in.}^2$. Since the price of one medium pizza is the same as the price of two small pizzas and the medium pizza has the greater area, the medium pizza is the better buy. (Because the prices are the same, it is not necessary to find price per square inch in this case.)

66. Find the volume of a rectangular solid with length 5 cm, width 3 cm, and height 4 cm.

$A = lwh = 5 \cdot 3 \cdot 4 = 60$

The volume is 60 cm^3.

67. Find the volume of a cylinder with radius 4 yd and height 8 yd.

$V = \pi r^2 h$

$= \pi(4)^2 \cdot 8 = 128\pi \approx 402$

The volume is $128\pi \text{ yd}^3 \approx 402 \text{ yd}^3$.

68. Find the volume of a sphere with radius 6 m.

$V = \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(6)^3 = \frac{4}{3}\cdot\pi\cdot 216$

$= 288\pi \approx 905$

The volume is $288\pi \text{ m}^3 \approx 905 \text{ m}^3$.

69. Find the volume of each box.

$V = lwh = (8\text{m})(4\text{m})(3\text{m}) = 96\text{m}^3$

The space required for 50 containers is $50(96 \text{ m}^3) = 4800 \text{ m}^3$.

70. Since the diameter of the fish tank 6 ft, the radius is 3 ft.

$V = \pi r^2 h = \pi(3)^2 \cdot 3 = 27\pi \approx 84.82$

The volume of the tank is approximately 85 ft^3. Divide by 5 to determine how many fish can be put in the tank.

$\frac{84.82}{5} \approx 16.96$

There is enough water in the tank for 16 fish. Round down to 16, since 0.96 of a fish cannot be purchased.

71. The sum of the measures of the angles of any triangle is $180°$, so $x + 3x + 2x = 180$.

$x + 3x + 2x = 180$

$6x = 180$

$x = 30$

If $x = 30$, then $3x = 90$ and $2x = 60$, so the angles measure $30°$, $60°$, and $90°$.

72. Let x = the measure of the second angle.
Let $2x + 15$ = the measure of the first angle.
Let $x + 25$ = the measure of the third angle.

$x + (2x + 15) + (x + 25) = 180$

$4x + 40 = 180$

$4x = 140$

$x = 35$

If $x = 35$, then $2x + 15 = 2(35) + 15 = 85$ and $x + 25 = 35 + 25 = 60$. The angles measure $85°$, $35°$, and $60°$.

73. If the measure of an angle is $57°$, the measure of its complement is $90° - 57° = 33°$

74. If the measure of an angle is $75°$, the measure of its supplement is $180° - 75° = 105°$.

75. Let x = the measure of the angle.
Let $90 - x$ = the measure of its complement.

$x = (90 - x) + 25$

$x = 115 - x$

$2x = 115$

$x = 57.5$

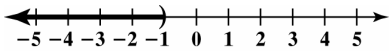
The measure of the angle is $57.5°$.

76. Let x = the measure of the angle.
Let $180 - x$ = the measure of its supplement.

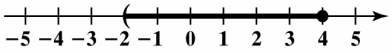
$$\begin{aligned} 180 - x &= 4x - 45 \\ 180 - 5x &= -45 \\ -5x &= -225 \\ x &= 45 \end{aligned}$$

If $x = 45$, then $180 - x = 135$. The measure of the angle is $45°$ and the measure of its supplement is $135°$.

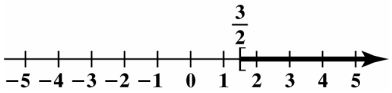
77. $x < -1$



78. $-2 < x \le 4$



79. $\left[\frac{3}{2}, \infty\right)$

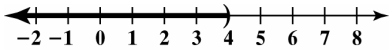


80. $(-\infty, 0)$

81.

$$\begin{aligned} 2x - 5 &< 3 \\ 2x - 5 + 5 &< 3 + 5 \\ 2x &< 8 \\ \frac{2x}{2} &< \frac{8}{2} \\ x &< 4 \end{aligned}$$

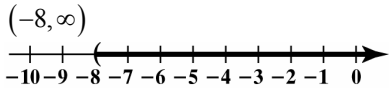
$(-\infty, 4)$



82.

$$\begin{aligned} \frac{x}{2} &> -4 \\ 2\left(\frac{x}{2}\right) &> 2(-4) \\ x &> -8 \end{aligned}$$

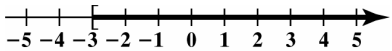
$(-8, \infty)$



83.

$$\begin{aligned} 3 - 5x &\le 18 \\ 3 - 5x - 3 &\le 18 - 3 \\ -5x &\le 15 \\ \frac{-5x}{-5} &\ge \frac{15}{-5} \\ x &\ge -3 \end{aligned}$$

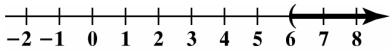
$[-3, \infty)$



84.

$$\begin{aligned} 4x + 6 &< 5x \\ 4x + 6 - 5x &< 5x - 5x \\ -x + 6 &< 0 \\ -x + 6 - 6 &< 0 - 6 \\ -x &< -6 \\ -1(-x) &> -1(-6) \\ x &> 6 \end{aligned}$$

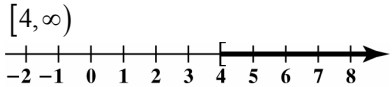
$(6, \infty)$



85.

$$\begin{aligned} 6x - 10 &\ge 2(x + 3) \\ 6x - 10 &\ge 2x + 6 \\ 6x - 10 - 2x &\ge 2x + 6 - 2x \\ 4x - 10 &\ge 6 \\ 4x - 10 + 10 &\ge 6 + 10 \\ 4x &\ge 16 \\ \frac{4x}{4} &\ge \frac{16}{4} \\ x &\ge 4 \end{aligned}$$

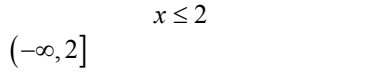
$[4, \infty)$



86.

$$\begin{aligned} 4x + 3(2x - 7) &\le x - 3 \\ 4x + 6x - 21 &\le x - 3 \\ 10x - 21 &\le x - 3 \\ 10x - 21 - x &\le x - 3 - x \\ 9x - 21 &\le -3 \\ 9x - 21 + 21 &\le -3 + 21 \\ 9x &\le 18 \\ \frac{9x}{9} &\le \frac{18}{9} \\ x &\le 2 \end{aligned}$$

$(-\infty, 2]$



87. $2(2x+4) > 4(x+2) - 6$

$4x + 8 > 4x + 8 - 6$

$4x + 8 > 4x + 2$

$4x + 8 - 4x > 4x + 2 - 4x$

$8 > 2$

Since $8 > 2$ is a true statement, the original inequality is true for all real numbers, and the solution set is $\{x \mid x \text{ is a real number}\}$.

88. $-2(x-4) \le 3x + 1 - 5x$

$-2x + 8 \le -2x + 1$

$-2x + 8 + 2x \le -2x + 1 + 2x$

$8 \le 1$

Since $8 \le 1$ is a false statement, the original inequality has no solution. The solution set is $\{\ \}$.

89. Let x = the student's score on the third test.

$$\frac{42 + 74 + x}{3} \ge 60$$

$$3\left(\frac{42 + 74 + x}{3}\right) \ge 3(60)$$

$42 + 74 + x \ge 180$

$116 + x \ge 180$

$116 + x - 116 \ge 180 - 116$

$x \ge 64$

The student must score at least 64 on the third test to pass the course.

90. $C = 10 + 5(x-1);\ C \le 500$

$10 + 5(x-1) \le 500$

$10 + 5x - 5 \le 500$

$5x + 5 \le 500$

$5x + 5 - 5 \le 500 - 5$

$5x \le 495$

$$\frac{5x}{5} \le \frac{495}{5}$$

$x \le 99$

You can talk no more than 99 minutes.

Chapter 2 Test

1. $4x - 5 = 13$

$4x + 5 + 5 = 13 + 5$

$4x = 18$

$$\frac{4x}{4} = \frac{18}{4} = \frac{9}{2}$$

$$x = \frac{9}{2}$$

The solution set is $\left\{\frac{9}{2}\right\}$.

2. $12x + 4 = 7x - 21$

$12x + 4 - 7x = 7x - 21 - 7x$

$5x + 4 = -21$

$5x + 4 - 4 = -21 - 4$

$5x = -25$

$$\frac{5x}{5} = \frac{-25}{5}$$

$x = -5$

The solution set is $\{-5\}$.

3. $8 - 5(x-2) = x + 26$

$8 - 5x + 10 = x + 26$

$18 - 5x = x + 26$

$18 - 5x - x = x + 26 - x$

$18 - 6x = 26$

$18 - 6x - 18 = 26 - 18$

$-6x = 8$

$$\frac{-6x}{-6} = \frac{8}{-6}$$

$$x = -\frac{8}{6} = -\frac{4}{3}$$

The solution set is $\left\{-\frac{4}{3}\right\}$.

4. $3(2y-4)=9-3(y+1)$

$6y-12=9-3y-3$

$6y-12=6-3y$

$6y-12+3y=6-3y+3y$

$9y-12=6$

$9y-12+12=6+12$

$9y=18$

$\frac{9y}{9}=\frac{18}{9}$

$y=2$

The solution set is $\{2\}$.

5. $\frac{3}{4}x=-15$

$\frac{4}{3}\left(\frac{3}{4}x\right)=\frac{4}{3}(-15)$

$x=-20$

The solution set is $\{-20\}$.

6. $\frac{x}{10}+\frac{1}{3}=\frac{x}{5}+\frac{1}{2}$

Multiply both sides by the LCD, 30.

$30\left(\frac{x}{10}+\frac{1}{3}\right)=30\left(\frac{x}{5}+\frac{1}{2}\right)$

$30\left(\frac{x}{10}\right)+30\left(\frac{1}{3}\right)=30\left(\frac{x}{5}\right)+30\left(\frac{1}{2}\right)$

$3x+10=6x+15$

$3x+10-6x=6x+15-6x$

$-3x+10=15$

$-3x+10-10=15-10$

$-3x=5$

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

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

The solution set is $\left\{-\frac{5}{3}\right\}$.

7. $N=2.4x+180;\ N=324$

$2.4x+180=324$

$2.4x+180-180=324-180$

$2.4x=144$

$\frac{2.4x}{2.4}=\frac{144}{2.4}$

$x=60$

The US population is expected to reach 324 million 60 years after 1960, in the year 2020.

8. $V=\pi r^2 h$ for h

$\frac{V}{\pi r^2}=\frac{\pi r^2 h}{\pi r^2}$

$\frac{V}{\pi r^2}=h$ or $h=\frac{V}{\pi r^2}$

9. $l=\frac{P-2w}{2}$ for w

$2l=2\left(\frac{P-2w}{2}\right)$

$2l=P-2w$

$2l-P=P-2w-P$

$2l-P=-2w$

$\frac{2l-P}{-2}=\frac{-2w}{-2}$

$\frac{2l-P}{-2}=w$ or $w=\frac{P-2l}{2}$

10. $A=PB;\ P=6\%=0.06,\ B=140$

$A=0.06(140)$

$A=8.4$

6% of 140 is 8.4.

11. $A=PB;$ A=120, $P=80\%=0.80$

$120=0.80B$

$\frac{120}{0.80}=\frac{0.80B}{0.80}$

$150=B$

120 is 80% of 150.

12. $A=PB;\ A=12,\ B=240$

$12=P\cdot 240$

$\frac{12}{240}=\frac{P\cdot 240}{240}$

$0.05=P$

12 is 5% of 240.

13. Let x = the unknown number.

$$5x-9=306$$
$$5x-9+9=306+9$$
$$5x=315$$
$$\frac{5x}{5}=\frac{315}{5}$$
$$x=63$$

The number is 63.

14. Let x = the number of people, in millions, with an income of \$50,000 - \$74,999.
Let $x+2.6$ = the number of people, in millions, with an income of \$75,000 or more.

$$x+(x+2.6)=14.2$$
$$x+x+2.6=14.2$$
$$2x+2.6=14.2$$
$$2x+2.6-2.6=14.2-2.6$$
$$2x=11.6$$
$$x=5.8$$
$$x+2.6=8.4$$

5.8 million people with an income of \$50,000 - \$74,999 and 8.4 million people with an income of \$75,000 or more had at least one major depressive episode.

15. Let x = number of minutes of long distance calls.

$$15+0.05x=45$$
$$0.05x=30$$
$$x=\frac{30}{0.05}$$
$$x=600$$

You can talk long distance for 600 minutes.

16. Let x = the width of the field.
Let $2x=$ the length of the field.

$$P=2l+2w$$
$$450=2\cdot 2x+2\cdot x$$
$$450=4x+2x$$
$$450=6x$$
$$\frac{450}{6}=\frac{6x}{6}$$
$$75=x$$
$$x=75$$
$$2x=150$$

The field is 75 yards wide and 150 yards long.

17. Let x = the book's original price.

$$x-0.20x=28$$
$$0.80x=28$$
$$x=\frac{28}{0.80}$$
$$x=35$$

The price of the book before the reduction was \$35.

18. Find the area of a triangle with base 47 meters and height 22 meters.

$$A=\frac{1}{2}bh=\frac{1}{2}(47)(22)=517$$

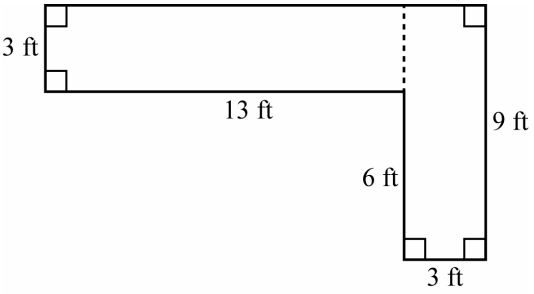
The area of the triangle is 517 m^2.

19. Find the area of a trapezoid with height 15 in, lower base 40 in and upper base 30 in.

$$A=\frac{1}{2}h(a+b)$$
$$=\frac{1}{2}(15)(40+30)$$
$$=\frac{1}{2}\cdot 15\cdot 70=525$$

The area is 525 in^2.

20. Notice that the height of the side rectangle is $6+3=9$ ft.



Using $A=lw$ we must find the sum of areas of the upper rectangle and the side rectangle.

$$A=(3)(13)+(3)(9)$$
$$=39+27$$
$$=66$$

The area is 66 ft^2.

21. Find the volume of a rectangular solid with length 3 in, width 2 in, and height 3 in.

$$V=lwh=3\cdot 2\cdot 3=18$$

The volume is 18 in^3.

22. Find the volume of a cylinder with radius 5 cm and height 7 cm.

$V = \pi r^2 h$

$= \pi(5)^2 \cdot 7 = \pi \cdot 25 \cdot 7$

$= 175\pi \approx 550$

The volume is 175π cm^3 or approximately 550 cm^3.

23. The area of the floor is $A = (40\text{ ft})(50\text{ ft}) = 2000\text{ ft}^2$.

The area of each tile is $A = (2\text{ ft})(2\text{ ft}) = 4\text{ ft}^2$.

The number of tiles needed is $\dfrac{2000\text{ ft}^2}{4\text{ ft}^2} = 500$.

Since there are 10 tiles in a package, the number of packages needed is $\dfrac{500}{10} = 50$.

Since each package costs \$13, the cost for enough tiles to cover the floor is $50(\$13) = \$650$.

24. $A = 56, b = 8$

$A = \dfrac{1}{2}bh$

$56 = \dfrac{1}{2} \cdot 8 \cdot h$

$56 = 4h$

$14 = h$

The height of the sail is 14 feet.

25. Let x = the measure of the second angle.
Let $3x$ = the measure of the first angle.
Let $x - 30$ = the measure of the third angle.

$x + 3x + (x - 30) = 180$

$5x - 30 = 180$

$5x = 210$

$x = 42$

The measure of the first angle: $3x = 3(42°) = 126°$.
The measure of the second angle: $x = 42°$.
The measure of the third angle:
$x - 30 = 42° - 30° = 12°$.

26. Let x = the measure of the angle.
Let $90 - x$ = the measure of its complement.

$x = (90 - x) + 16$

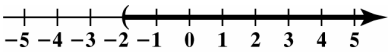
$x = 106 - x$

$2x = 106$

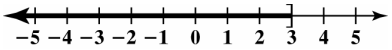
$x = 53$

The measure of the angle is $53°$.

27. $(-2, \infty)$



28. $(-\infty, 3]$

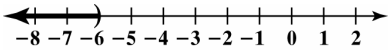


29. $\dfrac{x}{2} < -3$

$2\left(\dfrac{x}{2}\right) < 2(-3)$

$x < -6$

$(-\infty, -6)$



30. $6 - 9x \geq 33$

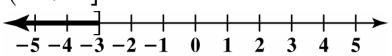
$6 - 9x - 6 \geq 33 - 6$

$-9x \geq 27$

$\dfrac{-9x}{-9} \leq \dfrac{27}{-9}$

$x \leq -3$

$(-\infty, -3]$



31. $4x - 2 > 2(x + 6)$

$4x - 2 > 2x + 12$

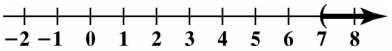
$4x - 2 - 2x > 2x + 12 - 2x$

$2x - 2 > 12$

$2x > 14$

$x > 7$

$(7, \infty)$



32. Let x = the student's score on the fourth exam.

$\dfrac{76 + 80 + 72 + x}{4} \geq 80$

$4\left(\dfrac{76 + 80 + 72 + x}{4}\right) \geq 4(80)$

$76 + 80 + 72 + x \geq 320$

$228 + x \geq 320$

$x \geq 92$

The student must score at least 92 on the fourth exam to have an average of at least 80.

33. Let x = the width of the rectangle.

$$2(20)+2x>56$$
$$40+2x>56$$
$$40-40+2x>56-40$$
$$2x>16$$
$$x>8$$

The perimeter is greater than 56 inches when the width is greater than 8 inches

Cumulative Review Exercises (Chapters 1-2)

1. $-8-(12-16)=-8-(-4)=-8+4=-4$

2. $(-3)(-2)+(-2)(4)=6+(-8)=-2$

3. $(8-10)^3(7-11)^2=(-2)^3(-4)^2$
$=-8(16)=-128$

4. $2-5[x+3(x+7)]$
$=2-5(x+3x+21)$
$=2-5(4x+21)$
$=2-20x-105$
$=-103-20x$

5. The rational numbers are
$-4,-\frac{1}{3},0,\sqrt{4}\,(=2)$, and 1063.

6. $\frac{5}{x}-(x+2)$

7. $-10{,}000<-2$ since $-10{,}000$ is to the left of -2 on the number line.

8. $6(4x-1-5y)=6(4x)-6(1)-6(5y)$
$=24x-6-30y$

9. $T=5.3n+9.5$
$T=5.3(4)+9.5$
$T=21.2+9.5$
$T=30.7$
According to the formula, 30.7% of consumers looked for trans fats on food labels in 2007. This underestimates the actual value shown in the bar graph by 0.3%

10. $T=5.3n+9.5$
$89=5.3n+9.5$
$89-9.5=5.3n+9.5-9.5$
$79.5=5.3n$
$\frac{79.5}{5.3}=\frac{5.3n}{5.3}$
$15=n$
If trends continue, 89% of consumers will look for trans fats on food labels 15 years after 2003, or 2018.

11. $5-6(x+2)=x-14$
$5-6x-12=x-14$
$-7-6x=x-14$
$-7-6x-x=x-14-x$
$-7-7x=-14$
$-7-7x+7=-14+7$
$-7x=-7$
$\frac{-7x}{-7}=\frac{-7}{-7}$
$x=1$
The solution set is $\{1\}$.

12. $\frac{x}{5}-2=\frac{x}{3}$
Multiply both sides by the LCD, 15.
$15\left(\frac{x}{5}-2\right)=15\left(\frac{x}{3}\right)$
$15\left(\frac{x}{5}\right)-15(2)=15\left(\frac{x}{3}\right)$
$3x-30=5x$
$3x-30-3x=5x-3x$
$-30=2x$
$\frac{-30}{2}=\frac{2x}{2}$
$-15=x$
The solution set is $\{-15\}$.

13. $V = \frac{1}{3}Ah$ for A

$$V = \frac{1}{3}Ah$$
$$3V = 3\left(\frac{1}{3}Ah\right)$$
$$3V = Ah$$
$$\frac{3V}{h} = \frac{Ah}{h}$$
$$\frac{3V}{h} = A \text{ or } A = \frac{3V}{h}$$

14. $A = PB$; $A = 48$, $P = 30\% = 0.30$

$$48 = 0.30B$$
$$\frac{48}{0.30} = \frac{0.30B}{0.30}$$
$$160 = B$$

48 is 30% of 160.

15. Let x = the width of the parking lot.
Let $2x - 10 =$ the length of the parking lot.

$$P = 2l + 2w$$
$$400 = 2(2x - 10) + 2 \cdot x$$
$$400 = 4x - 20 + 2x$$
$$400 = 6x - 20$$
$$400 + 20 = 6x - 20 + 20$$
$$420 = 6x$$
$$\frac{420}{6} = \frac{6x}{6}$$
$$70 = x$$
$$x = 70$$
$$2x - 10 = 130$$

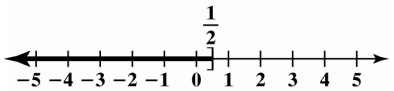
The parking lot is 70 yards wide and 130 yards long.

16. Let x = number of gallons of gasoline.

$$0.40x = 30,000$$
$$\frac{0.40x}{0.40} = \frac{30,000}{0.40}$$
$$x = 75,000$$

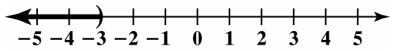
75,000 gallons of gasoline must be sold

17. $\left(-\infty, \frac{1}{2}\right]$



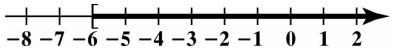
18.
$$3 - 3x > 12$$
$$3 - 3x - 3 > 12 - 3$$
$$-3x > 9$$
$$\frac{-3x}{-3} < \frac{9}{-3}$$
$$x < -3$$

$(-\infty, -3)$



19.
$$5 - 2(3 - x) \le 2(2x + 5) + 1$$
$$5 - 6 + 2x \le 4x + 10 + 1$$
$$2x - 1 \le 4x + 11$$
$$2x - 1 - 4x \le 4x + 11 - 4x$$
$$-2x - 1 \le 11$$
$$-2x - 1 + 1 \le 11 + 1$$
$$-2x \le 12$$
$$\frac{-2x}{-2} \ge \frac{12}{-2}$$
$$x \ge -6$$

$[-6, \infty)$



20. Let x = value of medical supplies sold.

$$600 + 0.04x > 2500$$
$$600 + 0.04x - 600 > 2500 - 600$$
$$0.04x > 1900$$
$$\frac{0.04x}{0.04} > \frac{1900}{0.04}$$
$$x > 47,500$$

You must sell more than \$47,500 worth of medical supplies.