Chapter 3
Lesson 3.1

1. $x + 11 = 7$
   $-11 \quad -11$
   $x = -4$

2. $x - 1.1 = 3.2$
   $+ 1.1 \quad +1.1$
   $x = 4.3$

3. $\frac{7x}{7} = \frac{21}{7}$
   $x = 3$

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

5. $\frac{5x}{12} = \frac{2}{3}$
   $(12)\frac{5x}{12} = \frac{2}{3}(12)$
   $\frac{5x}{5} = \frac{8}{5}$
   $x = \frac{8}{5}$

6. $x + \frac{5}{2} = \frac{2}{3}$
   $-\frac{5}{2} \quad -\frac{5}{2}$
   $x = \frac{2}{3} - \frac{5}{2} = \frac{2(2) - 5(3)}{6} = \frac{4 - 15}{6} = -\frac{11}{6}$

7. $x - \frac{5}{6} = \frac{3}{8}$
   $+\frac{5}{6} \quad +\frac{5}{6}$
   $x = \frac{3}{8} + \frac{5}{6} = \frac{3(3) + 5(4)}{24} = \frac{9 + 20}{24} = \frac{29}{24}$ OR $1\frac{5}{24}$

8. $\frac{0.01x}{0.01} = \frac{11}{0.01}$

   $x = 1{,}100$

9. $q - 13 = -13$

   $+13 \quad +13$

   $q = 0$

10. $z + 1.1 = 3.001$

    $-1.1 \quad -1.1$

    $z = 1.901$

11. $\frac{21s}{21} = \frac{3}{21}$

    $s = \frac{3}{21} = \frac{1}{7}$

12. $t + \frac{1}{2} = \frac{1}{3}$

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

    $t = \frac{1}{3} - \frac{1}{2} = \frac{1(2) - 1(3)}{6} = \frac{2-3}{6} = -\frac{1}{6}$

13. $\frac{7f}{11} = \frac{7}{11}$

    $\left(\frac{11}{7}\right)\frac{7f}{11} = \frac{7}{11}\left(\frac{11}{7}\right)$

    $f = 1$

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

    $(-2)\frac{3}{4} = -\frac{1}{2}y(-2)$

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

15. $6r = \frac{3}{8}$

$\frac{6r}{6} = \frac{\frac{3}{8}}{6}$

$r = \frac{\frac{3}{8}}{6} = \frac{3}{8}\left(\frac{1}{6}\right) = \frac{1}{16}$

16. $\frac{9b}{16} = \frac{3}{8}$

$\left(\frac{16}{9}\right)\frac{9b}{16} = \frac{3}{8}\left(\frac{16}{9}\right)$

$b = \frac{2}{3}$

17. a) The number of tokens, n, he needs to collect can be found by $25 = 10 + n$.

b) He collects $\frac{10}{8}w = 1.25w$ tokens per week.

c) The number of weeks it will take him to send off for his boat is
$r = 25 - 10 - 1.25w$
$r = 15 - 1.25w$

18. a) The cost of making the cake is \$8.50 + \$1.25 = \$9.75. Three times this amount is $u = 9.75(3)$.

b) Each slice will be $c = \frac{9.75(3)}{12}$

c) Total profit is $9.75(3) - 9.75$.

19. To figure out how many hot dogs he ate in one minute, find the quotient
$\frac{53.5}{12} \approx 4.46$ hot dogs per minute.

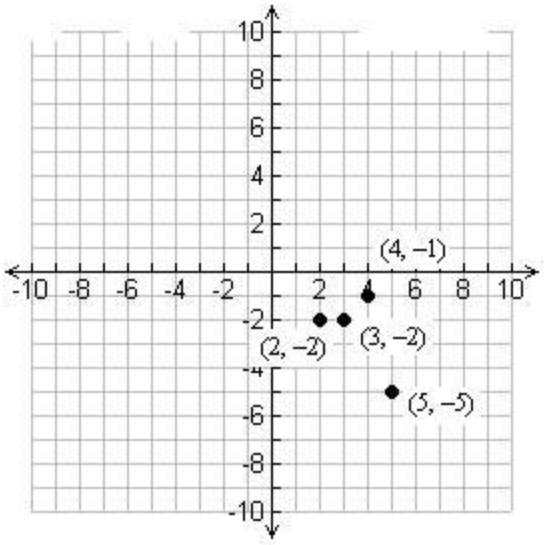
His old record was $53\frac{1}{2} - 3 = 50\frac{1}{2}$ hot dogs.

20. $\sqrt{48} = \sqrt{16(3)} = 4\sqrt{3} \approx 6.928$

21. 6.23 is a real number and a rational number

22. $\frac{118 \div 2}{4 \div 2} = \frac{59}{2}$ OR $29\frac{1}{2}$

23.



24. evaluate – means to follow the verbs in the math sentence. **Evaluate** can also be called simplify or answer.

25. The <u>difference</u> between m and n is 16.

26. $4(a + 11.2) = 4(a) + 4(11.2)$ represents the distributive property

Lesson 3.2

1. like terms - are expressions that have **identical** variable parts. (p. 90)

2. coefficient - numerical part of an algebraic term (p. 90)

3. $-7x + 39x = 32x$

4. $3x^2 + 21x + 5x + 10x^2 = 3x^2 + 10x^2 + 21x + 5x = 13x^2 + 26x$

5. $6xy + 7y + 5x + 9xy = 6xy + 9xy + 7y + 5x = 15xy + 7y + 5x$

6. $10ab + 9 - 2ab = 10ab - 2ab + 9 = 8ab + 9$

7. $-7mn - 2mn^2 - 2mn + 8 = -2mn^2 - 7mn - 2mn + 8 = -2mn^2 - 9mn + 8$

8. $-5y - 9 = 74$

First, we need to isolate the term with the variable ($-5y$), so we need to add 9 to both sides of the equation.

$-5y - 9 = 74$

$+9 \quad +9$

$-5y = 83$

Then we need to get rid of the number multiplied by y (-5), so we divide both sides of the equation by that value.

$$\frac{-5y}{-5} = \frac{83}{-5}$$

$$y = -\frac{83}{5} \text{ OR } -16\frac{3}{5}$$

9. $1.3x - 0.7x = 12$

$$\frac{0.6x}{0.6} = \frac{12}{0.6}$$

$x = 20$

CHECK

$1.3(20) - 0.7(20) = 12$

$26 - 14 = 12$

$12 = 12$ ✔

10. $6x - 1.3 = 3.2$

$+1.3 \quad +1.3$

$$\frac{6x}{6} = \frac{4.5}{6}$$

$x = 0.75$

CHECK

$6(0.75) - 1.3 = 3.2$

$4.5 - 1.3 = 3.2$

$3.2 = 3.2$ ✔

11. $5x - (3x + 2) = 1$

$5x - 3x - 2 = 1$

$2x - 2 = 1$

$+2 \quad +2$

$$\frac{2x}{2} = \frac{3}{2}$$

$$x = \frac{3}{2}$$

CHECK

$$5\left(\frac{3}{2}\right) - \left[3\left(\frac{3}{2}\right) + 2\right] = \frac{15}{2} - \left(\frac{9}{2} + 2\right) = \frac{15}{2} - \left(\frac{9}{2} + \frac{4}{2}\right) = \frac{15}{2} - \frac{13}{2} = \frac{2}{2} = 1$$ ✔

12. $4(x + 3) = 1$

$4x + 12 = 1$

$\quad -12 \quad -12$

$\frac{4x}{4} = \frac{-11}{4}$

$x = -\frac{11}{4}$

CHECK

$4(-\frac{11}{4} + 3) = 1$

$-11 + 12 = 1$

$1 = 1$ ✔

13. $5q - 7 = \frac{2}{3}$

$\quad +7 \quad +7$

$5q = \frac{2}{3} + 7 = \frac{2}{3} + \frac{21}{3} = \frac{23}{3}$

$\frac{5q}{5} = \frac{\frac{23}{3}}{5}$

$q = \frac{23}{3}\left(\frac{1}{5}\right) = \frac{23}{15}$

CHECK

$5\left(\frac{23}{15}\right) - 7 = \frac{2}{3}$

$\frac{23}{3} - \frac{21}{3} = \frac{2}{3}$

$\frac{2}{3} = \frac{2}{3}$ ✔

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

$(30)\left(\frac{3}{5}x+\frac{5}{2}\right)=\left(\frac{2}{3}\right)(30)$

$18x + 75 = 20$

$-75 \quad -75$

$\frac{18x}{18} = \frac{-55}{18}$

$x=-\frac{55}{18}$

CHECK

$\frac{3}{5}\left(\frac{-55}{18}\right)+\frac{5}{2}=\frac{2}{3}$

$\frac{-165}{90}+\frac{5}{2}=\frac{2}{3}$

$\frac{-165+225}{90}=\frac{2}{3}$

$\frac{60}{90}=\frac{2}{3}$

$\frac{2}{3}=\frac{2}{3}$ ✔

15. $s-\frac{3s}{8}=\frac{5}{6}$

$(24)\left(s-\frac{3s}{8}\right)=\left(\frac{5}{6}\right)(24)$

$24s - 9s = 20$

$15s = 20$

$s=\frac{4}{3}$

CHECK

$\frac{4}{3}-\frac{3\left(\frac{4}{3}\right)}{8}=\frac{5}{6}$

$\frac{4}{3}-\frac{4}{8}=\frac{5}{6}$

$\frac{4(8)-4(3)}{24}=\frac{5}{6}$

$\frac{32-12}{24}=\frac{5}{6}$

$\frac{20}{24}=\frac{5}{6}$ ➔ $\frac{5}{6}=\frac{5}{6}$ ✔

16. $0.1y + 11 = 0$

$\quad\quad - 11 \quad - 11$

$\frac{0.1y}{0.1} = \frac{-11}{0.1}$

$y = -110$

CHECK

$0.1(-110) + 11 = 0$

$-11 + 11 = 0$

$0 = 0$ ✔

17. $\frac{5q-7}{12} = \frac{2}{3}$

$(12)\left(\frac{5q-7}{12}\right) = \left(\frac{2}{3}\right)(12)$

$5q - 7 = 8$

$\quad + 7 \quad + 7$

$\frac{5q}{5} = \frac{15}{5}$

$q = 3$

CHECK

$\frac{5(3)-7}{12} = \frac{2}{3}$

$\frac{8}{12} = \frac{2}{3}$

$\frac{2}{3} = \frac{2}{3}$ ✔

18. $\frac{5(q-7)}{12} = \frac{2}{3}$

$\left(\frac{12}{5}\right)\left(\frac{5(q-7)}{12}\right) = \left(\frac{2}{3}\right)\left(\frac{12}{5}\right)$

$q - 7 = \frac{8}{5}$

$\quad + 7 \quad + 7$

$q = \frac{8}{5} + 7 = \frac{8}{5} + \frac{35}{5} = \frac{43}{5}$

CHECK

$\frac{5(\frac{43}{5}-7)}{12} = \frac{2}{3}$

$\frac{43-35}{12} = \frac{2}{3}$

$$\frac{8}{12} = \frac{2}{3}$$

$$\frac{2}{3} = \frac{2}{3}$$ ✔

19. $33t - 99 = 0$

$+ 99 \quad + 99$

$\frac{33t}{33} = \frac{99}{33}$

$t = 3$

CHECK

$33(3) - 99 = 0$

$99 - 99 = 0$

$0 = 0$ ✔

20. $5p - 2 = 32$

$+ 2 \quad + 2$

$\frac{5p}{5} = \frac{34}{5}$

$$p = \frac{34}{5}$$

CHECK

$$5\left(\frac{34}{5}\right) - 2 = 32$$

$34 - 2 = 32$

$32 = 32$ ✔

21. $14x + 9x = 161$

$\frac{23x}{23} = \frac{161}{23}$

$x = 7$

CHECK

$14(7) + 9(7) = 161$

$98 + 63 = 161$

$161 = 161$ ✔

22. $3m - 1 + 4m = 5$

$7m - 1 = 5$

$+1 \quad +1$

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

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

CHECK

$3\left(\frac{6}{7}\right) - 1 + 4\left(\frac{6}{7}\right) = 5$

$\frac{18}{7} - 1 + \frac{24}{7} = 5$

$\frac{18 - 7 + 24}{7} = 5$

$\frac{35}{7} = 5$

$5 = 5$ ✔

23. $8x + 3 = 11$

$-3 \quad -3$

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

$x = 1$

CHECK

$8(1) + 3 = 11$

$8 + 3 = 11$

$11 = 11$ ✔

24. $24 = 2x + 6$

$-6 \qquad -6$

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

$9 = x$

CHECK

$24 = 2(9) + 6$

$24 = 18 + 6$

$24 = 24$ ✔

25. $66 = \frac{2}{3}k$

$\left(\frac{3}{2}\right)(66) = \left(\frac{2}{3}k\right)\left(\frac{3}{2}\right)$

$99 = k$

CHECK

$66 = \frac{2}{3}(99)$

$66 = 66$ ✔

26. $\frac{5}{8} = \frac{1}{2}(a+2)$

$(2)\frac{5}{8} = \frac{1}{2}(a+2)(2)$

$\frac{5}{4} = a + 2$

$-2 \quad -2$

$\frac{5}{4} - 2 = a$

$\frac{5}{4} - \frac{8}{4} = a$

$-\frac{3}{4} = a$

CHECK

$\frac{5}{8} = \frac{1}{2}\left(-\frac{3}{4} + 2\right)$

$\frac{5}{8} = \frac{1}{2}\left(\frac{5}{4}\right)$

$\frac{5}{8} = \frac{5}{8}$ ✔

27. $16 = -3d - 5$

$+5 \quad +5$

$\frac{21}{-3} = \frac{-3d}{-3}$

$-7 = d$

CHECK

$16 = -3(-7) - 5$

$16 = 21 - 5$

$16 = 16$ ✔

28. Jayden's shoes cost 84.68(1.07) = $90.61.

29. Let h = the number of hours worked. Then we can write $98 + 60h = 498.00$.

$98 + 60h = 498.00$
$-98 \qquad -98$

$\frac{60h}{60} = \frac{400}{60}$
$h = 6.67$ hours

30. Let x = the amount of each payment. Then we can write $1195 = 250 + 5x$.

$1195 = 250 + 5x$
$-250 \quad -250$
$\frac{945}{5} = \frac{5x}{5}$
$x = 189$
Each payment will be $189.

31. Let m = the number of miles. Then $2.35 + 0.75m = 10$.

$2.35 + 0.75m = 10$
$-2.35 \qquad -2.35$
$\frac{0.75m}{0.75} = \frac{7.65}{0.75}$
$m = 10.2$ miles

32. Let p = the number of people. Then $150 + 3p = 300$.

33. Trish did not carry the negative with her when she divided both sides by a number. She should have divided by –2.

34. $d - 65 + 12 = 96$

35. domain: $0 \le x \le 10$

36. This relation is a function because it passes the vertical line test.

37. $\frac{1}{2} - \frac{15}{9} = \frac{1(9) - 15(2)}{18} = \frac{9 - 30}{18} = -\frac{21}{18} = -\frac{7}{6}$

38. The additive identity is 0. One can add any number to 0 and get that number.

39. The opposite of –4.1398 is 4.1398.

Lesson 3.3

1. $3(x-1)-2(x+3)=0$
   $3x-3-2x-6=0$
   $x-9=0$
   $x=9$

2. $7(w+20)-w=5$
   $7w+140-w=5$
   $6w+140=5$
   $-140 \quad -140$
   $\frac{6w}{6}=\frac{-135}{6}$
   $w=-22.5$

3. $9(x-2)=3x+3$
   $9x-2=3x+3$
   $-3x+2 \quad -3x+2$
   $\frac{6x}{6}=\frac{5}{6}$
   $x=\frac{5}{6}$

   $2\left(5a-\frac{1}{3}\right)=\frac{2}{7}$
   $5a-\frac{1}{3}=\frac{1}{7}$

4. $5a=\frac{1}{7}+\frac{1}{3}=\frac{1(3)+1(7)}{21}=\frac{10}{21}$
   $5a=\frac{10}{21}$
   $a=\frac{10}{21}\left(\frac{1}{5}\right)=\frac{2}{21}$

5. $\frac{2}{9}\left(i+\frac{2}{3}\right)=\frac{2}{5}$
   $i+\frac{2}{3}=\frac{2}{5}\left(\frac{9}{2}\right)$
   $i+\frac{2}{3}=\frac{9}{5}$
   $i=\frac{9}{5}-\frac{2}{3}=\frac{9(3)-2(5)}{15}=\frac{27-10}{15}=\frac{17}{15}$

6.

$$4\left(v+\frac{1}{4}\right)=\frac{35}{2}$$

$$v+\frac{1}{4}=\frac{35}{2}\left(\frac{1}{4}\right)$$

$$v+\frac{1}{4}=\frac{35}{8}$$

$$v=\frac{35}{8}-\frac{1}{4}=\frac{35-1(2)}{8}=\frac{35-2}{8}=\frac{33}{8}$$

7. $\frac{22}{2}=\frac{2(p+2)}{2}$

$11 = p + 2$

$-2 \quad -2$

$9 = p$

8. $\frac{-(m+4)}{-1}=\frac{-5}{-1}$

$m + 4 = 5$

$-4 \quad -4$

$m = 1$

9. $\frac{48}{4}=\frac{4(n+4)}{4}$

$12 = n + 4$

$-4 \quad -4$

$8 = n$

10.

$$\left[\frac{6}{5}\left(v-\frac{3}{5}\right)\right]=\frac{6}{25}$$

$$25\left(\frac{6}{5}v-\frac{18}{25}\right)=\left(\frac{6}{25}\right)25$$

$$30v-18=6$$

$$30v=24$$

$$v=\frac{24}{30}=\frac{4}{5}$$

11. $\frac{-10(b-3)}{-10}=\frac{-100}{-10}$

$b - 3 = 10$

$+3 \quad +3$

$b = 13$

12. $6v + 6(4v + 1) = -6$
$6v + 24v + 6 = -6$
$30v + 6 = -6$
$-6 \quad -6$
$30v = -12$
$v = -\frac{12}{30} = -\frac{2}{5}$

13. $-46 = -4(3s + 4) - 6$
$-46 = -12s - 16 - 6$
$-46 = -12s - 22$
$+22 \qquad +22$
$\frac{-24}{-12} = \frac{-12s}{-12}$
$2 = s$

14. $8(1 + 7m) + 6 = 14$
$-6 \quad -6$
$8 + 56m = 8$
$-8 \qquad -8$
$\frac{56m}{56} = \frac{0}{56}$
$m = 0$

15. $\frac{0}{-7} = \frac{-7(6 + 3k)}{-7}$
$0 = 6 + 3k$
$-6 \ -6$
$\frac{-6}{3} = \frac{3k}{3}$
$-2 = k$

16. $\frac{35}{-7} = \frac{-7(2 - x)}{-7}$
$-5 = 2 - x$
$-2 \quad -2$
$-7 = -x$
$7 = x$

17. $-3(3a + 1) - 7a = -35$
$-9a - 3 - 7a = -35$
$-16a - 3 = -35$
$+3 \quad +3$
$\frac{-16a}{-16} = \frac{-32}{-16}$
$a = 2$

18.
$$-2\left(n + \frac{7}{3}\right) = -\frac{14}{3}$$
$$n + \frac{7}{3} = -\frac{7}{3}$$
$$n = -\frac{7}{3} - \frac{7}{3} = -\frac{14}{3}$$

19.
$$-\frac{59}{60} = \frac{1}{6}\left(-\frac{4}{3}r - 5\right)$$
$$-60\left(-\frac{59}{60}\right) = \left(-\frac{4}{18}r - \frac{5}{6}\right)(-60)$$
$$59 = \frac{40}{3}r + 50$$
$$9 = \frac{40}{3}r$$
$$r = 9\left(\frac{3}{40}\right) = \frac{27}{40}$$

20.
$$7\left(\frac{4y + 3}{7}\right) = 9(7)$$
$$4y + 3 = 63$$
$$4y = 60$$
$$y = 15$$

21. $(c + 3) - 2c - (1 - 3c) = 2$
$c + 3 - 2c - 1 + 3c = 2$
$2c + 2 = 2$
$\frac{2c}{2} = \frac{0}{2}$
$c = 0$

22. $5m - 3[7 - (1 - 2m)] = 0$
$5m - 3(7 - 1 + 2m) = 0$
$5m - 3(6 + 2m) = 0$
$5m - 18 - 6m = 0$
$-m - 18 = 0$
$-18 = m$

23. $f - 1 + 2f + f - 3 = -4$
$4f - 4 = -4$
$4f = 0$
$f = 0$

24. Let n = the first integer. Then the sum of 4 consecutive even integers will be
$n + (n + 2) + (n + 4) + (n + 6) = 244$
$4n + 12 = 244$
$4n = 244 - 12$
$\frac{4n}{4} = \frac{232}{4}$
$n = 58$
This tells us the 4 consecutive even integers are 58, 60, 62, and 64.

25. Let x = the number. Then
$\frac{2}{3}x + 4 = 22$
$\frac{3}{2}\left(\frac{2}{3}x\right) = (18)\frac{3}{2}$
$x = 27$

26. Let p = the price of the pear. We know that the juice = 1.5 p and the sandwich = p + 1.40. The total is 3.50. So,

$3.50 = p + 1.5p + (p + 1.40)$
$3.50 = 3.5p + 1.40$
$\frac{2.10}{3.5} = \frac{3.5p}{3.5}$
$p = 0.60$
The pear costs \$0.60.

27. Let l = the number of laptops. Then
$5l$ = number of desktops
$\frac{5l}{5} = \frac{65}{5}$
$l = 13$
The school has 13 laptops.

28.

$$\frac{7}{100} = \frac{\text{commission}}{\text{sale price}}$$

$$\frac{7}{100} = \frac{5,389.12}{s}$$

$$7s = 538,912$$

$$s = \$76,987.43$$

The sale price is $76,987.43.

29. $1\frac{6}{7} \times \frac{2}{3} = \frac{13}{7} \times \frac{2}{3} = \frac{26}{21}$ OR $1\frac{5}{21}$

30. evaluate – means to follow the verbs in the math sentence. **Evaluate** can also be called simplify or answer.

31. $\sqrt{75} = \sqrt{25(3)} = 5\sqrt{3}$

32.

$$9\left(\frac{1}{9}m\right) = (12)9$$

$$m = 108$$

33. ((–5) – (–7) – (–3)) x (–10)
(–5 + 7 + 3) x (–10)
5 x (–10)
–50

34. $0.125 - \frac{1}{5} = 0.125 - .2 = -0.075$

Lesson 3.4

1. $3(x - 1) = 2(x + 3)$
   $3x - 3 = 2x + 6$
   $-2x + 3 \quad -2x + 3$
   $x = 9$

2. $7(x + 20) = x + 5$
   $7x + 140 = x + 5$
   $-x \quad -140 \quad -x \quad -140$
   $\frac{6x}{6} = \frac{-135}{6}$
   $x = 22.5$

3. $9(x - 2) = 3x + 3$
   $9x - 18 = 3x + 3$
   $-3x + 18 \quad -3x + 18$
   $\frac{6x}{6} = \frac{21}{6}$
   $x = \frac{21}{6} = \frac{7}{2}$

4. $2\left(a - \frac{1}{3}\right) = \frac{2}{5}\left(a + \frac{2}{3}\right)$
   $2a - \frac{2}{3} = \frac{2}{5}a + \frac{4}{15}$
   $-\frac{2}{5}a + \frac{2}{3} \quad -\frac{2}{5}a + \frac{2}{3}$
   $2a - \frac{2}{5}a = \frac{4}{15} + \frac{2}{3}$
   $\frac{10a - 2a}{5} = \frac{4 + 10}{15}$
   $\frac{5}{8}\left(\frac{8a}{5}\right) = \left(\frac{14}{15}\right)\frac{5}{8}$
   $a = \frac{7}{12}$

5.

$$35\left[\frac{2}{7}\left(t+\frac{2}{3}\right)\right]=\left[\frac{1}{5}\left(t-\frac{2}{3}\right)\right]35$$

$$10\left(t+\frac{2}{3}\right)=7\left(t-\frac{2}{3}\right)$$

$$10t+\frac{20}{3}=7t-\frac{14}{3}$$

$$3t=-\frac{34}{3}$$

$$t=-\frac{34}{9}$$

6.

$$\frac{1}{7}\left(v+\frac{1}{4}\right)=2\left(\frac{3v}{2}-\frac{5}{2}\right)$$

$$28\left(\frac{1}{7}v+\frac{1}{28}\right)=(3v-5)28$$

$$4v+1=84v-140$$

$$141=80v$$

$$v=\frac{141}{80}$$

7.

$$\frac{y-4}{11}=\frac{2}{5}\frac{2y+1}{3}$$

$$165\left(\frac{y-4}{11}\right)=\left(\frac{4y+2}{15}\right)165$$

$$15y-60=44y+22$$

$$-82=29y$$

$$y=-\frac{82}{29}$$

8.

$$144\left[\frac{z}{16}\right]=\left[\frac{2(3z+1)}{9}\right]144$$

$$9z=32(3z+1)$$

$$9z=96z+32$$

$$87z=-32$$

$$z=-\frac{32}{87}$$

9.

$$\frac{q}{16}+\frac{q}{6}=\frac{(3q+1)}{9}+\frac{3}{2}$$

$$\frac{q(3)+q(8)}{48}=\frac{2(3q+1)+3(9)}{18}$$

$$144\left(\frac{11q}{48}\right)=\left(\frac{6q+29}{18}\right)144$$

$$33q=48q+232$$

$$15q=-232$$

$$q=-\frac{232}{15}$$

10. $21 + 3b = 6 – 6(1 – 4b)$
$21 + 3b = 6 – 6 + 24b$
$21 + 3b = 24b$
$21 = 21b$
$b = 1$

11. $–2x + 8 = 8(1 – 4x)$
$–2x + 8 = 8 – 32x$
$30x = 0$
$x = 0$

12. $3(–5v – 4) = –6v – 39$
$–15v – 12 = –6v – 39$
$9v = 27$
$v = 3$

13. $–5(5k + 7) = 25 + 5k$
$–25k – 35 = 25 + 5k$
$–60 = 30k$
$k = –2$

14. $5x - 3 = (x + 5)3$
    $5x - 3 = 3x + 15$
    $2x = 18$
    $x = 9$

15. Let c = the original price of one CD.
    $5c + 6 = 9(c - 4) + 2$
    $5c + 6 = 9c - 36 + 2$
    $5c + 6 = 9c - 34$
    $40 = 4c$
    $c = 10$
    Since the original price is \$10, then the sale price is $10 - 4 = \$6$.

16. Let w = the number of weeks.
    $412 + 18w = 874 - 44w$
    $62w = 462$
    $w \approx 7.45$
    They will have the same amount in about 7.5 weeks.

17. a. Let t = the number of texts.
    $75 + 0.05t = 109$
    $0.05t = 34$
    $t = 680$ texts

    b. Plan B is better because after 680 texts, Plan A would cost more than Plan B.

18. a. Let h = the number of hours.
    $150 = 7.75h$
    $h = 19.35$ hours

    b. Choose Modern Rental because after 19.35 hours, Budgetwise will cost more.

19. $-12 + t = -20$
    $+ 12 \qquad + 12$
    $t = -8$

20. $3r - 7r = 32$
    $-4r = 32$
    $r = -8$

21. $35 = 5(e + 2)$
    $7 = e + 2$
    $5 = e$

22. $4n + 25 = 13$
$4n = -12$
$n = -3$

23. The opposite of $9\frac{1}{5}$ is $-9\frac{1}{5}$, which is equal to $-\frac{46}{5}$.

24. $(|b| - a) - (|d| - a) = (|-6| - 4) - (|5| - 4) = (6 - 4) - (5 - 4) = 2 - 1 = 1$

25. –3 is an integer that is not a counting number. Any negative number is acceptable.

Quick Quiz

1. The inverse of addition is subtraction.

2. $\frac{-4w}{-4} = \frac{16}{-4}$
$w = -4$

3. Let t = Shauna's previous time.
$56.7 = t - 0.98$
$t = 57.68$ seconds

4. $\frac{1}{2}b + 5 = 9$
$\frac{1}{2}b = 9 - 5$
$2\left(\frac{1}{2}b\right) = (4)2$
$b = 8$

5.
$3q + 5 - 4q = 19$
$-q + 5 = 19$
$-q = 14$
$q = -14$

Lesson 3.5

1. \$150 to \$3 becomes $\frac{150}{3} = \frac{50}{1} = 50$
2. 150 boys to 175 girls becomes $\frac{150}{175} = \frac{6}{7}$
3. 200 minutes to 1 hour becomes $\frac{200}{60} = \frac{10}{3}$
4. 10 days to 2 weeks = $\frac{10}{14} = \frac{5}{7}$
5. $\frac{54}{12} = \frac{9}{2}$ hotdogs/minute
6. $\frac{5,000}{250} = \frac{20}{1} = 20$ lbs/in^2
7. $\frac{20}{80} = \frac{1}{4}$ computers/student
8. $\frac{180}{6} = \frac{30}{1} = 30$ students/teacher
9. $\frac{12}{4} = 3$ meters/floor
10. $\frac{18}{15} = \frac{6}{5}$ minutes/appointment
11. There is more than one correct answer. One example is $\frac{30}{5} = \frac{6}{1}$. You could also flip both fractions, or swap the 5 and 6.
12. The means are 12 and 35 and the extremes are 5 and 84.
13. $\frac{13}{6} = \frac{5}{x}$
    $13x = 30$
    $x = \frac{30}{13}$
14. $\frac{1.25}{7} = \frac{3.6}{x}$
    $1.25x = 25.2$
    $x = 20.16$

15. $\frac{6}{19} = \frac{x}{11}$

$19x = 66$

$x = \frac{66}{19}$

16. $\frac{1}{x} = \frac{0.01}{5}$

$0.01x = 5$

$x = 500$

17. $\frac{300}{4} = \frac{x}{99}$

$4x = 29{,}700$

$x = 7{,}425$

18. $\frac{2.75}{9} = \frac{x}{\left(\frac{2}{9}\right)}$

$9x = 0.6\bar{1}$

$x \approx 0.68$

19. $\frac{1.3}{4} = \frac{x}{1.3}$

$4x = 1.69$

$x = 0.4225$

20. $\frac{0.1}{1.01} = \frac{1.9}{x}$

$0.1x = 1.919$

$x = 19.19$

21. $\frac{5p}{12} = \frac{3}{11}$

$55p = 36$

$p = \frac{33}{56}$

22. $-\frac{9}{x} = \frac{4}{11}$

$4x = -99$

$x = -24.75$

23. $\frac{n+1}{11} = -2$

$n + 1 = -22$

$n = -23$

24. $\frac{100}{908} = \frac{250}{x}$

$100x = 227{,}000$

$x = 2{,}270$

25. Let y = the height of Mount Yukon, b = the height of Ben Nevis, e = Mount Elbert.

Then $b = \frac{44}{48}(4800) = 4400$ meters

$e = \frac{220}{67}(4400) = 14,447.76$ meters

$y = \frac{298}{67}(14,447.76) = 64,260.19$ meters

Mount Yukon is about 64,260.19 meters tall.

26. Since 2 out of 3 students have a cell phone and 1 out of 5 of them are one year old or less, then $\frac{2}{3}\left(\frac{1}{5}\right) = \frac{2}{15}$ have cell phones that are one year old or less. This means that the ratio of students that have cell phones more than one year old is $\frac{13}{15}$.

27. $\frac{\text{Amazon}}{\text{used price}} = \frac{\$10.00}{\$6.50} \approx 1.54$. The Amazon price is about 1.54 times the used price.

$\frac{\text{used price}}{\text{Amazon}} = \frac{\$6.50}{\$10.00} = 0.65$. The used price is 0.65 times the Amazon price.

28. The unit price can be found by dividing the total price by the number of items.

$\frac{\$8.79}{10} = \frac{\$5.80}{x}$

$8.79x = 58$

$x = \frac{58}{8.79} \approx 6.6$

You can buy 6 notebooks, since you do not have quite enough to buy 7.

29. $\frac{1 \text{ cup mix}}{6 \text{ pancakes}} = \frac{x \text{ cups mix}}{21 \text{ pancakes}}$

So, $6x = 21$

$x = 3.5$ cups mix needed for 21 pancakes

$\frac{\frac{3}{4} \text{ cup water}}{6 \text{ pancakes}} = \frac{y \text{ cups water}}{21 \text{ pancakes}}$

$6y = 15.75$

$y = 2.625$ cups OR $2\frac{5}{8}$ cups

30. $\frac{1 \text{ N}}{3 \text{ H}} = \frac{x \text{ N}}{1{,}983 \text{ H}}$

$1{,}983 = 3x$

$x = 661$ H atoms

31. $\frac{5 \text{ won}}{9 \text{ games}} = \frac{x \text{ won}}{63 \text{ games}}$

$9x = 315$

$x = 35$ games won

32. First, we need to convert the time 7 hours to minutes, so $7(60) = 420$ minutes. Then we can set up out proportion is:

$\frac{15 \text{ miles}}{20 \text{ minutes}} = \frac{x \text{ miles}}{420 \text{ minutes}}$

$20x = 6300$

$x = 315$ miles

33. $\frac{15}{16} \div \frac{5}{8} = \frac{15}{16} \times \frac{8}{5} = \frac{3}{2}$

34. $|9 - 108| = |-99| = 99$

35. $8(8 - 3x) - 2(1 + 8x) = 64 - 24x - 2 - 16x = 62 - 40x$

36. $\frac{7(n + 7)}{7} = \frac{-7}{7}$

$n + 1 = -1$

$-1 \quad -1$

$n = -2$

37. $-22 = -3 + x$

$+3 \quad +3$

$x = -19$

38. $\frac{18}{2} = \frac{2u}{2}$

$u = 9$

39. $-\frac{1}{7} - \left(-1\frac{1}{3}\right) = -\frac{1}{7} + \frac{4}{3} = \frac{-1(3)+4(7)}{21} = \frac{-3+28}{21} = \frac{25}{21}$

40. $5 \times \frac{p}{6}|n| = 5 \times \frac{-6}{6}|10| = 5 \times (-1)(10) = -50$

41.

x	Work shown	$f(x) = \frac{1}{8}x + 2$
–4	$f(-4) = \frac{1}{8}(-4) + 2 = -\frac{1}{2} + 2 = \frac{3}{2}$	$\frac{3}{2}$
–3	$f(-3) = \frac{1}{8}(-3) + 2 = -\frac{3}{8} + 2 = \frac{-3+16}{8} = \frac{13}{8}$	$\frac{13}{8}$
–2	$f(-2) = \frac{1}{8}(-2) + 2 = \frac{-1}{4} + 2 = \frac{7}{4}$	$\frac{7}{4}$
–1	$f(-1) = \frac{1}{8}(-1) + 2 = \frac{-1}{8} + 2 = \frac{15}{8}$	$\frac{15}{8}$
0	$f(0) = \frac{1}{8}(0) + 2 = 2$	2
1	$f(1) = \frac{1}{8}(1) + 2 = \frac{1}{8} + 2 = \frac{17}{8}$	$\frac{17}{8}$
2	$f(2) = \frac{1}{8}(2) + 2 = \frac{1}{4} + 2 = \frac{9}{4}$	$\frac{9}{4}$
3	$f(3) = \frac{1}{8}(3) + 2 = \frac{3}{8} + \frac{16}{8} = \frac{19}{8}$	$\frac{19}{8}$
4	$f(4) = \frac{1}{8}(4) + 2 = \frac{1}{2} + 2 = \frac{5}{2}$	$\frac{5}{2}$

42. $y + 11$ becomes: eleven added to a number, y

Lesson 3.6

1. Similar figures are figures that have the same shape and all corresponding sides are proportional.

2. All the corresponding sides have the same ratio.

3. Indirect measurement utilizes similar figures to determine the measurement of an object that cannot be measured directly, like a tall building.

4. Law of Reflection – The angle that the light reflects off a mirror is the same as the angle that hits the mirror. This law can be used to show that two right triangles are similar. If the two triangles are similar, then proportions can be used to determine the length or height of an object.

5. $\frac{1 \text{ inches}}{20 \text{ miles}} = \frac{x \text{ inches}}{1,214 \text{ miles}}$

   $20x = 1{,}214$

   $x = 60.7$ inches

6. 1 mile : 1 mile would mean that there is no scaling from a map to the real space. The problem is that there would not be enough paper to create a drawing if the map covered too much distance.

7. We are going to use the proportion $\frac{\text{height}}{\text{shadow}} = \frac{\text{height}}{\text{shadow}}$. So,

   $\frac{66 \text{ inches}}{34 \text{ inches}} = \frac{h \text{ inches}}{99 \text{ inches}}$

   $34h = 6{,}534$

   $h = 192.2$ inches

   The tree is approximately 192.2 inches tall.

8.
   a. The length of the helicopter is 21 feet, which is found by measuring the length of the drawing and using the scale to determine actual length.
   b. The height of the helicopter is 10 feet.
   c. Each rotor is 12 feet.
   d. The cabin is 5 feet wide.
   e. The diameter of the rear rotor is 4 feet.

9. First, we need to convert $5\frac{1}{4}$ inches to feet (in decimal form).

$5\frac{1}{4} = \frac{21}{4}$ inches

$\frac{21}{4}\left(\frac{1 \text{ foot}}{12 \text{ inches}}\right) = \frac{21}{48} = 0.4375$ inches

We are going to use the proportion $\frac{\text{height}}{\text{shadow}} = \frac{\text{height}}{\text{shadow}}$. So,

$$\frac{3 \text{ feet}}{5.4375 \text{ feet}} = \frac{h \text{ feet}}{600 \text{ feet}}$$

$5.4375h = 1{,}800$

$h = 331.03$ feet

10. $\frac{12.4 \text{ inches}}{x \text{ miles}} = \frac{1.2 \text{ inches}}{15 \text{ miles}}$

$1.2x = 186$

$x = 155$ miles

The cities are 155 miles apart.

11. $\frac{\text{height}}{\text{shadow}} = \frac{\text{height}}{\text{shadow}}$

$\frac{6}{9} = \frac{h}{6}$

$9h = 36$

$h = 4$ feet

The dog is 4 feet tall.

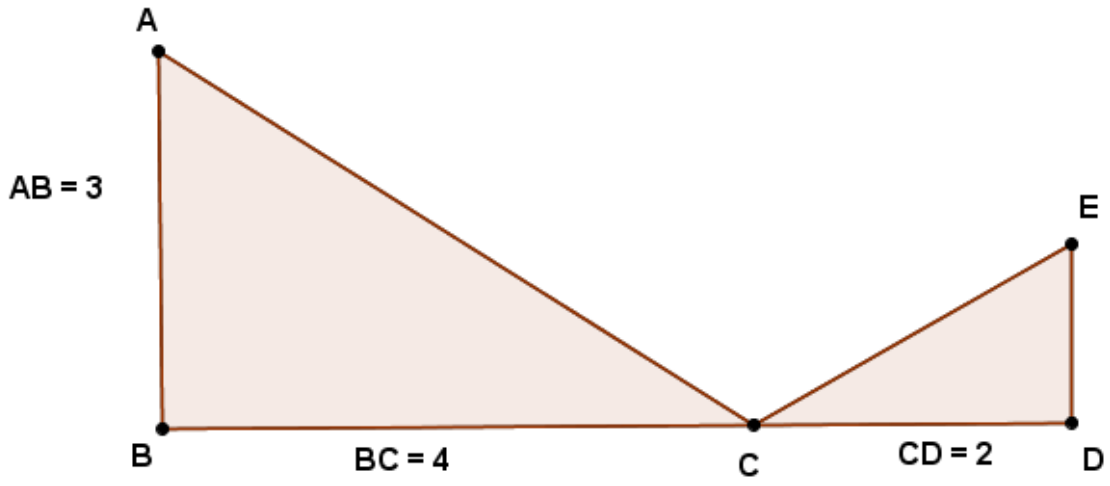
12. $\frac{3 \text{ inches}}{4 \text{ meters}} = \frac{12 \text{ inches}}{w \text{ meters}}$

$3w = 48$

$w = 16$ meters

The house is 16 meters wide.

13. We can use the figure to answer the question.



$\frac{BC}{CD} = \frac{AB}{DE} \Rightarrow \frac{4}{2} = \frac{3}{DE}$
$4DE = 6$
$DE = 1.5$ units

14. $\frac{\text{height}}{\text{shadow}} = \frac{\text{height}}{\text{shadow}}$
Since $\frac{5}{12} \approx 0.4167$
$\frac{42.9}{253.1} = \frac{5.4167}{s}$
$42.9s = 1370.96677$
$s = 31.96$ feet

The woman's shadow is about 31.96 feet.

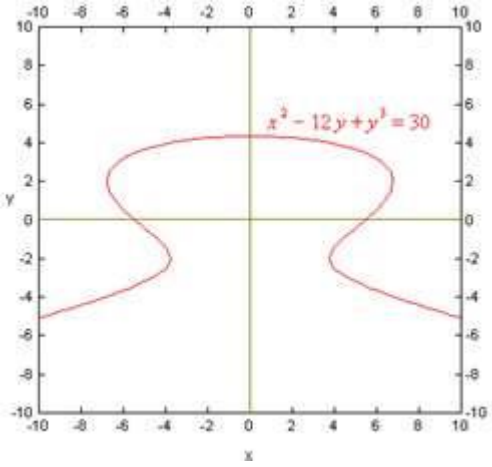
15. $-(7 - 7a) + 4a = -23 + 3a$
$-7 + 7a + 4a = -23 + 3a$
$-7 + 11a = -23 + 3a$
$8a = -16$
$a = -2$

16. Evaluating requires one to substitute a known quantity into an expression and simplify. For example, $3x + 2$ when $x = -4$ becomes $3(-4) + 2 = -12 + 2 = -10$. Solving requires one to solve an equation for an unknown quantity, such as
$3x + 2 = 11$
$3x = 9$
$x = 3$

17. $\sqrt{243} = \sqrt{81(3)} = 9\sqrt{3} \approx 15.6$

18. $2(8g + 2) - 1 + 4g - 2(2 - 5g) = 16g + 4 - 1 + 4g - 4 + 10g = 30g - 1$

19. There are many possible answers. One example of a relation that is not a function



is
It is not a function because it does not pass the Vertical Line Test.

20. Let j = the amount of money Jose has. We know that Huey = \$26, and Chloe = Huey – 4 = \$22. Then we know
$j = \frac{2}{3}(22) = \frac{44}{3} \approx 14.67$.
Jose has about \$14.67.

Lesson 3.7

1. $0.011(100\%) = 1.1\%$
2. $0.001(100\%) = 0.1\%$
3. $0.91(100\%) = 91\%$
4. $1.75(100\%) - 175\%$
5. $20(100\%) = 2000\%$
6. $\frac{1}{6} \approx 0.1667(100\%) = 16.67\%$
7. $\frac{5}{24} \approx 0.2083(100\%) = 20.83\%$
8. $\frac{6}{7} \approx 0.8571(100\%) = 85.71\%$
9. $\frac{11}{7} \approx 1.5714(100\%) = 157.14\%$
10. $\frac{13}{97} \approx 0.1340(100\%) = 13.40\%$
11. $11\% = \frac{11}{100}$
12. $65\% = \frac{65}{100} = \frac{13}{20}$
13. $16\% = \frac{16}{100} = \frac{4}{25}$
14. $12.5\% = \frac{125}{1000} = \frac{1}{8}$
15. $87.5\% = \frac{875}{1000} = \frac{7}{8}$
16. $0.32(600) = x$
    $192 = x$

17. 0.75% = 0.0075
    0.0075(16) = x
    0.12 = x

18. 0.092(500) = x
    46 = x

19. 8 = 0.20x
    $x = \frac{8}{0.20} = 40$

20. 99 = 1.80x
    $x = \frac{99}{1.8} = 55$

21. 7.2x = 45
    $x = \frac{45}{7.2} = 6.25(100\%) = 625\%$

22. 1.50x = 5
    $x = \frac{5}{150} \approx 0.033(100\%) = 3.3\%$

23. 50x = 2500
    $x = \frac{2500}{50} = 50(100\%) = 5,000\%$

24. The realtor earned 0.075(215,000) = \$16,125 in commission.

25. $\frac{1,750}{30,000} \approx 0.0583(100\%) = 5.83\%$

26. The shirt was discounted \$49.99 – \$29.99 = \$20. Therefore, the shirt was discounted $\frac{20}{49.99} = 0.40(100\%) = 40\%$.

27. Let p = the pre-sale price. We know that the % difference = amount of change/the pre-sale price.
    We can determine the sale percent as 100% – 35% = 65%.
    We need to know "195 is 65% of what number?"
    195 = 0.65p
    $p = \frac{195}{0.65} \approx 300$
    The pre-sale price for the shirt is \$300.

28. New rate = 9.50(100% + 12%) = 9.50(1.12) = $10.64/hour

29. Let p = the original purchase price for the stores. Then the selling price for Store A = $1.4p$ and the selling price for store B = $1.9p$.
With the permanent sale, Store B's new price = $(0.6)(1.9p) = 1.14p$ which is a better deal than Store A.

30. 788(0.18) = 141.84
About 142 students said their favorite show was reality-based.

31.

Step	Property
$4(x - 3) = 20$	given
$4x - 12 = 20$	Distributive Property of Equality
$4x = 20$	Addition Property of Equality
$x = 5$	Division Property of Equality

32. $V = \pi r^2 h = \pi(3)^2(5.5) \approx 155.51 \text{ in}^3$

33. *Jerry makes holiday baskets for his youth group.*

He can make one every 50 minutes. How many baskets can Jerry make in 25 hours?

34. A table can be used when there is a lot of data, or when organizing the data would help figure out a process. It is not useful if someone needs to work backwards, or there is not enough information where a table would be needed.

35. $\frac{10}{w} = \frac{12}{3}$
$12w = 30$
$w = 2.5$

Lesson 3.8

1. The dimensions of the sandbox are 5 feet by 8 feet, so the area of the base = 5(8) = 40 sq. ft.
   Let x = the height of the sand
   The volume of the sand = 30 cubic feet, so the height of the sand is

   $40x = 30$
   $x = 0.75$ inches.

   Therefore, the height of the box should be 0.75 + 4 = 4.75 inches.

2. First, how many stacks of 1.75 inch paper can be stacked to get 2 feet (24 inches)?
   $\frac{24}{1.75} \approx 13.71$ stacks
   Now, we can determine about how many sheets by multiplying.
   13.71(500) = 6,855 sheets

3. We first need to determine the price of the shoes with the 20% discount applied.
   \$36(0.8) = \$28.80
   The price with the coupon is \$28.80(0.9) = \$25.92

4. To determine the amount of time for the sound to reach the audience, we will use this method.
   $20 \text{ meters}\left(\frac{1 \text{ second}}{340 \text{ meters}}\right) = \frac{20}{340} = 0.059 \text{ seconds}$
   It is important to put the dimensions we want to cancel out on the top of one fraction and the bottom of the other fraction. This leaves only the desired dimension.

5. Let x = the amount of money she can spend on the vacation. Then we can determine the equation we need to use by looking at the percents.

   Since she spent 30% on the vacation, that means that she spent 70% of the vacation amount (x) on clothes.

   So we can write $x + 0.7x = 1{,}000$
   $1.7x = 1000$
   $x \approx$ \$588

   She spent approximately \$588 on vacation, so she spent about 1000 – 588 = \$412 on clothes.

6. The formula for the area of a circle is $A = \pi r^2$, where r = the radius.

   The area of the larger circle is $A = \pi(5.7)^2 \approx 102.07$ sq. cm.
   The area of the smaller circle is $A = \pi(2.3)^2 \approx 16.62$ sq. cm.

   So, the area available for storage is 102.07 – 16.62 = 85.45 sq cm.

7. We will need the information from the previous item. We know the area is 85.45 sq. cm. Density = $\frac{\text{data}}{\text{area}} = \frac{25 \text{ GB}}{85.45 \text{ sq. cm.}} = 0.29$ GB/sq.cm.

8. $V = \frac{\pi r^2 h}{3} = \frac{\pi(0.75)^2(5)}{2} \approx 4.42$ cubic inches

9. $\frac{39.37 \text{ inches}}{1 \text{ meter}}\left(\frac{1{,}000 \text{ meters}}{1 \text{ kilometer}}\right) = 39{,}370$ inches/km

10. $\frac{108 \text{ miles}}{1 \text{ hour}}(0.44704 \text{ meters/second}) \approx 48.28$ meters/second
    48.28(45 seconds) = 2,172.6 meters

11. The area of the rectangle, A, = 132 square centimeters and the length, l, = 11 centimeters. So,

    $132 = 11w$
    w = 12 centimeters

    The formula for the perimeter of a rectangle is $p = 2l + 2w$.
    $p = 2(11) + 2(12) = 22 + 24 = 46$ centimeters

12. SA = $6x^2 = 6(1)^2 = 6$ square inches

13. $\frac{14 \div 7}{21 \div 7} = \frac{2}{3}$

14. $\frac{55 \div 11}{33 \div 11} = \frac{5}{3}$

15. $\frac{15a}{36} = \frac{45}{12}$
    $180a = 1620$
    $a = 9$

16. $\frac{4x+5}{5} = \frac{2x+7}{7}$

$28x + 35 = 10x + 35$

$18x = 0$

$x = 0$

17. $4(x - 7) + x = 2$

$4x - 28 + x = 2$

$5x - 28 = 2$

$5x = 30$

$x = 6$

18. $x = 0.24(96) = 23.04$

19. $4\frac{2}{5} - \left(-\frac{7}{3}\right) = \frac{22}{5} + \frac{7}{3} = \frac{22(3)+7(5)}{15} = \frac{66+35}{15} = \frac{101}{15}$ OR $6\frac{11}{15}$

Lesson 3.9

1. $a + 11.2 = 7.3$
   $-11.2 \quad -11.2$
   $a = -3.9$

2. $9.045 + j = 27$
   $-9.045 \quad -9.045$
   $j = 17.955$

3. $11 = b + \frac{5}{7}$
   $b = 11 - \frac{5}{7} = \frac{11(7) - 5}{7} = \frac{77 - 5}{7} = \frac{72}{7}$ OR $10\frac{2}{7}$

4. $-22 = -3 + k$
   $+3 \quad +3$
   $k = -19$

5. $-9 = n - 6$
   $+6 \quad +6$
   $n = -3$

6. $-6 + l = -27$
   $+6 \quad +6$
   $l = -21$

7. $\frac{s}{2} = -18$
   $s = -18(2) = -36$

8. $29 = \frac{e}{27}$
   $e = 29(27) = 783$

9. $u \div -66 = 11$
   $u = 11(-66) = -726$

10. $-5f = -110$
    $f = -110(-5) = 550$

11. $76 = -19p$
    $p = 76(-19) = -1{,}444$

12. $-h = -9$
    $h = -9(-1) = 9$

13. $\frac{q+1}{11} = -2$

$(11)\frac{q+1}{11} = -2(11)$

$q + 1 = -22$

$q = -22 - 1 = -23$

14. $-2 - 2m = -22$

$-2m = -20$

$m = 10$

15. $-5 + \frac{d}{6} = -7$

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

$d = -2(6) = -12$

16. $32 = 2b - 3b + 5b$

$32 = 4b$

$b = 8$

17. $9 = 4h + 14h$

$9 = 18h$

$h = \frac{9}{18} = \frac{1}{2}$

18. $u - 3u - 2u = 144$

$-4u = 144$

$u = -36$

19. $2i + 5 - 7i = 15$

$-5i + 5 = 15$

$-5i = 10$

$i = -2$

20. $-10 = t + 15 - 4t$

$-10 = -3t + 15$

$-25 = -3t$

$t = \frac{25}{3}$ OR $8\frac{1}{3}$

21. $\frac{1}{2}k - 16 + 2\frac{1}{2}k = 0$

$3k = 16$

$k = \frac{16}{3}$ OR $5\frac{1}{3}$

22. $\frac{-1543}{120} = \frac{3}{5}x + \frac{11}{4}\left(-\frac{11}{5}x + \frac{8}{5}\right)$

$\frac{-1543}{120} = \frac{3}{5}x - \frac{121}{20}x + \frac{88}{20}$

$\frac{-1543}{120} = \frac{12-121}{20}x + \frac{88}{20}$

$120\left(\frac{-1543}{120}\right) = \left(-\frac{109}{20}x + \frac{88}{20}\right)120$

$-1543 = -654x + 528$

$-2071 = -654x$

$x = \frac{-2071}{-654} = 3\frac{109}{654}$

23. $-5.44x + 5.11(7.3x + 2) = -37.3997 + 6.8x$

$-5.44x + 37.303 + 10.22 = 37.3997 + 6.8x$

$-5.44x + 47.505 = 37.3997 + 6.8x$

$10.1053 = 12.24x$

$x \approx 0.8256$

24. $-5(5r + 7) = 25 + 5r$

$-25r - 35 = 25 + 5r$

$-60 = 30r$

$r = -2$

25. $-7p + 37 = 2(-6p + 1)$

$-7p + 37 = -12p + 2$

$5p = -35$

$p = -7$

26. $3(-5y - 4) = -6y - 39$

$-15y - 12 = -6y - 39$

$27 = 9y$

$y = 3$

27. $5(a - 7) + 2(a - 3(a - 5)) = 0$
$5a - 35 + 2(a - 3a + 15) = 0$
$5a - 35 + 2(-2a + 15) = 0$
$5a - 35 - 4a + 30 = 0$
$a - 5 = 0$
$a = 5$

28. 10 boys to 25 students = $\frac{10}{25} = \frac{2}{5}$

29. 96 apples to 42 pears = $\frac{96}{42} = \frac{48}{21}$

30. \$600 to \$900 = $\frac{600}{900} = \frac{2}{3}$

31. 45 miles to 3 hours = $\frac{45}{3} = 15$ mph

32. \$4.99 for 16 ounces of turkey burger = $\frac{\$4.99}{16 \text{ oz}} = \$0.31/\text{oz}$

33. 40 computers to 460 students = $\frac{40}{460} \approx 0.0870$ computers/student

34. 18 teachers to 98 students = $\frac{18}{98} \approx 0.1827$ teachers/student

35. 48 minutes to 15 appointments = $\frac{48}{15} = 3.2$ minutes/appointment

36. $-\frac{6}{n-7} = -\frac{2}{n+1}$
$\frac{6}{n-7} = \frac{2}{n+1}$
$6n + 6 = 2n - 14$
$4n = -20$
$n = -5$

37. $-\frac{9}{5}=\frac{x-7}{x+10}$

$5(x-7) = -9(x+10)$

$5x - 35 = -9x - 90$

$14x = -55$

$x=-\frac{55}{14}$ OR $-3\frac{13}{14}$

38. $\frac{5b}{12}=\frac{3}{11}$

$55b = 36$

$b=\frac{36}{55}$

39. $-\frac{12}{n}=\frac{5}{2n+6}$

$-12(2n + 6) = 5n$

$-24n - 72 = 5n$

$-72 = 19n$

$n=-\frac{72}{19} OR -3\frac{15}{19}$

40. 0.4567(100%) = 45.67%

41. 2.01(100%) = 201%

42. 0.005(100%) = 0.5%

43. 0.043(100%) = 4.3%

44. 23.5 ÷ 100 = 0.235

45. 0.08 ÷ 100 = 0.0008

46. 0.025 ÷ 100 = 0.00025

47. 125.4 ÷ 100 = 1.254

48. $78\%=\frac{78}{100}=\frac{39}{50}$

49. $11.2\%=\frac{112}{1000}=\frac{14}{125}$

50. $10.5\% = \frac{105}{1000} = \frac{21}{200}$

51. $33.\overline{3}\% = \frac{333}{1000}$

52. $32.4 = 0.45x$

$x = \frac{32.4}{0.45} = 72$

53. $58.7 = 1000x$

$x = \frac{58.7}{1000} = 0.0587(100\%) = 5.87\%$

54. $x = (0.12)78 = 9.36$

55. The markup price is 100% of the original price plus 20%, or 120% = 1.2.
So, the markup price = 44(1.2) = $52.80

56. The new price is 100% - 15% = 85% of the original price.
So, sale price = 240(0.85) = $204

57. The difference in price is 89.99 – 74.99 = $15.00.
The percent markdown = $\frac{\text{amt of change}}{\text{original price}} = \frac{15.00}{89.99} = 0.1667(100\%) = 16.67\%$

58. percent markup = $\frac{\text{amt of change}}{\text{original price}} = \frac{4}{10} = 0.4(100\%) = 40\%$

59. c = the original price of the item

$\frac{\text{amt of change}}{\text{original price}} = \frac{48}{c} = 0.3$

$c = \frac{48}{0.3} = 160$

The original price of the item was $160.

60. Let l = the length of the object.
The width (w) = l – 15, so the perimeter = $2l + 2w = 2l + 2(l - 15)$
$98 = 2l + 2l - 30$
$98 = 4l - 30$
$68 = 4l$
l = 17 units

The length of the object is 17 units.

61. Let m = the number of miles.
Then $16.75 = 4 + 0.25m$
$12.75 = 0.25m$
$51 = m$

He traveled 51 miles.

62. Let n = the number.
$2n + 38 = 124$
$2n = 86$
$n = 43$

63. Since all the sides of a square are the same, let s = the length of one side.
$4s = 260$
$s = 65$ yards

64. Since $\frac{1}{8}$ of the pie costs \$3.79, then the entire pie costs 3.79(8) = \$30.32.

65. The time the bulb was left on = $\frac{5.56}{0.06} \approx 92.67$ hours.

66. $\frac{\text{height}}{\text{shadow}} = \frac{\text{height}}{\text{shadow}}$

$$\frac{6\frac{1}{2}}{33.2} = \frac{\text{elephant}}{51.5}$$

So, $\text{elephant}(33.2) = 334.75$

$\text{elephant} = 10.08$ feet

The elephant is 10.08 feet.

67. $\frac{5 \text{ inches}}{32 \text{ miles}} = \frac{x \text{ inches}}{87 \text{ miles}}$
$32x = 435$
$x = 13.59$

The map would show the cities 13.59 inches apart.

3.10 Chapter Test

1. amt of change = 2.35 – 1.60 = 0.75

$$\frac{\text{amt of change}}{\text{original price}} = \frac{0.75}{1.60} = 0.48875(100\%) = 48.875\%$$

2. $\frac{3c}{8} = 11$

$3c = 88$

$c = 29.333\ldots$

3. $6.35(100\%) = 635\%$

4. $\frac{85}{6}$

5. Let x = the number of cupcakes made on the second day. Then

$(x - 12) + x = 68$

$2x - 12 = 68$

$2x = 80$

$x = 40$

She made 40 cupcakes on the second day.

6. $\frac{\text{height}}{\text{shadow}} = \frac{\text{height}}{\text{shadow}}$

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

$8x = 16$

$x = 2$

The shadow is 2 feet long.

7. $\frac{v}{v-2} = -\frac{9}{5}$

$-9(v-2) = 5v$

$-9v + 18 = 5v$

$18 = 14v$

$v = \frac{18}{14} = \frac{9}{7}$

8. $\frac{21 \text{ km}}{4 \text{ cm}} = \frac{x \text{ km}}{16 \text{ cm}}$

$4x = 336$

$x = 84$

Owosso and Perry are 84 km apart.

9. $-\frac{13}{4} - \frac{3}{2}\left(\frac{3}{4}j - \frac{4}{5}\right) = -\frac{14}{5}$

$-\frac{13}{4} - \frac{6}{8}j + \frac{8}{10} = -\frac{14}{5}$

$-\frac{6}{8}j + \frac{-13(5)+8(2)}{20} = -\frac{14}{5}$

$-\frac{3}{4}j - \frac{49}{20} = -\frac{14}{5}$

$-\frac{3}{4}j = -\frac{14}{5} + \frac{49}{20} = \frac{-14(4)+49}{20} = -\frac{7}{20}$

$-\frac{3}{4}j = -\frac{7}{20}$

$j = -\frac{7}{20}\left(-\frac{4}{3}\right) = \frac{7}{15}$

10. $2m(2 - 4) + 5m(-8) = 9$

$4m - 8 - 40m = 9$

$-36m - 8 = 9$

$-36m = 17$

$m = -\frac{17}{36}$

11. Let h = the number of hours.

$15 + 2h = 3.75h$

$15 = 1.75h$

$h = 8.57$

Job A and Job B will pay the same at 8.57 hours worked.

12. $9.0604 + 2.062k = 0.3(2.2k + 5.9)$

$9.0604 + 2.062k = 0.66k + 1.77$

$9.0604 + 1.402k = 1.77$

$1.402k = -7.2904$

$k = -5.2$

13. $-9 - a = 15$
$-a = 24$
$a = -24$

14. $46 = 0.11x$
$x = \dfrac{46}{0.11} = 418.18$ tons

15. $0.17x = 473$
$x = \dfrac{473}{0.17} \approx 2,782.35$ meters

16. The amount of change = 309 – 73 = 236
$\dfrac{\text{amt of change}}{\text{original price}} = \dfrac{236}{73} \approx 3.23(100\%) = 323\%$

17. $3\left(4\dfrac{1}{3}\right) = 3\left(\dfrac{13}{3}\right) = 13$ cups of flour

18. The amount of change = 80 – 45 = 35
$\dfrac{\text{amt of change}}{\text{original price}} = \dfrac{35}{80} = 0.4375(100\%) = 43.75\%$