

Solutions to Practice Problems in the Text

Chapter One: Fundamentals of Mathematical Modeling

Practice Set 1-2

1. $d = rt$
 $125 = 50t$ [Divide both sides by 50.]
 $t = 2.5$ hours
2. $d = rt$
 $170 = r(2.5)$ [Divide both sides by 2.5.]
 $68 \text{ mph} = r$
3. $I = Prt$
 $I = (\$5000)(0.05)(2) = \500
4. $I = Prt$
 $616 = (2800)r(4)$
 $616 = 11200r$
 $0.055 = r$
5. $A = \pi r^2$
 $A = \pi(3)^2 = (3.14)(9) = 28.26 \text{ in}^2$
6. $A = \pi r^2$
 $12.56 = (3.14)r^2$
 $4 = r^2$
 $\sqrt{4} = 2 \text{ ft} = r$
7. $A = \frac{1}{2}bh$
 $36 = \frac{1}{2}(8)h$
 $36 = 4h$
 $9 \text{ in} = h$
8. $A = \frac{1}{2}bh$
 $150 = \frac{1}{2}b(40)$
 $150 = 20b$
 $7.5 \text{ cm} = b$
9. $A = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{15(15-5)(15-12)(15-13)} =$
 $\sqrt{15(10)(3)(2)} = \sqrt{900} = 30 \text{ in}^2$
10. $A = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{6(6-3)(6-4)(6-5)} =$
 $\sqrt{6(3)(2)(1)} = \sqrt{36} = 6 \text{ in}^2$

$$11. C = \frac{5}{9}(F - 32) = \frac{5}{9}(68 - 32) = \frac{5}{9}(36) = 20^{\circ} C$$

$$12. C = \frac{5}{9}(F - 32) = \frac{5}{9}(-4 - 32) = \frac{5}{9}(-36) = -20^{\circ} C$$

$$13. F = \frac{9}{5}C + 32 = \frac{9}{5}(-10) + 32 = -18 + 32 = 14^{\circ} F$$

$$14. F = \frac{9}{5}C + 32 = \frac{9}{5}(100) + 32 = 180 + 32 = 212^{\circ} F$$

$$15. m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - (-4)}{-1 - 2} = \frac{-3 + 4}{-1 - 2} = \frac{1}{-3} = -\frac{1}{3}$$

$$16. m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 0}{-3 - (-1)} = \frac{-2}{-3 + 1} = \frac{-2}{-2} = 1$$

$$17. z = \frac{x - \bar{x}}{s} = \frac{95 - 100}{15} = \frac{-5}{15} = -\frac{1}{3}$$

$$18. z = \frac{x - \bar{x}}{s} = \frac{25.2 - 17.3}{7.9} = \frac{7.9}{7.9} = 1$$

$$19. a^2 + b^2 = c^2$$

$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$25 = c^2$$

$$\sqrt{25} = 5 = c$$

$$20. a^2 + b^2 = c^2$$

$$12^2 + 5^2 = c^2$$

$$144 + 25 = c^2$$

$$169 = c^2$$

$$\sqrt{169} = 13 = c$$

$$21. M = P\left(1 + \frac{r}{n}\right)^{nt} = 5000\left(1 + \frac{0.045}{12}\right)^{12 \cdot 10} = 5000\left(1 + \frac{0.045}{12}\right)^{120} = \$7834.96$$

$$22. M = P\left(1 + \frac{r}{n}\right)^{nt} = 12,000\left(1 + \frac{0.0325}{12}\right)^{12 \cdot 5} = 12,000\left(1 + \frac{0.0325}{12}\right)^{60} = \$14,114.28$$

$$23. x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{(5)^2 - 4(1)(-6)}}{2(1)} = \frac{-5 \pm \sqrt{25 + 24}}{2} =$$

$$\frac{-5 + \sqrt{49}}{2} = \frac{-5 + 7}{2} = \frac{2}{2} = 1 \quad \text{or} \quad \frac{-5 - \sqrt{49}}{2} = \frac{-5 - 7}{2} = \frac{-12}{2} = -6$$

$$24. x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(2)(-5)}}{2(2)} = \frac{9 \pm \sqrt{81 + 40}}{4} =$$

$$\frac{9 + \sqrt{121}}{4} = \frac{9 + 11}{4} = \frac{20}{4} = 5 \quad \text{or} \quad \frac{9 - \sqrt{121}}{4} = \frac{9 - 11}{4} = \frac{-2}{4} = -0.5$$

$$25. y = Ae^{rn} = 1,500,000e^{0.055 \cdot 7} = 1,500,000e^{0.385} = 2,204,421 \text{ bacteria}$$

$$26. y = Ae^{rn} = 45,000e^{0.015 \cdot 10} = 45,000e^{0.15} = 52,282.5 = 52,283 \text{ people}$$

$$27. I = Prt$$

$$\frac{I}{Pt} = \frac{Prt}{Pt} \quad [\text{Divide both sides by } Pt.]$$

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

$$28. V = lwh$$

$$\frac{V}{lh} = \frac{lwh}{lh} \quad [\text{Divide both sides by } lh.]$$

$$\frac{V}{lh} = w$$

$$29. A = \frac{1}{2}bh$$

$$2A = bh$$

[Multiply both sides by 2.]

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

[Divide both sides by h to solve for b .]

$$30. V = \frac{1}{3}Bh$$

$$3V = Bh$$

[Multiply both sides by 3.]

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

[Divide both sides by B to solve for h .]

$$31. P = 2L + 2W$$

$$P - 2W = 2L + 2W - 2W$$

[Subtract $2W$ from both sides.]

$$P - 2W = 2L$$

$$\frac{P - 2W}{2} = L$$

[Divide both sides by 2.]

$$32. P = 2L + 2W$$

$$P - 2L = 2L + 2W - 2L$$

[Subtract $2L$ from both sides.]

$$P - 2L = 2W$$

$$\frac{P - 2L}{2} = W$$

[Divide both sides by 2.]

$$33. A = \frac{1}{2}(B + b)h$$

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

[Multiply both sides by 2.]

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

$$2A = Bh + bh$$

[Use the Distributive Property.]

$$2A - bh = Bh + bh - bh$$

[Subtract bh from both sides.]

$$2A - bh = Bh$$

$$\frac{2A - bh}{h} = B$$

[Divide both sides by h to solve for B .]

$$34. \quad A = \frac{1}{2}(B + b)h$$

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

[Multiply both sides by 2.]

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

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

[Divide both sides by $(B + b)$ to solve for h .]

$$35. \quad 2x + 3y = 6$$

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

[Subtract $2x$ from both sides.]

$$3y = 6 - 2x$$

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

[Divide both sides by 3 to solve for y .]

$$36. \quad 2x - y = 10$$

$$2x - y - 2x = 10 - 2x$$

[Subtract $2x$ from both sides.]

$$-y = 10 - 2x$$

$$y = -10 + 2x$$

[Divide both sides by -1 .]

$$37. \quad A = \frac{x + y}{2}$$

$$2A = x + y$$

[Multiply both sides by 2.]

$$2A - y = x + y - y$$

[Subtract y from both sides.]

$$2A - y = x$$

$$38. \quad A = \frac{x + y}{2}$$

$$2A = x + y$$

[Multiply both sides by 2.]

$$2A - x = x + y - x$$

[Subtract x from both sides.]

$$2A - x = y$$

$$39. \quad F = \frac{9}{5}C + 32$$

$$5F = 9C + 160$$

[Multiply through by 5.]

$$5F - 160 = 9C + 160 - 160$$

[Subtract 160 from both sides.]

$$5F - 160 = 9C$$

$$\frac{5}{9}F - \frac{160}{9} = C$$

[Divide both sides by 9.]

$$\frac{5}{9}(F - 32) = C$$

[Factor out $\frac{5}{9}$.]

$$40. \quad C = \frac{5}{9}(F - 32)$$

$$C = \frac{5}{9}F - \frac{160}{9}$$

[Use the distributive property.]

$$C + \frac{160}{9} = \frac{5}{9}F - \frac{160}{9} + \frac{160}{9}$$

[Add $\frac{160}{9}$ to both sides.]

$$C + \frac{160}{9} = \frac{5}{9}F$$

$$\frac{9}{5}C + 32 = F$$

[Multiply through by $\frac{9}{5}$.]

$$41. \quad \text{BMI} = \frac{W}{H^2} \cdot 703 = \frac{140}{73^2} \cdot 703 = 18.4687... = 18.5, \text{ Normal}$$

$$42. \quad \text{BMI} = \frac{W}{H^2} \cdot 703 = \frac{160}{60^2} \cdot 703 = 31.2444... = 31.2, \text{ Obese}$$

Practice Set 1-3

$$1. \quad \frac{45 \text{ min}}{2 \text{ hr}} = \frac{45 \text{ min}}{120 \text{ min}} = \frac{3}{8}$$

$$2. \frac{1 \text{ hr}}{35 \text{ min}} = \frac{60 \text{ min}}{35 \text{ min}} = \frac{12}{7}$$

$$3. \frac{4 \text{ in}}{4 \text{ ft}} = \frac{4 \text{ in}}{48 \text{ in}} = \frac{1}{12}$$

$$4. \frac{3 \text{ ft}}{60 \text{ in}} = \frac{36 \text{ in}}{60 \text{ in}} = \frac{3}{5}$$

$$5. \frac{6 \text{ ft}}{3 \text{ yd}} = \frac{6 \text{ ft}}{9 \text{ ft}} = \frac{2}{3}$$

$$6. \frac{2 \text{ yd}}{12 \text{ ft}} = \frac{6 \text{ ft}}{12 \text{ ft}} = \frac{1}{2}$$

$$7. \frac{8 \text{ weeks}}{16 \text{ days}} = \frac{56 \text{ days}}{16 \text{ days}} = \frac{7}{2}$$

$$8. \frac{5 \text{ days}}{1 \text{ week}} = \frac{5 \text{ days}}{7 \text{ days}} = \frac{5}{7}$$

$$9. \frac{25 \text{ mL}}{1 \text{ L}} = \frac{25 \text{ mL}}{1000 \text{ mL}} = \frac{1}{40}$$

$$10. \frac{2400 \text{ mL}}{2 \text{ L}} = \frac{2400 \text{ mL}}{2000 \text{ mL}} = \frac{6}{5}$$

$$11. \frac{304 \text{ miles}}{9.5 \text{ gal}} = 32 \text{ mi./gal.}$$

$$12. \frac{450 \text{ miles}}{20 \text{ gal}} = 22.5 \text{ mi./gal.}$$

$$13. \frac{\$3.50}{10 \text{ min}} = \$0.35/\text{min.}$$

$$14. \frac{\$86.40}{720 \text{ kWh}} = \$0.12/\text{kWh}$$

$$15. \frac{\$48}{10 \text{ days}} = \$4.80/\text{day}$$

$$16. \frac{\$340}{40 \text{ hr}} = \$8.50 / \text{hr}$$

$$17. \frac{24 \text{ lb}}{15 \text{ people}} = 1.6 \text{ lb./person}$$

$$18. \frac{5.5 \text{ lb}}{12 \text{ people}} = 0.458\bar{3} \text{ lb./person}$$

$$19. \frac{x}{5} = \frac{3}{4}$$

$$4x = (3)(5)$$

$$4x = 15$$

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

[cross-multiplication property]

$$20. \frac{9}{2x} = \frac{6}{4}$$

$$(4)(9) = (2x)(6)$$

$$36 = 12x$$

$$3 = x$$

[cross-multiplication property]

$$21. \frac{30}{126} = \frac{5}{3x}$$

$$(3x)(30) = 5(126)$$

$$90x = 630$$

$$x = 7$$

[cross-multiplication property]

$$22. \frac{2x}{7} = \frac{8}{14}$$

$$(2x)(14) = (7)(8)$$

$$28x = 56$$

$$x = 2$$

[cross-multiplication property]

$$23. \frac{3x+6}{35} = \frac{2x-18}{5}$$

$$5(3x+6) = 35(2x-18)$$

$$15x+30 = 70x-630$$

$$15x+30-70x = 70x-630-70x$$

$$-55x+30 = -630$$

$$-55x+30-30 = -630-30$$

$$-55x = -660$$

$$x = 12$$

[cross-multiplication property]
[distributive property]

$$24. \frac{x-2}{7} = \frac{2x+2}{28}$$

$$28(x-2) = 7(2x+2)$$

$$28x-56 = 14x+14$$

$$28x-56-14x = 14x+14-14x$$

$$14x-56 = 14$$

$$14x-56+56 = 14+56$$

[cross-multiplication property]
[distributive property]

NOT FOR SALE

$$14x = 70$$
$$x = 5$$

25. $\frac{15}{18} = \frac{x-1}{x}$
 $(15)(x) = 18(x-1)$
 $15x = 18x - 18$
 $15x - 18x = 18x - 18 - 18x$
 $-3x = -18$
 $x = 6$

[cross-multiplication property]
[distributive property]

26. $\frac{3}{x+4} = \frac{5}{2x+3}$
 $3(2x+3) = 5(x+4)$
 $6x+9 = 5x+20$
 $6x+9-5x = 5x+20-5x$
 $x+9 = 20$
 $x+9-9 = 20-9$
 $x = 11$

[cross-multiplication property]
[distributive property]

27. $\frac{3}{x+1} = \frac{18}{9x-3}$
 $3(9x-3) = 18(x+1)$
 $27x-9 = 18x+18$
 $27x-9-18x = 18x+18-18x$
 $9x-9 = 18$
 $9x-9+9 = 18+9$
 $9x = 27$
 $x = 3$

[cross-multiplication property]
[distributive property]

28. $\frac{x+8}{6} = \frac{2x-8}{3}$
 $3(x+8) = 6(2x-8)$
 $3x+24 = 12x-48$
 $3x+24-12x = 12x-48-12x$
 $-9x+24 = -48$
 $-9x+24-24 = -48-24$
 $-9x = -72$
 $x = 8$

[cross-multiplication property]
[distributive property]

29. Unit rate equals cost divided by the number of square feet.
 $\$2235 \div 1500 \text{ ft}^2 = \$1.49/\text{ft}^2$

30. Unit rate equals cost divided by the number of yards.
 $\$47.80 \div 4 \text{ yd} = \$11.95/\text{yd}$

31. Cost per ounce = $\$8.99 \div 16 \text{ oz} = \0.561875 per ounce

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32. Cost per can = $\$7.14 \div 6 \text{ cans} = \1.19 per can

33. Brand X: $\$1.49 \div 8 \text{ oz} = \$0.18625/\text{ounce}$

Brand Z: $\$2.12 \div 12 \text{ oz} = \$0.1766\ldots/\text{ounce}$

Brand Z is the better buy because it costs less per ounce.

34. five 2-L colas: $\$4.95 \div 5 = \$0.99/\text{bottle}$

three 2-L colas: $\$2.99 \div 3 = \$0.99666\ldots/\text{bottle}$

Purchasing five 2-L colas for \$4.95 is a better buy.

35. Let $\frac{120 \text{ cal}}{\frac{3}{4} \text{ cup}} = \frac{x}{1 \text{ cup}}$.

$$(1)(120) = \frac{3}{4}x$$

$$120 = \frac{3}{4}x$$

$$160 \text{ calories} = x$$

[Cross multiply.]

[Multiply both sides by 4/3.]

36. Let $\frac{8 \text{ oz}}{90 \text{ cal}} = \frac{28 \text{ oz}}{x}$.

$$8x = (90)(28)$$

$$8x = 2520$$

$$x = 315 \text{ calories}$$

[Cross multiply.]

37. Let $\frac{2.5 \text{ dozen}}{1.25 \text{ cups}} = \frac{x \text{ dozen}}{3 \text{ cups}}$.

$$(3)(2.5) = 1.25x$$

$$7.5 = 1.25x$$

$$6 = x$$

Answer is 6 dozen or 72 muffins.

[Cross multiply.]

38. If each of 30 students has 2 cookies, then 60 cookies are needed. $60 \div 12 = 5 \text{ doz.}$

Let $\frac{3 \text{ dozen}}{2.5 \text{ cups}} = \frac{5 \text{ dozen}}{x}$

$$3x = (5)(2.5)$$

$$3x = 12.5$$

$$x = 4.16666\ldots = 4\frac{1}{6} \text{ cups}$$

[Cross multiply.]

39. Let $\frac{5 \text{ ft } 4 \text{ in}}{10.5 \text{ ft}} = \frac{x}{20 \text{ ft}}$. Convert the measurements to inches as follows: 5 ft 4 in = 5(12)

$$+ 4 = 64 \text{ inches; } 10.5 \text{ ft} = 10.5 \times 12 \text{ in} = 126 \text{ inches; } 20 \text{ ft} = 20 \times 12 \text{ in} = 240 \text{ inches.}$$

Now substitute:

$$\frac{64 \text{ in}}{126 \text{ in}} = \frac{x}{240 \text{ in}}$$

$$(64)(240) = 126x$$

$$15360 = 126x$$

$$121.9 \text{ inches} = x$$

Converting to feet and inches: $121.9 \text{ inches} \div 12 \text{ in/ft} = 10 \text{ ft. } 1.9 \text{ in.}$

40. Let $\frac{5 \text{ ft } 10 \text{ in}}{8 \text{ ft } 9 \text{ in}} = \frac{x}{14 \text{ ft}}$. Convert the measurements to inches as follows: $5 \text{ ft } 10 \text{ in} = 5(12)$

$+ 10 = 70 \text{ inches}$, $8 \text{ ft } 9 \text{ in} = 8(12) + 9 = 105 \text{ inches}$, and $14 \text{ ft} = 14(12) = 168 \text{ inches}$.

Now substitute:

$$\frac{70 \text{ in}}{105 \text{ in}} = \frac{x}{168 \text{ in}}$$

$$(70)(168) = 105x$$

[Cross multiply.]

$$11760 = 105x$$

$$112 \text{ inches} = x$$

$(112 \text{ inches} = 9 \text{ feet } 4 \text{ inches})$

41. Let $\frac{1.8 A}{18 V} = \frac{5.4 A}{x}$.

$$(18)(5.4) = 1.8A$$

[Cross multiply.]

$$97.2 = 1.8A$$

$$54 V = A$$

42. Let $\frac{10 A}{50 V} = \frac{25 A}{x}$

$$10x = (25)(50)$$

[Cross multiply.]

$$10x = 1250$$

$$x = 125 V$$

43. Let $\frac{110 \text{ lb}}{19.4 \text{ lb}} = \frac{200 \text{ lb}}{x}$

$$110x = (19.4)(200)$$

[Cross multiply.]

$$110x = 3880$$

$$x = 35.2727... \text{ or approximately } 35.3 \text{ lb.}$$

44. Let $\frac{110 \text{ lb}}{19.4 \text{ lb}} = \frac{155 \text{ lb}}{x}$

$$110x = (19.4)(155)$$

[Cross multiply.]

$$110x = 3007$$

$$x = 27.336363... \text{ or approximately } 27.3 \text{ lb.}$$

45. Let $\frac{10 \text{ lb}}{400 \text{ ft}^2} = \frac{x}{500 \text{ ft}^2}$

$$(10)(500) = 400x$$

[Cross multiply.]

$$5000 = 400x$$

$$12.5 \text{ lb} = x$$

46. Let $\frac{20}{1} = \frac{256 \text{ oz}}{x}$ [2 gallons = 256 oz.]
 $20x = (256)(1)$ [Cross multiply.]
 $20x = 256$
 $x = 12.8 \text{ oz.}$

47. Let $\frac{\$240}{1200 \text{ words}} = \frac{x}{1500 \text{ words}}$.
 $(240)(1500) = 1200x$ [Cross multiply.]
 $360,000 = 1200x$
 $\$300 = x$

48. Let $\frac{1500 \text{ doughnuts}}{9 \text{ hours}} = \frac{300 \text{ doughnuts}}{x}$
 $1500x = (9)(300)$ [Cross multiply.]
 $1500x = 2700$
 $x = 1.8 \text{ hr.}$

49. Let $\frac{1 \text{ adult}}{15 \text{ children}} = \frac{3 \text{ adults}}{x}$
 $x = (3)(15)$ [Cross multiply.]
 $x = 45 \text{ children}$

50. Let $\frac{1 \text{ adult}}{6 \text{ infants}} = \frac{x}{15 \text{ infants}}$
 $15 = 6x$ [Cross multiply.]
 $2.5 \text{ adults} = x$
 Therefore, 3 adults are needed for 15 infants.

51. Let $\frac{1 \text{ inch}}{8 \text{ feet}} = \frac{2.75 \text{ inches}}{x}$
 $x = (8)(2.75)$ [Cross multiply.]
 $x = 22 \text{ feet}$

Let $\frac{1 \text{ inch}}{8 \text{ feet}} = \frac{1.9375 \text{ inches}}{x}$
 $x = (8)(1.9375)$ [Cross multiply.]
 $x = 15.5 \text{ feet}$
 Dimensions are 22 ft $\times$ 15.5 ft

52. Let $\frac{1 \text{ inch}}{10 \text{ miles}} = \frac{x}{185 \text{ miles}}$
 $(1)(185) = 10x$ [Cross multiply.]
 $18.5 \text{ in} = x$

53. Let $\frac{\text{Mach } 1}{761.2 \text{ mph}} = \frac{\text{Mach } 3.1}{x}$
 $1x = (3.1)(761.2)$ [Cross multiply.]
 $x = 2359.72 \text{ mph}$

54. Let $\frac{\text{Mach } 1}{761.2 \text{ mph}} = \frac{x}{1903 \text{ mph}}$
 $761.2x = (1)(1903)$ [Cross multiply.]
 $x = 2.5 \text{ (Mach } 2.5)$

55. Let $\frac{400 \text{ ft}}{1 \text{ day}} = \frac{1000 \text{ ft}}{x}$
 $(1)(1000) = 400x$ [Cross multiply.]
 $1000 = 400x$
 $2.5 \text{ days} = x$

56. Let $\frac{8 \text{ sq / day}}{1 \text{ roofer}} = \frac{x}{2 \text{ roofers}}$
 $(2)(8 \text{ sq/day}) = x$ [Cross multiply.]
 $16 \text{ sq/day} = x$
 Since 2 roofers can do 16 squares per day, they can do 32 squares in 2 days.

57. Let $\frac{40 \text{ mg}}{1 \text{ mL}} = \frac{60 \text{ mg}}{x}$
 $40x = (1)(60)$ [Cross multiply.]
 $40x = 60$
 $x = 1.5 \text{ mL}$

58. Let $\frac{100 \text{ mg}}{1 \text{ kg}} = \frac{x}{9.3 \text{ kg}}$
 $(100)(9.3) = 1x$ [Cross multiply.]
 $930 \text{ mg} = x$

59. Let $\frac{1.8 \text{ mi}}{30 \text{ min}} = \frac{x}{45 \text{ min}}$
 $(1.8)(45) = 30x$ [Cross multiply.]
 $81 = 30x$
 $2.7 \text{ miles} = x$

$$\begin{aligned}
 60. \text{ Let } \frac{1 \text{ mph}}{1.609 \text{ kph}} &= \frac{x}{98 \text{ kph}} \\
 (1)(98) &= 1.609x \\
 98 &= 1.609x \\
 60.9 \text{ mph} &= x
 \end{aligned}$$

Practice Set 1-.4

1. $2x + 6$

2. $2x - 3$

3. $7x - 2$

4. $3 + 4x$

5. $3(4 + x)$

6. $2(x - 6)$

7. $\frac{1}{3}x - 5$

8. $x - \frac{3}{4}x$

9. Let Bill's salary = x . Then, Ann's salary = $x + \$5000$

10. Let Monday's attendance = x . Then, Friday's is $\frac{1}{2}x + 3$

11. Let the width = x . Then, the length = $2x + 5$.

12. Let the short rod = x . Then, each subsequent rod is 1 inch longer: $x + 1$ and $x + 2$.

$$\begin{aligned}
 13. \quad 5x + 5 &= 2x - 10 \\
 5x + 5 - 2x &= 2x - 10 - 2x \\
 3x + 5 &= -10 \\
 3x + 5 - 5 &= -10 - 5 \\
 3x &= -15 \\
 x &= -5
 \end{aligned}$$

$$\begin{aligned}
 14. \quad 8x - 16 &= 80 \\
 8x - 16 + 16 &= 80 + 16 \\
 8x &= 96 \\
 x &= 12
 \end{aligned}$$

$$\begin{aligned}
 15. \text{ Emily has saved } x. \text{ Elena has saved } 2x \text{ (twice as much).} \\
 x + 2x &= 72 \\
 3x &= 72 \\
 x &= 24 \text{ so Emily has saved } \$24 \text{ and Elena has saved } 2(\$24) = \$48.
 \end{aligned}$$

16. Let the lower grade = x . The higher grade is $x + 56$.

$$x + (x + 56) = 128$$

$$2x + 56 = 128$$

$$2x + 56 - 56 = 128 - 56$$

$$2x = 72$$

$$x = 36 \text{ so the lower grade is 36 and the higher is } 36 + 56 = 92.$$

17. Let x = the shorter piece. The longer piece will be $2x$.

$$x + 2x = 60 \text{ meters}$$

$$3x = 60 \text{ meters}$$

$$x = 20 \text{ meters}$$

The shorter piece is 20 meters long and the longer piece is $2(20) = 40$ meters long.

18. Let Joshua's age = x and Mario's age be $x + 18$.

$$x + (x + 18) = 46$$

$$2x + 18 = 46$$

$$2x + 18 - 18 = 46 - 18$$

$$2x = 28$$

$$x = 14$$

So, Joshua is 14 years old and Mario is $14 + 18 = 32$ years old.

19. Using the definition of an average, let x equal the missing grade.

$$\frac{88 + 91 + 95 + x}{4} = 90$$

$$88 + 91 + 95 + x = 4(90)$$

$$274 + x = 360$$

$$274 - 274 + x = 360 - 274$$

$$x = 86$$

In order to have a 90 average, she must make 86 on the last test.

20. Using the definition of an average, let x equal the missing grade.

$$\frac{60 + 92 + 78 + 89 + x}{5} = 84$$

$$60 + 92 + 78 + 89 + x = 5(84)$$

$$319 + x = 420$$

$$319 - 319 + x = 420 - 319$$

$$x = 101$$

In order to have a B average, she must make 101 on the last test. On a normal grading scale, this will be impossible.

21. Let x = the number of kilowatt-hours. Write the equation and solve.

$$\$20.00 + \$0.14x = \$85.78$$

$$20.00 - 20.00 + 0.14x = 85.78 - 20.00$$

$$0.14x = 65.78$$

$$x = \frac{65.78}{0.14} = 470 \text{ kWh (rounded)}$$

22. Let x = number of “out of area” minutes.

$$\$29.95 + \$9.95 + \$0.40x = \$69.90$$

$$39.90 + 0.40x = 69.90$$

$$39.90 - 39.90 + 0.40x = 69.90 - 39.90$$

$$0.40x = 30$$

$$x = 75$$

She was charged for 75 “out of area” minutes.

23. Let x = the taxi fare. Since $1/11$ of a mile costs \$0.20, the cost of one mile = $\$0.20 \times 11 = \2.20 .

$$x = \$3.20 + 18(\$2.20/\text{mile}) + \$1.20 = \$44.00$$

24. Let x = the taxi fare. Since $1/5$ of a mile costs \$0.40, the cost of one mile = $\$0.40 \times 5 = \2.00 .

$$x = \$2.50 + 16(\$2.00/\text{mile}) = \$34.50$$

25. The opponent scored x points in the game. Mighty Mites scored 39 points. This amount (39) is $2x - 1$.

$$2x - 1 = 39$$

$$2x - 1 + 1 = 39 + 1$$

$$2x = 40$$

$$x = 20$$

The opponent scored 20 points.

26. Let the number of games Jim won = x and the number that Gaylord won = $x + 99$.

$$x + (x + 99) = 529$$

$$2x + 99 = 529$$

$$2x + 99 - 99 = 529 - 99$$

$$2x = 430$$

$$x = 215$$

Jim won 215 games and Gaylord won $215 + 99 = 314$ games.

27. Let the integers be x , $x + 1$ and $x + 2$. Write the equation for the sum and solve.

$$x + (x + 1) + (x + 2) = 87$$

$$3x + 3 = 87$$

$$3x + 3 - 3 = 87 - 3$$

$$3x = 84$$

$$x = 28$$

The integers are $x = 28$, $x + 1 = 29$ and $x + 2 = 30$.

28. Let the integers be x , $x + 1$ and $x + 2$. Write the equation for the sum and solve.

$$x + (x + 1) + (x + 2) = 100$$

$$\begin{aligned} 3x + 3 &= 100 \\ 3x + 3 - 3 &= 100 - 3 \\ 3x &= 97 \\ x &= 32.333... \end{aligned}$$

Since this number is not an integer, there is not a set of consecutive integers that satisfies the requirements of this problem.

29. Let the odd integers be x , $x + 2$, and $x + 4$. Write the equation for the sum and solve.

$$\begin{aligned} x + (x + 2) + (x + 4) &= -273 \\ 3x + 6 &= -273 \\ 3x + 6 - 6 &= -273 - 6 \\ 3x &= -279 \\ x &= -93 \end{aligned}$$

The three integers are $x = -93$, $x + 2 = -91$, and $x + 4 = -89$.

30. Let the odd integers be x , $x + 2$, and $x + 4$. Write the equation for the sum and solve.

$$\begin{aligned} x + (x + 2) + (x + 4) &= 1503 \\ 3x + 6 &= 1503 \\ 3x + 6 - 6 &= 1503 - 6 \\ 3x &= 1497 \\ x &= 499 \end{aligned}$$

The three integers are $x = 499$, $x + 2 = 501$, and $x + 4 = 503$.

31. Let x = the value of the lot. Then, $6.5x$ = the value of the house.

$$\begin{aligned} x + 6.5x &= \$175,000 \\ 7.5x &= \$175,000 \\ x &= \$23,333.33 \end{aligned}$$

So, the lot is worth approximately \$23,333 and the house is worth about \$151,667.

32. Let x = the value of the lot. Then, $7x$ = the value of the house.

$$\begin{aligned} x + 7x &= \$164,000 \\ 8x &= \$164,000 \\ x &= \$20,500 \end{aligned}$$

So, the lot is worth approximately \$22,500 and the house is worth about \$143,500.

33. $x = \frac{949 \text{ yen}}{146 \text{ yen / dollar}} = \$6.50.$

34. $x = \frac{65 \text{ pounds}}{0.549 \text{ pounds / dollar}} = \118.40

35. $\text{time} = \frac{\text{distance}}{\text{speed}} = \frac{500\text{mi}}{170.265\text{mi / hr}} = 2.936598831\text{hr} = \text{about } 2 \text{ hr } 56 \text{ min}$

36. $x = 500 \text{ miles} \div 74.602 \text{ mph} = 6.702 \text{ hours}$. Convert 0.702 to minutes by multiplying $0.702(60) = 42.12$ to give the answer of approximately 3 hours and 42 minutes.

37. Let the number of males and females at the beginning of the semester = x .
If 8 males drop the class, there are $x - 8$ males remaining. Now the number of females is twice the number of males remaining.

$$\begin{aligned}x &= 2(x - 8) \\x &= 2x - 16 \\x - 2x &= 2x - 16 - 2x \\-x &= -16 \\x &= 16\end{aligned}$$

There were 16 males and 16 females at the beginning of the semester.

38. Let x = the number of Democrats and the number of Republicans in the Senate.

$$\begin{aligned}x + x + 2 &= 100 \\2x + 2 &= 100 \\2x + 2 - 2 &= 100 - 2 \\2x &= 98 \\x &= 49\end{aligned}$$

There were 49 Democrats and 49 Republicans in the Senate.

39. Let x = the number of bags of apples.

$$\begin{aligned}5x + 2x &= 252 \\7x &= 252 \\x &= 36\end{aligned}$$

There are 36 bags containing 5 lb. of apples and 36 bags containing 2 lb. of apples.

40. Let x = the number of seats in Theater B, $x + 150$ = the number of seats in Theater A.

$$\begin{aligned}(x + 150) + x + 270 &= 800 \\2x + 420 &= 800 \\2x + 420 - 420 &= 800 - 420 \\2x &= 380 \\x &= 190\end{aligned}$$

The number of seats in Theater A is $x + 150 = 190 + 150 = 340$.

41. Let x = profit from the automotive division. Then $x - 273$ represents the profit from financial services.

$$\begin{aligned}x + (x - 273 \text{ million}) &= 483 \text{ million} \\2x - 273 \text{ million} &= 483 \text{ million} \\2x - 273 \text{ million} + 273 \text{ million} &= 483 \text{ million} + 273 \text{ million} \\2x &= 756 \text{ million} \\x &= 378 \text{ million}\end{aligned}$$

The profit from the automotive division was 378 million and from financial services

was 378 million – 273 million = 105 million.

42. Let x = salary of Palmisano and $x - \$3.91$ million = Moonvie's salary.

$$x + x - 3.91 \text{ million} = 56.73 \text{ million}$$

$$2x - 3.91 \text{ million} + 3.91 \text{ million} = 56.73 \text{ million} + 3.91 \text{ million}$$

$$2x = 60.64 \text{ million}$$

$$x = 30.32 \text{ million}$$

Therefore, Palmisano made \$30.32 million and Moonvie made \$26.41 million in 2010.

43. Let x = attendance at the Ohio State game and $x - 1044$ = attendance at the Penn State game. Total attendance for the two teams in 2010 was 209,512.

$$x + x - 1044 = 209,512$$

$$2x - 1044 = 209,512$$

$$2x - 1044 + 1044 = 209,512 + 1044$$

$$2x = 210,556$$

$$x = 105,278$$

Therefore, the attendance at the Ohio State game was 105,278 and the attendance at the Penn State game was $105,278 - 1044 = 104,234$.

44. Let x = the middle-sized piece. The longest is $3x$ and the shortest is $3x - 23$.

The total length of the pipe is 40 inches. Therefore,

$$3x + x + 3x - 23 = 40$$

$$7x - 23 = 40$$

$$7x - 23 + 23 = 40 + 23$$

$$7x = 63$$

$$x = 9$$

Therefore, the middle sized piece is 9 in., the longest is $3(9) = 27$ in. and the shortest is $3x - 23 = 3(9) - 23 = 4$ in.

45. Let x = the original price of the radio. Savings = 15% of retail price or $0.15x$.

$$x - 0.15x = \$127.46$$

$$0.85x = \$127.46$$

$$x = \$149.95$$

The original price of the radio was \$149.95.

46. Let x = the original price of the watch. Savings = 25% of retail price or $0.25x$.

$$x - 0.25x = \$168.75$$

$$0.75x = \$168.75$$

$$x = \$225$$

The original price of the watch was \$225.00.

47. Let x = the wholesale price of the shoes. The markup amount is 65% times x .

$$x + 0.65x = \$125.40$$

$$1.65x = \$125.40$$

$$x = \$76$$

The wholesale price of the shoes was \$76.00.

48. Let x = the wholesale price of the shoes. The markup amount is 40% times x .

$$x + 0.40x = \$63$$

$$1.4x = \$63$$

$$x = \$45$$

The wholesale price of the shoes was \$45.00.

49. Let x = Drema's contributions. The company's contributions = 20% of x .

$$x + 0.20x = \$1200$$

$$1.2x = \$1200$$

$$x = \$1000$$

Drema deposited \$1000 into the account.

50. Let x = the population four years ago. The growth of the population is 5% of x .

$$x + 0.05x = 882$$

$$1.05x = 882$$

$$x = 840$$

There were 840 people in the town four years ago.

$$51. \text{ BMI} = \frac{W}{H^2} \cdot 703 = \frac{120}{60^2} \cdot 703 = 23.4333... = 23.4, \text{ Normal}$$

$$52. \text{ BMI} = \frac{W}{H^2} \cdot 703 = \frac{195}{67^2} \cdot 703 = 30.53798... = 30.5, \text{ Obese}$$

Chapter 1 Review Problems

1.. $I = Prt$

$$t = \frac{I}{Pr} \quad [\text{Divide both sides by } Pr.]$$

2. $2x + 3y = 9$

$$3y = -2x + 9 \quad [\text{Subtract } 2x \text{ from both sides.}]$$

$$y = -\frac{2}{3}x + 3 \quad [\text{Divide all terms by 3.}]$$

3. $C = \pi d$

$$d = \frac{C}{\pi} \quad [\text{Divide both sides by } \pi.]$$

4. $a + b + c = P$

$$c = P - a - b \quad [\text{Subtract } a \text{ and } b \text{ from both sides.}]$$

$$5. \frac{27 \text{ min}}{3 \text{ hr}} = \frac{27 \text{ min}}{180 \text{ min}} = \frac{3}{20}$$

$$6. \frac{4 \text{ weeks}}{21 \text{ days}} = \frac{28 \text{ days}}{21 \text{ days}} = \frac{4}{3}$$

$$7. \frac{6 \text{ in}}{5 \text{ ft}} = \frac{6 \text{ in}}{60 \text{ in}} = \frac{1}{10}$$

$$8. \frac{\$60}{5 \text{ hr}} = \$12/\text{hour}$$

$$9. \frac{44 \text{ bushels}}{8 \text{ trees}} = 5.5 \text{ bushels/tree}$$

$$10. \frac{\$12.80}{3.5 \text{ lb}} = \$3.66/\text{lb.}$$

$$11. \frac{x}{3} = \frac{4}{7}$$

$$7x = 12$$

$$x = \frac{12}{7}$$

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

$$4x = 24$$

$$x = 6$$

$$13. \frac{x-3}{8} = \frac{3}{4}$$

$$4x - 12 = 24$$

$$4x - 12 + 12 = 24 + 12$$

$$4x = 36$$

$$x = 9$$

$$14. \frac{4x-3}{7} = \frac{2x-1}{3}$$

$$12x - 9 = 14x - 7$$

$$12x - 9 - 14x = 14x - 7 - 14x$$

$$-2x - 9 + 9 = -7 + 9$$

$$-2x = 2$$

$$x = -1$$

$$15. A = \frac{1}{2}bh. \text{ Substitute: } A = \frac{1}{2}(3 \text{ in})(4 \text{ in}) = 6 \text{ in}^2$$

16. Let $\frac{2400 L}{50 \text{ min}} = \frac{x}{30 \text{ min}}$. Cross multiply.

$$72000 = 50x$$

$$1440 \text{ liters} = x$$

17. Let $\frac{3}{4} = \frac{x}{92}$. Cross multiply.

$$276 = 4x$$

$$69 \text{ dentists} = x$$

18. Let x = total number of minutes that you talk. Then, $\$1.24 + (x - 4)(\$0.28) = \$3.76$

$$1.24 + 0.28x - 1.12 = 3.76$$

$$0.12 + 0.28x = 3.76$$

$$0.12 + 0.28x - 0.12 = 3.76 - 0.12$$

$$0.28x = 3.64$$

$$x = 13 \quad \text{The call was 13 minutes long.}$$

19. Let x = number of minutes per month. Then, $\$50 + \$0.36x = \$99.68$.

$$0.36x = 99.68 - 50$$

$$0.36x = 49.68$$

$$x = 138 \text{ minutes}$$

20. Let x = labor time (per hour). Then, $\$40 + \$30x = \$115$

$$40 + 30x - 40 = 115 - 40$$

$$30x = 75$$

$$x = 2.5 \text{ hours}$$

21. Let the shorter piece be x and the longer be $x + 3$. Then, $x + (x + 3) = 33$

$$2x + 3 = 33$$

$$2x + 3 - 3 = 33 - 3$$

$$2x = 30$$

$$x = 15 \text{ in (short piece)} \quad \text{and} \quad x + 3 = 15 + 3 = 18 \text{ in (long piece)}$$

22. Let the short piece = x , the middle-sized piece = $x + 14$, and the long piece = $3x$.

$$\text{Then, } x + (x + 14) + 3x = 79$$

$$5x + 14 = 79$$

$$5x + 14 - 14 = 79 - 14$$

$$5x = 65$$

$$x = 13 \text{ cm (short)}$$

$$x + 14 = (13) + 14 = 27 \text{ cm (middle)}$$

$$3x = 3(13) = 39 \text{ cm (long)}$$

23. Let the calculator be x and the cassette player be $x + 140$.

$$\text{Then, } x + (x + 140) = 208$$

$$2x + 140 = 208$$

$$2x + 140 - 140 = 208 - 140$$

$$2x = 68$$

$x = \$34.00$ which is the cost of the calculator

24. Let n = the number of nickels and $2n - 2$ = the number of dimes.

Then, $n + (2n - 2) = 52$.

$$3n - 2 = 52$$

$$3n - 2 + 2 = 52 + 2$$

$$3n = 54$$

$n = 18$ There are 18 nickels and 34 dimes in the bank
for a total of \$4.30.

25. Use the formula $d = rt$ and substitute values.

$$182 \text{ mi} = (52 \text{ mph})(t)$$

$$t = 3.5 \text{ hours}$$

26. $T = UN + F$ Substitute the given values and solve.

$$\$16,750 = \$15N + \$2500$$

$$16750 - 2500 = 15N + 2500 - 2500$$

$$14250 = 15N$$

$$N = 950 \text{ units produced}$$

26. First remove the parentheses by use of the distributive property, then add 2 to the 12.

$$2 + 3(2x + 4) = 2 + 6x + 12 = 6x + 14.$$

28. $5x + 3 = 6x$

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

$$3 = x$$

29. for any triangle, $A + B + C = 180^\circ$

Let A = the first angle

The second angle, $B = 3A$

The third angle, $C = \frac{2}{3}(3A) = 2A$

$$A + 3A + 2A = 180^\circ$$

$$6A = 180^\circ$$

$$A = 30^\circ, B = 3(30^\circ) = 90^\circ, C = 2(30^\circ) = 60^\circ$$

30. First convert all the measurements to the same units, like inches.

$$5 \text{ ft } 3 \text{ in} = 63 \text{ in}, 10 \text{ ft } 6 \text{ in} = 126 \text{ in}, \text{ and } 52 \text{ ft} = 624 \text{ in}$$

Now set up a proportion like: $\frac{63 \text{ in}}{126 \text{ in}} = \frac{x}{624 \text{ in}}$

Cross multiply: $(63 \text{ in})(624 \text{ in}) = (126 \text{ in})(x)$

Divide by 126in: $x = 312 \text{ in} = 26 \text{ ft}$

Chapter 1 Test

$$1. \quad V = lwh$$

$$w = \frac{V}{lh} \quad [\text{Divide both sides by } lh.]$$

$$2. \quad h = vt - 16t^2$$

$$h + 16t^2 = vt \quad [\text{Add } 16t^2 \text{ to both sides.}]$$

$$\frac{h + 16t^2}{t} = v \quad [\text{Divide both sides by } t.]$$

$$3. \quad \frac{4 \text{ hr}}{1 \text{ day}} = \frac{4 \text{ hr}}{24 \text{ hr}} = \frac{1}{6}$$

$$4. \quad \frac{10 \text{ ft}}{160 \text{ in}} = \frac{120 \text{ in}}{160 \text{ in}} = \frac{3}{4}$$

$$5. \quad \frac{\$413.20}{4 \text{ days}} = \$103.30 / \text{day}$$

$$6. \quad \frac{7.5 \text{ lb}}{6 \text{ people}} = 1.25 \text{ lb} / \text{person}$$

$$7. \quad \frac{50 \text{ eggs}}{10 \text{ chickens}} = 5 \text{ eggs} / \text{chicken}$$

$$8. \quad \frac{7}{12} = \frac{3x}{10}$$

$$70 = 36x$$

$$\frac{70}{36} = \frac{35}{18} = x$$

$$9. \quad \frac{x-4}{8} = \frac{2x+3}{9}$$

$$9(x-4) = 8(2x+3)$$

$$9x-36 = 16x+24$$

$$9x-36-16x = 16x+24-16x$$

$$-7x-36 = 24$$

$$-7x-36+36 = 24+36$$

$$-7x = 60$$

$$x = -\frac{60}{7}$$

10. Let x = defective bulbs. Then, $\frac{3}{85} = \frac{x}{510}$.
 $85x = 1530$
 $x = 18$ bulbs

11. Let x = parts produced. Then, $\frac{300 \text{ parts}}{20 \text{ min}} = \frac{x}{45 \text{ min}}$.
 $20x = 13500$
 $x = 675$ parts

12. Given $P = 2L + 2W$. Substitute the given values into the formula.
 $P = 2(20 \text{ ft.}) + 2(12 \text{ ft.}) = 64 \text{ ft.}$

13. Company A Plan: $\$20 + 0.10m$ (where m = miles driven)
 Company B Plan: $\$10 + 0.30m$
 To find the number of miles where the two costs are equal, set these two expressions equal.

$$\begin{aligned} \$20 + 0.10m &= \$10 + 0.30m \\ 20 + 0.10m - 0.10m &= 10 + 0.30m - 0.10m \\ 20 &= 10 + 0.20m \\ 20 - 10 &= 10 + 0.20m - 10 \\ 10 &= 0.20m \\ 50 = m, &\text{ so at 50 miles the costs are the same for both plans} \end{aligned}$$

14. Let the number of passengers on one ship = x .
 The second ship holds twice as many passengers = $2x$
 Write the equation $x + 2x = 2250$ and solve.
 $3x = 2250$
 $x = 750$ so the smaller ship holds 750 passengers

15. Let Sarah's age be x . Then, Michelle's age is $5x - 10$. Write the equation and solve.
 $x + 5x - 10 = 44$
 $6x - 10 = 44$
 $6x - 10 + 10 = 44 + 10$
 $6x = 54$
 $x = 9$ so Sarah is 9 years and Michelle is $5(9) - 10 = 35$ years.

16. Let the short board = x and the longer one be $3x + 1$. Write the equation.
 $x + 3x + 1 = 21$
 $4x + 1 = 21$
 $4x + 1 - 1 = 21 - 1$
 $4x = 20$
 $x = 5$ so the short board is 5 ft. and the longer is $3(5) + 1 = 16$ ft.

17. $x + 12.3\%$ of x is now $\$2.83$ per gallon
 $x + 0.123x = \$2.83$

$$1.123x = \$2.83$$

$$x = \$2.52 \text{ per gallon}$$

18. $P - 22\%$ of P is now 28,000 people, after 8 years

$$P - 0.22P = 28,000$$

$$0.78P = 28,000$$

$$P = 35,897.4359 = 35,898 \text{ whole people 8 years ago}$$

Now divide the amount of decrease in population by 8 years to get a rough average yearly decrease in population:

$$35,898 - 28,000 = 7898 \text{ people in 8 years}$$

$$7898/8 = 987.25 \text{ or about 988 people per year decrease in population}$$

19. The average of the four grades needs to equal at least 84 so:

$$(75 + 82 + 80 + x)/4 = 84 \quad [\text{multiply by 4}]$$

$$75 + 82 + 80 + x = 336$$

$$237 + x = 336$$

$$x = 99 \text{ is the least the student can make an have an overall average of 84}$$

20. Let L = lot value, H = house value = $7.5L$

$$L + 7.5L = \$152,000$$

$$8.5L = \$152,000$$

$$L = \$17,882.35294 \text{ or about } \$17,882 \text{ for the lot}$$

$$H = 7.5L = \$134,117.6471 \text{ or about } \$138,118 \text{ for the house}$$

Chapter 2

Practice Set 2-1

1. Let $L = 360$ ft and $W = 160$ ft.

$$P = 2L + 2W$$

$$P = 2(360 \text{ ft}) + 2(160 \text{ ft}) = 720 \text{ ft} + 320 \text{ ft} = 1040 \text{ ft}$$

2. Let $d = 8$ ft

$$C = \pi d$$

$$C = \pi(8) = (3.14159)(8) \approx 25.1 \text{ ft}$$

3. Let $L = 15$ ft and $W = 11$ ft.

$$A = LW = (15 \text{ ft})(11 \text{ ft}) = 165 \text{ ft}^2$$

$1 \text{ yd}^2 = 9 \text{ ft}^2$ so divide by 9 to convert to square yards.

$$165 \text{ ft}^2 \div 9 \text{ ft}^2/\text{yd}^2 = 18.3 \text{ yd}^2$$

4. Let $r = 10$ ft.

$$A = \pi r^2 = \pi(10 \text{ ft})^2 \approx 314.159 \text{ ft}^2$$

Since this is half a circle, divide this answer by 2.

$$314.159 \text{ ft}^2 \div 2 \approx 157.1 \text{ ft}^2$$

5. A square has 4 equal sides. $P = 4L = 54$ in., so $L = 13.5$ in per side. The area of a square is given by the formula: $A = L^2 = (13.5 \text{ in})^2 = 182.25 \text{ in}^2$.

6. $A = lw$

$$65\text{cm}^2 = (13\text{cm})(w)$$

$$5\text{cm} = w$$

$$P = 2l + 2w = 2(13\text{cm}) + 2(5\text{cm}) = 36\text{cm}$$

7. Use the formula for the area of a rectangle to calculate the size of the area to be planted.

$$A = lw = (8.75 \text{ ft})(4.5 \text{ ft}) = 39.375 \text{ ft}^2$$

Since she needs four plants for every square foot, you should multiply this answer by 4.

This gives $39.375 * 4 = 157.5$ plants. In a practical sense, using this answer means you should buy 158 plants. If you round the area off to 40 ft^2 and multiply by 4, you would get 160 plants.

8. Find the circumference of the circular walkway with a diameter = 50 ft.

$$C = \pi d$$