

15A

$$1) \frac{AFG}{FG} = \frac{H}{FG} \Rightarrow A = \frac{H}{FG}$$

$$2) \frac{AB}{A} = \frac{GF}{A} \Rightarrow B = \frac{GF}{A}$$

$$3) \frac{YZ}{YZ} X = \frac{P(YZ)}{Q} \Rightarrow X = \frac{PYZ}{Q}$$

$$4) \frac{YZB}{YZ} X = \frac{A(YZB)}{B}$$

$$BX = AYZ \quad \frac{BX}{AZ} = Y$$

$$5) -A = D + B - C$$

$$A = -D - B + C$$

$$6) X = B + A - Y - Z$$

$$7) \frac{(C+D)B}{(C+D)} = 0(C+D) \Rightarrow B = 0$$

$$8) \frac{G(A+B)}{(A+B)} = \frac{D}{(A+B)} \Rightarrow G = \frac{D}{A+B}$$

$$9) \frac{YZ}{YZ} 1 = \frac{X(YZ)}{Z}$$

$$Z = XY \quad \frac{Z}{X} = Y$$

$$10) \frac{Q}{(S+T)} = \frac{R(S+T)}{(S+T)} \Rightarrow \frac{Q}{S+T} = R$$

$$11) \frac{3}{2} (R - Y) = \frac{2}{2} \left( \frac{2}{2} X \right)$$

$$\frac{3R - 3Y}{2} = X$$

$$12) \frac{B}{2rh} = \frac{2r\pi h}{2rh} \Rightarrow \frac{B}{2rh} = \pi$$

15B

$$1) \frac{(XYZ)1}{YZ} = \frac{(Z+X)}{YZ} \Rightarrow YZ =$$

$$XZ = YZ + XY \Rightarrow XZ - XY = YZ$$

$$\frac{X(Z-Y)}{(Z-Y)} = \frac{YZ}{(Z-Y)} \Rightarrow X = \frac{YZ}{(Z-Y)}$$

$$2) \frac{(B_2 A_2) B_1}{A_2} = \frac{(B_2 A_2) A}{B_2} \Rightarrow B_2 = \frac{A_1 A_2}{B_1}$$

$$3) \frac{R}{B(1+X)} = \frac{BW(1+X)}{B(1+X)} \Rightarrow W = \frac{R}{B+BX}$$

$$4) 2A - \frac{1}{2}A = B$$

$$\left( \frac{2}{2} \right) \frac{2}{2} A = B \left( \frac{2}{3} \right) \Rightarrow A = \frac{2B}{3}$$

$$5) \frac{XYZ}{YZ} = \frac{YZQ}{YZ} \Rightarrow X = Q$$

$$6) \left( \frac{4}{X} \right) X = \frac{XY}{X} \left( \frac{4}{X} \right) \Rightarrow 4 = Y$$

$$7) \frac{D}{R} = \frac{RT}{R} \Rightarrow T = \frac{D}{R}$$

$$8) \frac{TS}{(T+S)} = \frac{X(T+S)}{(T+S)} \Rightarrow X = \frac{TS}{T+S}$$

$$9) B \left( 3 - \frac{A}{B} \right) = C(B)$$

$$3B - A = CB \Rightarrow 3B - CB = A$$

$$B(3 - C) = A \Rightarrow B = \frac{A}{3 - C}$$

$$10) QP + QR - S = 10$$

$$QP - QR + S + 10 \Rightarrow P = \frac{-QR + S + 10}{Q}$$

$$11) X(A+B+C) = D \Rightarrow X = \frac{D}{A+B+C}$$

$$12) (W+i)X = \frac{Y(W+T)}{W+T}$$

$$\frac{(W+i)X}{X} = \frac{Y}{X} \Rightarrow i = \frac{Y}{X} - W$$

15C

- 1)  $B = \frac{AC}{D}$
- 2)  $R = \frac{D}{T}$
- 3)  $\frac{XAB}{C} = Y \quad X = \frac{CY}{AB}$
- 4)  $A \cdot \frac{1}{A} = \frac{B}{C} \cdot A \Rightarrow 1 = \frac{AB}{C}$   
 $\frac{C}{B} \cdot 1 = \frac{BA}{B} \cdot \frac{1}{A}$   
 $\frac{C}{B} = A$
- 5)  $T = \frac{D}{R}$
- 6)  $E \cdot \frac{A}{B} = \frac{D}{A} \cdot A \Rightarrow \frac{EA}{B} = D$
- 7) retail = wholesale + 40% of retail  
 $59 = W + (.40)(59) \Rightarrow 59 = W + 23.60$   
 $\$35.40 = W$  (mark up = profit)
- 8)  $WP \times 35.40 = 23.60 \Rightarrow$   
 $WP = \frac{23.60}{35.40} = 67\%$
- 9) \$9.35
- 10)  $76.15 = 62.30 + \text{tax} + 9.35 \Rightarrow \text{tax} = 4.50$   
 (total = food + tax + tip)  
 $\text{tax} = WP \times 62.30$   
 $4.50 = WP \times 62.30$   
 $7\% = WP$
- 11)  $H = 1, C = 12, O = 16$   
 $H_2CO = 1 + 1 + 12 + 16 = 30$   
 $\frac{C}{H_2CO} = \frac{12}{30} = 40\%$

$$12) \frac{O}{H_2CO} = \frac{16}{30} = 53\% \quad (H_2 = 7\%)$$

$$13) (9)^2 - 4(20)(1) = 81 - 80 = 1$$

real, rational, unequal

$$14) (X+5)(X+4) = 0 \quad X = -5, -4$$

$$15) (0)^2 - 4(-25) = 100$$

real, rational, unequal

$$16) (X-5)(X+5) = 0 \quad X = 5, -5$$

$$17) 9X^2 + 3X - 2 = 0$$

$$\frac{-3 \pm \sqrt{3^2 - 4(9)(-2)}}{18} = \frac{-3 \pm 9}{18}$$

$$\left(\frac{6}{18}, \frac{-12}{18}\right) = \left(\frac{1}{3}, -\frac{2}{3}\right)$$

$$18) \frac{-(-15) \pm \sqrt{(-15)^2 - 4(3)(-42)}}{2 \cdot 3} = \frac{15 \pm 27}{6} =$$

$$\left(\frac{42}{6}, \frac{-12}{6}\right) = (7, -2)$$

$$19) 4X^2 - X - 4 = 0; 4X^2 - X = 4;$$

$$X^2 - \frac{1}{4}X = 1; X^2 - \frac{1}{4}X + \frac{1}{64} = 1 + \frac{1}{64};$$

$$\left(X - \frac{1}{8}\right)^2 = \frac{65}{64}; \sqrt{\left(X - \frac{1}{8}\right)^2} = \sqrt{\frac{65}{64}};$$

$$X - \frac{1}{8} = \pm \frac{\sqrt{65}}{8}; X = \frac{1 \pm \sqrt{65}}{8}$$

$$20) 4\left(\frac{1}{8} - \frac{\sqrt{65}}{8}\right)^2 - \left(\frac{1}{8} - \frac{\sqrt{65}}{8}\right) - 4 = 0$$

$$\frac{1}{16} - \frac{\sqrt{65}}{8} + \frac{65}{16} - \frac{1}{8} + \frac{\sqrt{65}}{8} - \frac{64}{16} = 0$$

$$4\left(\frac{1}{8} + \frac{\sqrt{65}}{8}\right)^2 - \left(\frac{1}{8} + \frac{\sqrt{65}}{8}\right) - 4 = 0$$

$$\frac{1}{16} + \frac{\sqrt{65}}{8} + \frac{65}{16} - \frac{1}{8} - \frac{\sqrt{65}}{8} - \frac{64}{16} = 0$$

15D

$$1) H = \frac{V}{LW}$$

$$2) \frac{2}{A} \cdot A = \frac{AB}{2} \cdot \frac{2}{A}$$

$$B = 2$$

$$3) \frac{2L}{2} = \frac{P - 2W}{2}$$

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

$$4) H = \frac{V}{\pi R^2}$$

$$5) R = \frac{A}{2\pi H}$$

$$6) I = \frac{E}{R+r} \Rightarrow (R+r)I = E \Rightarrow R+r = \frac{E}{I}$$

$$R = \frac{E}{I} - r$$

7) gross = 15.3% G + 3% G + net pay  
 gross = .153 G + .03 G + 968.40  
 $1.0 G - .183 G = 968.40$   
 $\frac{.817 G}{.817} = \frac{968.40}{.817}$   
 $G = \$1,185.31$

$$8) 1,185.31 \div 180 = \$6.59$$

9) 12% of 6.59 = .79  $6.59 + .79 = 7.38$   
 $180 \times 7.38 = 1328.40$   $1328.40 \times .153 = 203.25$   
 $1328.40 \times .03 = 39.85$   
 $1328.40 - (203.25 + 39.85) = \$1,085.30$

$$10) \$1,328.40$$

11)  $Li = 7, S = 32, O = 16$   
 $Li_2SO_3 = 7 + 7 + 32 + 16 + 16 + 16 = 94$   
 $\frac{Li_2}{Li_2SO_3} = \frac{14}{94} = 15\%$

$$12) \frac{S}{Li_2SO_3} = \frac{32}{94} = 34\%$$

$$13) (-4)^2 - 4(1)(13) = 16 - 52 = -36$$

imaginary

$$14) X = \frac{4 \pm \sqrt{-36}}{2} = \frac{4 \pm 6i}{2} = 2 \pm 3i$$

$$15) (X)^2 + 6X - 3 = 0$$

$$6^2 - 4(1)(-3) = 36 + 13 = 48$$

real, irrational, unequal

$$16) X = \frac{-6 \pm \sqrt{6^2 - 4(1)(-3)}}{2(1)} =$$

$$\frac{-6 \pm 4\sqrt{3}}{2} = -3 \pm 2\sqrt{3}$$

$$17) 2X^2 + 6X - 3 = 0$$

$$\frac{-6 \pm \sqrt{6^2 - 4(2)(-3)}}{2(2)} = \frac{-6 \pm \sqrt{60}}{4} = \frac{-3 \pm \sqrt{15}}{2}$$

$$18) 2X^2 + 13X - 2X = 0$$

$$2X^2 + 11X = 0$$

$$\frac{-11 \pm \sqrt{11^2 - 4(2)(0)}}{4} = \frac{-11 \pm 11}{4} = (0, -11/2)$$

$$19) \frac{1}{2}AX^2Y^{-3} \cdot \frac{1}{A}AX^2 \cdot \frac{3}{2}AY^2 =$$

$$\frac{3X^4Y^{-1}}{X^2Y^{-1}} = \frac{3X^6}{2}$$

$$20) \frac{8A^2X}{12X^{-2}} \cdot \frac{12X^{-2}A}{11X^3A^{-2}} =$$

$$\frac{8A^3X^{-1}}{121A^{-2}X} = \frac{8A^5}{121X^2}$$

15E

$$1) F = \frac{5}{9}C + 32$$

$$F - 32 = 9/5 C \Rightarrow C = 5/9(F - 32)$$

$$2) W_1 = \frac{L_2 W_2}{L_1} \Rightarrow W_2 = \frac{L_1 W_1}{L_2}$$

$$3) \frac{A}{2\pi r} = \frac{2\pi r}{2\pi r} (H + r)$$

$$\frac{A}{2\pi r} = H + r \Rightarrow \frac{A}{2\pi r} - r = H$$

$$4) \frac{1}{F} + \frac{1}{B} = \frac{1}{A} \Rightarrow A \left( \frac{1}{F} + \frac{1}{B} \right) = 1$$

$$A = \frac{1 \times \frac{BF}{B+F}}{\frac{B+F}{BF} \times \frac{BF}{B+F}} \Rightarrow A = \frac{BF}{B+F}$$

$$5) \frac{D_2 F}{M_2 K} = \frac{M_1 M_2 \cdot D_2}{D_2 \cdot M_2 K}$$

$$M_1 = \frac{D_2 F}{M_2 K}$$

$$6) \frac{A}{2\pi r h} = 2\pi r h \Rightarrow \pi = \frac{A}{2rh}$$

$$7) W_p \times G_p = \text{Wins}$$

$$W_p \times 81 = 56$$

$$W_p = \frac{56}{81} = 69\%$$

$$8) W_p \times G = \text{Losses}$$

$$W_p \times 81 = 25$$

$$W_p = \frac{25}{81} = 31\%$$

$$9) 105 - 56 = 49 \text{ games}$$

$$10) \frac{49}{81} = 60\%$$

$$11) H = 1, N = 14$$

$$NH_3 = 14 + 1 + 1 + 1 = 17$$

$$\frac{N}{NH_3} = \frac{14}{17} = 82\%$$

$$12) \frac{H_3}{NH_3} = \frac{3}{17} = 18\%$$

$$13) (-7)^2 - 4(3)(2) = 49 - 24 = 25$$

real, rational, unequal

$$14) (3X - 1)(X - 2) \quad X = 1/3, 2$$

$$15) 5X^2 - 45 = 0$$

$$(0)^2 - 4(5)(-45) = 900$$

real, rational, unequal

$$16) 5(X^2 - 9) = 0$$

$$5(X - 3)(X + 3) = 0 \quad X = 3, -3$$

$$17) 3X^2 + 2X = 0$$

$$\frac{-2 \pm \sqrt{2^2 - 4(3)(0)}}{2(3)} = \frac{-2 \pm 2}{6} =$$

$$\left( \frac{0}{6}, \frac{-4}{6} \right) = \left( 0, \frac{-2}{3} \right)$$

$$18) 4X^2 - 12X + 3 = 0$$

$$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(4)(3)}}{2(4)} = \frac{12 \pm 4\sqrt{6}}{8} =$$

$$\frac{3 \pm \sqrt{6}}{2}$$

$$19) \text{multiply all terms by 20}$$

$$8X + 4 - 20X = 20 - 15X - 40$$

$$-12X + 4 = -15X - 20$$

$$3X = -24$$

$$X = -8$$

$$20) \text{multiply all terms by 36}$$

$$16X - 36 = -15X + 36X$$

$$-36 = 5X$$

$$X = -36/5$$

16A

$$1) \frac{A}{Or} = \frac{6}{5}, \frac{A}{T} = \frac{6}{11}, \frac{Or}{T} = \frac{5}{11}$$

$$\frac{6}{5} = \frac{12}{Or} \quad Or = \frac{5 \times 12}{6} = 10 \text{ oranges}$$

$$2) \frac{C}{S} = \frac{1}{2}, \frac{C}{T} = \frac{1}{3}, \frac{S}{T} = \frac{2}{3}$$

$$\frac{1}{3} = \frac{C}{30} \quad C = \frac{1 \times 30}{3} = 10 \text{ cloudy}$$

$$30 - 10 = 20 \text{ sunny}$$

$$3) \frac{A}{B} = \frac{2}{5}, \frac{A}{T} = \frac{2}{7}, \frac{B}{T} = \frac{5}{7}$$

$$\frac{B}{490,000} = \frac{5}{7} \quad B = \frac{5 \times 490,000}{7} = 350,000 \text{ votes}$$

$$4) \frac{S}{R} = \frac{8}{7}, \frac{S}{T} = \frac{8}{15}, \frac{R}{T} = \frac{7}{15}$$

$$\frac{S}{56} = \frac{8}{7} \quad S = \frac{8 \times 56}{7} = 64 \text{ squirrels}$$

$$5) \frac{R}{M} = \frac{3}{5}, \frac{R}{T} = \frac{3}{8}, \frac{M}{T} = \frac{5}{8}$$

$$\frac{M}{24} = \frac{5}{8} \quad M = \frac{5 \times 24}{8} = 15 \text{ students like math}$$

$$6) \frac{Na}{NaCl} = \frac{23}{58}$$

$$\frac{Na}{406} = \frac{23}{58} \quad Na = \frac{23(406)}{58} = 161 \text{ g}$$

$$7) \frac{Cl}{NaCl} = \frac{35}{58}$$

$$\frac{Cl}{406} = \frac{35}{58} \quad Cl = \frac{35(406)}{58} = 245 \text{ g}$$

$$8) \frac{H_2}{H_2CO} = \frac{2}{46}$$

$$\frac{H_2}{352} = \frac{2}{46} \quad H_2 = \frac{2(352)}{46} = 15.30 \text{ g}$$

$$9) \frac{C}{352} = \frac{12}{46} \quad C = \frac{12(352)}{46} = 91.83 \text{ g}$$

$$10) \frac{O_2}{352} = \frac{32}{46} \quad O_2 = \frac{32(352)}{46} = 244.87 \text{ g}$$