

12F

- 1) $6(2X + 4Y) = 12X + 24Y$
- 2) $A(3 + 4) = 3A + 4A$
- 3) $5X(3A + 2B) = 15AX + 10BX$
- 4) $6X + 30Y = 6(X + 5Y)$
- 5) $6A + 7A = A(6 + 7) = 13A$
- 6) $3AB + 6AD = 3A(B + 2D)$
- 7) $4F + 3G + 5F - G = 9F + 2G$
- 8) $4 - 6Y - 10 = -6Y - 6$
- 9) $10X + 3 = 9X + 3$
 $10X = 9X$
 $10X - 9X = 0$
 $X = 0$
- 10) $10(0) + 3 = 9(0) + 3$
 $0 + 3 = 0 + 3$
 $3 = 3$
- 11) $B - 18 = 21$
 $B = 21 + 18$
 $B = 39$
- 12) $(39) - 18 = 21$
 $21 = 21$
- 13) $\frac{2}{16} = \frac{1}{8}$
- 14) $\frac{5}{16}$
- 15) $\frac{3}{16}$

- 16) $9^2 + 12^2 = H^2$
 $81 + 144 = H^2$
 $225 = H^2$
 $15 \text{ ft.} = H$
- 17) $21^2 + 28^2 = 35^2$
 $441 + 784 = 1225$
 $1225 = 1225$; yes
- 18) $\frac{5}{6} \times \frac{2}{3} = \frac{5}{9}$
- 19) $\frac{2}{3} + \frac{1}{6} = \frac{2}{3} \times \frac{2}{1} = 4$
- 20) $\frac{2}{5} + \frac{1}{2} = \frac{4}{10} + \frac{5}{10} = \frac{9}{10}$
 take $\frac{9}{10}$ of 20: $20 \div 10 = 2$;
 $2 \times 9 = 18$ apples used, or
 2 apples left

Alternate method for #20:

- 20) take fractions of 20 first:
 $\frac{2}{5}$: $20 \div 5 = 4$; $4 \times 2 = 8$
 $\frac{1}{2}$: $20 \div 2 = 10$; $10 \times 1 = 10$
 $8 + 10 = 18$ used;
 $20 - 18 = 2$ left

13A

- 1) done
- 2) done
- 3) $3D = 9$
 $\frac{1}{3} \times 3D = \frac{1}{3} \times 9$
 $D = 3$
- 4) $3(3) = 9$
 $9 = 9$
- 5) done
- 6) done
- 7) $5Y + 8Y + 2 = 9Y + 22$
 $13Y + 2 = 9Y + 22$
 $13Y - 9Y = 22 - 2$
 $4Y = 20$
 $Y = 5$
- 8) $5(5) + 8(5) + 2 = 9(5) + 22$
 $25 + 40 + 2 = 45 + 22$
 $67 = 67$
- 9) $5D - 3 + D = 2D + 7 - D$
 $6D - 3 = D + 7$
 $6D - D = 7 + 3$
 $5D = 10$
 $D = 2$
- 10) $5(2) - 3 + (2) = 2(2) + 7 - (2)$
 $10 - 3 + 2 = 4 + 7 - 2$
 $9 = 9$
- 11) done
- 12) done
- 13) $2(5X - 8) + 2 = 2(X + 5)$
 $10X - 16 + 2 = 2X + 10$
 $10X - 2X = 10 + 16 - 2$
 $8X = 24$
 $X = 3$
- 14) $2(5(3) - 8) + 2 = 2((3) + 5)$
 $2(15 - 8) + 2 = 2(8)$
 $2(7) + 2 = 16$
 $14 + 2 = 16$
 $16 = 16$
- 15) $-3(2H - 3) = 29 - H$
 $-6H + 9 = 29 - H$
 $-6H + H = 29 - 9$
 $-5H = 20$
 $H = -4$
- 16) $-3(2(-4) - 3) = 29 - (-4)$
 $-3(-8 - 3) = 29 + 4$
 $-3(-11) = 33$
 $33 = 33$
- 17) $2X = 16$
 $\frac{1}{2} \times 2X = \frac{1}{2} \times 16$
 $X = 8$
- 18) $3R + 5 = 23$
 $3R = 23 - 5$
 $3R = 18$
 $R = 6$

13B

$$1) \quad 6X = 36$$

$$\frac{1}{6} \times 6X = \frac{1}{6} \times 36$$

$$X = 6$$

$$2) \quad 6(6) = 36$$

$$36 = 36$$

$$3) \quad 11F = 121$$

$$\frac{1}{11} \times 11F = \frac{1}{11} \times 121$$

$$F = 11$$

$$4) \quad 11(11) = 121$$

$$121 = 121$$

$$5) \quad 2B + 7 + 5B = 42$$

$$7B + 7 = 42$$

$$7B = 42 - 7$$

$$7B = 35$$

$$B = 5$$

$$6) \quad 2(5) + 7 + 5(5) = 42$$

$$10 + 7 + 25 = 42$$

$$42 = 42$$

$$7) \quad 5Q - 6 + 5Q = 2 + 3 + 9$$

$$10Q - 6 = 14$$

$$10Q = 20$$

$$Q = 2$$

$$8) \quad 5(2) - 6 + 5(2) = 2 + 3 + 9$$

$$10 - 6 + 10 = 14$$

$$14 = 14$$

$$9) \quad 3C - 8 + 7 = 12 + 1 + C$$

$$3C - 1 = 13 + C$$

$$3C - C = 13 + 1$$

$$2C = 14$$

$$C = 7$$

$$10) \quad 3(7) - 8 + 7 = 12 + 1 + (7)$$

$$21 - 8 + 7 = 20$$

$$20 = 20$$

$$11) \quad 2(Q + 2) = Q + 1$$

$$2Q + 4 = Q + 1$$

$$2Q - Q = 1 - 4$$

$$Q = -3$$

$$12) \quad 2((-3) + 2) = (-3) + 1$$

$$2(-1) = -2$$

$$-2 = -2$$

$$13) \quad 4(C + 5) = -1(C + 20)$$

$$4C + 20 = -C - 20$$

$$4C + C = -20 - 20$$

$$5C = -40$$

$$C = -8$$

$$14) \quad 4((-8) + 5) = -1((-8) + 20)$$

$$4(-3) = -1(12)$$

$$-12 = -12$$

$$15) \quad 2(B + 2) + B = 2(6 + B) + 1$$

$$2B + 4 + B = 12 + 2B + 1$$

$$3B + 4 = 2B + 13$$

$$3B - 2B = 13 - 4$$

$$B = 9$$

$$16) \quad 2((9) + 2) + (9) = 2(6 + (9)) + 1$$

$$2(11) + 9 = 2(15) + 1$$

$$22 + 9 = 30 + 1$$

$$31 = 31$$

$$17) \quad P + 5P = P + 3P + 20$$

$$6P = 4P + 20$$

$$2P = 20$$

$$P = 10$$

$$18) \quad 3(M + 2) = 21$$

$$3M + 6 = 21$$

$$3M = 15$$

$$M = \$5$$

13C

$$1) \quad 8X - 6 = 50$$

$$8X = 56$$

$$X = 7$$

$$2) \quad 8(7) - 6 = 50$$

$$56 - 6 = 50$$

$$3) \quad 10R = 110$$

$$R = 11$$

$$4) \quad 10(11) = 110$$

$$110 = 110$$

$$5) \quad 10B - 2B + 3 = 5B + 21$$

$$8B + 3 = 5B + 21$$

$$8B - 5B = 21 - 3$$

$$3B = 18$$

$$B = 6$$

$$6) \quad 10(6) - 2(6) + 3 = 5(6) + 21$$

$$60 - 12 + 3 = 30 + 21$$

$$51 = 51$$

$$7) \quad 6D - 10 = -2D - 34$$

$$6D + 2D = -34 + 10$$

$$8D = -24$$

$$D = -3$$

$$8) \quad 6(-3) - 10 = -2(-3) - 34$$

$$-18 - 10 = 6 - 34$$

$$-28 = -28$$

$$9) \quad -6B + 4 + 10B - 7 = 77$$

$$4B - 3 = 77$$

$$4B = 77 + 3$$

$$4B = 80$$

$$B = 20$$

$$10) \quad -6(20) + 4 + 10(20) - 7 = 77$$

$$-120 + 4 + 200 - 7 = 77$$

$$77 = 77$$

$$11) \quad 2(W + 5) + 4W = 4(3 + W)$$

$$2W + 10 + 4W = 12 + 4W$$

$$6W + 10 = 4W + 12$$

$$6W - 4W = 12 - 10$$

$$2W = 2$$

$$W = 1$$

$$12) \quad 2((1) + 5) + 4(1) = 4(3 + (1))$$

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

$$12 + 4 = 16$$

$$16 = 16$$

$$13) \quad (F - 1) - 2F = -2(3 + F)$$

$$-F - 1 = -6 - 2F$$

$$-F + 2F = -6 + 1$$

$$F = -5$$

$$14) \quad ((-5) - 1) - 2(-5) = -2(3 + (-5))$$

$$-6 + 10 = -2(-2)$$

$$4 = 4$$

$$15) \quad 2(X - 7) + 5X = 5(X - 2)$$

$$2X - 14 + 5X = 5X - 10$$

$$7X - 14 = 5X - 10$$

$$7X - 5X = -10 + 14$$

$$2X = 4$$

$$X = 2$$

$$16) \quad 2((2) - 7) + 5(2) = 5((2) - 2)$$

$$2(-5) + 10 = 5(0)$$

$$-10 + 10 = 0$$

$$0 = 0$$

$$17) \quad 8W = 32$$

$$\frac{1}{8} \times 8W = \frac{1}{8} \times 32$$

$$W = 4 \text{ miles}$$

$$18) \quad 2B + 7 = B + 17$$

$$2B - B = 17 - 7$$

$$B = 10$$

13D

- 1) $7X = 77$
 $\frac{1}{7} \times 7X = \frac{1}{7} \times 77$
 $X = 11$
- 2) $7(11) = 77$
 $77 = 77$
- 3) $6X - 10 = -46$
 $6X = -46 + 10$
 $6X = -36$
 $X = -6$
- 4) $6(-6) - 10 = -46$
 $-36 - 10 = -46$
 $-46 = -46$
- 5) $-3A - 5 + 4A - 6 + 2A = 19$
 $3A - 11 = 19$
 $3A = 19 + 11$
 $3A = 30$
 $A = 10$
- 6) $-3(10) - 5 + 4(10) - 6 + 2(10) = 19$
 $-30 - 5 + 40 - 6 + 20 = 19$
 $19 = 19$
- 7) $4(V + 4) = 3(V + 3)$
 $4V + 16 = 3V + 9$
 $4V - 3V = 9 - 16$
 $V = -7$
- 8) $4((-7) + 4) = 3((-7) + 3)$
 $4(-3) = 3(-4)$
 $-12 = -12$
- 9) $7^2 + 9^2 = 15^2$
 $49 + 81 = 225$
 $130 \neq 225$; no

- 10) $\frac{7}{16}$
- 11) $\frac{8}{16} = \frac{1}{2}$
- 12) $\frac{14}{16} = \frac{7}{8}$
- 13) $\frac{2}{8} \times \frac{1}{3} = \frac{1}{12}$
- 14) $\frac{7}{8} + \frac{3}{4} = \frac{7}{8} \times \frac{4}{3} = \frac{7}{6} = 1\frac{1}{6}$
- 15) $\frac{1}{2} + \frac{1}{5} = \frac{1}{2} \times \frac{5}{1} = \frac{5}{2} = 2\frac{1}{2}$
- 16) done
- 17) $3\frac{3}{8} + 1\frac{4}{5} = 4 + \frac{15}{40} + \frac{32}{40} = 4\frac{47}{40} =$
 $4 + 1 + \frac{7}{40} = 5\frac{7}{40}$
- 18) $2\frac{1}{10} + 3\frac{5}{8} = 5 + \frac{8}{80} + \frac{50}{80} =$
 $5\frac{58}{80} = 5\frac{29}{40}$
- 19) $4\frac{1}{2} + 3\frac{3}{8} = 7 + \frac{8}{16} + \frac{6}{16} =$
 $7\frac{14}{16} = 7\frac{7}{8}$ tons
- 20) $2X + 2 = 62$
 $2X = 62 - 2$
 $2X = 60$
 $X = \$30$

13E

- 1) $8X = -88$
 $X = -11$
- 2) $8(-11) = -88$
 $-88 = -88$
- 3) $7X + 5 = -23$
 $7X = -23 - 5$
 $7X = -28$
 $X = -4$
- 4) $7(-4) + 5 = -23$
 $-28 + 5 = -23$
 $-23 = -23$
- 5) $-5Y + 4 - 6Y = 13 - 2Y$
 $-11Y + 4 = 13 - 2Y$
 $-11Y + 2Y = 13 - 4$
 $-9Y = 9$
 $Y = -1$
- 6) $-5(-1) + 4 - 6(-1) = 13 - 2(-1)$
 $5 + 4 + 6 = 13 + 2$
 $15 = 15$
- 7) $4(L + 1) = 3(L + 4)$
 $4L + 4 = 3L + 12$
 $4L - 3L = 12 - 4$
 $L = 8$
- 8) $4((8) + 1) = 3((8) + 4)$
 $4(9) = 3(12)$
 $36 = 36$
- 9) $L^2 + 6^2 = 10^2$
 $L^2 + 36 = 100$
 $L^2 = 64$
 $L = 8$ ft.
- 10) $\frac{11}{16}$
- 11) $\frac{12}{16} = \frac{3}{4}$
- 12) $\frac{2}{16} = \frac{1}{8}$
- 13) $\frac{6}{10} + \frac{1}{5} = \frac{6}{10} \times \frac{2}{2} + \frac{2}{10} = \frac{8}{10} = \frac{4}{5}$
- 14) $\frac{5}{8} + \frac{1}{3} = \frac{5}{8} \times \frac{3}{3} + \frac{1}{3} = \frac{15}{24} + \frac{8}{24} = \frac{23}{24}$
- 15) $\frac{5}{9} \times \frac{2}{5} = \frac{1}{3}$
- 16) $1\frac{3}{5} + 4\frac{5}{6} = 5 + \frac{18}{30} + \frac{25}{30} =$
 $5 + \frac{43}{30} = 5 + 1\frac{13}{30} = 6\frac{13}{30}$
- 17) $3\frac{1}{3} + 5\frac{1}{4} = 8 + \frac{4}{12} + \frac{3}{12} = 8\frac{7}{12}$
- 18) $4\frac{2}{3} + 1\frac{2}{5} = 5 + \frac{10}{15} + \frac{6}{15} = 5 + \frac{16}{15} =$
 $5 + 1\frac{1}{15} = 6\frac{1}{15}$
- 19) $\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$
- 20) $3N + 23 = 29$
 $3N = 29 - 23$
 $3N = 6$
 $N = 2$

13F

- 1) $3X + 7 = 43$
 $3X = 43 - 7$
 $3X = 36$
 $X = 12$
- 2) $3(12) + 7 = 43$
 $36 + 7 = 43$
 $43 = 43$
- 3) $7Q + 3 = 3Q + 7 + 40$
 $7Q - 3Q = 7 + 40 - 3$
 $4Q = 44$
 $Q = 11$
- 4) $7(11) + 3 = 3(11) + 7 + 40$
 $77 + 3 = 33 + 7 + 40$
 $80 = 80$
- 5) $11A - 4A - 18 = 2A + A + 10$
 $7A - 18 = 3A + 10$
 $7A - 3A = 10 + 18$
 $4A = 28$
 $A = 7$
- 6) $11(7) - 4(7) - 18 = 2(7) + (7) + 10$
 $77 - 28 - 18 = 14 + 7 + 10$
 $31 = 31$
- 7) $-2(X + 7) + 4X = 4(X - 9)$
 $-2X - 14 + 4X = 4X - 36$
 $2X - 14 = 4X - 36$
 $2X - 4X = -36 + 14$
 $-2X = -22$
 $X = 11$

- 8) $-2((11) + 7) + 4(11) = 4((11) - 9)$
 $-2(18) + 44 = 4(2)$
 $-36 + 44 = 8$
 $8 = 8$
- 9) $5^2 + 12^2 = H^2$
 $25 + 144 = H^2$
 $169 = H^2$
 $H = 13 \text{ miles}$
- 10) $\frac{10}{16} = \frac{5}{8}$
- 11) $\frac{13}{16}$
- 12) $\frac{4}{16} = \frac{1}{4}$
- 13) $\frac{3}{8} \times \frac{1}{7} = \frac{3}{56}$
- 14) $\frac{3}{4} \div \frac{1}{8} = \frac{3}{4} \times \frac{8}{1} = 6$
- 15) $\frac{6}{7} \div \frac{5}{14} = \frac{6}{7} \times \frac{14}{5} = \frac{12}{5} = 2\frac{2}{5}$
- 16) $3\frac{3}{5} + 2\frac{7}{10} = 5 + \frac{30}{50} + \frac{35}{50} = 5 + \frac{65}{50} = 5 + 1\frac{15}{50} = 6\frac{3}{10}$
- 17) $2\frac{9}{10} + 4\frac{5}{8} = 6 + \frac{72}{80} + \frac{50}{80} = 6\frac{122}{80} = 6 + 1\frac{42}{80} = 7\frac{21}{40}$
- 18) $3\frac{1}{2} + 1\frac{3}{4} = 4 + \frac{4}{8} + \frac{6}{8} = 4\frac{10}{8} = 4 + 1\frac{2}{8} = 5\frac{1}{4}$
- 19) $\frac{6}{8} \div \frac{2}{8} = \frac{6}{8} \times \frac{8}{2} = 3$
- 20) $4N + 8N = 24$
 $12N = 24$
 $N = 2$

14A

- 1) done
- 2) $20 \times 9 - 14 \div 7 =$
 $180 - 2 = 178$
- 3) $120 \div 10 - 2 \times 3 + 5 =$
 $12 - 6 + 5 = 11$
- 4) $8^2 \div 2 - 6 \times 2^2 =$
 $64 \div 2 - 6 \times 4 =$
 $32 - 24 = 8$
- 5) $5 \times 3 + 6^3 - 10 \times 3 =$
 $5 \times 3 + 216 - 10 \times 3 =$
 $15 + 216 - 30 = 201$
- 6) $11^2 \times 5 - 7 \times 8 - 16 =$
 $121 \times 5 - 7 \times 8 - 16 =$
 $605 - 56 - 16 = 533$
- 7) $(16 + 9) + (8 + 3) \times 8 =$
 $25 + 11 \times 8 =$
 $25 + 88 = 113$
- 8) $(4 + 6) \times 9^2 - 6 \times 5 =$
 $10 \times 81 - 6 \times 5 =$
 $810 - 30 = 780$
- 9) $112 - (2^2 + 3) \times 5 =$
 $112 - (4 + 3) \times 5 =$
 $112 - 7 \times 5 =$
 $112 - 35 = 77$
- 10) $(18 \times 9 + 3)^2 - 10^2 =$
 $(162 + 3)^2 - 10^2 =$
 $165^2 - 10^2 =$
 $27,225 - 100 = 27,125$
- 11) $15^2 + (12 \div 3)^3 - (6 \div 3)^2 =$
 $15^2 + 4^3 - 2^2 =$
 $225 + 64 - 4 = 285$
- 12) $(8 + 1)^2 \div 3 + 9 \times 3^2 =$
 $9^2 \div 3 + 9 \times 3^2 =$
 $81 \div 3 + 9 \times 9 =$
 $27 + 81 = 108$
- 13) done
- 14) done
- 15) done
- 16) $9(2(4) - 6) = 2(7) + 2^2$
 $9(8 - 6) = 14 + 4$
 $9(2) = 18$
 $18 = 18$
- 17) $4^2 - 2^2 + 5 \times 3 = A$
 $16 - 4 + 5 \times 3 = A$
 $16 - 4 + 15 = A$
 $27 = A$
- 18) $4^2 - 2^2 + 5 \times 3 = (27)$
 $16 - 4 + 5 \times 3 = 27$
 $16 - 4 + 15 = 27$
 $27 = 27$