

pg 57 Maintaining Mathematical Proficiency

$$1. \begin{array}{r} 4y - 4x = 16 \\ +4x + 4y \\ \hline 8y = 4x + 16 \\ \hline y = x + 4 \end{array}$$

$$2. \begin{array}{r} 3y + 12x = 18 \\ -12x - 12x \\ \hline 3y = -12x + 18 \\ \hline y = -4x + 6 \end{array}$$

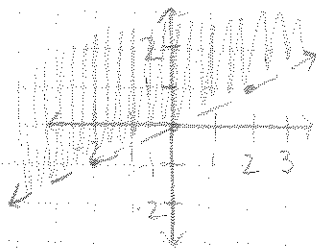
$$3. \begin{array}{r} 2x - 10 = 4y + 6 \\ -6 -6 \\ \hline 2x - 16 = 4y \\ \hline \frac{1}{4} 2x - 4 = y \end{array}$$

$$4. \begin{array}{r} X = 7y - y \\ X = 6y \\ \hline X = y \end{array}$$

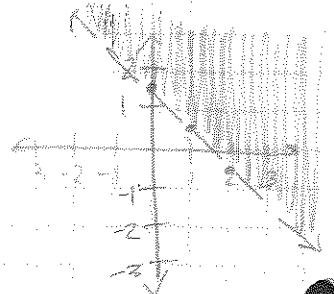
$$5. \begin{array}{r} X = 4y + 2y + 6 \\ -6 -6 \\ \hline X - 6 = 4y + 2y \\ X - 6 = 6y \\ \hline \frac{X - 6}{6} = y \end{array}$$

$$6. \begin{array}{r} 2y + 6xy = z \\ y(2 + 6x) = z \\ \hline y = \frac{z}{2 + 6x} \end{array}$$

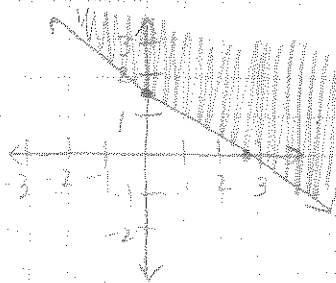
$$7. \begin{array}{r} X - 2y < 0 \\ -X \\ \hline -2y < -X \\ \hline y > \frac{1}{2} X \end{array}$$



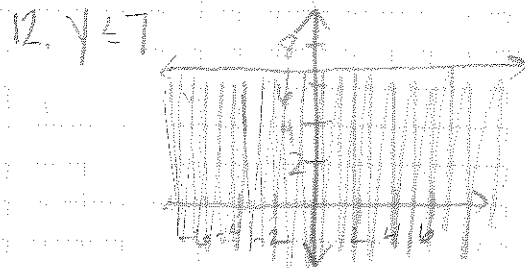
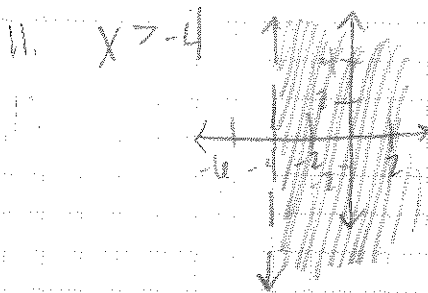
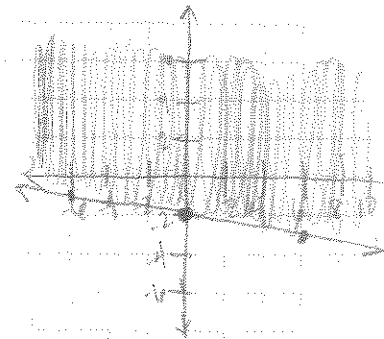
$$8. \begin{array}{r} 2x + 2y > 3 \\ -2x \\ \hline 2y > -2x + 3 \\ \hline y > -x + 3/2 \end{array}$$



$$9. \begin{array}{r} 3x + 5y \geq 8 \\ -3x \\ \hline 5y \geq -3x + 8 \\ \hline y \geq -\frac{3}{5}x + \frac{8}{5} \end{array}$$



$$10. \begin{array}{r} -x - 6y \leq 12 \\ +x \\ \hline -6y \leq x + 12 \\ \hline y \geq -\frac{1}{6}x - 2 \end{array}$$



13. NO, if the line runs through the point (0,0), it cannot be used as a test point

2.1 Solving Linear Systems Using Substitution

1. ordered triple

2. solve each equation for y → plug into other equations
 not find the solution to the system
 only puts them all as y

3. $(4, 5, 1)$
 $2(4) + 5 + 3(1) = 8$
 $8 - 5 + 3 = 8$
 $3 + 5 = 8$
 $8 = 8 ✓$

$1 + 3(-5) + 2(1) = -9$
 $4 - 15 + 2 = -9$
 $-11 + 2 = -9$
 $-9 = -9 ✓$

$-(4) - 2(-5) + 1 = -13$
 $-4 + 10 + 1 = -13$
 $6 + 1 = -13$
 $7 = -13$

NO, does not satisfy third equation

4. $(-2, 3, -6)$

$-(-2) + 2(3) + 2(-6) = -4$
 $2 + 6 + 12 = -4$
 $8 - 12 = -4$
 $-4 = -4 ✓$

$4(-2) + 3 - 3(-6) = 13$
 $-8 + 3 + 18 = 13$
 $-5 + 18 = 13$
 $13 = 13 ✓$

$-2 - 5(3) + (-6) = -23$
 $-2 - 15 - 6 = -23$
 $-17 - 6 = -23$
 $-23 = -23 ✓$

YES

5. $x = 4$ ← x already solved for

$x + y = -6$
 $4x - 3y + 2z = 26$

$(4, -10, 10)$

$x + y = -6$
 $4 + y = -6$
 $y = -10$

$4(4) - 3(-10) + 2z = 26$
 $16 + 30 + 2z = 26$
 $46 + 2z = 26$
 46
 $2z = -20$
 $z = -10$

6. $2x - 3y + z = 10$
 $y + 2z = 13$
 $z = 5$

$(7, 3, 5)$

$y + 2(5) = 13$
 $y + 10 = 13$
 $10 - 10$
 $y = 3$

$2x - 3(3) + 5 = 10$
 $2x - 9 + 5 = 10$
 $2x - 4 = 10$
 $+4 +4$
 $2x = 14$
 2
 $x = 7$

$$7. \begin{cases} x+2y = -1 \\ -x+3y+2z = -4 \\ -x+y-4z = 10 \end{cases} \rightarrow x = -2y - 1$$

$$\begin{aligned} -x+3y+2z &= -4 \\ -x+y-4z &= 10 \end{aligned}$$

$$\begin{aligned} -(-2y-1)+3y+2z &= -4 \\ 2y+1+3y+2z &= -4 \\ 5y+2z &= -5 \end{aligned}$$

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

$$\begin{aligned} x - \frac{2}{13} &= -1 \\ x &= -1 + \frac{2}{13} \\ x &= -\frac{11}{13} \end{aligned}$$

$$\boxed{x = -\frac{11}{13}}$$

$$\begin{aligned} -(-2y-1)+y-4z &= 10 \\ 2y+1+y-4z &= 10 \\ 3y-4z &= 9 \end{aligned}$$

$$3y - 4\left(-\frac{30}{13}\right) = 9$$

$$\begin{aligned} 3y + \frac{120}{13} &= 9 \\ 3y &= 9 - \frac{120}{13} \\ 3y &= \frac{117}{13} - \frac{120}{13} \\ 3y &= -\frac{3}{13} \\ y &= -\frac{1}{13} \end{aligned}$$

$$\boxed{y = -\frac{1}{13}}$$

$$\begin{aligned} 5y+2z &= -5 \\ 3y-4z &= 9 \rightarrow y = \frac{4}{3}z + 3 \end{aligned}$$

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

$$\frac{20z}{3} + 15 + 2z = -5$$

$$\frac{3}{26}z = -\frac{20 \cdot 3}{26}$$

$$\boxed{z = -\frac{30}{13}}$$

$$\boxed{\left(-\frac{11}{13}, -\frac{1}{13}, -\frac{30}{13}\right)}$$

$$8. \begin{cases} 2x-2y+z = 3 \\ 5y-z = -31 \\ x+3y+2z = -21 \end{cases} \rightarrow z = 5y + 31$$

$$\begin{aligned} 2x-2y+(5y+31) &= 3 \\ 2x-2y+5y+31 &= 3 \\ 2x+3y &= -28 \end{aligned}$$

$$2x+3y = -28$$

$$\begin{aligned} 2(-13y-83)+3y &= -28 \\ -26y-166+3y &= -28 \\ -23y &= 138 \\ y &= -6 \end{aligned}$$

$$\boxed{y = -6}$$

$$\begin{aligned} x+3y+2(5y+31) &= -21 \\ x+3y+10y+62 &= -21 \\ x+13y &= -83 \\ x-13y &= -83 \\ x &= -13y-83 \end{aligned}$$

$$\begin{aligned} 5(-6)-z &= -31 \\ -30-z &= -31 \\ z &= 1 \end{aligned}$$

$$\boxed{z = 1}$$

$$\begin{aligned} x+3(-6)+2(1) &= -21 \\ x-18+2 &= -21 \\ x-16 &= -21 \\ x &= -5 \end{aligned}$$

$$\boxed{(-5, -6, 1)}$$

$$9. \begin{cases} 12x+6y+7z = -35 \\ 7x-5y-6z = 200 \\ x+y = -10 \end{cases} \rightarrow y = -x-10$$

$$\begin{aligned} 10+y &= -10 \\ y &= -20 \end{aligned}$$

$$\boxed{y = -20}$$

$$\begin{aligned} 12x+6(-x-10)+7z &= -35 \\ 12x-6x-60+7z &= -35 \\ 6x+7z &= 25 \end{aligned}$$

$$\begin{aligned} 6x+7(2x-25) &= 25 \\ 6x+14x-175 &= 25 \\ 20x &= 200 \\ x &= 10 \end{aligned}$$

$$\boxed{x = 10}$$

$$\begin{aligned} 7x-5(-x-10)-6z &= 200 \\ 7x+5x+50-6z &= 200 \\ 12x-6z &= 150 \\ -6z &= -12x+150 \\ z &= 2x-25 \end{aligned}$$

$$\begin{aligned} 12(10)+6(-20)+7z &= -35 \\ 120-120+7z &= -35 \\ 7z &= -35 \\ z &= -5 \end{aligned}$$

$$\boxed{(10, -20, -5)}$$

$$10. \begin{aligned} 2x+y+z &= 12 \\ 5x+3y+5z &= 20 \\ x-4y+z &= -21 \rightarrow x=4y-z-21 \end{aligned}$$

$$\begin{aligned} x &= 4(5) + (-9) = -21 \\ x - 20 - 9 &= -21 \\ x - 29 &= -21 \\ +29 & \quad -29 \\ \hline x &= 8 \end{aligned}$$

$$(8, 5, -9)$$

$$\begin{aligned} 2(4y-z-21) + y + z &= 12 \\ 8y-2z-42 + y+z &= 12 \\ +42 & \quad +42 \end{aligned}$$

$$9y - z = 54$$

$$9(5) - z = 54$$

$$45 - z = 54$$

$$-45 \quad -45$$

$$+z = -9 \quad z = -9$$

$$\begin{aligned} 5(4y-z-21) + 5y + 5z &= 20 \\ 20y-5z-105 + 5y+5z &= 20 \\ +105 & \quad +105 \end{aligned}$$

$$\frac{25y}{25} = \frac{125}{25}$$

$$y = 5$$

$$11. \begin{aligned} x+y+z &= 24 \\ 5x+3y+z &= 56 \\ x+y+z &= 0 \rightarrow z = x+y \end{aligned}$$

$$4+8-z=0$$

$$12-z=0$$

$$z=12$$

$$(4, 8, 12)$$

$$\begin{aligned} x+y+(x+y) &= 24 \\ 2x+2y &= 24 \\ \frac{2}{2} \quad \frac{2}{2} \end{aligned}$$

$$x+y=12$$

$$x = -y+12$$

$$x = -8+12$$

$$x=4$$

$$5x+3y+x+y=56$$

$$6x+4y=56$$

$$6(-y+12)+4y=56$$

$$-6y+72+4y=56$$

$$-2y = -16$$

$$-2 \quad -2$$

$$y=8$$

$$12. \begin{aligned} -3x+y+2z &= -13 \\ 7x+2y-6z &= 37 \\ x-y+3z &= -14 \rightarrow x=y-3z-14 \end{aligned}$$

$$x-0+3(-5) = -14$$

$$x-15 = -14$$

$$+15 \quad +15$$

$$x=1$$

$$(1, 0, -5)$$

$$\begin{aligned} -3(y-3z-14) + y + 2z &= -13 \\ -3y+9z+42 + y+2z &= -13 \\ -42 & \quad -42 \end{aligned}$$

$$-2y+11z = -55$$

$$-2(3z+15) + 11z = -55$$

$$-6z-30+11z = -55$$

$$\frac{5z}{5} = \frac{-25}{5}$$

$$z = -5$$

$$\begin{aligned} 7(y-3z-14) + 2y - 6z &= 37 \\ 7y-21z-98 + 2y-6z &= 37 \\ +98 & \quad +98 \end{aligned}$$

$$9y - 27z = 135$$

$$y - 3z = 15$$

$$y = 3z + 15$$

$$y = 3(-5) + 15$$

$$y = -15 + 15$$

$$y = 0$$

$$13. \begin{aligned} -3x-4y+z &= -16 \rightarrow z=3x+4y-16 \\ x+11y-2z &= 30 \\ -9x-4y-z &= -4 \end{aligned}$$

$$-3(1) - 4(1) + z = -16$$

$$-3 - 4 + z = -16$$

$$-7 + z = -16$$

$$+7 \quad +7$$

$$z = -9$$

$$(1, 1, -9)$$

$$\begin{aligned} x+11y-2(3x+4y-16) &= 30 \\ x+11y-6x-8y+32 &= 30 \\ -32 & \quad -32 \end{aligned}$$

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

$$-5x+3(-1.5x+2.5) = -2$$

$$-5x-4.5x+7.5 = -2$$

$$-7.5 \quad -7.5$$

$$-9.5x = -9.5$$

$$-9.5 \quad -9.5$$

$$x=1$$

$$\begin{aligned} -9x-4y-(3x+4y-16) &= -4 \\ -9x-4y-3x-4y+16 &= -4 \\ -16 & \quad -16 \end{aligned}$$

$$-12x-8y = -20$$

$$-8y = 12x-20$$

$$y = -1.5x + 2.5$$

$$y = -1.5(1) + 2.5$$

$$y = -1.5 + 2.5$$

$$y = 1$$

$$14. \begin{cases} x-3y+6z=21 \\ 5x+2y-5z=30 \\ 2x-5y+7z=6 \end{cases} \rightarrow x=3y-6z+21$$

$$\begin{aligned} x-3(2)+6(5) &= 21 \\ x-6+30 &= 21 \\ x+24 &= 21 \\ x &= -3 \end{aligned}$$

$$\boxed{(-3, 2, 5)}$$

$$\begin{aligned} 3(3y-6z+21)+2y-5z &= 30 \\ 9y-18z+63+2y-5z &= 30 \\ 11y-23z &= -93 \end{aligned}$$

$$\begin{aligned} 11(10z-48)-23z &= -93 \\ 110z-528-23z &= -93 \\ 87z &= 435 \\ z &= 5 \end{aligned}$$

$$\boxed{z=5}$$

$$\begin{aligned} 2(6y-6z+21)-5y+2z &= -6 \\ 12y-12z+42-5y+2z &= -6 \\ 7y-10z &= -48 \end{aligned}$$

$$\begin{aligned} y-10z &= -48 \\ y &= 10z-48 \end{aligned}$$

$$\begin{aligned} y &= 10(5)-48 \\ y &= 50-48 \\ y &= 2 \end{aligned}$$

15 the negative should be distributed to make the equation

$$\begin{aligned} x-y-(11-3x-2y) &= -2 \\ x-y-11+3x+2y &= -2 \\ 4x+y &= 9 \end{aligned}$$

16 did not solve for y correctly. should be (did not \div by -1)

$$\begin{aligned} x-y-z &= -2 \\ -x+y+z &= -x+z \\ \hline y &= -x+z-2 \end{aligned}$$

$$y = x-z+2$$

$$\begin{aligned} 2x+3(3z+3)-z &= 1 \\ 2x+9z+9-z &= 1 \\ 2x+8z &= -8 \\ 2x &= -8-8z \\ x &= -4-4z \end{aligned}$$

$$x = 5z-4$$

$$17. \begin{cases} y+3z=3 \\ x+2y+z=8 \\ 2x+3y-z=1 \end{cases} \rightarrow y = -3z+3$$

$$\begin{aligned} x+2(-3z+3)+z &= 8 \\ x-6z+6+z &= 8 \\ x-5z &= 2 \end{aligned}$$

$$\begin{aligned} 5z-4-5z &= 2 \\ -4 &= 2 \end{aligned}$$

NO SOLUTION

$$18. \begin{cases} x=y-z \\ x+y+2z=1 \\ 5x+3y+6z=4 \end{cases}$$

$$\begin{aligned} y-z+y+2z &= 1 \\ 2y+z &= 1 \\ z &= -2y+1 \end{aligned}$$

$$\begin{aligned} 3(y-z)+3y+6z &= 4 \\ 3y-3z+3y+6z &= 4 \\ 6y+3z &= 4 \end{aligned}$$

$$\begin{aligned} 6y+3(-2y+1) &= 4 \\ 6y-6y+3 &= 4 \\ 3 &= 4 \end{aligned}$$

NO SOLUTION

$$19. \begin{cases} 2x+y-3z=-2 \\ 7x+3y-z=11 \\ -4x-2y+6z=4 \end{cases} \rightarrow y = -2x+3z-2$$

$$\begin{aligned} 7x+3(-2x+3z-2)-z &= 11 \\ 7x-6x+9z-6-z &= 11 \\ x+8z &= 5 \end{aligned}$$

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

Infinite Solutions

$$20. \begin{cases} 11x+11y-11z=44 \\ 22x-30y+15z=-8 \\ x+y-z=4 \end{cases} \rightarrow x = -y+z+4$$

$$\begin{aligned} 11(-y+z+4)+11y-11z &= 44 \\ -11y+11z+44+11y-11z &= 44 \\ 44 &= 44 \end{aligned}$$

Infinite Solutions

$$21. \begin{cases} 2x+3y-z=b \rightarrow z=2x+3y-b \\ 3x-12y+6z=9 \\ -x+4y-2z=-3 \end{cases}$$

$$\begin{aligned} 3x-12y+6(2x+3y-b) &= 9 \\ 3x-12y+12x+18y-6b &= 9 \\ 15x-6y &= 45 \\ 15x+6(-2.5x+7.5) &= 45 \\ 15x-15x+45 &= 45 \\ 45 &= 45 \end{aligned}$$

$$\begin{aligned} -x+4y-2(2x+3y-b) &= -3 \\ -x+4y-4x-6y+2b &= -3 \\ -5x-2y+2b &= -3 \\ \frac{-2y}{-2} &= \frac{5x-15}{-2} \\ y &= -2.5x+7.5 \end{aligned}$$

Infinite Solutions

$$22. \begin{cases} x-3y+z=2 \rightarrow x=3y-z+2 \\ 2x+y+z=6 \\ 3x-9y+13z=10 \end{cases}$$

$$\begin{aligned} 2(3y-z+2)+3y+13z &= 10 \\ 6y-2z+4+3y+13z &= 10 \\ -4 &= -4 \\ 9y-7z &= -2 \end{aligned}$$

$$\begin{aligned} 3(3y-z+2)+9y+13z &= 10 \\ 9y-3z+6+9y+13z &= 10 \\ 6 &= 10 \end{aligned}$$

NO SOLUTION

23. x = price/peanut
 y = price/cashews
 z = price/almonds

1lb ea for \$20 $\rightarrow x+y+z=20$
 cashew = \$4 $\rightarrow x+z=y$
 total weight $\rightarrow 2x+1y+3z=36$

$$\begin{aligned} x+(x+z)+z &= 20 & 2x+(x+z) &= 36 \\ 2x+z &= 20 & 3x+4z &= 36 \\ 2x &= -2z+20 & 3(-z+10)+4z &= 36 \\ x &= -z+10 & -3z+30+4z &= 36 \\ x &= -b+10 & -z &= 6 \\ \boxed{x=4} & & \boxed{z=6} & \end{aligned}$$

peanuts: \$4/lb
 cashews: \$10/lb
 almonds: \$6/lb

$$\begin{aligned} x+z &= y \\ 4+6 &= y \\ \boxed{10=y} \end{aligned}$$

24. x = 1st place votes
 y = 2nd place votes
 z = 3rd place votes

Player 1 $\rightarrow 23x+5y+z=131 \rightarrow z=-23x-5y+131$
 Player 2 $\rightarrow 5x+17y+4z=80$
 Player 3 $\rightarrow x+5y+15z=35$

$$\begin{aligned} 5x+17y+4(-23x-5y+131) &= 80 \\ 5x+17y-92x-20y+524 &= 80 \\ -87x-3y &= -444 \end{aligned}$$

$$\begin{aligned} x+5y+15(-23x-5y+131) &= 35 \\ x+5y-345x-75y+1965 &= 35 \\ -344x-70y &= -1930 \end{aligned}$$

$$\begin{aligned} \frac{-3y}{-3} &= \frac{87y-444}{-3} \\ y &= -29x+148 \\ y &= -29(5)+148 \\ \boxed{y=3} \end{aligned}$$

$$\begin{aligned} -344x-70y &= -1930 \\ -344x-70(-29x+148) &= -1930 \\ -344x+2030x-10360 &= -1930 \\ +10360 &+10360 \\ \boxed{1686x} &= \boxed{8430} \\ \boxed{x=5} \end{aligned}$$

$$\begin{aligned} 23(5)+5(3)+z &= 131 \\ 115+15+z &= 131 \\ 130+z &= 131 \\ -130 &-130 \\ \boxed{z=1} \end{aligned}$$

1st place: 5 pts
 2nd place: 3 pts
 3rd place: 1 pt

$$\begin{aligned} 25. \quad & x + 3y + 5z = 27 \\ & 2x + 7y - 9z = 3 \\ & 4x + 6y - 8z = 7 \end{aligned}$$

easiest to solve for x in equation 1
because its coefficient is 1

26. solve for a variable \rightarrow substitute the new equation into remaining three equations \rightarrow it is now a system of 3 variables & solve using substitution

$$\begin{aligned} 27. \quad & x = \text{lefties } \% \quad \text{lefties} \rightarrow x = \frac{1}{10}y \\ & y = \text{righties } \% \\ & z = \text{ambidextrous} \quad 2 \text{ \% righties} \rightarrow y = 9(x+z) \rightarrow y = 9x + 9z \\ & \text{total} \rightarrow x + y + z = 100 \end{aligned}$$

1% are ambidextrous

$$\begin{aligned} & x + 9x + 9z + z = 100 \\ & 10x + 10z = 100 \\ & 10 \cdot x = \frac{1}{10}(9x + 9z) = 10 \\ & 10x = 9x + 9z \\ & -9x \quad -9x \\ & x = 9z \\ & 10(9z) + 10z = 100 \\ & \frac{100z}{100} = \frac{100}{100} \\ & z = 1 \end{aligned}$$

$$\begin{aligned} 28. \quad & x = 1st \text{ pl} \\ & y = 2nd \text{ pl} \\ & z = 3rd \text{ pl} \end{aligned}$$

$$\begin{aligned} \# \text{ of athletes} & \rightarrow x + y + z = 20 \\ \text{points} & \rightarrow 5x + 3y + z = 68 \\ \text{2nd} = 1st + 3rd & \rightarrow y = x + z \end{aligned}$$

$$\begin{aligned} x + (x+z) + z &= 20 \\ 2x + 2z &= 20 \\ \frac{2x}{2} - \frac{2z}{2} &= \frac{20}{2} \\ x - z &= 10 \\ x &= z + 10 \\ x &= -z + 10 \\ \boxed{x = 7} \end{aligned}$$

$$\begin{aligned} 5x + 3(x+z) + z &= 68 \\ 5x + 3x + 3z + z &= 68 \\ 8x + 4z &= 68 \\ \frac{8x}{8} + \frac{4z}{4} &= \frac{68}{4} \\ x + z &= 17 \\ -z + 10 &= 17 \\ -z &= 7 \\ z &= -7 \end{aligned}$$

$$\begin{aligned} y &= 7 + 3 \\ \boxed{y = 10} \end{aligned}$$

7 1st
10 2nd
3 3rd

$$\begin{aligned} 29. \quad & l = \frac{1}{3}m \\ n &= l + m - 15 = \frac{1}{3}m + m - 15 \\ 40 &= n + m + l = (\frac{1}{3}m + m - 15) + m + (\frac{1}{3}m) \end{aligned}$$

$$\begin{aligned} 40 &= \frac{9}{3}m - 15 \\ +15 & \\ \frac{3}{8} \cdot 80 &= \frac{7}{3}m - \frac{3}{8} \cdot 15 \\ \boxed{30 = m} \end{aligned}$$

$$\begin{aligned} l &= \frac{1}{3}(30) \\ \boxed{l = 10} \end{aligned}$$

$$\begin{aligned} n &= 10 + 30 - 15 \\ n &= 40 - 15 \\ \boxed{n = 25} \end{aligned}$$

$$\begin{aligned} 30. \quad & A + B + C = 180 \\ & B = 5A - C \\ & C = A + B \end{aligned}$$

$$\begin{aligned} B &= 5A - (A+B) \\ B &= 5A - A - B \\ +B & \quad +B \\ 2B &= 4A \\ \frac{2B}{2} &= \frac{4A}{2} \\ B &= 2A \\ B &= 2(30) \\ \boxed{B = 60} \end{aligned}$$

$$\begin{aligned} C &= A + B \\ C &= A + 2A \\ C &= 3A \\ C &= 3(30) \\ \boxed{C = 90} \end{aligned}$$

$$\begin{aligned} A + B + C &= 180 \\ A + 2A + 3A &= 180 \\ 6A &= 180 \\ \frac{6A}{6} &= \frac{180}{6} \\ \boxed{A = 30} \end{aligned}$$

example

31. $x + y + z = -1 \rightarrow z = -x - y - 1$
 $2x + 3y - z = -7$
 $-x + 9y + 2z = 17$

$-4 + 1 + z = -1$
 $-3 + z = -1$
 $+z = +3$
 $z = 2$

$2x + 3y - (-x - y - 1) = -7$
 $2x + 3y + x + y + 1 = -7$
 $3x + 4y = -8$

$\frac{4y}{4} = \frac{-3x - 8}{4}$
 $y = -0.75x - 2$
 $y = -0.75(4) - 2$
 $y = -1$

$-x + 9y + 2(-x - y - 1) = 17$
 $-x + 9y - 2x - 2y - 2 = 17$
 $-3x + 7y = 19$

$-3x + 7(-0.75x - 2) = 19$
 $-3x - 5.25x - 14 = 19$
 $-8.25x = 33$
 $x = -4$

32. NO, 2 of the equations could intersect but not the third

33. $x = \text{bedroom}$ total Area $\rightarrow x + y + z = 840$
 $y = \text{bathroom}$ bed = kitchen $\rightarrow x = z$
 $z = \text{kitchen}$ 2 bath 2 kitchen $\rightarrow 2y + 2z = 980$

$x + y + x = 840$
 $2x + y = 840$
 $y = 840 - 2x$
 $2y + 2x = 980$
 $2(840 - 2x) + 2x = 980$
 $1680 - 4x + 2x = 980$
 $-1680 + 1680 - 2x = 980 - 1680$
 $-2x = -700$
 $x = 350$

352 sq ft per bedroom

34. a) infinite solutions

b) to be exactly one solution, there needs to be n equations for n variables

35. $x = \# \text{ roses}$
 $y = \# \text{ lilies}$
 $z = \# \text{ irises}$
 total budget 160 = 32
 # bouquet 8

a) $2.5x + 4y + 2z = 32$
 $x + y + z = 12$
 $x = 2(y + z)$
 $= 2y + 2z$
 $x = 2(2) + 2(2)$
 $x = 8$

$2.5(2y + 2z) + 4y + 2z = 32$
 $5y + 5z + 4y + 2z = 32$
 $9y + 7z = 32$
 $9y + 7(y + 4) = 32$
 $9y + 7y + 28 = 32$
 $16y = 4$
 $y = \frac{1}{4}$
 $z = 12 - y - x$
 $z = 12 - \frac{1}{4} - 8$
 $z = 3.75$

b) 8 roses, 2 lilies, 2 irises

- c) NO possible solutions
 8 roses, 1 lily, 3 irises
 8 roses, 2 lilies, 2 irises
 8 roses, 3 lilies, 1 iris
 8 roses, 4 lilies, 0 irises
 8 roses, 0 lilies, 4 irises

$2y + 2z + y + z = 12$
 $3y + 3z = 12$
 $y + z = 4$

- IF $y = 1, z = 3, x = 8$
 $y = 2, z = 2, x = 8$
 $y = 3, z = 1, x = 8$
 $y = 4, z = 0, x = 8$
 $y = 0, z = 4, x = 8$

36. a) one solution - they intersect at one point
 b) no solutions - they do not intersect

37. a) no solutions - 2 of the equations will never intersect
 b) one solution - the third line intersects at a point
 infinite solutions - the third line intersects at the line
 no solution - the third line does not intersect
 c) same as b)

38. $1x + -3y + 0z = -30$

$1(30) - 3(20) = -30$

$30 - 60 = -30$

$-30 = -30$

39. a = apple
 t = tangerine
 g = grapefruit
 b = banana

$$\begin{aligned} a + t &= g && \rightarrow a = g - t \\ b + t &= a && \rightarrow b + t = g - t \\ 2g &= 3b && \quad \quad \quad -t \quad -t \\ &&& \quad \quad \quad b = g - 2t \end{aligned}$$

$$\begin{aligned} 2g &= 3(g - 2t) \\ 2g &= 3g - 6t \\ -2g &= -2g + 6t \\ b &= g \end{aligned}$$

$$\begin{aligned} a + t &= g \\ a + t &= b + t \\ -t & \quad -t \\ a &= b \end{aligned}$$

5 tangerines to
 balance 1 apple