pg ble Maintaining Mathematical Proficiency

40. $x+3y=6$ and $-x-2y=-5$

$y=1$

$x+3(1)=6$

$-3 \quad -3$

$x=3$

$(3,1)$

41. $2x-y=-3$ and $-5x+y=3$

$-3x=0$

$\frac{-3x}{-3}=\frac{0}{-3}$

$x=0$

$-5(0)+y=3$

$y=3$

$(0,3)$

42. $4x+2y=-4$ and $2(-2x+6y=44)$

$4x+2y=-4$ and $-4x+12y=88$

$14y=84$

$\frac{14y}{14}=\frac{84}{14}$

$y=6$

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

$4x+12=-4$

$-12 \quad -12$

$\frac{4x}{4}=\frac{-16}{4}$

$x=-4$

$(-4,6)$

43. $(4x-3y=9)-1$ and $5x-2y=6$

$-4x+3y=-9$ and $5x-2y=6$

$4(3)-3y=9$

$12-3y=9$

$-12 \quad -12$

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

$y=1$

$-28x+21y=63$

$5x-21y=-126$

$\frac{-23x}{-23}=\frac{-189}{-23}$

$x=3$

$(3,1)$

2.2 Solving Linear Systems by Elimination

1. In each method, we eliminate a variable to get a system of two variables

2. It has infinitely many solutions when the result is 0 = 0

3. $x + y - 2z = 5$
$-x + 2y + z = 2$
$2x + 3y - z = 9$

$x + y - 2z = 5$
$-x + 2y + z = 2$
$3y - z = 7$

$-2x + 4y + 2z = 4$
$2x + 3y - z = 9$
$7y + z = 13$

$7(2) + z = 13$
$14 + z = 13$
$-14 \quad -14$
$\boxed{z = -1}$

$3y - z = 7$
$7y + z = 13$
$10y = 20$
$\frac{10y}{10} = \frac{20}{10}$
$\boxed{y = 2}$

$x + (2) - 2(-1) = 5$
$x + 2 + 2 = 5$
$x + 4 = 5$
$-4 \quad -4$
$\boxed{x = 1}$

$\boxed{(1, 2, -1)}$

4. $x + 4y - 6z = -1$
$2x - y + 2z = -7$
$-x + 2y - 4z = 5$

$x + 4y - 6z = -1$
$-x + 2y - 4z = 5$
$6y - 10z = 4$

$2x - y + 2z = -7$
$-2x + 4y - 8z = 10$
$3y - 6z = 3$
$3y - 6(-1) = 3$
$3y + 6 = 3$
$3y = -3$
$\frac{3y}{3} = \frac{-3}{3}$
$\boxed{y = -1}$

$6y - 10z = 4$
$-6y + 12z = -6$
$2z = -2$
$\frac{2z}{2} = \frac{-2}{2}$
$\boxed{z = -1}$

$x + 4(-1) - 6(-1) = -1$
$x - 4 + 6 = -1$
$x + 2 = -1$
$-2 \quad -2$
$\boxed{x = -3}$

$\boxed{(-3, -1, -1)}$

5. $3x - y + 2z = 4$
$6x - 2y + 4z = -8$
$2x - y + 3z = 10$

$-6x + 2y - 4z = -8$
$6x - 2y + 4z = -8$
$0 = -16$

NO SOLUTION

6. $5x + y - z = 6$

$5x + y - z = 6$

$-12x - 4y = -16$

No Solution

8. $2x - 3y + z = -6$
$x + y - z = 5$
$-7x + 2y - 6z = 31$

$-2x - 3y + z = -6$
$x + y - z = 5$
$-x - 2y = 1$

$7x + 12y - 2z = 30$
$-3x - 10y + 2z = -5$
$4x + 2y = 25$
$8 = 0$

Infinite Solutions

9. Did not multiply the constant (11) by 4

10. Did not multiply the constant (-18) by 3

11. $x + y - z = 4$
$3x + 2y + 4z = 17$
$-x + 5y + z = 8$

$x + y - z = 4$
$-x + 5y + z = 8$
$6y = 12$
$y = 2$

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

$3x + 2(2) + 4z = 17$
$3x + 4z = 13$
$-3x + 3z = -6$
$7z = 7$
$z = 1$

(3, 2, 1)

12. $2x - y - z = 15$
$4x + 5y + 2z = 10$
$-x - 4y + 3z = -20$

$-4x + 2y + 2z = 30$
$4x + 5y + 2z = 10$
$7y + 4z = -20$

$4x + 5y + 2z = 10$
$-4x - 14y + 12z = -80$
$-11y + 14z = -70$

$7y + 4z = -20 \rightarrow$
$-11y + 14z = -70 \rightarrow$

$-49y - 28z = 140$
$-22y + 28z = -140$
$-71y = 0$
$y = 0$

$7y + 4z = -20$
$7(0) + 4z = -20$
$4z = -20$
$z = -5$

$2x - 0 + (-5) = 15$
$+5 \quad +5$
$2x = 20$
$x = 10$

(5, 0, -5)

13. $x + 2y - z = 3$
$2x + 4y - 2z = 6$
$-x - 2y + z = -6$

$x + 2y - z = 3$
$-x - 2y + z = -6$
$0 = -3$

NO solution

14. $x + 2y + 3z = 4$
$-3x + 2y - z = 12$
$-2x - 2y - 4z = -14$

$-x - 2y - 3z = -4$
$-3x + 2y - z = 12$
$-4x - 4z = 8$

$-3x + 2y - z = 12$
$-2x - 2y - 4z = -14$
$-5x - 5z = -2$

$20x + 20z = -40$
$-20x - 20z = -8$
$0 = -48$

NO Solution

15. $x+2y-z=3$
$-2x-y+z=-1$
$6x-3y-z=-7$

$x+2y-z=3$
$-2x-y+z=-1$
$-x+y=2$

$6x-3y-z=-7$
$-2x-y+z=-1$
$4x-4y=-8$
$-4x+4y=8$
$0=0$

Infinite Solution:

16. $4x+y+5z=5$
$2x+2y+10z=10$
$x-y+2z=-2$

$-2x-2y-10z=-10$
$2x+2y+10z=10$
$0=0$

Infinite Solution

17. $2p+1d+3s=14$
$1p+2d+3s=15$
$3p+1d+1s=22$

$2p+1d+3s=14$
$-1p-1d-3s=-15$
$p-2s=-1$

$-1p-1d-3s=-15$
$3p+1d+1s=22$
$2p-2s=7$
$-2p+4s=2$
$2s=9$
$s=3$

$2p-2(3)=7$
$2p-6=7$
$2p=13$
$p=5$

$2(5)+1d+3(3)=14$
$10+d+9=14$
$-19=-14$
$d=1$

Price $5
Soda $1
Salad $3

18. $S+\ell=1300$
$S+2C=1400$
$S+\ell+C=1600$

$\begin{bmatrix}1&1&0&1300\\1&0&2&1400\\1&1&1&1600\end{bmatrix}$ $-R_1+R_2$ $\begin{bmatrix}1&1&0&1300\\0&-1&2&100\\1&1&1&1600\end{bmatrix}$ $-R_1+R_3$ $\begin{bmatrix}1&1&0&1300\\0&-1&2&100\\0&0&3&300\end{bmatrix}$ $\frac{1}{3}R_3$

$S+\ell=1300$
$-\ell+2C=100$
$C=300$

$-\ell+2(300)=100$
$-\ell+600=100$
$-600\ -600$
$-\ell=-500$
$\ell=500$

$S+500=1300$
$-500\ -500$
$S=200$

Sofa $800
Love seat $500
Chair $300

19. $A+S+C=400$
$22A+15S+13.50C=7840$
$C=S+40$

$A+S+(S+40)=400$
$-40\ -40$
$A+2S=360$
$A=360-2S$

$22A+15S+13.50(S+40)=7840$
$22A+15S+13.50S+540=7840$
$-540\ -540$
$22A+28.50S=7300$
$22(360-2S)+28.50S=7300$
$7920-44S+28.50S=7300$
$-7920\ -7920$
$-15.5S=-620$
$-15.5\ -15.5$
$S=40$

$C=40+40$
$C=80$

$A+40+80=400$
$A+120=400$
$-120\ -120$
$A=280$

280 Adults
40 students
80 children

20. $b+l+u=10{,}000$
$10b+8l+5u=70{,}000$
$u=4b$
$u=4000$

5000 lower deck

$b+l+4b=10{,}000$
$5b+l=10{,}000$
$l=-5b+10{,}000$

$l=5(1000)+10000$

$l=5000+1000$
$l=5000$

$10b+8l+5(4b)=70{,}000$
$10b+8l+20b=70{,}000$
$30b+8l=70{,}000$
$30b+8(-5b+10000)=70{,}000$
$30b-40b+80000=70{,}000$
$-10b+80000=70{,}000$
$-80000\quad -80000$
$-10b=-10{,}000$
$b=1000$

21. a) elimination - the x's can easily be eliminated
b) Gaussian → divide equation 3 by 2 so the coefficient on x is one

22. $q+2d+n=.50$
$q+2d+5n=.60$
$2q+d+n=.65$

23. $-1+2(2)-3(-3)=a$
$-1+4+9=a$
$3+9=a$
$12=a$

$-(-1)-2+(-3)=b$
$1-2-3=b$
$-1-3=b$
$-4=b$

$2(-1)+3(2)-2(-3)=c$
$-2+6+6=c$
$4+6=c$
$10=c$

24. $4x+y+z=0$
$2x+12y-3z=0$
$-x-14y-z=0$

$4x+y+z=0$
$-4x-12y+6z=0$
$7z=0$
$z=0$

$4x+y+z=0$
$-4x-y=0$
$-4z=0$
$-3z=0$
$z=0$

Yes, the x & y values will cancel every time

25. a) $a=-1\quad b=-1\quad c=-1$
$x+y+z=2$
$-x-y-z=10$
$0\neq 12$

b) $a=3\quad b=2\quad c=4$
$3x+2y+4z=10$
$x-2y+z=4$
$4x+5z=14$
can use elimination

c) $a=5\quad b=5\quad c=5$
$x+y+z=2 \rightarrow -5x-5y-5z=-10$
$5x+5y+5z=10$
$0=0$

26. $g+r+e=21$
$1.25g+r+1.5e=24$
$g=2$

$-g+r+e=19$
$r+1.5e=21.5$
$.5e=2.5$
$.5\quad .5$
$e=5$

$2+r+5=21$
$7+r=21$
$-7\quad -7$
$r=14$

21 lbs golden
14 lbs red
5 lbs empire