

3-VARIABLE SYSTEMS - Elimination

$$\begin{array}{l} -2 \quad x + 2y - 4z = -15 \\ -3 \quad \left[\begin{array}{l} 3x - 5y + z = 38 \\ 2x + 7y - 5z = -33 \end{array} \right. \end{array}$$

1) Eliminate x in Eq. 1 + 2

$$\begin{array}{r} -3x - 6y + 12z = 45 \\ + 2x + 7y - 5z = -33 \\ \hline -11y + 13z = 83 \end{array}$$

4) Sub value into a 2-var. equation & solve for the remaining variable.

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

$$3y + 9 = -3$$

$$3y = -12$$

$$y = -4$$

5) Sub both values into one of original equations

$$x + 2y - 4z = -15$$

$$x + 2(-4) - 4(3) = -15$$

$$x - 8 - 12 = -15$$

$$x = 5$$

2) Eliminate x in a different pair of equations (

$$-2x - 4y + 8z = 30$$

$$2x + 7y - 5z = -33$$

$$3y + 3z = -3$$

3) Combine the two 2-var. equations & eliminate a variable

$$\begin{array}{l} 3[-11y + 13z = 83] \\ 11[3y + 3z = -3] \end{array}$$

$$-33y + 39z = 249$$

$$33y + 33z = -33$$

$$\begin{array}{r} 72z = 216 \\ 72 \end{array}$$

$$z = 3$$

$$(x, y, z)$$

$$(5, -4, 3)$$

As part of a promotion, a local bank invites its customers to view a large sack full of \$5, \$10, and \$20 gold pieces, promising to give the sack to the first person able to state the number of coins for each denomination. Customers are told there are exactly 250 coins, with a total face value of \$1875. If there are also seven times as many \$5 gold pieces as \$20 gold pieces, how many of each denomination are there?

$$x + y + z = 250$$

$$5x + 10y + 20z = 1875$$

$$x = 7z$$

x = # of \$5 coins

y = # of \$10 coins

z = # of \$20 coins

$$\begin{array}{l} -10 \left[\begin{array}{l} x + y + z = 250 \\ 5x + 10y + 20z = 1875 \\ x - 7z = 0 \end{array} \right. \end{array}$$

1) Pair Eq. 1 & 2 eliminate y again.

$$\begin{array}{r} -10x - 10y - 10z = -2500 \\ 5x + 10y + 20z = 1875 \\ \hline -5x \quad \quad + 10z = -625 \end{array}$$

175	\$5	gold pieces	
50	\$10	"	"
25	\$20	"	"

$$\begin{array}{l} 2) \left[\begin{array}{l} x - 7z = 0 \\ -5x + 10z = -625 \end{array} \right] \end{array}$$

$$\begin{array}{r} x - 35z = 0 \\ + -5x + 10z = -625 \\ \hline -25z = -625 \end{array}$$

$$z = 25$$

3) Sub in values & find remaining variables.

$$x - 7(25) = 0$$

$$x - 175 = 0$$

$$x = 175$$

$$x + y + z = 250$$

$$175 + y + 25 = 250$$

$$-200$$

$$y = 50$$