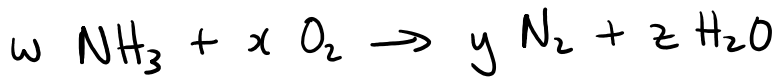


CBA ISI Friday 7:45-8:30

## 2.4 Applications

② Won't over

③ Coefficients are unknown



$$\text{N: } w = 2y \rightarrow w - 2y = 0$$

$$\text{H: } 3w = 2z \rightarrow 3w - 2z = 0$$

$$\text{O: } 2x = z \rightarrow 2x - z = 0$$

$$\begin{array}{cccc|c} w & x & y & z & \\ \hline 1 & 0 & -2 & 0 & 0 \\ 3 & 0 & 0 & -2 & 0 \\ 0 & 2 & 0 & -1 & 0 \end{array}$$

→

$$\begin{array}{cccc|c} w & x & y & z & \\ \hline 1 & 0 & 0 & -2/3 & 0 \\ 0 & 1 & 0 & -1/2 & 0 \\ 0 & 0 & 1 & -1/3 & 0 \end{array} \quad \text{RREF}$$

↑  
 $z = t$

$$w - \frac{2}{3}z = 0 \rightarrow \begin{array}{l} w = \frac{2}{3}t \\ x = \frac{1}{2}t \\ y = \frac{1}{3}t \end{array}$$

Choose smallest  $t$  that gives positive integer solutions.

$$t = 6$$

$$w = 4 \quad x = 3 \quad y = 2 \quad z = 6$$



④ a) Inflow = Outflow at each intersection

$$A: 20 = f_1 + f_2$$

$$B: f_1 + f_3 = 25$$

$$C: 30 = f_3 + f_4$$

$$D: f_2 + f_4 = 25$$

$$\begin{array}{cccc|c} f_1 & f_2 & f_3 & f_4 & \\ \hline 1 & 1 & 0 & 0 & 20 \\ 1 & 0 & 1 & 0 & 25 \\ 0 & 0 & 1 & 1 & 30 \\ 0 & 1 & 0 & 1 & 25 \end{array}$$

$$\rightsquigarrow \begin{array}{cccc|c} f_1 & f_2 & f_3 & f_4 & \\ \hline 1 & 0 & 0 & -1 & -5 \\ 0 & 1 & 0 & 1 & 25 \\ 0 & 0 & 1 & 1 & 30 \\ 0 & 0 & 0 & 0 & 0 \end{array} \quad \text{RREF}$$

$$\boxed{f_4 = t} \quad (t \geq 0)$$

$$f_1 - f_4 = -5 \quad \rightarrow \quad \boxed{f_1 = -5 + t} \quad (t \geq 5)$$

$$\boxed{f_2 = 25 - t} \quad \begin{array}{l} (25 - t \geq 0) \\ (25 \geq t) \\ (t \leq 25) \end{array}$$

$$\boxed{f_3 = 30 - t} \quad (t \leq 30)$$

Nonnegative solutions :  
 $5 \leq t \leq 25$

b)  $f_4 = 10 \Rightarrow t = 10$   
 $f_1 = 5 \quad f_2 = 15 \quad f_3 = 20$

c) Sub  $t = 5$  and  $t = 25$

$$0 \leq f_1 \leq 20$$

$$0 \leq f_2 \leq 20$$

$$5 \leq f_3 \leq 25$$

$$5 \leq f_4 \leq 25$$

⑤

$x =$  # of nickels  
 $y =$  " dimes  
 $z =$  " quarters

#Coins

$\phi$

$$\begin{cases} x + y + z = 20 \\ 5x + 10y + 25z = 300 \end{cases}$$

$$\begin{array}{ccc|c} x & y & z & \\ \hline 1 & 1 & 1 & 20 \\ 5 & 10 & 25 & 300 \end{array}$$

$$\rightsquigarrow \begin{array}{ccc|c} 1 & 0 & -3 & -20 \\ 0 & 1 & 4 & 40 \end{array} \quad \text{RREF}$$

$$z = t$$

$$x = -20 + 3t$$

$$y = 40 - 4t$$

$$(t \geq 0)$$

$$\begin{array}{l} -20 + 3t \geq 0 \\ 3t \geq 20 \\ t \geq \frac{20}{3} \\ t \geq 7 \end{array}$$

$$t \leq 10$$

11

1 1 1 1 1 1 1

Non-negative integer solutions:

$$7 \leq t \leq 10$$

$$t \leq 10$$

