

MPM2D - Exam Review - Units 6 & 7

Unit 6 - Linear Systems

1a. $3x + y = 5$ (1)
 $x - 2y = 11$ (2)

from (2) $x = 2y + 11$ (3)

Sub (3) into (1)
 $3(2y + 11) + y = 5$
 $6y + 33 + y = 5$
 $7y + 33 = 5$
 $7y = 5 - 33$
 $7y = -28$
 $y = -4$

Sub $y = -4$ into (3)
 $x = 2y + 11$
 $= 2(-4) + 11$
 $= -8 + 11$
 $x = 3$

\therefore POI is $(3, -4)$

b. $3x - 2y = -8$ (1)
 $-9x + 3y = 21$ (2)
 $\textcircled{1} \times 3$ $9x - 6y = -24$ (3)
 $\textcircled{2} + \textcircled{3}$ $-3y = -3$
 $y = 1$

Sub $y = 1$ into (1)
 $3x - 2y = -8$
 $3x - 2(1) = -8$
 $3x - 2 = -8$
 $3x = -6$
 $x = -2$

\therefore The POI is $(-2, 1)$

c. $2x - 3y = 10$ (1)
 $3x - 4y = 8$ (2)

$\textcircled{1} \times 4$: $8x - 12y = 40$ (3)
 $\textcircled{2} \times -3$: $-9x + 12y = -24$ (4)
 $\textcircled{3} + \textcircled{4}$ $-x = 16$
 $x = -16$

Sub $x = -16$ into (1)
 $2x - 3y = 10$
 $2(-16) - 3y = 10$
 $-32 - 3y = 10$
 $-3y = 42$
 $y = -14$

\therefore The POI is $(-16, -14)$

d. $6x - 3y = 4$ ①

$5x - 5y = 10$ ②

① $\times -5$ $-30x + 15y = -20$ ③

② $\times 6$ $30x - 30y = 60$ ④

③ + ④

$$\begin{array}{r} -15y = +40 \\ -15 \quad -15 \\ \hline \end{array}$$

$y = -\frac{8}{3}$

Sub $y = -\frac{8}{3}$ into ①

$6x - 3(-\frac{8}{3}) = 4$

$6x + \frac{24}{3} = 4$

$6x + 8 = 4$

$\frac{6x}{6} = \frac{-4}{6}$

$x = -\frac{2}{3}$

\therefore The POI is $(-\frac{2}{3}, -\frac{8}{3})$

f. $\frac{1}{3}x - \frac{1}{2}y = -\frac{5}{6}$ ①

$\frac{1}{5}x - \frac{1}{3}y = -\frac{3}{5}$ ②

① $\times 6$: $2x - 3y = -5$ ③

② $\times 15$: $3x - 5y = -9$ ④

③ $\times -3$: $-6x + 9y = 15$ ⑤

④ $\times 2$: $6x - 10y = -18$ ⑥

⑤ + ⑥

$$\begin{array}{r} -y = -3 \\ -1 \quad -1 \\ \hline \end{array}$$
 $y = 3$

e. $y = 2x - 30$ ①

$\frac{1}{5}x - \frac{1}{2}y = -1$ ②

② $\times 10$: $2x - 5y = -10$ ③

from ①: $-2x + y = -30$ ④

③ + ④

$$\begin{array}{r} -4y = -40 \\ -4 \quad -4 \\ \hline \end{array}$$

$y = 10$

Sub $y = 10$ into ①

$y = 2x - 30$

$10 = 2x - 30$

$\frac{40}{2} = \frac{2x}{2}$

$x = 20$

\therefore The POI is $(20, 10)$

Sub $y = 3$ into ③

$2x - 3y = -5$

$2x - 3(3) = -5$

$2x - 9 = -5$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

\therefore The POI is $(2, 3)$

2. let x be the # of \$5 bills
 " y " " " " \$10 "

$$x + y = 76 \quad (1)$$

$$5x + 10y = 600 \quad (2)$$

$$\begin{array}{r} (1) \times -5 \\ (2) + (3) \end{array} \quad \begin{array}{r} -5x - 5y = -380 \quad (3) \\ \hline 5y = 200 \end{array}$$

$$\frac{5y}{5} = \frac{200}{5}$$

$$y = 40$$

$$\text{Sub } y = 40 \text{ into } (1)$$

$$x + 40 = 76$$

$$x = 36$$

\therefore He has 36 \$5 bills
 and 40 \$10 bills.

$$3. \quad \boxed{\begin{array}{c} x \\ 78.9 \text{¢/L} \end{array}} + \boxed{\begin{array}{c} y \\ 71.9 \text{¢/L} \end{array}} = \boxed{\begin{array}{c} 1000 \text{ L} \\ 76,14 \text{¢/L} \end{array}}$$

let x be the amt of 78.9¢/L gasoline used
 " y " " " " 71.9¢/L " "

$$x + y = 1000 \quad (1)$$

$$78.9x + 71.9y = 76100 \quad (2)$$

$$(2) \times 10: 789x + 719y = 761000 \quad (3)$$

$$(1) \times -789 \quad \begin{array}{r} -789x - 789y = -789000 \quad (4) \end{array}$$

$$\begin{array}{r} -789y = -28000 \\ \hline -789y = -28000 \end{array}$$

$$y = 400$$

$$\text{Sub } y = 400 \text{ into } (1)$$

$$x + 400 = 1000$$

$$x = 600$$

\therefore 600 L of 78.9¢/L gasoline
 and 400 L of 71.9¢/L gasoline
 was used.

$$4. \begin{bmatrix} x \\ 0.05 \end{bmatrix} + \begin{bmatrix} y \\ 0.09 \end{bmatrix} = \begin{bmatrix} 3L \\ 0.08 \end{bmatrix}$$

Let x be the amt of 5% saline solution used
 " y " " " 9% " " "

$$\begin{aligned} x + y &= 3 & (1) \quad \text{Sub } y = 9/4 \text{ into } (1) \\ 0.05x + 0.09y &= 0.24 & (2) \quad x + 9/4 = 3 \\ & & x = 12/4 - 9/4 \\ & & x = 3/4 \end{aligned}$$

$$\begin{aligned} (2) \times 100 & 5x + 9y = 24 & (3) \\ (1) \times 5 & -5x - 5y = -15 & (4) \end{aligned}$$

$$(3) + (4) \quad 4y = 9 \\ y = 9/4$$

\therefore She needs $3/4L$ (0.75L)
 of the 5% $NaCl$ and
 $9/4$ (2.25L) of the 9% $NaCl$

5. Let x be the price of an apple per
 " y " " " " " a lemon meringue per

$$\begin{aligned} 6x + 4y &= 80 & (1) \quad \text{Sub } y = 14 \text{ into } (1) \\ 6x + 5y &= 94 & (2) \quad 6x + 4(14) = 80 \\ (1) - (2) & -y = -14 & 6x + 56 = 80 \\ & y = 14 & 6x = 24 \\ & & \frac{6x}{6} = \frac{24}{6} \\ & & x = 4 \end{aligned}$$

\therefore An apple per is \$14 & a lemon meringue per is \$14.

6. Let x be the # of students a van holds.
 " y " " " " " " " bus "

$$\begin{aligned} 16x + 5y &= 417 & (1) \quad \text{Sub } x = 12 \text{ into } (1) \\ 10x + 8y &= 480 & (2) \quad 16(12) + 5y = 417 \\ (1) \times 8 & 128x + 40y = 3336 & (3) \quad 192 + 5y = 417 \\ (2) \times -5 & -50x - 40y = -2400 & (4) \quad 5y = 225 \\ (3) + (4) & 78x = 936 & \frac{5y}{5} = \frac{225}{5} \\ & \frac{78x}{78} = \frac{936}{78} & y = 45 \\ & x = 12 \end{aligned}$$

\therefore A van holds
 12 students & a
 bus holds
 45

7

$$\begin{array}{|c|} \hline x \\ \hline 0.24 \\ \hline \end{array} + \begin{array}{|c|} \hline y \\ \hline 0.18 \\ \hline \end{array} = \begin{array}{|c|} \hline 42 \\ \hline 0.20 \\ \hline \end{array}$$

let x be the amt of 24% milk used
 " y " " " " " 18% " "

$$x + y = 42 \quad (1)$$

$$0.24x + 0.18y = 8.14 \quad (2)$$

$$24x + 18y = 814 \quad (3)$$

$$-24x - 24y = -1008 \quad (4)$$

$$\begin{array}{r} -6y = -168 \\ -6 \quad -6 \\ \hline y = 28 \end{array}$$

$$\text{Sub } y = 28 \text{ into } (1)$$

$$x + 28 = 42$$

$$x = 14$$

\therefore The farmer should use
 14 gallons of 24% and
 28 gallons of 18%.

8.

$$\begin{array}{|c|} \hline x \\ \hline 4.20 \\ \hline \end{array} + \begin{array}{|c|} \hline 12 \\ \hline 2.25 \\ \hline \end{array} = \begin{array}{|c|} \hline y \\ \hline 3.40 \\ \hline \end{array}$$

let x be the # of pounds of almonds used.
 " y " " " " " " " mixture made.

$$x + 12 = y \quad (1)$$

$$4.20x + 27 = 3.40y \quad (2)$$

$$420x + 2700 = 340y \quad (3)$$

$$-420x - 5040 = -420y \quad (4)$$

$$\begin{array}{r} -2340 = -80y \\ -80 \quad -80 \\ \hline y = 29.25 \end{array}$$

$$\text{Sub } y = 29.25 \text{ into } (1)$$

$$x + 12 = 29.25$$

$$x = 29.25 - 12$$

$$x = 17.25$$

\therefore 17.25 lbs of almonds will make
 29.25 lbs of the mixture.

9. $\begin{bmatrix} x \\ 8 \end{bmatrix} + \begin{bmatrix} y \\ 3 \end{bmatrix} = \begin{bmatrix} 5 \text{ kg} \\ 4.50 \end{bmatrix}$

Let x be the amt of cheez on the sampler
 y " " " " " " " " " " " " " " " "

$$x + y = 5 \quad (1)$$

$$8x + 3y = 22.50 \quad (2)$$

$$\textcircled{1} \times -8 \quad -8x - 8y = -40 \quad (3)$$

$$\textcircled{2} + \textcircled{3} \quad \begin{array}{r} -8x - 8y = -40 \\ 8x + 3y = 22.50 \\ \hline -5y = -17.5 \\ \hline y = 3.5 \end{array}$$

$$y = 3.5$$

$$\text{Sub } y = 3.5 \text{ into } (1)$$

$$x + 3.5 = 5$$

$$x = 5 - 3.5$$

$$x = 1.5$$

$\therefore 1.5 \text{ kg of cheez} + 3.5 \text{ kg}$
of kwis will be on
the sampler