

Quiz No # 1

Name

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Section

B

Department

Civil

Submitted to

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Solution: 1:2:1, 2:1:1, 2:0:2

40

P	E
A	E

B1

50

P	P
A	E

B2

P	P
A	A

B3

Let x, y, z be the cost/kg of Pak, Egyptian, American cotton respectively, then according to the given conditions:

$$\frac{1}{4}x + \frac{2y}{1} + \frac{1}{4}z = 40$$

$$2y + \frac{1}{4}y + \frac{1}{4}z = 50$$

$$\frac{2x}{4} + \frac{2}{4} = 2 = 60$$

} = A

$$1x + 2y + 1z = 160$$

$$2x + 1y + 1z = 200$$

$$1x + 1z = 120$$

} B

In matrix form, we can write as

2.

$$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 160 \\ 200 \\ 120 \end{bmatrix}$$

$$\text{Let } A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}, \quad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, \quad B = \begin{bmatrix} 160 \\ 200 \\ 120 \end{bmatrix}$$

$$\Rightarrow AX = B$$

$$\Rightarrow A_1 = \begin{bmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 120 & 0 & 1 \end{bmatrix}, \quad A_2 = \begin{bmatrix} 1 & 160 & 1 \\ 2 & 200 & 1 \\ 1 & 120 & 1 \end{bmatrix}$$

$$A_3 = \begin{bmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 0 & 120 \end{bmatrix}$$

$$\text{find } |A| \quad \left| \begin{array}{ccc|c} 1 & 2 & 1 & \\ 2 & 1 & 1 & \text{Expand by } R_1 \\ 1 & 0 & 1 & \end{array} \right|$$

$$= 1 \begin{vmatrix} 1 & 1 \\ 0 & 1 \end{vmatrix} - 2 \begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 2 & 1 \\ 1 & 0 \end{vmatrix}$$

$$= (1 \times 1 - 1 \times 0) - 2(2 \times 1 - 1 \times 1) + 1(2 \times 1 - 1 \times 0) = -2$$

Now

$$|A_1| = \begin{vmatrix} 160 & 2 & 1 \\ 200 & 1 & 1 \\ 120 & 0 & 1 \end{vmatrix} \quad \text{Expand by } R_1$$

(3)

$$= 160 \begin{vmatrix} 1 & 1 \\ 0 & 1 \end{vmatrix} - 2 \begin{vmatrix} 200 & 1 \\ 120 & 1 \end{vmatrix} + 1 \begin{vmatrix} 200 & 1 \\ 120 & 0 \end{vmatrix}$$

$$|A_1| = -120$$

$$|A_2| = \begin{vmatrix} 1 & 160 & 1 \\ 2 & 200 & 1 \\ 1 & 120 & 1 \end{vmatrix} \text{ Expand by } R_1$$

$$\Rightarrow 1 \begin{vmatrix} 200 & 1 \\ 120 & 1 \end{vmatrix} - 160 \begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 2 & 200 \\ 1 & 120 \end{vmatrix}$$

$$|A_2| = -40$$

$$|A_3| = \begin{vmatrix} 1 & 2 & 160 \\ 2 & 1 & 200 \\ 1 & 0 & 120 \end{vmatrix} \text{ Expand by } R_1$$

$$= 1 \begin{vmatrix} 1 & 200 \\ 0 & 120 \end{vmatrix} - 2 \begin{vmatrix} 2 & 200 \\ 1 & 120 \end{vmatrix} + 160 \begin{vmatrix} 2 & 1 \\ 1 & 0 \end{vmatrix}$$

$$= 1(120 - 0) - 2(240 - 200) + 160(0 - 1)$$

$$A_3 = 120$$

Now according to Cramer's rules

$$x = \frac{|A_1|}{|A|} = \frac{-120}{-2} = 60$$

$$y = \frac{|A_2|}{|A|} = \frac{-40}{-2} = 20$$

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$$z = \left| \frac{A_3}{A_1} \right| = \frac{-120}{-2} = 60$$

$$(x, y, z) = (60, 20, 60)$$

Pakistani : 60

Egyptain : 20

American : 60

