Topic (M5) Date

ULTIMATE MATHEMATICS

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MATRICES CLASS - 5 (M-5)

(WORD PROBLEMS)

Q=1 Let A → denotes the number of chemistry Books, physics book and economics book

$$A = \begin{matrix} \end{matrix} \begin{matrix} C & P & E \end{matrix} \begin{bmatrix} 120 & 96 & 120 \end{bmatrix}_{1\times 3}$$

Let B → denotes the selling price of 1 each chemistry book, physics book and eco book.

$$B = \begin{matrix} C \\ P \\ E \end{matrix} \begin{bmatrix} 80 \\ 60 \\ 40 \end{bmatrix}_{3\times 1}$$

Rough

$AB = (1\times 3)(3\times 1) = [\ -\ ]_{1\times 1}$ ✓

$BA = (3\times 1)(1\times 3) = \begin{bmatrix} - & - & - \\ - & - & - \\ - & - & - \end{bmatrix}_{3\times 3}$ ✗

$$AB = \begin{matrix} \end{matrix} \begin{matrix} C & P & E \end{matrix} \begin{bmatrix} - & - & - \end{bmatrix} \begin{matrix} C \\ P \\ E \end{matrix} \begin{bmatrix} - \\ - \\ - \end{bmatrix}$$

$$AB = \begin{bmatrix} 20160 \end{bmatrix}_{1\times 1}$$

∴ the book shop will receive Rs 20160 Ans.

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Qu. 2. A → denotes the amount ~~Rs~~ deposited in Bond I and Bond II

A → denotes the Investments in Bond I & Bond II

$$A = \begin{matrix} I & II \end{matrix} \begin{bmatrix} x & 30000-x \end{bmatrix}_{1\times 2}$$

B → denotes the Rate of interest from Bond I and Bond II

$$B = \begin{matrix} I \\ II \end{matrix} \begin{bmatrix} 5/100 \\ 7/100 \end{bmatrix}_{2\times 1}$$

Rough
AB → 1×2 2×1 = [—]₁×₁
BA = 2×1 1×2 = [— —]₂×₂

$$AB = \begin{matrix} I & II \end{matrix} \begin{bmatrix} x & 30000-x \end{bmatrix} \begin{matrix} I \\ II \end{matrix} \begin{bmatrix} 5/100 \\ 7/100 \end{bmatrix}$$

$$AB = \left[\frac{5x}{100} + \frac{210000-7x}{100} \right]$$

$$AB = \left[\frac{-2x + 210000}{100} \right]$$

$$[1800] = \left[\frac{-2x + 210000}{100} \right]$$

$$\Rightarrow 1800 = \frac{-2x + 210000}{100} \Rightarrow x = 15000$$

∴ Investment in Bond I = Rs 1500

Investment in Bond II = Rs 1500 Ans

Q1-3 Let X → denotes the number of notebooks, pens and pencils purchased by the Shopkeeper A, B, C

$$X = \begin{matrix} \\ A \\ B \\ C \end{matrix} \begin{matrix} \text{Notebook} & \text{Pen} & \text{Pencil} \\ \begin{bmatrix} 144 & 60 & 72 \\ - & - & - \\ - & - & - \end{bmatrix}_{3\times 3} \end{matrix}$$

Let Y → denotes the S.P of each N.B, Pen & Pencil

$$Y = \begin{matrix} \text{N.B} \\ \text{Pen} \\ \text{Pencil} \end{matrix} \begin{bmatrix} 40 \\ 125 \\ 35 \end{bmatrix}_{3\times 1}$$

$AB = 3\times 3 \;\; 3\times 1 = [\;]_{3\times 1}$

$BA = 3\times 1 \;\; 3\times 3 = (X)$

$$XY = \begin{matrix} \\ A \\ B \\ C \end{matrix} \begin{matrix} \text{N.B} & \text{Pen} & \text{Pencil} \\ \begin{bmatrix} & & \\ & & \\ & & \end{bmatrix}_{3\times 3} \end{matrix} \begin{matrix} \text{N.B} \\ \text{Pen} \\ \text{Pencil} \\ \begin{bmatrix} \\ \\ \end{bmatrix}_{3\times 1} \end{matrix}$$

$$XY = \begin{matrix} \\ A \\ B \\ C \end{matrix} \begin{bmatrix} = \\ = \\ = \end{bmatrix}_{3\times 1}$$

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✦ ULTIMATE MATHEMATICS →
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∴ A's bill = ₹ ____
B's Bill = ₹ ____ Ans
C's Bill = ₹ ____

Q1= (→ Let A → denotes the annual sale of each product x, y, z in Market I & Market II

$$A = \begin{matrix} \\ I \\ II \end{matrix} \begin{matrix} \begin{matrix} x & y & z \end{matrix} \\ \begin{bmatrix} 10000 & - & - \\ - & - & - \end{bmatrix}_{2\times 3} \end{matrix}$$

Let B → denotes the S.P of each product x, y, z

$$B = \begin{matrix} x \\ y \\ z \end{matrix} \begin{bmatrix} 2.50 \\ 1.50 \\ 1 \end{bmatrix}_{3\times 1}$$

Rough
AB 2×3 3×1 = 2×1
BA 3×1 3×3 (X)

Revenue Matrix = AB

$$AB = \begin{matrix} \\ I \\ II \end{matrix} \begin{matrix} \begin{matrix} x & y & z \end{matrix} \\ \begin{bmatrix} & & \\ & & \end{bmatrix} \end{matrix} \begin{matrix} \\ x \\ y \\ z \end{matrix} \begin{bmatrix} \\ \\ \end{bmatrix}$$

$$AB = \begin{matrix} \\ I \\ II \end{matrix} \begin{bmatrix} - \\ - \end{bmatrix}_{2\times 1}$$

∴ Revenue from Market I = ₹ ____
" " Mark II = ₹ ____

✓ Let C → Cost of C.P of each product x, y, z

$$C = \begin{matrix} x \\ y \\ z \end{matrix}\begin{bmatrix} 2 \\ 1 \\ 0.50 \end{bmatrix}_{3\times 1}$$

✓ Total cost Matrix = AC

$$AC = \begin{matrix} I \\ II \end{matrix}\begin{bmatrix} - \\ - \end{bmatrix}_{2\times 1}$$

✓ Profit Matrix = Revenue − Total cost

= AB − AC

$$= \begin{matrix} I \\ II \end{matrix}\begin{bmatrix} \cdot \end{bmatrix} - \begin{matrix} I \\ II \end{matrix}\begin{bmatrix} \quad \end{bmatrix}$$

$$= \begin{matrix} I \\ II \end{matrix}\begin{bmatrix} - \\ - \end{bmatrix}$$

From profit = [ ] + [ ] = Rs. ——

॥ श्री गणेशाय नमः ॥

WORD PROBLEMS

QNS:1 The bookshop of a particular school has 10 dozen chemistry books, 8 dozen physics books, 10 dozen economics books. Their selling prices are Rs 80, Rs 60 and Rs 40 each respectively. Find the total amount the bookshop will receive from selling all the books using matrix algebra

QNS:2 A trust fund has Rs 30,000 that must be invested in two different types of bonds. The first bond pays 5% interest per year and the second bond pays 7% interest per year. Using matrix multiplication, determine how to divide Rs 30,000 among the two types of bonds. If the trust fund must obtain an annual total interest of (i) Rs 1800 (ii) Rs 2000

QNS:3 Three shopkeepers A, B and C go to a store to buy stationary. A purchases 12 dozen notebooks, 5 dozen pens and 6 dozen pencils. B purchases 10 dozen notebooks, 6 dozen pens and 7 dozen pencils. C purchases 11 dozen notebooks, 13 dozen pens and 8 dozen pencils. A notebook cost 40 paise, a pen costs Rs 1.25 and a pencil costs 35 paise. Use matrix multiplication to calculate each individuals bill.

QNS:4 Two farmers Ramkishan and Gurucharan Singh cultivates only three varieties of rice namely Basmati, Permal and Nawab. The sale in (Rupees) of these varieties of rice by bot-

the farmers in the month of September and October are given by the following matrices

September Sale (Rs)

$$A = \begin{bmatrix} \text{Baimati} & \text{Pemal} & \text{Nawla} & \\ 10000 & 20000 & 30000 & \text{Ramkishan} \\ 50000 & 30000 & 10000 & \text{Gumucharan Singh} \end{bmatrix}$$

October Sales (Rs)

$$B = \begin{bmatrix} \text{Baimati} & \text{Pemal} & \text{Nawla} & \\ 5000 & 10,000 & 4,000 & \text{Ramkishan} \\ 20,000 & 10,000 & 10,000 & \text{Gumucharan Singh.} \end{bmatrix}$$

(1) Find the combined sales in September and October for each farmer in each variety.

(2) Find the decrease in sales from September to October

(3) If both farmers receive 2% profit in gross sales, Compute the profit for each farmer and for each variety sold in October.

Q No: 5 → In a legislative assembly election, a political group hired a public relations firm to promote its candidate in three ways: telephone, house calls, and letters. The cost per contact (in paise) is given in matrix A as

cost per contact (paise)

$$A = \begin{bmatrix} 40 & \text{Telephone} \\ 100 & \text{House call} \\ 50 & \text{letter} \end{bmatrix}$$

The number of contacts of each type made in two cities X and Y is given by

$$B = \begin{matrix} \text{Telephone} & \text{Haircall} & \text{Ultra} \\ \end{matrix}$$
$$\begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{bmatrix} \begin{matrix} \rightarrow X \\ \rightarrow Y \end{matrix}$$

Find the total amount spent by the group in the two cities X and Y.

QNS-6 → A manufacturer produces three products x, y and z which he sells in two markets. Annual sales are indicated below:

Market	PRODUCTS		
I	10000	2000	18000
II	6000	20000	8000

(a) If unit sale prices of x, y and z are Rs 2.50, Rs 1.50 and Rs 1.00 respectively. Find the total revenue in each market with the help of matrix algebra

(b) If the unit costs of the above three commodities are Rs 2.00, Rs 1.00 and 50 paise respectively. Find the gross profit.

QNS-7 → There are two families A and B. There are 4 men, 6 women and 2 children in family A and 2 men, 2 women and 4 children in family B. The recommended daily allowance for calories is; Man: 2400, woman: 1900, child: 1800 and for proteins is; Man: 55 gm, woman: 45 gm and child: 33 gm
Represent the above information by matrices.

Using matrix multiplication, calculate the total requirement of calories and proteins for each of the two families.

Ques 8 → Use matrix multiplication to divide Rs 30,000 in two parts such that the total annual interest at 9% on the first part and 11% on the second part amounts Rs. 3060

← ANSWERS →

(1). The total amount bookshop will receive is Rs 20160

(2). (i) Rs 15000, Rs 15000 (ii) Rs 5000, Rs 25000

(3). Rs 157.80 = A's bill
B's bill = Rs 167.40 and C's Bill = Rs 281.40

(4). (i) Combined Sale = A+B =

	Basmati	Permal	Naura	
	15000	30000	36000	Ram
	70000	40000	20000	Gurc

(ii) Change in Sale from Sep to October = A−B
(iii) In October, Ramkrishan receives Rs 100, Rs 200 and Rs 120 as profit and Gurucharan receives profit of Rs 400, Rs 200, Rs 200 in the sale of each variety of rice.

(5). The total amount spent by the group in the two cities is Rs 3400 and Rs 7200 respectively.

(6). (a) Total Revenue in Market I = Rs 46000 and total Revenue in Market II = Rs 53000
(b) Rs 15000, Rs 17000

(7). Family A requires 24600 calories and 556 gm proteins and family B requires 15,800 calories and 332gm proteins

(8) Rs 12,000 and Rs 18,000