CHAPTER 3 MATRICES

CASE STUDY BASED QUESTIONS

I. On her birthday, Seema decided to donate some money to children of an orphanage home. If there were 8 children less, everyone would have got Rs.10 more. However, if there were 16 children more, everyone would have got Rs.10 less. Let the number of children be x and the amount distributed by Seema for one child be y (in Rs.)

Based on the information in terms x and y are

1. The equation in terms x and y are

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- A) 5x-4y = 40, 5x-8y= -80 B) 5x-4y = 40, 5x-8y= 80
- C) 5x-4y = 40, 5x+8y= -80 D) 5x+4y = 40, 5x-8y= -80
- 2. Which of the following matrix equations represent the information given above?

	A) [555			B) $\begin{bmatrix} 5 & -4 \\ 5 & -8 \end{bmatrix}$		
	C) [5 5		D) [5 5	$\begin{bmatrix} 4 \\ -8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} =$	$\begin{bmatrix} 40\\-80 \end{bmatrix}$	
•	The nu	umber of children wh	o were gi	ven some	money by See	ma, is

- A) 30 B) 40 C) 23 D) 32
- 4. How much amount is given to each child by Seema?A) Rs.32B) Rs.30C) Rs.62D) Rs.26
- How much amount Seema spends in distributing the money to all the students of Orphanage?
 - A) Rs.609 B) Rs.960 C) Rs.906 D) Rs.690

II. The monthly incomes of two brothers Rakesh and Rajesh are in the ratio 3:4 and the monthly expenditures are in the ratio 5:7. Each brother saves Rs. 15000 per month.

Read the above instruction and answer the following questions.

- If monthly income of Rakesh and Rajesh are 3x and 4x and their expenditure are 5y and 7y respectively, then identify the system of linear equations for the above problem.
 A) x-y=15000, x+ y=15000
 B) 3x+ 5y=15000, 4x+ 7y=15000
 C) 3x-5y=15000, 4x-7y=15000
 D) 5x-3y=15000, x-4y=15000
- 2. Identify the matrix equation for question (6)
 - A) AX=B, where A = $\begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$, $B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$ B) BX=A, where A = $\begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$, $B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$ C) AB=I, where A = $\begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$, $B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$ D) AB=X, where A = $\begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$, $B = \begin{pmatrix} 15000 \\ 15000 \end{pmatrix}$
- 3. If AX = B, where A, X, B matrices then X should be
A) X = ABB) $X = A^{-1}B$ C) $X = AB^{-1}$ D) X = BA

4. If
$$A = \begin{pmatrix} 3 & -5 \\ 4 & -7 \end{pmatrix}$$
, then A^{-1}
A) $\begin{pmatrix} 7 & 5 \\ 4 & 3 \end{pmatrix}$
B) $\begin{pmatrix} -7 & 5 \\ 4 & 3 \end{pmatrix}$
C) $\begin{pmatrix} -7 & 5 \\ 4 & 3 - \end{pmatrix}$
D) $\begin{pmatrix} 7 & -5 \\ 4 & -3 \end{pmatrix}$

ZIET, BHUBANESWAR

5. Monthly incomes of Rajesh and Rajesh respectively are
 A) 90,000 each
 B) 90,000 and 1,20,000
 D) None

III. Read the passage given below and answer the following questions

Two business persons Rampal and Guru manufactures three types of products namely table, chair and benches. The sale (in rupees) of these products by both in the month of September and October are given by the following matrices A and B

September sales (in Rupees) table chair benches $A = \begin{bmatrix} 50001000015000\\ 100001300020000 \end{bmatrix} Rampal/Guru$

October sales (in Rupees) table chair benches $B = \begin{bmatrix} 150001800010000\\ 150002000025000 \end{bmatrix} Rampal / Guru$

- 1. The total sales in September and October for each farmer in each variety can be represented as
- a. A+B
- b. A-B
- c. AB
- d. none
- 2. What is the value of A_{23} and what does it represents
- a. 10000, sales of benches by Guru
- b. 20000, sales of benches by Guru
- c. 30000, sales of table by Rampal
- d. 20000, sales of chair by guru

3. The decrease in sales from September to October is given by ______.

- a. A+B
- b. A-B
- c. AB
- d. none

4. If Rampal receives 2% profit on gross sales, compute his profit for each type of product sold in October.

- a. Rs. 100, Rs. 200 and Rs. 120
- c. Rs. 300, Rs. 360 and Rs. 200
- d. Rs. 110, Rs. 200 and Rs. 120

IV. Three schools A, B and C organised a mela for collecting funds for helping the rehabilitation of earthquake victims. They sold hand made quilt, clothes and mats from recycled material at a cost of Rs. 25, Rs. 100 and Rs. 50 each. The number of articles sold by school A, B, C are given below.

School/Article	А	В	С
Quilts	20	30	25
Clothes	40	25	50
Mats	50	40	40

Based on the above information, answer the following questions.

1. If P be a 3x3 matrix represent the sale of handmade quilt, clothes and mats by three schools A, B and C, then

Ouilts Clothes Mats A [20 40 501 (A) P = B 25 25 40 C L 30 50 40J Quilts Clothes Mats A [20 40 501 P = B 30 (B) 25 40 C L 25 50 40J Quilts Clothes Mats 501 A [20 40 P = B 25 (C) 20 40 C L 30 50 40 Quilts Clothes Mats A [20 40 50 P = B | 25(D) 30 25 C L 30 50 40

2. If Q be 1x3 matrix represent the sale price(in Rs.) of given product per unit, then

(D) Rs. 8000

25] Quilts (A) Clothes 50 Q = [100] Mats 25] Quilts (B) Q = 100 Clothes [50] Mats Quilts Clothes Mats (C) $Q = [25 \ 100 \ 50]$ Quilts Clothes Mats (D) $Q = [25 \ 50 \ 100]$ 3. The fund collected by school A by selling the given articles is (A) Rs. 7000 (B) Rs. 6125 (C) Rs.8525 4. The fund collected by school B by selling the given articles is

(A) Rs. 5250 (B) Rs. 3750 (C) Rs. 7125 (D) Rs. 8125

5. The total funds collected for the required purpose is

(A) Rs. 20000 (B) Rs. 21000 (C) Rs. 30000 (D) Rs. 19875

V. A manufacturer produces three types of bolts X, Y and Z which he sells in two markets. Annual sales (in Rs) are indicated below :

Markets Products

	Х	Y	Z
1	10000	2000	18000
2	6000	20000	8000

If unit sales prices of X, Y and Z are Rs 2.50, Rs 1.50 and Rs 1.00 respectively, then answer the following questions using the concept of matrices.

1. Find the total revenue collected from the Market-I.

(A) Rs 44000

(B) Rs 48000

- (C) Rs 46000
- (D) Rs 53000
- 2. Find the total revenue collected from the Market-II.
- (A) Rs 51000
- (B) Rs 53000
- (C) Rs 46000
- (D) Rs 49000

3. If the unit costs of the above three commodities are Rs 2.00, Rs 1.00 and 50 paise respectively, then find the gross profit from both the markets.

- (A) Rs 53000
- (B) Rs 46000
- (C) Rs 64000
- (D) Rs 67000

VI. In a city there are two factories A and B. Each factory produces sports clothes for boys and girls. There are three types of clothes produced in both the factories, type I, II and III. For boys the number of units of types I, II and III respectively are 80, 70 and 65 in factory A and 85, 65 and 72 are in factory B. For girls the number of units of types I, II and III respectively are 80, 70 and 65 in factory are 80, 75, 90 in factory A and 50, 55, 80 are in factory B.



Based on the above information, answer the following questions.

1. If *P* represents the matrix of number of units of each type produced by factory *A* for both Boys and Girls the P is given by



2. If Q represents the matrix of number of units of each type produced by factory *B* forbothboysandgirls,thenQisgiven by

	B	oys	Girls				T	п	II			
(\cdot)	I	85	50		4)	Boys	50	55	8	n]		
(a)	Π	65	55		(D)	Cirle	85	65	7	2		
	III	72	80			UIIS	L02	05		']		
	-		-									
										Boys	Girl	5
	34346	- I	II	ш_					Ι	80	80	
(c)	Boys	s 80	75	90			(d)	Π	70	75	
	Girls	s 80	70	65					ш	65	90	

3.

(iii) The total production of sports clothes of each type for boys is given by the matrix

	I	II	III		I	п	III		Ι	II	III		I	II	ш
(a)	[165	130	137]	(b)	[130	165	137]	(c)	[165	135	137]	(d)	[137	135	165]

4.

$Z E(\mathbf{v}) $ Let R be a 3 × 2	matrix that rep	present the to	tal productio	on of spor	rts clothes	of each ty	pe for boys	and girls,	Page 5
(a) $\begin{bmatrix} 165 & 135 \\ 130 & 130 \end{bmatrix}$	$\begin{bmatrix} 137\\170 \end{bmatrix}$ (b)	[130 130 [165 135	170 138 (0	c) [165 135 137	132 130 170	(d)	130 168 130 135 170 137		

VII.Topromote the making of toilets for women, an organization tried to generate awareness through (i) house calls (ii) emails and (iii) announcements. The cost for each mode perattemptisgiven below:

(i) ₹50 (ii) ₹20 (iii)₹40

ThenumberofattemptsmadeinthevillagesX, YandZaregivenbelow:

(i)	(ii)	(iii)	(iv)
Х	400	300	100
Y	300	250	75
Z	500	400	150



Also, the chance of making of toilets corresponding to one attempt of given modes is (i) 2% (ii) 4% (iii) 20%

Basedontheaboveinformation, answerthefollowing questions.

1. The cost incurred by the organisation on village X is

(a) ₹10000 (b) ₹15000 (c) ₹30000 (d) ₹20000

2. The cost incurred by the organisation on village Y is

(a) ₹25000 (b) ₹18000 (c) ₹23000 (d) ₹28000

3. The cost incurred by the organisation on village Z is

(a) ₹19000 (b)₹39000 (c) ₹45000 (d) ₹50000

4. The total number of toilets that can be expected after the promotion in village X, is

(a) 20 (b) 30 (c) 40 (d) 50

5. The total number of toilets that can be expected after the promotion in village Z, is

(a) 26 (b) 36 (c) 46 (d) 56

VIII. A manufacture produces three stationery products Pencil, Eraser and Sharpener which he sells in two markets. Annual sales are indicated below

<u>Market</u>	Products (in numbers)							
	<u>Pencil</u>	<u>Eraser</u>	<u>Sharpener</u>					
Α	10,000	2000	18,000					
В	6000	20,000	8,000					

If the unit Sale price of Pencil, Eraser and Sharpener are Rs. 2.50, Rs. 1.50 and Rs. 1.00 respectively, and unit cost of the above three commodities are Rs. 2.00, Rs. 1.00 and Rs. 0.50 respectively, then,

Based on the above information answer the following:

1. Total revenue of market A

d. Rs. 40600 a. Rs. 64,000 b. Rs. 60,400 c. Rs. 46,000 2. Total revenue of market B a. Rs. 35,000 b. Rs. 53,000 c.Rs. 50,300 d.Rs. 30,500 3. Cost incurred in market A a.Rs. 13,000 b. Rs.30,100 c.Rs. 10,300 d. Rs. 31,000 4. Profit in market A and B respectively are a. (Rs. 15,000, Rs. 17,000) b.(Rs. 17,000, Rs. 15,000) c.(Rs. 51,000, Rs. 71,000) d. (Rs. 10,000, Rs. 20,000) 5. Gross profit in both market a. Rs.23,000 b. Rs. 20,300 c. Rs. 32,000 d. Rs. 30,200

IX. Three schools DPS, CVC and KVS decided to organize a fair for collecting money for helping the

flood victims. They sold handmade fans, mats and plates from recycled material at a cost of Rs.

25,	Rs.100 and Rs	s. 50 each	respectively.	The numbers	of articles sold	l are given as
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School /Article	DPS	CVC	KVS
Handmade fans	40	25	35
Mats	50	40	50
Plates	20	30	40

Based on the information given above, answer the following questions:

- 1. What is the total money (in Rupees) collected by the school DPS?
- a. 700
- b. 7,000
- c. 6;125

- d. 7875
- 2. What is the total amount of money (in Rs.) collected by schools CVC and KVS?
- a. 14,000
- b. 15,725
- c. 21,000
- d. 13,125
- 3. What is the total amount of money collected by all three schools DPS, CVC and KVS?
- a. Rs. 15,775
- b. Rs. 14,000
- c. Rs. 21,000
- d. Rs. 17,125
- 4. If the number of handmade fans and plates are interchanged for all the schools, then what

is the total money collected by all schools?

- a. Rs. 18,000
- b. Rs. 6,750
- c. Rs. 5,000
- d. Rs. 21,250
- 5. How many articles (in total) are sold by three schools?
- a. 230
- b. 130
- c. 430
- d. 330

X.Three NGO societies X, Y and Z decided to organize a fair for collecting money for helping the flood victims. They sold handmade fans, mats and plates from recycled material at a cost of ₹25,
 ₹.100 and ₹. 50 each respectively. The numbers of articles sold are given as

NGO →SOCIETY/ARTIC LE↓	x	Y	Z
Handmade fans	40	25	35
Mats	50	40	50
PLATES	20	30	40

Based on the information given above, answer the following questions :

1. What is the total money (in Rupees) collected by the sociteyZ? a) ₹ 700 b).₹ 7,000 c).₹ 6125 d). ₹ 7875

2. What is the total amount of money (in Rs.) collected by socities Y and Z?

- a) ₹ 14,000
- b) ₹ 15,725
- c) ₹ 21,000
- d) ₹ 13*,*125
- 3. What is the total amount of money collected by all three socities X,Y,Z?
- a) ₹. 15,775
- b).₹.14,000
- c)₹ 21,000
- d) ₹. 17,125

4. If the number of handmade fans and plates are interchanged for all the schools, then what is the total money collected by all socities ?

- (a) ₹. 18,000
- (b) ₹6,750
- (c) ₹5,000
- (d) ₹.21,250

5. How many articles (in total) are sold by three socities ?

- (i) 130
- (ii) 230
- (iii) 330
- (iv) 430

XI. Two farmers Ram and Shyam cultivate only three varieties of rice namely Basmati, Permal and Naura. The sale (in rupees) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B

September sales (in Rs)

 $\mathsf{A}{=}(\begin{matrix} 10,000 & 20,000 & 30,000 \\ 50,000 & 30,000 & 10,000 \end{matrix})$

October sales (in Rs)

 $\mathsf{B} = (\begin{matrix} 5,000 & 10,000 & 6,000 \\ 20,000 & 10,000 & 10,000 \end{matrix})$

Where first row and second row denote the sale of Ram and Shyam respectively.

Answer the following questions using above information

- 1. The total sale in September and October for each farmer in each variety can be represented as:
 - (a) A+B
 - (b) A-B
 - (c) AB
 - (d) None of these.
- 2. What is the value of A_{23} ?
 - (a) 10,000
 - (b) 20,000
 - (c) 30,000
 - (d) 40,000
- 3. The decrease in sale from September to October is given by
 - (a) A+B
 - (b) A-B
 - (c) $A^T B^T$
 - (d) None of these
- 4. If Ram receive 2% profit on gross sales, compute his profit for each variety sold in October
 - (a) Rs 100, Rs 200, Rs 120
 - (b) Rs 100, Rs 200, Rs 130
 - (c) Rs 100, Rs 220, Rs 120
 - (d) Rs 110, Rs 200, Rs 120
- 5. If Shyam receives 2% profit on gross sales, compute his profit for each variety sold in September
 - (a) Rs 100, Rs 200, Rs 120
 - (b) Rs 100, Rs 600, Rs 200
 - (c) Rs 400, Rs 200, Rs 120
 - (d) Rs 1200, Rs 200, Rs 120.

ANSWERS

I	1	А	2	С	3	D	4	В	5	В
П	1	А	2	А	3	В	4	D	5	D
111	1	А	2	В	3	В	4	С		
IV	1	В	2	В	3	А	4	А	5	D
V	1	С	2	D	3	В				
VI	1	D	2	А	3	С	4	А	5	А
VII	1	С	2	С	3	В	4	С	5	D
VIII	1	С	2	В	3	D	4	А	5	С
IX	1	В	2	А	3	С	4	D	5	D
X	1	В	2	А	3	С	4	D	5	С
XI	1	Α	2	Α	3	В	4	А	5	В

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