IV. MATRICES

EXAMPLE PROBLEMS

1. The table shows a five-day forecast indicating high (H) and low (L) temperatures in Fahrenheit. Organise the temperatures in a matrix where the first and second rows represent the High and Low temperatures respectively and identify which day will be the warmest?

Mon	Tue	Wed	Thu	Fri
H 88	H 90	H 86	H 84	H 85
L 54	L 56	L 53	L 52	L 52

2. The amount of fat, carbohydrate and protein in grams present in each food item respectively are as follows:

	Item 1	Item 2	Item 3	Item 4
Fat	5	0	1	10
Carbohydrate	0	15	6	9
Protein	7	1	2	8

Use the information to write 3 × 4 and 4 ×3 matrices.

3. *Let* A = [aij] = $\begin{pmatrix} 1 & 4 & 8 \\ 6 & 2 & 5 \\ 3 & 7 & 0 \\ 9 & -2 & -1 \end{pmatrix}$ find i) the order of the matrix ii) the elements a_{13} and a_{42}

iii) the position of the element 2

4. Construct a 2 ×3 matrix A = [aij] whose elements are given by $aij = |2i - 3j|$

5. if A = $\begin{pmatrix} 8 & 5 & 2 \\ 1 & -3 & 4 \end{pmatrix}$ then find A^T and $(A^T)^T$

6. Find the values of x, y and z if $\begin{pmatrix} x & 5 & 4 \\ 5 & 9 & 1 \end{pmatrix} = \begin{pmatrix} 3 & 5 & z \\ 5 & y & 1 \end{pmatrix}$

7. Solve $\begin{pmatrix} y \\ 3x \end{pmatrix} = \begin{pmatrix} 6 - 2x \\ 31 + 4y \end{pmatrix}$

8. If A= $\begin{pmatrix} -1 & 2 & 4 \\ 3 & 6 & -5 \end{pmatrix}$ find 3A

9. Let A= $\begin{pmatrix} 8 & 3 & 2 \\ 5 & 9 & 1 \end{pmatrix}$ and B = $\begin{pmatrix} 1 & -1 \\ 3 & 0 \end{pmatrix}$ find A+ B if it exists.

10. If A= $\begin{pmatrix} 5 & 6 & -2 & 3 \\ 1 & 0 & 4 & 2 \end{pmatrix}$ and B = $\begin{pmatrix} 3 & -1 & 4 & 7 \\ 2 & 8 & 2 & 3 \end{pmatrix}$ then find A+B

11. Matrix *A* shows the weight of four boys and four girls in kg at the beginning of diet programme to lose weight. Matrix *B* shows the corresponding weights after the diet programme.

$$A = \begin{pmatrix} 35 & 40 & 28 & 45 \\ 42 & 38 & 41 & 30 \end{pmatrix} \begin{matrix} \text{Boys} \\ \text{Girls} \end{matrix} \quad , \quad B = \begin{pmatrix} 32 & 35 & 27 & 41 \\ 40 & 30 & 34 & 27 \end{pmatrix} \begin{matrix} \text{Boys} \\ \text{Girls} \end{matrix}$$

Find the weight loss of the Boys and Girls.

12. Determine whether each matrix product is defined or not. If the product is defined, state the dimension of the product matrix.

    i) $A_{2\times 3}$ and $B_{5\times 4}$ ii) $A_{1\times 3}$ and $B_{4\times 3}$

13. solve $\begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 13 \end{pmatrix}$

14. if A= $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $I_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ then show that $A^2-(a+d)A = (bc-ad)I_2$

15. If A = $\begin{pmatrix} 8 & -7 \\ -2 & 4 \\ 0 & 3 \end{pmatrix}$ and B = $\begin{pmatrix} 9 & -3 & 2 \\ 6 & -1 & -5 \end{pmatrix}$ then find AB and BA if they exist

16. A= $\begin{bmatrix} 3 & 2 \\ -1 & 4 \end{bmatrix}$, B= $\begin{bmatrix} -2 & 5 \\ 6 & 7 \end{bmatrix}$ and C= $\begin{bmatrix} 1 & 1 \\ -5 & 3 \end{bmatrix}$ verify that A(B+C) = AB+AC

17. If A = $\begin{bmatrix} 1 & 3 \\ 9 & -6 \end{bmatrix}$ then verify AI=IA=A where I is the unit matrix of order 2

18. Prove that $\begin{vmatrix} 3 & 5 \\ 1 & 2 \end{vmatrix}$ and $\begin{vmatrix} 2 & -5 \\ -1 & 3 \end{vmatrix}$ are multiplicative inverses to each other

19. If A = $\begin{pmatrix} -2 \\ 4 \\ 5 \end{pmatrix}$ and B= $\begin{pmatrix} 1 & 3 & -6 \end{pmatrix}$ then verify that $(AB)^T = B^T A^T$