GURU HARRAI ACADEMY PRACTICE SHEET 1 (MATHEMATICS)
[MATRICS] (Class XII)

1) $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ → Horizontal lines, called Rows.

vertical lines called column

In Matrix A → number of Rows ie $i = 2$
number of columns ie $j = 2$

So, order or type of Matrix $A = i \times j = 2 \times 2$

2) Comparable Matrix: two Matrix can be compare if they have Equal No of rows and Equal no of columns, elements are different

$A = \begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix}$, $B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

order → 2x2 order (2x2)

A, B have same order so they are Comparable Matrix.

3) Equal Matrix: If two Matrix have same order and same elements.

4) Square Matrix: If $i = j$ of any Matrix ie number of Row and Number of column are same.

5) Null Matrix: If all elements of square Matrix are zero then called Null Matrix.

Example: $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}_{2\times 2} = O$ Null Matrix

6) Identity Matrix or Unit Matrix: (I_n)

A Square Matrix in which each diagonal Elements is Unity or 1 and rest all are zero.

$I_n = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}_{3 \times 3}$

7) Possible order of Matrix → (m×n) where m×n is the product of no of elements of matrix

Example : A is a matrix which has 12 elements

So possible orders are : 1×12, 12×1, 4×3, 3×4, 6×2, 2×6

So possible ordered pairs: (1,12), (12,1), (4,3) (3,4), (6×2) (2×6)

8) Number of all possible matrices of order 3×3 which each entry is 0 or 1

Solution : Since the matrix of order 3×3 has 9 elements ie 9 entries and each entry can be filled in 2 ways (either 0 or 1), so for each element there are two possibilities ie 0 or 1 same for 9 elements. So total possible ways will be $2\times2\times2\times2\times2\times2\times2\times2\times2 = 2^9 = 512$

9)

If two Matrix have same order then their corresponding elements can be added or subtracted.

10) Multiplication of A Matrix by scalar (number)

$$A = \begin{bmatrix} 2 & 3 & 6 \\ 4 & 5 & 7 \end{bmatrix}, \quad 3A = \begin{bmatrix} 6 & 9 & 18 \\ 12 & 15 & 21 \end{bmatrix}$$

ie each and every element of Matrix will multiply by scalar.

Solve the following questions

1. 1) If a matrix has 18 elements, what the possible order it can have

2) For a 2×2 matrix, $A = [a_{ij}]$, whose elements are given by $a_{ij} = \frac{i}{j}$, write the element of a_{12}

3) If A is a 3×3 matrix whose elements are given by $a_{ij} = \frac{1}{3}|-3i+j|$ then construct Matrix A

4) if $\begin{bmatrix} x+y & x+2 \\ 2x-y & 16 \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ 1 & 3y+1 \end{bmatrix}$, then find value of $y-x$

5) $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$, find $x-y+z$

Q6) $\begin{bmatrix} x & 3x-y \\ 2x+z & 3y-w \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$, find x, y, z, w

Q7) For what value of α the Matrix $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos \end{bmatrix}$ is an Identitity matrix

Q8) Write the number of all possible matrices of order 2×2 with each entry 1, 2, or 3

Q9) if $\begin{bmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{bmatrix} = A + \begin{bmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{bmatrix}$, then find Matrix A

Q10) If $A = \begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$, then find C such that

$5A + 3B + 2C$ is null Matrix

Q11) Find X such that $3A - 2B + X = 0$, $A = \begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$

Q12) Find X and Y such that

$X + Y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$, $X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

Multiplication of Matrix

Properties of Matrix Multiplication

1) Matrix multiplication is not commutative
   ie $AB \neq B \cdot A$
2) Multiplication is distributive over addition. ie
   $A(B+C) = AB + AC$
3) Multiplication is associative ie
   $(AB)C = A(BC)$
4) Existence of multiplicative identity
   if A is a matrix of order $m \times n$ then
   $I_m \times A = A = A \cdot I_n$ where I_m = Unit Matrix of order $m \times m$
   I_n = unit Matrix of order $n \times n$
5) $A^m = A^{m-1}A = A \cdot A^{m-1}$ $\forall\, m \in I$
6) If $f(x) = 2x^2 - 3x + 7$, A is square Matrix of order 3, then $f(A) = 2A^2 - 3A + 7I_3$
7) For Matrix A and B, If $AB = 0 \Rightarrow BA \neq 0$