Grade: XII **MATRICES**

1. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations

   $x+3z=9, -x+2y-2z=4, 2x-3y+4z=-3.$

2. If $A=\begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, find $A^2-5A+4I$ and hence find a matrix X such that

   $A^2-5A+4I+X=O.$

3. Three schools A, B and C organized a mela for collecting funds for helping the rehabilitation of flood victims. They sold handmade fans, mats and plates from recycled material at a cost of Rs.25, Rs.100 and Rs.50 each. The number of articles sold are given below

School	A	B	C
Hand fans	40	25	35
Mats	50	40	50
Plates	20	30	40

   Find the funds collected by each school separately by selling the above articles. Also find the total funds collected.

4 If $A=\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and I is the identity matrix of order 2, then show that

   $A^2=4A-3I$.

5. If $A=\begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}, B=\begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A+B)^2=A^2+B^2$, then find the value a and b.

6. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix}+\begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix}=\begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$, then find (x – y)

7. Solve: $\begin{pmatrix} x & 1 \end{pmatrix}\begin{pmatrix} 1 & 0 \\ -2 & 0 \end{pmatrix} = O$.

8. If $\begin{pmatrix} x-y & z \\ 2x-y & w \end{pmatrix} = \begin{pmatrix} -1 & 4 \\ 0 & 5 \end{pmatrix}$, find the values of x+y.

9. If $\begin{pmatrix} a+4 & 3b \\ 8 & -6 \end{pmatrix} = \begin{pmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{pmatrix}$, write the value of a – 2b

10. If $A + \begin{pmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{pmatrix} = \begin{pmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{pmatrix}$, then find the matrix A.

11. Find the value of a if $\begin{pmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{pmatrix} = \begin{pmatrix} -1 & 5 \\ 0 & 13 \end{pmatrix}$

12. For what value of x, is the matrix $A = \begin{pmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{pmatrix}$ a skew symmetric matrix?

13. If matrix $A = \begin{pmatrix} 2 & -2 \\ -2 & 2 \end{pmatrix}$ and $A^2 = pA$, then find the value of p.

14. Simplify: $\cos\theta \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix} + \sin\theta \begin{pmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{pmatrix}$

15. If $A^T = \begin{pmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$ then find $A' - B'$.

16. If $x\begin{pmatrix} 2 \\ 3 \end{pmatrix} + y\begin{pmatrix} -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 10 \\ 5 \end{pmatrix}$, write the values of x and y.

17. Using elementary transformations, find the inverse of the matrix

$$\begin{pmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$$

18. Using elementary transformations, find the inverse of the matrix

$$\begin{pmatrix} 1 & 3 & -2 \\ -3 & 0 & -1 \\ 2 & 1 & 0 \end{pmatrix}$$

19. Using elementary transformations, find the inverse of the matrix

$$\begin{pmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{pmatrix}.$$

20. If $A=\begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}$ then for what value of α is A an identity matrix?

21. Express the following matrix as the sum of a symmetric and skew symmetric matrix, and verity your result. $\begin{pmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{pmatrix}$.

22. Find the inverse of $\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$.

23. Verify: $(AB)' = B'A'$ for $A=\begin{pmatrix} 1 \\ -4 \\ 3 \end{pmatrix}, B=\begin{pmatrix} -1 & 2 & 1 \end{pmatrix}$.

24. Find the adjoint of the matrix $A=\begin{pmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{pmatrix}$ and hence show that $A(adjA)=|A|I_3$.

25. Two schools P and Q want to award their selected students on the values of Discipline, Politeness and Punctuality. The school P wants to award Rs.x each, Rs.y each and Rs. z each for the three respective values to its 3, 2 and 1 students with a total award money of Rs.1000. school Q wants to spend Rs.1500 to award its 4, 1 and 3 students on the respective values. If the total amount of awards for one prize on each value is Rs.600, using matrices, find the award money for each value. Apart from the above three values, suggest one more value for awards.

26. If $A^{-1}=\begin{pmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{pmatrix}$ and $B=\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$, find $(AB)^{-1}$.

27. Using matrices, solve the following equations:

$x - y + 2z = 7;\ 3x + 4y - 5z = -5,\ 2x - y + 3z = 12.$

28. Using matrices, solve the following equations:

$2x + 3y + 3z = 5;\ 3x - y - 2z = 3,\ x - 2y + z = -4.$

29. For what value of x , the matrix $\begin{pmatrix} 5-x & x+1 \\ 2 & 4 \end{pmatrix}$ is singular?

30. Using matrix method, solve the following system of equations:

$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1,\ \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2.$

31. Use product $\begin{pmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{pmatrix}\begin{pmatrix} -2 & 0 & 1 \\ 9 & 2 & 3 \\ 6 & 1 & -2 \end{pmatrix}$ to solve the system of equations.

$x - y + 2z = 1;\ 2y - 3z = 1;\ 3x - 2y + 4z = 2.$

32. If $A = \begin{pmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{pmatrix}$, *find* A^{-1}, using A^{-1} solve the following system of equations: $2x - 3y + 5z = 16,\ 3x + 2y - 4z = -4,\ x + y - 2z = -3.$

33. If $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$, *find* A^{-1} and hence solve the system of linear equations

$x + 2y + z = 4, -x + y + z = 0, x - 3y + z = 2.$