MATHEMATICS CLASS XII
CHAPTER – 4 DETERMINANTS

Q.1 Evaluate the following determinants :

(i) $\begin{vmatrix} -3 & 1 \\ 5 & 6 \end{vmatrix}$ **(ii)** $\begin{vmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{vmatrix}$ **(iii)** $\begin{vmatrix} cos\,15° & sin\,15° \\ sin\,75° & cos\,75° \end{vmatrix}$

Q.2. If $\begin{vmatrix} x-2 & -3 \\ 3x & 2x \end{vmatrix}$ **= 3, find the integrals value(s) of x.**

Q.3. What positive value of x makes the following pair of determinants equal?

$\begin{vmatrix} 2x & 3 \\ 5 & x \end{vmatrix}, \begin{vmatrix} 16 & 3 \\ 5 & 2 \end{vmatrix}.$

Q.4. Let $\begin{vmatrix} 3 & y \\ x & 1 \end{vmatrix}$ **=** $\begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$**. Find the possible values of x and y if x, y are natural numbers.**

Q.5. What is the value of the determinant $\begin{vmatrix} 0 & 2 & 0 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{vmatrix}$ **?**

Q.6. Evaluate $\begin{vmatrix} 3 & 7 & 13 \\ -5 & 0 & 0 \\ 0 & 11 & -2 \end{vmatrix}$**.**

Q.7. Evaluate the following determinants :

(i) $\begin{vmatrix} 2 & 3 & -5 \\ 7 & 1 & -2 \\ -3 & 4 & 1 \end{vmatrix}$ **(ii)** $\begin{vmatrix} 0 & sin\alpha & -cos\alpha \\ -sin\alpha & 0 & sin\beta \\ cos\alpha & -sin\beta & 0 \end{vmatrix}$

Q.8. There are two values of x which make determinant Δ = $\begin{vmatrix} 1 & -2 & 5 \\ 2 & x & -1 \\ 0 & 4 & 2x \end{vmatrix}$ **= 86, find the sum of these numbers.**

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Q.9. Show that the value of the determinant $\begin{vmatrix} a & \sin x & \cos x \\ -\sin x & -a & 1 \\ \cos x & 1 & a \end{vmatrix}$ is independent of x.

Q.10. Find the minors and cofactors of each element of the second column of the determinant Δ and hence find the value of the determinant Δ where

$$\Delta = \begin{vmatrix} 3 & -2 & 1 \\ 4 & 6 & 5 \\ 2 & -1 & 7 \end{vmatrix}.$$

Q.11. Find the cofactors of elements of the third row of the determinant

$\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ and verify that $a_{11} A_{31} + a_{12} A_{32} + a_{13}A_{33} = 0$.

Q.12. Evaluate the following determinants :

(i) $\begin{vmatrix} x^2 - x + 1 & x - 1 \\ x + 1 & x + 1 \end{vmatrix}$ (ii) $\begin{vmatrix} \cos 90^\circ & -\cos 45^\circ \\ \sin 90^\circ & \sin 45^\circ \end{vmatrix}$ (iii) $\begin{vmatrix} 2\cos\theta & -2\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$

Q.13. (i) Find the value of $\begin{vmatrix} \sin A & -\sin B \\ \cos A & \cos B \end{vmatrix}$, where A = 63° and B = 27°.

(ii) Find the value of $\begin{vmatrix} \cos A & \sin A \\ -\sin B & \cos B \end{vmatrix}$, where A = 75° and B = 45°.

4. (i) Write the cofactor of a_{12} in the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$.

(ii) If A_{ij} is the cofactor of the element a_{ij} of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$, then write the value of $a_{32} A_{32}$.

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Q.14. If A = [a_{ij}] is a 3 × 3 matrix and A_{ij}' s denote the cofactors of the corresponding elements a_{ij} ' s, then write the expression for the value of $|A|$ by expanding $|A|$ by

(i) 2nd row (ii) third column.

Q.15. Find the value of x if

(i) $\begin{vmatrix} 2x+5 & 3 \\ 5x+2 & 9 \end{vmatrix}$ **(ii)** $\begin{vmatrix} x & 4 \\ 2 & 2x \end{vmatrix}$ **(iii)** $\begin{vmatrix} x+2 & 3 \\ x+5 & 4 \end{vmatrix}$ **= 3.**

Q.16. Find the value of x if.

(i) $\begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix} = \begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix}$ **(ii)** $\begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix} = \begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix}$

Q.17. (i) If $\begin{vmatrix} x+1 & x-1 \\ x-3 & x+2 \end{vmatrix} = \begin{vmatrix} 4 & -1 \\ 1 & 3 \end{vmatrix}$**, then write the value x.**

Q.18. If $\begin{vmatrix} \sqrt{6} & x \\ \sqrt{20} & \sqrt{24} \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 5 & 2 \end{vmatrix}$ **, then write the value of x.**

Q.19. (i) If x ∈ N and $\begin{vmatrix} x & 3 \\ 4 & x \end{vmatrix} = \begin{vmatrix} 4 & -3 \\ 0 & 1 \end{vmatrix}$**, find the value(s) of x.**

(ii) If $\begin{vmatrix} x & x \\ 1 & x \end{vmatrix} = \begin{vmatrix} 3 & 4 \\ 1 & 2 \end{vmatrix}$ **, write the positive value of x.**

Q.20. If x ∈ I and $\begin{vmatrix} 2x & 3 \\ -1 & x \end{vmatrix} = \begin{vmatrix} 3 & 1 \\ x & 3 \end{vmatrix}$ **, find the value(s) of x.**

Q.21. If x ∈ R, 0 ≤ x ≤ $\frac{\pi}{2}$, and $\begin{vmatrix} 2\sin x & -1 \\ 1 & \sin x \end{vmatrix} = \begin{vmatrix} 3 & 0 \\ -4 & \sin x \end{vmatrix}$ **, then find the values of x.**

Q.22. If A = $\begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$**, then show that $|2A| = 4|A|$.**

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Q.23. If A = $\begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ and B = $\begin{bmatrix} 0 & 4 \\ -1 & 7 \end{bmatrix}$, find the determinant of the matrix $3A^2 - 2B$.

Q.24. Find the integral value(s) of x if $\begin{vmatrix} x^2 & x & 1 \\ 0 & 2 & 1 \\ 3 & 1 & 4 \end{vmatrix} = 28$.

Q.25. Prove that $\begin{vmatrix} 1 & a & b \\ -a & 1 & c \\ -b & -c & 1 \end{vmatrix} = 1 + a^2 + b^2 + c^2$.

Q.26. Show that the value of the determinant $\begin{vmatrix} 0 & \tan x & 1 \\ 1 & -\sec x & 0 \\ \sec x & 0 & \tan x \end{vmatrix}$ is independent of x.

Q.27. Using cofactors of element of second row, evaluate $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$.

Q.28. Without expanding evaluate the following determinants :

(i) $\begin{vmatrix} 49 & 1 & 6 \\ 39 & 7 & 4 \\ 26 & 2 & 3 \end{vmatrix}$ (ii) $\begin{vmatrix} 1 & a & a+b \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$ (iii) $\begin{vmatrix} 2 & 3 & 4 \\ 5 & 6 & 8 \\ 6x & 9x & 12x \end{vmatrix}$

Q.29. (i) Find the value of the determinant : $\begin{vmatrix} 0 & b-a & c-a \\ a-b & 0 & c-b \\ a-c & b-c & 0 \end{vmatrix} = 0$.

Q.30. Show that the determinant $\begin{vmatrix} \cos(x+y) & -\sin(x+y) & \cos 2y \\ \sin x & \cos x & \sin y \\ -\cos x & \sin x & \cos y \end{vmatrix}$ is independent of x only.

Q.31. If a, b,c are in A.P., prove that $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$.

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Q.32. If A and B are square matrices of order 3 such that $|A|$ = -1 and $|B|$ = 3, then find the value of $|3AB|$.

(i) If A is a square matrix and $|A|$ = 2, then write the value of $|AA'|$ when A' is the transpose of matrix A.

Q.33. Prove that

(i) $\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$

(ii) $\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix} = a^3$

(iii) $\begin{vmatrix} x+y & y+z & z+x \\ y+z & z+x & x+y \\ z+x & x+y & y+z \end{vmatrix} = 2\begin{vmatrix} x & y & z \\ y & z & x \\ z & x & y \end{vmatrix}$.

Q.34. Prove that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$.

Q.35. Using properties of determinants, prove that :

$\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2(a+b+c)(ab+bc+ca-a^2-b^2-c^2)$.

Q.36. Show that $\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = a^3+b^3+c^3-3abc$.

Q.37. Using properties of determinants, solve the following equations for x :

(i) $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$ **(ii)** $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0$.

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Q.38. Using properties of determinants, prove the following :

$$\begin{vmatrix} 1 & 1+p & 1+p+q \\ 2 & 3+2p & 1+3p+2q \\ 3 & 6+3p & 1+6p+3q \end{vmatrix} = 1.$$

Q.39. Using properties of determinants, prove that :

$$\begin{vmatrix} 1 & 1 & 1 \\ \alpha & \beta & \gamma \\ \beta\gamma & \gamma\alpha & \alpha\beta \end{vmatrix} = (\alpha-\beta)(\beta-\gamma)(\gamma-\alpha).$$

Q.40. Prove that $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (x-y)(y-z)(z-x).$

Q.41. Prove that $\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c).$

Q.42. Show that $\begin{vmatrix} b^2+c^2 & ab & ac \\ ba & c^2+a^2 & bc \\ ca & cb & a^2+b^2 \end{vmatrix} = 4a^2b^2c^2.$

Q.43. Show that $\begin{vmatrix} a & b-c & c+b \\ a+b & b & c-a \\ a-b & b+a & c \end{vmatrix} = (a+b+c)(a^2+b^2+c^2).$

Q.44. By using properties of determinants, prove that :

$$\begin{vmatrix} 1+sin^2x & cos^2x & 4\,sin\,2x \\ sin^2x & 1+\,cos^2x & 4\,sin\,2x \\ sin^2x & cos^2x & 1+4\,sin\,2x \end{vmatrix} = 2 + 4\sin 2x.$$

Q.45. In a triangle ABC, if $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1+sinA & 1+sinB & 1+sinC \\ sinA+sin^2A & sinB+sin^2B & sinC+sin^2C \end{vmatrix}$

= 0, then prove that Δ ABC is an isosceles triangle.

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Q.46. If p, q, r are not in G.P and

$$\begin{vmatrix} 1 & \frac{p}{q} & \alpha+\frac{q}{p} \\ 1 & \frac{r}{q} & \alpha+\frac{r}{q} \\ p\alpha+q & q\alpha+r & 0 \end{vmatrix} = 0$$, **show that** $p\alpha^2+2q\alpha+r=0$.

Q.47. Without exapanding, find the value of : $\begin{vmatrix} a+b & 2a+b & 3a+b \\ 2a+b & 3a+b & 4a+b \\ 4a+b & 5a+b & 6a+b \end{vmatrix}$.

Q.48. If A = $\begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$ **and B =** $\begin{bmatrix} -1 & 1 \\ 3 & 6 \end{bmatrix}$, **then find the value of** $|AB|$ **.**

Q.49. Using properties of determinants, solve the following equation for x :

$$\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix} = 0.$$

Q.50. Show that one root of the equation $\begin{vmatrix} x+a & b & c \\ b & x+c & a \\ c & a & x+b \end{vmatrix} = 0$ **is – (a + b + c).**

Q.51. Using determinants, find the area of the triangle with vertices (-3,5),(3,-6) and (7,2).

Q.52. Prove that the points P(a , b + c), Q(b ,c + a) and R (c, a + b) are collinear.

Q.53. If the points with vertices (p_1, q_1), (p_2, q_2) **and** (p_1+p_2, q_1+q_2) **are collinear, show that** $p_1q_2 = p_2q_1$.

Q.54. Using determinants, find the area of the triangle whose vertices are :

(i) (3,8), (-4,2), (5,1) (ii) (2,7), (1,1), (10,8).

Q.55. Show that the points (1,0), (6,0), (0,0) are collinear.

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Q.56. Using determinants, determine whether the points P(a, b + c), Q(b, c + a) and R(c, a + b) form a triangle or not.

Q.57. Using determinants, find the value of λ so that the points (λ , 7), (1, -5) and (-4,5) are collinear.

Q.58. Using determinants, find the equation of the line passing through the points (-1,3) and (0,2).

Q.59. Using determinants, show that following points are collinear :

(i) (1 , -1), (2 ,1),(4,5)   (ii) (11,7), (5,5) and (-1,3).

Q.60. If the points (a , b), (a' , b') and (a – a' , b – b') are collinear, prove that ab'= a'b.

Q.61. If the points (a, 0), (0,b) and (1,1) are collinear, prove that a + b = ab.

Q.62. If the matrix A = $\begin{bmatrix} 1 & -2 & 3 \\ 1 & 2 & 1 \\ x & 2 & -3 \end{bmatrix}$ **is singular, find x.**

Q.63. Find the adjoint of the matrix A = $\begin{vmatrix} 1 & -1 & 2 \\ 3 & 1 & -2 \\ 1 & 0 & 3 \end{vmatrix}$ **and verify that A (adj A) =** $|A|\, I_3$.

Q.64. If A = $\begin{bmatrix} 2 & -3 \\ 5 & 1 \end{bmatrix}$ **and B =** $\begin{bmatrix} -1 & 3 \\ 4 & 0 \end{bmatrix}$**, verify that adj (AB) = (adj B) (adj A).**

Q.65. Find the inverse of the matrix $\begin{bmatrix} cos\theta & sin\theta \\ -sin\theta & cos\theta \end{bmatrix}$.

Q.66. If A = $\begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$**, write A^{-1} in terms of A.**

Q.67. For the matrix A = $\begin{bmatrix} 2 & 4 \\ 1 & -3 \end{bmatrix}$**, verify that $(A^{-1}) = (A')^{-1}$.**

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Q.68. If A is a 3 × 3 invertible matrix, then show that for any scalar k (non – zero), kA is invertible and $(kA)^{-1} = \frac{1}{k}A^{-1}$.

Q.69. Find the inverse of the matrix A = $\begin{vmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{vmatrix}$ and verify that $A^{-1}A = I_3$.

Q.70. If A = $\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$, show that $A^2 - 6A + 17I = 0$. Hence, find A^{-1}.

Q.71. If A = $\begin{bmatrix} -1 & 2 & 0 \\ -1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$, show that $A^{-1} = A^2$.

Q.72. Which of the following matrices are non-singular ?

(i) $\begin{bmatrix} 6 & -3 & 2 \\ 2 & -1 & 2 \\ -10 & 5 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & -3 & 2 \\ 4 & -1 & 2 \\ 3 & 5 & 2 \end{bmatrix}$.

Q.73. Without computing adj A, find $|adj\ A|$ if

(i) A = $\begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix}$ (ii) A = $\begin{bmatrix} -2 & 0 & 0 \\ 3 & 4 & 0 \\ 10 & -7 & 3 \end{bmatrix}$ (iii) A = $\begin{vmatrix} 2 & -1 & -2 \\ 0 & 2 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

Q.74. (i) If A = $\begin{bmatrix} 2 & 1 \\ 7 & 5 \end{bmatrix}$, find $|A\ adj\ A|$.

(ii) If A = $\begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, find $|A\ adj\ A|$.

(iii) If A = $\begin{bmatrix} 3 & -1 \\ 4 & 5 \end{bmatrix}$, find adj (adj A).

Q.75. (i) If A is a matrix such that $A^3 = I$, then show that A is invertible.

(ii) If A is a matrix such that $A^4 = I$, then show that $A^{-1} = A^3$.

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Q.76. (i) If A = $\begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$, find adj A.

Q.77. If A = $\begin{bmatrix} 3 & -5 \\ 4 & 2 \end{bmatrix}$, find A(adj A).

Q.78. If A is a skew- symmetric matrix of order 3, then show that $|A|$ = 0.

Q.79. If x,y,z are real numbers such that x + y + z = π, then

find the value of $\begin{vmatrix} sin(x+y+z) & x & x \\ -siny & 0 & tanx \\ cos(x+y) & tan(y+z) & 0 \end{vmatrix}$.

Q.80. If the matrix $\begin{bmatrix} x+4 & x & x \\ x & x+4 & x \\ x & x & x+4 \end{bmatrix}$ is singular, find x.

Q.81. Determine the values of x for which the matrix

$\begin{bmatrix} x+1 & -3 & 4 \\ -5 & x+2 & 2 \\ 4 & 1 & x-6 \end{bmatrix}$ is singular.

Q.82. If A is a square matrix of order 2, prove that

A (adj A) = $|A|\, I_2$ = (adj A) A.

Q.83. If A = $\begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix}$, find A (adj A) without calculating adj A.

Q.84. For the matrix A = $\begin{bmatrix} 2 & -1 & 3 \\ 4 & 2 & 5 \\ 0 & 4 & -1 \end{bmatrix}$, verify that A (adj A) = O.

Q.85. For the matrix A = $\begin{bmatrix} 5 & 2 \\ -3 & -1 \end{bmatrix}$, verify that adj A' = (adj A)'.

Q.86. Given A = $\begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$, compute A^{-1} and show that $2A^{-1}$ = 91 – A.

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Q.87. If A = $\begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix}$, show that A – 31 = 2(I + 3A^{-1}).

Q.88. Given A = $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and B = $\begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix}$. Find $(AB)^{-1}$.

Q.89. Verify that $(AB)^{-1} = B^{-1} A^{-1}$ for matrices A = $\begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$.

Q.90. If A = $\begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$, show that $A^{-1} = A^3$.

Q.91. If A = $\begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, prove that A^{-1} = A'.

Q.92. If A = $\begin{bmatrix} 1 & tanx \\ -tanx & 1 \end{bmatrix}$, show that $A'A^{-1}$ = $\begin{bmatrix} cos\, 2x & -sin\, 2x \\ sin\, 2x & cos\, 2x \end{bmatrix}$.

Q.93. If A = $\begin{bmatrix} 3 & 1 \\ 7 & 2 \end{bmatrix}$, find A^{-1} and use this to solve the equations :

3x + 7y = 4, x + 2y = 1.

Q.94. Use matrix method to solve the following system of equations :

(i) 5x + 2y = 4
7x + 3y = 5

(ii) 4x – 3y = 3
3x – 5y = 7.

Q.95. Solve the following system of equations by using matrix method :

x + y = 1
7x + 7y = 7.

Q.96. Using matrices, solve the following system of equations :

(i) x + 2y – 3z = 6
3x + 2y – 2z = 3
2x – y + z = 2

(ii) 2x + 3y + 3z = 5
x – 2y + z = - 4
3x – y – 2z = 3

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Q.97. If A = $\begin{bmatrix} 3 & 5 \\ -2 & 3 \end{bmatrix}$, find A^{-1} and use it to solve the system of equations :

$3x - 2y = 7, 5x + 3y = 1.$

Q.98. If A = $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$, find A^{-1} and use it to solve the system of equations :

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

Q.99. If A = $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equation :

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

Q.100. If A = $\begin{bmatrix} 6 & 5 \\ 5 & 6 \end{bmatrix}$ and B = $\begin{bmatrix} 6 & -5 \\ -5 & 6 \end{bmatrix}$, find AB and use it to solve the system of equations :

$6x + 5y = 4, 5x + 6y = 7.$

Q.101. Solve the following system of linear equations by Cramer's rule :

$6x + y - 3z - 5 = 0$

$x + 3y - 2z - 5 = 0$

$2x + y + 4z - 8 = 0.$

Q.102. Using Cramer's rule find the quadratic defined by

$f(x) = ax^2 + bx + c$ if $f(1) = 0$, $f(2) = -2$ and $f(3) = -6$.

Q.103. Which of the following equations are consistent ? if consistent, solve them :

(i) $2x - y = 5$
$4x - 2y = 7$

(ii) $x + 2y = 5$
$3x + 6y = 15.$

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Q.104. Using determinants, show that the following system of linear equations is inconsistent :

$3x - y + 2z = 3$

$2x + y + 3z = 5$

$X - 2y - z = 1$.

Q.105. Using determinants, find whether the system $x - 3y + 5z = 4$, $2x - 6y + 10z = 11$, $3x - 9y + 15z = 12$ is consistent or not.

Q.106. By using determinants, solve the following of linear equations :

$x + y + z = 1$

$x + 2y + 3z = 4$

$x + 3y + 5z = 7$.

Q.107. Which of the following system has non-trivial solutions? If so, find these solutions.

(i) $3x + 7y - 2z = 0$ (ii) $x + 7y - 5z = 0$

$X + 7y + 7z = 0$ $x - 2y + 5z = 0$

$X - 2y + 7z = 0$ $3x + 6y - 5z = 0$.

Q.108. The sum of three numbers is 20. If we multiply the first number by 2 and add the second number to the result and subtract the third number, we get 23. By adding second and third numbers to three times the first number, we get 46. Represent the above problem algebraically and use Cramer's rule to find the numbers from these equations.

Q.109. Which of the following equations are consistent, solve them.

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(i) 3x + y = 5 (ii) x + 2y = 3

6x + 2y = 11 4x + 8y = 12.

Q.110. Which of the following equations are consistent? If consistent, solve them.

(i) x – y + 3z = 6 (ii) 4x – 2y + 6z = 8

x + 3y – 3z = - 4 2x – y + 3z = 4

5x + 3y + 3z = 14 2x – y + 3z = 13

(ii) 2x + y – 2z = 14

x – 2y + z = -2

5x – 5y + z = -2

Q.111. Which of the following system has non-trival solutions? If so, find these solutions.

(i) 5x + 5y + 2z = 0 (ii) 2x – 3y – z = 0

2x + 5y + 4z = 0 x + 3y – 2z = 0

4x + 5y + 2z = 0 x – 3y = 0.

Q.112. If the system of equations x – ky – z = 0, kx – y – z = 0 has a non- zero solution, then find the possible values of k.

Q.113. Let the three digit numbers A28, 3B9 and 62c, where A,B and C are integers between 0 and 9 divisible by a fixed integer k. Show that the determinant $\begin{vmatrix} A & 3 & 6 \\ 8 & 9 & C \\ 2 & B & 2 \end{vmatrix}$ **is divisible by k.**

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