DSB INTERNATIONAL PUBLIC SCHOOL

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SUMMER ASSIGNMENT

Class 12 - Mathematics

Time Allowed: 3 hours **Maximum Marks: 75**

1. Let R = {(a, a), (b, b), (c, c), (a, b)} be a relation on set A = {a, b, c}. Then, R is

   a) transitive b) anti – symmetric

   c) symmetric d) reflexive

2. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as aRb if a is congruent to b a,b $\in$ T. Then R is

   a) an equivalence relation b) neither reflexive nor symmetric

   c) transitive but not symmetric d) reflexive but not transitive

3. Let R a relation on N x N defined by (a,b) R (c,d) = a + d = b + c Then R is

   a) Reflexive and symmetric but not transitive b) Reflexive and transitive but not symmetric

   c) An equivalence relation d) Symmetric and transitive but not reflexive

4. Let A be the set of all points in a plane and let O be the origin. Let R = {(P, Q) : OP = OQ}. Then, R is

   a) An equivalence relation b) Symmetric and transitive but not reflexive

   c) Reflexive and symmetric but not transitive d) Reflexive and transitive but not symmetric

5. Let S be the set of all straight lines in a plane. Let R be a relation on S defined by a $Rb \Leftrightarrow a||b$.Them, R is

   a) reflexive and symmetric but not transitive b) symmetric and transitive but not reflexive

   c) an equivalence relation d) reflexive and transitive but not symmetric

6. If A = {a, b, c, d}, then a relation R = {(a, b), (b, a), (a, a)} on A is

   a) none of these b) symmetric only

   c) symmetric and transitive only d) reflexive and transitive only

7. f : C $\rightarrow$ R : f (z) = |z| is

   a) many-one and onto b) one-one and into

   c) one-one and onto d) many-one and into

8. Which of the following functions from Z into Z are bijections?

   a) f (x) = x^3 b) f (x) = 2x + 1

   c) f (x) = x + 2 d) f (x) = x^2 + 1

9. f : N $\rightarrow$ N : f(x) = x^2 + x + 1 is

   a) many-one and onto b) one-one and onto

   c) one-one and into d) many-one and into

10. Let A and B be two non-empty sets and let f : (A x B) $\rightarrow$ (B x A) : f(a, b) = (b, a). Then, f is

a) one-one and into
b) one-one and onto
c) many-one and onto
d) many-one and into

11. Equivalence classes A_i satisfy

A. No element of A_i is related to any element of A_j, $i \neq j$

B. No element of A_i is related to any element of A_i

C. Some elements of A_i are related to any element of A_j, , $i \neq j$

D. All elements of A_i are related to any element of A_j, $i \neq j$ $_i$ are related to any element of A_j, $i \neq j$

a) B
b) C
c) A
d) D

12. Let A = {1, 2, 3} and consider the relation R = {1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1,3)}. Then R is

a) neither symmetric, nor transitive
b) symmetric and transitive
c) reflexive but not symmetric
d) reflexive but not transitive

13. A relation R on a non – empty set A is an equivalence relation if it is

a) reflexive, symmetric and transitive
b) reflexive
c) reflexive, antisymmetric, transitive
d) symmetric and transitive

14. Let A = {1, 3, 5}. Then the number of equivalence relations in A containing (1, 3) is:

a) 3
b) 2
c) 4
d) 1

15. Let L denote the set of all straight lines in a plane. Let a relation R be defined by l R m if l is perpendicular to m for all l, m $\in$ L. Then, R is

a) none of these
b) symmetric
c) transitive
d) reflexive

16. Let us define a relation R in R as aRb if $a \geqslant b$. Then R is

a) neither transitive nor reflexive but symmetric
b) an equivalence relation
c) symmetric, transitive but not reflexive
d) reflexive, transitive but not symmetric

17. Let S be the set of all triangles in a plane and let R be a relation on S defined by $\Delta_1 S A_2 \Leftrightarrow A_1 = A_2$ Then. R is Then, R is

a) Reflexive and transitive but not symmetric
b) Reflexive and symmetric but not transitive
c) Symmetric and transitive but not reflexive
d) An equivalence relation

18. A function f: X $\rightarrow$ Y is said to be one – one and onto if

a) f is one – one
b) f is onto
c) f is both one – one and onto
d) f is either one – one or onto

19. For real numbers x and y, define xRy if and only if x – y + $\sqrt{2}$ is an irrational number. Then the relation R is

a) none of these

b) reflexive

c) transitive

d) symmetric

20. If the set Z of all integers, which of the following relation R is not an equivalence relation?

a) x R y : if x ≡ y |3|

b) x R y : if x – y is an even integer

c) x R y : if x = y

d) x R y : if x $\leq$ y

21. The principal value of $\text{cosec}^{-1}\left(-\sqrt{2}\right)$ is

a) $\frac{-\pi}{4}$

b) None of these

c) $\frac{5\pi}{4}$

d) $\frac{3\pi}{4}$

22. $\cot^{-1}\left(\frac{5}{3}\right)+\cot^{-1}\left(\frac{4}{5}\right)=$

a) $\cos^{-1}\left(\frac{27}{2\sqrt{38}}\right)$

b) $\tan^{-1}\left(\frac{37}{5}\right)$

c) $\cot^{-1}\left(\frac{27}{11}\right)$

d) 0

23. $\sin\left(\frac{\pi}{3}-\sin^{-1}\left(-\frac{1}{2}\right)\right)$ is equal to

a) $\frac{1}{4}$

b) $\frac{1}{3}$

c) 1

d) $\frac{1}{2}$

24. tan [2 $\tan^{-1}\frac{1}{5}-\frac{\pi}{4}$] = ?

a) $\frac{7}{12}$

b) $\frac{7}{17}$

c) $\frac{-7}{12}$

d) $\frac{-7}{17}$

25. The relation $\text{cosec}^{-1}\left(\frac{x^2+1}{2x}\right)=2\cot^{-1}x$ is valid for

a) $x \geqslant 0$

b) $x \leqslant 1$

c) $x \geqslant 1$

d) $x \leqslant 0$

26. If $\left(\cos^{-1}x+\sin^{-1}x\right)=\frac{\pi}{2}$, then x =

a) 0

b) None of these.

c) 1

d) $\frac{1}{2}$

27. The principal value of $\text{cosec}^{-1}\left(cosec(\frac{4\pi}{3}\right))$ is

a) $\frac{-\pi}{3}$

b) $\frac{\pi}{3}$

c) None of these

d) $\frac{2\pi}{3}$

28. The value of $\tan^2(\sec^{-1}2)+\cot^2(\text{cosec}^{-1}3)$ is

a) 15

b) 5

c) 13

d) 11

29. The principal value of $\cos^{-1}\left(\frac{-1}{2}\right)$ is

a) $\frac{4\pi}{3}$

b) $\frac{2\pi}{3}$

c) $\frac{\pi}{3}$

d) $\frac{-\pi}{3}$

30. $\tan^{-1}\{2\cos(2\sin^{-1}\frac{1}{2})\}$ = ?

a) $\frac{2\pi}{3}$ b) $\frac{\pi}{4}$

c) $\frac{3\pi}{4}$ d) $\frac{\pi}{3}$

31. Domain of $\sec^{-1}x$ is

a) [-1, 1] b) R - (-1, 1)

c) R - {0} d) R - [-1, 0]

32. If $\tan^{-1}\frac{x-1}{x+1}+\tan^{-1}\frac{2x-1}{2x+1}=\tan^{-1}\frac{23}{36}$. Then, x =

a) $\frac{-3}{8}$ b) $\frac{4}{3}$

c) $\frac{4}{3}\ or\ \frac{-3}{8}$ d) None of these

33. $\tan^{-1}\frac{1}{7}+2\tan^{-1}\frac{1}{3}$ is equal to

a) None of these b) $\frac{\pi}{2}$

c) $\frac{\pi}{4}$ d) $\frac{3\pi}{4}$

34. The positive integral solution of the equation: $\tan^{-1}x+\cos^{-1}\frac{y}{\sqrt{1+y^2}}=\sin^{-1}\frac{3}{\sqrt{10}}$ is

a) x = -2, y = -1 b) x = 2, y = 1

c) x = 1, y = 2 d) x = 3, y = 2

35. The domain of the function $y=\sin^{-1}(-x^2)$ is

a) [0, 1] b) ϕ

c) (0, 1) d) [–1, 1]

36. The value of $\cot(\sin^{-1}x)$ is

a) $\frac{\sqrt{1-x^2}}{x}$ b) $\frac{x}{\sqrt{1+x^2}}$

c) $\frac{1}{x}$ d) $\frac{\sqrt{1+x^2}}{x}$

37. If xy + yz +zx = 1, then value of $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z$ is

a) none of these b) π

c) 0 d) $\frac{\pi}{2}$

38. The principal value of $\cos^{-1}\left(\frac{-1}{\sqrt{2}}\right)$ is

a) $\frac{5\pi}{4}$ b) $\frac{3\pi}{4}$

c) $\frac{-\pi}{4}$ d) $\frac{\pi}{4}$

39. If $\tan^{-1}x+\tan^{-1}\frac{1}{7}=\frac{\pi}{4}$, then x =

a) $\frac{7}{6}$ b) $\frac{4}{3}$

c) $\frac{3}{4}$ d) $\frac{6}{7}$

40. Domain of f(x) = $\sin^{-1}x-sec^{-1}x$ is

a) None of these b) { 0, 1}

c) { -1 ,1} d) 0 or 1

41. If $\begin{bmatrix}3 & -2\\5 & 6\end{bmatrix}+2A=\begin{bmatrix}5 & 6\\-7 & 10\end{bmatrix}$ then A = ?

a) $\begin{bmatrix} 1 & 4 \\ -6 & 2 \end{bmatrix}$

b) None of these

c) $\begin{bmatrix} 1 & 3 \\ -5 & 4 \end{bmatrix}$

d) $\begin{bmatrix} -1 & 5 \\ -3 & 4 \end{bmatrix}$

42. If A is matrix of order m $\times$ n and B is a matrix such that AB′ and B′A are both defined, then order of matrix B is

a) n $\times$ m

b) m $\times$ n

c) m $\times$ m

d) n $\times$ n

43. If A is a square matrix such that A^2 = I, then $(A–I)^3 + (A + I)^3 –7A$ is equal to

a) I - A

b) A

c) I + A

d) 3A

44. Rank of a non-zero matrix is always

a) $\geqslant 1$

b) equal to 1

c) greater than 1

d) 0

45. The matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is

a) a diagonal matrix

b) a skew-symmetric matrix

c) a symmetric matrix

d) an upper triangular matrix

46. If A and B are 2-rowed square matrices such that $(A + B) = \begin{bmatrix} 4 & -3 \\ 1 & 6 \end{bmatrix}$ and $(A - B) = \begin{bmatrix} -2 & -1 \\ 5 & 2 \end{bmatrix}$ then AB = ?

a) $\begin{bmatrix} 7 & -5 \\ 1 & 5 \end{bmatrix}$

b) $\begin{bmatrix} -7 & 5 \\ 1 & -5 \end{bmatrix}$

c) $\begin{bmatrix} 7 & -1 \\ 5 & -5 \end{bmatrix}$

d) $\begin{bmatrix} 7 & -1 \\ -5 & 5 \end{bmatrix}$

47. If A and B are any two square matrices of the same order, then

a) adj(AB) = adj(A) adj (B)

b) $(AB)^t = B^tA^t$

c) AB = O

d) $(AB)^t = A^tB^t$

48. If A and B are two non-zero square matrices such that AB = 0, then

a) neither matrix is singular

b) either of them is singular

c) both A and B are singular

d) none of these

49. If A = $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then A^2 is equal to

a) $\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

50. If $A = \begin{bmatrix} 0 & -1 & 2 \\ 1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix}$, A + $2A^t$ equals

a) $2A^2$

b) A^t

c) A

d) $-A^t$

51. The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is a/an

a) none of these

b) symmetric matrix

c) skew symmetric matrix

d) identity matrix

52. The number of all possible matrices of order 3×3 with each entry 0 or 1 is

a) 81

b) none of these

c) 512

d) 18

53. If A = $\begin{bmatrix} 2 & 0 & -3 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$ is expressed as the sum of a symmetric and skew-symmetric matrix, then the symmetric matrix is

a) $\begin{bmatrix} 2 & 2 & -4 \\ 2 & 3 & 4 \\ -4 & 4 & 2 \end{bmatrix}$

b) $\begin{bmatrix} 2 & 4 & -5 \\ 0 & 3 & 7 \\ -3 & 1 & 2 \end{bmatrix}$

c) $\begin{bmatrix} 4 & 4 & -8 \\ 4 & 6 & 8 \\ -8 & 8 & 4 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

54. If (A - 2B) = $\begin{bmatrix} 1 & -2 \\ 3 & 0 \end{bmatrix}$ and (2A - 3B) = $\begin{bmatrix} -2 & 2 \\ 3 & -3 \end{bmatrix}$ then B = ?

a) $\begin{bmatrix} -4 & 6 \\ -3 & -3 \end{bmatrix}$

b) None of these

c) $\begin{bmatrix} 4 & -6 \\ 3 & -3 \end{bmatrix}$

d) $\begin{bmatrix} 6 & -4 \\ -3 & 3 \end{bmatrix}$

55. If $A_\alpha = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then $(A_\alpha)^2$ = ?

a) $\begin{bmatrix} \cos^2\alpha & \sin^2\alpha \\ -\sin^2\alpha & \cos^2\alpha \end{bmatrix}$

b) $\begin{bmatrix} 2\cos\alpha & 2\sin\alpha \\ -\sin\alpha & 2\cos\alpha \end{bmatrix}$

c) None of these

d) $\begin{bmatrix} \cos 2\alpha & \sin 2\alpha \\ -\sin 2\alpha & \cos 2\alpha \end{bmatrix}$

56. Let A be a non-singular square matrix of order 3 × 3. Then |adj A| is equal to

a) | A |

b) 3| A |

c) $|A|^3$

d) $|A|^2$

57. $\begin{vmatrix} \cos 70^\circ & \sin 20^\circ \\ \sin 70^\circ & \cos 20^\circ \end{vmatrix}$ = ?

a) $\cos 50^o$

b) $\sin 50^o$

c) 1

d) 0

58. A(adj A) is equal to

a) None of these

b) I

c) |A|I

d) O

59. If A is an invertible square matrix and k is a non-negative real number then$(kA)^{-1}$ = ?

a) $\frac{1}{k}$. A^{-1}

b) $-k.A^{-1}$

c) $k.A^{-1}$

d) None of these

60. The system of equations, 3x + y – z = 0, 5x + 2y – 3z = 2, 15x + 6y – 9z = 5 has

a) a unique solution

b) two distinct solutions

c) no solution

d) infinitely many solutions

61. If A is a non singular matrix of order 3 , then $|adj(A^3)|$=

a) None of these

b) $|A|^8$

c) $|A|^6$

d) $|A|^9$

62. If A is a square matrix of order 2, then det (adj A) =

a) $A^2 = O$

b) I

c) $2A^2$

d) |A|

63. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then the value of |adj A| is

a) a^2

b) a^6

c) a^9

d) a^{27}

64. Let a, b, c, d, u, v be integers. If the system of equations, ax + by = u, cx + dy = v, has a unique solution in integers, then

a) ad - bc need not be equal to ± 1.

b) ad – bc = - 1

c) ad – bc = 1

d) ad – bc = ± 1

65. If $A \cdot \begin{bmatrix} 3 & 2 \\ 1 & -1 \end{bmatrix} = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ then A = ?

a) $\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$

c) None of these

d) $\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$

66. Consider the system of equations:

$a_1x + b_1y + c_1z = 0$

$a_2x + b_2y + c_2z = 0$

$a_3x + b_3y + c_3z = 0$

If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$, then the system has

a) one trivial and one non-trivial solutions

b) no solution

c) more than two solutions

d) only trivial solution (0, 0, 0)

67. Which of the following is not correct in a given determinant of A, where A = $[a_{ij}]_{3\times 3}$.

a) Value of a determinant is obtained by

b) Order of minors and cofactors of elements

multiplying elements of a row or column by corresponding cofactors

of A is same

c) Order of minor is less than order of the det (A)

d) Minor of an element can never be equal to cofactor of the same element

68. Find the area of the triangle with vertices (0,0), (4,2), and (1,1).

a) 1 sq.unit

b) 2 sq.unit

c) 0 sq.unit

d) 5 sq.unit

69. Let A = $\begin{bmatrix} 1 & 0 & 0 \\ 5 & 2 & 0 \\ -1 & 6 & 1 \end{bmatrix}$, then adj (A) is

a) $\begin{bmatrix} 2 & -5 & 32 \\ 0 & 1 & 6 \\ 0 & 0 & 2 \end{bmatrix}$

b) $\begin{bmatrix} 2 & -25 & -32 \\ 0 & 2 & -36 \\ 0 & 0 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 2 & 0 & 0 \\ -25 & 2 & 0 \\ -32 & 36 & 1 \end{bmatrix}$

d) $\begin{bmatrix} 2 & 0 & 0 \\ -5 & 1 & 0 \\ 32 & -6 & 2 \end{bmatrix}$

70. The system of equations, x + y + z = 6, x + 2y + 3z = 14, x + 3y + 5z = 20 has

a) no solution

b) a unique solution

c) infinitely many solutions

d) only finitely many solutions

71. If A is an invertible matrix of order 3, then which of the following information is NOT true?

a) $(AB)^{-1} = B^{-1} A^{-1}$, where $B = [b_{ij}]_{3\times 3}$ and $|B| \neq 0$

b) $(A^{-1})^{-1} = A$

c) $|\text{adj } A| = |A|^2$

d) If BA = CA, then $B \neq C$, where B and C are square matrices of order 3

72. The system of equations x + 2y = 11, -2 x – 4y = 22 has

a) only one solution

b) infinitely many solutions

c) finitely many solutions

d) no solution

73. The system of equations, x + y = 2 and 2x + 2y = 3 has

a) a unique solution

b) finitely many solutions

c) no solution

d) infinitely many solutions

74. The area of a triangle with vertices (–3, 0), (3, 0) and (0, k) is 9 sq. units. The value of k will be

a) 6

b) 3

c) -9

d) 9

75. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then

a) none of these

b) a = cos 2θ, b = sin 2θ

c) a = 1, b = 1

d) a = sin 2θ, b = cos 2θ