

Time : 2:30 Hour

Total Marks : 300

Important Instructions :

1. This test Booklet contains **120** items (questions). Each item is printed in **English**. Each item comprises four responses (answer's). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
2. You have to mark all your responses **ONLY** on the separate Answer Sheet provided.
3. **All** items carry equal marks.
4. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions.
5. Penalty for wrong answers:
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.
 - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, one-third of the marks assigned to that question will be deducted as penalty.
 - (ii) If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct and there will be same penalty as above to that question.
 - (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be no penalty for that question.

1. What is the n^{th} term of the sequence 25, - 125, 625, - 3125, ...?
(a) $(-5)^{2n-1}$ (b) $(-1)^{2n} 5^{n+1}$
(c) $(-1)^{2n-1} 5^{n+1}$ (d) $(-1)^{n-1} 5^{n+1}$
2. Suppose $X = \{1, 2, 3, 4\}$ and R is a relation on X. If $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 1), (2, 3), (3, 2)\}$, then which one of the following is correct?
(a) R is reflexive and symmetric, but not transitive
(b) R is symmetric and transitive, but not reflexive
(c) R is reflexive and transitive, but not symmetric
(d) R is neither reflexive nor transitive, but symmetric
3. A relation R is defined on the set N of natural numbers as $xRy \Rightarrow x^2 - 4xy + 3y^2 = 0$. Then which one of the following is correct?
(a) R is reflexive and symmetric, but not transitive
(b) R is reflexive and transitive, but not symmetric
(c) R is reflexive, symmetric and transitive
(d) R is reflexive, but neither symmetric nor transitive
4. If $A = \{x \in Z : x^3 - 1 = 0\}$ and $B = \{x \in Z : x^2 + x + 1 = 0\}$, where Z is set of complex numbers, then what is $A \cap B$ equal to?
(a) Null set
(b) $\left\{ \frac{-1 + \sqrt{3}i}{2}, \frac{-1 - \sqrt{3}i}{2} \right\}$
(c) $\left\{ \frac{-1 + \sqrt{3}i}{4}, \frac{-1 - \sqrt{3}i}{4} \right\}$
(d) $\left\{ \frac{1 + \sqrt{3}i}{2}, \frac{1 - \sqrt{3}i}{2} \right\}$
5. Consider the following statements for the two non-empty sets A and B:
(1) $(A \cap B) \cup (A \cap \bar{B}) \cup (\bar{A} \cap B) = A \cup B$
(2) $(A \cup (\bar{A} \cap \bar{B})) = A \cup B$
which of the above statements is/are correct?
(a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2
6. Let X be a non-empty set and let A, B, C be subsets of X. Consider the following statements:
(1) $A \subset C \Rightarrow (A \cap B) \subset (C \cap B)$,
 $(A \cup B) \subset (C \cup B)$

- (2) $(A \cap B) \subset (C \cap B)$ for all sets $B \Rightarrow A \subset C$
 (3) $(A \cup B) \subset (C \cup B)$ for all sets $B \Rightarrow A \subset C$
 which of the above statements is/are correct?
 (a) 1 and 2 only (b) 2 and 3 only
 (c) 1 and 3 only (d) 1, 2 and 3
7. If $B = \begin{bmatrix} 3 & 2 & 0 \\ 2 & 4 & 0 \\ 1 & 1 & 0 \end{bmatrix}$, then what is adjoint of B equal to?
- (a) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ -2 & -1 & 8 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 0 & -2 \\ 0 & 0 & -1 \\ 0 & 0 & 8 \end{bmatrix}$
 (c) $\begin{bmatrix} 0 & 0 & 2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ (d) It does not exist
8. What are the roots of the equation $|x^2 - x - 6| = x + 2$?
 (a) -2, 1, 4 (b) 0, 2, 4
 (c) 0, 1, 4 (d) -2, 2, 4
9. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then the matrix A is a/an
 (a) Singular matrix (b) Involutory matrix
 (c) Nilpotent matrix (d) Idempotent matrix
10. If $\begin{vmatrix} x & -3i & 1 \\ y & 1 & i \\ 0 & 2i & -i \end{vmatrix} = 6 + 11i$, then what are the values of x and y respectively?
 (a) -3, 4 (b) 3, 4
 (c) 3, -4 (d) -3, -4
11. The common roots of the equations $z^3 + 2z^2 + 2z + 1 = 0$ and $z^{2017} + z^{2018} + 1 = 0$ are
 (a) -1, ω (b) 1, ω^2
 (c) -1, ω^2 (d) ω , ω^2
12. If $C(20, n+2) = C(20, n-2)$, then what is n equal to?
 (a) 8 (b) 10
 (c) 12 (d) 16
13. There are 10 points in a plane. No three of these points are in a straight line. What is the total number of straight lines which can be formed by joining the points?
 (a) 90 (b) 45
 (c) 40 (d) 30
14. The equation $px^2 + qx + r = 0$ (where p, q, r , all are positive) has distinct real roots a and b . Which one of the following is correct?
 (a) $a > 0, b > 0$ (b) $a < 0, b < 0$
 (c) $a > 0, b < 0$ (d) $a < 0, b > 0$
15. If $A = \{\lambda, \{\lambda, \mu\}\}$, then the power set of A is
 (a) $\{\phi, \{\phi\}, \{\lambda\}, \{\lambda, \mu\}\}$
 (b) $\{\phi, \{\lambda\}, \{\{\lambda, \mu\}\}, \{\lambda, \{\lambda, \mu\}\}\}$
 (c) $\{\phi, \{\lambda\}, \{\lambda, \mu\}, \{\lambda, \{\lambda, \mu\}\}\}$
 (d) $\{\{\lambda\}, \{\lambda, \mu\}, \{\lambda, \{\lambda, \mu\}\}\}$
- Consider the following for the next 02 (two) items that follow:**
- In a school, all the students play at least one of three indoor games – chess, carrom and table tennis. 60 play chess, 50 play table tennis, 48 play carrom, 12 play chess and carrom, 15 play carrom and table tennis, 20 play table tennis and chess.
16. What can be the minimum number of students in the school?
 (a) 123 (b) 111
 (c) 95 (d) 63
17. What can be the maximum number of students in the school?
 (a) 111 (b) 123
 (c) 125 (d) 135
18. If A is an identity matrix of order 3, then its inverse (A^{-1})
 (a) is equal to null matrix
 (b) is equal to A
 (c) is equal to 3A
 (d) does not exist
19. A is a square matrix of order 3 such that its determinant is 4. What is the determinant of its transpose?
 (a) 64 (b) 36
 (c) 32 (d) 4
20. From 6 programmers and 4 typists, an office wants to recruit 5 people. What is the number of ways this can be done so as to recruit at least one typist?
 (a) 209 (b) 210
 (c) 246 (d) 242
21. What is the number of terms in the expansion of $[(2x - 3y)^2 (2x + 3y)^2]^2$?
 (a) 4 (b) 5
 (c) 8 (d) 16

22. In the expansion of $(1 + ax)^n$, the first three terms are respectively 1 , $12x$ and $64x^2$. What is n equal to?
 (a) 6 (b) 9
 (c) 10 (d) 12
23. The numbers 1 , 5 and 25 can be three terms (not necessarily consecutive) of
 (a) only one AP
 (b) more than one but finite numbers of APs
 (c) infinite number of APs
 (d) finite number of GPs
24. The sum of $(p + q)^{\text{th}}$ and $(p - q)^{\text{th}}$ terms of an AP is equal to
 (a) $(2p)^{\text{th}}$ term (b) $(2q)^{\text{th}}$ term
 (c) Twice the p^{th} term (d) Twice the q^{th} term
25. If A is a square matrix of order $n > 1$, then which one of the following is correct?
 (a) $\det(-A) = \det A$
 (b) $\det(-A) = (-1)^n \det A$
 (c) $\det(-A) = -\det A$
 (d) $\det(-A) = n \det A$
26. What is the least value of $25 \operatorname{cosec}^2 x + 36 \sec^2 x$?
 (a) 1 (b) 11
 (c) 120 (d) 121
- Consider the following for the next 02 (two) items:**
 Let A and B be (3×3) matrices with $\det A = 4$ and $\det B = 3$.
27. What is $\det(2AB)$ equal to?
 (a) 96 (b) 72
 (c) 48 (d) 36
28. What is $\det(3AB^{-1})$ equal to?
 (a) 12 (b) 18
 (c) 36 (d) 48
- Consider the following for the next 02 (two) items:**
 A complex number is given by $z = \frac{1+2i}{1-(1-i)^2}$.
29. What is the modulus of z ?
 (a) 4 (b) 2
 (c) 1 (d) $\frac{1}{2}$
30. What is the principal argument of z ?
 (a) 0 (b) $\frac{\pi}{4}$
 (c) $\frac{\pi}{2}$ (d) π
31. What is the value of $\frac{\sin 34^\circ \cos 236^\circ - \sin 56^\circ \sin 124^\circ}{\cos 28^\circ \cos 88^\circ + \cos 178^\circ \sin 208^\circ}$?
 (a) -2 (b) -1
 (c) 2 (d) 1
32. $\tan 54^\circ$ can be expressed as
 (a) $\frac{\sin 9^\circ + \cos 9^\circ}{\sin 9^\circ - \cos 9^\circ}$ (b) $\frac{\sin 9^\circ - \cos 9^\circ}{\sin 9^\circ + \cos 9^\circ}$
 (c) $\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ}$ (d) $\frac{\sin 36^\circ}{\cos 36^\circ}$
- Consider the following for the next 03 (three) items:**
 If $p = X \cos \theta - Y \sin \theta$, $q = X \sin \theta + Y \cos \theta$
 and $p^2 + 4pq + q^2 = AX^2 + BY^2$, $0 \leq \theta \leq \frac{\pi}{2}$.
33. What is the value of θ ?
 (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$
 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$
34. What is the value of A ?
 (a) 4 (b) 3
 (c) 2 (d) 1
35. What is the value of B ?
 (a) -1 (b) 0
 (c) 1 (d) 2
- Consider the following for the next 02 (two) items:**
 It is given that $\cos(\theta - \alpha) = a$, $\cos(\theta - \beta) = b$.
36. What is $\cos(\alpha - \beta)$ equal to?
 (a) $ab + \sqrt{1-a^2}\sqrt{1-b^2}$ (b) $ab - \sqrt{1-a^2}\sqrt{1-b^2}$
 (c) $a\sqrt{1-b^2} - b\sqrt{1-a^2}$ (d) $a\sqrt{1-b^2} + b\sqrt{1-a^2}$
37. What is $\sin^2(\alpha - \beta) + 2ab \cos(\alpha - \beta)$ equal to?
 (a) $a^2 + b^2$ (b) $a^2 - b^2$
 (c) $b^2 - a^2$ (d) $-(a^2 + b^2)$
38. If $\sin \alpha + \cos \alpha = p$, then what is $\cos^2(2\alpha)$ equal to?
 (a) p^2 (b) $p^2 - 1$
 (c) $p^2(2 - p^2)$ (d) $p^2 + 1$
39. What is the value of $\sin^{-1} \frac{4}{5} + \sec^{-1} \frac{5}{4} - \frac{\pi}{2}$?
 (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$
 (c) π (d) 0

40. If $\sin^{-1} \frac{2p}{1+p^2} - \cos^{-1} \frac{1-q^2}{1+q^2} = \tan^{-1} \frac{2x}{1+x^2}$, then what is x equal to?
- (a) $\frac{p+q}{1+pq}$ (b) $\frac{p-q}{1+pq}$
 (c) $\frac{pq}{1+pq}$ (d) $\frac{p+q}{1-pq}$
41. If $\tan \theta = \frac{1}{2}$ and $\tan \phi = \frac{1}{3}$, then what is the value of $(\theta + \phi)$?
- (a) 0 (b) $\frac{\pi}{6}$
 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$
42. If $\cos A = \frac{3}{4}$, then what is the value of $\sin\left(\frac{A}{2}\right)\sin\left(\frac{3A}{2}\right)$?
- (a) $\frac{5}{8}$ (b) $\frac{5}{16}$
 (c) $\frac{5}{24}$ (d) $\frac{5}{32}$
43. What is the value of $\tan 75^\circ + \cot 75^\circ$?
- (a) 2 (b) 4
 (c) $2\sqrt{3}$ (d) $4\sqrt{3}$
44. What is the value of $\cos 46^\circ \cos 47^\circ \cos 48^\circ \cos 49^\circ \cos 50^\circ \dots \cos 135^\circ$?
- (a) -1 (b) 0
 (c) 1 (d) Greater than 1
45. If $\sin 2\theta = \cos 3\theta$, where $0 < \theta < \frac{\pi}{2}$, then what is $\sin \theta$ equal to?
- (a) $\frac{\sqrt{5}+1}{4}$ (b) $\frac{\sqrt{5}-1}{4}$
 (c) $\frac{\sqrt{5}+1}{16}$ (d) $\frac{\sqrt{5}-1}{16}$
46. If the roots of the equation $x^2 + px + q = 0$ are $\tan 9^\circ$ and $\tan 26^\circ$, then which one of the following is correct?
- (a) $q - p = 1$ (b) $p - q = 1$
 (c) $p + q = 2$ (d) $p + q = 3$
47. What is the fourth term of an AP of n terms whose sum is $n(n+1)$?
- (a) 6 (b) 8
 (c) 12 (d) 20
48. What is $(1 + \tan \alpha \tan \beta)^2 + (\tan \alpha - \tan \beta)^2 - \sec^2 \alpha \sec^2 \beta$ equal to?
- (a) 0 (b) 1
 (c) 2 (d) 4
49. If $p = \operatorname{cosec} \theta - \cot \theta$ and $q = (\operatorname{cosec} \theta + \cot \theta)^{-1}$, then which one of the following is correct?
- (a) $pq = 1$ (b) $p = q$
 (c) $p + q = 1$ (d) $p + q = 0$
50. If the angles of a triangle ABC are in the ratio 1 : 2 : 3, then the corresponding sides are in the ratio
- (a) 1 : 2 : 3 (b) 3 : 2 : 1
 (c) 1 : $\sqrt{3}$: 2 (d) 1 : $\sqrt{3}$: $\sqrt{2}$
51. Consider the following statements:
- (1) For an equation of a line, $x \cos \theta + y \sin \theta = p$, in normal form, the length of the perpendicular from the point (α, β) to the line is $|\alpha \cos \theta + \beta \sin \theta + p|$.
- (2) The length of the perpendicular from the point (α, β) to the line $\frac{x}{a} + \frac{y}{b} = 1$ is $\frac{|a\alpha + b\beta - ab|}{\sqrt{a^2 + b^2}}$
- which of the above statements is/are correct?
- (a) 1 only (b) 2 only
 (c) Both 1 and 2 (d) Neither 1 nor 2
52. A circle is drawn on the chord of a circle $x^2 + y^2 = a^2$ as diameter. The chord lies on the line $x + y = a$. What is the equation of the circle?
- (a) $x^2 + y^2 - ax - ay + a^2 = 0$
 (b) $x^2 + y^2 - ax - ay = 0$
 (c) $x^2 + y^2 + ax + ay = 0$
 (d) $x^2 + y^2 + ax + ay - 2a^2 = 0$
53. The sum of the focal distances of a point on an ellipse is constant and equal to the
- (a) length of minor axis
 (b) length of major axis
 (c) length of latus rectum
 (d) sum of the lengths of semi-major and semi-minor axes
54. The equation $2x^2 - 3y^2 - 6 = 0$ represents
- (a) a circle (b) a parabola
 (c) an ellipse (d) a hyperbola

55. The two parabolas $y^2 = 4ax$ and $x^2 = 4ay$ intersect
 (a) at two points on the line $y = x$
 (b) only at the origin
 (c) at three points one of which lies on $y + x = 0$
 (d) only at $(4a, 4a)$
56. The points $(1, 3)$ and $(5, 1)$ are two opposite vertices of a rectangle. The other two vertices lie on the line $y = 2x + c$. What is the value of c ?
 (a) 2 (b) -2
 (c) 4 (d) -4
57. If the lines $3y + 4x = 1$, $y = x + 5$ and $5y + bx = 3$ are concurrent, then what is the value of b ?
 (a) 1 (b) 3
 (c) 6 (d) $\frac{1}{2}$
58. What is the equation of the straight line which is perpendicular to $y = x$ and passes through $(3, 2)$?
 (a) $x - y = 5$ (b) $x + y = 5$
 (c) $x + y = 1$ (d) $x - y = 1$
59. The straight lines $x + y - 4 = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form a triangle, which is
 (a) isosceles (b) right-angled
 (c) equilateral (d) scalene
60. The circle $x^2 + y^2 + 4x - 7y + 12 = 0$, cuts an intercept on y -axis equal to
 (a) 1 (b) 2
 (c) 4 (d) 7
61. The centroid of the triangle with vertices $A(2, -3, 3)$, $B(5, -3, -4)$ and $C(2, -3, -2)$ is the point
 (a) $(-3, 3, -1)$ (b) $(3, -3, -1)$
 (c) $(3, 1, -3)$ (d) $(-3, -1, -3)$
62. What is the radius of the sphere $x^2 + y^2 + z^2 - 6x + 8y - 10z + 1 = 0$?
 (a) 5 (b) 2
 (c) 7 (d) 3
63. The equation of the plane passing through the intersection of the planes $2x + y + 2z = 9$, $4x - 5y - 4z = 1$ and the point $(3, 2, 1)$ is
 (a) $10x - 2y + 2z = 28$
 (b) $10x + 2y + 2z = 28$
 (c) $10x + 2y - 2z = 28$
 (d) $10x - 2y - 2z = 24$
64. The distance between the parallel planes $4x - 2y + 4z + 9 = 0$ and $8x - 4y + 8z + 21 = 0$ is
 (a) $\frac{1}{4}$ (b) $\frac{1}{2}$
 (c) $\frac{3}{2}$ (d) $\frac{7}{4}$
65. What are the direction cosines of z -axis?
 (a) $\langle 1, 1, 1 \rangle$ (b) $\langle 1, 0, 0 \rangle$
 (c) $\langle 0, 1, 0 \rangle$ (d) $\langle 0, 0, 1 \rangle$
66. If $\vec{a} = \hat{i} - 2\hat{j} + 5\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$ then what is $(\vec{b} - \vec{a}) \cdot (3\vec{a} + \vec{b})$ equal to?
 (a) 106 (b) -106
 (c) 53 (d) -53
67. If the position vectors of points A and B are $3\hat{i} - 2\hat{j} + \hat{k}$ and $2\hat{i} + 4\hat{j} - 3\hat{k}$ respectively, then what is the length of \overline{AB} ?
 (a) $\sqrt{14}$ (b) $\sqrt{29}$
 (c) $\sqrt{43}$ (d) $\sqrt{53}$
68. If in a right-angled triangle ABC, hypotenuse $AC = p$, then what is $\overline{AB} \cdot \overline{AC} + \overline{BC} \cdot \overline{BA} + \overline{CA} \cdot \overline{CB}$ equal to?
 (a) p^2 (b) $2p^2$
 (c) $\frac{p^2}{2}$ (d) p
69. The sine of the angle between vectors $\vec{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$ and $\vec{b} = 4\hat{i} + 3\hat{j} - \hat{k}$ is
 (a) $\frac{1}{\sqrt{26}}$ (b) $\frac{5}{\sqrt{26}}$
 (c) $\frac{5}{26}$ (d) $\frac{1}{26}$
70. What is the value of λ for which the vectors $3\hat{i} + 4\hat{j} - \hat{k}$ and $-2\hat{i} + \lambda\hat{j} + 10\hat{k}$ are perpendicular?
 (a) 1 (b) 2
 (c) 3 (d) 4
71. What is the derivative of $\sec^2(\tan^{-1} x)$ with respect to x ?
 (a) $2x$ (b) $x^2 + 1$
 (c) $x + 1$ (d) x^2
72. If $f(x) = \log_{10}(1 + x)$, then what is $4f(4) + 5f(1) - \log_{10} 2$ equal to?
 (a) 0 (b) 1
 (c) 2 (d) 4

73. A function f defined by $f(x) = \ln(\sqrt{x^2+1} - x)$ is
 (a) an even function
 (b) an odd function
 (c) Both even and odd function
 (d) Neither even nor odd function
74. The domain of the function f defined by $f(x) = \log_x 10$ is
 (a) $x > 10$
 (b) $x > 0$ excluding $x = 10$
 (c) $x \geq 10$
 (d) $x > 0$ excluding $x = 1$
75. $\lim_{x \rightarrow 0} \frac{1 - \cos^3 4x}{x^2}$ is equal to
 (a) 0
 (b) 12
 (c) 24
 (d) 36
76. For $r > 0$, $f(r)$ is the ratio of perimeter to area of a circle of radius r . Then $f(1) + f(2)$ is equal to
 (a) 1
 (b) 2
 (c) 3
 (d) 4
77. If $f(x) = 3^{1+x}$, then $f(x)f(y)f(z)$ is equal to
 (a) $f(x+y+z)$
 (b) $f(x+y+z+1)$
 (c) $f(x+y+z+2)$
 (d) $f(x+y+z+3)$
78. The number of real roots for the equation $x^2 + 9|x| + 20 = 0$ is
 (a) Zero
 (b) One
 (c) Two
 (d) Three
79. If $f(x) = \sin(\cos x)$, then $f'(x)$ is equal to
 (a) $\cos(\cos x)$
 (b) $\sin(-\sin x)$
 (c) $(\sin x) \cos(\cos x)$
 (d) $(-\sin x) \cos(\cos x)$
80. The domain of the function $f(x) = \sqrt{(2-x)(x-3)}$
 (a) $(0, \infty)$
 (b) $[0, \infty)$
 (c) $[2, 3]^\infty$
 (d) $(2, 3)$
81. The solution of the differential equation $\frac{dy}{dx} = \cos(y-x) + 1$ is
 (a) $e^x[\sec(y-x) - \tan(y-x)] = c$
 (b) $e^x[\sec(y-x) + \tan(y-x)] = c$
 (c) $e^x \sec(y-x) \tan(y-x) = c$
 (d) $e^x = \csc(y-x) \tan(y-x)$
82. $\int_0^{\pi/2} |\sin x - \cos x| dx$ is equal to
 (a) 0
 (b) $2(\sqrt{2}-1)$
 (c) $2\sqrt{2}$
 (d) $2(\sqrt{2}+1)$
83. If $y = a \cos 2x + b \sin 2x$, then
 (a) $\frac{d^2y}{dx^2} + y = 0$
 (b) $\frac{d^2y}{dx^2} + 2y = 0$
 (c) $\frac{d^2y}{dx^2} - 4y = 0$
 (d) $\frac{d^2y}{dx^2} + 4y = 0$
84. A given quantity of metal is to be cast into a half cylinder (*i.e.*, with a rectangular base and semicircular ends). If the total surface area is to be minimum, then the ratio of the height of the half cylinder to the diameter of the semicircular ends is
 (a) $\pi : (\pi + 2)$
 (b) $(\pi + 2) : \pi$
 (c) 1 : 1
 (d) None of the above
85. $\int_0^{\pi/2} e^{\sin x} \cos x dx$ is equal to
 (a) $e + 1$
 (b) $e - 1$
 (c) $e + 2$
 (d) e
86. If $f(x) = \frac{x-2}{x+2}$, $x \neq -2$, then what is $f^{-1}(x)$ equal to?
 (a) $\frac{4(x+2)}{x-2}$
 (b) $\frac{x+2}{4(x-2)}$
 (c) $\frac{x+2}{x-2}$
 (d) $\frac{2(1+x)}{1-x}$
87. What is $\int \ln(x^2) dx$ equal to?
 (a) $2x \ln(x) - 2x + c$
 (b) $\frac{2}{x} + c$
 (c) $2x \ln(x) + c$
 (d) $\frac{2 \ln(x)}{x} - 2x + c$
88. The minimum distance from the point $(4, 2)$ to $y^2 = 8x$ is equal to
 (a) $\sqrt{2}$
 (b) $2\sqrt{2}$
 (c) 2
 (d) $3\sqrt{2}$
89. The differential equation of the system of circles touching the y -axis at the origin is
 (a) $x^2 + y^2 - 2xy \frac{dy}{dx} = 0$
 (b) $x^2 + y^2 + 2xy \frac{dy}{dx} = 0$
 (c) $x^2 - y^2 + 2xy \frac{dy}{dx} = 0$
 (d) $x^2 - y^2 - 2xy \frac{dy}{dx} = 0$

105. A fair coin is tossed and an unbiased dice is rolled together. What is the probability of getting a 2 or 4 or 6 along with head?
- (a) $\frac{1}{2}$ (b) $\frac{1}{3}$
 (c) $\frac{1}{4}$ (d) $\frac{1}{6}$
106. If A, B, C are three events, then what is the probability that at least two of these occur together?
- (a) $P(A \cap B) + P(B \cap C) + P(C \cap A)$
 (b) $P(A \cap B) + P(B \cap C) + P(C \cap A) - P(A \cap B \cap C)$
 (c) $P(A \cap B) + P(B \cap C) + P(C \cap A) - 2P(A \cap B \cap C)$
 (d) $P(A \cap B) + P(B \cap C) + P(C \cap A) - 3P(A \cap B \cap C)$
107. If two variables X and Y are independent, then what is the correlation coefficient between them?
- (a) 1
 (b) -1
 (c) 0
 (d) None of the above
108. Two independent events A and B are such that $P(A \cup B) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{6}$. If $P(B) < P(A)$, then what is $P(B)$ equal to?
- (a) $\frac{1}{4}$ (b) $\frac{1}{3}$
 (c) $\frac{1}{2}$ (d) $\frac{1}{6}$
109. The mean of 100 observations is 50 and the standard deviation is 10. If 5 is subtracted from each observation and then it is divided by 4, then what will be the new mean and the new standard deviation respectively?
- (a) 45, 5 (b) 11.25, 1.25
 (c) 11.25, 2.5 (d) 12.5, 2.5
110. If two fair dice are rolled then what is the conditional probability that the first dice lands on 6 given that the sum of numbers on the dice is 8?
- (a) $\frac{1}{3}$ (b) $\frac{1}{4}$
 (c) $\frac{1}{5}$ (d) $\frac{1}{6}$
111. Two symmetric dice flipped with each dice having two sides painted red, two painted black, one painted yellow and the other painted white. What is the probability that both land on the same colour?
- (a) $\frac{3}{18}$ (b) $\frac{2}{9}$
 (c) $\frac{5}{18}$ (d) $\frac{1}{3}$
112. There are n socks in a drawer, of which 3 socks are red. If 2 of the socks are chosen randomly and the probability that both selected socks are red is $\frac{1}{2}$, then what is the value of n ?
- (a) 3 (b) 4
 (c) 5 (d) 6
113. Two cards are chosen at random from a deck of 52 playing cards. What is the probability that both of them have the same value?
- (a) $\frac{1}{17}$ (b) $\frac{3}{17}$
 (c) $\frac{5}{17}$ (d) $\frac{7}{17}$
114. In eight throws of a die, 5 or 6 is considered a success. The mean and standard deviation of total number of successes is respectively given by
- (a) $\frac{8}{3}, \frac{16}{9}$ (b) $\frac{8}{3}, \frac{4}{3}$
 (c) $\frac{4}{3}, \frac{4}{3}$ (d) $\frac{4}{3}, \frac{16}{9}$
115. A and B are two events such that \bar{A} and \bar{B} are mutually exclusive. If $P(A) = 0.5$ and $P(B) = 0.6$, then what is the value of $P(A|B)$?
- (a) $\frac{1}{5}$ (b) $\frac{1}{6}$
 (c) $\frac{2}{5}$ (d) $\frac{1}{3}$
116. Consider the following statements:
- (1) The algebraic sum of deviations of a set of values from their arithmetic mean is always zero.
 (2) Arithmetic mean > Median > Mode for a symmetric distribution.
- Which of the above statements is/are correct?
- (a) 1 only (b) 2 only
 (c) Both 1 and 2 (d) Neither 1 nor 2

117. Let the correlation coefficient between X and Y be 0.6 . Random variables Z and W are defined as $Z = X + 5$ and $W = \frac{Y}{3}$. What is the correlation coefficient between Z and W ?
- (a) 0.1 (b) 0.2
(c) 0.36 (d) 0.6
118. If all the natural numbers between 1 and 20 are multiplied by 3 , then what is the variance of the resulting series?
- (a) 99.75 (b) 199.75
(c) 299.25 (d) 399.25
119. What is the probability that an interior point in a circle is closer to the centre than to the circumference?
- (a) $\frac{1}{4}$
(b) $\frac{1}{2}$
(c) $\frac{3}{4}$
(d) It cannot be determined
120. If A and B are two events, then what is the probability of occurrence of either event A or event B ?
- (a) $P(A) + P(B)$ (b) $P(A \cup B)$
(c) $P(A \cap B)$ (d) $P(A) P(B)$



Answers

Q. No.	Answer Key	Topic Name	Chapter Name
1	(d)	Sequence & Series	Algebra
2	(a)	Set Theory and Relations	Algebra
3	(d)	Set Theory and Relations	Algebra
4	(b)	Set Theory and Relations	Algebra
5	(a)	Set Theory and Relations	Algebra
6	(d)	Set Theory and Relations	Algebra
7	(a)	Matrices and Determinants	Algebra
8	(d)	Theory of Equation	Algebra
9	(b)	Matrices and Determinants	Algebra
10	(a)	Matrices and Determinants	Algebra
11	(d)	Complex Number	Algebra
12	(b)	Binomial Theorem	Algebra
13	(b)	Permutation and Combination	Algebra
14	(b)	Theory of Equation	Algebra
15	(b)	Set Theory and Relations	Algebra
16	(b)	Set Theory and Relations	Algebra
17	(b)	Set Theory and Relations	Algebra
18	(b)	Matrices and Determinants	Algebra
19	(d)	Matrices and Determinants	Algebra
20	(c)	Permutations and Combinations	Algebra
21	(b)	Binomial Theorem	Algebra
22	(b)	Binomial Theorem	Algebra
23	(c)	Sequence and Series	Algebra
24	(c)	Sequence and Series	Algebra
25	(b)	Matrices and Determinants	Algebra
26	(d)	Sequence and Series	Algebra
27	(a)	Matrices and Determinants	Algebra
28	(c)	Matrices and Determinants	Algebra
29	(c)	Complex Numbers	Algebra
30	(a)	Complex Numbers	Algebra
31	(a)	Trigonometric Ratios and Identities	Trigonometry

Q. No.	Answer Key	Topic Name	Chapter Name
32	(c)	Trigonometric Ratios and Identities	Trigonometry
33	(c)	Trigonometric Ratios and Identities	Trigonometry
34	(b)	Trigonometric Ratios and Identities	Trigonometry
35	(a)	Trigonometric Ratios and Identities	Trigonometry
36	(a)	Trigonometric Ratios and Identities	Trigonometry
37	(a)	Trigonometric Ratios and Identities	Trigonometry
38	(c)	Trigonometric Ratios and Identities	Trigonometry
39	(d)	Inverse Trigonometric Functions	Trigonometry
40	(b)	Inverse Trigonometric Functions	Trigonometry
41	(c)	Trigonometric Ratios and Identities	Trigonometry
42	(b)	Trigonometric Ratios and Identities	Trigonometry
43	(b)	Trigonometric Ratios and Identities	Trigonometry
44	(b)	Trigonometric Ratios and Identities	Trigonometry
45	(b)	Trigonometric Ratios and Identities	Trigonometry
46	(a)	Trigonometric Ratios and Identities	Trigonometry
47	(b)	Sequence and Series	Algebra
48	(a)	Trigonometric Ratios and Identities	Trigonometry
49	(b)	Trigonometric Ratios and Identities	Trigonometry
50	(c)	Properties of Triangle	Trigonometry
51	(d)	Straight Line	Coordinate Geometry
52	(b)	Circle	Coordinate Geometry
53	(a)	Ellipse	Coordinate Geometry
54	(d)	Hyperbola	Coordinate Geometry
55	(a)	Parabola	Coordinate Geometry
56	(d)	Straight Line	Coordinate Geometry
57	(c)	Straight Line	Coordinate Geometry
58	(b)	Straight Line	Coordinate Geometry
59	(a)	Straight Line	Coordinate Geometry
60	(a)	Circle	Coordinate Geometry
61	(b)	Three Dimensional Geometry	Vectors and 3D Geometry
62	(c)	Three Dimensional Geometry	Vectors and 3D Geometry
63	(a)	Three Dimensional Geometry	Vectors and 3D Geometry
64	(a)	Three Dimensional Geometry	Vectors and 3D Geometry

Q. No.	Answer Key	Topic Name	Chapter Name
65	(d)	Three Dimensional Geometry	Vectors and 3D Geometry
66	(b)	Vector Algebra	Vectors and 3D Geometry
67	(d)	Vector Algebra	Vectors and 3D Geometry
68	(a)	Vector Algebra	Vectors and 3D Geometry
69	(b)	Vector Algebra	Vectors and 3D Geometry
70	(d)	Vector Algebra	Vectors and 3D Geometry
71	(a)	Differential Coefficient	Calculus
72	(d)	Logarithm and its Applications	Algebra
73	(b)	Functions	Calculus
74	(d)	Logarithm and its Applications	Algebra
75	(c)	Limits	Calculus
76	(c)	Functions	Calculus
77	(c)	Functions	Calculus
78	(a)	Theory of Equation	Algebra
79	(d)	Differential Coefficient	Calculus
80	(c)	Functions	Calculus
81	(a)	Differential Equation	Calculus
82	(b)	Definite Integration	Calculus
83	(d)	Differential Equation	Calculus
84	(a)	Application of Derivatives	Calculus
85	(b)	Definite Integration	Calculus
86	(d)	Functions	Calculus
87	(a)	Indefinite Integration	Calculus
88	(b)	Application of Derivatives	Calculus
89	(c)	Differential Equation	Calculus
90	(c)	Differential Equation	Calculus
91	(a)	Differential Equation	Calculus
92	(d)	Continuity and Differentiability	Calculus
93	(b)	Application of Derivatives	Calculus
94	(a)	Indefinite Integration	Calculus
95	(b)	Area under Curves	Calculus
96	(c)	Trigonometric Ratios and Identities	Trigonometry
97	(a)	Circle	Coordinate Geometry

Q. No.	Answer Key	Topic Name	Chapter Name
98	(c)	Trigonometric Ratios and Identities	Trigonometry
99	(c)	Permutation and Combination	Algebra
100	(a)	Height and Distance	Trigonometry
101	(d)	Probability	Statistics and Probability
102	(d)	Probability	Statistics and Probability
103	(a)	Probability	Statistics and Probability
104	(c)	Probability	Statistics and Probability
105	(c)	Probability	Statistics and Probability
106	(c)	Probability	Statistics and Probability
107	(c)	Statistics	Statistics and Probability
108	(b)	Probability	Statistics and Probability
109	(c)	Statistics	Statistics and Probability
110	(c)	Probability	Statistics and Probability
111	(c)	Probability	Statistics and Probability
112	(b)	Probability	Statistics and Probability
113	(a)	Probability	Statistics and Probability
114	(b)	Probability	Statistics and Probability
115	(b)	Probability	Statistics and Probability
116	(a)	Statistics	Statistics and Probability
117	(d)	Statistics	Statistics and Probability
118	(c)	Statistics	Statistics and Probability
119	(a)	Probability	Statistics and Probability
120	(b)	Probability	Statistics and Probability