

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 set 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. $A \subset C \Rightarrow (A \cap B) \subset (C \cup B), (A \cup B) \subset (C \cup B)$
 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 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 $\begin{bmatrix} x & -3i & 1 \\ y & 1 & i \\ 0 & 2i & -1 \end{bmatrix} = 6 + 11i$, 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. $\{\phi, \{\lambda\}, \{\lambda, \mu\}, \{\lambda, \mu\}\}$
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. $(2)^{\text{th}}$ 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. $\det(-A) = (-1)^{\text{th}} \det A$
C. $\det(-A) = -\det A$
D. $\det(-A) = n \det A$
26. What is the least value of $25 \text{ coec}^2x + 36 \text{ sec}^2 x$?
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:

$$z = \frac{1 + 2i}{1 - (1 - i)^2}$$

A complex number is given by

29. What is the modulus of z ?
A. 4 B. 2

46. If the roots of the equation $x^2 + px + q = 0$ are $\tan 19^\circ$ 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 $\left| \frac{a\alpha + b\beta - ab}{\sqrt{a^2 + b^2}} \right|$.
- 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 point $(1, 3)$ 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. 3
 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 $2x + y + 2z$

96. If $\sin \theta + \cos \theta = \sqrt{2} \cos \theta$, then what is $(\cos \theta - \sin \theta)$ equal to?
- A. $-\sqrt{2} \cos \theta$ B. $-\sqrt{2} \sin \theta$
 C. $\sqrt{2} \sin \theta$ D. $\sin \theta$
97. In a circle of diameter 44 cm, the length of a chord is 22 cm. What is the length of minor arc of the chord?
- A. $\frac{484}{21}$ cm B. $\frac{242}{21}$ cm
 C. $\frac{121}{21}$ cm D. $\frac{44}{7}$ cm
98. If $\sin \theta = -\frac{1}{2}$ and $\tan \theta = \frac{1}{\sqrt{3}}$ then in which quadrant does θ lie?
- A. First B. Second
 C. Third D. Fourth
99. How many three-digit even numbers can be formed using the digits 1, 2, 3, 4 and 5 when repetition of digits is not allowed?
- A. 36 B. 30
 C. 24 D. 12
100. The angle of elevation of a tower of height h from a point A due South of it is x and from a point B due East of A is y . If $AB = z$, then which one of the following is correct?
- A. $h^2 (\cot^2 y - \cot^2 x) = z^2$
 B. $z^2 (\cot^2 y - \cot^2 x) = h^2$
 C. $h^2 (\tan^2 y - \tan^2 x) = z^2$
 D. $z^2 (\tan^2 y - \tan^2 x) = h^2$
101. From a deck of cards, cards are taken out with replacement. What is the probability that the fourteenth card taken out is an ace?
- A. $\frac{1}{51}$ B. $\frac{4}{51}$
 C. $\frac{1}{52}$ D. $\frac{1}{13}$
102. If A and B are two events such that $P(A) = 0.5$, $P(B) = 0.6$ and $P(A \cap B) = 0.4$, then what is $P(\overline{A \cup B})$ equal to?
- A. 0.9 B. 0.7
 C. 0.5 D. 0.3
103. A problem is given to three students A, B and C whose probabilities of solving the problem are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if they all solve the problem independently?
- A. $\frac{29}{32}$ B. $\frac{27}{32}$
 C. $\frac{25}{32}$ D. $\frac{23}{32}$
104. A pair of fair dice is rolled. What is the probability that the second dice lands on a higher value than does the first?
- A. $\frac{1}{4}$ B. $\frac{1}{6}$
 C. $\frac{5}{12}$ D. $\frac{5}{18}$
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 events 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:
- The algebraic sum of deviations of a set of values from their arithmetic mean is always zero.
 - 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. $P(A)P(B)$