MATHEMATICS

1. The real value of α for which the expression $\frac{1-i\sin\alpha}{1+2i\sin\alpha}$ is purely real is

(A) $(n + 1)\frac{\pi}{2}$ (B) $(2n + 1)\frac{\pi}{2}$
(C) $n\pi$ (D) none of these

2. If $e^{i\theta} = \cos\theta + i\sin\theta$, then for the triangle ABC, $e^{iA}.e^{iB}.e^{iC}$ is
(A) $-i$ (B) -1
(C) 1 (D) none of these

3 The value of $\sum_{r=1}^{16}\left(\sin\frac{2r\pi}{17}+i\cos\frac{2r\pi}{17}\right)$ is
(A) 1 (B) i
(C) $-i$ (D) -1

4. If $z = \frac{(\cos\theta+i\sin\theta)^n(\sin\theta+i\cos\theta)^m}{(\sin\theta-i\cos\theta)^k}$, then $|z|$ is
(A) 0 (B) 1
(C) 2 (D) none of these

5. If $x = \cos 2\alpha + i\sin 2\alpha$, $y = \cos 2\beta + i\sin 2\beta$, $z = \cos 2\gamma + i\sin 2\gamma$, then $\sqrt{xyz}+\frac{1}{\sqrt{xyz}}$ is

(A) $2\cos(\alpha + \beta + \gamma)$ (B) $2i\sin(\alpha + \beta + \gamma)$
(C) $e^{i(\alpha+\beta+\gamma)}$ (D) None of these

6. A square matrix A is invertible iff detA is equal to
(A) 0 (B) 1
(C) non zero (D) -1

7. Which of the following is not true
(A) Every skew-symmetric matrix of odd order is non-singular
(B) If determinant of a square matrix is non-zero, then it is non-singular
(C) Adjoint of a symmetric matrix is symmetric
(D) Adjoint of a diagonal matrix is diagonal

8. If for $AX=B$, $B = \begin{bmatrix} 9 \\ 52 \\ 0 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 3 & -\frac{1}{2} & -\frac{1}{2} \\ -4 & \frac{3}{4} & \frac{5}{4} \\ 2 & -\frac{1}{4} & -\frac{3}{4} \end{bmatrix}$

the X is equal to

(A) $\begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix}$ (B) $\begin{bmatrix} -\frac{1}{2} \\ -\frac{1}{2} \\ 2 \end{bmatrix}$ (C) $\begin{bmatrix} -4 \\ 2 \\ 3 \end{bmatrix}$ (D) $\begin{bmatrix} 3 \\ \frac{3}{4} \\ -\frac{3}{4} \end{bmatrix}$

9. $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix} =$

(A) $a^2 + b^2 + c^2 - 3abc$ (B) 3ab
(C) 3a + 5b (D) 0.

10. If the system of equations kx + 3y – 4z = 0, x – ky + z = 0, 5x + 4y – 3z = 0 has a non – zero solution, then k =
(A) – 2, 6 (B) 1, -5
(C) – 1, 5 (D) none of these.

11. The value of x for which $\begin{vmatrix} x & 2 & 2 \\ 3 & x & 2 \\ 3 & 3 & x \end{vmatrix} + \begin{vmatrix} 1-x & 2 & 4 \\ 2 & 4-x & 8 \\ 4 & 8 & 16-x \end{vmatrix} > 33$ are

(A) $0 < x < 1$ (B) $-\frac{1}{2} < x < \frac{1}{2}$

(C) $x < -\frac{1}{7}$ or $x > 1$ (D) none of these.

12. If the roots of equations $ax^2 + bx + c = 0$ are of the form $\frac{\alpha}{\alpha-1}$ and $\frac{\alpha+1}{\alpha}$, then the value of $(a + b + c)^2$ is
(A) $b^2 - 4ac$ (B) $b^2 - 2ac$
(C) $2b^2 - ac$ (D) $4b^2 - 2ac$

13. The quadratic equation $8\sec^2 x - 6\sec x + 1 = 0$ has
(A) infinitely many roots (B) exactly two roots
(C) exactly four roots (D) no root.

14. If the equation $ax^2 + 2bx - 3c = 0$ has no real root and $\frac{3c}{4} < a + b$, then
(A) $c < 0$ (B) $c > 0$
(C) $c \geq 0$ (D) $c = 0$

15. If $\frac{x^2 - bx}{ax - c} = \frac{\lambda - 1}{\lambda + 1}$ has roots equal in magnitude and opposite in sign, then the value of λ is
(A) $\frac{a-b}{a+b}$ (B) $\frac{a+b}{a-b}$
(C) c (D) 1/c

16. If (x + 1) is a factor of $x^4 + (p - 3)x^3 - (3p - 5)x^2 + (2p - 9)x + 6$, then the value of P is
(A) -4 (B) 0
(C) 4 (D) 2

17. The number of diagonals that can be drawn by joining the vertices of an octagon is
(A) 28 (B) 48
(C) 20 (D) none

18. There are 10 roads to a village from a town. The number of different ways in which a villager can go to a town and return back is
(A) 25 (B) 20
(C) 10 (D) 100

19. The number of ways in which 8 men can use 8 pens, no pen remain unused is

(A) $^8P_8$
(B) $^8C_8$
(C) $^8C_8$
(D) 8

20. The number of ways in which four letters can be selected from the word 'APSARA'

(A) 2
(B) 7
(C) 5
(D) 10

21. Number of ways of selecting 7 players out of 12 players when 2 of them are always included

(A) $^{10}C_6$
(B) $^{10}C_5$
(C) $^{12}C_7$
(D) $^{10}C_7$

22 The coefficient of x^5 in the expansion of $(1 + x)^{21} + (1 + x)^{22} + \ldots\ldots\ldots + (1 + x)^{30}$ is

(A) $^{51}C_5$
(B) $^9C_5$
(C) $^{31}C_6 - {}^{21}C_6$
(D) $^{30}C_5 + {}^{20}C_5$.

23. If the coefficients of x^7 and x^8 in $\left(2+\frac{x}{3}\right)^n$ are equal then n is

(A) 56
(B) 55
(C) 45
(D) 15.

24. The sum of all the coefficients in the binomial expansion of $(x^2 + x - 3)^{319}$ is

(A) 1
(B) 2
(C) – 1
(D) 0.

25. The smallest positive integer n, for which $n! < \left(\frac{n+1}{2}\right)^n$ holds, is

(A) 1
(B) 3
(C) 2
(D) 4

26. If $x^a = x^{b/2}z^{b/2} = z^c$, then a, b, c are in

(A) A.P.
(B) G.P.
(C) H.P.
(D) none of these

27. If $x^{18} = y^{21} = z^{28}$, then 3, $3\log_y x$, $3\log_z y$, $7\log_x z$ are in

(A) A.P.
(B) G.P.
(C) H.P.
(D) none of these

28. The least value of 'a' for which $5^{1+x} + 5^{1-x}$, $\frac{a}{2}$, $25^x + 25^{-x}$ are three consecutive terms of an A.P. is

(A) 10
(B) 5
(C) 12
(D) none of these

29. If $A = 1 + r^a + r^{2a} + r^{3a} + \ldots\ldots \infty$ and $B = 1 + r^b + r^{2b} + r^{3b} + \ldots\ldots \infty$, then a/b is equal to

(A) $\log_{1-B}(1 - A)$
(B) $\log_{\frac{B-1}{B}}\left(\frac{A-1}{A}\right)$
(C) $\log_B A$
(D) none of these

30. If $a_1, a_2, a_3, \ldots\ldots$ is an A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$ then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to
(A) 909 (B) 75
(C) 750 (D) 900

31. The vector $\vec a = 3\hat j + 4\hat k$ is the sum of two vectors $\vec a_1$ and $\vec a_2 . \vec a_1$ is parallel to the vector $\vec b = \hat i + \hat j$ and $\vec a_2$ is perpendicular to $\vec b$. Vector $\vec a_1$ is equal to
(A) $\frac{3}{2}(\hat i + \hat j)$ (B) $\frac{1}{2}(\hat i + \hat j)$
(C) $\frac{2}{3}(\hat i + \hat j)$ (D) $\frac{1}{3}(\hat i + \hat j)$

32. If $\vec a + \vec b$ is at right angles to $\vec b$ and $2\vec b + \vec a$ is at right angles to $\vec a$, then
(A) $a = \sqrt{2b}$ (B) $a = 2b$
(C) $a = b$ (D) $2a = b$

33. A parallelogram is constructed with $\vec a$ and $\vec b$ as adjacent sides that $|\vec a| = a$ and $|\vec b| = b$. The vector which coincides with the altitude of the parallelogram and is perpendicular to vector $\vec a$ is
(A) $\vec b - \frac{(\vec a.\vec b)\vec a}{a^2}$ (B) $\vec a - \frac{(\vec a.\vec b)\vec b}{b^2}$
(C) $\vec a - \frac{(\vec a.\vec b)\vec b}{a^2}$ (D) $\vec b - \frac{(\vec a.\vec b)\vec a}{b^2}$

34. $(\vec a \times \vec b) \times (\vec a \times \vec c).\vec d$ equals
(A) $[\vec a\,\vec b\,\vec c](\vec b.\vec d)$ (B) $[\vec a\,\vec b\,\vec c](\vec a.\vec d)$
(C) $[\vec a\,\vec b\,\vec c](\vec c.\vec d)$ (D) None of these

35. $\vec a \times (\vec a \times (\vec a \times \vec b))$ equals
(A) $(\vec a.\vec a)(\vec a \times \vec b)$ B) $(\vec a.\vec a)(\vec b \times \vec a)$
(C) $(\vec b.\vec b)(\vec a \times \vec b)$ D) $(\vec b.\vec b)(\vec b \times \vec a)$

36. The probability that a card drawn out of a pack of 52 cards is a spade is
(A) $\frac{1}{2}$ (B) $\frac{1}{4}$
(C) $\frac{1}{13}$ (D) $\frac{2}{13}$

37. In a class of 10 students 4 are boys and rest are girls. The probability that a student selected will be girl is
(A) $\frac{1}{5}$ (B) $\frac{2}{3}$
(C) $\frac{3}{5}$ (D) $\frac{4}{5}$

38. If P(E) denotes the probability of an event E, then
(A) $P(E) \le 0$ (B) $P(E) \ge 1$
(C) $0 \le P(E) \le 1$ (D) $-1 \le P(E) \le 1$

39. From a group of 7 men and 7 ladies, a committee of 6 person is formed, x probability that the committee will consist of exactly 2 ladies is

(A) $\frac{4}{11}$ (B) $\frac{3}{11}$

(C) $\frac{2}{11}$ (D) $\frac{5}{11}$

40. If 6 boys and 6 girls sit in a row randomly then the probability that all the 6 girls sit together is

(A) $\frac{1}{61}$ (B) $\frac{3}{61}$

(C) $\frac{1}{132}$ (D) $\frac{3}{132}$

41. The join of the points (-3, -4) and (1, -2) is divided by y-axis in the ratio

(A) 1 : 3 (B) 2 : 3

(C) 3 :1 (D) 3 : 2

42 If the vertices of a triangle are (0, 0), (a, 0) and (a/2, $\sqrt{3}a/2$), the coordinates of the incentre of the triangle are

(A) $\left(\frac{a}{3}, \frac{a}{2\sqrt{3}}\right)$ (B) $\left(\frac{a}{2}, \frac{a\sqrt{3}}{6}\right)$

(C) $\left(\frac{a}{6}, \frac{a\sqrt{3}}{2}\right)$ (D) $\left(\frac{3a}{4}, \frac{\sqrt{3}a}{4}\right)$

43. The line $\frac{x}{3}+\frac{y}{4}=1$ meets the axis of y and axis of x at A and B respectively. A square ABCD is constructed on the line segment AB away from the origin, the coordinates of the vertex of the square farthest from the origin are

(A) (7, 3) (B) (4, 7)

(C) (6, 4) (D) (3, 8)

44. Through the point (13, 31) a straight line is drawn to meet the axes of x and y at Q and S respectively. If the rectangle OQRS is completed, the coordinates of R satisfy the equation

(A) $\frac{13}{x}+\frac{31}{y}=1$ (B) $\frac{31}{x}+\frac{13}{y}=1$

(C) $\frac{13}{x}-\frac{31}{y}=1$ (D) $\frac{31}{x}-\frac{13}{y}=1$

45. Area of the rhombus enclosed by the lines ax ± by ± c = 0 is

(A) $\frac{2a^2}{bc}$ (B) $\frac{2b^2}{ca}$

(C) $\frac{2c^2}{ab}$ (D) none of these

46. If (x, 3) and (3, 5) are the extremities of a diameter of a circle with centre at (2, y), then the values of x and y are

(A) x = 1, y = 4 (B) x = 4, y = 1

(C) x = 8, y = 2 (D) none of these

47. Circles are drawn through the point (2, 0) to cut intercept of length 5 units on the x- axis. If their centers lie in the first quadrant, then their equation is
(A) $x^2 + y^2 - 9x + 2fy + 14 = 0$
(B) $3x^2 + 3y^2 + 27x - 2fy + 42 = 0$
(C) $x^2 + y^2 - 9x - 2fy + 14 = 0$
(D) $x^2 + y^2 - 2fx - 9y + 14 = 0$

48. The equation of the circle which touches both the axes and the straight line 4x + 3y = 6 in the first quadrant and lies below it is
(A) $4x^2 + 4y^2 - 4x - 4y + 1 = 0$
(B) $x^2 + y^2 - 6x - 6y + 9 = 0$
(C) $x^2 + y^2 - 6x - y + 9 = 0$
(D) $4(x^2 + y^2 - x - 6y) + 1 = 0$

49. To which of the following circles, the line y – x + 3 = 0 is normal at the point $\left(3+\frac{3}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$
(A) $x^2 + y^2 - 6x + 4y + 8 = 0$
(B) $x^2 + y^2 - 4x + 7 = 0$
(C) $x^2 + y^2 - 4x - 6y + 8 = 0$
(D) none of these

50. The slope of the tangent at the point (h, h) of the circle $x^2 + y^2 = a^2$ is
(A) 0
(B) 1
(C) -1
(D) depends on h.

51. If a tangent to the parabola $y^2 = ax$ makes an angle 45^0 with x-axis, its point of contact will be
(A) $\left(\frac{a}{2}, \frac{a}{4}\right)$
(B) $\left(-\frac{a}{2}, \frac{a}{4}\right)$
(C) $\left(\frac{a}{4}, \frac{a}{2}\right)$
(D) $\left(\frac{-a}{4}, \frac{a}{2}\right)$

52. The slope of the normal at the point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is
(A) $\frac{1}{t}$
(B) t
(C) –t
(D) $-\frac{1}{t}$

53. The length of sub-normal to the parabola $y^2 = 4ax$ at any point is equal to
(A) $a\sqrt{2}$
(B) $2\sqrt{2}\,a$
(C) $\frac{a}{\sqrt{2}}$
(D) 2a

54. The normal drawn at a point $(at_1^2, 2at_1)$ of the parabola $y^2 = 4ax$ meets it again in the point $(at_2^2, 2at_2)$, then
(A) $t_1 = 2t_2$
(B) $t_1^2 = 2t_2$
(C) $t_1t_2 = -1$
(D) $t_2 = -t_1 - \frac{2}{t_1}$

55. The focus of the parabola $x^2 - 4x - 8y - 4 = 0$ are
(A) (0, 2)
(B) (2, 1)
(C) (1, 2)
(D) (-2, -1)

56. The equation of an ellipse whose focus is (-1, 1), whose directrix is x – y + 3 = 0 and whose $e = \frac{1}{2}$ is

(A) $7x^2 + 7y^2 + 2xy + 10x – 10y + 7 = 0$
(B) $7x^2 - 2xy + 7y^2 - 10x + 10y + 7 = 0$
(C) $7x^2 - 2xy + 7y^2 - 10x - 10y - 7 = 0$
(D) $7x^2 - 2xy + 7y^2 + 10x + 10y - 7 = 0$.

57. The foci of the ellipse $25 (x + 1)^2 + 9(y + 2)^2 = 225$ are at
(A) (-1, 2) and (-1, -6)
(B) (-1, 2) and (6, 1)
(C) (1, -2) and (1, 6)
(D) (-1, -2) and (1, 6)

58. The equations of the tangents of the ellipse $9x^2 + 16y^2 = 144$ which passes through the point (2, 3) is
(A) $y = 3, x + y = 5$
(B) $y = -3, x – y = 5$
(C) $y = 4, x + y = 3$
(D) $y = -4, x – y = 3$.

59. Equation of ellipse with foci (5, 0) and (-5, 0) and $5x – 36 = 0$ as one directrix, is
(A) $11x^2 + 36y^2 = 196$
(B) $11x^2 + 18y^2 = 396$
(C) $11x^2 + 18y^2 = 198$
(D) $11x^2 + 36y^2 = 396$

60. Centre of the hyperbola $x^2 + 4y^2 + 6xy + 8x – 2y + 7 = 0$ is
(A) (1, 1)
(B) (0, 2)
(C) (2, 0)
(D) none of these.

61. If 'e' is the eccentricity of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and 'θ' be the angle between the asymptotes, then $\cos\left(\frac{\theta}{2}\right)$ is equal to
(A) $\frac{1}{2}$
(B) $\frac{1}{e}$
(C) $\frac{1}{e^2}$
(D) none of these.

62. The reciprocal of the eccentricity of a rectangular hyperbola is
(A) 2
(B) $\frac{1}{2}$
(C) $\sqrt{2}$
(D) $\frac{1}{\sqrt{2}}$.

63. The value of $\sum_{K=1}^{6}\left(\sin\frac{2\pi K}{7} - i\cos\frac{2\pi K}{7}\right)$ is
(A) – 1
(B) 0
(C) – i
(D) i

64. The value of $4 \cos 20^0 - \sqrt{3} \cot 20^0$ is
(A) 1
(B) – 1
(C) $-\frac{1}{2}$
(D) none of these

65. The value of the expression $\sqrt{3}$ cosec 20^0 – sec 20^0
(A) 2
(B) $\frac{2 \sin 20^0}{\sin 40^0}$
(C) 4
(D) $\frac{4 \sin 20^0}{\sin 40^0}$

66. The value of $\cos\frac{\pi}{7} + \cos\frac{3\pi}{7} + \cos\frac{5\pi}{7}$ is equal to

(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$

(C) 1 (D) none of these

67. The maximum value of $12 \sin \theta - 9 \sin^2\theta$ is

(A) 3 (B) 4

(C) 5 (D) none of these

68. $\sin x + \sin^2 x + \sin^3 x = 1$, then $\cos^6 x - 4 \cos^4 x + 8 \cos^2 x$ is

(A) 3 (B) 4

(C) 2 (D) 1

69. If $\tan\theta \tan(\pi/3 + \theta) \tan(\pi/3 - \theta) = k \tan 3\theta$, then k is

(A) 1 (B) 1/3

(C) 3 (D) none of these

70. General solution of $\tan 5\theta = \cot 2\theta$ is

(A) $\theta = n\pi/7 + \pi/2$ (B) $\theta = n\pi/3$

(C) $\theta = n\pi/7 + \pi/14$ (D) $\theta = \frac{n\pi}{7} - \frac{\pi}{14}$

71. The shortest distance between the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-2}{1}$ and $\frac{x-4}{-2} = \frac{y-4}{0} = \frac{z-5}{3}$ is

(A) 5/2 (B) zero

(C) 4/3 (D) none of these

72. a = 2, b = 3, c = 5 in triangle ABC, then $\angle C =$

(A) $\pi/6$ (B) $\pi/3$

(C) $\pi/2$ (D) none of these

73. If $\frac{r}{r_1} = \frac{r_2}{r_3}$ then

(A) $A = 90^0$ (B) $B = 90^0$

(C) $C = 90^0$ (D) none of these

74. In any triangle; $b^2 \sin 2C + c^2 \sin 2B =$

(A) Δ (B) 2Δ

(C) 3Δ (D) 4Δ

75. If $\log x \geq 0$, then which is true

(A) $x \in [1, \infty)$ (B) $x \in (1/2, \infty)$

(C) $x \in (2, 7)$ (D) none of these

76. Let *R* be the relation over the set of integers such that *m R n* if and only if *m* is a multiple of *n*, then *R* is

(a) reflexive and transitive (b) symmetric

(c) an equivalence relation (d) none of these

77. A cricket ball of mass 200 grams moving with a velocity of 20 metres/sec. is brought to rest by a player in 0.1 sec. The average force applied by the player is

(a) 4×10^3 dynes (b) 4×10^4 dynes

(c) 4×10^5 dynes (d) 4×10^6 dynes

78. The constraints $-x_1+x_2\le1, -x_1+3x_2\le9, x_1\ge0, x_2\ge0$ define

(a) a bounded feasible region (b) unbounded feasible region

(c) both bounded and unbounded region (d) none of these

79. The coefficient of correlation between x and y is 0.6. u and v are two variables defined as $u=\frac{x-3}{2}, v=\frac{y-2}{3}$, then coefficient of correlation between u and v is

(a) 0.2 (b) 0.3 (c) 0.6 (d) 1

80. Simplified value of Boolean expression $x\,(x + y) + [(y' + x)\,y]'$ is

(a) 0 (b) x (c) y (d) 1

81. The slope of the tangent to the curve $y=\sqrt{4-x^2}$ at the point where the ordinate and the abscissa are equal, is

(a) –1 (b) 1 (c) 0 (d) none of these

82. On the curve $x^3=12y$ the abscissa changes at a faster rate than the ordinate. Then x belongs to the interval

(a) (–2, 2) (b) (–1, 1) (c) (0, 2) (d) none of these

83. If $a>b>0$, the minimum value of $a\sec\theta-b\tan\theta$ is

(a) $b-a$ (b) $\sqrt{a^2+b^2}$ (c) $\sqrt{a^2-b^2}$ (d) $2\sqrt{a^2-b^2}$

84. The maximum value of $\left(\frac{1}{x}\right)^{2x^2}$ is

(a) e (b) $\sqrt[e]{e}$ (c) 1 (d) none of these

85. $\lim\limits_{n\to\infty}\frac{2^k+4^k+6^k+.....+(2n)^k}{n^{k+1}}, k\ne-1,$ is equal to

(a) 2^k (b) $\frac{2^k}{k+1}$ (c) $\frac{1}{k+1}$ (d) none of these

86. If $af(x)+bf\left(\frac{1}{x}\right)=\frac{1}{x}-5, x\ne0, a\ne b,$ then $\int_1^2 f(x)dx$ equals

(a) $\dfrac{(\log 2-5)a+\dfrac{13}{2}b}{a^2-b^2}$ (b) $\dfrac{(\log 2-5)a+\dfrac{7b}{2}}{a^2-b^2}$

(c) $\dfrac{(5-\log 2)a+\dfrac{7b}{2}}{a^2-b^2}$ (d) none of these

87. The degree of the differential equation $\sqrt{1+\left(\dfrac{dy}{dx}\right)^2}=x^2$ is

(a) one (b) two (c) half (d) four

88. The solution of $(x+\log y)dy+ydx=0$ when $y(0)=1$ is

(a) $y(x-1)+y\log y=0$ (b) $y(x-1+\log y)+1=0$

(c) $xy+y\log y+1=0$ (d) none of these

89. Let $\vec{a}=\hat{i}-2\hat{j}+3\hat{k}, \vec{b}=2\hat{i}+3\hat{j}-\hat{k}$ and $\vec{c}=\lambda\hat{i}+\hat{j}+(2\lambda-1)\hat{k}$. If $\vec{c}$ is parallel to the plane of the vectors $\vec{a}$ and $\vec{b}$ then λ is

(a) 1 (b) 0 (c) –1 (d) 2

90. If $\overrightarrow{AB}=\vec{b}$ and $\overrightarrow{AC}=\vec{c}$ then the length of the perpendicular from A to the line BC is

(a) $\dfrac{|\vec{b}\times\vec{c}|}{|\vec{b}+\vec{c}|}$ (b) $\dfrac{|\vec{b}\times\vec{c}|}{|\vec{b}-\vec{c}|}$ (c) $\dfrac{1}{2}\dfrac{|\vec{b}\times\vec{c}|}{|\vec{b}-\vec{c}|}$ (d) none of these

91. Three dice are thrown simultaneously. The probability of getting a sum of 15 is

(a) $\dfrac{1}{72}$ (b) $\dfrac{5}{36}$ (c) $\dfrac{5}{72}$ (d) none of these

92. The probability that out of 10 persons, all born in April, at least two have the same birthday is

(a) $\dfrac{{}^{30}C_{10}}{(30)^{10}}$ (b) $1-\dfrac{{}^{30}C_{10}}{30!}$ (c) $\dfrac{(30)^{10}-{}^{30}C_{10}}{(30)^{10}}$ (d) none of these

93. The equation of the straight line passing through the origin and perpendicular to the lines $\dfrac{x+1}{-3}=\dfrac{y-2}{2}=\dfrac{z}{1}$ and $\dfrac{x-1}{1}=\dfrac{y}{-3}=\dfrac{z+1}{2}$ has the equation

(a) $x=y=z$ (b) $\dfrac{x}{4}=\dfrac{y}{3}=\dfrac{z}{6}$ (c) $\dfrac{x}{3}=\dfrac{y}{1}=\dfrac{z}{0}$ (d) none of these

94. The distance between the lines $\dfrac{x-4}{2}=\dfrac{y+1}{-3}=\dfrac{z}{6}$ and $\dfrac{x}{-1}=\dfrac{y-1}{3/2}=\dfrac{z+1}{-3}$ is

(a) $\sqrt{\dfrac{629}{7}}$ (b) $\sqrt{\dfrac{39}{7}}$ (c) $\dfrac{\sqrt{629}}{7}$ (d) none of these

95. Which of the following planes intersects the planes $x-y+2z=3$ and $4x+3y-z=1$ along the same line ?

(a) $11x+10y-5z=0$ (b) $7x+7y-4z=0$

(c) $5x+2y+z=2$ (d) none of these

96. Two finite sets *A* and *B* having *m* and *n* elements. The total number of relations *A* to *B* is 64, then possible values of *m* and *n* are :

(a) 2 and 4 (b) 2 and 3 (c) 2 and 1 (d) 64 and 1

97. If $A = \{x : x^2 - 3x + 2 = 0\}$, and *R* is a universal relation on *A*, then *R* is :

(a) {(1, 1), (2, 2)} (b) {(1, 1)}

(c) {ϕ} (d) {(1, 1), (1, 2), (2, 1), (2, 2)}

98. If the line of action of the resultant of two forces *P* and *Q* divides the angle between them in the ratio 1 : 2, then the magnitude of resultant is :

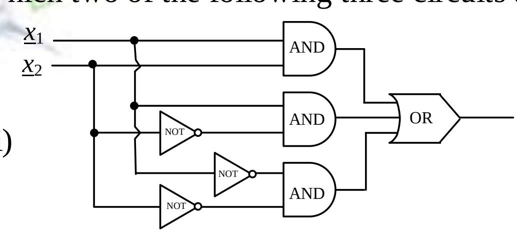
(a) $\frac{P^2 + Q^2}{P}$ (b) $\frac{P^2 + Q^2}{Q}$ (c) $\frac{P^2 - Q^2}{P}$ (d) $\frac{P^2 - Q^2}{Q}$

99. Two stones are projected from the top of a cliff *h* metres high with the same speed *u* so as to hit the ground at the same spot. If one of the stones is projected horizontally and the other is projected at an angle α to the horizontal, then tan θ is equal to

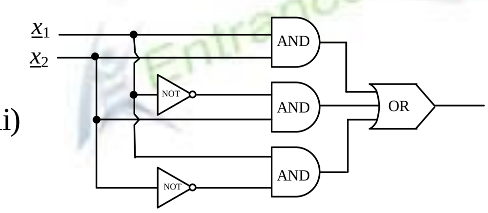
(a) $u\sqrt{\frac{2}{gh}}$ (b) $\sqrt{\frac{2u}{gh}}$ (c) $2g\sqrt{\frac{u}{h}}$ (d) $2h\sqrt{\frac{u}{g}}$

100. Which two of the following three circuits are equivalent?

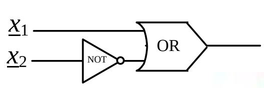
(i)



(ii)



(iii)



(a) (i) & (iii) (b) (i) & (ii)

(c) (ii) & (iii) (d) none of these