MATHEMATICS

1. In a non-leap year, the probability of having 53 Tuesdays or 53 Wednesdays is

(A) $\frac{4}{7}$ (B) $\frac{3}{7}$

(C) $\frac{2}{7}$ (D) $\frac{1}{7}$

2. If A and B are two sets such that $n(A-B)=24$, $n(B-A)=19$ and $n(A\cap B)=11$, then $n(A)$ is

(A) 35 (B) 43

(C) 30 (D) 13

3. The Cartesian equation of the plane perpendicular to the line $\frac{x-1}{2}=\frac{y-3}{-1}=\frac{z-4}{2}$ and passing through the origin is

(A) $2x-y+2z-7=0$ (B) $2x+y+2z=0$

(C) $2x-y+2z=0$ (D) $2x-y-z=0$

4. The area of the region bounded by the curve $y=\sin x$ between the coordinates $x=0, x=\frac{\pi}{2}$ and $y=0$ is

(A) 2 sq.unit (B) 4 sq.unit

(C) 3 sq.unit (D) 1 sq.unit

5. From the permutations made out of the letters of the word 'TRIANGLE', how many of them will begin with T and end with E ?

(A) 720 (B) 1350

(C) 2880 (D) 5400

6. If $t(1+x^2)=x$ and $x^2+t^2=y$, then at $x=2$, the value of $\frac{dy}{dx}$ is

(A) $\frac{488}{125}$ (B) $\frac{88}{125}$

(C) $\frac{101}{125}$ (D) None of these

7. If $\sin^2\theta = \frac{1}{4}$, then θ is equal to

(A) $n\pi \pm \frac{\pi}{6}$ (B) $n\pi \pm \frac{\pi}{3}$

(C) $n\pi \pm \frac{\pi}{4}$ (D) $n\pi$

8. If n is any positive integer, then the value of $\frac{i^{4n+1} - i^{4n-1}}{2}$ is equal to

(A) 1 (B) -1

(C) i (D) $-i$

9. From mean value theorem, $f(b) - f(a) = (b-a)f'(x_1)$, $a < x_1 < b$; if $f(x) = 1/x$, then x_1 is equal to

(A) $\sqrt{ab}$ (B) $\frac{a+b}{2}$

(C) $\frac{2ab}{a+b}$ (D) $\frac{b-a}{b+a}$

10. A die is rolled. If the outcome is an odd number, then the probabilty of getting a prime is

(A) $\frac{3}{4}$ (B) $\frac{2}{3}$

(C) $\frac{1}{2}$ (D) $\frac{1}{4}$

11. If $f(x) = \frac{1}{1-x}$, then $f[f\{f(x)\}]$ is equal to

(A) $\frac{x-1}{x}$ (B) $f(x)$

(C) x (D) $-f(x)$

12. If ${}^nP_r = 60$ and ${}^nC_r = 10$, then the value of r is

(A) 6 (B) 5

(C) 4 (D) 3

13. If A and B are any 2×2 matrices, then $|A+B|=0$ implies

(A) $|A|+|B|=0$ (B) $|A|=0$ or $|B|=0$

(C) $|A|=|B|=0$ (D) None of these

14. The number of ways in which a team of 11 players can be selected from 22 players, when two particular players are always selected and four particular players are always excluded

(A) ${}^{22}C_{11-2}$ (B) ${}^{16}C_{9}$

(C) ${}^{16}C_{11}$ (D) ${}^{20}C_{8}$

15. The solution of $(2x-10y^3)\frac{dx}{dy}+y=0$ is

(A) $xy^2 = 2y^5 + C$ (B) $x + y = Ce^{2x}$

(C) $y^2 = 2x^3 + C$ (D) $x(y^2 + xy) = 0$

16. A and B appear for an interview for two vacancies in the same post. The probability of A's selection is $\frac{1}{6}$ and that of B's selection is $\frac{1}{4}$. The probability that none is selected is

(A) $\frac{2}{5}$ (B) $\frac{3}{5}$

(C) $\frac{5}{8}$ (D) $\frac{1}{7}$

17. Let $\frac{d}{dx}F(x)=\frac{e^{\sin x}}{x}, x>0$. If $\int_1^4 \frac{3}{x}e^{\sin x^3}dx = F(k)-F(1)$, then one possible value of k is

(A) 15 (B) 16

(C) 63 (D) 64

18. The solution of $\sqrt{3}x^2-\sqrt{2}x+3\sqrt{3}=0$ is

(A) $\frac{\sqrt{2}+i\sqrt{34}}{2\sqrt{3}},\frac{\sqrt{2}-i\sqrt{34}}{2\sqrt{3}}$ (B) $\frac{-\sqrt{2}+i\sqrt{34}}{2\sqrt{3}},\frac{-\sqrt{2}-i\sqrt{34}}{2\sqrt{3}}$

(C) $\frac{2+i\sqrt{34}}{2\sqrt{3}},\frac{2-i\sqrt{34}}{2\sqrt{3}}$ (D) $\frac{2+i\sqrt{34}}{\sqrt{3}},\frac{2-i\sqrt{34}}{\sqrt{3}}$

19. In a ΔABC, if $a=2, b=3$ and $\sin A = \frac{2}{3}$, then $\angle B$ is equal to

(A) 45^{o} (B) 60^{o}

(C) 90^{o} (D) 120^{o}

20. If $f(x) = \begin{cases} ax^2 + b, \ b \neq 0, \ x \leq 1 \\ bx^2 + ax + c, \ \text{if} \ \ x > 1 \end{cases}$

then $f(x)$ is continuous and differentiable at $x = 1$ if

(A) $c = 0$, $a = 2b$ (B) $a = c, c \in R$

(C) $a = b, c = 0$ (D) $a = b, c \neq 0$

21. For a 3×3 matrix A, if $|A| = 4$, then $|adjA|$ equals

(A) -4 (B) 4

(C) 16 (D) 64

22. The equation of the straight line passing through the point (1,2) and perpendicular to the line $x + y + 1 = 0$ is

(A) $y - x + 1 = 0$ (B) $y - x - 1 = 0$

(C) $y - x + 2 = 0$ (D) $y - x - 2 = 0$

23. If A is a square matrix of order n and λ is a scalar, then $|\lambda A|$ is

(A) $\lambda|A|$ (B) $|\lambda||A|$

(C) $\lambda^{n}|A|$ (D) None of these

24. Let A be the set of all real numbers and let R be a relation in A defined by $R = \{ (a, b) : a \leq b^2 \}$, then R is

(A) Reflexive

(B) Symmetric

(C) Transitive

(D) Not reflexive, symmetric and transitive

25. The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5, 5), (15, 15), (0, 20). Let $Z = px + qy$, where $p, q > 0$. Condition on p and q so that the maximum of Z occurs at both the points (15, 15) and (0, 20) is

(A) $p = q$ (B) $p = 2q$

(C) $q = 2p$ (D) $q = 3p$

26. If ${}^{n}C_{14} = {}^{n}C_{16}$, the value of n is

(A) 32 (B) 30

(C) 14 (D) 12

27. If $y = (x^x)^x$, then $\frac{dy}{dx}$ is equal to

(A) $xy\,(1 + \log x)$ (B) $xy\,(1 + 2\log x)$

(C) $\frac{x}{y}\,(1 + \log x)$ (D) $\frac{x}{y}\,(1 + 2\log x)$

28. The locus of a point which moves so that its distance from a fixed point, called focus, bears a constant ratio, which is less than unity, to its distance from a fixed line, called the directrix is called

(A) a parabola (B) a hyperbola

(C) an ellipse (D) a circle

29. The tangent to a given curve is perpendicular to x-axis if

(A) $\frac{dy}{dx} = 0$ (B) $\frac{dy}{dx} = 1$

(C) $\frac{dx}{dy} = 0$ (D) $\frac{dx}{dy} = 1$

30. The expression $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x}$ can be reduced to

(A) $\cot 3x$ (B) $\tan 4x$

(C) $\cot 5x$ (D) None of these

31. x^x has a stationary point at

(A) $x = e$ (B) $x = 1/e$

(C) $x = 1$ (D) $x = \sqrt{e}$

32. Consider the planes $3x-6y-2z=15$ and $2x+y-2z=5$

Statement-1 : The parametric equations of the line of intersection of the given planes are $x=3+14t, y=1+2t, z=15t$, where t being the parameter.

Statement-2 : The vector $14\vec{i}+2\vec{j}+15\vec{k}$ is parallel to the line of intersection of given planes.

(A) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.

(C) Statement-1 is true, Statement-2 is false.

(D) Statement-1 is false, Statement-2 is true.

33. The radius of a circular soap bubble is increasing at the rate of 0.2 cm/s. Then the rate of increase in its surface area when the radius is 7 cm, will be

(A) $35.2\, cm^2/s$ (B) $11.2\, cm^2/s$

(C) $24\, cm^2/s$ (D) $42.5\, cm^2/s$

34. The tangent to the curve $y=e^{2x}$ at the point (0,1) meets the *x*-axis at

(A) (0, 0) (B) (2, 0)

(C) $(-\frac{1}{2}, 0)$ (D) None of these

35. The perpendicular bisector of the line segment joining P(1,4) and Q(*k*,3) has *y* intercept -4. Then

(A) $k=\pm 3$ (B) $k=\pm 4$

(C) $k=\pm 5$ (D) $k=5$

36. If *A* and *B* are symmetric matrices, then *ABA* is

(A) symmetric (B) skew symmetric

(C) diagonal (D) triangular

37. The following are the marks obtained by 9 students in mathematics test :

50, 69, 20, 33, 53, 39, 40, 65, 59. The mean deviation from the median is

(A) 9 (B) 10.5

(C) 12.67 (D) 14.76

38. The eccentricity of the hyperbola $x^2 - y^2 = 9$ is

(A) less than 1 (B) 1

(C) $\sqrt{2}$ (D) None of these

39. If $\cot^{-1}\left(-\frac{1}{5}\right) = \theta$, then $\sin\theta$ is equal to

(A) $\frac{5}{26}$ (B) $\frac{5}{\sqrt{26}}$

(C) $\frac{26}{\sqrt{5}}$ (D) $\frac{25}{5}$

40. Statement-1 : The circle $x^2 + y^2 - 8x - 4y + 16 = 0$ touches the x-axis at the point (4, 0)

Statement-2 : The circle $(x - x_1)^2 + (y - r)^2 = r^2$ touches the x-axis at the point $(x_1, 0)$

(A) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.

(C) Statement-1 is true, Statement-2 is false.

(D) Statement-1 is false, Statement-2 is true.

41. $\int e^{Kx}\{K.f(x) + f'(x)\}dx$ is equal to

(A) $e^x Kf(x) + C$ (B) $e^{Kx} f(x) + C$

(C) $e^K xf'(x) + C$ (D) $e^{Kx} f''(x) + C$

42. If $P(A \cup B) = P(A \cap B)$ for any two events A and B, then

(A) $P(A) = P(B)$ (B) $P(A) > P(B)$

(C) $P(A) < P(B)$ (D) None of these

43. Which of the following does not have a proper subset ?

(A) $\{x : x \in \square\}$ (B) $\{x : x \in \square, 3 < x < 4\}$

(C) $\{x : x \in \square, 3 < x < 4\}$ (D) None of these

44. The mean of the numbers $a, b, 8, 5, 10$ is 6 and variance is 6.80. Then

(A) $a = 3$ and $b = 7$ (B) $a = 4$ and $b = 7$

(C) $a = 5$ and $b = 3$ (D) $a = 3$ and $b = 4$

45. The acute angle between the lines $x - 2y + 3 = 0$ and $3x + y - 1 = 0$ is

(A) $\tan^{-1}(7)$ (B) $\tan^{-1}(4)$

(C) $\tan^{-1}(9)$ (D) $\tan^{-1}(5)$

46. Statement-1 : The probability of drawing either an ace or a king from a pack of 52 playing cards in a single draw is $\frac{1}{13}$.

Statement-2 : If A and B are two events, then $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

(A) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.

(C) Statement-1 is true, Statement-2 is false.

(D) Statement-1 is false, Statement-2 is true.

47. Let A and B be events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$ and $P(A \cap B) = \frac{1}{5}$, then $P\left(\bar{B}/\bar{A}\right)$ is

(A) $\frac{23}{30}$ (B) $\frac{37}{40}$

(C) $\frac{38}{53}$ (D) $\frac{37}{55}$

48. The value of $\int_{-\pi/2}^{\pi/2} \sin^7 x dx$ is

(A) 1 (B) 0

(C) 7 (D) -1

49. If $\vec{a} = 3\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = 6\hat{i} + 4\hat{j} - 2\hat{k}$ and $\vec{c} = 3\hat{i} - 2\hat{j} - 4\hat{k}$, then $\vec{a}.(\vec{b} \times \vec{c})$ is

(A) -120 (B) 120

(C) 118 (D) 122

50. Let $A = \{10, 11, 12, 14, 26\}$ and let $f : A \rightarrow N : f(n) =$ highest prime factor of n. The range of f is

(A) $\{3, 5, 7, 11, 13\}$

(B) $\{10, 12, 14, 26\}$

(C) $\{11\}$

(D) None of these

51. The area bounded by the curve $y^2 = 9x$ and the lines $x = 1, x = 4$ and $y = 0$ in the first quadrant is

(A) 7 sq. unit

(B) 14 sq. unit

(C) 28 sq. unit

(D) 25 sq. unit

52. A set is said to be a convex set, if every point on the line segment joining any two points in it lies in it. Which of the following is convex set ?

(A) $\{(x, y) : x^2 + y^2 \geq 1\}$

(B) $\{(x, y) : 4 \leq x^2 + y^2 \leq 9\}$

(C) $\{(x, y) : 2x^2 + 3y^2 \leq 6\}$

(D) None of these

53. Let A and B be the coefficient matrix and constant matrix of a given system of equation. Then the system has infinitely many solutions if

(A) $|A| = 0$ and $(adjA)B = 0$

(B) $|A| \neq 0$ and $(adjA)B = 0$

(C) $|A| = 0$ and $(adjA)B \neq 0$

(D) $|A| \neq 0$ and $(adjA)B \neq 0$

54. If $\vec{a}$ and $\vec{b}$ are unit vectors such that $\vec{a}.\vec{b} = \cos\theta$, then the value of $|\vec{a} + \vec{b}|$ is

(A) $2\sin\frac{\theta}{2}$

(B) $2\sin\theta$

(C) $2\cos\frac{\theta}{2}$

(D) $2\cos\theta$

55. If a, b, c are in A.P as well as in G. P then

(A) $a = b \neq c$

(B) $a = b = c$

(C) $a \neq b = c$

(D) $a \neq b \neq c$

56. Let R,S and T be three non-collinear points on the plane with position vectors $\vec{a},\vec{b}$ and $\vec{c}$ respectively ; and let $\vec{r}$ be the position vector of any point on the plane. Then the equation of the plane passing through R, S and T is

(A) $(\vec{r}-\vec{a}).[\vec{b}\times\vec{c}]=0$

(B) $(\vec{r}-\vec{a}).[(\vec{b}-\vec{a})\times(\vec{c}-\vec{a})]=0$

(C) $\vec{r}.[(\vec{b}-\vec{a})\times(\vec{c}-\vec{a})]=0$

(D) $\vec{a}.[(\vec{b}-\vec{r})\times(\vec{c}-\vec{r})]=0$

57. The value of the integral $\int_0^1 e^{x^2}dx$ lies in

(A) less than *e* and greater than 1

(B) greater than *e* and less than 1

(C) less than 1 and greater than 0

(D) none of these

58. If $\lim_{x\to 1}\frac{x^4-1}{x-1}=\lim_{x\to k}\frac{x^3-k^3}{x^2-k^2}$, then *k* is equal to

(A) $\frac{2}{3}$

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

(C) $\frac{8}{3}$

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

59. $\frac{d}{dx}\left(\sqrt{e^{\sqrt{x}}}\right)$ is equal to

(A) $\frac{e^{\sqrt{x}}}{4\sqrt{x}}$

(B) $\frac{e^{\frac{1}{2}\sqrt{x}}}{4\sqrt{x}}$

(C) $\frac{e^{\frac{1}{4}\sqrt{x}}}{\sqrt{x}}$

(D) $\frac{4e^{\sqrt{x}}}{\sqrt{x}}$

60. Let $A=\{1,2,3,4,6\}$ and let $R=\{(a,b):a,b\in A \text{ and } a \text{ divides } b\}$. The range of R is

(A) {2,4,6}

(B) {1,3}

(C) {1,2,3,4,6}

(D) {1,3,6}

61. A function $f(x)=(x-1)e^x+1$ for all $x>0$ is

(A) strictly decreasing

(B) strictly increasing

(C) increasing and decreasing

(D) neither increasing nor decreasing

Paragraph for question numbers 62 to 64

Consider the lines $L_1 : \dfrac{x+1}{-3} = \dfrac{y-3}{2} = \dfrac{z+2}{1}$ and $L_2 : \dfrac{x}{1} = \dfrac{y-7}{-3} = \dfrac{z+7}{2}$

62. The lines L_1 and L_2 are

(A) Perpendicular (B) Coplanar

(C) Parallel (D) None of these

63. The lines L_1 and L_2 intersect at the point

(A) $(2,1,-3)$ (B) $(-3,2,1)$

(C) $(1,-3,2)$ (D) (2,2,2)

64. Equation of a plane containing L_1 and L_2 is

(A) $x+y+z=0$

(B) $3x-2y-z=0$

(C) $x-3y+2z=0$

(D) there is no plane containing L_1 and L_2

65. In an Arithmetic Progression, if $T_a = b$, $T_{a+b} = 0$, then T_b is

(A) a (B) $-a$

(C) $a+b$ (D) $a - b$

66. If the line $\vec{r} = \vec{a} + \lambda \vec{m}$ lies in the plane $\vec{r}.\vec{n} = d$, then

(A) $\vec{m}.\vec{n} = 0$ and $\vec{a}.\vec{n} = d$ (B) $\vec{m}.\vec{n} \neq 0$ and $\vec{a}.\vec{n} = 0$

(C) $\vec{m}.\vec{n} = 0$ and $\vec{a}.\vec{n} = 0$ (D) $\vec{m}.\vec{n} \neq 0$ and $\vec{a}.\vec{n} = d$

67. $\displaystyle\int \frac{\cot x}{\sin^{1/3} x} dx$ is equal to

(A) $-\dfrac{2}{\sin^3 x} + C$ (B) $\dfrac{3}{\sin^{1/3} x} + C$

(C) $-\dfrac{3}{\sqrt[3]{\sin x}} + C$ (D) None of these

68. If A is an invertible matrix, then $\det(A^{-1})$ is equal to

(A) 1 (B) $|A|$

(C) $\frac{1}{|A|}$ (D) -1

69. If $y = \sin^n x \cos nx$, then $\frac{dy}{dx}$ is equal to

(A) $n\sin^{n-1}x \cos(n+1)x$ (B) $n\sin^{n-1}x \sin(n+1)x$

(C) $n\sin^{n-1}x \cos(n-1)x$ (D) $n\sin^{n-1}x \cos nx$

70. The angle between the line $\frac{x+1}{2}=\frac{y-1}{1}=\frac{z-3}{-2}$ and the plane $x+y+1=0$ is

(A) 30° (B) 60°

(C) 45° (D) 120°

71. The value of the expression $\left(\sqrt{3}\sin 75^{\circ} - \cos 75^{\circ}\right)$ is

(A) $2\sin 15^{\circ}$ (B) $1+\sqrt{3}$

(C) $2\sin 105^{\circ}$ (D) $\sqrt{2}$

72. The derivation of the function $\cot^{-1}[(\cos 2x)^{1/2}]$ at $x = \frac{\pi}{6}$ is

(A) $\left(\frac{2}{3}\right)^{\frac{1}{2}}$ (B) $\left(\frac{1}{3}\right)^{\frac{1}{2}}$

(C) $3^{\frac{1}{2}}$ (D) $6^{\frac{1}{2}}$

73. If $\begin{vmatrix} p+x & p & x \\ p-x & p & x \\ p-x & p & -x \end{vmatrix} = 0$, then x is

(A) p (B) $2p$

(C) 0 (D) $3p$

74. If $\int f(x)dx = f(x)$, then

(A) $f(x) = x$ (B) $f(x) =$ constant

(C) $f(x) = 2x + C$ (D) $f(x) = e^x$

75. The negation of the statement "If I become a Chief Minister, then I will build a Dam" is

(A) I will not become a Chief Minister or I will build a Dam.

(B) I will become a Chief Minister and I will not build a Dam.

(C) Either I will not become a Chief Minister or I will not build a Dam.

(D) Neither I will become a Chief Minister nor I will build a Dam.

76. $\int \frac{2^x}{\sqrt{1-4^x}} dx$ is equal to

(A) $\log 2 \sin^{-1}(2^x) + C$

(B) $\frac{1}{\sin^{-1} 2^x}(\log x) + C$

(C) $\frac{1}{\log 2}\sin^{-1}(2^x) + C$

(D) $\frac{1}{\log 2^x}(\sin^{-1}) + C$

77. If p, q, r are in A. P , then p^{th}, q^{th}, r^{th} terms are in

(A) A.P

(B) G.P

(C) Reciprocals of these terms are in G.P

(D) None of these

78. $\int e^{-\log x} dx$ is equal to

(A) $-e^{-\log x} + C$

(B) $-xe^{-\log x} + C$

(C) $xe^{-\log x} + C$

(D) $\log |x| + C$

79. If $f(x) = 1 + x + \frac{x^2}{2} + ... + \frac{x^{100}}{100}$, then $f'(1)$ is equal to

(A) $\frac{1}{100}$

(B) 100

(C) 0

(D) 1

80. The integrating factor of the differential equation $\sin 2x \frac{dy}{dx} - y = \tan x$ is

(A) $\sqrt{\sin x}$

(B) $\sec x$

(C) $\tan x$

(D) $\frac{1}{\sqrt{\tan x}}$

81. Consider a binary operation * on N defined by $a * b = a^3 + b^3$, then

(A) * is commutative but not associative

(B) * is associative and commutative

(C) * is associative but not commutative

(D) * is neither commutative nor associative

82. If $\frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}=0$, then its solution is

(A) $\sin x + \sin y = C$

(B) $\frac{\sin^{-1} x}{\sin^{-1} y} = C$

(C) $\sin^{-1}x . \sin^{-1} y = C$

(D) $\sin^{-1}x + \sin^{-1}y = C$

83. If $\sin\theta+\cos\theta=\sqrt{2}\sin\theta$, then the value of $\sin\theta-\cos\theta$ is

(A) $\sqrt{2}\cos\theta$

(B) $-\sqrt{2}\sin\theta$

(C) $-\sqrt{2}\cos\theta$

(D) $\sqrt{2}\sin\theta$

84. If $\sin x=\frac{\sqrt{5}}{3}$ and $0<x<\frac{\pi}{2}$, then the value of $\cos 2x$ is

(A) -1

(B) $-\frac{1}{9}$

(C) 2

(D) $\frac{2\sqrt{5}}{3}$

85. In a binomial distribution, mean and variance are 12 and 3 respectively. Then number of trials is

(A) 16

(B) 15

(C) 12

(D) 10

86. The least positive integral value of m for which $\left(\frac{1+i}{1-i}\right)^m=1$ is

(A) 2

(B) 3

(C) 4

(D) 8

87. If 4th term in the expansion of $\left(ax+\frac{1}{x}\right)^n$ is $\frac{5}{2}$, then the value of a and n are

(A) $\frac{1}{2}, 6$

(B) 1, 3

(C) $\frac{1}{2}, 3$

(D) $\frac{1}{2}, \frac{1}{3}$

88. The co-efficient of $x^8 y^{10}$ in $(x + y)^{18}$ is

(A) 2^{18}

(B) ${}^{18}P_{10}$

(C) ${}^{18}C_8$

(D) ${}^{18}C_7$

Paragraph for question numbers 89 to 91

Let $P(2,3,-4)$ be a point on space and $\vec{b} = 2\hat{i} - \hat{j} + 2\hat{k}$ be a vector.

89. Vector equation of a plane passing through the point *P* perpendicular to the vector $\vec{b}$ is

(A) $\vec{r}.(2\hat{i} - \hat{j} + 2\hat{k}) = 7$ (B) $\vec{r}.(2\hat{i} - \hat{j} + 2\hat{k}) = -7$

(C) $\vec{r}.(2\hat{i} + 3\hat{j} - 4\hat{k}) = 7$ (D) $\vec{r}.(2\hat{i} + 3\hat{j} - 4\hat{k}) = -7$

90. Cartesian equation of the plane π passing through the point with position vector $\vec{b}$ and perpendicular to the vector $\overrightarrow{OP}$, O being origin is

(A) $2x - y + 2z + 7 = 0$ (B) $2x - y + 2z - 7 = 0$

(C) $2x + 3y - 4z + 7 = 0$ (D) $2x + 3y - 4z - 7 = 0$

91. The Cartesian equation of the line passing through the point with position vector $\vec{b}$ and parallel to the vector $\overrightarrow{OP}$, O being origin is

(A) $\frac{x-2}{2} = \frac{y-3}{-1} = \frac{z+4}{2}$ (B) $\frac{x-2}{2} = \frac{y+1}{3} = \frac{z-2}{-4}$

(C) $\frac{x}{2} = \frac{y+3}{1} = \frac{z-4}{-2}$ (D) None of these

92. If $\vec{a}$ and $\vec{b}$ are two unit vectors, then what is the angle between $\vec{a}$ and $\vec{b}$ for $\sqrt{3}\vec{a} - \vec{b}$ to be a unit vector ?

(A) 90° (B) 60°

(C) 45° (D) 30°

93. If $y = \sqrt{x + \sqrt{x + \sqrt{x + ...\infty}}}$, then $\frac{dy}{dx}$ is equal to

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

(C) $-\frac{1}{2y}$ (D) $\frac{1}{2y-1}$

94. If $\int x^6 \sin(5x^7)dx = \frac{K}{5}\cos(5x^7), x \neq 0$, then

(A) $K = 7$ (B) $K = -7$

(C) $K = \frac{1}{7}$ (D) $K = \frac{1}{-7}$

95. If $f\left(x+\frac{1}{x}\right)=x^2+\frac{1}{x^2}\,(x\neq 0)$, then $f(x)$ is equal to

(A) x^2

(B) $x^2 - 1$

(C) $x^2 - 2$

(D) x

96. A parabolic reflector is 9 cm deep and its diameter is 24 cm. The distance of the focus from the vertex is

(A) 2 cm

(B) 7 cm

(C) 5 cm

(D) 4 cm

97. The differential equation of all parabolas having vertex at the origin and axis along the positive direction of the x-axis is

(A) $y-2x\frac{dy}{dx}=0$

(B) $y^2-2y\frac{dy}{dx}=0$

(C) $y^2-2xy\frac{dy}{dx}=0$

(D) $y^2-2x^2y^2\frac{dy}{dx}=0$

98. If A and B are two matrices such that $A+B$ and AB are both defined, then

(A) A and B can be any matrices

(B) A, B are square matrices not necessarily of same order

(C) A, B are square matrices of same order

(D) No. of columns of A = No. of rows of B

99. If $\mathrm{A}+\mathrm{B}+\mathrm{C}=\pi$, then $\sin\mathrm{A}+\sin\mathrm{B}+\sin\mathrm{C}$ is equal to

(A) $4\cos\frac{\mathrm{A}}{2}\cos\frac{\mathrm{B}}{2}\cos\frac{\mathrm{C}}{2}$

(B) $\sin\mathrm{A}\sin\mathrm{B}\sin\mathrm{C}$

(C) $\frac{1}{4}\sin\frac{\mathrm{A}}{2}\sin\frac{\mathrm{B}}{2}\sin\frac{\mathrm{C}}{2}$

(D) $\frac{1}{2}\cos\mathrm{A}\cos\mathrm{B}\cos\mathrm{C}$

100. The solution set of $|x|<4$ is

(A) $]-4,4[$

(B) $]0,4[$

(C) $]-4,0[$

(D) $[-4,0[$

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