The West Bengal Central School Service Commission
2nd SLST 2025
MATHEMATICS
[CLASSES : IX - X]

1. If A = {*a, b, c, d*} then the number of non-empty proper subsets of A is

    (A) 14

    (B) 15

    (C) 16

    (D) 17

2. If the radial velocity of a particle is proportional to the transverse velocity, then the path is

    (A) a conic

    (B) an equiangular spiral

    (C) a cardiode

    (D) a straight line

3. Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = x^2$, $x \in \mathbb{R}$, then f is —

    (A) only injective

    (B) only surjective

    (C) both injective and surjective

    (D) neither injective nor surjective

4. Let (G, o) be a group. Define a mapping $f : G \to G$ by $f(x) = x^{-1}$, $x \in G$. Then f is —

    (A) only injective

    (B) only surjective

    (C) not well defined

    (D) bijective

5. The value of $\lim\limits_{(x, y) \to (0, 0)} \dfrac{xy}{x^2 + y^2}$ is

    (A) 1

    (B) $\dfrac{1}{2}$

    (C) $\dfrac{1}{4}$

    (D) does not exist

6. If x, y are real then the value of $|e^{x+iy}|$ is

   (A) e^x

   (B) $e^{|x|}$

   (C) $e^{\sqrt{x^2+y^2}}$

   (D) $e^{|x|+|y|}$

7. A line $\dfrac{x-1}{2} = \dfrac{y-2}{2} = \dfrac{z-4}{1}$ lies on the plane $ax - 3y + 5z + d = 0$ Then the value of 'a' is —

   (A) –1

   (B) 1

   (C) $\dfrac{1}{2}$

   (D) 3

8. The variance of 30 observations was found to be 10. If each observation is multiplied by 5 then the new variance of the observations will be

   (A) 50

   (B) 15

   (C) 250

   (D) 150

9. In the ring $(Q, +, \bullet)$

   (A) only 1 and –1 are units.

   (B) each element is unit.

   (C) only non-zero element is unit.

   (D) there is no unit element.

10. The equation $xy - px - qy + pq = 0$ represents $(p, q \in \mathbb{R})$

    (A) an ellipse

    (B) a circle

    (C) a hyperbola

    (D) a pair of straight lines

11. If we take $\pi = 3.14$ instead of 3.14159, then the absolute error correct upto 2 significant figures is

    (A) 0.15

    (B) 0.00159

    (C) 0.015

    (D) 0.0016

12. An integrating factor for the differential equation $(x + 1)\dfrac{dy}{dx} - y = e^{3x}(x + 1)^2$ is

    (A) $\dfrac{1}{(1+x)^2}$

    (B) $x + 1$

    (C) $\dfrac{1}{x^2 + 1}$

    (D) $x^2 + 1$

13. In an examination, 30% of the students failed in Mathematics, 15% failed in Chemistry and 10% failed in both Mathematics and Chemistry. A student is selected at random. If he has failed in Chemistry then the probability that he has passed in Mathematics is

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

(B) 1

(C) 0

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

14. Two eigenvectors of a square matrix A over a field F corresponding to two distinct eigenvalues of A are always

(A) equal

(B) independent

(C) dependent

(D) null

15. If $f : \mathbb{Z} \to \mathbb{Z}$ be defined by $f(n) = (-1)^n$, $n \in \mathbb{Z}$ and $g : \mathbb{Z} \to \mathbb{Z}$ is defined by $g(n) = 2n$, $n \in \mathbb{Z}$, then gof and fog are respectively

(A) $2(-1)^n$ and 1, $n \in \mathbb{Z}$

(B) 1 and $2(-1)^n$, $n \in \mathbb{Z}$

(C) 2 and $(-1)^n$, $n \in \mathbb{Z}$

(D) 1 and $(-1)^n$, $n \in \mathbb{Z}$

16. The envelope of the family of straight lines $y = mx + \sqrt{a^2 m^2 + b^2}$ (*a, b* are constants and *m* is the parameter)

(A) Circle

(B) Ellipse

(C) Hyperbola

(D) Parabola

17. If the roots of the equation $ax^2 + bx + c = 0$ (*a, b* ≠ 0) are in the ratio $r : 1$ then the value of $\frac{r}{(r+1)^2}$ is

(A) $\frac{bc}{a}$

(B) $\frac{ca}{b}$

(C) $\frac{ca}{b^2}$

(D) $\frac{bc}{a^2}$

18. $\int_0^{\pi/2} \sin^5 x\, dx =$

(A) 1

(B) $\frac{15}{8}$

(C) $\frac{8}{15}$

(D) $\frac{8}{15}\pi$

19. The value of

$$\lim_{n \to \infty}\left[\frac{n}{n^2}+\frac{n}{1^2+n^2}+\frac{n}{2^2+n^2}+...+\frac{n}{(n-1)^2+n^2}\right] \text{ is}$$

(A) $\frac{\pi}{4}$

(B) $\frac{\pi}{2}$

(C) $\frac{\pi}{6}$

(D) 1

20. If two straight lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect each other, then the value of k is

(A) $\frac{2}{9}$

(B) $\frac{9}{2}$

(C) 9

(D) – 1

21. For $A = (a_{ij})_{m \times n}$, $m, n > 1$, if $a_{ij} = 1$ for all i, j then rank (A) is

(A) 1

(B) 0

(C) Number of rows of A

(D) Number of columns of A

22. The equation $x^2 + xy + y^2 + x + y = 1$ represents

(A) an ellipse

(B) a hyperbola

(C) a parabola

(D) a pair of straight lines

23. If $|\vec{a}|=|\vec{b}|=|\vec{a}+\vec{b}|=1$ then $|\vec{a}-\vec{b}|$ is equal to

(A) $\sqrt{2}$

(B) $\sqrt{3}$

(C) $2\sqrt{3}$

(D) $\sqrt{5}$

24. The Trapezoidal rule applied to $\int_0^2 f(x)dx$ gives the value 4 and Simpson's $\frac{1}{3}$ rule gives the value 2. Then $f(1)$ is

(Given, h = length of subinterval = 1)

(A) 1

(B) 0

(C) –1

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

25. Given that $x = A\cos(pt - \alpha)$ where A, p, α are constants, then the false statement is —

    (A) $\dfrac{d^2x}{dt^2} = -p^2x$

    (B) $\dfrac{d^3x}{dt^3} = -p^2\dfrac{dx}{dt}$

    (C) $\dfrac{d^2x}{dt^2} = px^2$

    (D) $x = f(t)$, for some function f

26. Let $S = \{(x, y, z) \in \mathbb{R}^3 : x + y + z = 1\}$ and

    $T = \{(x, y, z) \in \mathbb{R}^3 : x = z = 0\}$. Then

    (A) S is a subspace of $\mathbb{R}^3$ but not T.

    (B) T is a subspace of $\mathbb{R}^3$ but not S.

    (C) neither S nor T is a subspace of $\mathbb{R}^3$.

    (D) both S and T are subspaces of $\mathbb{R}^3$.

27. If a, b are real then the value of $\tan\left(i\log\dfrac{a - ib}{a + ib}\right)$ is

    (A) $\dfrac{2ab}{a^2 - b^2}$

    (B) $\dfrac{ab}{a^2 + b^2}$

    (C) $\dfrac{ab}{a^2 - b^2}$

    (D) $\dfrac{2ab}{a^2 + b^2}$

28. The set $\{(x_1, x_2) : (x_1^2 + x_2^2 \le 1, x_1, x_2 \ge 0\}$ is

    (A) a convex set with two extreme points.

    (B) a convex set with infinite number of extreme points.

    (C) a convex set with no extreme point.

    (D) not a convex set.

29. A function $f : \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = |x|$. Then

    (A) f is differentiable at $x = 0$

    (B) f is differentiable everywhere on $\mathbb{R}$.

    (C) f is not differentiable only at x = 0.

    (D) f is not differentiable at any point of $\mathbb{R}$.

30. The number of real solutions of the equation $x^2 - 3|x| + 2 = 0$ is —

    (A) 0

    (B) 1

    (C) 2

    (D) 4

31. If $f(x) = \cos^2 x + \sec^2 x$ $(x \neq (2n+1)\dfrac{\pi}{2},\ n \in N \cup \{0\})$, then which one of the following is always true?

    (A) $f(x) < 1$

    (B) $f(x) = 1$

    (C) $1 < f(x) < 2$

    (D) f(x) > 2

32. In an abelian group, if $O(a) = 5$ and $O(b) = 7$ then $(ab)^{14}$ is equal to

    (A) a

    (B) a^{-1}

    (C) ab

    (D) b

33. If A and B be two $n \times n$ real square matrices and α be a real constant then which of the following is true?
    (A) $det\ (\alpha A + B) = \alpha\ det\ A + det\ B$
    (B) $det\ (\alpha A - B) = \alpha\ det\ A - det\ B$
    (C) $det\ (\alpha A \cdot B) = \alpha\ det\ A\ det\ B$
    (D) $det\ (\alpha A \cdot B) = \alpha^n\ det\ A\ det\ B$

34. The Simpson's $\dfrac{1}{3}$ Rule is applicable when number of subinterval is
    (A) Prime
    (B) Odd
    (C) Even
    (D) Multiple of 3

35. If the initial approximation (x_0) of a root of the equation $x^2 + x - 5 = 0$ is 2 then the next approximation (x_1) of the root is

    (A) $\dfrac{11}{5}$

    (B) $\dfrac{7}{5}$

    (C) $\dfrac{9}{5}$

    (D) $\dfrac{13}{5}$

36. If $f(x)$ is an even function then $\displaystyle\int_0^x f(t)\,dt$ is

    (A) an even function

    (B) an odd function

    (C) neither even nor odd function

    (D) zero function

37. The order of the differential equation whose general solution is $y = 2ax + a^2$ is

    (A) 1   (B) 2

    (C) 3   (D) undefined

38. An experiment consists in throwing a die 5 times and noting the number of sixes. The experiment was repeated 200 times with the following results:

No. of sixes:	0	1	2	3	4	5
Frequency:	58	86	40	14	2	0

Then the sample mean is

(A) 1.04

(B) 1.08

(C) 1.05

(D) 0.08

39. If A be a 2×2 non-singular square matrix then *adj (adj A)* is

(A) A^2

(B) A

(C) A^{-1}

(D) A^{-2}

40. The series $\sum\limits_{n=1}^{\infty} \dfrac{1}{n^p}$ is convergent when

(A) $p = 0$

(B) $p < 0$

(C) $p > 0$

(D) $p > 1$

41. For what value of x the vectors $x\hat{i} - 4\hat{j} + 5\hat{k}$, $\hat{i} + 2\hat{j} + \hat{k}$ and $2\hat{i} - \hat{j} + \hat{k}$ are coplanar?

(A) $\dfrac{3}{29}$

(B) $\dfrac{29}{3}$

(C) $\dfrac{20}{3}$

(D) 0

42. The set $S = \{(x,y,z) \in \mathbb{R}^3 : x^2 + y^2 = 0\}$ is

(A) not a subspace of $\mathbb{R}^3$

(B) a subspace of $\mathbb{R}^3$ and *dim(s) = 1*

(C) a subspace of $\mathbb{R}^3$ and *dim(s) = 2*

(D) a subspace of $\mathbb{R}^2$ and *dim(s) = 2*

43. The solution $(1, 1, 0, 2)$ to the system

$x_1 + x_2 + x_3 = 2$

$x_1 + x_2 - 3x_3 = 2$

$2x_1 + 4x_2 + 3x_3 - x_4 = 4$ is

(A) a basic feasible solution.

(B) a basic but not feasible solution.

(C) a non-degenerate basic feasible solution.

(D) not a basic solution.

44. A function $f: \mathbb{R} \to \mathbb{R}$ is defined by

$f(x) = 2x, x \in \mathbb{Q}$

$= 1 - x, x \in \mathbb{R} \setminus \mathbb{Q}$

then

(A) f is continuous at every point of $\mathbb{R}$.

(B) f is continuous at $x = \dfrac{1}{2}$.

(C) f is continuous at $x = \dfrac{1}{3}$.

(D) f is continuous at $x = 0$.

45. $\displaystyle\int_0^{\pi/2} \dfrac{\sin x}{\sin x + \cos x}\,dx =$

(A) $\dfrac{\pi}{2}$

(B) $\dfrac{\pi}{4}$

(C) $\dfrac{1}{2}$

(D) 1

46. The value of the integral $\displaystyle\int_e^{e^2} \dfrac{dx}{x \log x}$ is

(A) 1

(B) log 2

(C) 2log 2

(D) $\dfrac{1}{\log 2}$

47. For a rectilinear motion of a particle if an Impulse I changes its velocity from u to v and E is the change of kinetic energy, then

(A) $E = I\left(\dfrac{2u + 3v}{5}\right)$

(B) $E = I\left(\dfrac{u + v}{2}\right)$

(C) $E = I\left(\dfrac{u + 2v}{3}\right)$

(D) $E = I\left(\dfrac{u + v}{5}\right)$

48. The equations of the straight lines bisecting the angles between the pair of lines $3x^2 + xy - 2y^2 = 0$ is

(A) $x^2 - 10xy - y^2 = 0$

(B) $x^2 + 10xy - y^2 = 0$

(C) $x^2 + 10xy + y^2 = 0$

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

49. In an LPP, the decision variables can take

    (A) any real values.

    (B) integer values only.

    (C) any non-negative real values.

    (D) non-negative integer values only.

50. If $n = 10$, $\sum x = 20$, $\sum x^2 = 200$ then the variance of the associated distribution is

    (A) 4

    (B) 16

    (C) 9

    (D) 3

51. The identity element on the set $\mathbb{Z}$ of integers under the binary operation '*' defined by $a * b = a + b + 1 \ \forall \ a, b \in \mathbb{Z}$ is

    (A) 0

    (B) – 1

    (C) 1

    (D) 2

52. Let $f(x, y)$ be defined on a domain D in the xy-plane and $(a, b) \in D$. Further, f_y exists in the neighbourhood of (a, b) and f_{yx} is continuous at (a, b), then

    (A) $f_{xy} = f_{yx}$, $\forall \ (x, y) \in D$

    (B) at the point (a, b), $f_{xy} \neq f_{yx}$

    (C) at the point (a, b) $f_{xy} = f_{yx}$

    (D) at the point (a, b) f_{xy} may not exist

53. If n is a positive integer >1 and z is a complex number satisfying the equation $z^n = (1 + z)^n$, then

    (A) $\text{Re}(z) \leq 0$

    (B) $\text{Re}(z) > 0$

    (C) $\text{Re}(z) = 1$

    (D) $\text{Im}(z) = 0$

54. Which of the following functions does not satisfy the conditions of Rolle's theorem in $[-1, 1]$?

    (A) x^2

    (B) $\dfrac{1}{x^2 + 4}$

    (C) $\dfrac{1}{x}$

    (D) $\sqrt{x^2 + 3}$

55. If pair of lines $x^2 - 2pxy - y^2 = 0$ and $x^2 - 2qxy - y^2 = 0$ be such that each pair bisects the angle between the other pair, then

(A) $pq = 1$

(B) $pq = -2$

(C) $p + q = -1$

(D) $pq = -1$

56. The curve $\dfrac{2}{r} = \dfrac{1}{2} + \dfrac{1}{4}\cos\theta$ represents

(A) a parabola

(B) a hyperbola

(C) an ellipse

(D) a straight line

57. The eigenvalues of a real skew symmetric matrix are only

(A) real number

(B) irrational number

(C) purely imaginary number or zero

(D) rational number

58. Which of the following statements is true?

(A) Every convergent sequence is bounded.

(B) Every bounded sequence is convergent.

(C) An unbounded sequence may be convergent.

(D) Every monotone sequence is convergent.

59. The direction cosine of the normal to the plane $Z = 5$ is

(A) (0, 0, 1)

(B) (1, 0, 0)

(C) (0, 1, 0)

(D) $\left(\dfrac{1}{\sqrt{2}}, \dfrac{1}{\sqrt{2}}, 0\right)$

60. The value of $\lim\limits_{n \to \infty}\left(1 + \dfrac{1}{n}\right)^n$ is

(A) a rational number

(B) an irrational number

(C) a natural number

(D) an integer

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