Centum team examinations

Public Examination 2024-2025

11th Standard

Maths

Date : 16-09-

Reg.No. : | | | | | | |

Exam Time : 03:00 Hrs

Total Marks :

I. Multiple Choice answer

20 x 1 =

1) Let f:R→R be defined by f(x) = 1 - |x|. Then the range of f is

(a) R (b) $(1,\infty)$ (c) $(-1,\infty)$ (d) $(-\infty,1]$

2) If A = {(x,y) : y = sin x, x ∈ R} and B = {(x,y) : y = cos x, x ∈ R} then A∩B contains

(a) no element (b) infinitely many elements (c) only one element (d) cannot be determined

3) If a and b are the real roots of the equation $x^2 - kx + c = 0$, then the distance between the points (a, 0) and (b, 0) is

(a) $\sqrt{k^2-4c}$ (b) $\sqrt{4k^2-c}$ (c) $\sqrt{4c-k^2}$ (d) $\sqrt{k-8c}$

4) If $\frac{kx}{(x+2)(x-1)} = \frac{2}{x+2} + \frac{1}{x-1}$, then the value of k is

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

5) If $\cos p\theta + \cos q\theta = 0$ and if $p \neq q$, then θ is equal to (n is any integer)

(a) $\frac{\pi(3n+1)}{p-q}$ (b) $\frac{\pi(2n+1)}{p\pm q}$ (c) $\frac{\pi(n\pm1)}{p\pm q}$ (d) $\frac{\pi(n+2)}{p+q}$

6) The maximum value of $4\sin^2 x + 3\cos^2 x + sin\frac{x}{2} + cos\frac{x}{2}$ is

(a) $4+\sqrt{2}$ (b) $3+\sqrt{2}$ (c) 9 (d) 4

7) The product of r consecutive positive integers is divisible by

(a) r! (b) (r-1)! (c) (r+1)! (d) r^r

8) Number of sides of a polygon having 44 diagonals is

(a) 4 (b) 4! (c) 11 (d) 22

9) The value of $\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \ldots . is$

(a) $\frac{e^2+1}{2e}$ (b) $\frac{(e+1)^2}{2e}$ (c) $\frac{(e-1)^2}{2e}$ (d) $\frac{e^2+1}{2e}$

10) The sum of an infinite GP is 18. If the first term is 6, the common ratio is

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{1}{6}$ (d) $\frac{3}{4}$

11) The slope of the line which makes an angle 45° with the line 3x- y = -5 are:

(a) 1, -1 (b) $\frac{1}{2}, -2$ (c) $1, \frac{1}{2}$ (d) $2, -\frac{1}{2}$

12) The image of the point (2, 3) in the line y = -x is

(a) (-3, -2) (b) (-3, 2) (c) (-2, -3) (d) (3, 2)

13) If $\begin{vmatrix} 2a & x_1 & y_1 \\ 2b & x_2 & y_2 \\ 2c & x_3 & y_3 \end{vmatrix} = \frac{abc}{2} \neq 0$, then the area of the triangle whose vertices are $\left(\frac{x_1}{a}, \frac{y_1}{a}\right), \left(\frac{x_2}{b}, \frac{y_2}{b}\right), \left(\frac{x_3}{c}, \frac{y_3}{c}\right)$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{4}abc$ (c) $\frac{1}{8}$ (d) $\frac{1}{8}abc$

14) If the square of the matrix $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is the unit matrix of order 2, then α, β and γ should satisfy the relation.

(a) $1 + \alpha^2 + \beta\gamma = 0$ (b) $1 - \alpha^2 - \beta\gamma = 0$ (c) $1 - \alpha^2 + \beta\gamma = 0$ (d) $1 + \alpha^2 - \beta\gamma = 0$

15) A vector $\overrightarrow{OP}$ makes 60° and 45° with the positive direction of the x and y axes respectively. Then the angle between $\overrightarrow{OP}$ and the z-axis is

(a) 45° (b) 60° (c) 90° (d) 30°

16) Two vertices of a triangle have position vectors $3\hat{i} + 4\hat{j} - 4\hat{k}$ and $2\hat{i} + 3\hat{j} + 4\hat{k}$. If the position vector of the centroid is $\hat{i} + 2\hat{j} + 3\hat{k}$, then the position vector o the third vertex is

(a) $-2\hat{i} - \hat{j} + 9\hat{k}$ (b) $-2\hat{i} - \hat{j} - 6\hat{k}$ (c) $2\hat{i} - \hat{j} + 6\hat{k}$ (d) $-2\hat{i} + \hat{j} + 6\hat{k}$

17) $\int \sin^3 x dx$ is

(a) $\frac{-3}{4}cos\ x - \frac{cos\ 3x}{12} + c$ (b) $\frac{3}{4}cos\ x + \frac{cos\ 3x}{12} + c$ (c) $\frac{-3}{4}cos\ x + \frac{cos\ 3x}{12} + c$ (d) $\frac{-3}{4}sin\ x - \frac{sin\ 3x}{12} + c$

18) If two events A and B are such that $P(\overline{A}) = \frac{3}{10}$ and $P(A \cap \overline{B}) = \frac{1}{2}$, then $P(A \cap B)$ is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$

19) $\int \frac{e^x\left(x^2 \tan^{-1} x + \tan^{-1} x + 1\right)}{x^2+1} dx$ is

(a) $e^x \tan^{-1}(x+1)+c$ (b) $\tan^{-1}(e^x)+c$ (c) $e^x \frac{(tan^{-1}x)^2}{2} + c$ (d) $e^x \tan^{-1} x+c$

20) The probability of two events A and B are 0.3 and 0.6 respectively. The probability that both A and B occur simultaneously is 0.18. The probability that neither A nor B occurs is

(a) 0.1 (b) 0.72 (c) 0.42 (d) 0.28

ll. Answer 7 question q.no 30 compula

7x 2 =

21) Discuss the following relations for reflexivity, symmetricity and transitivity:
Let A be the set consisting of all the members of a family. The relation R defined by "aRb if a is not a sister of b".

22) Find the principal solution and general solutions of the following : $\sin\theta = -\frac{1}{\sqrt{2}}$

23) Express each of the following sum or difference as a product.sin 50° + sin 20°.

24) Write the equation of the lines through the point (1,-1)
(i) parallel to x + 3y - 4 = 0
(ii) perpendicular to 3x + 4y = 6

25) Write the n^{th} term of the following sequences
$\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \frac{9}{10}$

26) Find the distance between the line 4x + 3y + 4 = 0 and a point.(7,−3)

27) If $A = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$, then compute A^4.

28) Represent graphically the displacement of 45cm 30°north of east.

29) Find a direction ratio and direction cosines of the following vectors $3\hat{i} - 4\hat{k}$

30) Find the value of n if $\frac{1}{8!} + \frac{1}{9!} = \frac{n}{10!}$

III.Answer 7 question Q.no 40 Complusary

10 x 3 =

31) Let P be the set of all triangles in a plane and R be the relation defined on P as aRb if a is similar to b. Prove that R is an equivalence relation.

32) Simplify by rationalising the denominator $\frac{7+\sqrt{6}}{3-\sqrt{2}}$

33) Prove that ap + q = 0 if $f(x) = x^3 - 3px + 2q$ is divisible by $g(x) = x^2 + 2ax + a^2$.

34) How many numbers can be formed using the digits 1, 2, 3, 4, 2, 1 such that, even digits occupies even place?

35) Prove that ${}^{10}C_2 + 2 \times {}^{10}C_3 + {}^{10}C_4 = {}^{12}C_4$

36) If O is origin and R is a variable point on $y^2 = 4x$, then find the equation of the locus of the mid-point of the line segment OR.

37) Show that $2x^2 + 3xy - 2y^2 + 3x + y + 1 = 0$ represents a pair of perpendicular lines.

38) If $\vec{a}, \vec{b}$ are unit vectors and θ is the angle between them, show that $tan\frac{\theta}{2} = \frac{|\vec{a}-\vec{b}|}{|\vec{a}+\vec{b}|}$

39) Integrate the following functions with respect to x : $\frac{cos2x}{sin^2 x cos^2 x}$

40) A bag contains 7 red and 4 black balls, 3 balls are drawn at random. Find the probability that (i) all are red (ii) one red and 2 black.

IV. Answer all the questions

7 x 5 =

41) a) Let A = {0,1, 2, 3}. Construct relations on A of the following types:
(i) not reflexive, not symmetric, not transitive.
(ii) not reflexive, not symmetric, transitive.

(OR)

b) Let f, g: $R \to R$ be defined as f (x) = 2x -|x| and g(x) = 2x + |x|. find f o g.

42) a) Show that $\sin^2\frac{\pi}{18} + \sin^2\frac{\pi}{9} + \sin^2\frac{7\pi}{18} + \sin^2\frac{4\pi}{9} = 2$

(OR)

b) Solve: $\frac{1}{5}|10x - 2| < 1$

43) a) Find λ, when the projection of $\vec{a} = \lambda\hat{i} + \hat{j} + 4\hat{k}$ on $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$ is 4 units.

(OR)

b) Integrate the following functions with respect to x : $\frac{1}{\sqrt{x+3}-\sqrt{x-4}}$

44) a) Find the last two digits of the number 7^{400}.

(OR)

b) An advertising executive is studying television viewing habits of married men and women during prime time hours. Based on the past viewing records he has determined that during prime time wives are watching television 60% of the time. It has also been determined that when the wife is watching television, 40% of the time the husband is also watching. When the wife is not watching the television, 30% of the time the husband is watching the television. Find the probability that
(i) the husband is watching the television during the prime time of television
(ii) if the husband is watching the television, the wife is also watching the television.

45) a) Find the value of $\begin{vmatrix} 1 & log_x y & log_x z \\ log_y x & 1 & log_y z \\ log_z x & log_z y & 1 \end{vmatrix}$ if x, y, z $\neq$ 1.

(OR)

b) The medians of a triangle are concurrent.

46) a) If $(n + 1)C_8 : (n - 3) P_4 = 57:16$, find n.

(OR)

b) Find the distance
between two points (5, 4) and (2, 0)

47) a) Derive projection formula from ; Law of cosines

(OR)

b) In the binomial coefficient of $(1+x)^n$ the Coefficients of the 5^{th}, 6^{th} and 7^{th} terms are in A.P find all values of n

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