MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 44

Mathematics

1. If α, β and γ are the roots of the equation $x^3 + x + 2 = 0$, then the equation whose roots are $(\alpha - \beta)(\alpha - \gamma), (\beta - \gamma)(\beta - \gamma)$ and $(\gamma - \alpha)(\gamma - \alpha)$ is

A. $x^3 - 6x^2 + 216 = 0$

B. $x^3 - 3x^2 + 112 = 0$

C. $x^3 + 6x^2 - 216 = 0$

D. $x^3 + 3x^2 - 112 = 0$

Answer: D

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2. (A) Number of values of a for which the common chord of the circles $x^2 + y^2 = 8$ and $(x - a)^2 + y^2 = 8$ subtends a right angle at the origin is

A. 0

B. 2

C. 5

D. 3

Answer: B

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3. If λ is the remainder when 2^{2021} is divided by 17, then the value of λ must be equal to

A. 3

B. 7

C. 13

D. 15

Answer: D

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4. Number of ways in which 5 boys and 4 girls can be arranged on a circular table such that no two girls sit together and two particular boys are always together: (A) 276 (B) 288 (C) 296 (D) 304

A. 288

B. 44

C. 720

D. 540

Answer: A

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5. Let $f(n, x) = \int n\cos(nx)dx$, with $f(n, 0) = 0$. If the expression $\Sigma_{x=1}^{89} f(1, x)$ simplifies to $\frac{\sin a \sin b}{\sin c}$, then the value of $\frac{b}{ac}$ is (where $a > b$)

A. 45

B. 89

C. $\frac{89}{45}$

D. $\frac{45}{89}$

Answer: C

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6. Consider $A = \int_0^{\frac{\pi}{4}} \frac{\sin(2x)}{x}dx$, then

A. $A > \frac{\pi}{2}$

B. $A = \frac{\pi}{2}$

C. $A < \frac{\pi}{2}$

D. $A > \pi$

Answer: C

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7. The locus of the mid - points of the chords of the hyperbola $3x^2 - 2y^2 + 4x - 6y = 0$ which are parallel to the line $y = 2x + 4$ is

A. $3x - 2y = 4$

B. $4x - 4y = 3$

C. $3y - 4x + 4 = 0$

D. $3x - 4y = 2$

Answer: A

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8. The difference between the maximum and minimum values of the function $f(x) = \sin^3 x - 3\sin x,\ \forall x \in \left[0, \frac{\pi}{6}\right]$ is

A. 2

B. $\frac{1}{2}$

C. $\frac{11}{8}$

D. $\frac{7}{6}$

Answer: C

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9. The solution of the differential equation $\frac{dy}{dx} = \frac{x - y}{x + 4y}$ is (where C is the constant of integration)

A. $xy + y^2 = x + C$

B. $xy - y^2 = x^2 + C$

C. $xy + 2y^2 = x^2 + C$

D. $2xy + 4y^2 = x^2 + C$

Answer: D

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10. The value of $\lim_{x \to 0} \frac{1 - \cos^3(\sin x)}{\sin x \sin(\sin x)\cos(\sin x)}$

A. $\frac{3}{2}$

B. 1

C. 0

D. 2

Answer: A

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11. Let the normals at points $A(4a, -4a)$ and $B(9a, -6a)$ on the parabola $y^2 = 4ax$ meet at the point

P. The equation of the nornal from P on $y^2 = 4ax$ (other than PA and PB) is

A. $5x + y - 135a = 0$

B. $5x - y + 115a = 0$

C. $5x + y + 115 = 0$

D. $5x - y - 115a = 0$

Answer: A

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12. The number of real solution(s) of the equation $\sin^{-1}\sqrt{x^2 - 5x + 5} + \cos^{-1}\sqrt{4x - x^2 - 3} = \pi$ is/are

A. one

B. two

C. zero

D. infinite

Answer: A

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13. ABC is an acute angled triangle with circumcenter O and orthocentre H. If AO=AH, then find the angle A.

A. 30°

B. 60°

C. 75°

D. 90°

Answer: B

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14. Consider a skew - symmetric matrix $A = \begin{bmatrix} a & b \\ -b & c \end{bmatrix}$ such that a, b and c are selected from the set $S = \{0, 1, 2, 3, \ldots\ldots\ldots\ldots 12\}$. If $|A|$ is divisible by 3, then the number of such possible matrices is

A. 4

B. 5

C. 6

D. 12

Answer: B

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15. Let $A = |a_{ij}|$ be a 3×3 matrix where $a_{ij} = \begin{cases} (i^j - j^i + 2ij)x & i < j \\ 1 & i > j,, \\ 0 & i = j \end{cases}$ then the minimum value of $|A|$ is equal to (where x is a real number)

A. $\frac{1}{4}$

B. $-\frac{8}{33}$

C. 7

D. $-\frac{4}{33}$

Answer: D

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16. Consider on experiment of a single throw of a pair of unbiased normal dice. Let three events $\varepsilon_1, \varepsilon_2$ and ε_3 are defined as follows ε_1 : getting prime numbered face on each dice

ε_2 : getting the same number on each dice

ε_3 : getting the sum of 4 on two dice which of the following is not true?

A. The probabilities $P(\varepsilon_1), P(\varepsilon_2), P(\varepsilon_3)$ are arithmetic progression.

B. The events εg_1 and ε_2 are dependent

C. $P\left(\frac{\varepsilon_3}{\varepsilon_1}\right) = \frac{2}{9}$

D. $P\left(\frac{\varepsilon_3}{\varepsilon_1}\right) = \frac{1}{9}$

Answer: C

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17. Which of the following statements is false when p is true and q is false?

A. $(p \Rightarrow q) \Leftrightarrow r$

B. $(\Leftrightarrow q) \Rightarrow r$

C. $(q \Rightarrow r) \Rightarrow p$

D. $(r \Rightarrow p) \Rightarrow q$

Answer: D

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18. For a comple number Z, if $|Z-1+i|+|Z+i|=1$, then the range of the principle argument of Z is (where principle arg $(Z) \in (-\pi, \pi]$)

A. $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$

B. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

C. $\left[-\frac{\pi}{2}, -\frac{\pi}{4}\right]$

D. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

Answer: C

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19. Let $f: A \to B$ is a function defined by $f(x) = \frac{2x}{1+x^2}$. If the function f(x) is a bijective function, than the correct statement can be

A. $A = B = [-1, 1]$

B. $A = B = [-2, 2]$

C. $A = [-1, 1], B = [-2, 2]$

D. $A = [-2, 2], B = [-1, 1]$

Answer: A

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20. Two data sets each of size 10 has the variance as 4 and k and the corresponding means as 2 and 4 respectively. If

the variance of the combined data set is 5.5, then the value of k is equal to

A. 5

B. 6

C. 4

D. 3

Answer: A

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21. If $S = 1(25) + 2(24) + 3(23) + \ldots\ldots\ldots\ldots + 24(2) + 25(1)$ then the value of $\frac{S}{900}$ is equal to

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22. The area (in sq. units) bounded by the curve $f(x) = \max(|x| - 1, 1 - |x|)$ with the x- axis from $x = -1$ to $x = 1$ is

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23. Let $f(x) = \tan^{-1}\left(\frac{x^3 - 1}{x^2 + x}\right)$, then the value of $17f'(2)$ is equal to

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24. Let $P(1, 2, 3)$ be a point in space and Q be a point on the line $\frac{x-1}{2} = \frac{y-3}{5} = \frac{z-1}{3}$ such that PQ is parallel to $5x - 4y + 3z = 1$. If the length of PQ is equal to k units, then the value of k^2 is equal to

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25. Let the lengths of the altitudes from the vertices $A(-1, 1), B(5, 2), C(3, -1)$ of ΔABC are p_1, p_2, p_3 units respectively then the value of $\frac{\left(\frac{1}{p_1}\right)^2 + \left(\frac{1}{p_3}\right)^2}{\left(\frac{1}{p_2}\right)^2}$ is equal to

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