MATHS

BOOKS - NTA MOCK TESTS

NTA TPC JEE MAIN TEST 100

Mathematics Single Choice

1. The sum of the binomial coefficients

$$\left(\frac{{}^{50}C_0}{1} + \frac{{}^{50}C_2}{3} + \frac{{}^{50}C_4}{5} + \ldots\ldots + \frac{{}^{50}C_{50}}{51}\right)$$ is equal to

A. $\frac{2^{50}}{51}$

B. $\frac{2^{50}}{51}$

C. $\frac{2^{51} - 1}{51}$

D. $\frac{2^{51} - 1}{50}$

Answer: A

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2. If s, s are the length of the perpendicular on a tangent from the I foci, a, a are those from the vertices, c is that from the centre and e is the eccentricity of the ellipse, $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, then $\frac{ss' - c^2}{aa' - c^2} =$

A. e

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

C. $\frac{1}{e^2}$

D. e^2

Answer: D

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3. If the truth values of statements p, q, rare True, True and False respectively

Statement-1: Statement

$-(p \vee q) \wedge (p \vee \sim r) \wedge (\sim p \vee \sim q)$ is false.

Statement-2 : For given truth values

$\sim(p \vee q)$ is false, $(p \vee \sim r)$ is true, $(\sim p \vee \sim q)$ is false.

A. Statement-1 is True, Statement-2 is True: Statement-2 is NOT a correct explanation for Statement-1

B. Statement - 1 is True, Statement -2 is True: Statement-2 is a correct explanation for Statement - 1

C. Statement-1 is True, Statement-2 is False

D. Statement - 1 is False, Statement -2 is True

Answer: B

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4. If ω is cube root of unity, then

$$\Delta = \begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} =$$

A. $x^3 + 1$

B. $x^3 + \omega$

C. $x^3 + \omega^2$

D. x^3

Answer: D

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5. If $f : [0, \infty) \to [0, \infty)$ is a function with $f(0) = 0$ and $f'(x) > 1 \forall x \in (0, \infty)$ then number of solution(s) of the equation f (x) = f' (x) is

A. 0

B. 1

C. 2

D. infinite

Answer: B

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6. The smallest set A such that

$A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$ is

A. $\{2, 3, 5\}$

B. $\{3, 5, 9\}$

C. $\{1, 2, 5, 9\}$

D. None of these

Answer: B

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7. Let T_n be n^{th} term of a sequence for $n = 1, 2, 3, 4, \ldots\ldots.$ If $3T_{n+1} = T_n$ and $T_4 = \frac{1}{81}$, then the value of $\sum_{n=1}^{\infty}\left(\frac{T_n.\,T_{n+1}}{T_{n+2}}\right)$ is equal to

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

B. 1

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

D. 0

Answer: C

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8. A card is lost from a pack of 52 playing cards. From the remainder of the pack,one card is drawn and is found to be spade. The probability that the missing card is a spade is

A. $\frac{5}{17}$

B. $\frac{4}{17}$

C. $\frac{3}{17}$

D. $\frac{2}{17}$

Answer: B

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9. The three lines through the origin with direction cosines $l_1, m_1, n_1, l_2, m_2, n_2,$ and l_3, m_3, n_3 are coplanar, if

A. $l_1(l_2 - l_3) + m_1(m_2 - m_3) + n_1(n_2 - n_3) = 0$

B.

$$l_1(m_2n_3 - m_3n_2) + m_1(n_2l_3 - n_3l_2) + n +_1 (l_2m_3 - l_3m_2) = 0$$

C. $\begin{vmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{vmatrix} = 0$

D. None of these

Answer: C

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10. Let the three sides of a trapezium are equal and each equal to 6 cm. If area of trapezium is maximum, then length of fourth side of trapezium is

A. 6 cm

B. 9 cm

C. 12 cm

D. 15 cm

Answer: C

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11. If $z + \frac{1}{z} = 2\cos\theta$, then the value of $\left|\left(z^{2n} - 1\right) / \left(z^{2n} + 1\right)\right|$

A. $|\tan n\theta|$

B. $\tan n\theta$

C. $|\cot n\theta|$

D. $\cot n\theta$

Answer: B

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12. $\lim_{x \to 0} \frac{(1 - \cos x)(3 + \cos 2x)}{x . \tan 2x} =$

A. 0

B. 1

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

D. -1

Answer: B

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13. Let $f(x) = \frac{\sqrt{sgn(\alpha x^2 + \alpha x + 1)}}{\cot^{-1}(x^2 - \alpha)}$. If f(x) is continuous for all $x \in R$ then number of integers in the range of α is

A. 0

B. 4

C. 5

D. 6

Answer: B

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14. The value of $\sqrt{2}\int \frac{\sin x dx}{\sin\left(x - \frac{\pi}{4}\right)}$ is equal to

A. $x - \log\left|\cos\left(x - \frac{\pi}{4}\right)\right| + c$

B. $x + \log\left|\cos\left(x - \frac{\pi}{4}\right)\right| + c$

C. $x - \log\left|\sin\left(x - \frac{\pi}{4}\right)\right| + c$

D. $x + \log\left|\sin\left(x - \frac{\pi}{4}\right)\right| + c$

Answer: D

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15. If tangents be drawn to the circle $x^2 + y^2 = 12$ at its points of intersection with the circle $x^2 + y^2 - 5x + 3y - 2 = 0$, then the tangents intersect at the point

A. $\left(-6, \frac{18}{5}\right)$

B. $\left(6, \frac{18}{5}\right)$

C. $\left(-6, -\frac{18}{5}\right)$

D. $\left(6, -\frac{18}{5}\right)$

Answer: D

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16. Let the area bounded by the x- axis, curve $y = \left(1 + \frac{8}{x^2}\right)$ and the ordinates x = 2 and x = 4 is "A" sq. unit and if the ordinate x = a divides the area into two equal parts, then the correct statement among the following is

A. A = 3 and a = 2

B. A = 2 and a = 1

C. $A = 4\sqrt{2}$ and $a = \sqrt{2}$

D. A=4 and $a = 2\sqrt{2}$

Answer: D

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17. In an examination, a pupil's average marks were 63 per paper. If he had obtained 20 more marks for his geography paper and 2 more marks for his History paper, his average per paper would have been 65, then the number of papers in the examination are

A. 8

B. 9

C. 10

D. 11

Answer: D

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18. The equation of image of pair of lines $y = |x - 1|$ in y-axis is :

A. $x^2 + y^2 + 2x + 1 = 0$

B. $x^2 - y^2 + 2x - 1 = 0$

C. $x^2 - y^2 + 2x + 1 = 0$

D. None of these

Answer: C

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19. If e_1 and e_2 are the roots of the equation $x^2 - ax + 2 = 0$ where $e_1, e_2$are the eccentricities of an ellipse and hyperbola respectively then the value of a belongs to

A. $(3, \infty)$

B. $(2, \infty)$

C. $(1, \infty)$

D. $(-\infty, 1) \cup (1, 2)$

Answer: A

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20. For every natural number n

A. $n > 2^n$

B. $n < 2^n$

C. $n \geq 2^n$

D. $n \leq 2^n$

Answer: B

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Mathematics Subjective Numerical

1. Let $g(x) = \log f(x)$ where f(x) is twice differentiable positive function on $(0, \infty)$ such that $f(x+1) = x f(x)$. Find $g''\left(\frac{3}{2}\right) - g''\left(\frac{1}{2}\right)$

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2. Between two junction stations A and B, there are 12 intermediate stations. Find the number of ways in which a train can be made to halt at 4 of these stations so that no two of these are consecutive

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3. If $A = \begin{bmatrix} 1 & \frac{1}{2} \\ 0 & 1 \end{bmatrix}$ and $A^{64} = \begin{bmatrix} 1 & 2^{\lambda} \\ 0 & 1 \end{bmatrix}$. Find the value of λ.

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4. Tangents are drawn to the hyperbola $x^2 - 9y^2 = 9$ from (3,2). Find the area of the triangle that these tangents form with their chord of contact.

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5. Let O be an interior point of ΔABC satisfying $\overrightarrow{OA} + 2\overrightarrow{OB} + 3\overrightarrow{OC} = \overrightarrow{0}$, then the ratio of the areas of ΔABC to

ΔAOC is

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6. If $f(x) = pe^{2x} + qe^{x} + rx$ satisfies $f(0) = -1, f'(\log 2) = 31, \int_0^{\log 4} \left(pe^{2x} + qe^{x}\right) dx = \frac{39}{2},$ then evaluate $p + q + 2r$

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7. Evaluate

$\cos^2 88^\circ + \cos^2 28^\circ - \cos 88^\circ \cos 28^\circ$

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8. Consider the equation

$\sin x \sin\left(x + \frac{\pi}{3}\right)\sin\left(x - \frac{\pi}{3}\right) + \frac{1}{4} = 0$,. The $x \in [0, 3\pi]$

sum of the values of r that satisfy the equation is $\left(\frac{m}{n}\right)\pi$, where G.C.D (m,n) =1 Find $\left[\frac{m}{n}\right]$ (where [] represents the greatest integer function.)

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9. Let $x^2 + y^2 + z^2 = r^2$. If $\tan^{-1}\left(\frac{xy}{zr}\right) + \tan^{-1}\left(\frac{yz}{xr}\right)$ then evaluate $+\tan^{-1}\left(\frac{zx}{yr}\right) = m\pi$

m.

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10. Find the degree of differential equation which satisfies

$\sqrt{1 - x^2} + \sqrt{1 - y^2} = a(x - y)$

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