MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 49

Mathematics

1. If $C_0, C_1, C_2, \ldots\ldots, C_{20}$ are the binomial coefficients in the expansion of $(1+x)^{20}$, then the value of $\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + \ldots\ldots + 19\frac{C_{19}}{C_{18}} + 20\frac{C_{20}}{C_{19}}$ is equal to (where C_r represetns $.^n C_r$)

A. 120

B. 210

C. 180

D. 240

Answer: B

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2. If one root is greater than 2 and the other root is less than 2 for the equation $x^2 - (k+1)x + \left(k^2 + k - 8\right) = 0$, then the value of k lies between

A. $(-2, 2)$

B. $(-2, 4)$

C. $(-2, 0)$

D. $(-2, 3)$

Answer: D

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3. If $a_1 + a_5 + a_{10} + a_{15} + a_{24} = 225$, then the sum of the first 24 terms of the arithmetic progression $a_1, a_2, a_3 \ldots\ldots\ldots$ is equal to

A. 450

B. 675

C. 900

D. 1200

Answer: C

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4. The value of $2\alpha + \beta\left(0 < \alpha, \beta < \frac{\pi}{2}\right)$, satisfying the equation $\cos\alpha\cos\beta\cos(\alpha+\beta) = -\frac{1}{8}$ is equal to

A. $\frac{5}{6}\pi$

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

C. π

D. $\frac{7\pi}{12}$

Answer: C

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5. A pole is situated at the centre of a regular hexagonal park. The angle of elevation of the top of the vertical pole when observed from each vertex of the hexagon is $\frac{\pi}{3}$. If the area of the circle circumscribing the hexagon is $27m^2$, then the height of the tower is

A. $3\sqrt{\frac{3}{\pi}}m$

B. $\frac{3}{\sqrt{\pi}}m$

C. $\sqrt{\frac{3}{\pi}}m$

D. $\frac{9}{\sqrt{\pi}}m$

Answer: D

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6. The value of $\lim_{n\to\infty}\frac{[x]+[2^2x]+[3^2x]+\ldots+[n^2x]}{1^2+2^2+3^2+\ldots.+n^2}$ is equal to (where $[x]$ represents the greatest integer part of x)

A. x

B. 2x

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

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

Answer: A

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7. Let $I = \int \frac{\cos^3 x}{1 + \sin^2 x} dx$, then I is equal to (where c is the constant of integration)

A. $2\tan^{-1}(x) + \sin x + c$

B. $2\tan^{-1}(\sin x) - \sin x + c$

C. $2\tan^{-1}(x) - x + c$

D. $2\tan^{-1}(\sin x) + \sin x + c$

Answer: B

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8. The slope of the tangent (other than the x - axis) drawn from the origin to the curve $y = (x-1)^6$ is

A. $\frac{6^5}{5^4}$

B. $-\frac{6^5}{5^5}$

C. $\frac{6^5}{5^5}$

D. $-\frac{6^6}{5^5}$

Answer: D

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9. The maximum value of the expression $\sin\theta\cos^2\theta(\forall\theta \in [0, \pi])$ is

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

B. $\frac{2}{\sqrt{3}}$

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

D. $\frac{1}{\sqrt{3}}$

Answer: C

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10. The area (in sq. units) bounded by $y = \begin{cases} e^x & : x \geq 0 \\ e^{-x} & : x \leq 0 \end{cases}$ with the axis from $x = -1$ to $x = 1$ is

A. e

B. 2e

C. $2e - 2$

D. $2e + 2$

Answer: C

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11. The slope of the tangent at any arbitrary point of a curve is twice the product of the abscissa and square of the ordinate of the point. Then, the equation of the curve is (where c is an arbitrary constant)

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

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

C. $xy + y + c = 0$

D. $xy^2 + cy + y = 0$

Answer: B

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12. If the system of equations $3x + y + z = 1, 6x + 3y + 2z = 1$ and $\mu x + \lambda y + 3z = 1$ is inconsistent, then

A. $\mu \neq 9, \lambda \neq 5$

B. $\mu \neq 9, \lambda = 5$

C. $\mu = 9, \lambda = 5$

D. $\mu = 9, \lambda \neq 5$

Answer: D

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13. The probability of an event A is $\frac{4}{5}$. The probability of an event B, given that the event A occurs is $\frac{1}{5}$. The probability of event A, given that the event B occurs is $\frac{2}{3}$. The probability that neigher of the events occurs is

A. $\frac{3}{25}$

B. $\frac{2}{5}$

C. $\frac{1}{25}$

D. $\frac{2}{15}$

Answer: A

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14. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors such that $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 1$ and $\left|\vec{c}\right| = 3$. If the projection of $\vec{b}$ along $\vec{a}$ is double of the projection of $\vec{c}$ along $\vec{a}$ and $\vec{b}, \vec{c}$ are perpendicular to each other, then the value of $\frac{\left|\vec{a} - \vec{b} + 2\vec{c}\right|^2}{2}$ is equal to

A. 41

B. 14

C. $\sqrt{14}$

D. 20.5

Answer: D

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15. The distance of the point (2, 3, 2) from the plane $3x + 4y + 4z = 23$ measured parallel to the line $\frac{x+3}{1} = \frac{y-6}{-2} = \frac{z-1}{1}$ is

A. $\sqrt{108}$ units

B. 12 units

C. $\sqrt{54}$ units

D. $\sqrt{236}$ units

Answer: C

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16. Let the equations of the sides PQ, QR, RS and SP of a quadrilateral PQRS are $x + 2y - 3 = 0, x - 1 = 0, x - 3y - 4 = 0$ and $5x + y + 12 = 0$ respectively. If θ is the angle between the diagonals PR and QS, then the value of $|\tan\theta|$ is equal to

A. 2

B. -2

C. 1

D. Not defined

Answer: D

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17. The locus of the point of intersection of the tangents at the extremities of a chord of the circle $x^2 + y^2 = r^2$ which touches the circle $x^2 + y^2 + 2rx = 0$ is

A. $y^2 = 2r\left(x - \frac{r}{2}\right)$

B. $y^2 = -2r\left(x + \frac{r}{2}\right)$

C. $y^2 = 2r\left(x + \frac{r}{2}\right)$

D. $y^2 = -2r\left(x - \frac{r}{2}\right)$

Answer: C

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18. Two straight lines having variable slopes m_1 and m_2 pass through the fixed points $(a, 0)$ and $(-a, 0)$ respectively. If $m_1 m_2 = 2$, then the eccentricity of the locus of the point of intersection of the lines is

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 2

D. $\sqrt{\frac{3}{2}}$

Answer: B

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19. For a complex number Z, if $\arg Z = \frac{\pi}{4}$ and $\left|Z + \frac{1}{Z}\right| = 4$, then the value of $\left||Z| - \frac{1}{|Z|}\right|$ is equal to

A. $\sqrt{14}$

B. $\sqrt{18}$

C. 4

D. $\sqrt{12}$

Answer: A

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20. In a factory, workers work in three shifts, say shift 1, shift 2 and shift 3 and they get wages in the ratio $3:4:8$ depending on the shift 1, 2 and 3 respectively. Number of workers in the shifts are in the ratio $3:2:5$. If the total number of workers working is 1500 and wages per worker in shift 1 is Rs. 300, then the mean wage of a worker is

A. Rs. 460

B. Rs. 520

C. Rs. 570

D. Rs. 420

Answer: C

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21. The value of $a+b$ such that the inequality $a \leq 5\cos\theta + 3\cos\left(\theta + \frac{\pi}{3}\right) + 3 \leq b$ holds true for all the real values of θ is (equality holds on both sides atleast once for real values of θ)

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22. If the line $y = -\frac{7}{2}$ is the directrix of the parabola $x^2 - ky + 8 = 0$, then the sum of all the possible values of k is equal to

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23. Let A be a non - singular square matrix such that $A^2 = A$ satisfying $(I - 0.8A)^{-1} = I - \alpha A$ where I is a unit matrix of the same order as that of A, then the value of -4α is equal to

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24. Let

$$f(x) = \begin{cases} \left(\frac{1-\cos x}{(2\pi - x)^2}\right)\left(\frac{\sin^2 x}{\log(1+4\pi^2-4\pi x+x^2)}\right) & : \quad x \neq 2\pi \\ \lambda & : \quad x = 2\pi \end{cases}$$

is continuous at $x = 2\pi$, then the value of λ is equal to

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25. If $\int_{20}^{40} \frac{\sin x}{\sin x + \sin(60 + x)} dx = k$, then the value of $\frac{k}{4}$ is equal to

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