MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 56

Mathematics

1. The ratio of the coefficient of x^{15} to the term independent of x in the expansion of $\left(X^2+\frac{2}{x}\right)^{15}$ is

A. $1:8$

B. $1:12$

C. $1:16$

D. $1:32$

Answer: D

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2. Consider a function $g(x) = f(x-2),\ \forall x \in R,$ where

$f(x) = \begin{cases} \frac{1}{|x|} & : |x| \geq 1 \\ ax^2 + b & : |x| < 1 \end{cases}$. If $g(x)$ is continuous as well as differentiable for all x, then

A. $a = \frac{-1}{2}, b = \frac{3}{2}$

B. $a = \frac{1}{2}, b = \frac{3}{2}$

C. $a = \frac{-1}{2}, b = \frac{-3}{2}$

D. None of these

Answer: A

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3. The value of the integral $I = \int \frac{dx}{\sqrt{1+\sin x}}, \forall x \in \left[0, \frac{\pi}{2}\right]$ is equal to $k \ln\left(\tan\left(\frac{x}{4} + \frac{\pi}{8}\right)\right) + c$, then the value of $k\sqrt{2}$ is equal to (where, c is the constant of integration)

A. $\sqrt{2}$

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

C. 1

D. $2\sqrt{2}$

Answer: C

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4. The sum of the infinite series

$$\frac{1}{3}+\frac{3}{3.7}+\frac{5}{3.7.11}+\frac{7}{3.7.11.15}+\ldots\ldots\ldots\ldots$$

is

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

B. $\frac{1}{3}$

C. $\frac{1}{6}$

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

Answer: A

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5. If p and q are two logical statements, then $\sim(p \vee q) \rightarrow (p \rightarrow q)$ is equivalent to

A. $p \wedge q$

B. $p \rightarrow (p \vee q)$

C. $p \vee q$

D. $(p \vee q) \leftrightarrow (p \wedge q)$

Answer: B

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6. A tower subtends angles $\alpha, 2\alpha$ and 3α respectively at points, A, B and C (all points lying on the same side on a horizontal line through the foot of the tower), then the value of $\frac{AB}{BC}$ is equal to

A. $1 + 2\cos 2\alpha$

B. $1 - 2\cos 2\alpha$

C. $1 + 3\cos 2\alpha$

D. $1 - 3\cos 2\alpha$

Answer: A

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7. If $\cos^{-1}|\sin x| \geq \sin^{-1}|\sin x|$, then the number of integral values of x in the interval $x \in [0, 3\pi]$ are

A. 7

B. 6

C. 4

D. 5

Answer: D

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8. The number of ways in which we can put 5 different balls in 5 different boxes such that atmost three boxes are empty, is equal to

A. $5^5 + 5$

B. $5^5 - 10$

C. $5^5 - 5$

D. $5^5 - 4^5$

Answer: C

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9. If the equation $x^3 - 6x^2 + 9x + \lambda = 0$ has exactly one root in (1, 3), then λ belongs to the interval

A. $(-6, -3)$

B. $(-4, 0)$

C. $(-2, 2)$

D. $(-1, 3)$

Answer: B

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10. Let $a_n = \int_0^{\frac{\pi}{2}} \frac{1-\cos 2nx}{1-\cos 2x} dx$, then $a_1, a_2, a_2, \ldots\ldots\ldots$ are in

A. Arithmetic Progression

B. Geometric Progression

C. Harmonic Progression

D. Arithmetic Geometric Progression

Answer: A

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11. The solution of the differential equation $\frac{dy}{dx} = e^y\left(\frac{1}{2x^2} + 1\right), (\forall x > 0)$ is $\lambda x e^{-y} = 1 - 2x^2$ (where c is an arbitrary constant). Then, the value of λ is equal to

A. 2

B. 4

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

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

Answer: A

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12. If the area bounded by the parabola $y = 2 - x^2$ and the line $y = -x$ is $\frac{k}{2}$ sq. units, then the value of 2k is equal to

A. 9

B. 27

C. 18

D. 32

Answer: C

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13. Consider three square matrices A, B and C of order 3 such that $A^T = A - 2B$ and $B^T = B - 4C$, then the incorrect option is

A. $|A| = 0$

B. $|B| = 0$

C. $|C| = 0$

D. $B = 2C$

Answer: A

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14. The tangent to the circle $x^2 + y^2 = 5$ at the point $(1, -2)$ also touches the circle $x^2 + y^2 - 8x + 6y + 20 = 0$ at the point

A. $(2, 1)$

B. $(-3, 0)$

C. $(-1, -1)$

D. $(3, -1)$

Answer: D

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15. A line L passing through $(1, 2, 3)$ and perpendicular to the line $L_1 : \frac{x-1}{-2} = \frac{y+1}{3} = \frac{z-5}{4}$ is also

intersecting the line L_1. If the line L intersects the plane $2x + y + z + 6 = 0$ at point (α, β, γ), then the value of $2020\alpha + \beta + 2\gamma$ is equal to

A. 2058

B. 78

C. 28

D. -4012

Answer: C

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16. Probability that A will pass the exam is $\frac{1}{4}$, B will pass the exam is $\frac{2}{5}$ and C will pass the exam is $\frac{2}{3}$. The probability that exactly one of them will pass th exam is

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

B. $\frac{3}{20}$

C. $\frac{9}{20}$

D. $\frac{4}{5}$

Answer: C

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17. The coordinate axes is rotated and shifted in such a way that the $\mathrm{IV}^{\mathrm{th}}$ quadrant direction of line $4x + 3y - 35 = 0$ becomes that new positive x - axis direction and the I^{st} quadrant direction of line $3x - 4y + 5 = 0$ becomes the new positive y - axis direction. If origin as per old coordinate system is O, then according to the new coordinate system, the coordinates of O are

A. $(1, 7)$

B. $(-1, 7)$

C. $(1, -7)$

D. $(7, -1)$

Answer: C

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18. Let

$$P = \begin{bmatrix} 2\alpha \\ 5 \\ -3\alpha^2 \end{bmatrix} \text{ and } Q = \begin{bmatrix} 2l & -m & 5n \end{bmatrix} \text{ are}$$

two matrices, where $l, m, n, \alpha \in R$, then the value of determinant PQ is equal to

A. 0

B. -1

C. 2

D. not possible

Answer: A

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19. Let S and S' are the foci of the ellipse $x = 3 + 5\cos\theta, y = -2 + 4\sin\theta$. If B is one of the ends of one of the latus rectum, then the area (in sq. units) of the triangle BSS' is equal to

A. $\frac{24}{5}$

B. $\frac{48}{5}$

C. $\frac{12}{5}$

D. $\frac{64}{5}$

Answer: B

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20. For a complex number $Z, |Z| = 1$ and $\arg\ (Z) = \theta$. If $(Z)\left(Z^2\right)\left(Z^3\right)\ldots\left(Z^n\right) = 1$, then the value of θ is

A. $\dfrac{4m\pi}{n(n+1)}, m \in I$

B. $\dfrac{2m\pi}{n(n+1)}, m \in I$

C. $\dfrac{m\pi}{n(n+1)}, m \in I$

D. None of these

Answer: A

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21. The value of $\lim_{x \to 0} \frac{\ln(10 - 9\cos 2x)}{\ln^2(\sin 3x + 1)}$ is equal to

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22. Consider a parallelogram constructed on the vectors

$\vec{A} = 5\vec{p} + 2\vec{q}$ and $\vec{B} = \vec{p} - 3\vec{q}$. If $\left|\vec{p}\right| = 2, \left|\vec{q}\right| = 5$, the angle between $\vec{p}$ and $\vec{q}$ is $\frac{\pi}{3}$ and the length of the smallest diagonal of the parallelogram is k units, then the value of k^2 is equal to

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23. If the line $y = mx + c$ touches the parabola $y^2 = 12(x + 3)$ exactly for one value of $m(m > 0)$, then the value of $\frac{c+m}{c-m}$ is equal to

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24. The sum of all the values of x between 0 and 4π which satisfy the equation $\sin x\sqrt{8\cos^2 x} = 1$ is $k\pi$, then the value of $\frac{k}{5}$ is equal to

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25. If the value of the integral $I = \int_0^1 \frac{dx}{x + \sqrt{1 - x^2}}$ is equal to $\frac{\pi}{k}$, then the

value of k is equal to