MATHS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 57

Mathematics

1. $\Sigma_{r=0}^{n}\left(\frac{r^2}{r+1}\right).{}^{n}C_r$ is equal to

A. $\frac{2^{n-1}\left(n^2+n+2\right)-1}{(n+1)}$

B. $\frac{2^{n-1}\left(n^2-n-2\right)+1}{(n+1)}$

C. $\frac{2^{n-1}\left(n^2-n+2\right)-1}{(n+1)}$

D. $\frac{2^{n-1}\left(n^2+n-2\right)+1}{(n+1)}$

Answer: C

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2. A ray of light through the point $A(1, 2, 3)$ strikes the plane $x + y + z = 12$ at a point B and on reflection passes through the point $C(3, 5, 9)$. If the equation of a plane containing the incident ray and the reflected ray is P = 0 has the distance of P = 0 from (0, 0, 0) is λ units, then the value of $13\lambda^2$ is equal to

A. 1

B. 2

C. 4

D. 6

Answer: B

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3. If $\sin\left(\frac{23\pi}{24}\right) = \sqrt{\frac{2\sqrt{p} - \sqrt{q} - 1}{4\sqrt{r}}}$, then the value of $\left(p^2 + q^2 - r^2\right)$ is equal to

A. 6

B. 12

C. -1

D. 9

Answer: D

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4. If $\int_0^1 e^{x^2}(x-a)dx = 0$, then the value of $\int_0^1 e^{X^2}dx$ is euqal to

A. $\frac{1}{2a}(e-1)$

B. $\frac{a}{2}(e-1)$

C. $\frac{1}{2a}(e+1)$

D. $\frac{a}{2}(e+1)$

Answer: A

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5. The statement $p \Rightarrow (q \wedge p)$ is negation of the statement

A. $p \Rightarrow q$

B. $p \wedge q$

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

D. $\sim(p \wedge q)$

Answer: C

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6. Let circles C_1, C_2 and C_3 with centres O_1, O_2 and O_3 respectively touch each other externally, where

$O_1 = (-36, 7), O_2 = (20, 7)$ and $O_3 = (0, -8)$.

The coordinates of the centre of a circle passing through the points of contact of circles C_1, C_2 and C_2, C_3 and C_3, C_1 are

A. $(-1, 0)$

B. $(1, 0)$

C. $(0, 1)$

D. $(0, -1)$

Answer: A

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7. If $f: R \to [-1, 1]$ be a function defined as $f(x) = \sin\left(\frac{x^2 - 8}{x^2 + 2}\right)$, then f is

A. one - one but not onto

B. one - one and onto

C. onto but not one - one

D. neither one - one nor onto

Answer: D

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8. The area (in sq. units) of the triangle formed by the lines $y = 2x, y = -2x$ and the tangent at the point $(\sqrt{5}, 4)$ on $4x^2 - y^2 = 4$ is equal to

A. 4

B. 2

C. 1

D. 3

Answer: B

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9. The value of $\int \frac{\ln(\cot x)}{\sin 2x} dx$ is equal to (where, C is the constant of integration)

A. $\frac{(\ln(\cot x))^2}{2} + C$

B. $\frac{(\ln(\cot x))^2}{4} + C$

C. $\frac{(\ln(\cot x))^2}{6} + C$

D. $-\frac{1}{4}(\ln(\cot x))^2 + C$

Answer: D

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10. If $x = 2n\pi + \tan^{-1}.\frac{p}{q}$ and $y = r$ is a solution of the equation

$12\sin x + 5\cos x = 2y^2 - 8y + 21$, then the value of k, such that $\sqrt{p^2 + q^2 + kr^2} = 15$, is equal to

A. 5

B. 14

C. $\frac{31}{4}$

D. -22

Answer: B

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11. The order and degree of the differential equation of all the parabolas which have a fixed length of latus and their axes are parallel to the x - axis, are respectively

A. 2, 1

B. 1, 2

C. 2, 2

D. 1, 1

Answer: A

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12. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three non - zero and non - coplanar vectors such that $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right] = 4$, then the value of $\left(\vec{a} + 3\vec{b} - \vec{c}\right).\left(\left(\vec{a} - \vec{b}\right) \times \left(\vec{a} - 2\vec{b} - 3\vec{c}\right)\right)$ equal to

A. 40

B. 44

C. 48

D. 52

Answer: D

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13. The number of values of x such that $x, [x] \text{ and } \{x\}$ are in arithmetic progression is equal to (where $[.]$ denotes the greatest integer function and $\{.\}$ denotes the fractional part function)

A. 0

B. 1

C. 2

D. 4

Answer: C

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14. Let $a = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ are two matrices. If $(A+B)^2 = A^2 + B^2$, then the value of $3a + 4b$ is equal to

A. 15

B. 17

C. 19

D. 21

Answer: C

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15. There are n sets of observation given as $(1), (2, 3), (4, 5, 6), (7, 8, 9, 10), \ldots\ldots$ The mean of the 13^{th} set of observation is equal to

A. 70

B. 80

C. 75

D. 85

Answer: D

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16. If $Z = \cos\phi + i\sin\phi\left(\forall\phi \in \left(\frac{\pi}{3}, \pi\right)\right)$, then the value of $arg\left(Z^2 - Z\right)$ is equal to (where, $arg(Z)$ represents the argument of the complex number Z lying in the interval $(-\pi, \pi]$ and $i^2 = -1$)

A. $\frac{3\phi + \pi}{2}$

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

C. $\frac{3}{2}(\phi - \pi)$

D. $\frac{3\phi - \pi}{2}$

Answer: C

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17. Given $P = (1, 0)$ and $Q = (-1, 0)$ and R is a variable point on one side of the line PQ such that $\angle RPQ - \angle RQP = \frac{\pi}{4}$. The locus of the point R is

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

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

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

D. $y^2 - x^2 - 2xy + 1 = 0$

Answer: D

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18. If $(x_0, y_0, z_0)$is any solution of the system of equations

$2x - y - z = 1, \ -x - y + 2z = 1$ and $x - 2y + z = 2$

, then the value of $\frac{x_0^2 - y_0^2 + 1}{z_0}$ (where, $z_0 \neq 0$) is

A. 1

B. 2

C. 3

D. 4

Answer: B

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19. If the function $f(x) = \begin{cases} a\sqrt{x+7} & : \ 0 \leq x < 9 \\ bx + 5 & : \ x \geq 9 \end{cases}$ is differentiable for $x \geq 0$, then the value of $5a + 6b$ is equal to

A. $\frac{240}{23}$

B. 10

C. $\frac{80}{23}$

D. $\frac{250}{23}$

Answer: B

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20. Let $f(x) = \begin{cases} x^2 + 4 & : & x < 0 \\ 4 - 2x & : & x \geq 0 \end{cases}$ then the area bounded by $y = f(x)$ and the x - axis from $x = -1$ to $x = 3$ is equal to

A. 9 sq. units

B. $\frac{28}{3}$ sq. units

C. $\frac{29}{3}$ sq. units

D. 27 sq. units

Answer: B

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21. Let e and l are the eccentricity and length of the lactus rectum respectively of the conic described parametrically by $x = t^2 - t + 1, y = t^2 - t + 1$, then the value of $\frac{e}{l^2}$ is equal to

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22. Mr. Vipin, a famous liar, is known to speak the truth 5 out of 6 times. His blind folded friend Shubham throws a pair of dice and asked Vipin the result, who says the sum of numbers on the pair of disc is 9. The probability that the sum of numbers on the pair of dice is actually 9 is k, then the value of 52k is equal to

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23. A trapezium is such that three of its sides have lengths as 9cm, then the length (in cm) of the fourth side such that the area of trapezium is maximum, is

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24. If the value of $\lim_{x \to \frac{\pi}{6}} \frac{\cos\left(x + \frac{\pi}{3}\right)}{\left(1 - \sqrt{3}\tan x\right)}$ is equal to λ , then the value of $120\lambda^2$ is equal to

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25. If $.^{n+2}C_8 :^{n-2}P_4 = 57:16$, then the value of $\frac{n}{2}$ is

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