



## MATHS

### BOOKS - NTA MOCK TESTS

#### NTA JEE MOCK TEST 49

#### Mathematics

1. If  $C_0, C_1, C_2, \dots, C_{20}$  are the binomial coefficients in the expansion of  $(1+x)^{20}$ , then the value \_\_\_\_\_ of

$$\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + \dots + 19\frac{C_{19}}{C_{18}} + 20\frac{C_{20}}{C_{19}} \quad \text{is}$$

equal to (where  $C_r$  represents  ${}^n C_r$ )

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  $x^2 - (k + 1)x + (k^2 + k - 8) = 0$ , 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  $a_1, a_2, a_3, \dots$  is equal to

A. 450

B. 675

C. 900

D. 1200

**Answer: C**



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4. The value of  $2\alpha + \beta$  ( $0 < \alpha, \beta < \frac{\pi}{2}$ ), 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.  $\pi$

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

$$\lim_{n \rightarrow \infty} \frac{[x] + [2^2x] + [3^2x] + \dots + [n^2x]}{1^2 + 2^2 + 3^2 + \dots + n^2}$$
 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

$$y = \begin{cases} e^x & : x \geq 0 \\ e^{-x} & : x \leq 0 \end{cases} \quad \text{with the axis from}$$

$x = -1$  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

$$3x + y + z = 1, 6x + 3y + 2z = 1 \quad \text{and}$$

$\mu x + \lambda y + 3z = 1$  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 neither 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  $|\vec{a}| = 2$ ,  $|\vec{b}| = 1$  and  $|\vec{c}| = 3$ . 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  $\frac{|\vec{a} - \vec{b} + 2\vec{c}|^2}{2}$  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

$$\frac{x + 3}{1} = \frac{y - 6}{-2} = \frac{z - 1}{1} \text{ is}$$

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  $\theta$  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  $\theta$  is (equality holds on both sides atleast once for real values of  $\theta$ )

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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  $-4\alpha$  is equal to

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**24.**

Let

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

is continuous at  $x = 2\pi$ , then the value of  $\lambda$  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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