# JEE (Main) – Mathmatics
## Sample Question Paper

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| **Subject** | Mathmatics |
| **Total Number of Questions** | 25 |
| **Maximum Marks** | 100 |
| **Time Allowed** | 60 Minutes |

**Marking Scheme (As per JEE Main Pattern)**

Each question carries **4 (four) marks**.
**1 (one) mark** will be deducted for each incorrect answer.
No marks will be deducted for unattempted questions.
Only one option is correct for each question.

**Important Instructions**

1. This Question Paper consists of **25 Multiple Choice Questions** from **Mathmatics** only.
2. All questions are compulsory.
3. Rough work should be done only in the space provided in the Question Paper.
4. Calculators, mobile phones, smart watches, or any electronic devices are strictly prohibited.

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| Name of the Candidate (Capital Letters) | |
| Roll Number | |
| Examination Centre Name | |
| Candidate's Signature | Date |

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| Invigilator's Signature |

# MATHEMATICS

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**1.** The number of functions $f:\{1,2,3,4\}\to\{a\in:Z|a|\le 8\}$ satisfying $f(n)+\frac{1}{n}f(n+1)=1,\forall n\in\{1,2,3\}$ is

**A)** 2 **B)** 1

**C)** 4 **D)** 3

**2.** If $(a,b)$ be the orthocenter of the triangle whose vertices are $(1,2)$, $(2,3)$, and $(3,1)$, and $I_1=\int_a^b x\sin(4x-x^2)dx$, $I_2=\int_a^b \sin(4x-x^2)dx$, then $36\frac{I_1}{I_2}$ is equal to:

**A)** 80 **B)** 88

**C)** 66 **D)** 72

**3.** If the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ meets the line $\frac{x}{7}+\frac{y}{2\sqrt{6}}=1$ on the $x$-axis and the line $\frac{x}{7}-\frac{y}{2\sqrt{6}}=1$ on the $y$-axis, then the eccentricity of the ellipse is

**A)** $\frac{5}{7}$ **B)** $\frac{2\sqrt{6}}{7}$

**C)** $\frac{3}{7}$ **D)** $\frac{2\sqrt{5}}{7}$

**4.** The statement $(p\wedge(\sim q))\Rightarrow(p\Rightarrow(\sim q))$ is

**A)** equivalent to$p\vee q$ **B)** equivalent to$(-p)\vee(-q)$

**C)** a contradiction **D)** a tautology

**5.** If the probability that the random variable $X$ takes values $x$ is given by $P(X=x)=k(x+1)3^{-x}, x=0,1,2,\ldots$, where $k$ is a constant, then $P(X\ge 2)$ is equal to:

**A)** $\frac{5}{18}$ **B)** $\frac{10}{18}$

**C)** $\frac{20}{27}$ **D)** $\frac{7}{27}$

**6.** Find the number of integral values of x which satisfy the inequality $x_2$–10x+19<6.

**A)** 5 **B)** 11

**C)** 7 **D)** 8

**7.** If $f(x)-f(y)=ln\left(\frac{x}{y}\right)+x-y$, then find $\sum_{k=1}^{20} f'\left(\frac{1}{k^2}\right)$

**A)** 2890 **B)** 2390

**C)** 1245 **D)** None of this

**8.** Let the function $f(x)=2x^3+(2p-7)x^2+3(2p-9)x-6$ have a maxima for some value of $x<0$ and a minima for some value of $x>0$ Then, the set of all values of $p$ is

**A)** $\left(\frac{9}{2},\infty\right)$ **B)** $\left(0,\frac{9}{2}\right)$

**C)** $\left(-\frac{9}{2},\frac{9}{2}\right)$ **D)** $\left(-\infty,\frac{9}{2}\right)$

**9.** A straight line cuts off the intercepts $OA = a$ and $OB = b$ on the positive directions of $x$-axis and $y$ axis respectively If the perpendicular from origin $O$ to this line makes an angle of $\frac{\pi}{6}$ with positive direction of $y$-axis and the area of $\triangle OAB$ is $\frac{98}{3}\sqrt{3}$, then $a^2 - b^2$ is equal to :

**A)** $\frac{392}{3}$ **B)** $\frac{196}{3}$

**C)** 196 **D)** 98

**10.** Let awards in event A is 48 and awards in event B is 25 and awards in event C is 18 and also n(A ∪ B ∪ C) = 60, n(A ∩ B ∩ C) = 5, then how many got exactly two awards is?

**A)** 21 **B)** 25

**C)** 24 **D)** 23

**11.** The sum of the absolute maximum and minimum values of the function $f(x) = \left|x^2 - 5x + 6\right| - 3x + 2$in the interval $[-1, 3]$ is equal to :

**A)** 12 **B)** 10

**C)** 24 **D)** 13

**12.** The complex number $z = \frac{i-1}{\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}}$ is equal to :

**A)** $\sqrt{2}i\left(\cos\frac{5\pi}{12} - i\sin\frac{5\pi}{12}\right)$ **B)** $\cos\frac{\pi}{12} - i\sin\frac{\pi}{12}$

**C)** $\sqrt{2}\left(\cos\frac{\pi}{12} + i\sin\frac{\pi}{12}\right)$ **D)** $\sqrt{2}\left(\cos\frac{5\pi}{12} + i\sin\frac{5\pi}{12}\right)$

**13.** The sum $\sum_{n=1}^{21} \frac{3}{(4n-1)(4n+3)}$ is equal to

**A)** $\frac{7}{87}$ **B)** $\frac{7}{29}$

**C)** $\frac{14}{87}$ **D)** $\frac{21}{29}$

**14.** $Height of tower AB is 30m where B is foot of tower. Angle of elevation from a point C on level ground to top of to$

**A)** 300($\sqrt{3}$-1) **B)** 600($\sqrt{3}$-1)

**C)** 150($\sqrt{3}$-1) **D)** 100($\sqrt{3}$-1)

**15.** Let $P(x_0, y_0)$ be the point on the hyperbola $3x^2 - 4y^2 = 36$, which is nearest to the line $3x + 2y = 1$. Then $\sqrt{2}(y_0 - x_0)$ is equal to:

**A)** -9 **B)** 3

**C)** 9 **D)** -3

**16.** The number of integral values of $k$, for which one root of the equation

$$2x^2 - 8x + k = 0$$

lies in the interval $(1, 2)$ and its other root lies in the interval $(2, 3)$, is:

**A)** 2 **B)** 0

**C)** 1 **D)** 2

**17.** If the number of words, with or without meaning, which can be made using all the letters of the word *MATHEMATICS* in which C and S do not come together, is (6!)k , is equal to

**A)** 5670 **B)** 1890

**C)** 595 **D)** 657

**18.** Let the point $P(\alpha, \beta)$ be at a unit distance from each of the two lines $L_1 : 3x - 4y + 12 = 0$, and $L_2 : 8x + 6y + 11 = 0$ If $P$ lies below $L_1$ and above $L_2$, then $100(\alpha + \beta)$ is equal to

**A)** $-14$ **B)** 42

**C)** $-22$ **D)** 14

**19.** If the sum and product of four positive consecutive terms of a GP, are 126 and 1296, respectively, then the sum of common ratios of all such GPs is

**A)** $\frac{9}{2}$ **B)** 3

**C)** 7 **D)** 14

**20.** The set of all values of $a$ for which $\lim\limits_{x \to a}([x - 5] - [2x + 2]) = 0$,where $[\propto]$ denotes the greatest integer less than or equal to $\propto$ is equal to

**A)** $[-7.5, -6.5)$ **B)** $(-7.5, -6.5)$

**C)** $(-7.5, -6.5]$ **D)** $[-7.5, -6.5]$

**21.** The mean and standard deviation of 10 observations are 20 and 8 respectively. Later on, it was observed that one observation was recorded as 50 instead of 40. Then the correct variance is:

**A)** $\frac{247}{3}$ **B)** $\frac{167}{2}$

**C)** 118 **D)** 96

**22.** Let $y = f(x) = \sin^3\left(\frac{\pi}{3}\left(\cos\left(\frac{\pi}{3\sqrt{2}}\left(-4x^3 + 5x^2 + 1\right)^{\frac{3}{2}}\right)\right)\right)$ Then, at $x = 1$

**A)** $2y' + \sqrt{3}\pi^2 y = 0$ **B)** $\sqrt{2}y' - 3\pi^2 y = 0$

**C)** $2y' + 3\pi^2 y = 0$ **D)** $y' + 3\pi^2 y = 0$

**23.** The number of common terms in the progressions 4, 9, 14, 19, ...,up to 25th term and 3, 6, 9, 12, ..., up to 37th term is:

**A)** 9 **B)** 5

**C)** 7 **D)** 8

**24.** Let $\alpha > 0$ If $\int\limits_0^{\alpha} \frac{x}{\sqrt{x+\alpha}-\sqrt{x}}dx = \frac{16+20\sqrt{2}}{15}$, then $\alpha$ is equal to :

**A)** 2 **B)** $2\sqrt{2}$

**C)** 4 **D)** $\sqrt{2}$

**25.** If the foot of the perpendicular drawn from $(1, 9, 7)$ to the line passing through the point $(3, 2, 1)$ and parallel to the planes $x + 2y + z = 0$ and $3y - z = 3$ is $(\alpha, \beta, \gamma)$, then $\alpha + \beta + \gamma$ is equal to

**A)** $-1$ **B)** 1

**C)** 3 **D)** 5

# JEE MAIN MATHEMATICS ANSWER KEY

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| 1. (A) | 2. (D) | 3. (A) | 4. (D) | 5. (D) |
| 6. (C) | 7. (A) | 8. (D) | 9. (A) | 10. (A) |
| 11. (B) | 12. (D) | 13. (B) | 14. (B) | 15. (A) |
| 16. (C) | 17. (A) | 18. (D) | 19. (C) | 20. (B) |
| 21. (A) | 22. (C) | 23. (C) | 24. (A) | 25. (D) |