

## JEE MAIN 23 JANUARY 2025 SHIFT 1

### MATHEMATICS QUESTION PAPER WITH ANSWER KEY

Q.No.	Questions	Answers
1	If for an arithmetic progression, if first term is 3 and sum of first four terms is equal to of the sum of next four terms, then the sum of first 20 terms is	-1080
2	How many words can be formed from the word DAUGHTER such that any vowels are not together	36000
3	Two biased dies are tossed. Die 1 has 1 on two faces, 2 on two faces, 3 and 4 on other faces, while die 2 has 2 on 2 faces, 4 on 2 faces and 1 and 3 on other faces. Then the probability that when throwing these dices we get sum 4 or 5.	4/9
4	If $f(x)$ is continuous at $x = 0$ , where $f(x) = \begin{cases} (2/x) (\sin(k_1 + 1)x + \sin(k_2 + 1)x), & x < 0 \\ 4 & x = 0 \\ (2/x) (\log(k_2x + 1)/\log(k_1x + 1)) & x > 0 \end{cases}$ Find the value of $k_1^2 + k_2^2$ .	2
5	Find $\cos^{-1}[(12/13) \cos x + (5/13) \sin x]$ if $x \in [\pi/2, \pi]$	$x - \tan^{-1}(5/12)$
6	If for the system of linear equations having infinite solutions $(\lambda - 4)x + (\lambda - 2)y + \lambda z = 0$ $2x + 3y + 5z = 0$ $x + 2y + 6z = 0$ then $\lambda^2 + \lambda$ is	90
7	A relation defined on set $A = \{1, 2, 3, 4\}$ , then how many ordered pairs are added to $R = \{(1, 2), (2, 3), (3, 3)\}$ so that it becomes equivalence relation?	7
8	The sum of all rational terms in the expansion $(1 + 2^{1/3} + 3^{1/2})^6$ is	638
9	If $ z/(z + i)  = 2$ represents a circle with centre P then distance of P from D is (where D: (1,5))	$(370/9)^{1/2}$

10	If the equation $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ has equal roots and if $a + c = 5$ and $b = 16/5$ , then the value of $a^2 + c^2$ is equal to	9
11	Consider the set $S = \{1, 2, 3, \dots, 1000\}$ . Then the number of arithmetic progression that can be formed using elements of set $S$ such that first term is 1 and last term is 1000 is	8
12	Let $A$ and $B$ are non-singular commutative matrices. Then $A[(\text{adj } A^{-1})(\text{adj}(B^{-1}))]^{-1}B$ is equal to	$ A   B  I_n$
13	The area of larger portion enclosed by curves $y =  x - 1 $ and $x^2 + y^2 = 25$ is equal to $(\alpha\pi + \beta)/4$ (where $\alpha, \beta$ are natural numbers), then $\alpha + \beta$ equals to	77
14	Let $f(x) = \log_e x$ and $g(x) = [(2x^4 - 2x^3 - x^2 + 2x - 1)/(2x^2 - 2x + 1)]$ , then the domain of $f(g(x))$ for $x > 0$ is	$(1, \infty)$
15	If the curve satisfying the differential equation $dy/dx = (6 - 2e^{2x}y)/(1 + e^{2x})$ passes through $(0, 0)$ and $(\ln 2, k)$ , then $k$ is	$(6/5) * (\ln 2)$
16	Find $I = \int dx / ((x - 1)^{11/13} * (x + 15)^{15/13})$	$(13/32)((x - 1)/(x + 15))^{2/13} + C$