

Permutations and Combinations

Subjects : Maths

Previous Year Questions of JEE
Mains

Maths - Section A (MCQ.)

- The number of elements in the set $S = \left\{ (r, k) : k \in \mathbb{Z} \text{ and } {}^{36}C_{r+1} = \frac{6({}^{35}C_r)}{(k^2 - 3)} \right\}$, is :
A) 2 B) 4 C) 8 D) 16
- The number of seven-digit numbers, that can be formed by using the digits 1, 2, 3, 5 and 7 such that each digit is used at least once, is :
A) 15400 B) 17800 C) 16800 D) 29400
- Let p_n denote the total number of triangles formed by joining the vertices of an n -side regular polygon. If $p_{n+1} - p_n = 66$, then the sum of all distinct prime divisors of n is:
A) 7 B) 8 C) 5 D) 6
- The number of ways of forming a queue of 4 boys and 3 girls such that all the girls are not together, is:
A) 5040 B) 3050 C) 3410 D) 4320
- Let $A = \{(a, b, c) : a, b, c \text{ are non-negative integers and } a + b + 2c = 22\}$. Then $n(A)$ is equal to:
A) 121 B) 124 C) 144 D) 169
- Two players A and B play a series of games of badminton. The player, who wins 5 games first, wins the series. Assuming that no game ends in a draw, the number of ways, in which player A wins the series is _____.
A) 123 B) 124 C) 125 D) 126
- A box contains 5 blue, 6 yellow and 4 red balls. The number of ways, of drawing 8 balls containing at least two balls of each colour, is :
A) 4100 B) 4140 C) 4230 D) 4290
- The number of 4-letter words, with or without meaning, each consisting of two vowels and two consonants that can be formed from the letters of the word INCONSEQUENTIAL, without repeating any letter, is:
A) 2670 B) 2840 C) 2920 D) 3600
- A building has ground floor and 10 more floors. Nine persons enter in a lift at the ground floor. The lift goes up to the 10th floor. The number of ways, in which any 4 persons exit at a floor and the remaining 5 persons exit at a different floor, if the lift does not stop at the first and the second floors, is equal to :
A) 2184 B) 3064 C) 7056 D) 11340
- A person has three different bags and four different books. The number of ways, in which he can put these books in the bags so that no bag is empty, is:

A) 18

B) 36

C) 39

D) 72

11. Three persons enter in a lift at the ground floor. The lift will go up to 10^{th} floor. The number of ways, in which the three persons can exit the lift at three different floors, if the lift does not stop at first, second and third floors, is equal to ____ .

A) 210

B) 420

C) 105

D) 315

12. Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Let x be the number of 9-digit numbers formed using the digits of the set S such that only one digit is repeated and it is repeated exactly twice. Let y be the number of 9-digit numbers formed using the digits of the set S such that only two digits are repeated and each of these is repeated exactly twice. Then,

A) $29x = 5y$ B) $45x = 7y$ C) $21x = 4y$ D) $56x = 9y$

13. The number of numbers greater than 5000, less than 9000 and divisible by 3, that can be formed using the digits 0, 1, 2, 5, 9, if the repetition of the digits is allowed, is ____ .

A) 40

B) 42

C) 44

D) 46

14. The largest value of n , for which 40^n divides $60!$, is

A) 13

B) 11

C) 12

D) 14

15. The letters of the word "UDAYPUR" are written in all possible ways with or without meaning and these words are arranged as in a dictionary. The rank of the word "UDAYPUR" is:

A) 1580

B) 1578

C) 1579

D) 1581

16. The largest $n \in \mathbb{N}$ for which 7^n divides $101!$, is :

A) 16

B) 18

C) 15

D) 19

17. Let S be the set of the first 11 natural numbers. Then the number of elements in $A = \{B \subseteq S : n(B) \geq 2 \text{ and the product of all elements of } B \text{ is even}\}$ is ____ .

A) 1979

B) 2048

C) 1984

D) 1974

18. The number of elements in the relation $R = \{(x, y) : 4x^2 + y^2 < 52, x, y \in \mathbb{Z}\}$ is

A) 77

B) 89

C) 67

D) 86

19. Let S denote the set of 4-digit numbers $abcd$ such that $a > b > c > d$ and P denote the set of 5-digit numbers having product of its digits equal to 20. Then $n(S) + n(P)$ is equal to:

A) 210

B) 260

C) 50

D) 250

20. The number of ways, in which 16 oranges can be distributed to four children such that each child gets at least one orange, is:

A) 429

B) 384

C) 403

D) 455

21. The number of 4-letter words, with or without meaning, which can be formed using the letters of 'PQRPQRSTUVWXYZ', is:

A) 1420

B) 1422

C) 1424

D) 1426

22. Let ABC be a triangle. Consider four points p_1, p_2, p_3, p_4 on the side AB , five points p_5, p_6, p_7, p_8, p_9 on the side BC and four points $p_{10}, p_{11}, p_{12}, p_{13}$ on the side AC . None of these points is a vertex of the triangle ABC . Then the total number of pentagons, that can be formed by taking all the vertices from the points $p_1, p_2, \dots, p_{13}$, is ____ .

A) 640

B) 650

C) 660

D) 670

23. For $n \geq 2$, let S_n denote the set of all subsets of $\{1, 2, \dots, n\}$ with no two consecutive numbers. For example $\{1, 3, 5\} \in S_6$, but $\{1, 2, 4\} \notin S_6$. Then $n(S_5)$ is equal to _____

- A) 10 B) 11 C) 12 D) 13

24. The number of singular matrices of order 2, whose elements are from the set $\{2, 3, 6, 9\}$ is

- A) 32 B) 34 C) 36 D) 38

25. Let m and n , ($m < n$) be two 2-digit numbers. Then the total numbers of pairs (m, n) , such that $\gcd(m, n) = 6$, is _____

- A) 60 B) 64 C) 72 D) 84

26. If the number of seven-digit numbers, such that the sum of their digits is even, is $m \cdot n \cdot 10^n$; $m, n \in \{1, 2, 3, \dots, 9\}$, then $m + n$ is equal to _____

- A) 10 B) 15 C) 14 D) 9

27. The largest $n \in \mathbb{N}$ such that 3^n divides $50!$ is:

- A) 21 B) 22 C) 20 D) 23

28. Let $S = \{p_1, p_2, \dots, p_{10}\}$ be the set of first ten prime numbers. Let $A = S \cup P$, where P is the set of all possible products of distinct elements of S . Then the number of all ordered pairs (x, y) , $x \in S$, $y \in A$, such that x divides y , is _____.

- A) 5120 B) 5130 C) 5140 D) 5150

29. There are 12 points in a plane, no three of which are in the same straight line, except 5 points which are collinear. Then the total number of triangles that can be formed with the vertices at any three of these 12 points is

- A) 230 B) 220 C) 200 D) 210

30. Line L_1 of slope 2 and line L_2 of slope $\frac{1}{2}$ intersect at the origin O . In the first quadrant, $P_1, P_2, \dots, P_{12}$ are 12 points on line L_1 and $Q_1, Q_2, \dots, Q_9$ are 9 points on line L_2 . Then the total number of triangles, that can be formed having vertices at three of the 22 points $O, P_1, P_2, \dots, P_{12}, Q_1, Q_2, \dots, Q_9$, is:

- A) 1080 B) 1134 C) 1026 D) 1188

31. Group A consists of 7 boys and 3 girls, while group B consists of 6 boys and 5 girls. The number of ways, 4 boys and 4 girls can be invited for a picnic if 5 of them must be from group A and the remaining 3 from group B, is equal to :

- A) 8750 B) 9100 C) 8925 D) 8575

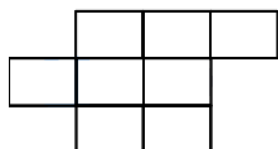
32. From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include atleast 4 batsmen and atleast 4 bowlers. One batsmen and one bowler who are captain and vice-captain respectively of the team should be included. Then the total number of ways such a selection can be made, is

- A) 165 B) 155 C) 145 D) 135

33. A card from a pack of 52 cards is lost. From the remaining 51 cards, n cards are drawn and are found to be spades. If the probability of the lost card to be a spade is $\frac{11}{50}$, the n is equal to

- A) 4 B) 6 C) 2 D) 8

34. The number of ways, in which the letters A, B, C, D, E can be placed in the 8 boxes of the figure below so that no row remains empty and at most one letter can be placed in a box, is :



- A) 5880 B) 960 C) 840 D) 5760

35. The number of 6-letter words, with or without meaning, that can be formed using the letters of the word MATHS such that any letter that appears in the word must appear at least twice, is _____.
A) 1405 B) 1406 C) 1407 D) 1408
36. From all the English alphabets, five letters are chosen and are arranged in alphabetical order. The total number of ways, in which the middle letter is 'M', is :
A) 5148 B) 6084 C) 4356 D) 14950
37. The number of sequences of ten terms, whose terms are either 0 or 1 or 2, that contain exactly five 1s and exactly three 2s, is equal to
A) 360 B) 45 C) 2520 D) 1820
38. If all the words with or without meaning made using all the letters of the word "KANPUR" are arranged as in a dictionary, then the word at 440th position in this arrangement, is :
A) PRNAUK B) PRKANU C) PRKAUN D) PRNAKU
39. Let P be the set of seven digit numbers with sum of their digits equal to 11. If the numbers in P are formed by using the digits 1, 2 and 3 only, then the number of elements in the set P is :
A) 173 B) 164 C) 158 D) 161
40. The number of natural numbers, between 212 and 999, such that the sum of their digits is 15, is
A) 60 B) 61 C) 64 D) 62
41. The number of different 5 digit numbers greater than 50000 that can be formed using the digits 0, 1, 2, 3, 4, 5, 6, 7, such that the sum of their first and last digits should not be more than 8, is
A) 4608 B) 5720 C) 5719 D) 4607
42. The number of 3-digit numbers, that are divisible by 2 and 3, but not divisible by 4 and 9, is _____.
A) 120 B) 145 C) 125 D) 143
43. The number of ways, 5 boys and 4 girls can sit in a row so that either all the boys sit together or no two boys sit together, is _____.
A) 17284 B) 17265 C) 17280 D) 14785
44. The number of words, which can be formed using all the letters of the word "DAUGHTER", so that all the vowels never come together, is
A) 36000 B) 37000 C) 34000 D) 35000
45. In a group of 3 girls and 4 boys, there are two boys B_1 and B_2 . The number of ways, in which these girls and boys can stand in a queue such that all the girls stand together, all the boys stand together, but B_1 and B_2 are not adjacent to each other, is :
A) 96 B) 144 C) 120 D) 72
46. The number of integers, between 100 and 1000 having the sum of their digits equals to 14, is
A) 60 B) 45 C) 27 D) 70
47. The number of ways five alphabets can be chosen from the alphabets of the word MATHEMATICS, where the chosen alphabets are not necessarily distinct, is equal to :
A) 175 B) 181 C) 177 D) 179
48. The number of 3-digit numbers, formed using the digits 2, 3, 4, 5 and 7, when the repetition of digits is not allowed, and which are not divisible by 3, is equal to
A) 10 B) 41 C) 25 D) 36

49. If all the words with or without meaning made using all the letters of the word "NAGPUR" are arranged as in a dictionary, then the word at 315th position in this arrangement is :
- A) *NRAGUP* B) *NRAGPU* C) *NRAPGU* D) *NRAPUG*
50. The number of triangles whose vertices are at the vertices of a regular octagon but none of whose sides is a side of the octagon is
- A) 24 B) 56 C) 16 D) 48
51. The total number of 4–digit numbers whose greatest common divisor with 54 is 2 , is
- A) 3000 B) 1000 C) 1500 D) 3600
52. The number of 3 digit numbers, that are divisible by either 3 or 4 but not divisible by 48, is
- A) 472 B) 432 C) 507 D) 400
53. The number of seven digits odd numbers, that can be formed using all the seven digits 1, 2, 2, 2, 3, 3, 5 is
- A) 238 B) 240 C) 239 D) 235
54. Let 5 digit numbers be constructed using the digits 0, 2, 3, 4, 7, 9 with repetition allowed, and are arranged in ascending order with serial numbers. Then the serial number of the number 42923 is
- A) 2997 B) 2996 C) 2995 D) 2994
55. The number of words, with or without meaning, that can be formed using all the letters of the word *ASSASSINATION* so that the vowels occur together, is
- A) 50200 B) 50100 C) 50400 D) 50300
56. The total number of six digit numbers, formed using the digits 4, 5, 9 only and divisible by 6 , is
- A) 80 B) 81 C) 82 D) 83
57. If ${}^{2n}C_3 : {}^nC_3 = 10 : 1$, then the ratio $(n^2 + 3n) : (n^2 - 3n + 4)$ is
- A) 35 : 16 B) 65 : 37 C) 27 : 11 D) 2 : 1
58. All the letters of the word *PUBLIC* are written in all possible orders and these words are written as in a dictionary with serial numbers. Then the serial number of the word *PUBLIC* is
- A) 580 B) 582 C) 578 D) 576
59. The number of 4–letter words, with or without meaning, each consisting of 2 vowels and 2 consonants, which can be formed from the letters of the word *UNIVERSE* without repetition is
- A) 431 B) 430 C) 432 D) 487
60. The number of arrangements of the letter of the word "*INDEPENDENCE*" in which all the vowels always occur together is
- A) 16800 B) 14800 C) 18000 D) 33600
61. Let the number of elements in sets *A* and *B* be five and two respectively. Then the number of subsets of $A \times B$ each having at least 3 and at most 6 element is :
- A) 792 B) 752 C) 782 D) 772
62. Some couples participated in a mixed doubles badminton tournament. If the number of matches played, so that no couple played in a match, is 840, then the total numbers of persons, who participated in the tournament, is
- A) 14 B) 12 C) 10 D) 16

63. Eight persons are to be transported from city *A* to city *B* in three cars of different makes. If each car can accommodate at most three persons, then the number of ways, in which they can be transported, is
- A) 3360 B) 1680 C) 560 D) 1120
64. The sum of all the four-digit numbers that can be formed using all the digits 2, 1, 2, 3 is equal to
- A) 266665 B) 26663 C) 26664 D) 26666
65. In an examination, 5 students have been allotted their seats as per their roll numbers. The number of ways, in which none of the students sits on the allotted seat, is
- A) 43 B) 44 C) 42 D) 41
66. If the letters of the word *MATHS* are permuted and all possible words so formed are arranged as in a dictionary with serial numbers, then the serial number of the word *THAMS* is
- A) 103 B) 104 C) 101 D) 102
67. The number of five digit numbers, greater than 40000 and divisible by 5, which can be formed using the digits 0, 1, 3, 5, 7 and 9 without repetition, is equal to
- A) 120 B) 132 C) 72 D) 96
68. The number of seven digit positive integers formed using the digits 1, 2, 3 and 4 only and sum of the digits equal to 12 is
- A) 412 B) 411 C) 413 D) 414
69. All words, with or without meaning, are made using all the letters of the word *MONDAY*. These words are written as in a dictionary with serial numbers. The serial number of the word *MONDAY* is
- A) 327 B) 326 C) 328 D) 324
70. Total numbers of 3-digit numbers that are divisible by 6 and can be formed by using the digits 1, 2, 3, 4, 5 with repetition, is
- A) 15 B) 16 C) 14 D) 13
71. A person forgets his 4-digit *ATM* pin code. But he remembers that in the code all the digits are different, the greatest digit is 7 and the sum of the first two digits is equal to the sum of the last two digits. Then the maximum number of trials necessary to obtain the correct code is
- A) 72 B) 71 C) 70 D) 79
72. The value of $\sum_{r=0}^{22} {}^{22}C_r \cdot {}^{23}C_r$ is
- A) ${}^{45}C_{22}$ B) ${}^{44}C_{22}$
C) ${}^{45}C_{21}$ D) ${}^{44}C_{21}$
73. If $({}^{30}C_1)^2 + 2({}^{30}C_2)^2 + 3({}^{30}C_3)^2 \dots \dots \dots 30({}^{30}C_{30})^2 = \frac{\alpha 60!}{(30!)^2}$, then α is equal to
- A) 30 B) 60 C) 15 D) 10
74. In an examination of Mathematics paper, there are 20 questions of equal marks and the question paper is divided into three sections : A, B and C. A student is required to attempt total 15 questions taking at least 4 questions from each section. If section *A* has 8 questions, section *B* has 6 questions and section *C* has 6 questions, then the total number of ways a student can select 15 questions is
- A) 11370 B) 11376 C) 11375 D) 11350
75. The total number of words (with or without meaning) that can be formed out of the letters of the word '*DISTRIBUTION*' taken four at a time, is equal to

A) 3733

B) 3736

C) 3734

D) 3735

76. If for some m, n ; ${}^6C_m + 2({}^6C_{m+1}) + {}^6C_{m+2} > {}^8C_3$ and ${}^{n-1}P_3 : {}^nP_4 = 1 : 8$, then ${}^nP_{m+1} + {}^{n+1}C_m$ is equal to

A) 380

B) 376

C) 384

D) 372

77. If n is the number of ways five different employees can sit into four indistinguishable offices where any office may have any number of persons including zero, then n is equal to :

A) 47

B) 53

C) 51

D) 43

78. There are 5 points P_1, P_2, P_3, P_4, P_5 on the side AB , excluding A and B , of a triangle ABC . Similarly there are 6 points $P_6, P_7, \dots, P_{11}$ on the side BC and 7 points $P_{12}, P_{13}, \dots, P_{18}$ on the side CA of the triangle. The number of triangles, that can be formed using the points $P_1, P_2, \dots, P_{18}$ as vertices, is :

A) 776

B) 751

C) 796

D) 771

79. Let the set $S = \{2, 4, 8, 16, \dots, 512\}$ be partitioned into 3 sets A, B, C with equal number of elements such that $A \cup B \cup C = S$ and $A \cap B = B \cap C = A \cap C = \phi$. The maximum number of such possible partitions of S is equal to :

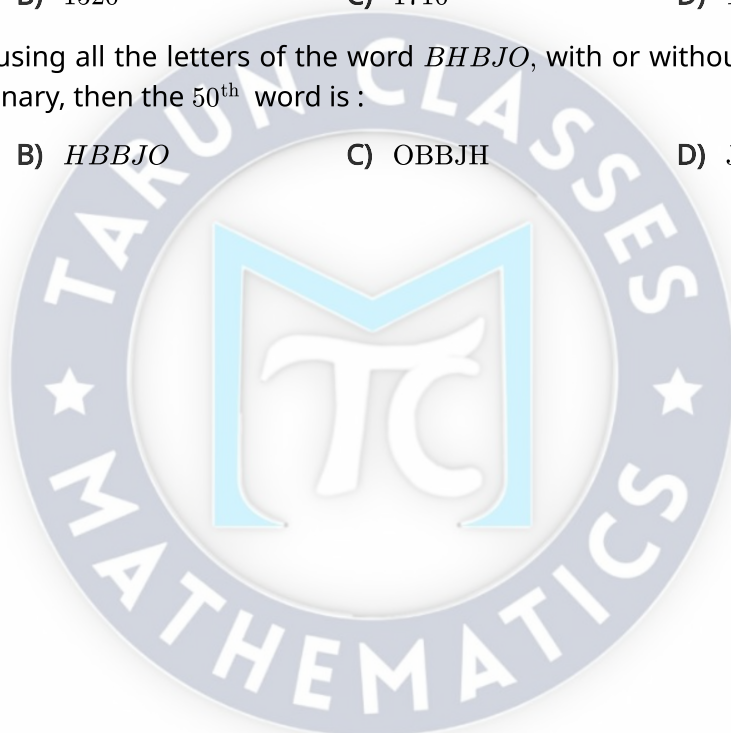
A) 1680

B) 1520

C) 1710

D) 1640

80. 60 words can be made using all the letters of the word $BHBJO$, with or without meaning. If these words are written as in a dictionary, then the 50th word is :

A) $OBBHJ$ B) $HBBJO$ C) $OBBJH$ D) $JBBOH$ 

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1 - B	2 - C	3 - C	4 - D	5 - C	6 - D	7 - A	8 - D	9 - C	10 - B
11 - A	12 - C	13 - B	14 - D	15 - A	16 - A	17 - A	18 - A	19 - B	20 - D
21 - B	22 - C	23 - D	24 - C	25 - B	26 - C	27 - B	28 - A	29 - D	30 - B
31 - C	32 - B	33 - C	34 - D	35 - A	36 - A	37 - C	38 - C	39 - D	40 - C
41 - D	42 - C	43 - C	44 - A	45 - B	46 - D	47 - D	48 - D	49 - C	50 - C
51 - A	52 - B	53 - B	54 - A	55 - C	56 - B	57 - D	58 - B	59 - C	60 - A
61 - A	62 - D	63 - B	64 - C	65 - B	66 - A	67 - A	68 - C	69 - A	70 - B
71 - A	72 - A	73 - C	74 - B	75 - C	76 - D	77 - C	78 - B	79 - A	80 - C