PERMUTATIONS AND COMBINATIONS

Definition of permutation, Number of permutations with or without epetition, Conditional permutations

1. In how many ways can 10 true-false questions be replied

(A) 20 (B) 100
(C) 512 (D) 1024

2. How many even numbers of 3 different digits can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 (repetition is not allowed)

(A) 224 (B) 280
(C) 324 (D) None of these

3. If ${}^{n}P_{5} = 9 \times {}^{n-1}P_{4}$, then the value of n is

(A) 6 (B) 8
(C) 5 (D) 9

4. The value of ${}^{n}P_{r}$ is equal to

(A) ${}^{n-1}P_{r} + r\,{}^{n-1}P_{r-1}$ (B) $n.\,{}^{n-1}P_{r} + {}^{n-1}P_{r-1}$
(C) $n({}^{n-1}P_{r} + {}^{n-1}P_{r-1})$ (D) ${}^{n-1}P_{r-1} + {}^{n-1}P_{r}$

5. Find the total number of 9 digit numbers which have all the digits different

(A) $9 \times 9!$ (B) $9!$
(C) 10 ! (D) None of these

6. Four dice (six faced) are rolled. The number of possible outcomes in which at least one die shows 2 is

(A) 1296 (B) 625
(C) 671 (D) None of these

7. There are 4 parcels and 5 post-offices. In how many different ways the registration of parcel can be made

(A) 20 (B) 4^5
(C) 5^4 (D) $5^4 - 4^5$

8. In how many ways can 5 prizes be distributed among four students when every student can take one or more prizes

(A) 1024 (B) 625
(C) 120 (D) 600

9. In a train five seats are vacant, then how many ways can three passengers sit

(A) 20 (B) 30
(C) 10 (D) 60

10. The product of any r consecutive natural numbers is always divisible by

(A) $r!$ (B) r^2
(C) r^n (D) None of these

11. If ${}^{12}P_{r} = 1320$, then r is equal to

(A) 5 (B) 4
(C) 3 (D) 2

12. Assuming that no two consecutive digits are same, the number of n digit numbers, is

(A) $n!$ (B) 9 !
(C) 9^n (D) n^9

13. The numbers of arrangements of the letters of the word SALOON, if the two O's do not come together, is

(A) 360 (B) 720
(C) 240 (D) 120

14. The number of words which can be formed from the letters of the word MAXIMUM, if two consonants cannot occur together, is

(A) 4 ! (B) $3! \times 4!$
(C) 7 ! (D) None of these

15. In how many ways n books can be arranged in a row so that two specified books are not together

(A) $n! - (n-2)!$ (B) $(n-1)!(n-2)$
(C) $n! - 2(n-1)$ (D) $(n-2)\,n!$

16. How many numbers lying between 500 and 600 can be formed with the help of the digits 1, 2, 3, 4, 5, 6 when the digits are not to be repeated

(A) 20 (B) 40

(C) 60 (D) 80

17. Numbers greater than 1000 but not greater than 4000 which can be formed with the digits 0, 1, 2, 3, 4 (repetition of digits is allowed), are

(A) 350 (B) 375

(C) 450 (D) 576

18. The number of numbers that can be formed with the help of the digits 1, 2, 3, 4, 3, 2, 1 so that odd digits always occupy odd places, is

(A) 24 (B) 18

(C) 12 (D) 30

19. In how many ways can 5 boys and 3 girls sit in a row so that no two girls are together

(A) $5! \times 3!$ (B) ${}^4P_3 \times 5!$

(C) ${}^6P_3 \times 5!$ (D) ${}^5P_3 \times 3!$

20. How many numbers less than 1000 can be made from the digits 1, 2, 3, 4, 5, 6 (repetition is not allowed)

(A) 156 (B) 160

(C) 150 (D) None of these

21. How many words can be formed with the letters of the word MATHEMATICS by rearranging them

(A) $\frac{11!}{2!2!}$ (B) $\frac{11!}{2!}$

(C) $\frac{11!}{2!2!2!}$ (D) $11!$

22. The number of arrangements of the letters of the word CALCUTTA

(A) 2520 (B) 5040

(C) 10,080 (D) 40,320

23. How many numbers, lying between 99 and 1000 be made from the digits 2, 3, 7, 0, 8, 6 when the digits occur only once in each number

(A) 100 (B) 90

(C) 120 (D) 80

24. In a circus there are ten cages for accommodating ten animals. Out of these four cages are so small that five out of 10 animals cannot enter into them. In how many ways will it be possible to accommodate ten animals in these ten cages

(A) 66400 (B) 86400

(C) 96400 (D) None of these

25. How many words can be made from the letters of the word COMMITTEE

(A) $\frac{9!}{(2!)^2}$ (B) $\frac{9!}{(2!)^3}$

(C) $\frac{9!}{2!}$ (D) $9!$

26. How many numbers can be made with the digits 3, 4, 5, 6, 7, 8 lying between 3000 and 4000 which are divisible by 5 while repetition of any digit is not allowed in any number

(A) 60 (B) 12

(C) 120 (D) 24

27. The letters of the word MODESTY are written in all possible orders and these words are written out as in a dictionary, then the rank of the word MODESTY is

(A) 5040 (B) 720

(C) 1681 (D) 2520

28. If a denotes the number of permutations of $x+2$ things taken all at a time, b the number of permutations of x things taken 11 at a time and c the number of permutations of $x-11$ things taken all at a time such that $a = 182\,bc$, then the value of x is

(A) 15 (B) 12

(C) 10 (D) 18

29. All possible four digit numbers are formed using the digits 0, 1, 2, 3 so that no number has repeated digits. The number of even numbers among them is

(A) 9 (B) 18
(C) 10 (D) None of these

30. The number of ways in which ten candidates $A_1, A_2, ...A_{10}$ can be ranked such that A_1 is always above A_{10} is

(A) $5!$ (B) $2(5!)$
(C) $10!$ (D) $\frac{1}{2}(10!)$

31. How many numbers greater than hundred and divisible by 5 can be made from the digits 3, 4, 5, 6, if no digit is repeated

(A) 6 (B) 12
(C) 24 (D) 30

32. The number of 7 digit numbers which can be formed using the digits 1, 2, 3, 2, 3, 3, 4 is

(A) 420 (B) 840
(C) 2520 (D) 5040

33. The number of 4 digit numbers that can be formed from the digits 0, 1, 2, 3, 4, 5, 6, 7 so that each number contain digit 1 is

(A) 1225 (B) 1252
(C) 1522 (D) 480

34. The number of 4 digit even numbers that can be formed using 0, 1, 2, 3, 4, 5, 6 without repetition is

(A) 120 (B) 300
(C) 420 (D) 20

35. Total number of four digit odd numbers that can be formed using 0, 1, 2, 3, 5, 7 are

(A) 216 (B) 375
(C) 400 (D) 720

36. The number of arrangements of the letters of the word BANANA in which two N's do not appear adjacently is

(A) 40 (B) 60
(C) 80 (D) 100

37. The number of ways in which 5 boys and 3 girls can be seated in a row so that each girl in between two boys

(A) 2880 (B) 1880
(C) 3800 (D) 2800

38. Eleven books consisting of 5 Mathematics, 4 Physics and 2 Chemistry are placed on a shelf. The number of possible ways of arranging them on the assumption that the books of the same subject are all together is

(A) 4! 2! (B) 11!
(C) 5! 4! 3! 2! (D) None of these

39. The number of words that can be formed out of the letters of the word ARTICLE so that the vowels occupy even places is

(A) 36 (B) 574
(C) 144 (D) 754

40. The number of ways in which 9 persons can be divided into three equal groups is

(A) 1680 (B) 840
(C) 560 (D) 280

Circular permutations

41. In how many ways a garland can be made from exactly 10 flowers

(A) $10!$ (B) $9!$
(C) $2(9!)$ (D) $\frac{9!}{2}$

42. 20 persons are invited for a party. In how many different ways can they and the host be seated at a circular table, if the two particular persons are to be seated on either side of the host

(A) $20!$ (B) $2.18!$
(C) $18!$ (D) None of these

43. The number of ways in which 5 beads of different colours form a necklace is

(A) 12 (B) 24
(C) 120 (D) 60

44. n gentlemen can be made to sit on a round table in

(A) $\frac{1}{2}(n+1)!$ ways (B) $(n-1)!$ ways

(C) $\frac{1}{2}(n-1)!$ ways (D) $(n+1)!$ ways

45. The number of ways in which 5 male and 2 female members of a committee can be seated around a round table so that the two female are not seated together is

(A) 480 (B) 600

(C) 720 (D) 840

Definition of combination, Conditional combinations, Division into groups, Derangements

46. If $^{n}C_{r-1}=36, {}^{n}C_{r}=84$ and $^{n}C_{r+1}=126$, then the value of r is

(A) 1 (B) 2

(C) 3 (D) None of these

47. $^{n}C_{r}+2\,{}^{n}C_{r-1}+{}^{n}C_{r-2}=$

(A) $^{n+1}C_{r}$ (B) $^{n+1}C_{r+1}$

(C) $^{n+2}C_{r}$ (D) $^{n+2}C_{r+1}$

48. In a conference of 8 persons, if each person shake hand with the other one only, then the total number of shake hands shall be

(A) 64 (B) 56

(C) 49 (D) 28

49. $^{n}C_{r}+{}^{n}C_{r-1}$ is equal to

(A) $^{n+1}C_{r}$ (B) $^{n}C_{r+1}$

(C) $^{n+1}C_{r+1}$ (D) $^{n-1}C_{r-1}$

50. If $^{8}C_{r}={}^{8}C_{r+2}$, then the value of $^{r}C_{2}$ is

(A) 8 (B) 3

(C) 5 (D) 2

51. If $^{20}C_{n+2}={}^{n}C_{16}$, then the value of n is

(A) 7 (B) 10

(C) 13 (D) No value

52. The value of $^{15}C_{3}+{}^{15}C_{13}$ is

(A) $^{16}C_{3}$ (B) $^{30}C_{16}$

(C) $^{15}C_{10}$ (D) $^{15}C_{15}$

53. Everybody in a room shakes hand with everybody else. The total number of hand shakes is 66. The total number of persons in the room is

(A) 11 (B) 12

(C) 13 (D) 14

54. The solution set of $^{10}C_{x-1}>2\,.\,{}^{10}C_{x}$ is

(A) {1, 2, 3} (B) {4, 5, 6}

(C) {8, 9, 10} (D) {9, 10, 11}

55. $\sum_{r=0}^{m}{}^{n+r}C_{n}=$

(A) $^{n+m+1}C_{n+1}$ (B) $^{n+m+2}C_{n}$

(C) $^{n+m+3}C_{n-1}$ (D) None of these

56. If $^{2n}C_{2}:{}^{n}C_{2}=9:2$ and $^{n}C_{r}=10$, then r =

(A) 1 (B) 2

(C) 4 (D) 5

57. If $^{10}C_{r}={}^{10}C_{r+2}$, then $^{5}C_{r}$ equals

(A) 120 (B) 10

(C) 360 (D) 5

58. If $^{n}C_{r}=84, {}^{n}C_{r-1}=36$ and $^{n}C_{r+1}=126$, then n equals

(A) 8 (B) 9

(C) 10 (D) 5

59. If $^{n}C_{3}+{}^{n}C_{4}>{}^{n+1}C_{3}$, then

(A) $n>6$ (B) $n>7$

(C) $n<6$ (D) None of these

60. Value of r for which $^{15}C_{r+3}={}^{15}C_{2r-6}$ is

(A) 2 (B) 4

(C) 6 (D) – 9

61. If $^{n+1}C_{3}=2\,{}^{n}C_{2}$, then $n=$

(A) 3 (B) 4

(C) 5 (D) 6

62. $\begin{pmatrix} n \\ n-r \end{pmatrix} + \begin{pmatrix} n \\ r+1 \end{pmatrix}$, whenever $0 \le r \le n-1$ is equal to

(A) $\begin{pmatrix} n \\ r-1 \end{pmatrix}$ (B) $\begin{pmatrix} n \\ r \end{pmatrix}$

(C) $\begin{pmatrix} n \\ r+1 \end{pmatrix}$ (D) $\begin{pmatrix} n+1 \\ r+1 \end{pmatrix}$

63. The least value of natural number *n* satisfying $C(n,5)+C(n,6) > C(n+1,5)$ is

(A) 11 (B) 10

(C) 12 (D) 13

64. There are 15 persons in a party and each person shake hand with another, then total number of hand shakes is

(A) ${}^{15}P_2$ (B) ${}^{15}C_2$

(C) 15! (D) $2(15!)$

65. If n and r are two positive integers such that $n \ge r$, then ${}^nC_{r-1} + {}^nC_r =$

(A) ${}^nC_{n-r}$ (B) ${}^nC_r$

(C) ${}^{n-1}C_r$ (D) ${}^{n+1}C_r$

66. The numbers of permutations of n things taken r at a time, when p things are always included, is

(A) ${}^nC_r\ p!$ (B) ${}^{n-p}C_r\ r!$

(C) ${}^{n-p}C_{r-p}\ r!$ (D) None of these

67. Two packs of 52 cards are shuffled together. The number of ways in which a man can be dealt 26 cards so that he does not get two cards of the same suit and same denomination is

(A) ${}^{52}C_{26} \,.\, 2^{26}$ (B) ${}^{104}C_{26}$

(C) $2 \,.\, {}^{52}C_{26}$ (D) None of these

68. In a touring cricket team there are 16 players in all including 5 bowlers and 2 wicket-keepers. How many teams of 11 players from these, can be chosen, so as to include three bowlers and one wicket-keeper

(A) 650 (B) 720

(C) 750 (D) 800

69. Out of 6 books, in how many ways can a set of one or more books be chosen

(A) 64 (B) 63

(C) 62 (D) 65

70. Choose the correct number of ways in which 15 different books can be divided into five heaps of equal number of books

(A) $\dfrac{15!}{5!(3!)^5}$ (B) $\dfrac{15!}{(3!)^5}$

(C) ${}^{15}C_5$ (D) ${}^{15}P_5$

71. The number of ways of dividing 52 cards amongst four players equally, are

(A) $\dfrac{52!}{(13!)^4}$ (B) $\dfrac{52!}{(13!)^2\ 4!}$

(C) $\dfrac{52!}{(12!)^4\ (4!)}$ (D) None of these

72. How many words of 4 consonants and 3 vowels can be formed from 6 consonants and 5 vowels

(A) 75000 (B) 756000

(C) 75600 (D) None of these

73. In the 13 cricket players 4 are bowlers, then how many ways can form a cricket team of 11 players in which at least 2 bowlers included

(A) 55 (B) 72

(C) 78 (D) None of these

74. Six '+' and four '–' signs are to placed in a straight line so that no two '–' signs come together, then the total number of ways are

(A) 15 (B) 18

(C) 35 (D) 42

75. The number of groups that can be made from 5 different green balls, 4 different blue balls and 3 different red balls, if at least 1 green and 1 blue ball is to be included

(A) 3700 (B) 3720
(C) 4340 (D) None of these

76. All possible two factors products are formed from numbers 1, 2, 3, 4, ..., 200. The number of factors out of the total obtained which are multiples of 5 is

(A) 5040 (B) 7180
(C) 8150 (D) None of these

77. The total number of ways of selecting six coins out of 20 one rupee coins, 10 fifty paise coins and 7 twenty five paise coins is

(A) 28 (B) 56
(C) ${}^{37}C_6$ (D) None of these

78. The number of ways in which thirty five apples can be distributed among 3 boys so that each can have any number of apples, is

(A) 1332 (B) 666
(C) 333 (D) None of these

79. A father with 8 children takes them 3 at a time to the Zoological gardens, as often as he can without taking the same 3 children together more than once. The number of times he will go to the garden is

(A) 336 (B) 112
(C) 56 (D) None of these

80. In how many ways can 5 red and 4 white balls be drawn from a bag containing 10 red and 8 white balls

(A) ${}^{8}C_5 \times {}^{10}C_4$ (B) ${}^{10}C_5 \times {}^{8}C_4$
(C) ${}^{18}C_9$ (D) None of these

81. ${}^{14}C_4 + \sum_{j=1}^{4} {}^{18-j}C_3$ is equal to

(A) ${}^{18}C_3$ (B) ${}^{18}C_4$
(C) ${}^{14}C_7$ (D) None of these

82. The number of ways in which four letters of the word 'MATHEMATICS' can be arranged is given by

(A) 136 (B) 192
(C) 1680 (D) 2454

83. 10 different letters of English alphabet are given. Out of these letters, words of 5 letters are formed. How many words are formed when at least one letter is repeated

(A) 99748 (B) 98748
(C) 96747 (D) 97147

84. The number of ways in which a committee of 6 members can be formed from 8 gentlemen and 4 ladies so that the committee contains at least 3 ladies is

(A) 252 (B) 672
(C) 444 (D) 420

85. A person is permitted to select at least one and at most *n* coins from a collection of $(2n+1)$ distinct coins. If the total number of ways in which he can select coins is 255, then *n* equals

(A) 4 (B) 8
(C) 16 (D) 32

Geometrical problems

86. The number of diagonals in a polygon of m sides is

(A) $\frac{1}{2!}m(m-5)$ (B) $\frac{1}{2!}m(m-1)$
(C) $\frac{1}{2!}m(m-3)$ (D) $\frac{1}{2!}m(m-2)$

87. The number of straight lines joining 8 points on a circle is

(A) 8 (B) 16
(C) 24 (D) 28

88. The number of triangles that can be formed by choosing the vertices from a set of 12 points, seven of which lie on the same straight line, is

(A) 185 (B) 175

(C) 115 (D) 105

89. In a plane there are 10 points out of which 4 are collinear, then the number of triangles that can be formed by joining these points are

(A) 60 (B) 116

(C) 120 (D) None of these

90. There are 16 points in a plane out of which 6 are collinear, then how many lines can be drawn by joining these points

(A) 106 (B) 105

(C) 60 (D) 55

91. The straight lines I_1, I_2, I_3 are parallel and lie in the same plane. A total number of m points are taken on I_1, n points on I_2, k points on I_3. The maximum number of triangles formed with vertices at these points are

(A) ${}^{m+n+k}C_3$

(B) ${}^{m+n+k}C_3 - {}^{m}C_3 - {}^{n}C_3 - {}^{k}C_3$

(C) ${}^{m}C_3 + {}^{n}C_3 + {}^{k}C_3$

(D) None of these

92. The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines is

(A) 6 (B) 18

(C) 12 (D) 9

93. Six points in a plane be joined in all possible ways by indefinite straight lines, and if no two of them be coincident or parallel, and no three pass through the same point (with the exception of the original 6 points). The number of distinct points of intersection is equal to

(A) 105 (B) 45

(C) 51 (D) None of these

94. There are m points on a straight line AB and n points on another line AC, none of them being the point A. Triangles are formed from these points as vertices when (i) A is excluded (ii) A is included. Then the ratio of the number of triangles in the two cases is

(A) $\frac{m+n-2}{m+n}$ (B) $\frac{m+n-2}{2}$

(C) $\frac{m+n-2}{m+n+2}$ (D) None of these

95. There are n straight lines in a plane, no two of which are parallel and no three pass through the same point. Their points of intersection are joined. Then the number of fresh lines thus obtained is

(A) $\frac{n(n-1)(n-2)}{8}$

(B) $\frac{n(n-1)(n-2)(n-3)}{6}$

(C) $\frac{n(n-1)(n-2)(n-3)}{8}$

(D) None of these

96. Let T_n denote the number of triangles which can be formed using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 21$, then n equals

(A) 5 (B) 7

(C) 6 (D) 4

97. Out of 10 points in a plane 6 are in a straight line. The number of triangles formed by joining these points are

(A) 100 (B) 150

(C) 120 (D) None of these

98. There are *n* points in a plane of which *p* points are collinear. How many lines can be formed from these points

(A) ${}^{(n-p)}C_2$ (B) ${}^{n}C_2 - {}^{p}C_2$

(C) ${}^{n}C_2 - {}^{p}C_2 + 1$ (D) ${}^{n}C_2 - {}^{p}C_2 - 1$

99. Given six line segments of lengths 2, 3, 4, 5, 6, 7 units, the number of triangles that can be formed by these lines is

(A) ${}^6C_3 - 7$ (B) ${}^6C_3 - 6$

(C) ${}^6C_3 - 5$ (D) ${}^6C_3 - 4$

100. A polygon has 35 diagonals, then the number of its sides is

(A) 8 (B) 9

(C) 10 (D) 11

Multinomial theorem, Number of divisors, Miscellaneous problems

101. In how many ways can Rs. 16 be divided into 4 person when none of them get less than Rs. 3

(A) 70 (B) 35

(C) 64 (D) 192

102. A set contains $(2n+1)$ elements. The number of sub-sets of the set which contain at most n elements is

(A) 2^n (B) 2^{n+1}

(C) 2^{n-1} (D) 2^{2n}

103. The number of divisors of 9600 including 1 and 9600 are

(A) 60 (B) 58

(C) 48 (D) 46

104. Number of ways of selection of 8 letters from 24 letters of which 8 are a, 8 are b and the rest unlike, is given by

(A) 2^7 (B) $8 . 2^8$

(C) $10 . 2^7$ (D) None of these

105. If ${}^nP_4 = 30\, {}^nC_5$, then n =

(A) 6 (B) 7

(C) 8 (D) 9

106. The number of ordered triplets of positive integers which are solutions of the equation $x+y+z=100$ is

(A) 6005 (B) 4851

(C) 5081 (D) None of these

107. If a, b, c, d, e are prime integers, then the number of divisors of ab^2c^2de excluding 1 as a factor, is

(A) 94 (B) 72

(C) 36 (D) 71

108. An *n*-digit number is a positive number with exactly n digits. Nine hundred distinct *n*-digit numbers are to be formed using only the three digits 2, 5 and 7. The smallest value of n for which this is possible is

(A) 6 (B) 7

(C) 8 (D) 9

109. Number of divisors of n = 38808 (except 1 and *n*) is

(A) 70 (B) 68

(C) 72 (D) 74

110. If ${}^nP_4 = 24 . {}^nC_5$, then the value of *n* is

(A) 10 (B) 15

(C) 9 (D) 5