11. In how many ways can 10 true-false questions be replied
(a) 20 (b) 100
(c) 512 (d) 1024

12. 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

13. If ${}^{n}P_5 = 9\times{}^{n-1}P_4$, then the value of n is
(a) 6 (b) 8
(c) 5 (d) 9

14. The value of ${}^{n}P_r$ is equal to **[IIT 1971; MP PET 1993**
(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) ${}^{n-1}P_{r-1} + {}^{n-1}P_r$

15. 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

16. 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

17. There are 4 parcels and 5 post-offices. In how many different ways the registration of parcel can be made
[MP PET 1983]
(a) 20 (b) 4^5
(c) 5^4 (d) $5^4 - 4^5$

18. In how many ways can 5 prizes be distributed among four students when every student can take one or more prizes
[BIT Ranchi 1990; RPET 1988, 97]
(a) 1024 (b) 625
(c) 120 (d) 600

19. In a train five seats are vacant, then how many ways can three passengers sit **[RPET 1985; MP PET**
(a) 20 (b) 30
(c) 10 (d) 60

20. The product of any r consecutive natural numbers is always divisible by
(a) $r!$ (b) r^2
(c) r^n (d) None of these

21. The sum of the digits in the unit place of all numbers formed with the help of 3, 4, 5, 6 taken all at a time is
[Pb. CET 1990]
(a) 18 (b) 432
(c) 108 (d) 144

22. Six identical coins are arranged in a row. The number of ways in which the number of tails is equal to the number of heads is
(a) 20 (b) 9
(c) 120 (d) 40

23. The figures 4, 5, 6, 7, 8 are written in every possible order. The number of numbers greater than 56000 is
(a) 72 (b) 96
(c) 90 (d) 98

24. In how many ways can 10 balls be divided between two boys, one receiving two and the other eight balls
(a) 45 (b) 75
(c) 90 (d) None of these

25. The sum of all 4 digit numbers that can be formed by using the digits 2, 4, 6, 8 (repetition of digits not allowed) is
(a) 133320 (b) 533280
(c) 53328 (d) None of these

26. There are 5 roads leading to a town from a village. The number of different ways in which a villager can go to the town and return back, is
(a) 25 (b) 20
(c) 10 (d) 5

27. In how many ways can five examination papers be arranged so that physics and chemistry papers never come together
(a) 31 (b) 48
(c) 60 (d) 72

28. The number of ways in which first, second and third prizes can be given to 5 competitors is
(a) 10 (b) 60
(c) 15 (d) 125

29. The number of 3 digit odd numbers, that can be formed by using the digits 1, 2, 3, 4, 5, 6 when the repetition is allowed, is **[Pb. CET 1999]**
(a) 60 (b) 108
(c) 36 (d) 30

30. How many numbers of five digits can be formed from the numbers 2, 0, 4, 3, 8 when repetition of digits is not allowed
[MP PET 2000; Pb. CET 2001]
(a) 96 (b) 120
(c) 144 (d) 14

31. If ${}^{12}P_r = 1320$, then r is equal to
(a) 5 (b) 4
(c) 3 (d) 2

32. 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

33. 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

34. 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

35. 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) $(n-2)n!$

36. 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

37. 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 **[IIT 1976; AI**

(a) 350 (b) 375

(c) 450 (d) 576

38. 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 **[RPET 1988,** 1

(a) 24 (b) 18

(c) 12 (d) 30

39. 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) ${}^5P_3\times 3!$

40. 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

41. How many words can be formed from the letters of the word COURTESY, whose first letter is C and the last letter is Y

(a) $6!$ (b) $8!$

(c) $2(6)!$ (d) $2(7)!$

42. How many words can be made from the letters of the word DELHI, if L comes in the middle in every word

(a) 12 (b) 24

(c) 60 (d) 6

43. How many numbers consisting of 5 digits can be formed in which the digits 3, 4 and 7 are used only once and the digit 5 is used twice

(a) 30 (b) 60

(c) 45 (d) 90

44. In how many ways 3 letters can be posted in 4 letter-boxes, if all the letters are not posted in the same letter-box

(a) 63 (b) 60

(c) 77 (d) 81

45. The number of 5 digit telephone numbers having at least one of their digits repeated is

(a) 90,000 (b) 100,000

(c) 30,240 (d) 69,760

46. How many words can be formed with the letters of the word MATHEMATICS by rearranging them **[MP PET 1984; DCE 2001]**

(a) $\frac{11!}{2!2!}$ (b) $\frac{11!}{2!}$

(c) $\frac{11!}{2!2!2!}$ (d) $11!$

47. The number of arrangements of the letters of the word CALCUTTA **[MP PET 1984]**

(a) 2520 (b) 5040

(c) 10,080 (d) 40,320

48. 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

49. 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 **[Roorkee 1989]**

(a) 66400 (b) 86400

(c) 96400 (d) None of these

50. How many words can be made from the letters of the word COMMITTEE **[RPET 1986; MP PET 2002]**

(a) $\frac{9!}{(2!)^2}$ (b) $\frac{9!}{(2!)^3}$

(c) $\frac{9!}{2!}$ (d) $9!$

51. 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 **[RPET 1990]**

(a) 60 (b) 12

(c) 120 (d) 24

52. 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

53. 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 $a=182bc$, then the value of x is

(a) 15 (b) 12

(c) 10 (d) 18

54. 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

55. 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) $\frac{1}{2}(10!)$

56. All the letters of the word 'EAMCET' are arranged in all possible ways. The number of such arrangements in which two vowels are not adjacent to each other is **[EAMCET 1987; DEC 2000]**

(a) 360 (b) 114
(c) 72 (d) 54

57. In how many ways can 5 boys and 5 girls stand in a row so that no two girls may be together

(a) $(5!)^2$ (b) $5!\times 4!$
(c) $5!\times 6!$ (d) $6\times 5!$

58. The total number of permutations of the letters of the word "BANANA" is **[RPET 1997, 2000]**

(a) 60 (b) 120
(c) 720 (d) 24

59. The number of words which can be made out of the letters of the word MOBILE when consonants always occupy odd places is

(a) 20 (b) 36
(c) 30 (d) 720

60. How many numbers greater than 24000 can be formed by using digits 1, 2, 3, 4, 5 when no digit is repeated **[RPET 1999]**

(a) 36 (b) 60
(c) 84 (d) 120

61. 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 **[AMU 1999]**

(a) 6 (b) 12
(c) 24 (d) 30

62. 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

63. 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

64. The number of 4 digit even numbers that can be formed using 0, 1, 2, 3, 4, 5, 6 without repetition is **[Kerala (Engg.) 2001]**

(a) 120 (b) 300
(c) 420 (d) 20

65. 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

66. The number of arrangements of the letters of the word BANANA in which two N's do not appear adjacently is **[IIT Screening 2002]**

(a) 40 (b) 60
(c) 80 (d) 100

67. 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 **[Kerala (Engg.) 2002]**

(a) 2880 (b) 1880
(c) 3800 (d) 2800

68. 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 **[AMU 2002]**

(a) 4! 2! (b) 11!
(c) 5! 4! 3! 2! (d) None of these

69. The number of words that can be formed out of the letters of the word ARTICLE so that the vowels occupy even places is **[Karnataka CET 2003]**

(a) 36 (b) 574
(c) 144 (d) 754

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

(a) 1680 (b) 840
(c) 560 (d) 280

71. If a man and his wife enter in a bus, in which five seats are vacant, then the number of different ways in which they can be seated is

(a) 2 (b) 5
(c) 20 (d) 40

72. If the letters of the word *SACHIN* arranged in all possible ways and these words are written out as in dictionary, then the word *SACHIN* appears at serial number **[AIEEE 2005]**

(a) 603 (b) 602
(c) 601 (d) 600

73. Let the eleven letters A, B .....,K denote an arbitrary permutation of the integers (1, 2,.....11), then $(A-1)(B-2)(C-3).....(K-11)$

(a) Necessarily zero (b) Always odd
(c) Always even (d) None of these

74. 4 Note of Rs. 100 and 5 note in which first of Rs. 1, second of Rs. 2, Third of Rs. 5, fourth of Rs. 20 and fifth one of Rs. 50 distributed in 3 children such that each child receive at least one note of Rs. 100. The total number of ways of distribution

(a) 3×5^3 (b) 5×3^5
(c) 3^6 (d) None of these

75. How many numbers lying between 999 and 10000 can be formed with the help of the digit 0,2,3,6,7,8 when the digits are not to be repeated

(a) 100 (b) 200
(c) 300 (d) 400

Circular permutations

1. If eleven members of a committee sit at a round table so that the President and Secretary always sit together, then the number of arrangements is

(a) $10!\times 2$ (b) $10!$

(c) $9!\times 2$ (d) None of these

2. In how many ways can 5 keys be put in a ring

(a) $\frac{1}{2}4!$ (b) $\frac{1}{2}5!$

(c) $4!$ (d) $5!$

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

(a) $5!\times 5!$ (b) $4!\times 5!$

(c) $\frac{5!\times 5!}{2}$ (d) None of these

4. In how many ways can 12 gentlemen sit around a round table so that three specified gentlemen are always together

(a) 9 ! (b) 10 !

(c) 3 ! 10 ! (d) 3 ! 9 !

5. In how many ways can 15 members of a council sit along a circular table, when the Secretary is to sit on one side of the Chairman and the Deputy Secretary on the other side

(a) $2\times 12!$ (b) 24

(c) $2\times 15!$ (d) None of these

6. In how many ways a garland can be made from exactly 10 flowers **[MP PET 1984]**

(a) $10!$ (b) $9!$

(c) $2(9!)$ (d) $\frac{9!}{2}$

7. 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

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

(a) 12 (b) 24

(c) 120 (d) 60

9. n gentlemen can be made to sit on a round table in **[MP PET 1982]**

(a) $\frac{1}{2}(n+1)!$ ways (b) $(n-1)!$ ways

(c) $\frac{1}{2}(n-1)!$ ways (d) $(n+1)!$ ways

10. 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 **[Roorkee 1999]**

(a) 480 (b) 600

(c) 720 (d) 840

11. In how many ways 7 men and 7 women can be seated around a round table such that no two women can sit together **[EAMCET 1990; MP PET 2001; DCE 2001; UPSEAT 2002;Pb. CET 2000]**

(a) $(7!)^2$ (b) $7!\times 6!$

(c) $(6!)^2$ (d) $7!$

12. The number of circular permutations of n different objects is **[Kerala (Engg.) 2001]**

(a) $n!$ (b) n

(c) $(n-2)!$ (d) $(n-1)!$

13. The number of ways that 8 beads of different colours be string as a necklace is

(a) 2520 (b) 2880

(c) 5040 (d) 4320

14. The number of ways in which 6 men and 5 women can dine at a round table if no two women are to sit together is given by

(a) $6!\times 5!$ (b) 30

(c) $5!\times 4!$ (d) $7!\times 5!$

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

1. If n is even and the value of ${}^nC_r$ is maximum, then $r=$

(a) $\frac{n}{2}$ (b) $\frac{n+1}{2}$

(c) $\frac{n-1}{2}$ (d) None of these

2. A man has 7 friends. In how many ways he can invite one or more of them for a tea party

(a) 128 (b) 256

(c) 127 (d) 130

3. There are 12 volleyball players in all in a college, out of which a team of 9 players is to be formed. If the captain always remains the same, then in how many ways can the team be formed

(a) 36 (b) 108

(c) 99 (d) 165

4. In how many ways can a girl and a boy be selected from a group of 15 boys and 8 girls

(a) 15×8 (b) $15+8$

(c) ${}^{23}P_2$ (d) ${}^{23}C_2$

5. If ${}^{15}C_{3r}={}^{15}C_{r+3}$, then the value of r is **[IIT 1967; RPET 1991; MP PET 1998; Karnataka CET 1996]**

(a) 3 (b) 4

(c) 5 (d) 8

6. ${}^{47}C_4+\sum_{r=1}^{5}{}^{52-r}C_3=$ **[IIT 1980; RPET 2002; UPSEAT 2000]**

(a) ${}^{47}C_6$ (b) ${}^{52}C_5$

(c) ${}^{52}C_4$ (d) None of these

7. ${}^nC_r\div{}^nC_{r-1}=$ **[MP PET 1984]**

(a) $\frac{n-r}{r}$ (b) $\frac{n+r-1}{r}$

(c) $\frac{n-r+1}{r}$ (d) $\frac{n-r-1}{r}$

8. If ${}^{2n}C_3 : {}^nC_2 = 44:3$, then for which of the following values of r, the value of ${}^nC_r$ will be 15 **[MP PET 1981]**

(a) $r=3$ (b) $r=4$

(c) $r=6$ (d) $r=5$

9. If $2\times{}^nC_5 = 9\times{}^{n-2}C_5$, then the value of n will be

(a) 7 (b) 10

(c) 9 (d) 5

10. If ${}^{n^2-n}C_2 = {}^{n^2-n}C_{10}$, then $n=$

(a) 12 (b) 4 only

(c) -3 only (d) 4 or -3

11. If ${}^nC_{r-1}=36$, ${}^nC_r=84$ and ${}^nC_{r+1}=126$, then the value of r is **[IIT 1979; Pb. CET 1993, 2003; DCE 1999, 2000; MP PET 2001]**

(a) 1 (b) 2

(c) 3 (d) None of these

12. ${}^nC_r + 2{}^nC_{r-1} + {}^nC_{r-2} =$

(a) ${}^{n+1}C_r$ (b) ${}^{n+1}C_{r+1}$

(c) ${}^{n+2}C_r$ (d) ${}^{n+2}C_{r+1}$

13. 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

14. ${}^nC_r + {}^nC_{r-1}$ is equal to **[MP PET 1984; Kerala (Engg.) 2002]**

(a) ${}^{n+1}C_r$ (b) ${}^nC_{r+1}$

(c) ${}^{n+1}C_{r+1}$ (d) ${}^{n-1}C_{r-1}$

15. If ${}^8C_r = {}^8C_{r+2}$, then the value of ${}^rC_2$ is **[MP PET 1984; RPET 1987]**

(a) 8 (b) 3

(c) 5 (d) 2

16. If ${}^{20}C_{n+2} = {}^nC_{16}$, then the value of n is **[MP PET 1984]**

(a) 7 (b) 10

(c) 13 (d) No value

17. The value of ${}^{15}C_3 + {}^{15}C_{13}$ is

(a) ${}^{16}C_3$ (b) ${}^{30}C_{16}$

(c) ${}^{15}C_{10}$ (d) ${}^{15}C_{15}$

18. 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 **[MNR 1991; Kurukshetra CEE 1998; Kerala (Engg.) 2**

(a) 11 (b) 12

(c) 13 (d) 14

19. 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}

20. $\sum_{r=0}^{m} {}^{n+r}C_n =$ **[Pb. CET 2003]**

(a) ${}^{n+m+1}C_{n+1}$ (b) ${}^{n+m+2}C_n$

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

21. In a football championship, there were played 153 matches. Every team played one match with each other. The number of teams participating in the championship is **[WB JEE 1992; Kurukshetra CEE 1998]**

(a) 17 (b) 18

(c) 9 (d) 13

22. In an examination there are three multiple choice questions and each question has 4 choices. Number of ways in which a student can fail to get all answers correct, is **[Pb. CET 1990; UPSEAT 2001]**

(a) 11 (b) 12

(c) 27 (d) 63

23. If $\alpha = {}^mC_2$, then ${}^{\alpha}C_2$ is equal to

(a) ${}^{m+1}C_4$ (b) ${}^{m-1}C_4$

(c) $3\,.\,{}^{m+2}C_4$ (d) $3\,.\,{}^{m+1}C_4$

24. On the occasion of Deepawali festival each student of a class sends greeting cards to the others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is

(a) ${}^{20}C_2$ (b) $2\,.\,{}^{20}C_2$

(c) $2\,.\,{}^{20}P_2$ (d) None of these

25. In a city no two persons have identical set of teeth and there is no person without a tooth. Also no person has more than 32 teeth. If we disregard the shape and size of tooth and consider only the positioning of the teeth, then the maximum population of the city is

(a) 2^{32} (b) $(32)^2-1$

(c) $2^{32}-1$ (d) 2^{32-1}

26. If ${}^{2n}C_2 : {}^nC_2 = 9:2$ and ${}^nC_r = 10$, then $r=$

(a) 1 (b) 2

(c) 4 (d) 5

27. If ${}^{10}C_r = {}^{10}C_{r+2}$, then ${}^5C_r$ equals **[RPET 1996]**

(a) 120 (b) 10

(c) 360 (d) 5

28. If ${}^nC_r = 84$, ${}^nC_{r-1} = 36$ and ${}^nC_{r+1} = 126$, then n equals **[RPET 1997; MP PET 2001]**

(a) 8 (b) 9

(c) 10 (d) 5

29. If ${}^nC_3 + {}^nC_4 > {}^{n+1}C_3$, then **[RPET 1999]**

(a) $n>6$ (b) $n>7$

(c) $n<6$ (d) None of these

30. Value of r for which ${}^{15}C_{r+3} = {}^{15}C_{2r-6}$ is **[Pb. CET 1999]**

(a) 2 (b) 4
(c) 6 (d) – 9

31. If ${}^{n+1}C_3 = 2\,{}^{n}C_2$, then n = **[MP PET 2000; Pb. CET 200**

(a) 3 (b) 4
(c) 5 (d) 6

32. $\binom{n}{n-r}+\binom{n}{r+1}$, whenever $0 \le r \le n-1$ is equal to **[AMU 2000]**

(a) $\binom{n}{r-1}$ (b) $\binom{n}{r}$
(c) $\binom{n}{r+1}$ (d) $\binom{n+1}{r+1}$

33. The least value of natural number n satisfying $C(n,5)+C(n,6) > C(n+1,5)$ is **[EAMCET 2002]**

(a) 11 (b) 10
(c) 12 (d) 13

34. There are 15 persons in a party and each person shake hand with another, then total number of hand shakes is **[RPET 2002]**

(a) ${}^{15}P_2$ (b) ${}^{15}C_2$
(c) 15! (d) 2(15!)

35. If n and r are two positive integers such that $n \ge r$, then ${}^{n}C_{r-1} + {}^{n}C_r =$ **[Kerala (Engg.) 2002]**

(a) ${}^{n}C_{n-r}$ (b) ${}^{n}C_r$
(c) ${}^{n-1}C_r$ (d) ${}^{n+1}C_r$

36. If ${}^{43}C_{r-6} = {}^{43}C_{3r+1}$, then the value of r is **[Kerala (Engg.) 2002]**

(a) 12 (b) 8
(c) 6 (d) 10

37. How many numbers of 6 digits can be formed from the digits of the number 112233

(a) 30 (b) 60
(c) 90 (d) 120

38. In an election there are 8 candidates, out of which 5 are to be choosen. If a voter may vote for any number of candidates but not greater than the number to be choosen, then in how many ways can a voter vote

(a) 216 (b) 114
(c) 218 (d) None of these

39. In an election the number of candidates is 1 greater than the persons to be elected. If a voter can vote in 254 ways, then the number of candidates is

(a) 7 (b) 10
(c) 8 (d) 6

40. In how many ways can 21 English and 19 Hindi books be placed in a row so that no two Hindi books are together

(a) 1540 (b) 1450
(c) 1504 (d) 1405

41. ${}^{n}C_r + {}^{n-1}C_r + \ldots\ldots + {}^{r}C_r =$ **[AMU 2002]**

(a) ${}^{n+1}C_r$ (b) ${}^{n+1}C_{r+1}$
(c) ${}^{n+2}C_r$ (d) 2^n

42. How many words can be formed by taking 3 consonants and 2 vowels out of 5 consonants and 4 vowels

(a) ${}^{5}C_3 \times {}^{4}C_2$ (b) $\frac{{}^{5}C_3 \times {}^{4}C_2}{5}$
(c) ${}^{5}C_3 \times {}^{4}C_3$ (d) $({}^{5}C_3 \times {}^{4}C_2)(5)!$

43. In how many ways a team of 11 players can be formed out of 25 players, if 6 out of them are always to be included and 5 are always to be excluded

(a) 2020 (b) 2002
(c) 2008 (d) 8002

44. In how many ways can a committee consisting of one or more members be formed out of 12 members of the Municipal Corporation

(a) 4095 (b) 5095
(c) 4905 (d) 4090

45. Out of 10 white, 9 black and 7 red balls, the number of ways in which selection of one or more balls can be made, is

(a) 881 (b) 891
(c) 879 (d) 892

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

(a) ${}^{n}C_r\ p!$ (b) ${}^{n-p}C_r\ r!$
(c) ${}^{n-p}C_{r-p}\ r!$ (d) None of these

47. 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) ${}^{52}C_{26} \cdot 2^{26}$ (b) ${}^{104}C_{26}$
(c) $2 \cdot {}^{52}C_{26}$ (d) None of these

48. 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 **[MP PET 1984]**

(a) 650 (b) 720
(c) 750 (d) 800

49. Out of 6 books, in how many ways can a set of one or more books be chosen **[MP PET 1984]**

(a) 64 (b) 63
(c) 62 (d) 65

50. Choose the correct number of ways in which 15 different books can be divided into five heaps of equal number of books **[MP PET 1982]**

(a) $\frac{15!}{5!(3!)^5}$ (b) $\frac{15!}{(3!)^5}$
(c) ${}^{15}C_5$ (d) ${}^{15}P_5$

51. The number of ways of dividing 52 cards amongst four players equally, are **[IIT 1979]**

(a) $\frac{52!}{(13!)^4}$ (b) $\frac{52!}{(13!)^2\ 4!}$

(c) $\frac{52!}{(12!)^4\,(4!)}$ (d) None of these

52. How many words of 4 consonants and 3 vowels can be formed from 6 consonants and 5 vowels **[RPE**

(a) 75000 (b) 756000

(c) 75600 (d) None of these

53. 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

54. 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

55. 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 **[IIT 1974]**

(a) 3700 (b) 3720

(c) 4340 (d) None of these

56. In how many ways can 6 persons be selected from 4 officers and 8 constables, if at least one officer is to be included **[Roorkee 1985; MP PET 2001]**

(a) 224 (b) 672

(c) 896 (d) None of these

57. To fill 12 vacancies there are 25 candidates of which five are from scheduled caste. If 3 of the vacancies are reserved for scheduled caste candidates while the rest are open to all, then the number of ways in which the selection can be made **[RPET 1981]**

(a) ${}^5C_3 \times {}^{22}C_9$ (b) ${}^{22}C_9 - {}^5C_3$

(c) ${}^{22}C_3 + {}^5C_3$ (d) None of these

58. In an election there are 5 candidates and three vacancies. A voter can vote maximum to three candidates, then in how many ways can he vote

(a) 125 (b) 60

(c) 10 (d) 25

59. There are 9 chairs in a room on which 6 persons are to be seated, out of which one is guest with one specific chair. In how many ways they can sit

(a) 6720 (b) 60480

(c) 30 (d) 346

60. Out of 6 boys and 4 girls, a group of 7 is to be formed. In how many ways can this be done if the group is to have a majority of boys

(a) 120 (b) 90

(c) 100 (d) 80

61. The number of ways in which 10 persons can go in two boats so that there may be 5 on each boat, supposing that two particular persons will not go in the same boat is **[Pb. CET 1999]**

(a) $\frac{1}{2}({}^{10}C_5)$ (b) $2({}^8C_4)$

(c) $\frac{1}{2}({}^8C_5)$ (d) None of these

62. The number of ways in which we can select three numbers from 1 to 30 so as to exclude every selection of all even numbers is

(a) 4060 (b) 3605

(c) 455 (d) None of these

63. A total number of words which can be formed out of the letters a, b, c, d, e, f taken 3 together such that each word contains at least one vowel, is

(a) 72 (b) 48

(c) 96 (d) None of these

64. The number of ways in which any four letters can be selected from the word 'CORGOO' is

(a) 15 (b) 11

(c) 7 (d) None of these

65. The total number of natural numbers of six digits that can be made with digits 1, 2, 3, 4, if all digits are to appear in the same number at least once, is

(a) 1560 (b) 840

(c) 1080 (d) 480

66. 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

67. 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

68. 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

69. 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

70. In how many ways can 5 red and 4 white balls be drawn from a bag containing 10 red and 8 white balls **[EAMCET 1991; Pb. CET 2000]**

(a) ${}^8C_5 \times {}^{10}C_4$ (b) ${}^{10}C_5 \times {}^8C_4$

(c) ${}^{18}C_9$ (d) None of these

71. ${}^{14}C_4 + \sum_{j=1}^{4} {}^{18-j}C_3$ is equal to **[EAMCET 1991]**

(a) ${}^{18}C_3$ (b) ${}^{18}C_4$

(c) ${}^{14}C_7$ (d) None of these

72. The number of ways in which four letters of the word 'MATHEMATICS' can be arranged is given by **[Kurukshetra CEE 1996; Pb. CET 1995]**

(a) 136 (b) 192

(c) 1680 (d) 2454

73. 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 **[UPSEAT 1999]**

(a) 99748 (b) 98748

(c) 96747 (d) 97147

74. 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 **[Kerala (Engg.) 2002]**

(a) 252 (b) 672

(c) 444 (d) 420

75. 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

76. A man has 10 friends. In how many ways he can invite one or more of them to a party

(a) $10!$ (b) 2^{10}

(c) $10!-1$ (d) $2^{10}-1$

77. A student is to answer 10 out of 13 questions in an examination such that he must choose at least 4 from the first five question. The number of choices available to him is **[AIEEE 2003]**

(a) 140 (b) 196

(c) 280 (d) 346

78. If ${}^nC_r$ denotes the number of combinations of n things taken r at a time, then the expression ${}^nC_{r+1}+{}^nC_{r-1}+2\times{}^nC_r$ equals **[AIEEE 2003]**

(a) ${}^{n+2}C_r$ (b) ${}^{n+2}C_{r+1}$

(c) ${}^{n+1}C_r$ (d) ${}^{n+1}C_{r+1}$

79. A student is allowed to select at most n books from a collection of $(2n+1)$ books. If the total number of ways in which he can select one book is 63, then the value of n is **[IIT 1987; RPET 1999; Pb. CET 2003; Orissa JEE 2005]**

(a) 2 (b) 3

(c) 4 (d) None of these

80. ${}^{n-1}C_r=(k^2-3).{}^nC_{r+1}$ if $k\in$ **[IIT Screening 2004]**

(a) $[-\sqrt{3},\sqrt{3}]$ (b) $(-\infty,-2)$

(c) $(2,\infty)$ (d) $(\sqrt{3},2)$

81. The value of $\sum_{r=0}^{n-1}\frac{{}^nC_r}{{}^nC_r+{}^nC_{r+1}}$ equals **[MP PET 2004]**

(a) $n+1$ (b) $\frac{n}{2}$

(c) $n+2$ (d) None of these

82. Out of 5 apples, 10 mangoes and 15 oranges, any 15 fruits distributed among two persons. The total number of ways of distribution

(a) 66 (b) 36

(c) 60 (d) None of these

83. The value of ${}^{50}C_4+\sum_{r=1}^{6}{}^{56-r}C_3$ is

(a) ${}^{56}C_3$ (b) ${}^{56}C_4$

(c) ${}^{55}C_4$ (d) ${}^{55}C_3$

84. If ${}^nC_{12}={}^nC_6$, then ${}^nC_2=$ **[Karnataka CET 2005]**

(a) 72 (b) 153

(c) 306 (d) 2556

85. A student is to answer 10 out of 13 questions in an examination such that he must choose at least 4 from the first five questions. The number of choices available to him is

(a) 140 (b) 196

(c) 280 (d) 346

(e) 265

Geometrical problems

1. The number of triangles that can be formed by 5 points in a line and 3 points on a parallel line is

(a) ${}^8C_3$ (b) ${}^8C_3-{}^5C_3$

(c) ${}^8C_3-{}^5C_3-1$ (d) None of these

2. The number of diagonals in a octagon will be **[MP PET 1984; Pb. CET 1989, 2000]**

(a) 28 (b) 20

(c) 10 (d) 16

3. If a polygon has 44 diagonals, then the number of its sides are **[MP PET 1998; Pb. CET 1996, 2002]**

(a) 7 (b) 11

(c) 8 d) None of these

4. How many triangles can be formed by joining four points on a circle

(a) 4 (b) 6

(c) 8 (d) 10

5. How many triangles can be drawn by means of 9 non-collinear points

(a) 84 (b) 72

(c) 144 (d) 126

6. The number of diagonals in a polygon of m sides is **[BIT 1992; MP PET 1999; UPSEAT 1999; DCE 1999; Pb. CET 2001]**

(a) $\frac{1}{2!}m(m-5)$ (b) $\frac{1}{2!}m(m-1)$

(c) $\frac{1}{2!}m(m-3)$ (d) $\frac{1}{2!}m(m-2)$

7. The number of straight lines joining 8 points on a circle is **[MP PET 1984]**

(a) 8 (b) 16

(c) 24 (d) 28

8. 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 **[Roorkee 1989; BIT 1989; MP PET 1995; Pb. CET 1997, 98; Roorkee 2000; DCE 2002; AMU 200**

(a) 185 (b) 175

(c) 115 (d) 105

9. 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

10. There are 16 points in a plane out of which 6 are collinear, then how many lines can be drawn by joining these points **[RPET 1986; MP PET 1987]**

(a) 106 (b) 105

(c) 60 (d) 55

11. The straight lines l_1, l_2, l_3 are parallel and lie in the same plane. A total number of m points are taken on l_1, n points on l_2, k points on l_3. The maximum number of triangles formed with vertices at these points are **[IIT Screening 1993; UPSEAT 2001]**

(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

12. The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines is **[WB JEE 1993;**

(a) 6 (b) 18

(c) 12 (d) 9

13. 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

14. 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

15. 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

16. A parallelogram is cut by two sets of m lines parallel to its sides. The number of parallelograms thus formed is **[Karnataka CET 1992]**

(a) $({}^{m}C_2)^2$ (b) $\left({}^{m+1}C_2\right)^2$

(c) $\left({}^{m+2}C_2\right)^2$ (d) None of these

17. In a plane there are 37 straight lines of which 13 pass through the point A and 11 pass through the point B. Besides no three lines pass through one point, no line passes through both points A and B and no two are parallel. Then the number of intersection points the lines have is equal to

(a) 535 (b) 601

(c) 728 (d) None of these

18. The greatest possible number of points of intersection of 8 straight lines and 4 circles is

(a) 32 (b) 64

(c) 76 (d) 104

19. Out of 18 points in a plane, no three are in the same straight line except five points which are collinear. The number of (i) straight lines, (ii) triangles which can be formed by joining them is

(i) (a) 140 (b) 142 (c) 144 (d) 146

(ii) (a) 816 (b) 806 (c) 800 (d) 750

20. There are 16 points in a plane, no three of which are in a straight line except 8 which are all in a straight line. The number of triangles that can be formed by joining them equals **[Kurukshetra CEE 1996, 1998]**

(a) 504 (b) 552

(c) 560 (d) 1120

21. 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

22. Out of 10 points in a plane 6 are in a straight line. The number of triangles formed by joining these points are **[RPET 2000]**

(a) 100 (b) 150

(c) 120 (d) None of these

23. There are n points in a plane of which p points are collinear. How many lines can be formed from these points **[Karnataka CET 2002]**

(a) $^{(n-p)}C_2$ (b) $^{n}C_2 - {}^{p}C_2$

(c) ${}^{n}C_2 - {}^{p}C_2 + 1$ (d) ${}^{n}C_2 - {}^{p}C_2 - 1$

24. 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 **[AMU 2002]**

(a) ${}^{6}C_3 - 7$ (b) ${}^{6}C_3 - 6$

(c) ${}^{6}C_3 - 5$ (d) ${}^{6}C_3 - 4$

25. A polygon has 35 diagonals, then the number of its sides is **[AMU 2002]**

(a) 8 (b) 9

(c) 10 (d) 11

26. The number of straight lines that can be formed by joining 20 points no three of which are in the same straight line except 4 of them which are in the same line **[Kerala (Engg.) 2002]**

(a) 183 (b) 186

(c) 197 (d) 185

Multinomial theorem, Number of divisors, Miscellaneous problems

1. If ${}^{n}C_r = {}^{n}C_{r-1}$ and ${}^{n}P_r = {}^{n}P_{r+1}$, then the value of n is

(a) 3 (b) 4

(c) 2 (d) 5

2. ${}^{n}P_r \div {}^{n}C_r =$ **[MP PET 1984]**

(a) $n!$ (b) $(n-r)!$

(c) $\frac{1}{r!}$ (d) $r!$

3. The number of numbers of 4 digits which are not divisible by 5 are

(a) 7200 (b) 3600

(c) 14400 (d) 1800

4. If ${}^{n}P_r = 840$, ${}^{n}C_r = 35$, then n is equal to **[EAMCET 198**

(a) 1 (b) 3

(c) 5 (d) 7

5. If ${}^{n}P_3 + {}^{n}C_{n-2} = 14n$, then $n =$

(a) 5 (b) 6

(c) 8 (d) 10

6. 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

7. 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}

8. The number of divisors of 9600 including 1 and 9600 are **[IIT Screening 1993]**

(a) 60 (b) 58

(c) 48 (d) 46

9. 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) $8 \cdot 2^8$

(c) $10 \cdot 2^7$ (d) None of these

10. If ${}^{n}P_4 = 30\,{}^{n}C_5$, then $n =$ **[MP PET 1995]**

(a) 6 (b) 7

(c) 8 (d) 9

11. 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

12. 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

13. 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 **[IIT 1998]**

(a) 6 (b) 7

(c) 8 (d) 9

14. Number of divisors of $n = 3880$ (except 1 and n) is **[RPET 2000]**

(a) 70 (b) 68

(c) 72 (d) 74

15. If ${}^{n}P_4 = 24 \cdot {}^{n}C_5$, then the value of n is **[Karnataka CET 2001]**

(a) 10 (b) 15

(c) 9 (d) 5

16. If ${}^{n}P_r = 720 \cdot {}^{n}C_r$, then r is equal to **[Kerala (Engg.) 2001]**

(a) 6 (b) 5

(c) 4 (d) 7

17. The sum $\sum_{i=0}^{m} \binom{10}{i}\binom{20}{m-i}$, $\left(\text{where } \binom{p}{q} = 0 \text{ if } p < q\right)$, is maximum when m is **[IIT Screening 2002]**

(a) 5 (b) 15

(c) 10 (d) 20

18. The sum of all positive divisors of 960 is **[Karnataka CET 2000]**

(a) 3048 (b) 3087

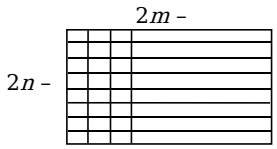
(c) 3047 (d) 2180

19. The number of way to sit 3 men and 2 women in a bus such that total number of sitted men and women on each side is 3

(a) $5!$ (b) ${}^6C_5 \times 5!$

(c) $6! \times {}^6P_5$ (d) $5! + {}^6C_5$

20. There is a rectangular sheet of dimension $(2m-1) \times (2n-1)$, (where $m > 0, n > 0$). It has been divided into square of unit area by drawing lines perpendicular to the sides. Find number of rectangles having sides of odd unit length



(a) $(m+n+1)^2$ (b) $mn(m+1)(n+1)$

(c) 4^{m+n-2} (d) m^2n^2

21. If $P(n,r) = 1680$ and $C(n,r) = 70$, then $69n + r! =$

[Kerala (Engg.)2005]

(a) 128 (b) 576

(c) 256 (d) 625

(e) 1152

Critical Thinking

Objective Questions

1. The value of $2^n\{1.3.5.....(2n-3)(2n-1)\}$ is

(a) $\frac{(2n)!}{n!}$ (b) $\frac{(2n)!}{2^n}$

(c) $\frac{n!}{(2n)!}$ (d) None of these

2. A question paper is divided into two parts A and B and each part contains 5 questions. The number of ways in which a candidate can answer 6 questions selecting at least two questions from each part is **[Roorkee 1980]**

(a) 80 (b) 100

(c) 200 (d) None of these

3. How many numbers lying between 10 and 1000 can be formed from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 (repetition is allowed)

(a) 1024 (b) 810

(c) 2346 (d) None of these

4. The number of ways in which the letters of the word TRIANGLE can be arranged such that two vowels do not occur together is

(a) 1200 (b) 2400

(c) 14400 (d) None of these

5. There are four balls of different colours and four boxes of colours same as those of the balls. The number of ways in which the balls, one in each box, could be placed such that a ball does not go to box of its own colour is **[IIT 1992]**

(a) 8 (b) 7

(c) 9 (d) None of these

6. If ${}^{56}P_{r+6} : {}^{54}P_{r+3} = 30800 : 1$, then $r =$

[Roorkee 1983; Kurukshetra CEE 1998]

(a) 31 (b) 41

(c) 51 (d) None of these

7. Ten different letters of an alphabet are given. Words with five letters are formed from these given letters. Then the number of words which have at least one letter repeated is

[IIT 1980; MNR 1998, 99; DCE 2001]

(a) 69760 (b) 30240

(c) 99748 (b) None of these

8. The number of ways of dividing 52 cards amongst four players so that three players have 17 cards each and the fourth player just one card, is

(a) $\frac{52!}{(17!)^3}$ (b) $52!$

(c) $\frac{52!}{17!}$ (d) None of these

9. The number of ways in which the letters of the word ARRANGE can be arranged such that both R do not come together is **[MP PET 1993]**

(a) 360 (b) 900

(c) 1260 (d) 1620

10. A box contains two white balls, three black balls and four red balls. In how many ways can three balls be drawn from the box if at least one black ball is to be included in the draw

(a) 64 (b) 45

(c) 46 (d) None of these

11. m men and n women are to be seated in a row so that no two women sit together. If $m > n$, then the number of ways in which they can be seated is

(a) $\frac{m!(m+1)!}{(m-n+1)!}$ (b) $\frac{m!(m-1)!}{(m-n+1)!}$

(c) $\frac{(m-1)!(m+1)!}{(m-n+1)!}$ (d) None of these

12. A five digit number divisible by 3 has to formed using the numerals 0, 1, 2, 3, 4 and 5 without repetition. The total number of ways in which this can be done is

[IIT 1989; AIEEE 2002]

(a) 216 (b) 240

(c) 600 (d) 3125

13. In a certain test there are n questions. In the test 2^{n-i} students gave wrong answers to at least i

questions, where $i = 1, 2, ...n$. If the total number of wrong answers given is 2047, then n is equal to

(a) 10 (b) 11

(c) 12 (d) 13

14. The number of times the digit 3 will be written when listing the integers from 1 to 1000 is

(a) 269 (b) 300

(c) 271 (d) 302

15. Ten persons, amongst whom are A, B and C to speak at a function. The number of ways in which it can be done if A wants to speak before B and B wants to speak before C is

(a) $\frac{10!}{6}$ (b) $3!7!$

(c) ${}^{10}P_3 \cdot 7!$ (d) None of these

16. The number of ways in which an examiner can assign 30 marks to 8 questions, awarding not less than 2 marks to any question is

(a) ${}^{21}C_7$ (b) ${}^{30}C_{16}$

(c) ${}^{21}C_{16}$ (d) None of these

17. How many words can be made out from the letters of the word INDEPENDENCE, in which vowels always come together

(a) 16800 (b) 16630

(c) 1663200 (d) None of these

18. Five balls of different colours are to be placed in three boxes of different sizes. Each box can hold all five balls. In how many ways can we place the balls so that no box remains empty

(a) 50 (b) 100

(c) 150 (d) 200

19. In how many ways can a committee be formed of 5 members from 6 men and 4 women if the committee has at least one woman **[RPET 1987; IIT 19**

(a) 186 (b) 246

(c) 252 (d) None of these

20. How many words can be made from the letters of the word BHARAT in which B and H never come together **[IIT 1977]**

(a) 360 (b) 300

(c) 240 (d) 120

21. There are 10 persons named $A, B, ...J$. We have the capacity to accommodate only 5. In how many ways can we arrange them in a line if A is must and G and H must not be included in the team of 5

(a) ${}^{8}P_5$ (b) ${}^{7}P_5$

(c) ${}^{7}C_3(4!)$ (d) ${}^{7}C_3(5!)$

22. The number of times the digit 5 will be written when listing the integers from 1 to 1000 is

(a) 271 (b) 272

(c) 300 (d) None of these

23. The exponent of 3 in 100! is

(a) 33 (b) 44

(c) 48 (d) 52

24. The total number of different combinations of one or more letters which can be made from the letters of the word 'MISSISSIPPI' is

(a) 150 (b) 148

(c) 149 (d) None of these

25. A person goes in for an examination in which there are four papers with a maximum of m marks from each paper. The number of ways in which one can get $2m$ marks is

(a) ${}^{2m+3}C_3$ (b) $\frac{1}{3}(m+1)(2m^2+4m+1)$

(c) $\frac{1}{3}(m+1)(2m^2+4m+3)$ (d) None of these

26. There were two women participating in a chess tournament. Every participant played two games with the other participants. The number of games that the men played between themselves proved to exceed by 66 the number of games that the men played with the women. The number of participants is

(a) 6 (b) 11

(c) 13 (d) None of these

27. 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 each child will go to the garden is

(a) 56 (b) 21

(c) 112 (d) None of these

28. A library has a copies of one book, b copies of each of two books, c copies of each of three books and single copies of d books. The total number of ways in which these books can be distributed is

(a) $\frac{(a+b+c+d)!}{a!\,b!\,c!}$ (b) $\frac{(a+2b+3c+d)!}{a!\,(b!)^2\,(c!)^3}$

(c) $\frac{(a+2b+3c+d)!}{a!\,b!\,c!}$ (d) None of these

29. A car will hold 2 in the front seat and 1 in the rear seat. If among 6 persons 2 can drive, then the number of ways in which the car can be filled is

(a) 10 (b) 20

(c) 30 (d) None of these

30. There are $(n+1)$ white and $(n+1)$ black balls each set numbered 1 to $n+1$. The number of ways in which the balls can be arranged in a row so that the adjacent balls are of different colours is

(a) $(2n+2)!$ (b) $(2n+2)! \times 2$

(c) $(n+1)!\times 2$ (d) $2\{(n+1)!\}^2$

31. 12 persons are to be arranged to a round table. If two particular persons among them are not to be side by side, the total number of arrangements is **[EA**

(a) $9(10!)$ (b) $2(10!)$

(c) $45(8!)$ (d) $10!$

32. How many numbers between 5000 and 10,000 can be formed using the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 each digit appearing not more than once in each number

[Karnataka CET 1993]

(a) $5\times {}^8P_3$ (b) $5\times {}^8C_3$

(c) $5!\times {}^8P_3$ (d) $5!\times {}^8C_3$

33. If x, y and r are positive integers, then

${}^xC_r + {}^xC_{r-1}{}^yC_1 + {}^xC_{r-2}{}^yC_2 + \ldots\ldots + {}^yC_r =$

[Karnataka CET 1993; RPET 2001]

(a) $\frac{x!\,y!}{r!}$ (b) $\frac{(x+y)!}{r!}$

(c) ${}^{x+y}C_r$ (d) ${}^{xy}C_r$

34. The number of ways in which an arrangement of 4 letters of the word 'PROPORTION' can be made is

(a) 700 (b) 750

(c) 758 (d) 800

35. The number of different words that can be formed out of the letters of the word 'MORADABAD' taken four at a time is

(a) 500 (b) 600

(c) 620 (d) 626

36. There are three girls in a class of 10 students. The number of different ways in which they can be seated in a row such that no two of the three girls are together is

(a) $7!\times {}^6P_3$ (b) $7!\times {}^8P_3$

(c) $7!\times 3!$ (d) $\frac{10!}{3!7!}$

37. For $2 \le r \le n$, $\binom{n}{r} + 2\binom{n}{r-1} + \binom{n}{r-2}$ is equal to

[IIT Screening 2000; Pb. CET 2000]

(a) $\binom{n+1}{r-1}$ (b) $2\binom{n+1}{r+1}$

(c) $2\binom{n+2}{r}$ (d) $\binom{n+2}{r}$

38. The number of positive integral solutions of $abc = 30$ is

[UPSEAT 2001]

(a) 30 (b) 27

(c) 8 (d) None of these

39. How many different nine-digit numbers can be formed from the digits of the number 223355888 by rearrangement of the digits so that the odd digits occupy even places

[IIT Screening 2000; Karnataka CET 2002]

(a) 16 (b) 36

(c) 60 (d) 180

40. A dictionary is printed consisting of 7 lettered words only that can be made with a letter of the word CRICKET. If the words are printed at the alphabetical order, as in an ordinary dictionary, then the number of word before the word CRICKET is **[Orissa JEE 2003]**

(a) 530 (b) 480

(c) 531 (d) 481