23. Permutations and Combinations

PART-A

Model 1

1. In how many different ways can 5 persons stand in a row for a photograph?

1) 100 2) 120 3) 50 4) 5 5) None of these

2. How many different words can be formed using the letters of the word 'BANKER'?

1) 120 2) 6 3) 720 4) 12 5) None of these

3. In how many ways can the letters of the word COMPUTER be arranged?

1) 6! 2) 7! 3) 8! 4) 5040 5) None of these

4. How many different 4 digit numbers can be formed using the digits 1, 2,3,6,7 and 9?

1) 120 2) 24 3) 720 4) 360 5) None of these

Model 2

5. How many different words can be formed using the letters of the words

(i) MIRROR (ii) BANANA (iii) SUCCESSFUL

1) 120, 60, 151200 2) 6!, 6!, 10! 3) 4!, 3!, 6!

4) 120, 120, 360 5) None of these

6. A set of 12 books has 3 identical Quant books, 3 identical Reasoning books, 4 identical English books and 2 different books on General Awareness. In how many different ways can these 12 books be arranged in a book-shelf?

1) 12! 2) 12!/(3!x3!x4!) 3) 12!/(3!x3!x4!x2!) 4) 126 5) None of these

7. In how many ways can a set of chess pieces consisting of a king, a queen, two identical rooks, two identical knights and two identical bishops be placed on the first row of a chessboard?

1) 8! 2) 8^8 3) 5040 4) 4280 5) None of these

8. A father has 2 apples and 3 pears. Each weekday (Monday through Friday) he gives one of the fruits to his daughter. In how many ways can this be done?

1) 120 2) 10 3) 24 4) 12 5) None of these

Model 3

9. How many different words can be formed using the letters of the word 'EDUCATION' such that

(i) the word always starts with the letter 'D'?

1) 9! 2) 8! 3) 2 x 8! 4) 8!/2 5) None of these

(ii) the word always ends with a vowel?

1) 5! x 8! 2) 8! 3) 5 x 8! 4) 9! 5) None of these

(iii) the word always begins with the letter 'A' and ends with a consonant?

1) 7! 2) 7! x 4! 3) 4 x 7! 4) 8! x 4 5) None of these

(iv) all the consonants are always together

1) 6! x 4 2) 6! 3) 2 x 8! 4) 6! x 4! 5) None of these

(v) the letters D, A, O and N are always together

1) 6! x 4 2) 6! 3) 2 x 8! 4) 6! x 4! 5) None of these

(vi) No two consonants are together

1) 6! x $^{6}P_{4}$ 2) 6! 3) 5! x $^{6}P_{4}$ 4) 6! x 2! 5) None of these

(vii) the letters A and T are never together

1) 7! x $^{8}P_{4}$ 2) 7! 3) 2 x 7! 4) 7! x $^{8}P_{2}$ 5) None of these

10. In how many ways can the letters of the word PLUMBER such that all the vowels are always together?

1) 6! x 2! 2) 7! 3) 5! x 2! 4) 6! 5) None of these

Model 4

11. How many 5 digit numbers can be formed with the digits 2, 4, 5, 8 and 9 when

(i) Repetition is not allowed

1) 5 2) 5! 3) 5^5 4) 25 5) None of these

(ii) Repetition is allowed

1) 5 2) 5! 3) 5^5 4) 25 5) None of these

12. How many 4 digit numbers can be formed with the digits 0, 1, 3 and 6?

1) 6 2) 4! 3) 9 4) 18 5) None of these

13. How many 4 digit numbers can be formed using the digits 5, 6, 8 and 9 such that

(i) The number is greater than 8000

1) 6 2) 4! 3) 12 4) 24 5) None of these

(ii) The number is less than 6000

1) 6 2) 4! 3) 12 4) 24 5) None of these

Model 5

14. In how many ways can 6 persons be seated around a circular table for dinner?

1) 6! 2) 5! 3) 5!/2 4) 6!/2 5) None of these

15. How many different garlands can be made using 12 flowers of different colors?

1) 12! 2) 11! 3) 11!/2 4) 12!/2 5) None of these

16.How many bracelets can be made by stringing 9 different colored beads together?

1) 20160 2) 40320 3) 80640 4) 10080 5) None of these

Model 6

17.Eight boys participated in each of 5 different competitions. In how many different ways

can the winner prize be given for all the competitions? 1) 5 2) 5! 3) 8 4) ${}_8P_5$ 5) None of these

18. In how many ways can the top three ranks be awarded for a particular

exam/competition involving 12 participants?

1) 12! 2) 3! 3) 12!/3! 4) ${}_{12}P_3$ 5) None of these

Model 7

19.In how many different ways can a committee of 8 persons be formed out of 5 men and

3 women?

1) 8! 2) 8 3) 1 4) ${}^8C_3$ 5) None of these

20.In how many different ways can a cricket team of 11 players be chosen out of total 14

players?

1) 356 2) 364 3) 256 4) 712 5) None of these

Model 8

21. Out of 10 men, there are 4 doctors, 3 teachers and 3 lawyers and out of 8 women, there are 3 doctors, 3 dancers and 2 lawyers. In how many ways can a committee of 5 persons be formed such that

(i) There are 3 doctors and 2 lawyers in the committee?

1) ${}^{7}C_5 \times {}^{5}C_5$ 2) ${}^{10}C_5 \times {}^{8}C_5$ 3) ${}^{10}C_7 \times {}^{8}C_5$ 4) ${}^{7}C_3 \times {}^{5}C_2$ 5) None of these

(ii) There are 2 teachers and 1 doctor in the committee?

1) 678 2) 588 3) 756 4) 624 5) None of these

(iii) There are 2 female doctors and 2 male lawyers?

1) 108 2) 188 3) 256 4) 124 5) None of these

(iv) There are at least 3 doctors in the committee?

1) ${}^{7}C_3 \times {}^{11}C_3 + {}^{7}C_4 \times {}^{11}C_4 + {}^{7}C_5$ 2) ${}^{7}C_2 \times {}^{11}C_3 + {}^{7}C_1 \times {}^{11}C_4 + {}^{7}C_5$ 3) ${}^{7}C_3 \times {}^{11}C_2 + {}^{7}C_5$

4) ${}^{7}C_3 \times {}^{11}C_2 + {}^{7}C_4 \times {}^{11}C_1 + {}^{7}C_5$ 5) None of these

(v) There is no doctor and no dancer in the committee?

1) 108 2) 178 3) 56 4) 112 5) None of these

22. A committee of 5 members is to be formed out of 5 professors, 6 Teachers and 3 Readers. In how many different ways can this be done such that

(i) The committee consists of 2 Professors, 2 Teachers and 1 Reader

1) 450 2) 225 3) 55 4) 90 5) None of these (ii) The committee includes all the 3 Readers

1) 90 2) 180 3) 21 4) 55 5) None of these

23. A committee of 5 members is to be formed out of 3 trainees, 4 professors and 6 research associates. In how many different ways can this be done if

(i) The committee should have all 4 professors and 1 research associate or all 3 trainees and 2 professors

1) 12 2) 13 3) 24 4) 52 5) None of these

(ii) The committee should have 2 trainees and 3 research associates.

1) 15 2) 45 3) 60 4) 9 5) None of these

Model 9

24. In how many ways can a cricket team of 11 players be chosen out of 8 batsmen and 6 bowlers such that

(i) There are 7 batsmen

1) ${}_8C_4 \times {}_6C_4$ 2) ${}_{14}C_{11}$ 3) ${}_8C_7 \times {}_6C_4$ 4) ${}_8C_7 \times {}_6C_5$ 5) None of these

(ii) There are 5 bowlers

1) ${}_8C_6 \times {}_6C_5$ 2) ${}_{14}C_{11}$ 3) ${}_8C_7 \times {}_6C_4$ 4) ${}_8C_7 \times {}_6C_5$ 5) None of these

(iii) The majority is of batsmen

1) ${}_8C_7 \times {}_6C_4 + {}_8C_8 \times {}_6C_3$ 2) ${}_8C_6 \times {}_6C_5 + {}_8C_7 \times {}_6C_4 + {}_8C_8 \times {}_6C_3$

3) ${}_8C_6 \times {}_6C_5$ 4) ${}_7C_3 \times {}_{11}C_2 + {}_7C_4 \times {}_{11}C_1 + {}_7C_5$ 5) None of these

(iv) There are not more than 5 bowlers

1) ${}_8C_7 \times {}_6C_4 + {}_8C_8 \times {}_6C_3$ 2) ${}_{14}C_{11} - {}_6C_6 \times {}_8C_5$

3) ${}_6C_5 \times {}_8C_6$ 4) ${}_7C_3 \times {}_{11}C_2 + {}_7C_4 \times {}_{11}C_1 + {}_7C_5$ 5) None of these

V) 2 particular batsmen are always included and 1 particular bowler is always excluded

1) ${}^6C_6 \times {}^5C_5$ 2) ${}^{11}C_9$ 3) ${}^8C_7 \times {}^6C_4$ 4) ${}^8C_7 \times {}^6C_5$ 5) None of these

25. In how many ways can 3 women be selected out of 15 women if one particular woman is always included and two particular women are always excluded?

1) 66 2) 77 3) 88 4) 99 5) None of these

Model 10

1) 15 2) 32 3) 31 4) 16 5) None of these

27. In how many ways can a person choose 1 or more out of 4 electrical appliances?

1) 10 2) 12 3) 14 4) 15 5) None of these

28. In a party, there are 15 persons and every person shakes hand with every other person. What will be the total number of handshakes?

1) 105 2) 120 3) 140 4) 210 5) None of these

29. How many parallelograms are formed by a set of 5 parallel lines intersecting another set of 8 parallel lines?

1) 56 2) 140 3) 280 4) 120 5) None of these

30. A sentence can be formed by choosing one word of each type from 7 nouns, 5 verbs and 2 adjectives written on a blackboard and we do not care about how much sense the sentence makes. How many different sentences can be formed?

1) $7^2 \times 5^2 \times 2^2$ 2) 7×5×2×3! 3) 7! ×5! × 2! 4) $2^7 \times 2^5 \times 2^2$ 5) None of these

Answers:

1 - 2	2 - 3	3 – 3	4 - 4	5 - 1	6 - 2	7 - 3	8 - 2	9(i)-2
9(ii)-3	9(iiii)-3	9(iv)-4	9(v)-4	9(vi)-3	9(vii)-4	10 - 1	11(i)-2	11(ii)-3
12 - 4	13(i)-3	13(ii)-1	14 - 2	15 - 3	16 - 1	17 - 3	18 - 4	19 - 3
20 - 2	21(i)-4	21(ii)-2	21(iii)-1	21(vi)-4	21(v)-3	22(i)-1	22(ii)-4	23(i)-1
23(ii)-3	24(i)-3	24(ii)-1	24(iii)-2	24(iv)-2	24(v)-2	25 - 1	26 - 3	27 - 4
28 - 1	29 - 3	30 – 2						

PART-B

1. How many words can be formed using the letter of the word ADROIT which either begin with T or end in A?

   1) 216 2) 36 3) 423 4) 512 5) None of these

2. How many words can be formed using the letters of the word RATIOS so that the vowels occupy the even places?

   1) 216 2) 36 3) 27 4) 196 5) None of these

3. How many words can be formed using the letters of the word SEARCH which begin with A but do not end in R?

   1) 64 2) 24 3) 96 4) 72 5) None of these

4. How many words can be formed using the letters of the word ANSWER which neither begin with R nor end in A?

1) 504 2) 500 3) 496 4) 304 5) None of these

5. If all possible four-digit numbers are formed using the digits 5, 6, 7, 8 without repetition and arranged in ascending order of magnitude, then find the position of the number 7685.
   1) 16 2) 15 3) 21 4) 27 5) None of these

6. In a cricket tournament, each participating team plays once against every other team and in all 36 matches are played. Find the number of teams that participated in the tournament?
   1) 10 2) 8 3) 9 4) 7 5) None of these

7. Out of 8 persons in a group, find the number of ways of selecting 3 persons and also the number of ways of arranging these 3 selected persons in a row?
   1) 56,336 2) 336,56 3) 470,50 4) 72,389 5) None of these

8. A certain group of friends met on a New Year eve party and each person shook hand with everybody else in the group exactly once and the number of handshakes turned out to be 66. On the occasion of Pongal, if each person in this group sends a greeting card to every other person in the group, then how many cards are exchanged?
   1) 33 2) 66 3) 132 4) 264 5) None of these

9. Mr. Kapil, one of the members of the group referred to in the above problem, wants to invite home one or more of his friends (from that group) for dinner, then in how many ways can the invitation be extended?
   1) 1024 2) 2048 3) 1023 4) 2047 5) None of these

10. Rohit attempts a true or false question paper which contains 10 questions at random. The number of ways in which he would have answered one or more question is
    1) 3^{10} 2) $3^{10} - 1$ 3) 2^{10} 4) $2^{10} - 1$ 5) None of these

Answers:

1 – 1	2 - 2	3 - 3	4 - 1	5 - 1	6 - 3	7 – 1	8 - 3	9 - 4	10 - 2

24. Probability

PART-A

Model 1

1. When two coins are tossed simultaneously, what is the probability that both the coins show heads as output?

1) – 2) – 3) – 4) – 5) None of these

2. When three coins are tossed simultaneously, what is the probability that two coins show tails as output?

1) 2) 3) 4) 5) None of these

Model 2

3. When an unbiased dice is rolled, what is the probability that the output is

(i) 1

1) - 2)- 3)– 4)- 5) None of these

(ii) 2

1) - 2)- 3)– 4)- 5) None of these

(iii) A prime number

1) - 2)- 3)– 4)- 5) None of these

(iv) Greater than 2

1) - 2)- 3)– 4)– 5) None of these

4. When two dice are rolled together, what is the probability that the sum of the outputs is 8?

1) 2) 3) 4) 5) None of these

Model 3

Directions (5-9): Study the given information carefully and answer the questions that follow.

A box contains 6 red, 4 blue, 2 green and 3 yellow marbles.

5. If four marbles are picked at random, what is the probability that two are blue, one is green and one is yellow?

1) — 2) — 3) — 4) — 5) None of these

6. If three marbles are picked at random, what is the probability that all are red?
   1) – 2) — 3) — 4) — 5) None of these

7. If two marbles are picked at random, what is the probability that either both are yellow or both are green?
   1) — 2)— 3) – 4) — 5) None of these

8. If two marbles are picked at random, what is the probability that none is yellow?
   1) — 2)– 3) — 4) — 5) None of these

9. If three marbles are picked at random, what is the probability that at least one is blue?
   1) — 2) — 3)— 4)— 5) None of these

Directions (10-14): Study the following information carefully to answer the questions that follow.

A box contains 2 blue caps, 4 red caps, 5 green caps and 1 yellow cap.

10. If four caps are picked at random, what is the probability that None is green?
    1) — 2)— 3)— 4)— 5) None of these

11. If two caps are picked at random, what is the probability that both are blue?
    1) – 2) — 3) — 4) — 5) None of these

12. If one cap is picked at random, what is the probability that it is either blue or yellow?
    1) – 2) - 3) – 4) — 5) None of these

13. If two caps are picked at random, what is the probability that at least one is red?
    1) – 2) — 3) — 4) — 5) None of these

14. If three caps are picked at random, what is the probability that two are red that two are red and one is green?
    1) — 2) — 3) – 4) — 5) None of these

Directions (15-17): Study the given information carefully and answer the questions that follow.

15. There are 3 green 4 red and 5 blue marbles in a bag. If three marbles are picked at

random, whatis the probability thateitherallaregreenor all are red?

1)— 2) — 3)— 4)— 5) None of these

16.If two marbles are drawn at random, what is the probability that both are red?

1)– 2)– 3)— 4)– 5) None of these

17.If three marbles are picked at random, what is the probability that at least one is blue?

1) — 2) 3) — 4) — 5) None of these

Model 4

18.The probability that Rohan can solve a question is 3/4 and the probability that Sohan can solve it is 5/8. What is the probability that the question gets solved if both of them try it?

1) 2) – 3) — 4) 5) None of these

19.A bag contains 5 red and 4 green balls and another bag contains 3 red and 7 black balls. If a ball is drawn from each bag. Find the probability that both are of different colors.

1) 2) – 3) — 4) — 5) None of these

20.A Company has two Grids – Grid 1 and Grid 2. Out of 5 Directors and 4 General Managers of Grid 1, one person is transferred to Grid 2, which has 3 Directors and 7 General Managers. If one person is promoted from Grid 2, then what is the probability that this person is a director?

1)— 2) — 3)— 4)— 5) None of these

Answe

rs

1 – 4	2 - 2	3(i)-1	3(ii)-1	3(iii)-3	3(iv)-2	4 - 3	5 - 1	6 - 2
7 – 4	8 - 3	9 – 2	10 - 1	11 - 5	12 - 2	13 - 3	14 - 4	15 - 4
16 – 5	17 - 2	18 – 4	19 - 2	20 - 1				

PART-B

1. When two cards are drawn simultaneously from a pack of cards, what is the probability that both are red or both are kings?

   1) $\frac{26C_2}{52C_2}$ 2) $\frac{4C_2}{52C_2}$ 3) $\frac{26C_2 + 4C_2 - 2C_2}{52C_2}$ 4) $\frac{26C_2 + 4C_2}{52C_2}$

   5) None of these

2. If 5 coins are tossed together, what is the probability of getting atmost 3 tails?

   1) $\frac{5}{32}$ 2) $\frac{1}{32}$ 3) $\frac{13}{16}$ 4) $\frac{7}{16}$ 5) None of these

3. When 3 cards are drawn in succession from a pack of cards with replacement, what is the probability that the first drawn card is a heart, the second is a red card and the third a prime number card?

   1) $\frac{1}{26}$ 2) $\frac{1}{4}$ 3) $\frac{4}{13}$ 4) $\frac{1}{2}$ 5) None of these

4. Vignesh who is interested in philately saw 4 Indonesian, 5 Mexican and 6 Egyptian stamps in a box. He drew 2 stamps from the box one after the other without replacement. What is the probability that the stamp drawn second is Mexican when the stamp drawn first is replaced?

   1) $\frac{1}{3}$ 2) $\frac{5}{3}$ 3) $\frac{15}{3}$ 4) $\frac{1}{15}$ 5) None of these

5. When a fair coin is tossed nine times, find the probability of getting a head at least once?

   1) $\frac{1}{512}$ 2) $\frac{511}{512}$ 3) $\frac{9}{512}$ 4) $\frac{503}{512}$ 5) None of these

6. The probability that a boy hits his target is $\frac{1}{3}$. If he throws 5 times in succession, what is the probability that he hit the target?

   1) $\frac{1}{243}$ 2) $\frac{211}{243}$ 3) $\frac{200}{243}$ 4) $\frac{100}{243}$ 5) None of these

7. An anti craft gun can fire four shots at a time. If the probabilities of the first, second, third and last shot hitting the enemy aircraft are 0.7, 0.6, 0.5 and 0.4. What is the probability that four shots aimed at an enemy aircraft will bring the aircraft down?

1) 0.087 2) 0.916 3) 0.036 4) 0.964 5) None of these

8. Assume that there are 253 people in the room. Ignoring leap years, what is the probability that no one else in the room shares your birthday?

1) $\left\lfloor 364/365 \right\rfloor^{253}$ 2) $1-\left\lfloor 364/365 \right\rfloor^{253}$ 3) $\left\lfloor 364/365 \right\rfloor^{253-1}$ 4) 5) None of these

9. 30 students went to a theatre, in which seats are numbered from 1 – 30. Find the probability that the seat number and the roll number of 30 students is the same (Assume 30 students have their roll number from 1 to 30).

1) 0 2) $2/30$ 3) $1/6!$ 4) $1/30!$ 5) None of these

Directions (10-12): A toys factory is transporting balls of 5 different colors – yellow, blue, red, green and white. Mr. Bholeram, a worker in the factory has to separate these balls as per their colors into different boxes and label them with the corresponding colored labels. Mr.Bholeram, after separating the balls, sealed the boxes and then labeled the boxes at random.

10. What is the probability that all the boxes are labeled correctly?

1) 1 2) 0 3) $1/120$ 4) $119/120$ 5) None of these

11. What is the probability that at least one box is labeled incorrectly?

1) 1 2) 0 3) $1/120$ 4) $119/120$ 5) None of these

12. What is the probability that exactly one box is labeled incorrectly?

1) 1 2) 0 3) $11/120$ 4) $44/120$ 5) None of these

Answers:

1 – 3	2 – 3	3 – 1	4 - 1	5 - 2	6 - 2	7 - 4	8 - 1	9 – 4	10 - 3
11 - 4	12 – 2								