UNIT 4: PERMUTATIONS AND COMBINATIONS

CLASS PROBLEMS

Fundamental principle of counting

Q1. Find the number of 4 letter words, with or without meaning which can be formed out of the letters of the word ROSE assuming that
   a. Repetition of the letters is not allowed. Ans: 24
   b. Repetition of the letters is allowed. Ans: 256

Q2. How many 3 digit numbers can be formed from the digits $1, 2, 3, 4$ and 5 when
   a. Repetition of the digits is allowed. Ans: 125
   b. Repetition of the digits is not allowed. Ans: 60

Q3. How many 3 digit even numbers can be formed from the digits $1, 2, 3, 4, 5, 6$ if the digits can be repeated. Ans: 108

Q4. A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there. Ans: 8

Q5. Find the number of different signals that can be generated by arranging at least 2 flags in order (one below the other) on a vertical staff, if five different flags are available.
Ans: 320

Factorial notation

Q1. Evaluate
   a. $8!$ Ans: 40320
   b. $4!-3!$ Ans: 18

Q2. Is $3!+4!=7!$? Ans: not equal

Q3. If $\frac{1}{6!}+\frac{1}{7!}=\frac{x}{8!}$ find x. Ans: 64

Q4. Compute $\frac{8!}{6!\times 2!}$ Ans: 28

Permutations formulae

Q1. How many 4 digit numbers can be formed by using the digits 1 to 9 if repetition of the digits is not allowed Ans: 3024

Q2. How many 4 digit numbers are there with no digit repeated? Ans: 4536

Q3. Find the numbers of different 8 letter arrangements that can be made from the letters of the word DAUGHTER so that

a. All vowels occur together Ans: 4320
b. All vowels do not occur together Ans: 36000

Q4. Find r if

a. ${}^5P_r = 2{}^6P_{r-1}$ Ans: $r = 3$
b. ${}^5P_r = {}^6P_{r-1}$ Ans: $r = 4$

Q5. In how many ways can 4 red, 3 yellow and 2 green discs be arranged in a row if the discs of the same color are indistinguishable? Ans: 1260

Q6. Find the numbers of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements,

a. Do the words start with P Ans: 138600
b. Do all the vowels always occur together Ans: 16800
c. Do the vowels never occur together Ans: 1646400
d. Do the words begin with I and end in P Ans: 12600

Combinations formulae

Q1. What is the number of ways of choosing 4 from a pack of 52 playing cards. In how many ways of these

a. 4 cards are of the same suit Ans: 2860
b. 4 cards belong to 4 different suits Ans: 28561
c. Are face cards Ans: 495
d. 2 are red cards and 2 are black cards Ans: 105625
e. Cards are of the same color Ans: 29900

Q2. Determine n if

a. ${}^{2n}C_2 : {}^nC_2 = 12:1$ Ans: $n = 5$
b. ${}^{2n}C_3 : {}^nC_3 = 11:1$ Ans: $n = 6$

Q3. Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls if each selection consists of 3 balls of each color. Ans: 2000

Q4. In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 specific courses are compulsory for every student? Ans: 35

Q5. How many chords can be drawn through 21 points on a circle?
Ans: 210

Q6. In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers?
Ans: 3960

Application problems

Q1. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has

a. No girl Ans: 21
b. At least one boy and one girl Ans: 441
c. At least 3 girls Ans: 91

Q2. How many words, with or without meaning can be formed using all the letters of the word EQUATION at a time so that the vowels and consonants occur together?
Ans: 1440

Q3. If the different permutations of all the letter of the word EXAMINATION are listed as in a dictionary, how many words are there in this list before the first word starting with E?
Ans: 907200

Q4. It is required to seat 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible? Ans: 2880

Q5. In an examination, a question paper consists of 12 questions divided into 2 parts, i.e. Part I and Part II, containing 5 and 7 question respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can a student select the questions? Ans: 420