Distance Learning Programme : An initiative by AEES, MUMBAI

CLASS XI-MATHEMATICS

CHAPTER 7

PERMUTATIONS AND COMBINATIONS

HANDOUT OF MODULE-2/3

1.A Permutation is an arrangement in a definite order of a number of objects taken some or all at a time.

2. **Permutation of n different objects** The number of permutations of *n* different objects taken r at a time when $0< r \leq n$ and the objects do not repeat can be obtained by fundamental principle of counting as n(n-1)(n-2)……(n-r+1) , which is denoted by $for\ \ n_{p_r} = \frac{n!}{(n-r)!}$.

3. Properties of n_{P_r}:

(i) ${}^{n}P_{n} = n\,(n-1)\,(n-2)\ldots 1 = n!$

(ii) ${}^{n}P_{0} = \frac{n!}{n!} = 1$

(iii) ${}^{n}P_{1} = n$

(iv) ${}^{n}P_{n-1} = n!$

(v) ${}^{n}P_{r} = n \cdot {}^{n-1}P_{r-1} = n(n-1) \cdot {}^{n-2}P_{r-2}$

$= n(n-1)(n-2) \cdot {}^{n-3}P_{r-3}$

(vi) ${}^{n-1}P_{r} + r \cdot {}^{n-1}P_{r-1} = {}^{n}P_{r}$

(vii) $\frac{{}^{n}P_{r}}{{}^{n}P_{r-1}} = n - r + 1$

4.Factorial notation :

The notation n! represents the product of first n natural numbers ,i.e., the

product 1x2x3x….x(n-1)xn = n!

and 0! defined as 1.

Examples:

5! = 5x4x3x2x1=120

7!= 7x6x5x4x3x2x1= 5040

5.The number of permutations of n different objects taken r at a time ,where repetitions is allowed ,is n^r .

6.The number of permutations of n objects ,where p objects are of the same kind and rest are all different = $\frac{n!}{p!}$

7. The number of permutations of n objects ,where P_1 objects are of one kind ,P_2 objects are of the second kind,… ,….. P_k are of k th kind and the rest ,if any ,are of different kind is $\frac{n!}{p_1!p_2!\,p_{3\,!\ldots}p_k!}$

Example 1:

How many words(with or with out meaning) can be made from the letters of the word MONDAY ,assuming that no letter is repeated,
if, (i) 4 letters are used at a time.

(ii) All letters are used at a time

(iii) All letters are used but the first is vowel

Ans: (i) If 4 letters are used at a time,

then the number of words formed by letters of the

word , MONDAY = $6_{P_4} = \frac{6!}{2!} = 6X5X4X3 = 360.$

(ii) All letters are used at a time = 6! = 6x5x4x3x2x1 = 720

(iii) All letters used but first is vowel = 2x5! = 2x5x4x3x2x1=240

Example 2:

Find the number of arrangements of the letter of the word INDEPENDENCE.

Ans: Total number of letters in the word 'INDEPENDENCE' is 12, out of which N appears 3 times, E appears 4 times and D appears 2 times and rest are all different.

Hence,

the required number of arrangements = $\frac{12!}{3!4!2!} = 1663200$

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