



CHAPTER 6
PERMUTATIONS AND COMBINATIONS

NOTES

FACTORIAL NOTATION: The continued product of first n natural number is called a “factorial n ” denoted by $n!$ or $\lfloor n$. Thus $n! = 1 \times 2 \times 3 \times \dots \times n$

PERMUTATION: The different arrangement in a definite order which can be made out of a given number of things by taking some or all at a time are called permutations.

Note: ${}^n P_r$ denotes the number of permutations of n different things taken r ($\leq n$) at a time and no thing is repeated.

Theorem 1: The number of permutations of n different things taking r ($\leq n$) of them at a time is given by

$${}^n P_r = \frac{n!}{(n-r)!}$$

Theorem 2: The number of permutations of n things, where p things are of one kind, q things are of second kind and rest are all different is $\frac{n!}{p!q!}$.

COMBINATION: A group or a selection which can be formed by taking some or all of a number of things (irrespective of their order) is called a combination.

Note: The number of combinations of n different things taken r at a time is denoted by ${}^n C_r$ or $\binom{n}{r}$.

Theorem: ${}^n P_r = {}^n C_r \times r!, 0 < r \leq n$ (Relation between permutation and combination)

Notes:

1. ${}^n C_r = \frac{n!}{r!(n-r)!}$

2. $0! = 1$

3. ${}^n C_r = {}^n C_{n-r}$

4. ${}^n C_n = 1$

5. ${}^n C_0 = 1$

6. $\frac{1}{(-m)!} = 0$, where m is a positive integer.

Theorem: ${}^n C_r + {}^n C_{r-1} = {}^{n+1} C_r$
