- Identical things of another type, r identical things of the third type, and n different things
- Number of divisors of N

- Divisions and distributions
  - Distinct objectives
  - Distribution of identical objectives
- Application of Multinomial Expansion
  - Different cases of multinomial theorem
- Exponent Of a Prime Number n!.
- Principles of inclusion and exclusion
  - Derangement
  - Distribution of n different objects into r distinct boxes if in each box at least 1object is placed

PERMUTATION & COMBINATION

Factorial:

A handy Notation: $n! = n.(n-1).(n-2).....3.2.1$; $n! = n.(n-1)!$ Where $n \in N$

1. $0! = 1! = 1$
2. Factorials are not defined for negative integers.
3. n! is also denoted by
4. $(2n)! = 2^n.n![1.3.5.7.\ldots\ldots(2n-1)]$
5. Prime Factorization of (n): If (p) is a prime number and (n) is a positive integer, then The exponent of (p) in (n) is denoted by $(E_p(n))$ and is given by

$$E_p(n!) = \left[\frac{n}{p}\right] + \left[\frac{n}{p^2}\right] + \left[\frac{n}{p^3}\right] + \cdots .. + \left[\frac{n}{p^k}\right]$$

Where $p^k \leq n < p^{K+1}$ and [x] denotes the integral part of x.

If we express the powers of each prime contained in any number (n) individually, then (n) can be represented as $n = 2^{\alpha_i} \cdot 3^{\alpha_2} \cdot 5^{\alpha_3} \cdot 7^{\alpha_4}$

Where a_i are whole numbers.