Important Concepts
Permutation and Combination

Permutation and Combination Formulas

- Number of all **permutations** of n things, taken r at a time, is given by
  ${}^{n}P_{r} = \frac{n!}{(n-r)!}$ nPr = (n−r)!n!
- Number of all **combinations** of n things, taken r at a time, is given by
  ${}^{n}C_{r} = \frac{n!}{(r)!(n-r)!}$ nCr = (r)!(n−r)!n!

Points to remember

- Factorial of any negative quantity is not valid.
- If a particular thing can be done in m ways and another thing can be done in n ways, then
  - Either one of the two can be done in ***m + n*** ways and
  - Both of them can be done in ***m × n*** ways
- 0! = 1
- 1! = 1
- If from the total set of n objects and 'p_1' are of one kind and 'p_2' and 'p_3' and so on .... till p_r are others respectively then
  ${}^{n}P_{r} = \frac{n!}{p_1! \times q_2! \times \ldots\ldots p_r!}$ nPr = p1!×q2!×..... pr!n!
- ${}^{n}P_{n} = n!$
- ${}^{n}c_{n} = 1$
- ${}^{n}c_{0} = 1$
- ${}^{n}c_{r} = {}^{n}c_{(n-r)}$
- ${}^{n}c_{0}+{}^{n}c_{1}+{}^{n}c_{2}+{}^{n}c_{3}+\ldots{}^{n}c_{n} = 2^{n}$

Distribution of		**How many balls** **boxes can contain**			
k Balls	into n Boxes	No Restrictions	≤ 1 (At most one)	≥ 1 (At least one)	= 1 (Exactly one)
Distinct	Distinct	n^k (formula 1)	${}^{n}P_{k}$ (formula 2)	S(k,n) × n! (formula 3) **(Not Imp)**	${}^{n}P_{n}$ = n! if k = n 0 if k ≠ n (formula 4)
Identical	Distinct	${}^{(k+n-1)}C_{(n-1)}$ (formula 5)	${}^{n}C_{k}$ (formula 6)	${}^{(k-1)}C_{(n-1)}$ (formula 7)	1 if k = n 0 if k ≠ n (formula 8)