(6) **Circular Permutation:-**

If no distinction is made between the clockwise & anti − clockwise arrangement then

the no. of permutation $= \frac{1}{2}(n-1)!$.

And if the distinction is made then the no. of total permutation $= (n-1)!$.

Combination

(1) *The no. of combinatios of n dissimilar things taken r at a time* $= {}^{n}_{r}C = \frac{n!}{r!(n-r)!}$

(2) ${}^{n}_{r}C = {}_{n-r}^{\;\;n}C$

(3) *If* ${}^{n}_{p}C = {}^{n}_{q}C$, *then* $p + q = n$. $[p \neq q]$

(4) ${}^{n}_{r}C + {}_{r-1}^{\;\;n}C = {}^{n+1}_{\;\;r}C$

(5) $\frac{{}^{n}_{r}C}{{}_{r-1}^{\;\;n}C} = \frac{n-r+1}{r}$

(6) *The total no. of combinations of n dissimilar things taken one, two, etc. all at a time* =

${}^{n}_{1}C + {}^{n}_{2}C + {}^{n}_{3}C + \cdots \ldots + {}^{n}_{n}C = 2^n - 1$

(7) *The no. of ways in which it is possible to make a selection by taking some or all out of* $p + q + r + \cdots \ldots$ *things, whereof p are alike of one kind, q alike of second kind, r alike of third kind; and so on*

$= (p+1)(q+1)(r+1) \ldots \ldots - 1$

(8) *If* $n = +ve$ *even integer, then* ${}^{n}_{r}C$ *is greatest when* $r = \frac{n}{2}$.

If $n = +ve$ *odd integer then* ${}^{n}_{r}C$ *is greatest when* $r = \frac{n-1}{2}$ *or* $\frac{n+1}{2}$.

(9) *The no. of ways in which* $(m+n)$ *things can be divided into two groups, containing m & n things*

respectively $= \frac{(m+n)!}{m!\,n!}$.

(10) *The no. of ways in which* $(m+n+p)$ *things can be divided into three groups, containing m, n, p*

things respectively $= \frac{(m+n+p)!}{m!\,n!\,p!}$.

Binomial Theorem

(1) *If n is a + ve integer, then*

$(a+x)^n = a^n + {}^{n}_{1}Ca^{n-1}x^1 + {}^{n}_{2}Ca^{n-2}x^2 + \cdots \ldots \ldots + {}^{n}_{r}Ca^{n-r}x^r + \cdots \ldots \ldots + x^n$

(2) *If n is a − ve integer or fraction, then*

$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \cdots \ldots \ldots \infty$ $\quad [|x| < 1]$

(3) *General term* $= (r+1) -$ *th term* $= t_{r+1} = {}^{n}_{r}Ca^{n-r}x^r$

(4) (i) *If n is even, then there exists a middle term & the middle term will be* $\left(\frac{n}{2} + 1\right) -$ *th term.*

(ii) *If n is odd, then there exists two middle terms & the middle terms will be*

$\left(\frac{n-1}{2} + 1\right) -$ *th term &* $\left(\frac{n+1}{2} + 1\right) -$ *th term.*

(5) (i) *In the above expansion, the m − th term will be greatest if* $\frac{(n+1)x}{a+x} = a \;\; +ve$ *integer* (m)