

*Binomial Theorem*Essential information

- ${}^nC_r$ is the number of different combinations of n objects, r of one type, $(n - r)$ another.
- $n! = n(n - 1)(n - 2) \dots 1$

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

- The number of arrangements of an n -letter word, with ONE letter repeated p times is $\left(\frac{n!}{p!}\right)$
- The Binomial Theorem is given by

$$(a + x)^n = a^n + \binom{n}{1}a^{n-1}x + \binom{n}{2}a^{n-2}x^2 + \dots + \binom{n}{r}a^{n-r}x^r + \dots x^n$$

where a and x are numbers and n is a positive integer.

For example,

$$(1 + x)^4 = 1 + 4x + 6x^2 + 4x^3 + x^4$$

So the binomial coefficients are 1, 4, 6, 4 and 1.

- Note that

$$1! = 1 \text{ and } 0! = 1$$