Combinatorics

Factorial

$0! = 1$

$1! = 1$

$2! = 1 \times 2 = 2$

$3! = 1 \times 2 \times 3 = 6$

$4! = 1 \times 2 \times 3 \times 4 = 24$

$5! = 1 \times 2 \times 3 \times 4 \times 5 = 120$

Permutations

Selecton of r items from n items. Order is IMPORTANT

AB is not BA, Megna, Molly is not same as Molly, Megna

Formula $P = \frac{n!}{(n-r)!}$

Example:

Select 2 letter from ABC

$n = 3$

$r = 2$

AB, AC, BA, CA, BC, CB

Total = 6

$P = \frac{n!}{(n-r)!} = \frac{3!}{(3-2)!} = \frac{3!}{1!} = \frac{3 \times 2 \times 1}{1} = 6$

Combination:

Selection where order is not important.

AB is same as BA

Megna, Molly is same as Molly, Megna

Formula $C = \frac{n!}{r!(n-r)!} = \frac{P!}{r!}$

Example:

Select 2 letters from ABC $\quad n = 3, \; r = 2$

AB, AC, BC $= 3$ => order is not important.

$$C = \frac{n!}{r!(n-r)!} = \frac{3!}{2!(1!)} = \frac{1 \times 2 \times 3}{2} = 3$$

$$C = \frac{P!}{r!} = \frac{6}{2} = 3$$