Basic combinatorial results:

Proposition: The number of *permutations* of n distinct objects is $n! = n(n-1)(n-2)\cdots 1$

Example: We can permute symbols A, B and C in $3! = 6$ ways.

Definition: $0! = 1$.

Proposition: The number of permutations of r objects chosen from n distinct objects is
$n^{(r)} = n!/(n-r)!$

Example: We can permute two of the symbols A, B, C, D and E in $5^{(2)} = 5!/(5-2)! = 120/6 = 20$ ways.

Proposition: The number of *combinations* of r objects chosen from n distinct objects is

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

Example: We can choose two of the symbols A, B, C, D and E in $\binom{5}{2} = \frac{5!}{2!(5-2)!} = 10$ ways.