4 Counting

★ **Basic Counting Principle**

⇒ Let there be n stages and n_i choises at Stage i.

↳ Number of choice $= n_1 * n_2 * \cdots * n_n$

- **Permutations:** Number of ways of ordering n elements:

$$n(n-1)(n-2)\cdots 1 = n! \quad \{n\text{-factorial}\}$$

★ **Combination**

$\binom{n}{k}$ ⇒ Number of k-element subset of a given n-element set.

$$\boxed{\binom{n}{k} = \frac{n!}{k!(n-k)!}} \quad \forall \quad n = 0, 1, 2\cdots \quad k = 0, 1 \cdots n$$