

Counting Principles

Arrangements

The number of ways of arranging n unlike objects in a line

$$\begin{aligned} &= n! \\ &= n(n-1)(n-2) \dots 3 \cdot 2 \cdot 1 \end{aligned}$$

The number of ways of arranging n objects, when p are repeated

$$= \frac{n!}{p!}$$

The number of ways of arranging n objects, when p are repeated, q are repeated, r are repeated, ...

$$= \frac{n!}{p! q! r! \dots}$$

Permutations

Order is important

The number of ways of choosing r items from objects n objects

$$\begin{aligned} &= {}^n P_r \\ &= \frac{n!}{(n-r)!} \end{aligned}$$

Combinations

Order is NOT important

The number of ways of choosing r items from objects n objects

$$\begin{aligned} &= {}^n C_r = \binom{n}{r} \\ &= \frac{n!}{(n-r)! r!} \end{aligned}$$