

The Counting Principle

If one activity can occur in any one of m ways and another activity can occur in any one of n ways, then both activities can occur in any one of $m \times n$ ways.

Permutation

1. A permutation is an arrangement of objects in some specific order.
2. The symbol ${}_n P_n$ represents the number of permutations of n things taken n at a time. ${}_n P_n = n!$ where $n! = n(n-1)(n-2) \dots (2)(1)$
3. The symbol ${}_n P_r$ represents the number of permutations of n things taken r at a time. ${}_n P_r = \frac{n!}{(n-r)!}$ also, ${}_n P_r = \underbrace{n(n-1)(n-2)\dots}_{r \text{ factors}}$
4. The number of permutations of n things taken n at a time when r are identical is given by $\frac{n!}{r!}$ or $\frac{{}_n P_n}{r!}$

Combination

1. A combination is a selection in which order is not important
2. The number of combinations of n things taken r at a time is given by ${}_n C_r = \frac{{}_n P_r}{r!}$
3. For any counting number n , the following statements are true:
 - ${}_n C_n = 1$
 - ${}_n C_0 = 1$
4. For any whole numbers n and r , when $r \leq n$ ${}_n C_r = {}_n C_{n-r}$