

select r objects from n without
order with repetition $= \binom{n+r-1}{r-1}$

Tutorial Notes 1 of MATH2421

A brief summary of course material

$$= \left\langle \begin{matrix} n \\ r \end{matrix} \right\rangle$$

1. (The Basic Principle of Counting)

Suppose that two experiments are to be performed:

If experiment 1 can result in any one of m possible outcomes; and experiment 2 can result in any one of n possible outcomes; then together there are mn possible outcomes of the two experiments.

2. (General Principle in Permutations)

Suppose there are n (distinct) objects, then the total number of different arrangements is

$$n(n-1)(n-2) \cdots 3 \cdot 2 \cdot 1 = n!$$

with the convention that $0! = 1$.

3. (General Principle in Permutations)

For n objects of which n_1 are alike, n_2 are alike, \dots , n_r are alike, there are

$$\frac{n!}{n_1! n_2! \cdots n_r!}$$

different permutations of the n objects.

Example

1. (Permutation)

Five people, designated as A, B, C, D, E, are arranged in linear order.

(1) How many ways to arrange these five people? (120)

(2) How many ways to arrange these five people, if they are arranged in a circle? (24)

2. (Accounting and Permutation)

How many different number-plates for cars can be made if each number-plate contains four of the digits 0 to 9 followed by a letter A to Z, assuming that

(a) no repetition of digits is allowed? (131,040)

(b) repetition of digits is allowed? (260,000)

3.(Permutation)

In how many ways can the six letters of the word "mammal" be arranged in a row? (60)

4.(Permutation)

How many different ways can 3 red, 4 yellow and 2 blue bulbs be arranged in a string of Christmas tree lights with 9 sockets? (1260)