

Statistics Notes (II)

Contents

| | | |
|----------|--------------------------------------|----------|
| 1 | Probbility | 2 |
| 1.1 | Important Terms | 2 |
| 1.2 | Permutaion and Combination | 2 |

1 Probability

1.1 Important Terms

Trial A single performance of well-defined experiment

Experiment a scientific test in which you perform a series of actions and carefully observe their effects in order to learn about something.

1.2 Permutation and Combination

Permutation is all about arranging items, while combination is used to find the ways to select items.

If we have 3 items A, B, and C; we can arrange them in the following way.

- ABC
- ACB
- BAC
- BCA
- CAB
- CBA

There are 6 possible ways to arrange 3 items in 3 positions.

Thinking another way, there are 3 positions and 3 items. The first position can be filled up in 3 ways (A or B or C), the second in 2 ways (after one item is fixed in the first position, be it A or B, or C), and the third in 1 way.

| Position | 1 | 2 | 3 |
|------------------|---|---|---|
| Possible options | 3 | 2 | 1 |

Mathematically, this is also written as $3!$ (3 factorial), which is nothing but $3 \times 2 \times 1 = 6$

Similarly, if we have 4 items to arrange in 4 places, we can write:

| Position | 1 | 2 | 3 | 4 |
|------------------|---|---|---|---|
| Possible options | 4 | 3 | 2 | 1 |

Thus we can arrange this in $4 \times 3 \times 2 \times 1 = 4! = 24$ ways.

Now, what if we want to arrange 2 items out of 4 items. In this case we have 2 places, but 4 items.

We get $4 \times 3 = 12$ ways.

This is also written as ${}^4P_2 = 12$ (shown below)

| | | |
|------------------|---|---|
| Position | 1 | 2 |
| Possible options | 4 | 3 |

$${}^nP_r = \frac{n!}{(n-p)!}$$