

Permutations

In this lesson, we'll learn how to calculate permutations in different cases.

We'll cover the following ^

- With repetition
- Without repetition

Order matters for Permutations.

How many ways can we order 3 numbers (1, 2, 3)? There are 6 ways.

- 1 - 2 - 3
- 1 - 3 - 2
- 2 - 1 - 3
- 2 - 3 - 1
- 3 - 1 - 2
- 3 - 2 - 1

The number of ways is just $n!$

Quick explanation: How many ways can we select the number in the first position, we have 3. Now we have 2 options for the second position. Similarly, only 1 choice for the third position.

$$\text{ways} = 3 * 2 * 1 = 3! = 6$$

With repetition

Arranging k items from n is just n^k .

You have to pick k items and n choice for each of them.

Without repetition

Expanding on the example above, if we want to find the number of the possible ordering of 3 numbers from (1, 2, 3, 4, 5).

- 5 choices for the first position
- 4 choices for the second position
- 3 choices for the third position

This is denoted by $P(n, k)$ - n permute k . Defined as:

$$P(n, k) = \frac{n!}{(n-k)!}$$

So, for the above example, the number of ways is

$$P(5, 3) = \frac{5!}{2!} = 5 * 4 * 3 = 60$$

In the next lesson, we'll move on to combinations.