Counting

How many words can we make?

In a weird language, there are only three letters: A, B and C. How many two-letter words can you make in this language? (Any sequence of letters is a word in this language, it doesn't have to be possible to pronounce!)

There will be $3 \times 3 = 9$ words, because we can pick any of A, B, C for the first letter in our word, and then again any of the three for the second.

How many five-letter words are there in a language which only has 2 letters?

Rearranging

I want to eat an apple, a banana, a cupcake, a doughnut, and an egg in some order. How many different ways are there of ordering the foods?

I have 5 choices for the first food, then four for the next one (since I've eaten one of the five already), only three for the next one and so on.
So there are $5 \times 4 \times 3 \times 2 \times 1 = 120$ choices.

We call this number **5 factorial**, and we write it with an exclamation mark: **5!**

What happens if instead of the egg I have a second apple, how many choices do I have?