

counting outcomes

A **permutation of items** is an arrangement of the items in a certain order, where each item can be used only once in the sequence: $n! = n(n - 1)(n - 2) \cdots (2)(1)$

A **permutation of n items taken k at of time** is the number of ways to select k items from n distinct items and arranging them in order:

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

A **combination of n items taken k at of time** any selection of k items from n elements where order is not important:

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

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example

In a group of six men and four women, I select a committee of three at random. What is the probability that all three committee numbers are women?

The number of ways to select a three-women committee from four women: $\binom{4}{3} = \frac{3!}{3!(4-3)!} = 4$

The number of ways to select a three-person committee from the 10 people (the total number of outcomes):

$$\binom{10}{3} = \frac{10!}{10!(10-3)!} = 120$$

Probability of all female committee: $\frac{4}{120} = \frac{1}{30} = 0.03$