Permutation

An ordered arrangement of a group of objects

△○■ is different from ○■△
1st 2nd 3rd   1st 2nd 3rd
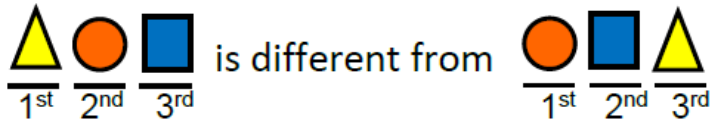
Both arrangements are included in possible outcomes.

Example:
    5 people to fill 3 chairs (**order matters**).
    How many ways can the chairs be filled?
    1st chair – 5 people to choose from
    2nd chair – 4 people to choose from
    3rd chair – 3 people to choose from
  # possible arrangements are $5 \cdot 4 \cdot 3 = 60$

Permutation
(Formula)

To calculate the number of permutations

$$n^P r = \frac{n!}{(n-r)!}$$

n and r are positive integers, $n \geq r$, and n is the total number of elements in the set and r is the number to be ordered.

Example: There are 30 cars in a car race. The first-, second-, and third-place finishers win a prize. How many different arrangements (order matters) of the first three positions are possible?

$$30^P 3 = \frac{30!}{(30\text{-}3)!} = \frac{30!}{27!} = 24360$$