Permutations & Combinations

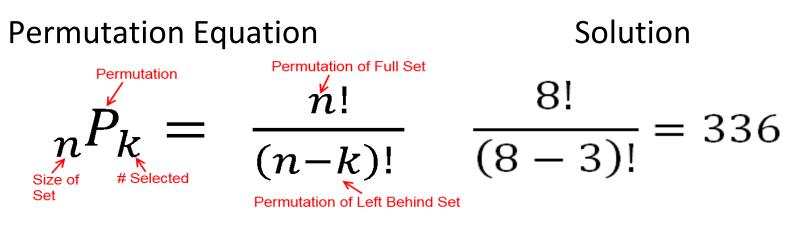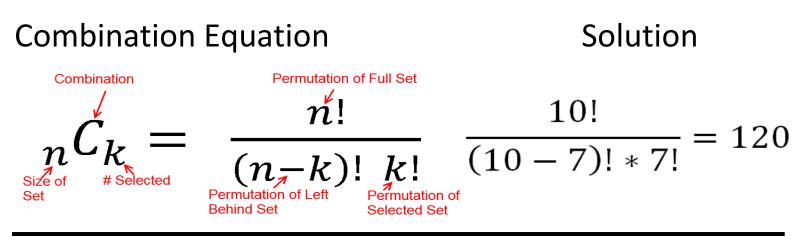**Use Permutations when the order matters: Example - 8 people are in a track meet. How many different ways can they place 1st, 2nd, and 3rd**

Permutation Equation   Solution

Permutation

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

Permutation of Full Set

Size of Set   # Selected

Permutation of Left Behind Set

$$\frac{8!}{(8-3)!} = 336$$

Use Combinations when the order does not matter: Example - You have 10 items of clothing, but can only pack 7 in a suitcase. How many different combinations of clothes can you take?

Combination Equation   Solution

Combination

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

Permutation of Full Set

Size of Set   # Selected

Permutation of Left Behind Set   Permutation of Selected Set

$$\frac{10!}{(10-7)! * 7!} = 120$$

Or : Start with the permutation of all the items, and divide by the permutations of any groups you don't care about the order of. Example - You have 14 people and you need to break them into 3 teams of 4 people, with 2 left over to spectate

$$\# \text{ of Important Possibilities} = \frac{Total\ Possibilities}{\#\ of\ Unimportant\ Possibilities}$$

$$3{,}153{,}150 = \frac{14!}{4! * 4! * 4! * 2!}$$