Counting Rule (Multiplication Principle): If one even can occur m ways and another event can occur n ways, the total number of different ways the events can occur together is $m \times n$.

Note: It can be extended to more than 2 events (e.g. $m \times n \times s$)

Ex You must create a 4 digit PIN for a new account.
How many different possible PINs can be created? What if no digit can be repeated?

Ex Suppose the class is divided into 4 groups, each to make a presentation. How many different possible presentation orders are there?

Ex 9 players show up for a little league team that you coach. How many possible different batting orders are there?

Ex You have 200 guests ate your wedding dinner. How many different ways could they be seated?

Ex Suppose 12 kids show up for the little league game. How many different 9-person batting orders are there?

Permutation Rule (_____)
If you have n _____ items and you choose r of them _____ (and without replacement), the possibilities are called _____ and the total number of permutations is given by

Order Matters:

Ex Suppose a class has 15 groups for presentations, but only 3 groups will present the first day. How many possible group presentation orders could there be for the first day?

Ex You must create a password containing only letters and numbers. It must be exactly 8 characters long and no letter/number can be repeated.

(a). How many posssible passwords are there?

(b). If someone randomly chose 8 characters, what is the probability that they guessed your password correctly?

Ex How many ways can you rearrange the letters SUM? **Ex** How many ways can you rearrange the letters ADD?

Ex How many ways can you rearrange the letters DADDY?

Ex How many ways can you rearrange the letters DADDA?

Permutation Rule (_____)
If you have n items available and some are _____ the total number of ways to rearrange _____ into different permutations is given by

Ex How many ways can you rearrange the letters CHICAGO ILLINOIS?

Ex Suppose our class (30 students) has been chosen to send a delegation of 3 students to the Elementary Statistics Conference in Hawaii. How many different groups of 3 students can be selected?

Combination Rule

If you have n _____ items and you choose r of them _____ , the possibilities are called _____ and the total number of combinations is given by

Ex For a summer freshman advising date, Dr. Crawford is given 6 of the 10 incoming Math, CS, and Physics majors to advise.

(a). If she meets the students one at a time, how many different ways can she meet them?

(b). If she meets the whole group of 6 (out of 10) at once, how many different possible groups are there?

(c). Suppose the 10 students consist of 6 boys and 4 girls. If her group of 6 must have 2 girls and 4 boys, how many possible different groups of 6 could she have?