Arrangements and Permutations

List the different ways we can arrange your three classmates!

How many ways? _____

Let's think about it another way…

_____	•	_____	•	_____	=	_____
How Many To Choose From to Fill the First Slot?		How Many To Choose From to Fill the Second Slot?		How Many To Choose From to Fill the Third Slot?		

Examples:

1. How many different six-letter arrangements can be formed using the letters in the word CARPET?

Total letters available? _____ Slots to fill? _____

2. How many different ways can 5 books be arranged on a shelf?

3. How many different batting orders can you have with 9 baseball players?

Jaime, Terry, Rory, and Mary are all running for class officers. The positions that need to be filled are President, Vice President, and Secretary. The candidate who receives the most votes will be the President, the second most Vice President and the third most Secretary. Draw a tree diagram to show the possible outcomes of the election.

How many different results to the election are possible? _____

Going back to the question…

How many candidates?_____ **Slots to fill?**_____

When we talk about making different ARRAGNGEMENTS we call these…

Permutations

We can find these values on the calculator

Total Number of Possibilities	${}_nP_r$	**How many Slots to Fill**

Math → PRB → 2:nPr

Type a Few Into Your Calculator

1. ${}_{10}P_3$
2. ${}_5P_5$
3. ${}_7P_6$

Examples:

1. Determine how many four-letter arrangements are possible with the letters A, N, G, L, and E if no letter may be repeated.

Letters to choose from?_____ How Many Slots to Fill?_____

2. How many ways can you arrange 8 books on a shelf that will only fit 5 books?

Number of Books?_____ How Many Slots to Fill?_____

3. There were seven students running in a race. How many different arrangements of first, second, and third place are possible?

Number of Students?_____ How Many Slots to Fill?_____

Now if you notice right below ${}_nP_r$ you see ${}_nC_r$. The "C" stands for **Combinations**.

Use ${}_nP_r$ when...	**Use ${}_nC_r$ when...**

Mixed Review Examples

1. How many different arrangements of 3 letters can be formed from the letters in the word TROPHY?

Total Number of Letters?_____ Slots to Fill? _____

2. Billy is trying to break into his brother's safe but must try and figure out his brother's password in order to open the safe. The password consists of 3 letters. Once a letter is used, it cannot be used again. How many total letter arrangements will Billy have to try?

Total Number of Letters?_____ Slots to Fill? _____

3. There are 10 teachers in the math department. How many different 4 teacher committees can be formed?

Total Number of Teachers?_____ Slots to Fill? _____

4. Rusty wants to customize his own license plate. The DMV tells him that he must fill a total of 6 slots on his license plate. Three of the slots must be filled with digits 0 through 9. The other three slots must be filled with letters from the alphabet having 26 letters.

Total Number of Digits?_____ Slots to Fill? _____

Total Number of Letters?_____ Slots to Fill? _____

If repetition of digits is allowed, but repetition of letters is not allowed, determine the number of different passwords that can be made?

Practice: Arrangements and Permutations Name _____

1. Eight people are entered in a race. If there are no ties, in how many ways can the first three places come out?

2. How many different three-letter arrangements can be formed using the letters in the word *ABSOLUTE* if each letter is used only once?

3. The bowling team at Lincoln High School must choose a president, vice president, and secretary. If the team has 10 members, which expression could be used to determine the number of ways the officers could be chosen?

4. How many different 3 person basketball teams can be made from 12 people.

Challenge:

5. Laura has a 4-digit combination lock on her briefcase and has forgotten the combination. If she knows that the first digit is a 3, and the second digit is prime, how many numbers must Laura try before the lock is sure to open?