	Order is important		Order is NOT important
	Arrange **Permutations**	**Arrange and Pick** **Variations**	**Pick** **Combinations**
Without repetition	$P_n = P_n^n = n!$	$V_p^n = P_p^n = \frac{n!}{(n-p)!}$	$C_p^n = \frac{n!}{p!(n-p)!}$
Example	*How many ways are there to arrange **3** letters **a,b,c**?* $P_3 = 3! = 6$ $\begin{bmatrix} abc & bca & cab \\ acb & bac & cba \end{bmatrix}$	*How many words of **2** different letters can you make with **4** letters **a,b,c,d**?* $V_2^4 = 12$ $\begin{bmatrix} - & ab & ac & ad \\ ba & - & bc & bd \\ ca & cb & - & cd \\ da & db & dc & - \end{bmatrix}$	*How many ways are there to pick **2** different letters out of **4** letters **a,b,c,d**? **[number of subsets]*** $C_2^4 = 6$ $\begin{bmatrix} - & ab & ac & ad \\ - & - & bc & bd \\ - & - & - & cd \\ - & - & - & - \end{bmatrix}$
With repetition	$P_{n_1,\ldots,n_k} = \frac{(\sum n_i)!}{\prod (n_i!)}$	$\overline{V}_p^n = n^p$	$\overline{C}_p^n = C_p^{n+p-1}$
Example	*How many ways are there to arrange **2** letters **a** and **2** letters **b**?* $P_{2,2} = \frac{(2+2)!}{2!.2!} = 6$ $\begin{bmatrix} aabb & abab & abba \\ baab & baba & bbaa \end{bmatrix}$	*How many words of **2** letters can you make with **4** letters **a,b,c,d**?* $\overline{V}_2^4 = 16$ $\begin{bmatrix} aa & ab & ac & ad \\ ba & bb & bc & bd \\ ca & cb & cc & cd \\ da & db & dc & dd \end{bmatrix}$	*How many ways are there to pick **2** letters out of **4** letters **a,b,c,d**?* $\overline{C}_2^4 = C_2^5 = 10$ $\begin{bmatrix} aa & ab & ac & ad \\ - & bb & bc & bd \\ - & - & cc & cd \\ - & - & - & dd \end{bmatrix}$

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