Purpose of Program-

So basically, the branch- "Combinatorics" revolves around four fundamental concepts. They are listed as below-

1) Combinations without repetitions/replacements.
2) Combinations with repetitions/replacements.
3) Permutations without repetitions/replacements.
4) Permutations with repetitions/replacements.

Suppose we have a string of length- **n** and we want to generate all ***combinations/permutations*** taken **r** at a time ***with/without repetitions.***

Below is a summary table depicting the fundamental concepts in Combinatorics Theory.

Summary Table

	Replacements/Repetitions allowed	**Replacements/Repetitions not allowed**
Permutations/Order Important	n^r possibilities See this- http://www.geeksforgeeks.org/print-all-combinations-of-given-length/ **See the special case when r=n below** http://www.geeksforgeeks.org/print-all-permutations-with-repetition-of-characters/	^nP_r possibilities See this- http://www.geeksforgeeks.org/write-a-c-program-to-print-all-permutations-of-a-given-string/ **Here r=n, as we are permuting all the characters of the string.**
Combinations/Order Not Important	$^{n+r-1}C_r$ possibilities	^nC_r possibilities See this- http://www.geeksforgeeks.org/print-all-possible-combinations-of-r-elements-in-a-given-array-of-size-n/

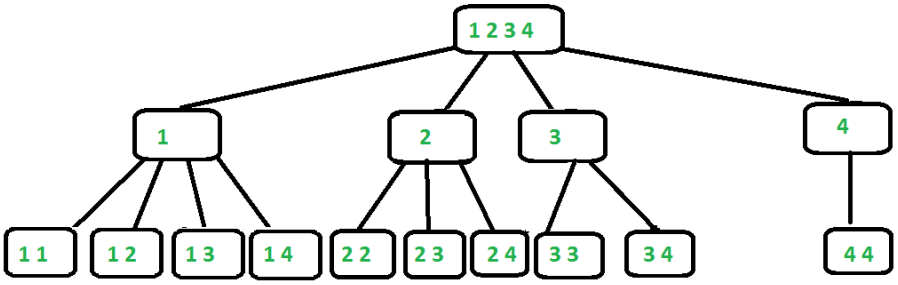
Motivation behind the article-

As, I felt that there is no good article/code for the third case(***Order Not important and Repetitions allowed***) on the web (including-http:/www.geeksforgeeks.org) , hence this article came to my mind.

Explanation-

We will recur for all the possibilities of the string, even if the characters are repeating.

The base case of the recursion is when there is a total of 'r' characters and the combination is ready to be printed.
For clarity, see the recursion tree for the string- " 1 2 3 4" and r=2



Recursion Tree for the string= " 1 2 3 4 "

Time Complexity-

For a string of length- **n** and combinations taken **r** at a time with repetitions, it takes a total of **$O(^{n+r-1}C_r)$** time.

Space Complexity-

Since, we have created another array- chosen[] of size- '**r**', hence we need an extra **O(r)** space.

References- https://en.wikipedia.org/wiki/Combination