



PROBLEM STATEMENT:

We are given a string `str`, say "abc", we have to return all the permutations of the string in lexicographically increasing order.

A string `str1` is lexicographically less than a string `str2` if:

- ① $str1 \neq str2$
- ② `str1` is a prefix of `str2`

OR

- ② There exists some i ($0 \leq i < \min(|str1|, |str2|)$) such that $str1[i] < str2[i]$ (ASCII values) and for all $0 \leq j < i$, $str1[j] = str2[j]$.

Example: `str1 = "abcde0 1 2 3 4 5 6fg"`

`str2 = "abc0 1 2 3 4 5xyz"`

Equal \leftarrow First Difference where $str1[i] < str2[i]$

$\Rightarrow str1 < str2$ lexicographically

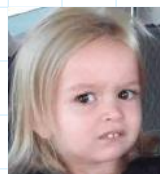
APPROACH: Say our string is "abc"

We want to generate the following permutations:

abc, acb, bac, bca, cab, cba

So, we want to swap elements throughout the string to generate the permutations.

Confused? No worries.



EXAMPLE : str = "abc"

Starting with $i=0$, $\begin{matrix} i \\ abc \\ 0\ 1\ 2 \end{matrix}$

① Swap a with a, increment i. $\begin{matrix} i \\ abc \\ 0\ 1\ 2 \end{matrix}$

② Swap a with b, increment i. $\begin{matrix} i \\ bac \\ 0\ 1\ 2 \end{matrix}$

③ Swap a with c, increment i. $\begin{matrix} i \\ cba \\ 0\ 1\ 2 \end{matrix}$

Call the function again for $i=1$ for each output in steps ① to ③.

④ $\begin{matrix} i \\ abc \\ 0\ 1\ 2 \end{matrix} \Rightarrow$ Swap b with b $\Rightarrow \begin{matrix} i \\ abc \\ 0\ 1\ 2 \end{matrix}$ ①

⑤ $\begin{matrix} i \\ abc \\ 0\ 1\ 2 \end{matrix} \Rightarrow$ Swap b with c $\Rightarrow \begin{matrix} i \\ acb \\ 0\ 1\ 2 \end{matrix}$ ②

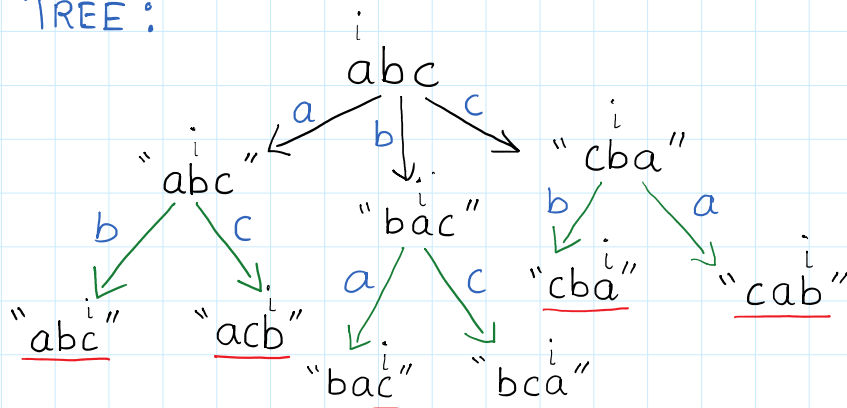
⑥ $\begin{matrix} i \\ bac \\ 0\ 1\ 2 \end{matrix} \Rightarrow$ Swap a with a $\Rightarrow \begin{matrix} i \\ bac \\ 0\ 1\ 2 \end{matrix}$ ③

⑦ $\begin{matrix} i \\ bac \\ 0\ 1\ 2 \end{matrix} \Rightarrow$ Swap a with c $\Rightarrow \begin{matrix} i \\ bca \\ 0\ 1\ 2 \end{matrix}$ ④

⑧ $\begin{matrix} i \\ cba \\ 0\ 1\ 2 \end{matrix} \Rightarrow$ Swap b with b $\Rightarrow \begin{matrix} i \\ cba \\ 0\ 1\ 2 \end{matrix}$ ⑤

⑨ $\begin{matrix} i \\ cba \\ 0\ 1\ 2 \end{matrix} \Rightarrow$ Swap b with a $\Rightarrow \begin{matrix} i \\ cab \\ 0\ 1\ 2 \end{matrix}$ ⑥

RECURSION TREE :



Code :

```
class Solution {
private:
    void solve(vector<int> nums, vector<vector<int>>& ans, int i) {
        if(i >= nums.size()) {
            ans.push_back(nums);
            return;
        }
        for(int j=i; j<nums.size(); j++) {
            swap(nums[i], nums[j]);
            solve(nums, ans, i+1);
            swap(nums[i], nums[j]);
        }
    }
public:
    vector<vector<int>> permute(vector<int>& nums) {
        vector<vector<int>> ans;
        int index = 0;
        solve(nums, ans, index);
        return ans;
    }
};
```

When you
do a swap &
generate all
permutations for

the given index, you need to swap them again to bring the array back to its original state.

EXAMPLE :

