

Mahender Kumar (mkumar04)

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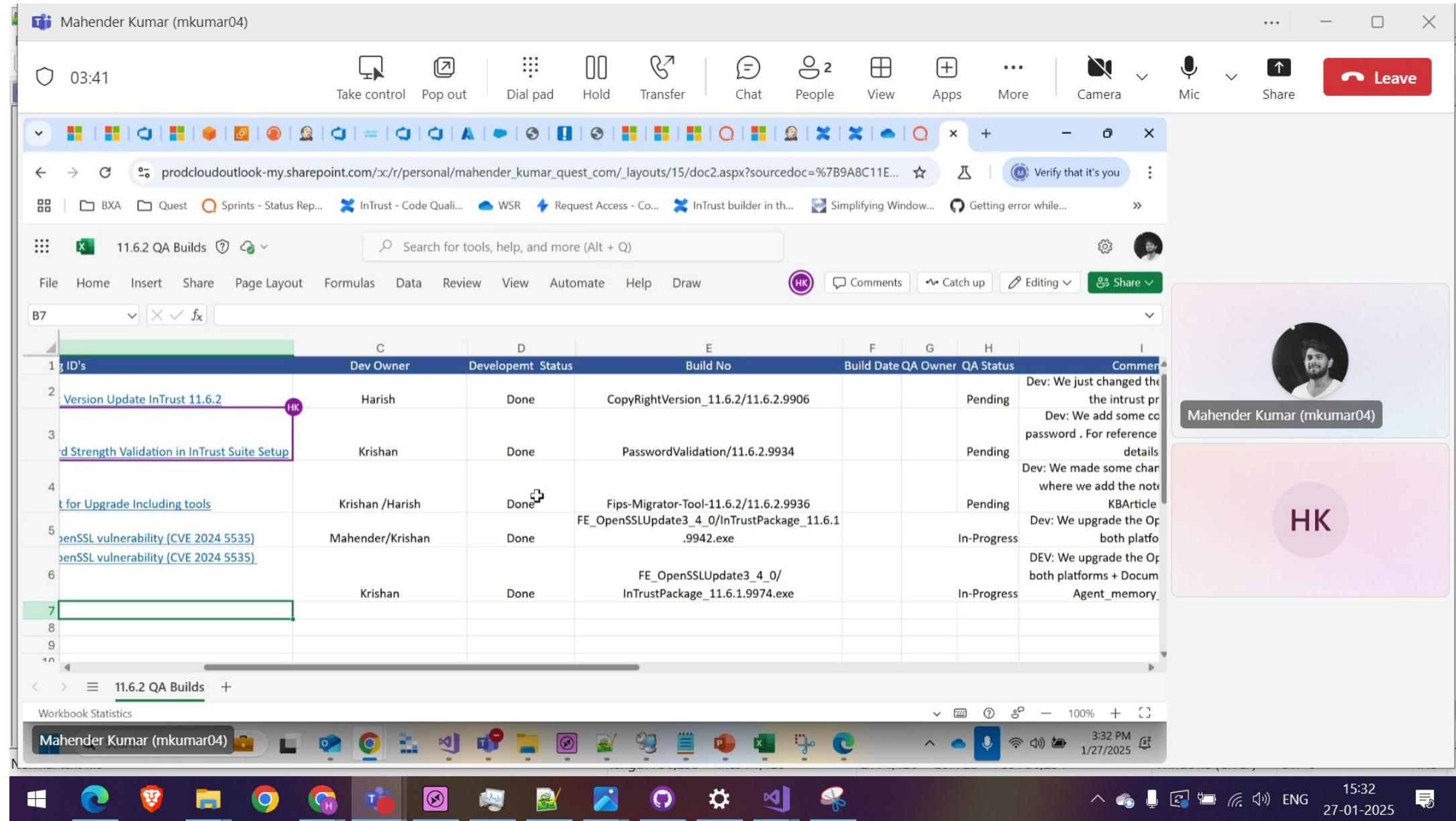
Mahender Kumar (mkumar04)

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Mahender Kumar (mkumar04) 3:32 PM 1/27/2025

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<https://www.youtube.com/watch?v=Nnb1wdx2Ma&index=52>**5. Subset-II**[https://www.youtube.com/watch?v=RIn3gOkbhQE&list=PLgUwDviBlf0p4ozDR\\_kJJkQNnb1wdx2Ma&index=53](https://www.youtube.com/watch?v=RIn3gOkbhQE&list=PLgUwDviBlf0p4ozDR_kJJkQNnb1wdx2Ma&index=53)**6. K-th permutation Sequence**[https://www.youtube.com/watch?v=wT7gcXLYoao&list=PLgUwDviBlf0p4ozDR\\_kJJkQNnb1wdx2Ma&index=55](https://www.youtube.com/watch?v=wT7gcXLYoao&list=PLgUwDviBlf0p4ozDR_kJJkQNnb1wdx2Ma&index=55)**Day10: (Recursion and Backtracking)****1. Print all Permutations of a string/array**

2. N queens Problem
3. Sudoku
4. M coloring Problem (Graph prob)
5. Rat in a Maze
6. Word Break (print all ways)

**Day11: (Divide and Conquer)**

1. 1/N-th root of an integer (use binary search) (square root, cube root, ..)
2. Matrix Median
3. Find the element that appears once in sorted array, and rest element appears twice  
(Binary search)
4. Search element in a sorted and rotated array/ find pivot where it is rotated
5. Median of 2 sorted arrays
6. K-th element of two sorted arrays

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# L12. Print all Permutations of a String/Array | Recursion | Approach - 1

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## 46. Permutations

Medium

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Given an array `nums` of distinct integers, return *all the possible permutations*. You can return the answer in **any order**.

### Example 1:

**Input:** nums = [1,2,3]

**Output:** [[1,2,3], [1,3,2], [2,1,3], [2,3,1], [3,1,2], [3,2,1]]

### Example 2:

**Input:** nums = [0,1]

**Output:** [[0,1], [1,0]]

### Example 3:

**Input:** nums = [1]

**Output:** [[1]]

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[ 1 , 2 , 3 ]

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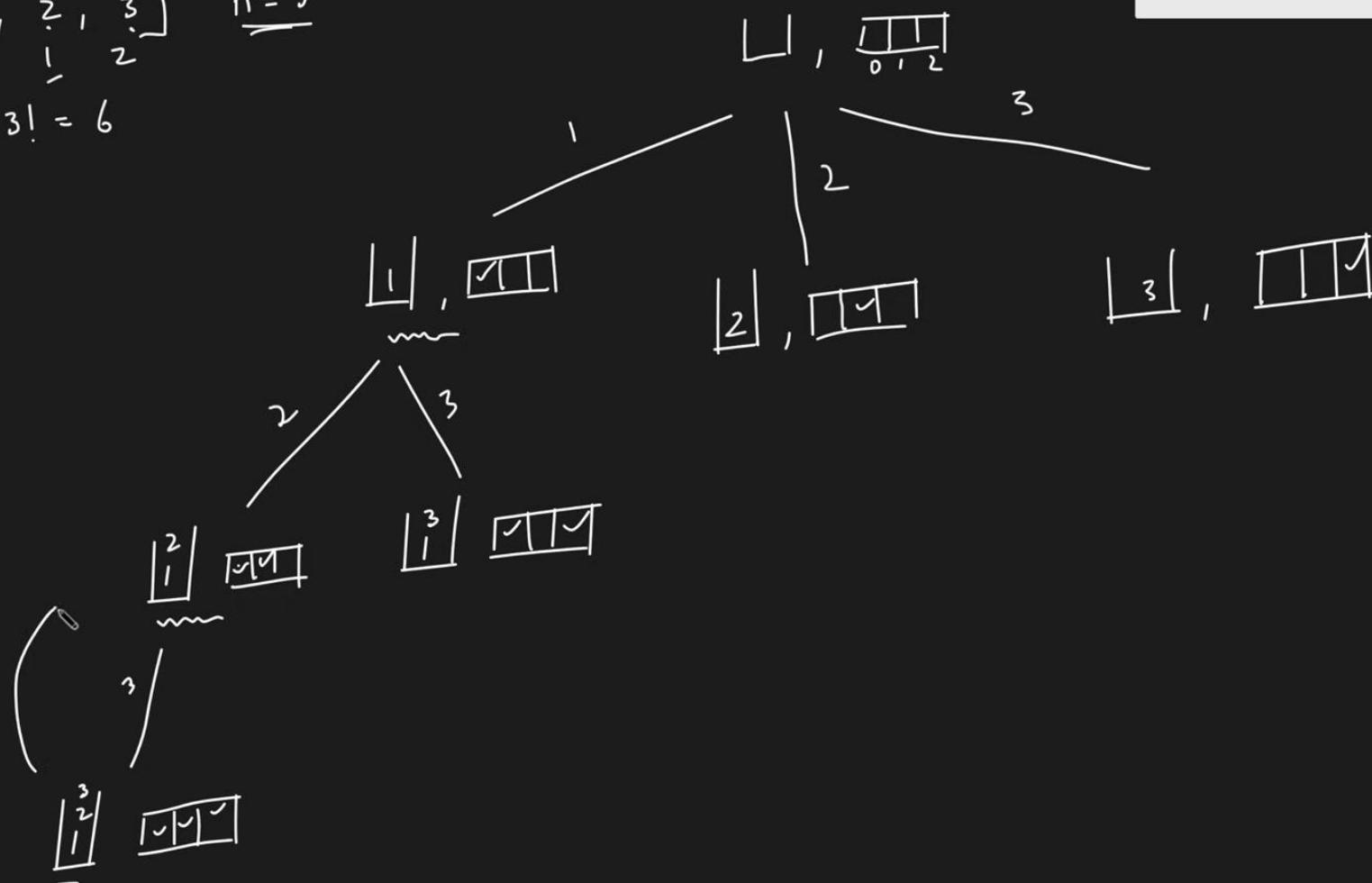


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$$\left[ \begin{matrix} 1 \\ 0 \end{matrix}, \begin{matrix} 2 \\ 1 \end{matrix}, \begin{matrix} 3 \\ 2 \end{matrix} \right] \quad \underline{n=3}$$

$$\underline{n!} = 3! = 6$$

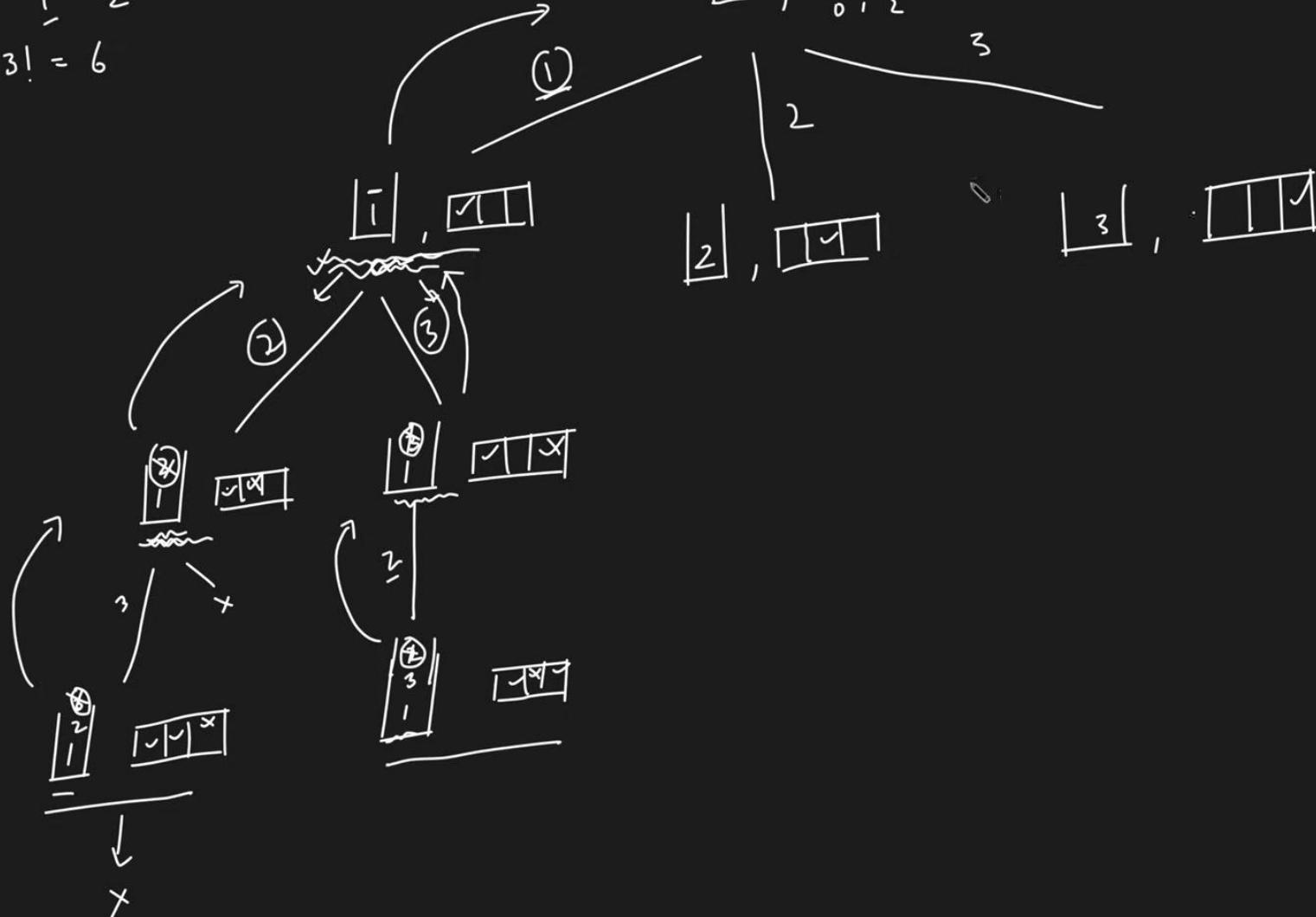
1, 2, 3



$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad | \underline{n=3}$$

$$n! = 3! = 6$$

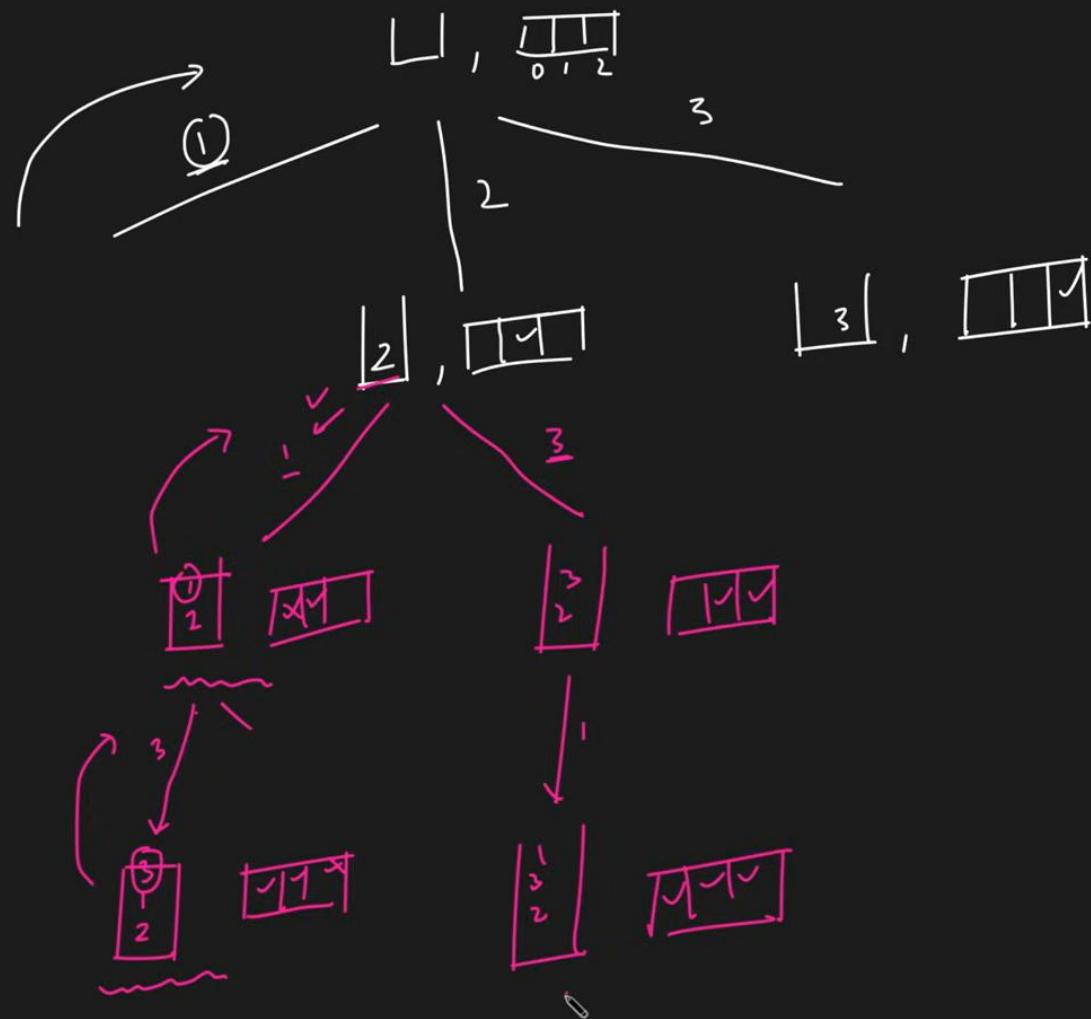
$$\begin{bmatrix} 1, 2, 3 \\ 1, 3, 2 \end{bmatrix}$$



$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad | \underline{n=3}$$

$$n! = 3! = 6$$

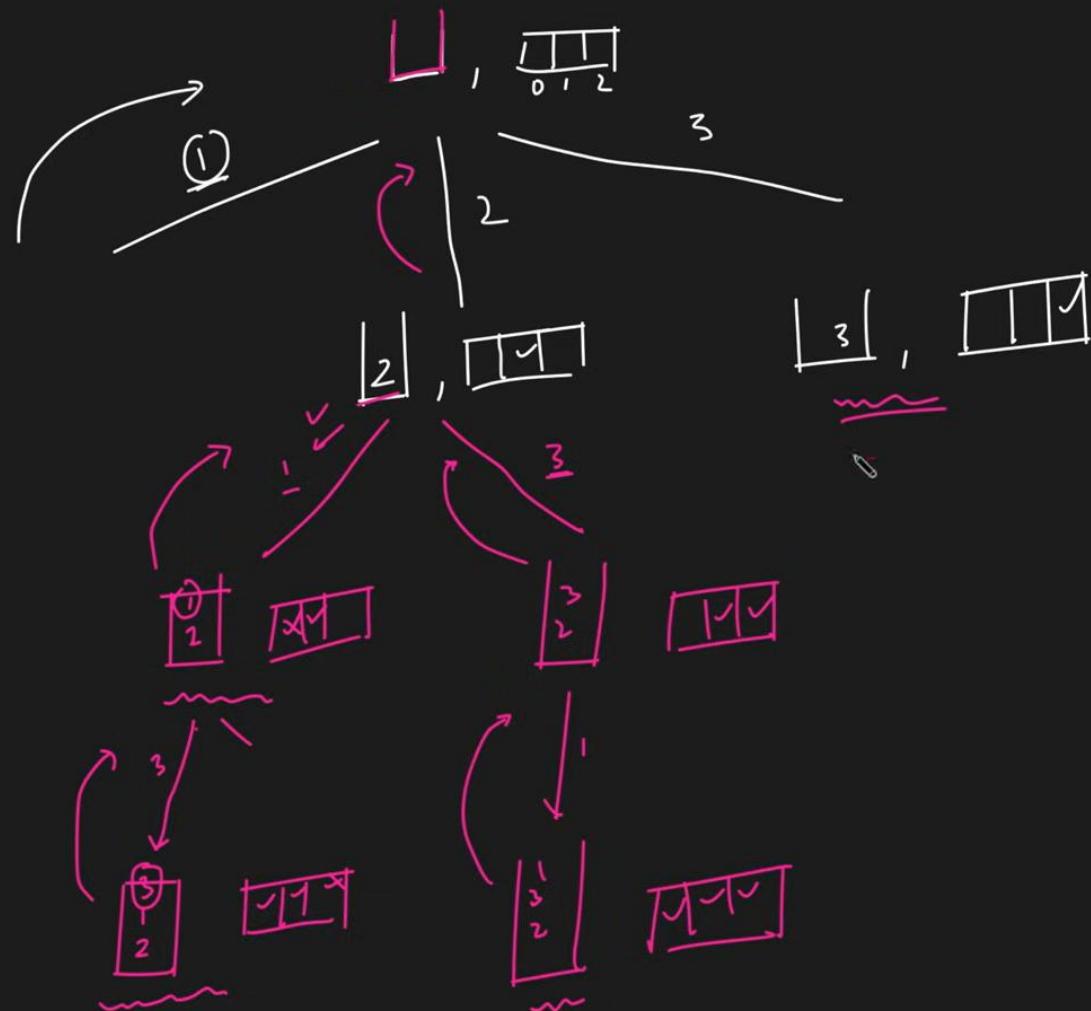
$$\begin{bmatrix} 1, 2, 3 \\ 1, 3, 2 \\ 2, 1, 3 \\ 2, 3, 1 \end{bmatrix}$$



$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad | \underline{n=3}$$

$$\frac{n!}{-} = 3! = 6$$

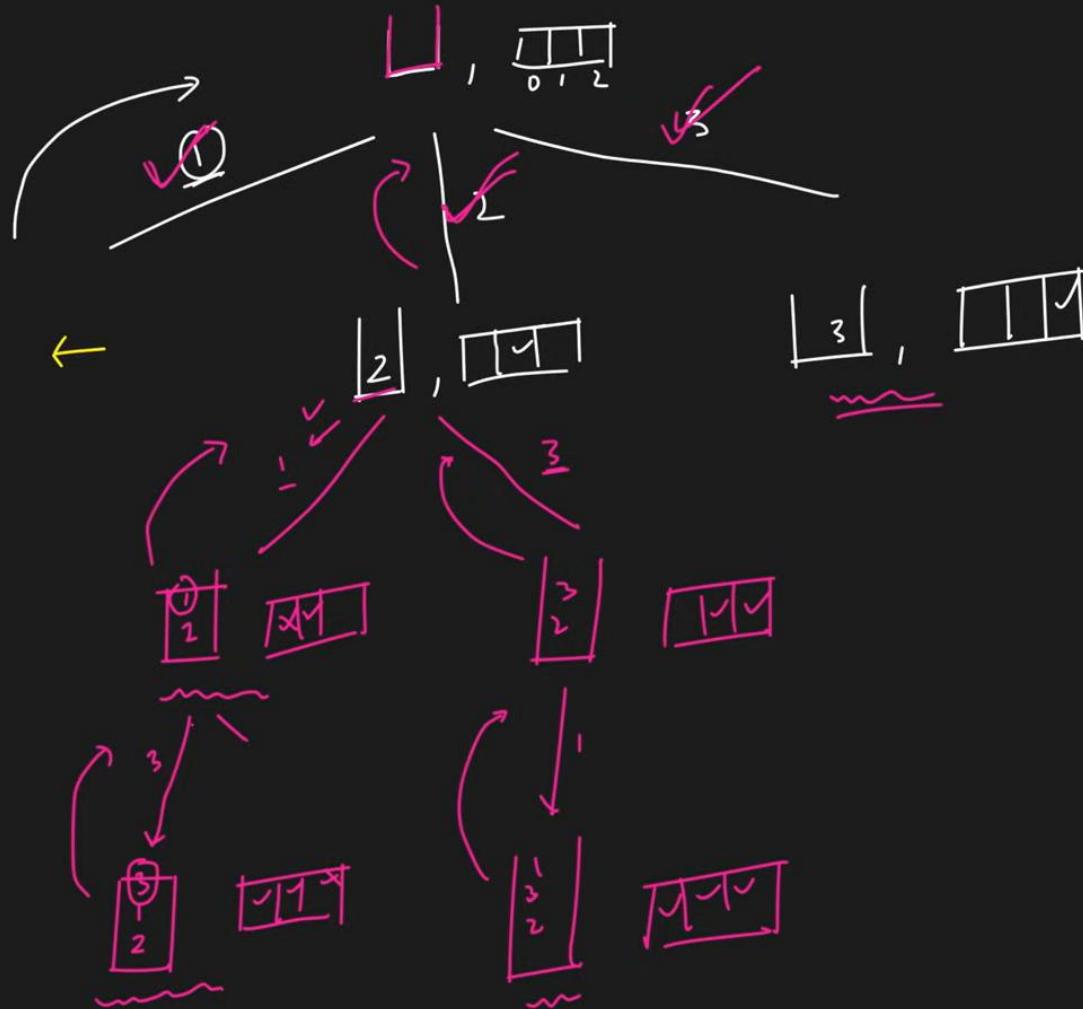
$$\begin{bmatrix} 1, 2, 3 \\ 1, 3, 2 \\ 2, 1, 3 \\ 2, 3, 1 \end{bmatrix}$$



$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad |n=3|$$

$$\underline{n!} = 3! = 6$$

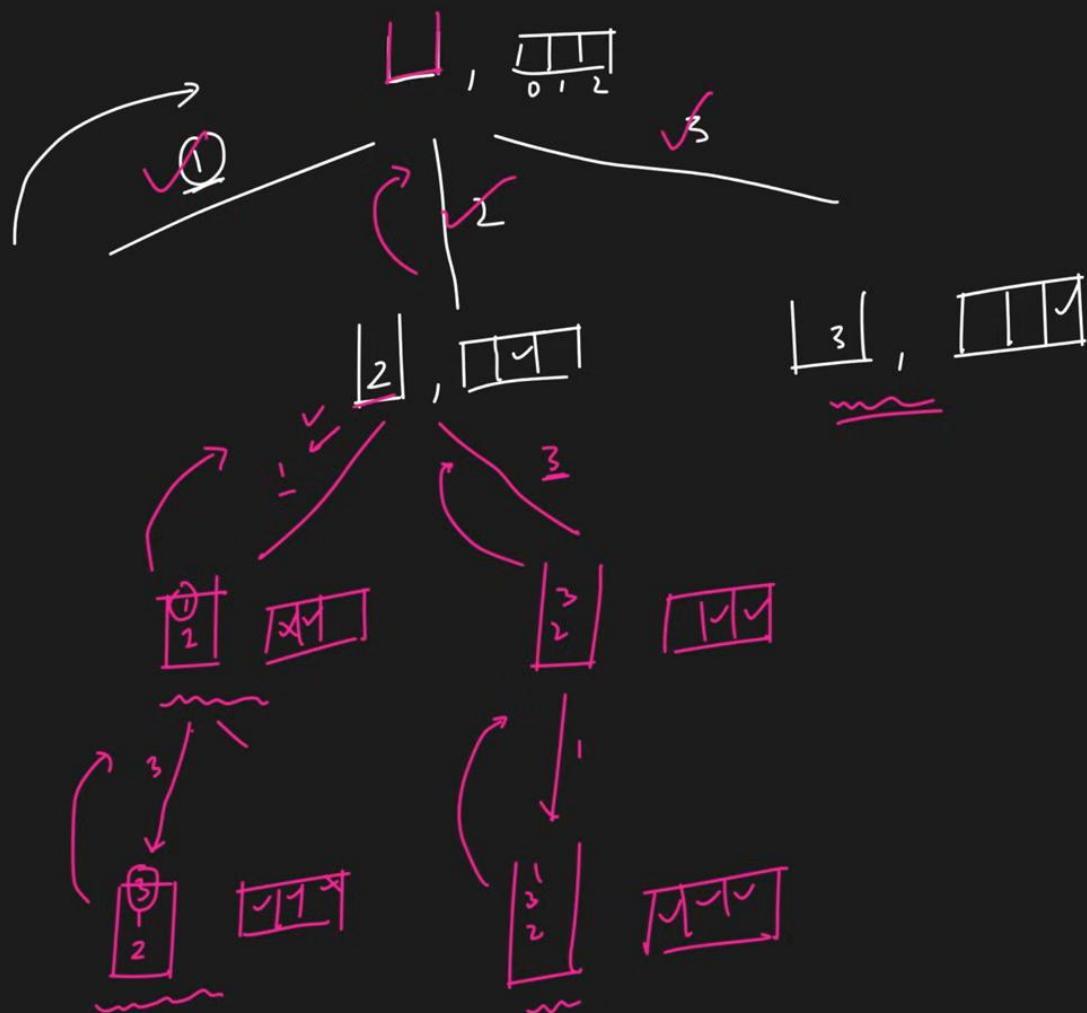
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$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad | \underline{n=3}$$

$$n! = 3! = 6$$

$$\begin{array}{c} [1, 2, 3] \\ [1, 3, 2] \\ [2, 1, 3] \\ [2, 3, 1] \\ [3, 1, 2] \\ [3, 2, 1] \end{array} \quad \begin{array}{c} 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 0 \end{array}$$



$$\left[ \begin{array}{ccc} 1 & 2 & 3 \\ 0 & 1 & 2 \end{array} \right] \quad | \underline{n=3}$$

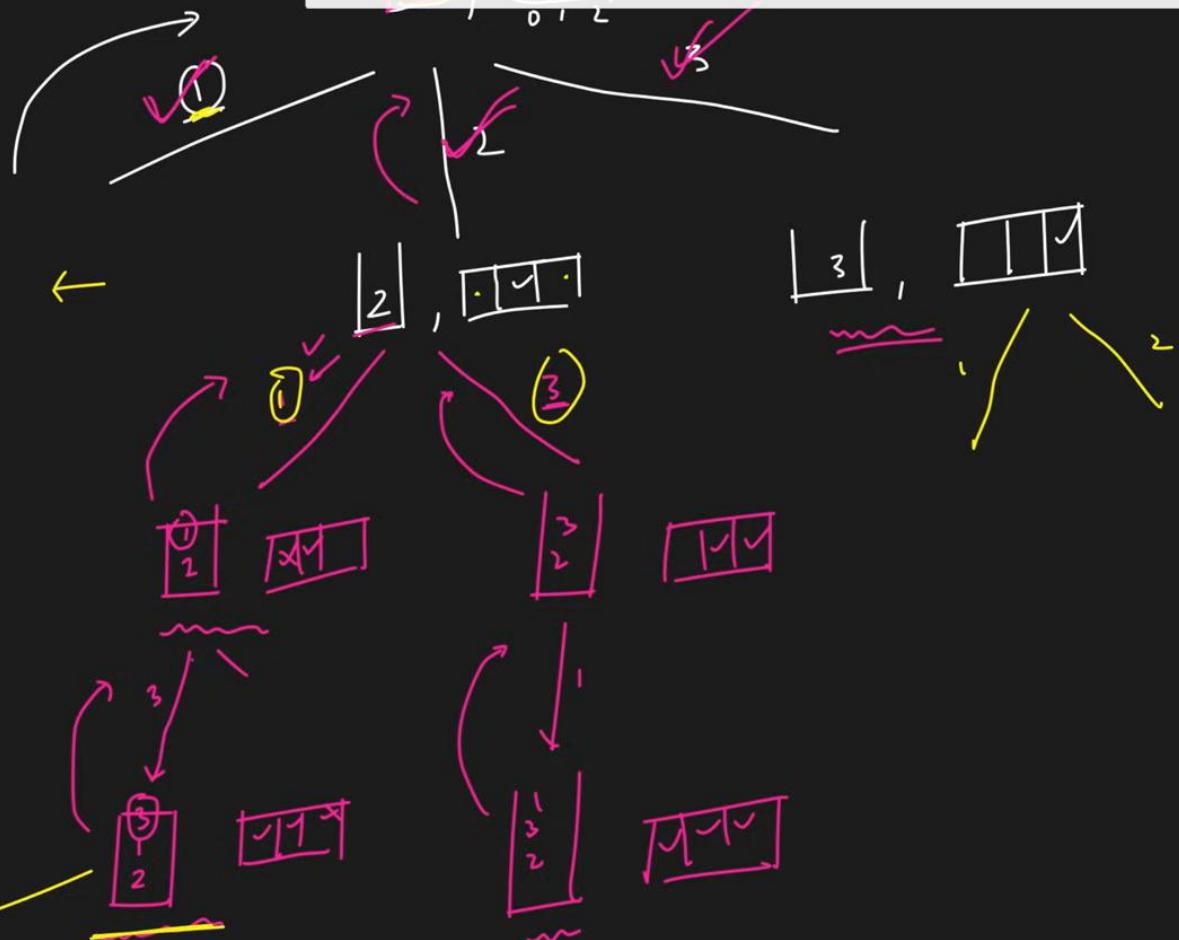
Two Sum Problem | Leetcode's First Ever Problem | Please watch ...

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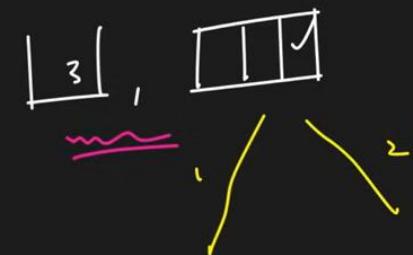
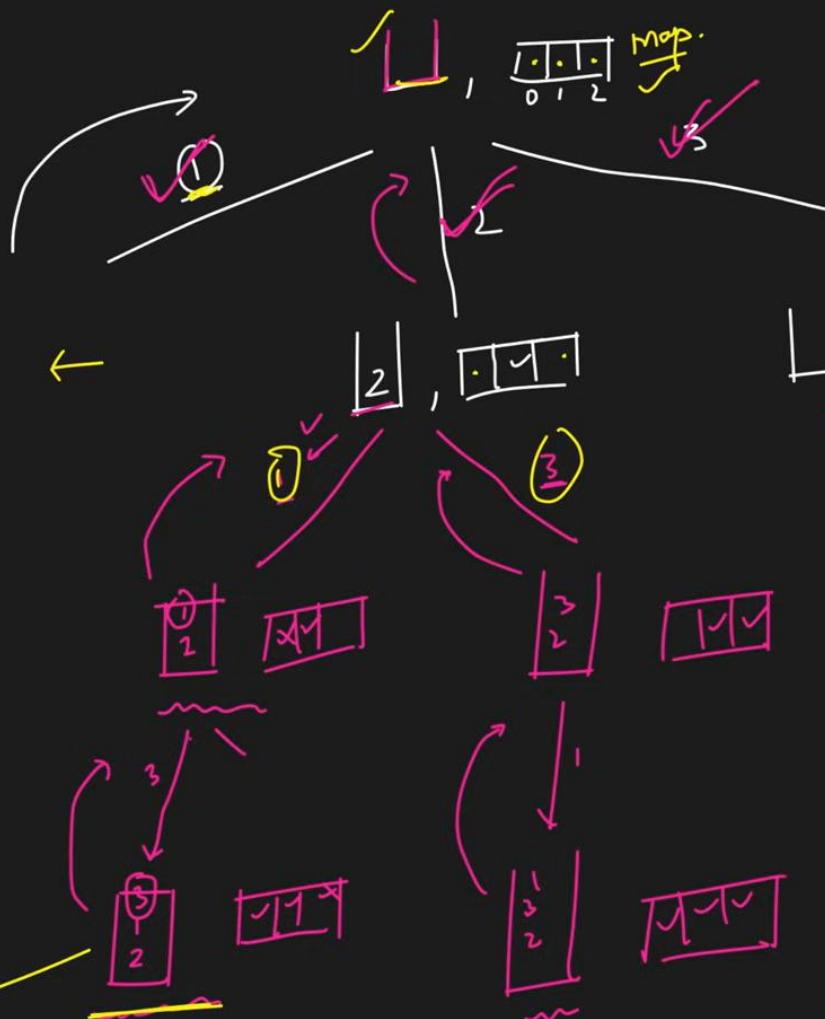
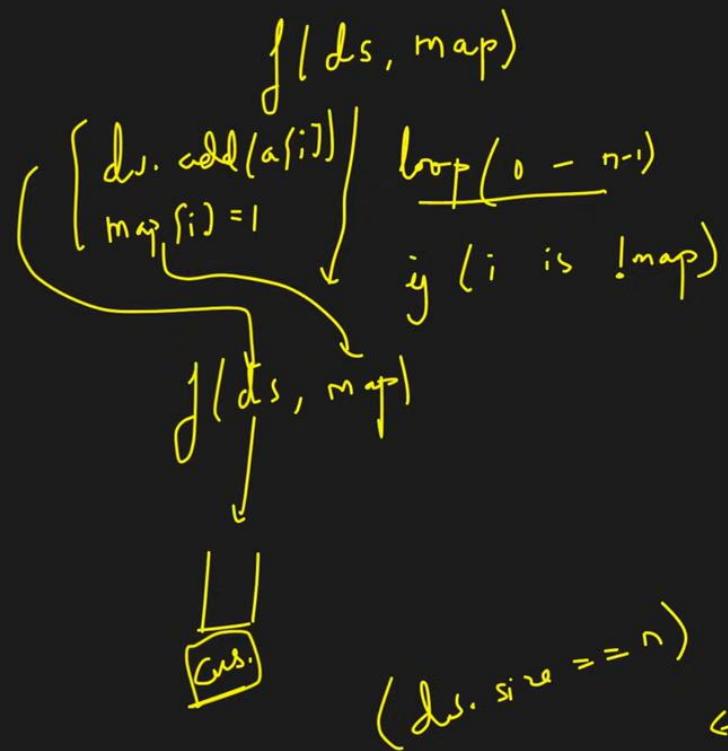
graph TD
    Start(( )) --> Loop{loop(0 - n-1)}
    Loop -- "if (i is !map)" --> Add[ds.add(a[i])]
    Add --> F1[f(ds, map)]
    F1 -- "map[s_i] = 1" --> F2[f(ds, map)]
    F2 --> End(( ))
  
```

The diagram shows the execution flow of a C++ code segment. It starts with a main loop condition: `loop(0 - n-1)`. Inside the loop, there is a decision point: `if (i is !map)`. If the condition is true, it executes the statement `ds.add(a[i])`. After this, it calls the function `f(ds, map)`. This call returns the value `map[s_i] = 1`. Finally, it makes another call to the function `f(ds, map)`.



$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad |n=3|$$

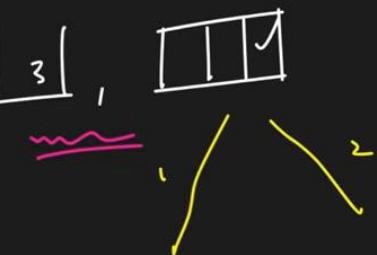
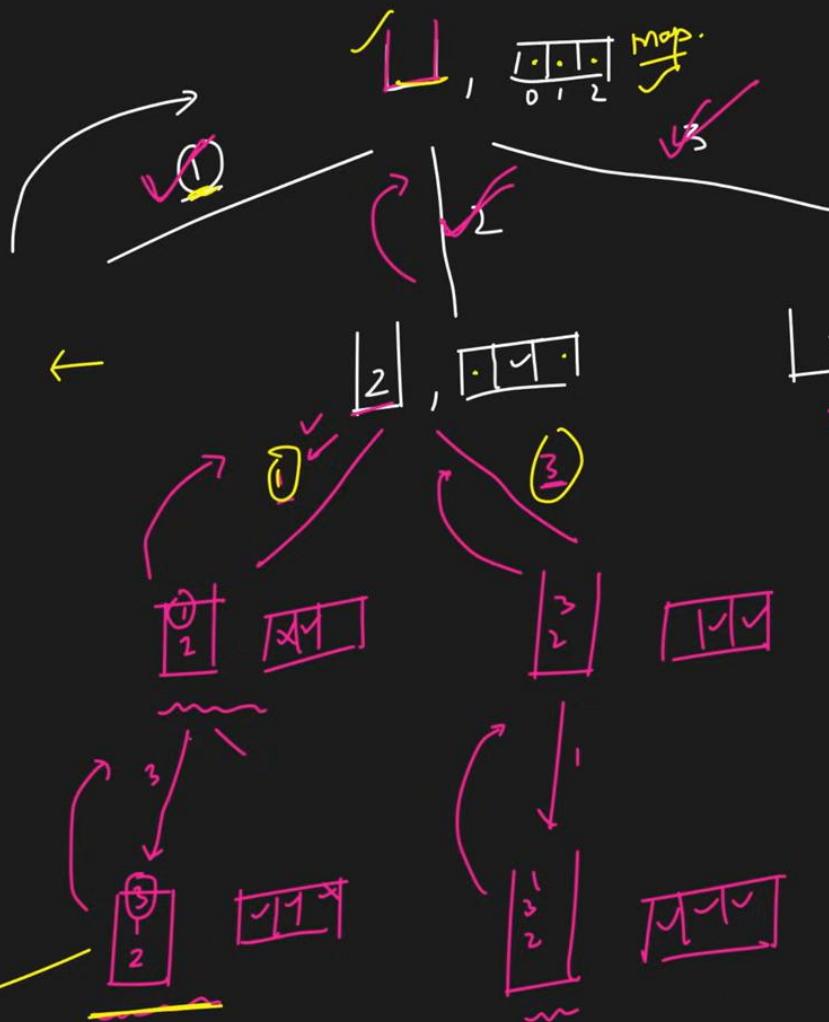
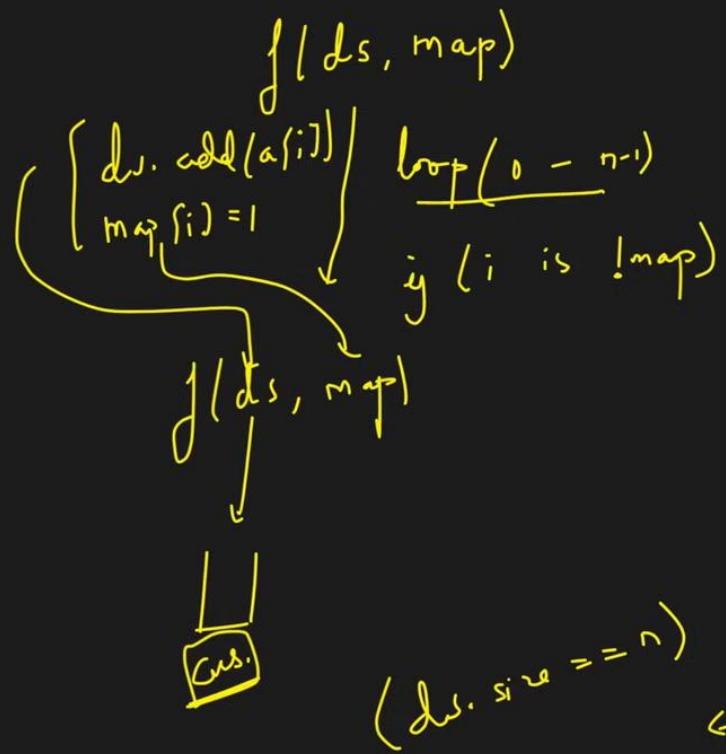
$$\underline{n!} = 3! = 6$$



$$\begin{aligned} T_C &\rightarrow n! \times n \\ SC &\rightarrow o(n) + o(\underline{n}) \end{aligned}$$

$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad |n=3|$$

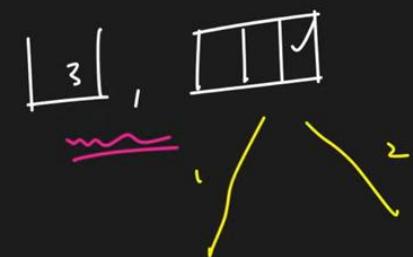
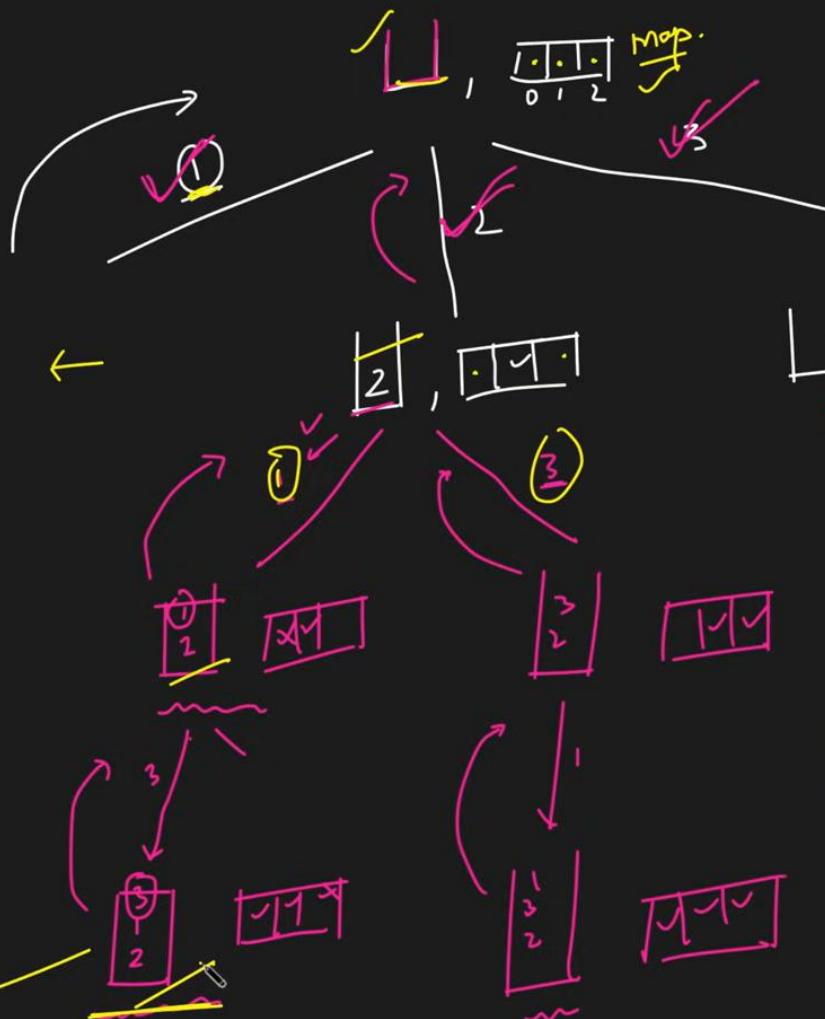
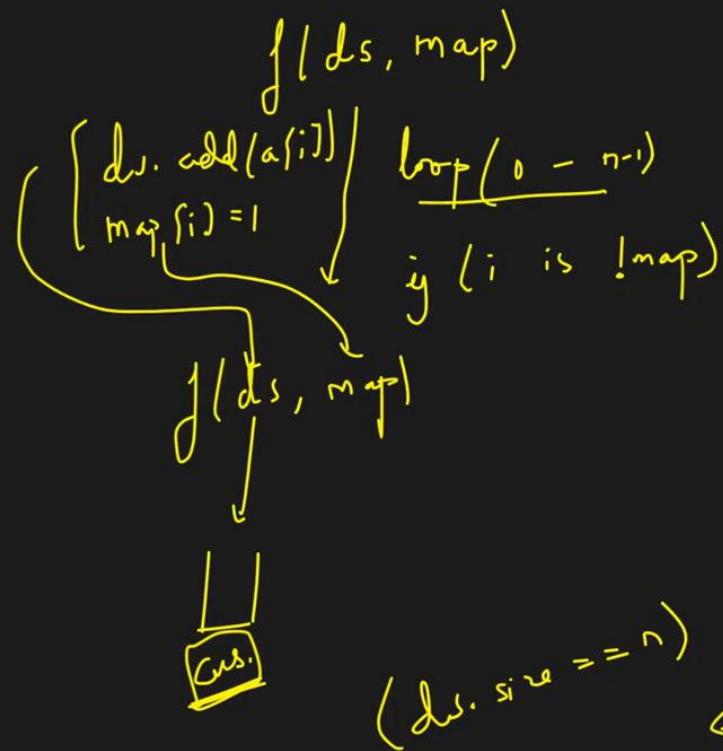
$$\underline{n!} = 3! = 6$$



$$\begin{cases} T_C \rightarrow n! \times n \\ S_C \rightarrow o(n) + o(n) \end{cases}$$

$$\left[ \begin{smallmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \end{smallmatrix} \right] \quad |n=3|$$

$$\underline{n!} = 3! = 6$$



$$\begin{cases} T_C \rightarrow n! \times n \\ S_C \rightarrow o(n) + o(n) \end{cases}$$

$=$   
 $o(n)$

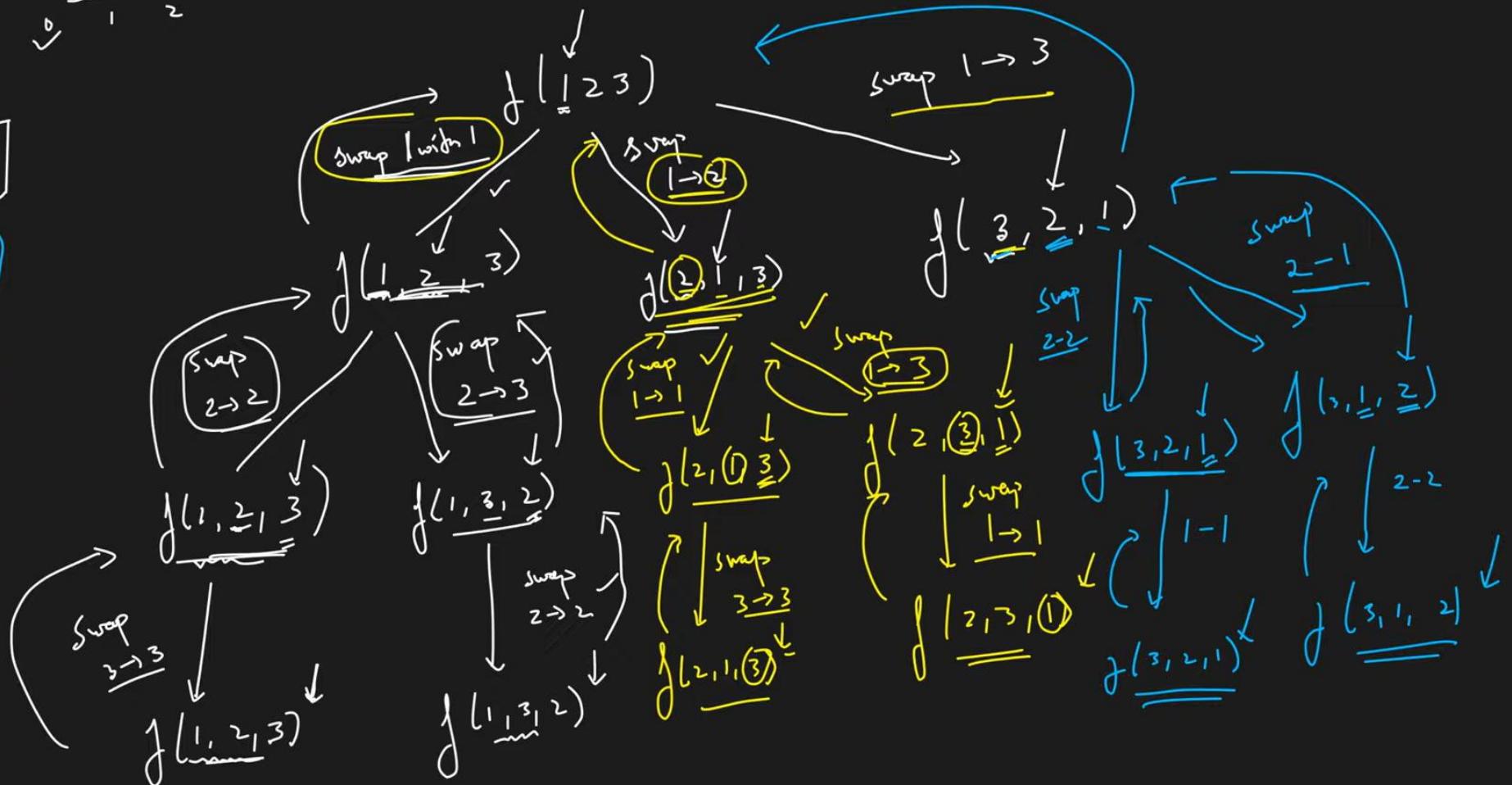
```
1 class Solution {
2     private void recurPermute(int[] nums, List<Integer> ds, List<List<Integer>> ans, boolean []freq) {
3         if(ds.size() == nums.length) {
4             ans.add(new ArrayList<>(ds));
5             return;
6         }
7         for(int i = 0;i<nums.length;i++) {
8             if(!freq[i]) {
9                 freq[i] = true;
10                ds.add(nums[i]);
11                recurPermute(nums, ds, ans, freq);
12                ds.remove(ds.size() - 1);
13                freq[i] = false;
14            }
15        }
16    }
17 }
18 public List<List<Integer>> permute(int[] nums) {
19     List<List<Integer>> ans = new ArrayList<>();
20     List<Integer> ds = new ArrayList<>();
21     boolean freq[] = new boolean[nums.length];
22     recurPermute(nums, ds, ans, freq);
23     return ans;
24 }
25 }
```

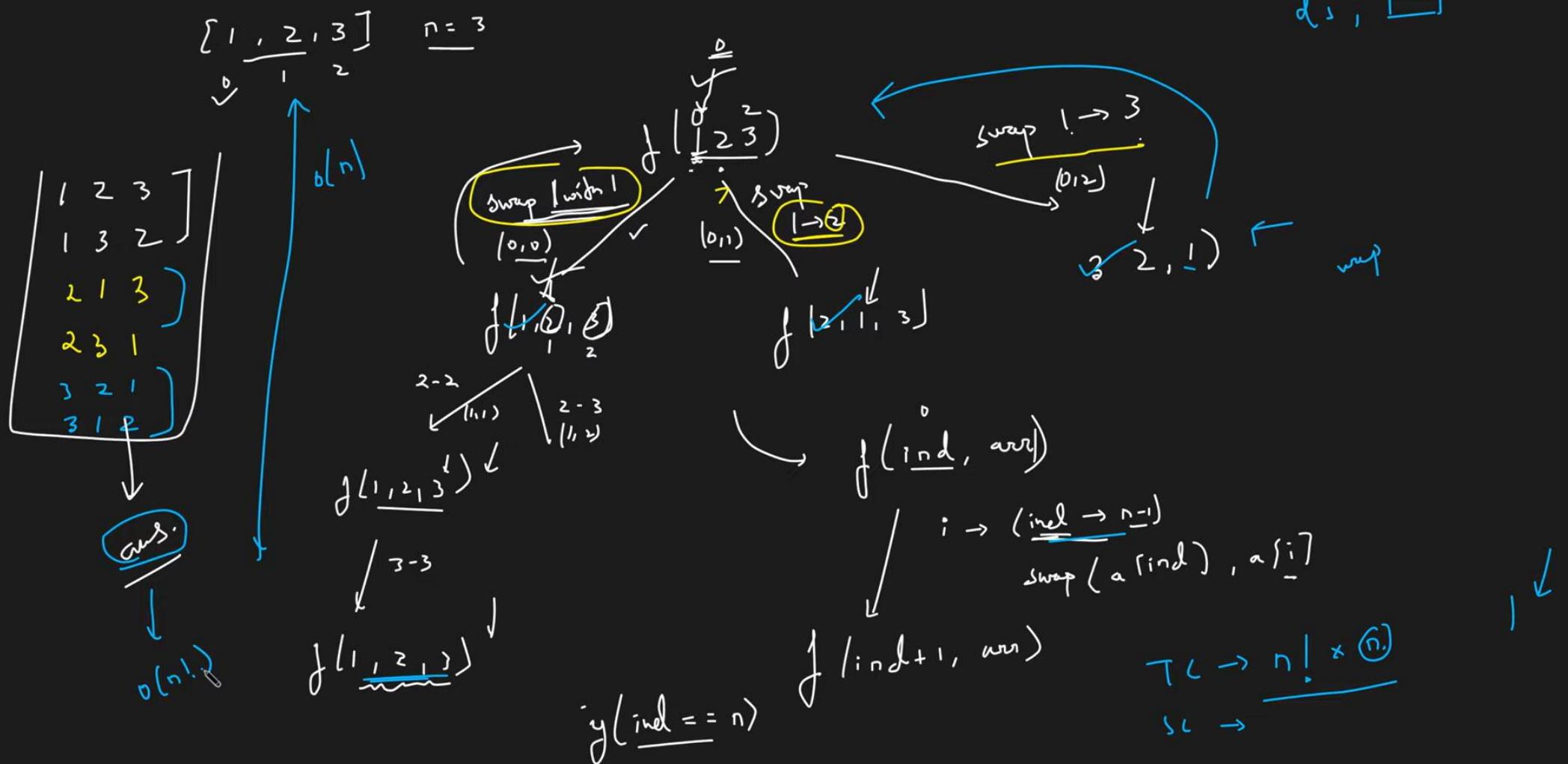
```
1 class Solution {
2 private:
3     void recurPermute(vector<int> &ds, vector<int> &nums, vector<vector<int>> &ans, int freq[]) {
4         if(ds.size() == nums.size()) {
5             ans.push_back(ds);
6             return;
7         }
8         for(int i = 0;i<nums.size();i++) {
9             if(!freq[i]) {
10                 ds.push_back(nums[i]);
11                 freq[i] = 1;
12                 recurPermute(ds, nums, ans, freq);
13                 freq[i] = 0;
14                 ds.pop_back();
15             }
16         }
17     }
18 }
19 public:
20     vector<vector<int>> permute(vector<int>& nums) {
21         vector<vector<int>> ans;
22         vector<int> ds;
23         int freq[nums.size()];
24         for(int i = 0;i<nums.size();i++) freq[i] = 0;
25         recurPermute(ds, nums, ans, freq);
26         return ans;
27     }
28 }
```

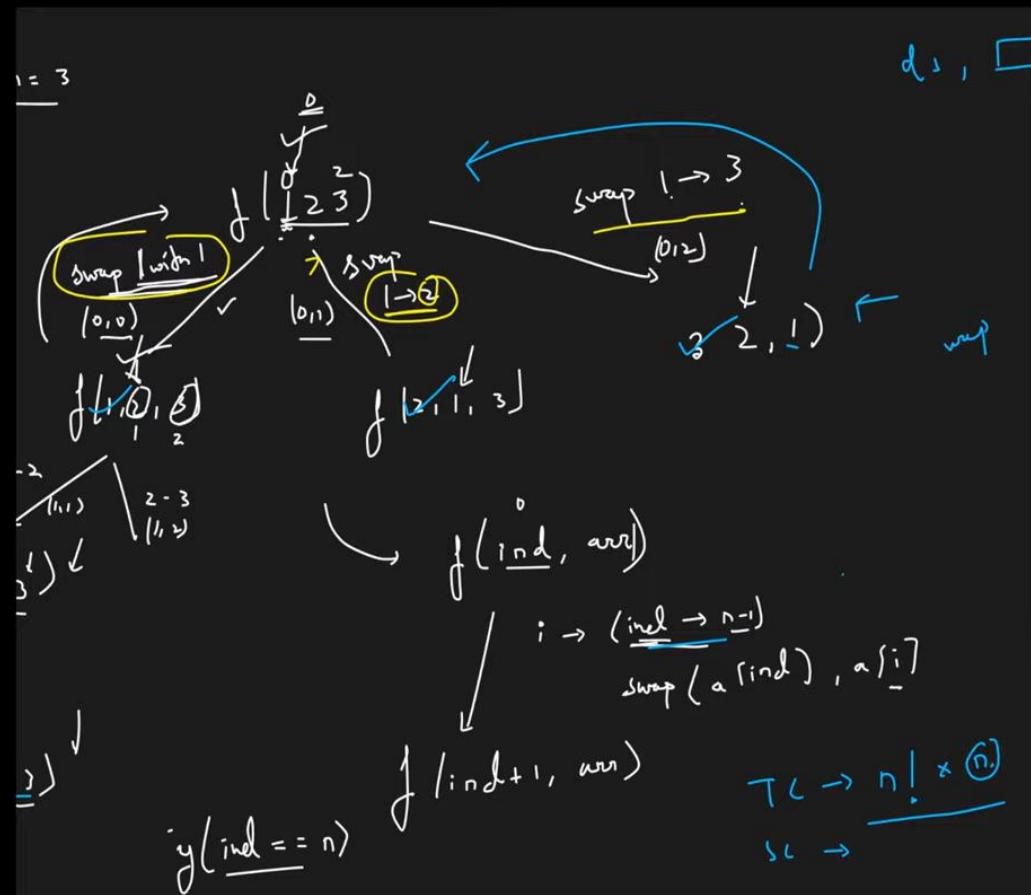
$\{1, 2, \underline{3}\}$

$$\begin{bmatrix} 1 & 2 & 3 \\ \downarrow & 1 & 2 \end{bmatrix} \quad n=3$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 2 \\ 2 & 1 & 3 \\ 2 & 3 & 1 \\ 3 & 2 & 1 \\ 3 & 1 & 2 \end{bmatrix}$$





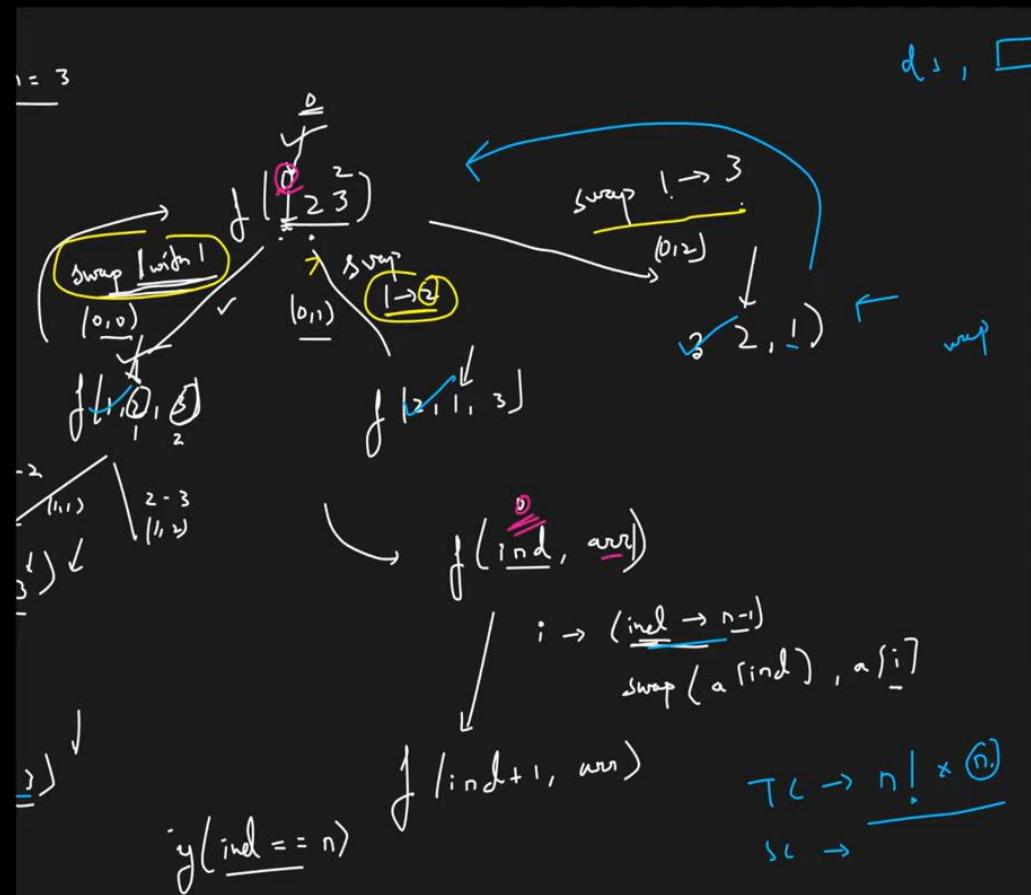


*i Java Autocomplete*

```

1 class Solution {
2     private void recurPermute(int index, int[] nums, List<List<Integer>> ans) {
3         if(index == nums.length) {
4             // copy the ds to ans
5             List<Integer> ds = new ArrayList<>();
6             for(int i = 0;i<nums.length;i++) {
7                 ds.add(nums[i]);
8             }
9             ans.add(new ArrayList<>(ds));
10            return;
11        }
12        for(int i = index;i<nums.length;i++) {
13            swap(i, index, nums);
14            recurPermute(index+1, nums, ans);
15            swap(i, index, nums);
16        }
17    }
18    private void swap(int i, int j, int[] nums) {
19        int t = nums[i];
20        nums[i] = nums[j];
21        nums[j] = t;
22    }
23    public List<List<Integer>> permute(int[] nums) {
24        List<List<Integer>> ans = new ArrayList<>();
25        recurPermute(0, nums, ans);
26        return ans;
27    }
28 }

```



```

i C++ Autocomplete
1 class Solution {
2 private:
3     void recurPermute(int index, vector<int> &nums, vector<vector<int>> &ans) {
4         if(index == nums.size()) {
5             ans.push_back(nums);
6             return;
7         }
8         for(int i = index;i<nums.size();i++) {
9             swap(nums[index], nums[i]);
10            recurPermute(index+1, nums, ans);
11            swap(nums[index], nums[i]);
12        }
13    }
14 public:
15     vector<vector<int>> permute(vector<int>& nums) {
16         vector<vector<int>> ans;
17         recurPermute(0, nums, ans);
18         return ans;
19     }
20 }
21

```