Week 4 LIVE

Backtracking Hard Problems & Doubts

In This Lecture

1. Subsequences of An Array
2. Combination Sum Problem
3. Palindromic Partitioning

Subsequences of An Array

Input:

arr[] = [1, 2, 3]

Output:

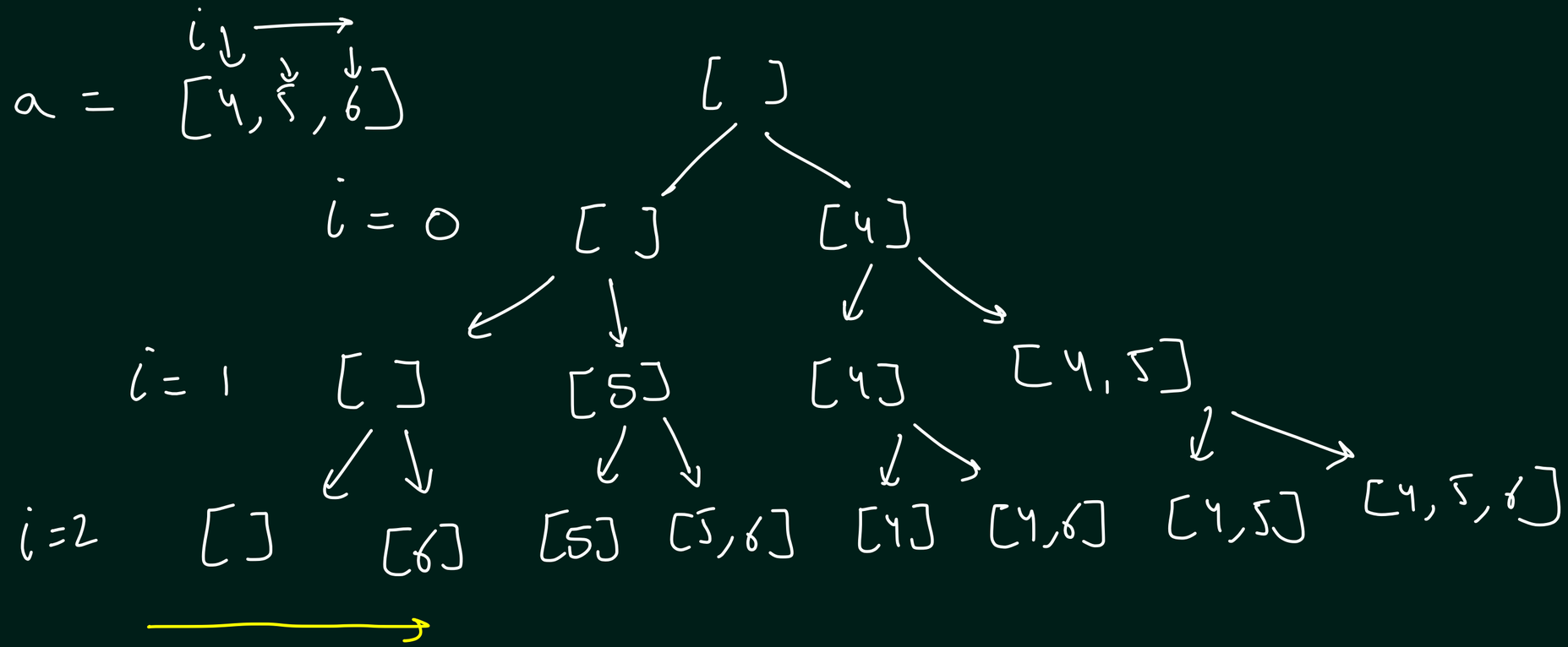
[[], [1], [1, 2], [1, 2, 3], [1, 3], [2], [2, 3], [3]]

{a, b, c} → {a, c}, {b, c}
{c}

0 or more elements pick
+ including the order

Subarray → {1, 2, 3, 5}
{2, 5}
{5, 2} ✗

Subsequences of An Array



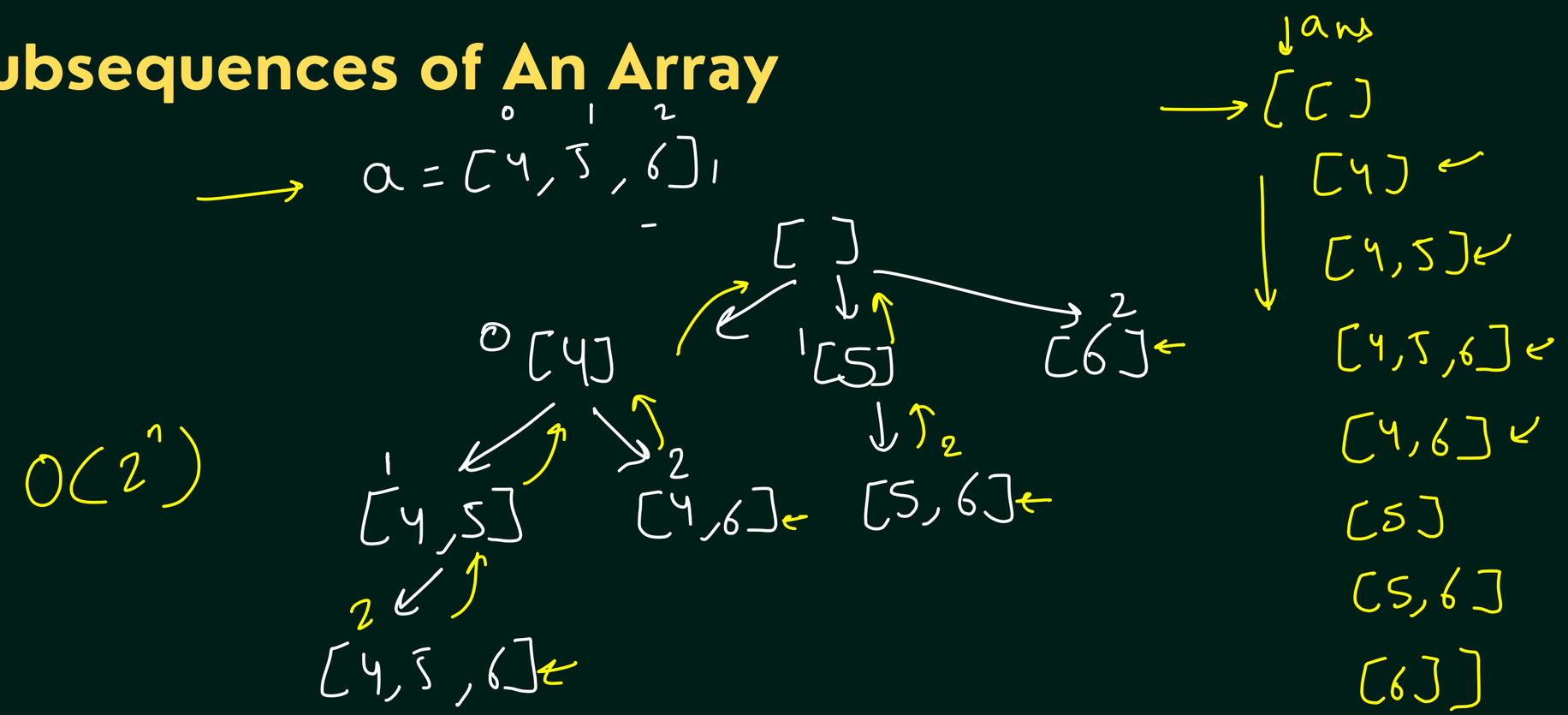
$n = 3$

2^n

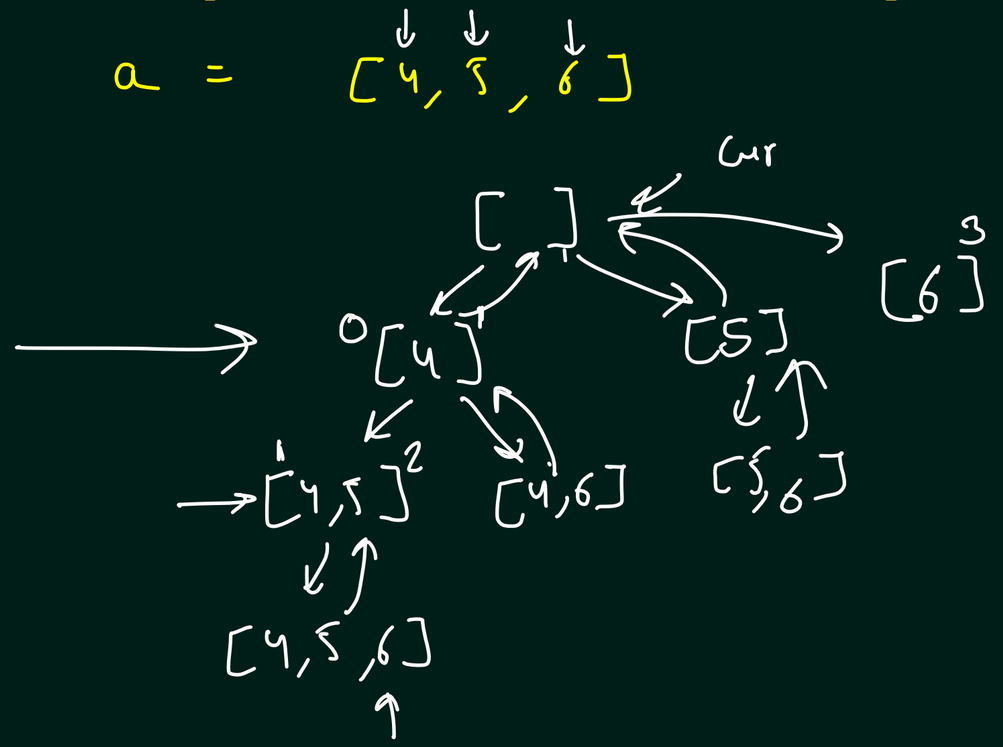
$O(2^n)$

$n \log n \longrightarrow 2^n \log_2 2^n \longrightarrow O(n \times 2^n)$

Subsequences of An Array



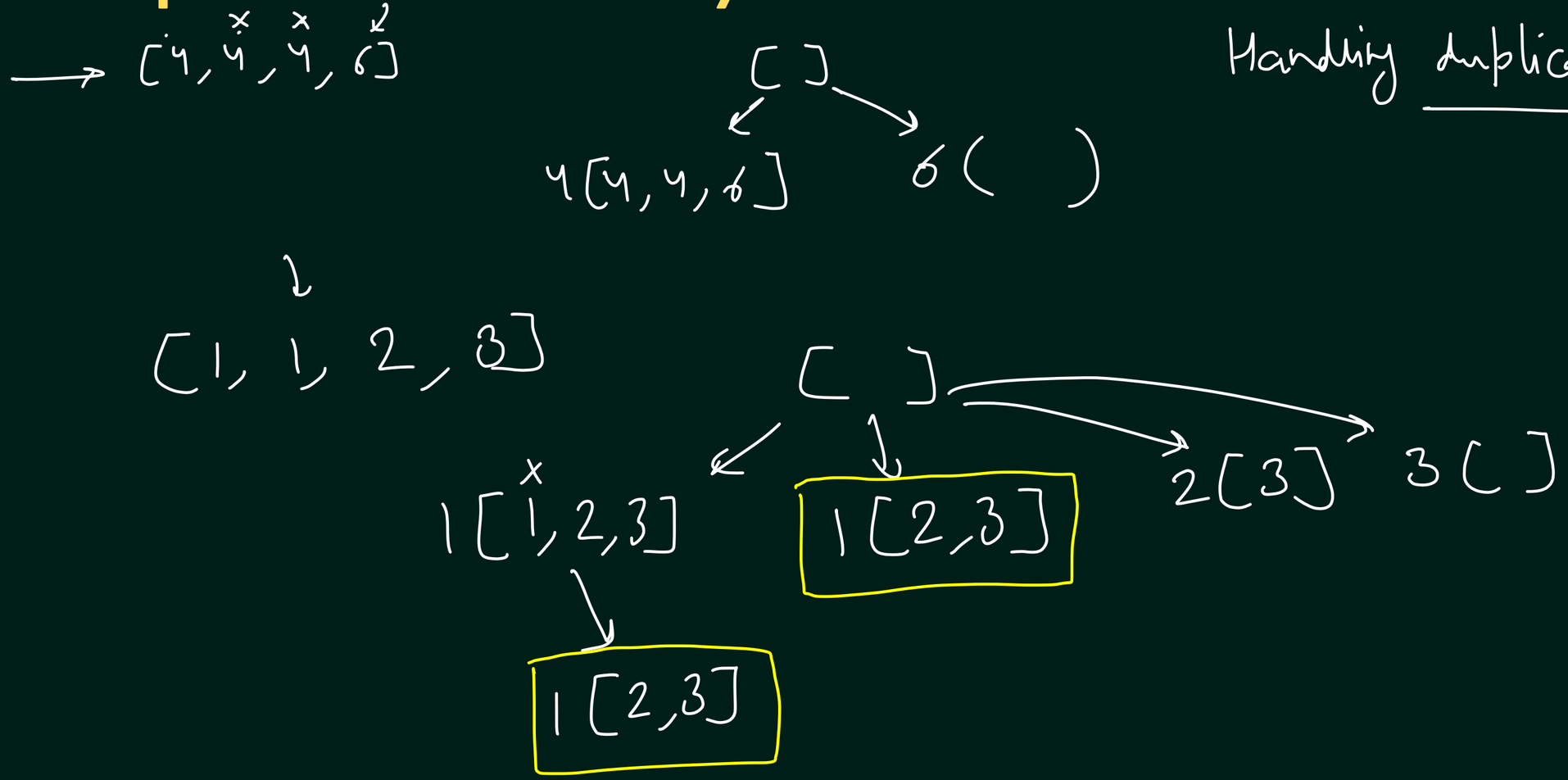
Subsequences of An Array




```java
static void helperSubsequence(int a[], ArrayList<ArrayList<Integer>> ans,
                              int index, ArrayList<Integer> cur) {

    ArrayList<Integer> curCopy = new ArrayList<>(cur);
    ans.add(curCopy);

    for(int i = index; i<a.length; i++) {
        cur.add(a[i]);
        helperSubsequence(a, ans, index: i+1, cur);
        cur.remove( index: cur.size()-1); //backtrack
    }

}
```

[
[],
[4],
[4,5]
[4,5,6]
[4,6]
[5]
[5,6]
[6]
]

Subsequences of An Array



Combination Sum Problem

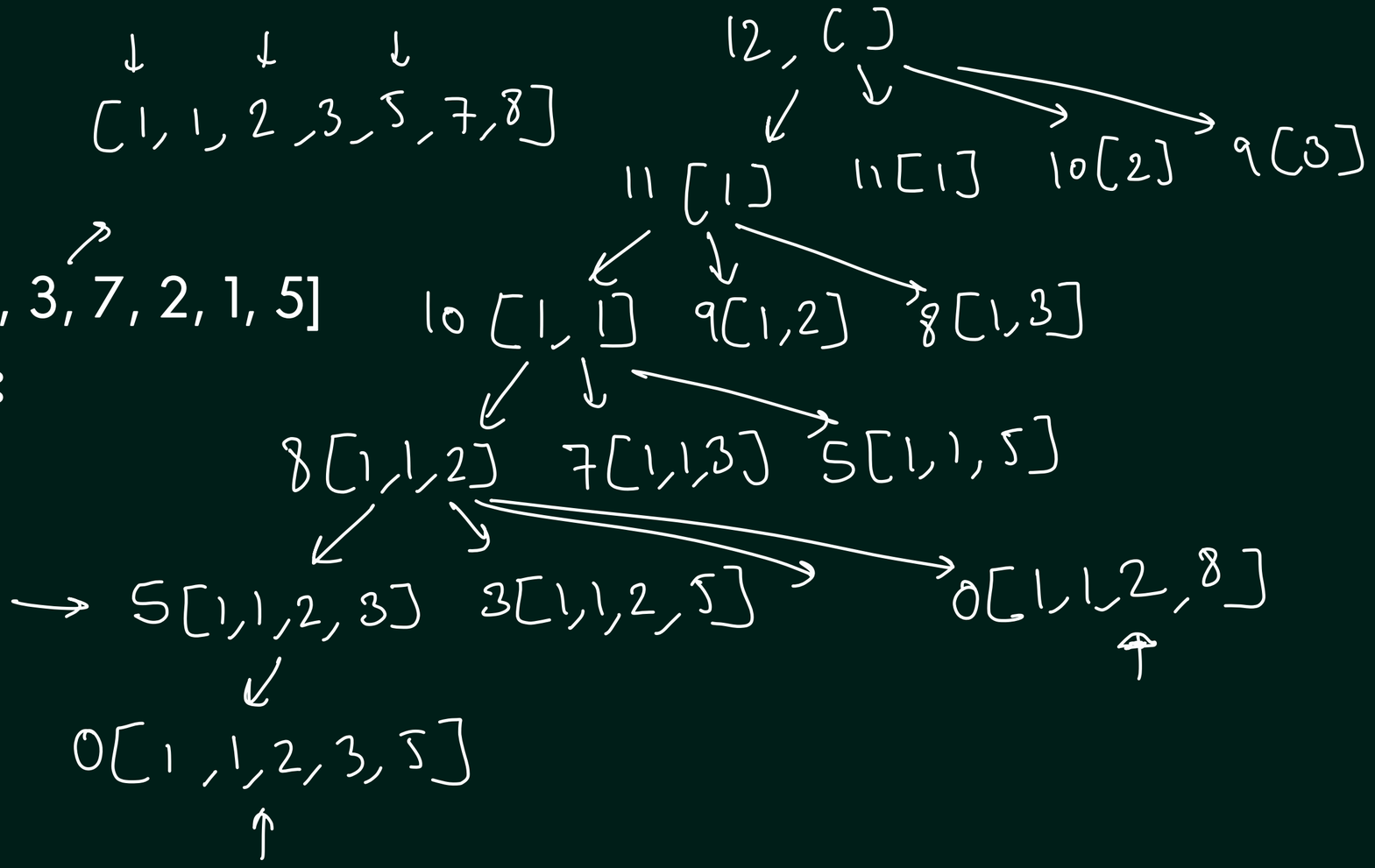
Input:

Target = 12

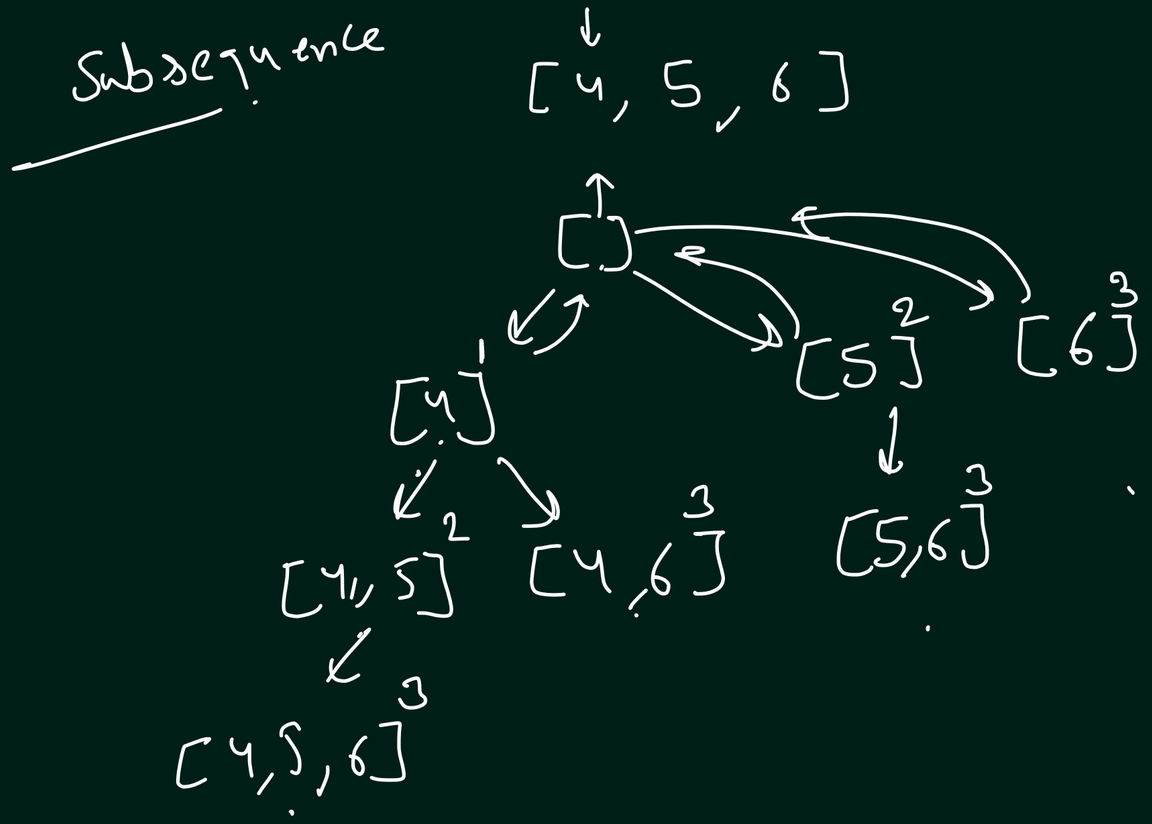
Candidates = [8, 1, 3, 7, 2, 1, 5]

Sample Output:

[[1, 1, 2, 3, 5],
[1, 1, 2, 8],
[1, 1, 3, 7],
[1, 3, 8],
[2, 3, 7],
[5, 7]]



Combination Sum Problem




```java
static void helperSubsequence(int a[], ArrayList<ArrayList<Integer>> ans,
                              int index, ArrayList<Integer> cur) {

    ArrayList<Integer> curCopy = new ArrayList<>(cur);
    ans.add(curCopy);

    for(int i = index; i<a.length; i++) {

        if(i > index && a[i] == a[i-1]) continue;

        cur.add(a[i]);
        helperSubsequence(a, ans, index: i+1, cur);
        cur.remove( index: cur.size()-1); //backtrack
    }

}
```

Palindromic Partitioning

Input:

↳"aab"

Output:

[["a", "a", "b"],

["aa", "b"]]