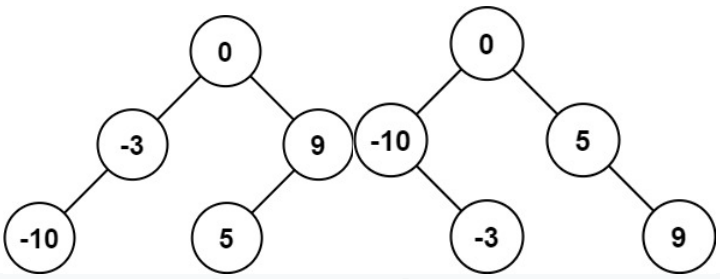
108. Convert Sorted Array to Binary Search Tree

Easy

Given an integer array `nums` where the elements are sorted in **ascending order**, convert *it to a **height-balanced** binary search tree*.

A **height-balanced** binary tree is a binary tree in which the depth of the two subtrees of every node never differs by more than one.

Example 1:

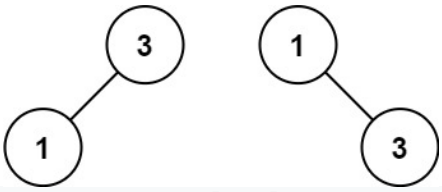



```
Input: nums = [-10,-3,0,5,9]

Output: [0,-3,9,-10,null,5]

Explanation: [0,-10,5,null,-3,null,9] is also accepted:
```

Example 2:




```
Input: nums = [1,3]

Output: [3,1]

Explanation: [1,null,3] and [3,1] are both height-balanced BSTs.
```

Constraints:

- `1 <= nums.length <= 10⁴`
- `-10⁴ <= nums[i] <= 10⁴`
- `nums` is sorted in a **strictly increasing** order.

Related Topics

Array | Divide and Conquer | Tree | Binary Search Tree | Binary Tree

```
/**
 * Definition for a binary tree node.
 * public class TreeNode {
 *     int val;
 *     TreeNode left;
 *     TreeNode right;
 *     TreeNode() {}
 *     TreeNode(int val) { this.val = val; }
 *     TreeNode(int val, TreeNode left, TreeNode right) {
 *         this.val = val;
 *         this.left = left;
 *         this.right = right;
 *     }
 * }
 */

class Solution {
    public TreeNode create(int[] nums, int index, int length) {
        TreeNode head;
        int lengthl = length / 2;
        int lengthr = length - (length / 2 + 1);
        if (length == 1) {
            head = new TreeNode(nums[index], null, null);
        } else if (length == 2) {
            head = new TreeNode(nums[index], create(nums, index - (lengthl + 1) / 2, lengthl), null);
        } else
            head = new TreeNode(nums[index], create(nums, index - (lengthl + 1) / 2, lengthl),
                    create(nums, index + lengthr / 2 + 1, lengthr));
        return head;
    }

    public TreeNode sortedArrayToBST(int[] nums) {
        TreeNode head = create(nums, nums.length / 2, nums.length);
        return head;
    }

}
```

- In this approch I used analogy to binary search and recursion

```
class Solution {
public TreeNode sortedArrayToBST(int[] nums) {
return Tree(nums,0,nums.length-1);
}
public TreeNode Tree(int[] nums,int l ,int h){
    TreeNode ans = null;
    if(l<=h){
       int m = (l+h)/2;
        TreeNode root = new TreeNode(nums[m]);
        root.left  = Tree(nums,l,m-1);
        root.right = Tree(nums,m+1,h);
        ans = root;
    }
```

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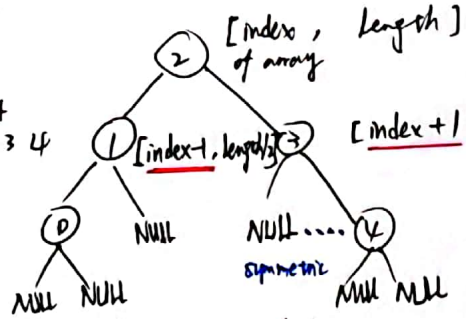
I. Divide & Conquer

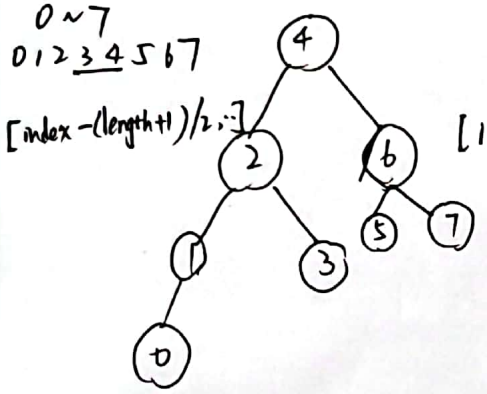


~ invariant.

Misleading Examples

boundaries Length' = 2 || 1.

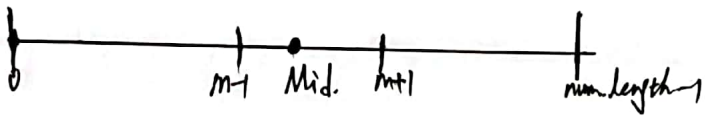
index = length / 2

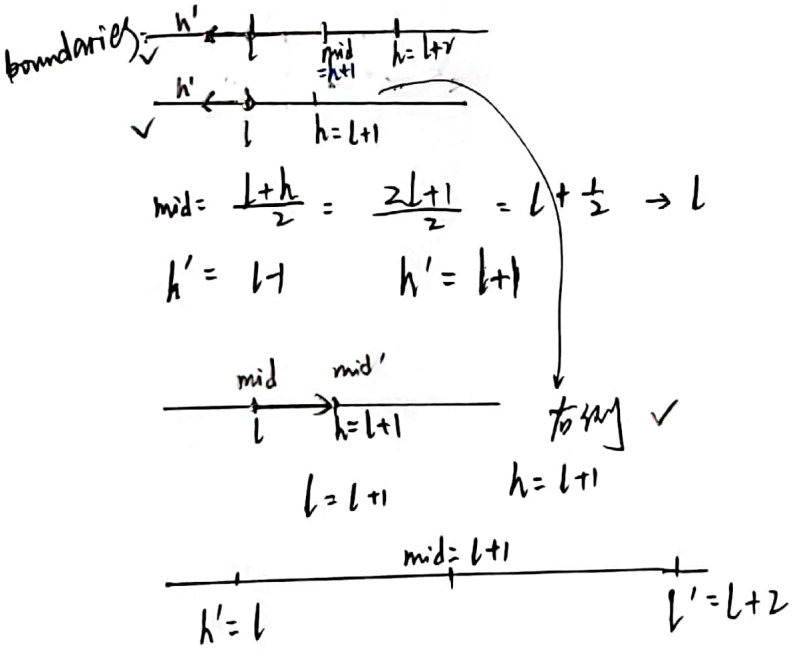


Fix Index'

[index + length/2 + 1, ·]

II. Binary Search





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