Construct Binary Tree using Preorder and Inorder Traversal [LeetCode](https://leetcode.com/problems/construct-binary-tree-from-preorder-and-inorder-traversal/description/)

Given two integer arrays preorder and inorder where preorder is the preorder traversal of a binary tree and inorder is the inorder traversal of the same tree, construct and return *the binary tree*.

Example:

The input Inorder Traversal:

9 3 15 20 7

The input Preorder Traversal:

3 9 20 15 7

Output:

3

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9 20

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15 7

Level Order Traversal:

Level 0: 3

Level 1: 9, 20

Level 2: 15, 7

Postorder Traversal:

9 15 7 20 3

**Approach 1: Function to build a binary tree from preorder and inorder traversals**

* Define a helper function **solve** that constructs a binary tree recursively:
  + Base case: If the inorder index is out of bounds or all nodes have been processed in the preorder traversal, return nullptr.
  + Extract the current element from the preorder traversal.
  + Create a new node with the current element.
  + Find the index of the current element in the inorder traversal.
  + Recursively build the left and right subtrees.
* In the **buildTree** function, initialize **preIndex** to 0 and call the **solve** function to create the binary tree.
* **Time Complexity: O(N) as it visits each node exactly once.**
* **Space Complexity: O(N) for the function call stack and O(N) for the input vectors.**

**Approach 2: Function to build a binary tree from preorder and inorder traversals using a hashmap for optimized lookup**

* Define a helper function **buildTreeHelper** that constructs a binary tree recursively using a hashmap for optimized lookup:
  + Base case: If the inorder index is out of bounds or all nodes have been processed in the preorder traversal, return nullptr.
  + Extract the current element from the preorder traversal.
  + Create a new node with the current element.
  + Find the index of the current element in the hashmap.
  + Recursively build the left and right subtrees.
* In the **buildTreeOptimized** function:
  + Initialize **preIndex** to 0 and **mp**, an unordered map that stores the indices of elements in the inorder traversal for efficient lookup.
  + Populate the hashmap with the indices of elements in the inorder traversal.
  + Call the **buildTreeHelper** function to create the binary tree.
* **Time Complexity: O(N) as it visits each node exactly once.**
* **Space Complexity: O(N) for the function call stack, O(N) for the hashmap, and O(N) for the input vectors.**

**Conclusion:**

* Both approaches effectively construct a binary tree from the given inorder and preorder traversals.
* The output demonstrates the level-order traversal of the binary tree and its postorder traversal. Both methods yield the same tree structure.
* The optimized approach using a hashmap for efficient lookup may offer better performance in terms of time complexity, especially for larger input trees.