Documentation for hasPathSum Function

Overview

The hasPathSum function is designed to determine if a binary tree has a root-to-leaf path such that the sum of the node values along the path equals a given target sum. A root-to-leaf path is defined as a path starting from the root node and ending at a leaf node. A leaf node is a node with no children.

Parameters

- **root (TreeNode):** The root node of the binary tree.
- **targetSum (int):** The target sum to be checked against the path sums in the binary tree.

Returns

- **bool:** Returns True if there is at least one root-to-leaf path in the tree where the sum of the node values equals targetSum. Otherwise, returns False.

Detailed Explanation

- The function operates using a recursive approach to traverse the tree and check for the presence of a valid path sum.

1. Base Case: Empty Tree

- If the tree is empty (root is None), the function returns False because there are no paths to check.

2. Leaf Node Check

- If the current node is a leaf node (i.e., it has no left or right child), the function checks if the node's value is equal to the targetSum. If it is, the function returns True.

3. Recursive Case: Non-Leaf Node

- If the current node is not a leaf node, the function recursively checks the left and right subtrees. The targetSum is updated by subtracting the current node's value. This step ensures that the remaining sum to be checked against the subsequent nodes is correct.

4. Combining Results

- The function returns True if either the left or the right subtree contains a valid path sum. Otherwise, it returns False.

Example 1

- **Input:** root = [5,4,8,11,null,13,4,7,2,null,null,null,1], targetSum = 22
- **Output:** True
- **Explanation:** The root-to-leaf path with the target sum is 5 → 4 → 11 → 2, which sums to 22.

Example 2

- **Input:** root = [1,2,3], targetSum = 5
- **Output:** False
- **Explanation:** There are two root-to-leaf paths: 1 → 2 (sum is 3) and 1 → 3 (sum is 4). Neither path sums to 5.

Example 3

- **Input:** root = [], targetSum = 0
- **Output:** False
- **Explanation:** Since the tree is empty, there are no root-to-leaf paths.

Constraints

- The number of nodes in the tree is in the range [0, 5000].
- The value of each node (Node.val) is between -1000 and 1000.
- The targetSum is between -1000 and 1000.