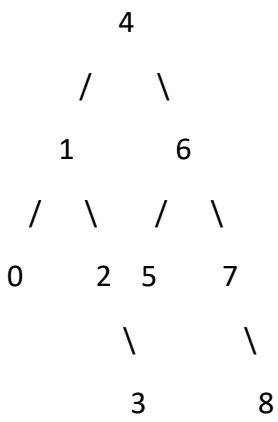
Convert Binary Search Tree (BST) to Greater Sum Tree (GST) LeetCode

Given the root of a Binary Search Tree (BST), convert it to a Greater Tree such that every key of the original BST is changed to the original key plus the sum of all keys greater than the original key in BST.

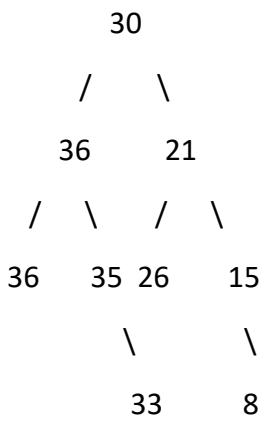
As a reminder, a *binary search tree* is a tree that satisfies these constraints:

- The left subtree of a node contains only nodes with keys **less than** the node's key.
- The right subtree of a node contains only nodes with keys **greater than** the node's key.
- Both the left and right subtrees must also be binary search trees.

Example:



Output:



Approach 1: Convert a binary search tree (BST) into a Greater Sum Tree (GST)

- **Function Purpose**:
    - The **convertBST** function converts a BST into a Greater Sum Tree (GST).

- **Explanation**:
    - It uses two helper functions: **inorderTraversal** to calculate cumulative sums of nodes and **updateBST** to update the BST with cumulative sums.
    - Cumulative sums are stored in a vector, and values are updated in the BST by popping values from the vector.
- **Time Complexity**:
    - **O(N), where N is the number of nodes in the BST, as we perform an in-order traversal once.**
- **Space Complexity:**
    - **O(N), for the vector storing cumulative sums and the call stack space for recursion.**

Approach 2: Convert a binary search tree (BST) into a Greater Sum Tree (GST) using an optimized approach

- **Function Purpose**:
    - The **convertBSTOptimized** function converts a BST into a Greater Sum Tree (GST) using an optimized approach.
- **Explanation**:
    - It uses a helper function **convertBSTHelper** that performs the in-order traversal in reverse order, updating the nodes with the greater sum.
- **Time Complexity**:
    - **O(N), where N is the number of nodes in the BST, as we traverse all nodes once.**
- **Space Complexity:**
    - **O(H), where H is the height of the BST, for the call stack space.**

Conclusion:

- **Approach 2 is more memory-efficient, and it has the same time complexity as Approach 1 (O(N)). It is the preferred approach.**