1. Path Sum

Given a binary tree and an integer sum, determine if there is a root-to-leaf path such that adding up all the values along the path equals the given sum.

2. Count Leaf Nodes

Write a function to count the number of leaf nodes in a binary tree. A leaf node is defined as a node with no children.

3. Serialize and Deserialize a Binary Tree

Write functions to serialize a binary tree into a string and deserialize it back to a binary tree.

4. Diameter of a Binary Tree

Calculate the diameter of a binary tree. The diameter is defined as the length of the longest path between any two nodes in the tree.

5. Lowest Common Ancestor (LCA)

Given a binary tree and two nodes, find their lowest common ancestor (LCA). The LCA is defined as the deepest node that is an ancestor of both nodes.

6. Symmetric Tree Check

Determine whether a given binary tree is symmetric around its center. A tree is symmetric if its left and right subtrees are mirror images of each other.

7. Maximum Path Sum

Find the maximum path sum in a binary tree. The path may start and end at any node in the tree, and you need to return the maximum sum of values along that path.

8. Binary Tree to Doubly Linked List Conversion

Convert a binary tree into a doubly linked list (DLL) in-place. The DLL should follow the in-order traversal of the binary tree, and you should maintain pointers for both directions (next and previous).