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Grokking the Coding Interview: Patterns for Coding Questions

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Sum of Path Numbers (medium)

We'll cover the following

Problem Statement

Try it yourself

Solution

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Problem Statement

Given a binary tree where each node can only have a digit (0-9) value, each root-to-leaf path will represent a number. Find the total sum of all the numbers represented by all paths.

Example 1:

Output: 408

Explanation: The sum of all path numbers: 17 + 192 + 199

1

7

9

2

9

Example 2:

Output: 332

Explanation: The sum of all path numbers: 101 + 116 + 115

1

0

1

1

6

5

Try it yourself

Try solving this question here:

Java

Python3

JS

C++

```
1 class TreeNode:
2     def __init__(self, val, left=None, right=None):
3         self.val = val
4         self.left = left
5         self.right = right
6
7
8 def find_sum_of_path_numbers(root):
9     # TODO: Write your code here
10    return -1
11
12
13
14 def main():
15     root = TreeNode(1)
16     root.left = TreeNode(0)
17     root.right = TreeNode(1)
18     root.left.left = TreeNode(1)
19     root.right.left = TreeNode(6)
20     root.right.right = TreeNode(5)
21     print("Total Sum of Path Numbers: " + str(find_sum_of_path_numbers(root)))
22
23
24 main()
25
```

Run

Save

Reset

Solution

This problem follows the [Binary Tree Path Sum](#) pattern. We can follow the same **DFS** approach. The additional thing we need to do is to keep track of the number representing the current path.

How do we calculate the path number for a node? Taking the first example mentioned above, say we are at node '7'. As we know, the path number for this node is '17', which was calculated by: `1 * 10 + 7 => 17`. We will follow the same approach to calculate the path number of each node.

Code

Here is what our algorithm will look like:

Java

Python3

C++

JS

```
1 class TreeNode:
2     def __init__(self, val, left=None, right=None):
3         self.val = val
4         self.left = left
5         self.right = right
6
7
8 def find_sum_of_path_numbers(root):
9     return find_root_to_leaf_path_numbers(root, 0)
10
11
12 def find_root_to_leaf_path_numbers(currentNode, pathSum):
13     if currentNode is None:
14         return 0
15
16     # calculate the path number of the current node
17     pathSum = 10 * pathSum + currentNode.val
18
19     # if the current node is a leaf, return the current path sum
20     if currentNode.left is None and currentNode.right is None:
21         return pathSum
22
23     # traverse the left and the right sub-tree
24     return find_root_to_leaf_path_numbers(currentNode.left, pathSum) + find_root_to_leaf_path_numbers(currentNode.right, pathSum)
25
26
27 def main():
28     root = TreeNode(1)
29     root.left = TreeNode(0)
30     root.right = TreeNode(1)
31     root.left.left = TreeNode(1)
```

Run

Save

Reset

Time complexity

The time complexity of the above algorithm is $O(N)$, where 'N' is the total number of nodes in the tree. This is due to the fact that we traverse each node once.

Space complexity

The space complexity of the above algorithm will be $O(N)$ in the worst case. This space will be used to store the recursion stack. The worst case will happen when the given tree is a linked list (i.e., every node has only one child).

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All Paths for a Sum (medium)

Path With Given Sequence (medium)

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