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834. Sum of Distances in Tree

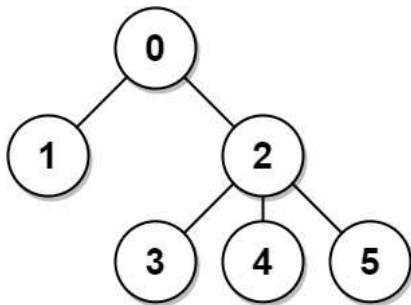
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There is an undirected connected tree with n nodes labeled from 0 to $n - 1$ and $n - 1$ edges.

You are given the integer n and the array edges where $\text{edges}[i] = [a_i, b_i]$ indicates that there is an edge between nodes a_i and b_i in the tree.

Return an array answer of length n where $\text{answer}[i]$ is the sum of the distances between the i^{th} node in the tree and all other nodes.

Example 1:



Input: $n = 6$, $\text{edges} = [[0,1], [0,2], [2,3], [2,4], [2,5]]$

Output: $[8, 12, 6, 10, 10, 10]$

Explanation: The tree is shown above.

We can see that $\text{dist}(0,1) + \text{dist}(0,2) + \text{dist}(0,3) + \text{dist}(0,4) + \text{dist}(0,5)$ equals $1 + 1 + 2 + 2 + 2 = 8$.

Hence, $\text{answer}[0] = 8$, and so on.

```

1 class Solution {
2 public:
3     vector<int> sumOfDistancesInTree(int n, vector<vector<int>> edges) {
4         vector<int> count(n, 1);
5         vector<int> ans(n);
6         vector<unordered_set<int>> tree(n);
7
8         for(const vector<int>& edge: edges){
9             const int u = edge[0];
10            const int v = edge[1];
11            tree[u].insert(v);
12            tree[v].insert(u);
13        }
14        postorder(tree, 0, -1, count, ans);
15        preorder(tree, 0, -1, count, ans);
16        return ans;
17    }
18 private:
19     void postorder(const vector<unordered_set<int>>& tree,
20                     vector<int>& count, vector<int>& ans){
21         for(const int child: tree[node]){
22             if(child == parent)
23                 continue;
24             postorder(tree, child, node, count, ans);
25             count[node] += count[child];
26             ans[node] += ans[child] + count[child];
27         }
28     }
29     void preorder(const vector<unordered_set<int>>& tree,
30                  vector<int>& count, vector<int>& ans){
31         for(const int child: tree[node]){
32             ...
33         }
34     }
35 }
  
```

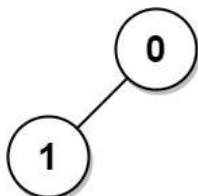
Example 2:



Input: $n = 1$, $\text{edges} = []$

Output: $[0]$

Example 3:



Input: $n = 2$, $\text{edges} = [[1,0]]$

Output: $[1, 1]$

Constraints:

- $1 \leq n \leq 3 * 10^4$
- $\text{edges.length} == n - 1$
- $\text{edges}[i].length == 2$

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