# Problem 3515: Shortest Path in a Weighted Tree

## Problem Information

**Difficulty:** Hard
**Acceptance Rate:** 41.29%
**Paid Only:** No
**Tags:** Array, Tree, Depth-First Search, Binary Indexed Tree, Segment Tree

## Problem Description

You are given an integer `n` and an undirected, weighted tree rooted at node 1 with `n` nodes numbered from 1 to `n`. This is represented by a 2D array `edges` of length `n - 1`, where `edges[i] = [ui, vi, wi]` indicates an undirected edge from node `ui` to `vi` with weight `wi`.

You are also given a 2D integer array `queries` of length `q`, where each `queries[i]` is either:

* `[1, u, v, w']` - **Update** the weight of the edge between nodes `u` and `v` to `w'`, where `(u, v)` is guaranteed to be an edge present in `edges`. * `[2, x]` - **Compute** the **shortest** path distance from the root node 1 to node `x`.

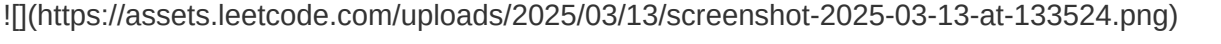
Return an integer array `answer`, where `answer[i]` is the **shortest** path distance from node 1 to `x` for the `ith` query of `[2, x]`.

**Example 1:**

**Input:** n = 2, edges = [[1,2,7]], queries = [[2,2],[1,1,2,4],[2,2]]

**Output:** [7,4]

**Explanation:**



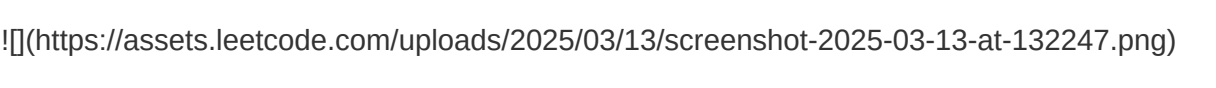
* Query `[2,2]`: The shortest path from root node 1 to node 2 is 7. * Query `[1,1,2,4]`: The weight of edge `(1,2)` changes from 7 to 4. * Query `[2,2]`: The shortest path from root node 1 to node 2 is 4.

**Example 2:**

**Input:** n = 3, edges = [[1,2,2],[1,3,4]], queries = [[2,1],[2,3],[1,1,3,7],[2,2],[2,3]]

**Output:** [0,4,2,7]

**Explanation:**



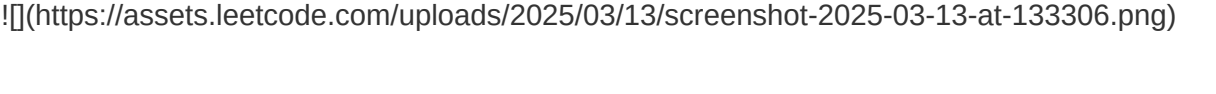
* Query `[2,1]`: The shortest path from root node 1 to node 1 is 0. * Query `[2,3]`: The shortest path from root node 1 to node 3 is 4. * Query `[1,1,3,7]`: The weight of edge `(1,3)` changes from 4 to 7. * Query `[2,2]`: The shortest path from root node 1 to node 2 is 2. * Query `[2,3]`: The shortest path from root node 1 to node 3 is 7.

**Example 3:**

**Input:** n = 4, edges = [[1,2,2],[2,3,1],[3,4,5]], queries = [[2,4],[2,3],[1,2,3,3],[2,2],[2,3]]

**Output:** [8,3,2,5]

**Explanation:**



* Query `[2,4]`: The shortest path from root node 1 to node 4 consists of edges `(1,2)`, `(2,3)`, and `(3,4)` with weights `2 + 1 + 5 = 8`. * Query `[2,3]`: The shortest path from root node 1 to node 3 consists of edges `(1,2)` and `(2,3)` with weights `2 + 1 = 3`. * Query `[1,2,3,3]`: The weight of edge `(2,3)` changes from 1 to 3. * Query `[2,2]`: The shortest path from root node 1 to node 2 is 2. * Query `[2,3]`: The shortest path from root node 1 to node 3 consists of edges `(1,2)` and `(2,3)` with updated weights `2 + 3 = 5`.

**Constraints:**

* `1 <= n <= 105` * `edges.length == n - 1` * `edges[i] == [ui, vi, wi]` * `1 <= ui, vi <= n` * `1 <= wi <= 104` * The input is generated such that `edges` represents a valid tree. * `1 <= queries.length == q <= 105` * `queries[i].length == 2` or `4` * `queries[i] == [1, u, v, w']` or, * `queries[i] == [2, x]` * `1 <= u, v, x <= n` * `(u, v)` is always an edge from `edges`. * `1 <= w' <= 104`

## Code Snippets

### C++:

```
class Solution {
public:
vector<int> treeQueries(int n, vector<vector<int>>& edges,
vector<vector<int>>& queries) {

}
};
```

### Java:

```
class Solution {
public int[] treeQueries(int n, int[][] edges, int[][] queries) {

}
}
```

### Python3:

```
class Solution:
def treeQueries(self, n: int, edges: List[List[int]], queries:
List[List[int]]) -> List[int]:
```