Problem 3068: Find the Maximum Sum of Node Values

Problem Information

Difficulty: Hard
Acceptance Rate: 69.60%
Paid Only: No
Tags: Array, Dynamic Programming, Greedy, Bit Manipulation, Tree, Sorting

Problem Description

There exists an **undirected** tree with `n` nodes numbered `0` to `n - 1`. You are given a **0-indexed** 2D integer array `edges` of length `n - 1`, where `edges[i] = [ui, vi]` indicates that there is an edge between nodes `ui` and `vi` in the tree. You are also given a **positive** integer `k`, and a **0-indexed** array of **non-negative** integers `nums` of length `n`, where `nums[i]` represents the **value** of the node numbered `i`.

Alice wants the sum of values of tree nodes to be **maximum** , for which Alice can perform the following operation **any** number of times (**including zero**) on the tree:

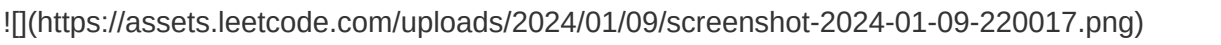
* Choose any edge `[u, v]` connecting the nodes `u` and `v`, and update their values as follows: * `nums[u] = nums[u] XOR k` * `nums[v] = nums[v] XOR k`

Return _the**maximum** possible **sum** of the **values** Alice can achieve by performing the operation **any** number of times_.

Example 1:

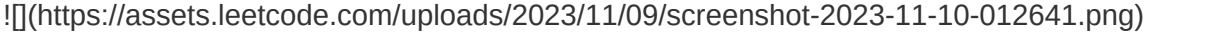
Input: nums = [1,2,1], k = 3, edges = [[0,1],[0,2]] **Output:** 6 **Explanation:** Alice can achieve the maximum sum of 6 using a single operation: - Choose the edge [0,2]. nums[0] and nums[2] become: 1 XOR 3 = 2, and the array nums becomes: [1,2,1] -> [2,2,2]. The total sum of values is 2 + 2 + 2 = 6. It can be shown that 6 is the maximum achievable sum of values.

Example 2:



Input: nums = [2,3], k = 7, edges = [[0,1]] **Output:** 9 **Explanation:** Alice can achieve the maximum sum of 9 using a single operation: - Choose the edge [0,1]. nums[0] becomes: 2 XOR 7 = 5 and nums[1] become: 3 XOR 7 = 4, and the array nums becomes: [2,3] -> [5,4]. The total sum of values is 5 + 4 = 9. It can be shown that 9 is the maximum achievable sum of values.

Example 3:



Input: nums = [7,7,7,7,7,7], k = 3, edges = [[0,1],[0,2],[0,3],[0,4],[0,5]] **Output:** 42 **Explanation:** The maximum achievable sum is 42 which can be achieved by Alice performing no operations.

Constraints:

* `2 <= n == nums.length <= 2 * 104` * `1 <= k <= 109` * `0 <= nums[i] <= 109` * `edges.length == n - 1` * `edges[i].length == 2` * `0 <= edges[i][0], edges[i][1] <= n - 1` * The input is generated such that `edges` represent a valid tree.

Code Snippets

C++:

```
class Solution {
public:
long long maximumValueSum(vector<int>& nums, int k, vector<vector<int>>&
edges) {

}
};
```

Java:

```
class Solution {
public long maximumValueSum(int[] nums, int k, int[][] edges) {
```

```
}
}
```

Python3:

```
class Solution:
def maximumValueSum(self, nums: List[int], k: int, edges: List[List[int]]) ->
int:
```