Problem 2421: Number of Good Paths

Problem Information

Difficulty: Hard
Acceptance Rate: 56.17%
Paid Only: No
Tags: Array, Hash Table, Tree, Union Find, Graph, Sorting

Problem Description

There is a tree (i.e. a connected, undirected graph with no cycles) consisting of `n` nodes numbered from `0` to `n - 1` and exactly `n - 1` edges.

You are given a **0-indexed** integer array `vals` of length `n` where `vals[i]` denotes the value of the `ith` node. You are also given a 2D integer array `edges` where `edges[i] = [ai, bi]` denotes that there exists an **undirected** edge connecting nodes `ai` and `bi`.

A **good path** is a simple path that satisfies the following conditions:

1. The starting node and the ending node have the **same** value. 2. All nodes between the starting node and the ending node have values **less than or equal to** the starting node (i.e. the starting node's value should be the maximum value along the path).

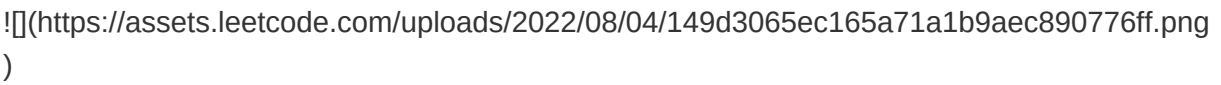
Return _the number of distinct good paths_.

Note that a path and its reverse are counted as the **same** path. For example, `0 -> 1` is considered to be the same as `1 -> 0`. A single node is also considered as a valid path.

Example 1:

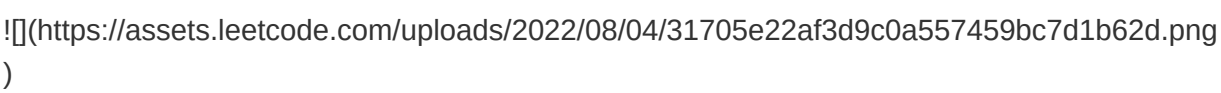
Input: vals = [1,3,2,1,3], edges = [[0,1],[0,2],[2,3],[2,4]] **Output:** 6 **Explanation:** There are 5 good paths consisting of a single node. There is 1 additional good path: 1 -> 0 -> 2 -> 4. (The reverse path 4 -> 2 -> 0 -> 1 is treated as the same as 1 -> 0 -> 2 -> 4.) Note that 0 -> 2 -> 3 is not a good path because vals[2] > vals[0].

Example 2:



Input: vals = [1,1,2,2,3], edges = [[0,1],[1,2],[2,3],[2,4]] **Output:** 7 **Explanation:** There are 5 good paths consisting of a single node. There are 2 additional good paths: 0 -> 1 and 2 -> 3.

Example 3:



Input: vals = [1], edges = [] **Output:** 1 **Explanation:** The tree consists of only one node, so there is one good path.

Constraints:

* `n == vals.length` * `1 <= n <= 3 * 104` * `0 <= vals[i] <= 105` * `edges.length == n - 1` * `edges[i].length == 2` * `0 <= ai, bi < n` * `ai != bi` * `edges` represents a valid tree.

Code Snippets

C++:

```
class Solution {
public:
int numberOfGoodPaths(vector<int>& vals, vector<vector<int>>& edges) {

}
};
```

Java:

```
class Solution {
public int numberOfGoodPaths(int[] vals, int[][] edges) {

}
```

```
}
```

Python3:

```
class Solution:
def numberOfGoodPaths(self, vals: List[int], edges: List[List[int]]) -> int:
```