IOI Team Training 2013 – Online Test 1, 6–7 June, 2013

Balancing Paths

You are given a tree with N nodes, where the nodes are labeled 1 to N. The edges of the tree are of two types: type-0, and type-1.

A path from node u to node v, $u \neq v$, is called balanced iff there exists a node w along the path, $w \notin \{u, v\}$, such that the number of type-0 edges from u to w is equal to the number of type-1 edges from u to w, and the same holds from w to v.

Find the number of unordered pairs $\{u, v\}$ of nodes, such that the path from u to v is balanced ($u \neq v$).

Program and Grader

Implement one function in the file `balpaths.cpp`.

```
long long countPaths (int N, int * u, int * v, int * type);
```

that returns the number of balanced paths in the tree. The tree has `N` nodes. For each `i` in `[1..N-1]`, edge `i` connects `u[i]` and `v[i]` and has type `type[i]`.

Input and Output

The program `grader_balpaths.cpp` takes input in the following format:

- The first line has a single integer, N.
- This is followed by $N - 1$ lines describing the edges of the tree. Each line `i`, `i` in `[1..N-1]`, consists of three integers: `u[i]`, `v[i]` and `type[i]`.

`grader_balpaths.cpp` then calls your function `countPaths()` and outputs the value that your function returns.

Test data

- Subtask 1 (15 marks) : $N \leq 100$
- Subtask 2 (15 marks) : $N \leq 1000$
- Subtask 3 (70 marks) : $N \leq 100,000$

Sample input

```
7
1 2 0
3 1 1
2 4 0
5 2 0
6 3 1
5 7 1
```

Sample output

```
1
```

Limits

- *Memory limit* : 128 MB
- *Time limit* : 4s