F. Pairs of Paths

time limit per test: 6 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

You are given a tree consisting of n vertices, and m simple vertex paths. Your task is to find how many pairs of those paths intersect at exactly one vertex. More formally you have to find the number of pairs (i, j) $(1 \le i < j \le m)$ such that $path_i$ and $path_j$ have exactly one vertex in common.

Input

First line contains a single integer n $(1 \le n \le 3 \cdot 10^5)$.

Next $n - 1$ lines describe the tree. Each line contains two integers u and v $(1 \le u, v \le n)$ describing an edge between vertices u and v.

Next line contains a single integer m $(1 \le m \le 3 \cdot 10^5)$.

Next m lines describe paths. Each line describes a path by it's two endpoints u and v $(1 \le u, v \le n)$. The given path is all the vertices on the shortest path from u to v (including u and v).

Output

Output a single integer — the number of pairs of paths that intersect at exactly one vertex.

Examples

input Copy

```
5
1 2
1 3
1 4
3 5
4
2 3
2 4
3 4
3 5
```

output Copy

```
2
```

input Copy

```
1
3
1 1
1 1
1 1
```

output Copy

```
3
```

input Copy

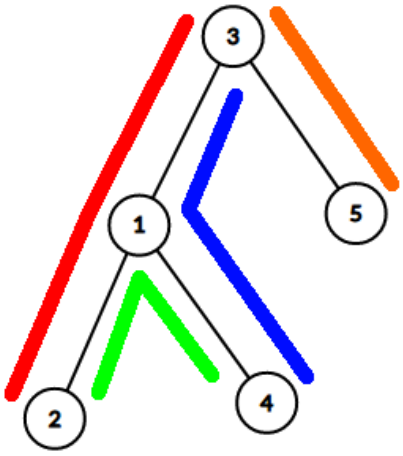
```
5
1 2
1 3
1 4
```

```
3 5
6
2 3
2 4
3 4
3 5
1 1
1 2
```

output Copy

```
7
```

Note



The tree in the first example and paths look like this. Pairs $(1, 4)$ and $(3, 4)$ intersect at one vertex.

In the second example all three paths contain the same single vertex, so all pairs $(1, 2)$, $(1, 3)$ and $(2, 3)$ intersect at one vertex.

The third example is the same as the first example with two additional paths. Pairs $(1, 4)$, $(1, 5)$, $(2, 5)$, $(3, 4)$, $(3, 5)$, $(3, 6)$ and $(5, 6)$ intersect at one vertex.