

Pondo Tree Distance

time limit per test: 2 seconds (5 seconds for Python)
memory limit per test: 500 megabytes
input: standard input
output: standard output
points: 100 · problem code: pondotreedist

You are given a tree with n vertices and q queries. Each query gives two vertices u and v . Output the number of edges on the unique path between u and v .

This is a follow-up to Pondo LCA II. Root the tree at vertex 1, then

$$\text{dist}(u, v) = \text{depth}[u] + \text{depth}[v] - 2 \cdot \text{depth}[\text{lca}(u, v)].$$

In particular, $\text{dist}(u, u) = 0$. Use an Euler tour to compute the lowest common ancestors.

Input

The first line contains two integers n and q .

Each of the next $n - 1$ lines contains two integers u and v , denoting an undirected edge between u and v .

Each of the next q lines contains two integers u and v , the endpoints of one path.

Vertices are numbered 1 through n . The edges form a tree.

Output

Print q lines. The i -th line should contain the distance between the two vertices of the i -th query.

Constraints

- $1 \leq n, q \leq 10^5$
- $1 \leq u, v \leq n$

Example 1

Input

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

Output

```
2
2
3
2
1
0
```

Explanation

The tree looks like this:



Rooted at 1, the depths of vertices 1, 2, 3, 4, 5 are 0, 1, 2, 2, 1. Then $\text{dist}(3, 5) = 2 + 1 - 2 \cdot 0 = 3$, and $\text{dist}(4, 4) = 0$.

Example 2

Input

```

10 10
4 7
7 8
2 4
6 7
8 10
5 8
2 9
3 7
1 9
2 9
6 8
8 9
2 8
8 9
3 8
4 10
5 7
5 6
3 9

```

Output

```

1
2
4
3
4
2
3
2
3
4

```