

Pondo LCA I

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: pondolcai

You are given a tree with n vertices, rooted at vertex 1, and q queries. Each query gives two vertices u and v . Output the lowest common ancestor of u and v .

The lowest common ancestor of u and v is the deepest vertex that lies on both the path from the root to u and the path from the root to v . In particular, $\text{lca}(u, u) = u$, and if u is an ancestor of v then $\text{lca}(u, v) = u$.

Solve the queries with an Euler tour. Unlike the enter/exit tour (first and last visit only), record a vertex every time you visit it: when you first enter it, and again each time you return from a child. The lowest common ancestor of u and v is then the vertex of minimum depth on the tour between their first visits.

The bounds are small, so you may scan that range in $O(n)$ time per query.

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 vertices of one query.

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

Output

Print q lines. The i -th line should contain the lowest common ancestor of the i -th query.

Constraints

- $1 \leq n, q \leq 10^2$
- $1 \leq u, v \leq n$

Example 1

Input

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

Output

```
1
1
2
2
4
```

Explanation

The tree, rooted at 1, looks like this:



- $\text{lca}(2, 5) = 1$
- $\text{lca}(5, 2) = 1$
- $\text{lca}(3, 4) = 2$
- $\text{lca}(2, 3) = 2$
- $\text{lca}(4, 4) = 4$

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

```
9
7
9
2
9
7
4
7
7
9
```