Problem G
Ancestor Query
Time limit: 2 seconds

Given a tree graph with N vertices, $N-1$ edges, default rooted at vertex 1, and Q queries, where each query has the following format:

- `! root` : Choose *root* as the **new root** of tree graph.
- `? u v` : Find the lowest common ancestor of two nodes u and v in the tree graph with the new root from last `!` query.

Input

First line containing a integer N – denote the numbers of vertices.

Next $N-1$ lines, each line containing two integers u, v – denote the edges of graph.

Next line containing a integer Q – denote the numbers of queries.

Next Q lines containing a query in the format described above.

Output

For each queries `?` please answer the result of that query.

Constraints

$2 \leq N, M \leq 10^5$.

Sample Input 1	Sample Output 1
9 1 2 1 3 2 4 2 5 3 6 3 7 6 8 6 9 5 ? 4 5 ? 5 6 ? 8 7 ! 6 ? 8 7	2 1 3 6

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