

Query on a tree V

You are given a tree (an acyclic undirected connected graph) with N nodes. The tree nodes are numbered from 1 to N . We define $\text{dist}(a, b)$ as the number of edges on the path from node a to node b .

Each node has a color, white or black. All the nodes are black initially.

We will ask you to perform some instructions of the following form:

- $0\ i$: change the color of i -th node (from black to white, or from white to black).
- $1\ v$: ask for the minimum $\text{dist}(u, v)$, node u must be white (u can be equal to v). Obviously, as long as node v is white, the result will always be 0.

Input

- In the first line there is an integer N ($N \leq 100000$)
- In the next $N-1$ lines, the i -th line describes the i -th edge: a line with two integers $a\ b$ denotes an edge between a and b .
- In the next line, there is an integer Q denotes the number of instructions ($Q \leq 100000$)
- In the next Q lines, each line contains an instruction " $0\ i$ " or " $1\ v$ "

Output

For each " $1\ v$ " operation, print one integer representing its result. If there is no white node in the tree, you should write " -1 ".

Example

Input:

```
10
1 2
1 3
2 4
1 5
1 6
4 7
7 8
5 9
1 10
10
0 6
0 6
0 6
1 3
0 1
0 1
1 3
1 10
1 4
1 6
```

Output:

2
2
2
3
0