Back From Summer '19 P5: ABC123E

Time limit: 1.0s **Memory limit:** 128M

There is a tree containing N nodes that is connected with $N-1$ edges. This tree is rooted at node 1. A path is defined as a sequence of at least two nodes where consecutive nodes are connected in the tree by edges, and every node occurs at most once. As such, there are exactly $\frac{N \times (N-1)}{2}$ paths in the tree. The length of a path is defined as the number of edges in that path.

The *heaviness* of the tree is defined as the average length of all the paths in the tree. Recall that the average in this case is $\frac{\text{sum of the path lengths}}{\text{number of paths}}$.

Evan is planning to modify the tree. He will choose two nodes, i and j, such that i and j are not in each other's subtree (not ancestors of one another), and ask you:

- If the subtree rooted at node i is swapped with the subtree rooted at node j (that is, i and all of its descendants are moved to the location of j, and vice versa), is the *heaviness* of the resultant tree lower, equal, or higher than the original tree's *heaviness*?

He will ask Q of these questions. Note that the questions are not persistent.

Input Specification

The first line will contain two integers, N, Q $(3 \leq N \leq 10^5, 1 \leq Q \leq 10^5)$.

The next $N-1$ lines will each contain two integers, u, v $(1 \leq u, v \leq N)$, the edges of the tree.

The next Q lines will each contain two integers, i, j $(1 \leq i, j \leq N, i \neq j)$, a question as defined above. i and j will not be ancestors of one another.

Output Specification

For each question, output `-1` if the *heaviness* in the resultant tree is less than in the original tree, `0` if it is equal, and `1` if it is greater, on its own line.

Constraints

Subtask 1 [5%]

$Q, N \leq 100$

Subtask 2 [35%]

$Q, N \leq 1000$

Subtask 3 [60%]

No additional constraints.

Sample Input 1

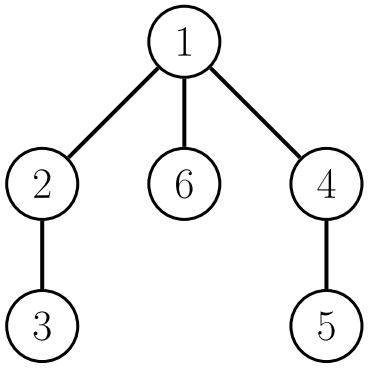
```
6 3
1 2
2 3
1 4
4 5
1 6
2 4
3 5
2 5
```

Sample Output 1

```
0
0
1
```

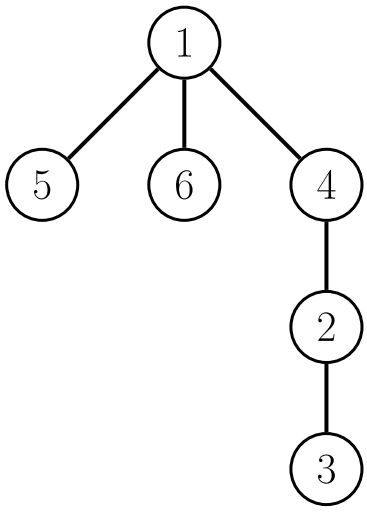
Explanation For Sample 1

The original tree is shown:



The *heaviness* is $\frac{31}{15} \approx 2.067$.

For the third question, the tree looks like:



The new *heaviness* is $\frac{32}{15} \approx 2.133$, which is larger than $\frac{31}{15}$.

Sample Input 2

```
13 10
1 12
12 13
1 2
2 3
2 4
2 5
2 6
3 7
7 8
8 9
9 10
10 11
7 12
8 12
9 12
10 12
11 12
8 4
7 5
3 6
3 12
3 13
```

Sample Output 2

```
0
-1
-1
0
1
-1
-1
0
1
1
```