Problem H
Colored Tree and Path

Time Limit: 4 seconds

You are given a tree with N vertices, numbered 1 through N. Edge i connects vertices a_i and b_i. Each vertex i is assigned a color c_i.

You are asked to process Q queries. In each query, four integers u_1, v_1, u_2, v_2 are given.

For each query, determine the maximum integer K ($0 \leq K \leq N$) such that the following condition holds:

- For every $j = 1, 2, \ldots, K$, the number of vertices of color j on the path from u_1 to v_1 is equal to the number of vertices of color j on the path from u_2 to v_2.

Input

The input is given in the following format:

N
a_1 b_1
a_2 b_2
$\vdots$
a_{N-1} b_{N-1}
c_1 c_2 $\ldots$ c_N
Q
Query_1
Query_2
$\vdots$
Query_Q

Each Query is given in the following format:

u_1 v_1 u_2 v_2

- $1 \leq N \leq 100\,000$
- $1 \leq a_i, b_i \leq N$ $(1 \leq i \leq N-1)$
- $1 \leq c_i \leq N$ $(1 \leq i \leq N)$
- $1 \leq Q \leq 100\,000$
- $1 \leq u_1, v_1, u_2, v_2 \leq N$ $(1 \leq i \leq Q)$
- The given graph is a tree.
- All input values are integers.

Output

Output Q lines. On the i-th line ($1 \leq i \leq Q$), output the answer for the i-th query.

Sample Input	Sample Output
6 2 3 4 3 6 2 3 5 2 1 1 2 2 3 1 1 4 1 6 5 4 6 5 1 5 1 1 6 6 1 5 4 2	0 6 6 0