

Problem J. Paternity Testing

Input file: standard input
Output file: standard output
Time limit: 3 seconds
Memory limit: 512 megabytes

You have a tree consisting of n nodes labeled from 1 to n . The tree is rooted at node 1. A function $cnt(v, l, r)$ is defined as the number of nodes in a subtree of node v , that have indices from l to r inclusive. You are required to answer q queries. The query is represented by a pair (l_i, r_i) . The answer to the query is a sum $\sum_{l \leq i \leq r} cnt(i, l, r)$.

Input

First line contains an integer n — the number of nodes in the tree.

Next $n - 1$ lines indicate ancestors of the nodes in the tree. Each i -th line of those $n - 1$ lines contains the ancestor's index for the $i + 1$ -th node in the tree.

The following line contains a single integer q — the number of queries to be answered.

Each of the next q lines contains two numbers u_i and v_i — encoded queries.

$$1 \leq n \leq 50000$$

$$1 \leq q \leq 50000$$

$$0 \leq u_i, v_i \leq 10^9$$

Let ans_i be the answer to the i -th query ($ans_0 = 0$). Then, the parameters of the i -th query are:

$$x_i = 1 + ((u_i \oplus ans_{i-1}) \bmod n)$$

$$y_i = 1 + ((v_i \oplus ans_{i-1}) \bmod n)$$

$$l_i = \min(x_i, y_i)$$

$$r_i = \max(x_i, y_i)$$

Output

Print q lines. The i -th line should contain the answer to the query (l_i, r_i) .

Example

standard input	standard output
9	42
1	8
2	3
3	3
4	3
5	
5	
7	
8	
5	
0 8	
1 2	
2 3	
4 5	
6 7	