



## Problem A. Another Tree Queries Problem

Input file:	standard	input
Output file:	standard	output
Time limit:	6  seconds	
Memory limit:	1024  mebi	bytes

You have a tree of N vertices. Vertices are enumerated by sequential integers from 1 to N, and the *i*-th vertex contains the variable  $A_i$ . Initially  $A_i = 0$   $(1 \le i \le N)$ .

You have to process Q queries. Each query is one of the following:

- "1 u v": Root the tree at vertex u, consider the subtree of vertex v, and for each vertex i in the subtree of v, increase  $A_i$  by one.
- "2 u v": For each vertex i in the unique simple path from u to v, increase  $A_i$  by one.
- "3 v": Print  $\sum_{i=1}^{N} \operatorname{dist}(v,i) \cdot A_i$ , where  $\operatorname{dist}(x,y)$  is the number of edges in the path from vertex x to vertex y.

## Input

The first line contains an integer N, the number of vertices  $(1 \le N \le 2 \cdot 10^5)$ .

The next N - 1 lines contain the description of the tree. Each such line contains two integers u and v separated by a space, meaning that there is an edge connecting u and v  $(1 \le u, v \le N)$ . It is guaranteed that the resulting graph is a tree.

The next line contains an integer Q, the number of queries  $(1 \le Q \le 2 \cdot 10^5)$ .

The next Q lines contain queries, one per line. Each query is given in one of the formats described above  $(1 \le u, v \le N)$ . You may assume that there is at least one query of type "3".

## Output

For each query of type "3", print the result on a separate line.

## Example

standard input	standard output
5	1
4 2	5
2 5	
1 5	
1 3	
5	
2 2 4	
3 4	
2 1 5	
255	
3 2	