Two tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	512 megabytes

Temirlan, as a true friend, gave Dimash two trees. These trees, however, were not the usual trees you might encounter but two undirected connected graphs without cycles. Each tree has n nodes which are numbered from 1 to n.

Dimash has chosen the node v ($1 \le v \le n$), and rooted both trees on that node. After that, he determined the value $sub_1(x)$ — the number of nodes in the subtree of node x in the first tree, and the value $sub_2(x)$ — the number of nodes in the subtree of node x in the second tree. Then he determined the *difference* of the trees as the number of nodes x ($1 \le x \le n$) such that $sub_1(x) > sub_2(x)$.

Recall that the *subtree* of a node in a rooted tree is a part of tree consisting of this node and all its descendants. In other words, *subtree* of a node x is formed by nodes i, such that node x is present on the path from the root of the tree to the vertex i.

For every node v ($1 \le v \le n$), Dimash wants to find the *difference* of the trees, if both trees were to be rooted on this node v. Help him with this!

Input

The first line of the input contains one integer n ($1 \le n \le 5 \cdot 10^5$) — the number of nodes in the tree.

Then $n - 1$ lines follow, each of them contains two integers u and v ($1 \le u, v \le n$) which describe a pair of nodes connected by an edge in the first tree.

Then $n - 1$ lines follow, each of them contains two integers u and v ($1 \le u, v \le n$) which describe a pair of nodes connected by an edge in the second tree.

Output

Print n space-separated integers, the i-th number is the *difference* of trees, if both trees are rooted on node i.

Scoring

Subtask	Additional restrictions	Points	Required subtasks
0	Examples	0	—
1	$n \le 2000$	12	0
2	$n \le 100000$	22	1
3	Every node has at most two neighbors	23	—
4	Both trees are complete binary trees	17	—
5	—	26	2, 3, 4

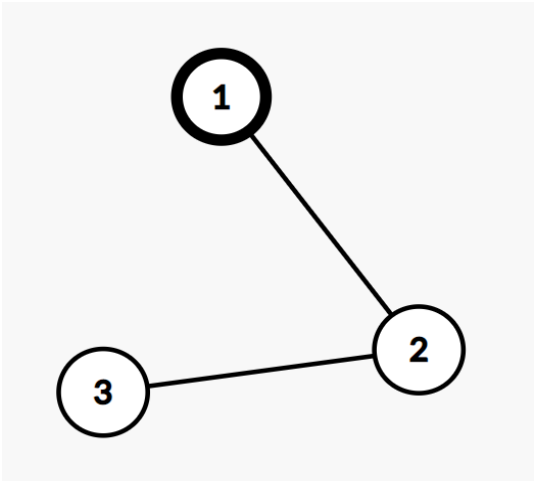
Recall that complete binary trees are trees where each vertex, except for leaves, has exactly two child vertices, and all leaves are at the same depth.

Examples

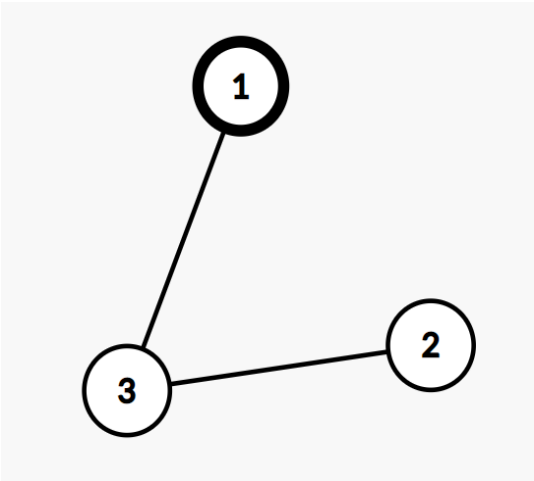
standard input	standard output
3 1 2 2 3 1 3 2 3	1 0 1
5 1 4 2 4 3 2 3 5 3 1 2 3 5 2 4 2	1 1 1 0 2

Note

In the first example, when both trees are rooted on node 1, values of sub_1 are $[3, 2, 1]$ and values of sub_2 are $[3, 1, 2]$. Only for node 2 the condition $sub_1(2) > sub_2(2)$, in other words $2 > 1$, is satisfied. That is the why answer is 1.



First tree



Second tree