Problem J. Reconstruction

Time limit: 3 seconds
Memory limit: 1024 megabytes

Pig100ton has a tree T_1 with n vertices and an array a of length n whose elements are initially equal to 0. He can construct a new tree T_2 from T_1 by performing the following operations for n times:

- Choose an arbitrary vertex x that is not deleted in T_1. Let its father in T_2 be a_x (if $a_x = 0$, then let x be the root of T_2).
- For all vertices y that can be reached from x by edges in T_1, assign x to a_y.
- Delete vertex x and the edges adjacent to x in T_1.

Pig100ton has another tree T of n vertices. For each $1 \le u \le n$, he wants to know whether T is a possible tree that can be constructed by him from T_1 if T is rooted at vertex u. Please help him find the answers.

Input

The first line contains a single integer n ($1 \le n \le 5 \cdot 10^5$), denoting the number of vertices in the tree T_1.

Each of the next $n-1$ lines contains two integers u and v ($1 \le u, v \le n, u \ne v$), representing an undirected edge from u to v in T_1. It is guaranteed that the given edges form a tree.

Each of the next $n-1$ lines contains two integers u and v ($1 \le u, v \le n, u \ne v$), representing an undirected edge from u to v in T. It is guaranteed that the given edges form a tree.

Output

Output a string of length n in a single line. The i-th character is '1' if T is a possible tree that can be constructed by him from T_1 when T is rooted at vertex i, or '0' otherwise.

Examples

standard input	standard output
3 1 2 2 3 2 1 1 3	001
6 1 3 3 4 3 6 4 5 5 2 1 3 1 4 4 5 5 2 3 6	010110