Codeforces Round #395 (Div. 1)

A. Timofey and a tree

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Each New Year Timofey and his friends cut down a tree of n vertices and bring it home. After that they paint all the n its vertices, so that the i-th vertex gets color c_i.

Now it's time for Timofey birthday, and his mother asked him to remove the tree. Timofey removes the tree in the following way: he takes some vertex in hands, while all the other vertices move down so that the tree becomes rooted at the chosen vertex. After that Timofey brings the tree to a trash can.

Timofey doesn't like it when many colors are mixing together. A subtree annoys him if there are vertices of different color in it. Timofey wants to find a vertex which he should take in hands so that there are no subtrees that annoy him. He doesn't consider the whole tree as a subtree since he can't see the color of the root vertex.

A subtree of some vertex is a subgraph containing that vertex and all its descendants.

Your task is to determine if there is a vertex, taking which in hands Timofey wouldn't be annoyed.

Input

The first line contains single integer n ($2 \le n \le 10^5$) — the number of vertices in the tree.

Each of the next $n - 1$ lines contains two integers u and v ($1 \le u, v \le n, u \ne v$), denoting there is an edge between vertices u and v. It is guaranteed that the given graph is a tree.

The next line contains n integers $c_1, c_2, \ldots, c_n$ ($1 \le c_i \le 10^5$), denoting the colors of the vertices.

Output

Print "NO" in a single line, if Timofey can't take the tree in such a way that it doesn't annoy him.

Otherwise print "YES" in the first line. In the second line print the index of the vertex which Timofey should take in hands. If there are multiple answers, print any of them.

Examples

input
4 1 2 2 3 3 4 1 2 1 1
output
YES 2

input
3 1 2 2 3 1 2 3
output
YES 2

input
4 1 2 2 3 3 4 1 2 1 2
output
NO

B. Timofey and rectangles

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

One of Timofey's birthday presents is a colourbook in a shape of an infinite plane. On the plane n rectangles with sides parallel to coordinate axes are situated. All sides of the rectangles have **odd** length. Rectangles cannot intersect, but they can touch each other.

Help Timofey to color his rectangles in 4 different colors in such a way that every two rectangles touching each other by side would have different color, or determine that it is impossible.

Two rectangles intersect if their intersection has positive area. Two rectangles touch by sides if there is a pair of sides such that their intersection has non-zero length

The picture corresponds to the first example

Input

The first line contains single integer n ($1 \le n \le 5 \cdot 10^5$) — the number of rectangles.

n lines follow. The i-th of these lines contains four integers x_1, y_1, x_2 and y_2 ($-10^9 \le x_1 < x_2 \le 10^9$, $-10^9 \le y_1 < y_2 \le 10^9$), that means that points (x_1, y_1) and (x_2, y_2) are the coordinates of two opposite corners of the i-th rectangle.

It is guaranteed, that all sides of the rectangles have **odd** lengths and rectangles don't intersect each other.

Output

Print "NO" in the only line if it is impossible to color the rectangles in 4 different colors in such a way that every two rectangles touching each other by side would have different color.

Otherwise, print "YES" in the first line. Then print n lines, in the i-th of them print single integer c_i ($1 \le c_i \le 4$) — the color of i-th rectangle.

Example

input
8 0 0 5 3 2 -1 5 0 -3 -4 2 -1 -1 -1 2 0 -3 0 0 5 5 2 10 3 7 -3 10 2 4 -2 7 -1

output
YES 1 2 2 3 2 2 4 1

C. Timofey and remoduling

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Little Timofey likes integers a lot. Unfortunately, he is very young and can't work with very big integers, so he does all the operations modulo his favorite prime m. Also, Timofey likes to look for arithmetical progressions everywhere.

One of his birthday presents was a sequence of **distinct** integers $a_1, a_2, ..., a_n$. Timofey wants to know whether he can rearrange the elements of the sequence so that is will be an arithmetical progression modulo m, or not.

Arithmetical progression modulo m of length n with first element x and difference d is sequence of integers $x, x + d, x + 2d, ..., x + (n - 1)\cdot d$, each taken modulo m.

Input

The first line contains two integers m and n ($2 \le m \le 10^9 + 7$, $1 \le n \le 10^5$, m is prime) — Timofey's favorite prime module and the length of the sequence.

The second line contains n **distinct** integers $a_1, a_2, ..., a_n$ ($0 \le a_i < m$) — the elements of the sequence.

Output

Print -1 if it is not possible to rearrange the elements of the sequence so that is will be an arithmetical progression modulo m.

Otherwise, print two integers — the first element of the obtained progression x ($0 \le x < m$) and its difference d ($0 \le d < m$).

If there are multiple answers, print any of them.

Examples

input
17 5 0 2 4 13 15
output
13 2

input
17 5 0 2 4 13 14
output
-1

input
5 3 1 2 3
output
3 4

D. Timofey and a flat tree

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Little Timofey has a big tree — an undirected connected graph with n vertices and no simple cycles. He likes to walk along it. His tree is flat so when he walks along it he sees it entirely. Quite naturally, when he stands on a vertex, he sees the tree as a rooted tree with the root in this vertex.

Timofey assumes that the **more** non-isomorphic subtrees are there in the tree, the more beautiful the tree is. A subtree of a vertex is a subgraph containing this vertex and all its descendants. You should tell Timofey the vertex in which he should stand to see the most beautiful rooted tree.

Subtrees of vertices u and v are isomorphic if the number of children of u equals the number of children of v, and their children can be arranged in such a way that the subtree of the first son of u is isomorphic to the subtree of the first son of v, the subtree of the second son of u is isomorphic to the subtree of the second son of v, and so on. In particular, subtrees consisting of single vertex are isomorphic to each other.

Input

First line contains single integer n ($1 \le n \le 10^5$) — number of vertices in the tree.

Each of the next $n - 1$ lines contains two integers u_i and v_i ($1 \le u_i, v_i \le 10^5$, $u_i \ne v_i$), denoting the vertices the i-th edge connects.

It is guaranteed that the given graph is a tree.

Output

Print single integer — the index of the vertex in which Timofey should stand. If there are many answers, you can print any of them.

Examples

input
3 1 2 2 3
output
1

input
7 1 2 4 2 2 3 5 6 6 7 3 7
output
1

input
10 1 7 1 8 9 4 5 1 9 2 3 5 10 6 10 9 5 10
output
2

Note

In the first example we can stand in the vertex 1 or in the vertex 3 so that every subtree is non-isomorphic. If we stand in the vertex 2, then subtrees of vertices 1 and 3 are isomorphic.

In the second example, if we stand in the vertex 1, then only subtrees of vertices 4 and 5 are isomorphic.

In the third example, if we stand in the vertex 1, then subtrees of vertices 2, 3, 4, 6, 7 and 8 are isomorphic. If we stand in the vertex 2, than only subtrees of vertices 3, 4, 6, 7 and 8 are isomorphic. If we stand in the vertex 5, then subtrees of vertices 2, 3, 4, 6, 7 and 8 are isomorphic, and subtrees of vertices 1 and 9 are isomorphic as well:

7 8 4 2

E. Timofey and our friends animals

time limit per test: 7 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

After his birthday party, Timofey went to his favorite tree alley in a park. He wants to feed there his favorite birds — crows.

It's widely known that each tree is occupied by a single crow family. The trees in the alley form a row and are numbered from 1 to n. Some families are friends to each other. For some reasons, two families can be friends only if they live not too far from each other, more precisely, there is no more than k - 1 trees between any pair of friend families. Formally, the family on the u-th tree and the family on the v-th tree can be friends only if $|u$ - $v| \leq k$ holds.

One of the friendship features is that if some family learns that Timofey is feeding crows somewhere, it notifies about this all friend families. Thus, after Timofey starts to feed crows under some tree, all the families that are friends to the family living on this tree, as well as their friends and so on, fly to the feeding place. Of course, the family living on the tree also comes to the feeding place.

Today Timofey came to the alley and noticed that all the families that live on trees with numbers strictly less than l or strictly greater than r have flown away. Thus, it is not possible to pass the information about feeding through them. Moreover, there is no need to feed them. Help Timofey to learn what is the minimum number of trees under which he has to feed crows so that all the families that have remained will get the information about feeding. You are given several situations, described by integers l and r, you need to calculate the answer for all of them.

Input

The first line contains integers n and k ($1 \leq n \leq 10^5$, $1 \leq k \leq 5$), where n is the number of trees, and k is the maximum possible distance between friend families.

The next line contains single integer m ($0 \leq m \leq n \cdot k$) — the number of pair of friend families.

Each of the next m lines contains two integers u and v ($1 \leq u, v \leq 10^5$), that means that the families on trees u and v are friends. It is guaranteed that $u \neq v$ and $|u$ - $v| \leq k$. All the given pairs are distinct.

The next line contains single integer q ($1 \leq q \leq 10^5$) — the number of situations you need to calculate the answer in.

Each of the next q lines contains two integers l and r ($1 \leq l \leq r \leq 10^5$), that means that in this situation families that have flown away lived on such trees x, so that either $x < l$ or $x > r$.

Output

Print q lines. Line i should contain single integer — the answer in the i-th situation.

Example

input
5 3 3 1 3 2 3 4 5 5 1 1 1 2 2 3 1 3 1 5
output
1 2 1 1 2

Note

In the first example the following family pairs are friends: $(1, 3)$, $(2, 3)$ and $(4, 5)$.

- In the first situation only the first family has remained, so the answer is 1.
- In the second situation the first two families have remained, and they aren't friends, so the answer is 2.
- In the third situation the families 2 and 3 are friends, so it is enough to feed any of them, the answer is 1.
- In the fourth situation we can feed the first family, then the third family will get the information from the first family, and the second family will get the information from the third. The answer is 1.
- In the fifth situation we can feed the first and the fifth families, so the answer is 2.