Codeforces Round #411 (Div. 2)

A. Fake NP

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

Tavak and Seyyed are good friends. Seyyed is very funny and he told Tavak to solve the following problem instead of *longest-path*.

You are given l and r. For all integers from l to r, inclusive, we wrote down all of their integer divisors except 1. Find the integer that we wrote down the maximum number of times.

Solve the problem to show that it's not a *NP* problem.

Input

The first line contains two integers l and r ($2 \le l \le r \le 10^9$).

Output

Print single integer, the integer that appears maximum number of times in the divisors.

If there are multiple answers, print any of them.

Examples

```
input
```
```
19 29
```
```
output
```
```
2
```

```
input
```
```
3 6
```
```
output
```
```
3
```

Note

Definition of a divisor: https://www.mathsisfun.com/definitions/divisor-of-an-integer-.html

The first example: from 19 to 29 these numbers are divisible by 2: $\{20, 22, 24, 26, 28\}$.

The second example: from 3 to 6 these numbers are divisible by 3: $\{3, 6\}$.

B. 3-palindrome

In the beginning of the new year Keivan decided to reverse his name. He doesn't like palindromes, so he changed Naviek to Navick.

He is too selfish, so for a given n he wants to obtain a string of n characters, each of which is either 'a', 'b' or 'c', with no *palindromes* of length 3 appearing in the string as a substring. For example, the strings "abc" and "abca" suit him, while the string "aba" doesn't. He also want the number of letters 'c' in his string to be as little as possible.

Input
The first line contains single integer n ($1 \le n \le 2 \cdot 10^5$) — the length of the string.

Output
Print the string that satisfies all the constraints.

If there are multiple answers, print any of them.

Examples

input
2
output
aa

input
3
output
bba

Note
A *palindrome* is a sequence of characters which reads the same backward and forward.

C. Find Amir

A few years ago Sajjad left his school and register to another one due to security reasons. Now he wishes to find Amir, one of his schoolmates and good friends.

There are n schools numerated from 1 to n. One can travel between each pair of them, to do so, he needs to buy a ticket. The ticker between schools i and j costs and can be used multiple times. Help Sajjad to find the minimum cost he needs to pay for tickets to visit all schools. He can start and finish in any school.

Input

The first line contains a single integer n ($1 \leq n \leq 10^5$) — the number of schools.

Output

Print single integer: the minimum cost of tickets needed to visit all schools.

Examples

input
2

output
0

input
10

output
4

Note

In the first example we can buy a ticket between the schools that costs .

D. Minimum number of steps

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

We have a string of letters 'a' and 'b'. We want to perform some operations on it. On each step we choose one of substrings "ab" in the string and replace it with the string "bba". If we have no "ab" as a substring, our job is done. Print the minimum number of steps we should perform to make our job done modulo $10^9 + 7$.

The string "ab" appears as a substring if there is a letter 'b' right after the letter 'a' somewhere in the string.

Input

The first line contains the initial string consisting of letters 'a' and 'b' only with length from 1 to 10^6.

Output

Print the minimum number of steps modulo $10^9 + 7$.

Examples

input
ab
output
1

input
aab
output
3

Note

The first example: "ab" $\longrightarrow$ "bba".

The second example: "aab" $\longrightarrow$ "abba" $\longrightarrow$ "bbaba" $\longrightarrow$ "bbbbaa".

E. Ice cream coloring

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

Isart and Modsart were trying to solve an interesting problem when suddenly Kasra arrived. Breathless, he asked: "Can you solve a problem I'm stuck at all day?"

We have a tree T with n vertices and m types of ice cream numerated from 1 to m. Each vertex i has a set of s_i types of ice cream. Vertices which have the i-th ($1 \le i \le m$) type of ice cream form a connected subgraph. We build a new graph G with m vertices. We put an edge between the v-th and the u-th ($1 \le u, v \le m, u \ne v$) vertices in G if and only if there exists a vertex in T that has both the v-th and the u-th types of ice cream in its set. The problem is to paint the vertices of G with minimum possible number of colors in a way that no adjacent vertices have the same color.

Please note that we consider that empty set of vertices form a connected subgraph in this problem.

As usual, Modsart don't like to abandon the previous problem, so Isart wants you to solve the new problem.

Input

The first line contains two integer n and m ($1 \le n, m \le 3 \cdot 10^5$) — the number of vertices in T and the number of ice cream types.

n lines follow, the i-th of these lines contain single integer s_i ($0 \le s_i \le 3 \cdot 10^5$) and then s_i distinct integers, each between 1 and m — the types of ice cream in the i-th vertex. The sum of s_i doesn't exceed $5 \cdot 10^5$.

n - 1 lines follow. Each of these lines describes an edge of the tree with two integers u and v ($1 \le u, v \le n$) — the indexes of connected by this edge vertices.

Output

Print single integer c in the first line — the minimum number of colors to paint the vertices in graph G.

In the second line print m integers, the i-th of which should be the color of the i-th vertex. The colors should be between 1 and c. If there are some answers, print any of them.

Examples

input
```
3 3
1 1
2 2 3
1 2
1 2
2 3
```

output
```
2
1 1 2
```

input
```
4 5
0
1 1
1 3
3 2 4 5
2 1
3 2
4 3
```

output
```
3
1 1 1 2 3
```

Note

In the first example the first type of ice cream is present in the first vertex only, so we can color it in any color. The second and the third ice cream are both presented in the second vertex, so we should paint them in different colors.

In the second example the colors of the second, the fourth and the fifth ice cream should obviously be distinct.

F. Expected diameter of a tree

Pasha is a good student and one of MoJaK's best friends. He always have a problem to think about. Today they had a talk about the following problem.

We have a forest (acyclic undirected graph) with n vertices and m edges. There are q queries we should answer. In each query two vertices v and u are given. Let V be the set of vertices in the connected component of the graph that contains v, and U be the set of vertices in the connected component of the graph that contains u. Let's add an edge between some vertex and some vertex in and compute the value d of the resulting component. If the resulting component is a tree, the value d is the *diameter* of the component, and it is equal to -1 otherwise. What is the expected value of d, if we choose vertices a and b from the sets uniformly at random?

Can you help Pasha to solve this problem?

The *diameter* of the component is the maximum *distance* among some pair of vertices in the component. The *distance* between two vertices is the minimum number of edges on some path between the two vertices.

Note that queries don't add edges to the initial forest.

Input

The first line contains three integers n, m and $q(1 \leq n, m, q \leq 10^5)$ — the number of vertices, the number of edges in the graph and the number of queries.

Each of the next m lines contains two integers u_i and v_i $(1 \leq u_i, v_i \leq n)$, that means there is an edge between vertices u_i and v_i.

It is guaranteed that the given graph is a forest.

Each of the next q lines contains two integers u_i and v_i $(1 \leq u_i, v_i \leq n)$ — the vertices given in the i-th query.

Output

For each query print the expected value of d as described in the problem statement.

Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}. Let's assume that your answer is a, and the jury's answer is b. The checker program will consider your answer correct, if .

Examples

input
```
3 1 2
1 3
3 1
2 3
```

output
```
-1
2.0000000000
```

input
```
5 2 3
2 4
4 3
4 2
4 1
2 5
```

output
```
-1
2.6666666667
2.6666666667
```

Note

In the first example the vertices 1 and 3 are in the same component, so the answer for the first query is -1. For the second query there are two options to add the edge: one option is to add the edge 1 - 2, the other one is 2 - 3. In both ways the resulting diameter is 2, so the answer is 2.

In the second example the answer for the first query is obviously -1. The answer for the second query is the average of three cases: for added edges 1 - 2 or 1 - 3 the diameter is 3, and for added edge 1 - 4 the diameter is 2. Thus, the answer is .