Задача A. Police Station

Имя входного файла:	`стандартный ввод`
Имя выходного файла:	`стандартный вывод`
Ограничение по времени:	4 секунды
Ограничение по памяти:	512 мегабайт

A network of hyperspace highways is built in the galaxy. Each of the highways is a one-directional corridor which connects two planets. Galactic government wants to find a planet on which a police station will be built.

In order for the police to protect the whole galaxy, it must be possible to travel from the police station to every planet in the galaxy using the hyperspace highways network.

It is not necessary that the police can return back to the police station from any planet using the hyperspace highways. The police needs not to hurry on the way back, and so they can use slower ways than highways.

The government does not know how to deal with finding the suitable planet for the police station; therefore, they ask for your help.

You are given the network of one-directional hyperspace highways. Find all planets from which it is possible to reach all other planets in the galaxy using some sequence of highways.

Формат входных данных

The first line of the input contains two integers N a M: the number of planets and the number of highways.

Then, M more lines follow. Each contains two integers A_i and B_i: the numbers of planets connected by i-th highway. Each of the highways is one-directional and can only be used to travel from the planet A_i to the planet B_i.

It holds $1 \leqslant N, M \leqslant 10^6$.
For all i it holds $1 \leqslant A_i, B_i \leqslant N$ and $A_i \neq B_i$.
No two highways connect equal planets in the same direction. However, they can connect equal planets in the opposite direction.
Furthermore, in 28 % of the testcases $N \leqslant 10^3$ and $M \leqslant 3 \cdot 10^3$.

Формат выходных данных

Output two lines. The first line should contain the total number of planets which are suitable for the police station. The second line should contain a space-separated list of these planets **in ascending order**.

Примеры

стандартный ввод	стандартный вывод
5 6 1 3 1 4 4 2 2 1 2 5 5 4	4 1 2 4 5
3 2 1 3 2 3	0

Задача B. Pyramid

Имя входного файла:	стандартный ввод
Имя выходного файла:	стандартный вывод
Ограничение по времени:	6 секунд
Ограничение по памяти:	512 мегабайт

Archaeologists have just deciphered hieroglyphs on walls of a pyramid. The writings on one of the walls describe N sacred numbers. All numbers which are divisible by at least one of these numbers are also sacred.

The writings on M other walls claim that the Q_i-th lowest sacred number has magic properties. The archaeologists would like to know which numbers have the magic properties. Could you help them with that?

You are given N positive integers $A_1, A_2, \ldots, A_N$ and M positive integers $Q_1, Q_2, \ldots, Q_M$. For each $i \in \{1, 2, \ldots, M\}$ find the Q_i-th lowest positive integer which is divisible by at least one of the integers $A_1, A_2, \ldots, A_N$.

Формат входных данных

The first line of the input contains two integers N a M. The second line contains space-separated integers A_1, A_2, ..., A_N. Then, M lines follow. Each of them contains an integer Q_i.

It holds $1 \leqslant N \leqslant 15$ and $1 \leqslant M \leqslant 50$.
For all $i \in \{1, 2, \ldots, N\}$ it holds $2 \leqslant A_i \leqslant 10^{18}$.
For the product of these numbers it holds $A_1 \cdot A_2 \cdot \ldots \cdot A_N \leqslant 10^{18}$.
For all $i \in \{1, 2, \ldots, M\}$ it holds $1 \leqslant Q_i \leqslant 10^{18}$.
Each number on the output is lower than or equal to 10^{18}.
Furthermore, in 10 % of the testcases $Q_1, Q_2, \ldots, Q_M \leqslant 10^6$.
Furthermore, in 30 % of the testcases $N \leqslant 2$.

Формат выходных данных

Output M lines. The i-th line should contain the Q_i-th lowest positive integer which is divisible by at least one of the integers $A_1, A_2, \ldots, A_N$.

Примеры

стандартный ввод	стандартный вывод
5 5 2 5 7 10 11 1 2 3 10 20	2 4 5 14 28
2 1 70 100 5	210

Задача C. Robot Race

Имя входного файла:	стандартный ввод
Имя выходного файла:	стандартный вывод
Ограничение по времени:	7 секунд
Ограничение по памяти:	512 мегабайт

A robot race on a maze will be held in Byteland. The maze has a shape of a rectangle and is divided into $n \times m$ fields arranged in n rows and m columns. Each of the fields is either empty or contains an obstacle.

The contestants register their robots for the competition and come to the maze one after another. Each of the contestants gets random coordinates of the initial field and the target field. The robot is then placed in the initial field and must get to the target field using a sequence of steps.

To make the game more challenging, the rules specify that in each step the robot can only move one field right or one field down in the maze. Moving the robot in any other direction is not allowed.

The contestant whose robot gets fastest from the initial field to the target field wins the competition. If the robot does not get to the target field in the time limit, the contestant in disqualified.

The organizers of the competition realized that if the contestant gets bad coordinates, the robot will not be able to get to the target field using any sequence of moves. In that case they would like to give the contestant another pair of coordinates.

You are given a map of a maze of size $n \times m$ and q pairs of coordinates of the initial and target fields. Determine for each pair of coordinates whether it is possible to get from the initial field to the target field using a sequence of steps right or down.

Формат входных данных

The first line contains three integers n, m and q: the number of rows and columns of the maze and the number of pairs of coordinates.

Each of the following n lines contains m characters describing the fields of the maze. The character `.` represents an empty field and the character `#` a field with an obstacle.

Then q lines follow describing the pairs of coordinates. The i-th of them contains four integers r_{1i}, c_{1i}, r_{2i}, c_{2i}: the row and the column of the initial field and the row and the column of the target field.

It holds $1 \leqslant n, m \leqslant 1000$ and $1 \leqslant q \leqslant 10^6$.
For all $i \in \{1, 2, \ldots, q\}$ it holds $1 \leqslant r_{1i}, r_{2i} \leqslant n$ and $1 \leqslant c_{1i}, c_{2i} \leqslant m$.
For all $i \in \{1, 2, \ldots, q\}$ the fields in the maze with coordinates (r_{1i}, c_{1i}) and (r_{2i}, c_{2i}) are empty.
Furthermore, in 24 % of the testcases $q \leqslant 300$.

Формат выходных данных

Output q lines. The i-th line should contain the word `YES` if the robot can get from the i-th initial field to the i-th target field, or the word `NO` otherwise.

Примеры

стандартный ввод	стандартный вывод
3 4 5 .#.. .##. 1 1 3 4 1 3 3 4 1 1 1 1 1 1 2 4 2 1 2 4	YES YES YES NO NO

Задача D. Corporate life (after hostile takover)

Имя входного файла:	`стандартный ввод`
Имя выходного файла:	`стандартный вывод`
Ограничение по времени:	2 секунды
Ограничение по памяти:	512 мегабайт

JanuszPol is a Polish company which has a long tradition to its name. Recently, though, it fell into dire financial situation, and was eventually taken over by a foreign competitor. The new board decided to completely rebuild the company organization. Until now, it was a typical tree structure:

- There was exactly one executive director, who had no superiors,
- Every other employee had exactly one superior, and there were no cyclic relations.

For every employee x, their *subordinate* is every employee y, who is under x in the tree (there is a sequence of direct superiors from y to x).

After the takeover, the company will employ the same people, and it will also be organized as a tree, but every employee will receive a diffrent position, so the shape of the tree may change completely. The executive director is, however, guaranteed to keep the position. Now everyone is afraid to give orders to anyone else – any moment now, a subordinate may become the superior...

Given the description of the tree before and after the takover, for every employee x determine the number of the people who were subordinates of x and will remain the subordinates after the takeover.

Формат входных данных

The first line of the input contains an integer n ($2 \leqslant n \leqslant 200\,000$): the number of employees. The employees are numbered from 1 to n, with the person number 1 being the executive director. The second line contains the company structure before the takeover: there are $n-1$ numbers $a_2, a_3, \ldots, a_n$ with a_i being the number of i's superior. The third line also contains $n-1$ numbers $b_2, b_3, \ldots, b_n$, where b_i is the superior of i after the takeover. You may assume that both descriptions define a proper tree rooted at 1.

Формат выходных данных

Output a single line containing n numbers – i-th of them should be the number of people who are i's subordinates in both trees at once.

Примеры

стандартный ввод	стандартный вывод
5 1 1 3 3 1 2 3 1	4 0 1 0 0

Замечание

Subtask	Points	Maximal n
1	30	2 000
2	70	200 000