Problem A. Pizza

Input file:	*standard input*
Output file:	*standard output*
Time limit:	10 seconds
Memory limit:	512 mebibytes

Little Vitechka got a job at pizza delivery. When he started his work, he found a problem: the company in which he works produces pizzas and boxes for them of very unusual form. Their forms can be arbitrary convex polygons. To start the delivery, Vitechka has to fit all of the pizzas into their boxes. While doing so, he can't flip the pizzas (but he can rotate them).

Help Vitechka to solve this problem. For every pizza, determine if it is possible to fit it in its box, and if yes, find out how to do that.

Input

The first line contains an integer t ($1 \le t$), the number of pizzas. It is followed by t blocks. Each block describes a pizza and its box.

The first line of a block contains an integer n ($3 \le n \le 30$), the number of vertices in the polygon describing the shape of the pizza. Each of the next n lines contains two real numbers not exceeding 10^6 by the absolute value, which are coordinates of a single vertex of the polygon. The vertices are given in the counter-clockwise order. The next line contains an integer m ($3 \le m \le 30$), the number of vertices in the polygon describing the shape of the box. Then follows the description of the box shape in the same format.

All real numbers in the input contain no more than twenty decimal digits after the point.

The total number of vertices of all polygons does not exceed 10^3.

It is guaranteed that, if we move each point of a block by distance at most 10^{-3} in any direction, the test will still be correct, and the possibility to fit the pizza into its box will not change.

Output

For each block, if it is impossible to fit the pizza into the box, print "`NO`" on a single line. Otherwise, on the first line, print "`YES`", and on the second line, print three real numbers describing the motion of the pizza. The first number must be angle by which the pizza must be rotated around the origin. The second and the third numbers are the coordinates of the vector, by which the pizza should be moved afterwards. After applying the described motion, the pizza should fit into the box. The pizza is considered inside the box if each of its vertices is located at distance no more than 10^{-3} from the box.

Example

standard input	standard output
2 3 0 0 2 0 0 2 3 3 0 3 3 0 3 3 3 0 3 3 0 3 3 0 0 2 0 0 2	NO YES 3.1415926 3 3

Problem B. Divide and Conquer

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

There are n people in Vitechka's class. In this class, any two classmates are either friends or enemies. Vitechka is a very crafty person, so he befriended all of his friends with each other and embroiled all of his enemies with each other. To think about his next steps, he drew a scheme of relationships in the class. The scheme is a graph with n vertices, where for every student, there is exactly one vertex. Two vertices are connected by an edge only if the corresponding students are friends. But after Vitechka draw the scheme, he forgot which vertex described himself. Help Vitechka to find this vertex.

Input

The first line contains two integers n and m ($1 \le n \le 10^6$, $0 \le m \le 10^6$) which are the number of vertices and number of edges in the graph. Each of the next m lines contains two integers a_i and b_i ($1 \le a_i, b_i \le n$, $a_i \ne b_i$) which mean that vertices a_i and b_i are connected by an edge. Each pair of vertices is connected by at most one edge.

Output

Print the number of vertex which may be associated with Vitechka. If there are several possible answers, print any of them. It is guaranteed that at least one answer exists.

Examples

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

Problem C. Spatial Thinking

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	512 mebibytes

Little Vitechka boasted to little Mitechka that he is quite familiar with n-dimensional space. Mitechka didn't believe him and bet that Vitechka wouldn't be able to partition an n-dimensional cube into n-dimensional simplices. Here, a simplex is a body in n-dimensional space with $(n + 1)$ vertices each of which coincides with one of the cube's vertices. Additionally, the n-dimensional volume of a simplex must not be zero.

To make sure that Vitechka's partitioning is correct, they agreed to act as follows: Mitechka arranges a list of m points inside a cube; then Vitechka constructs a set of simplices, and for each point from Mitechka's list, he specifies a certain simplex from his set. After that, Mitechka does two validations. First: the sum of n-dimensional volumes of simplices given by Vitechka must be equal to the volume of the cube. Second: each point from Mitechka's list must lie either inside or on the border of the simplex specified for this point by Vitechka. If both these tests are successful, Mitechka has to declare Vitechka a winner.

So they agreed. But having started to do the task, Vitechka realized that he had overrated his power. Now he needs your help.

The cube is set by the inequality system $0 \le x_i \le 1$.

Input

The first line contains two integers n and m ($2 \le n \le 8$, $0 \le m \le 10^5$). Each of the following m lines contains n numbers which are the coordinates of points. All coordinates are real values from 0 to 1 with no more than five decimal digits after the point.

Output

On the first line, print t, the number of simplices. On each of the following t lines, print $n \cdot (n+1)$ numbers. The $(n \cdot (j-1) + i)$-th number in the $(k+1)$-st row must be the i-th coordinate of the j-th vertex of the k-th simplex. Each coordinate must be equal to either 0 or 1.

After that, print m lines. In the $(i + t + 1)$-th line display the number of simplex, which contains the i-th point.

The answer is considered to be correct if the sum of simplex volumes is equal to 1, and each of the m given points lies inside or on the border of the corresponding specified simplex.

Example

standard input	standard output
2 3 0 1 0.5 0.5 1 0	2 0 0 0 1 1 1 0 0 1 0 1 1 1 1 2

Problem D. Palindromes

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2.5 seconds (*4 seconds for Java*)
Memory limit:	512 mebibytes

Little Vitechka loves palindromes. On his birthday, little Mitechka presented him a table with m lines and n columns filled with lowercase Latin letters. But Mitechka didn't know that Vitechka likes a table only if at least one line in it is a palindrome. Now Mitechka wants to cut his table along columns into several tables in such way that Vitechka likes all the resulting tables. Mithecka wants to minimize the number of the resulting tables. Help him to find this number.

Input

The first line contains two integers m and n ($1 \le m \le 10$, $1 \le n \le 10^5$).

Next m lines contain the description of the table. Each of them contains a string of n lowercase Latin letters.

Output

Print one number: the answer to the problem.

Example

standard input	standard output
2 11 xyaaabaaaxy aaaaxyzaaba	3

Problem E. Travelling by River

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	512 mebibytes

Little Vitechka loves to sail on the river, but if the ship will sail more than k hours, then he gets sea sickness, so he does not use such ships. There are n ports on the river which are numbered according to the river's flow. It takes exactly one hour for a ship to sail between any two neighboring ports. Vitechka knows all the routes along the river. Every route connects two different ports. He left only the routes which last no longer than k hours, and got a list of only m routes.

Now Vitechka wants to travel. He drew up a plan of his journey which is an ordered list of several (not necessarily different) ports in the order in which he would like to visit them. But it turned out that the journey isn't very economical, so Vitechka decided to delete some of the ports from his list. He wants to do it as follows: the first port stays on the list, and for each next port, it stays on the list if and only if it does not coincide with the previous non-deleted port, and it can be reached from the previous non-deleted port (possibly with transfers) sailing always in one direction (either always within the flow, or always against the flow of the river).

Help Vitechka to get his resulting journey.

Input

The first line contains three integers n, m and k ($2 \le n \le 2 \cdot 10^5$, $0 \le m \le 2 \cdot 10^5$, $1 \le k \le 200$).

The next m lines describe the routes. Each of these lines contains two integers u_i and v_i ($1 \le u_i < v_i \le n$, $v_i - u_i \le k$) which are the numbers of the ports connected by the route.

The next line contains one integer q ($1 \le q \le 2 \cdot 10^5$), the number of ports in the plan.

The following line contains q integers $x_1, \ldots, x_q$ ($1 \le x_i \le n$, $x_i \ne x_{i+1}$) which are the numbers of ports in the plan.

Output

Print the resulting plan of the journey in the same format as the initial one: on the first line, the total number of ports in the journey, and on the second one, the port numbers themselves in the order of visiting them.

Example

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

Problem F. Cake

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Little Vitechka and little Mitechka have bought a cake which appears to be a connected checkered figure on a checkered pan. But no matter how hard they tried to cut it into two pieces, one part was always more beautiful than the other. So they decided to cut the cake into two equal pieces. The parts must be connected and the cuts must go along the cells.

Help Vitechka and Mitechka to cut the cake.

Two figures are equal if there is an isometry of a plane (a composition of axial symmetries, parallel shifts and rotations) mapping one into another.

A checkered figure is connected if one can reach each any cell from any other cell by moving only between the cells of the figure which are adjacent by side.

Input

The first line contains two integers n and m: height and width of the pan correspondingly ($1 \le n, m \le 1000$).

Each of the following n lines contains m characters "`.`" or "`X`" specifying the pan. The figure covers those and only those cells of the pan which have the symbol "`X`".

It is guaranteed that the cake occupies at least 1 and no more than 1000 cells of the pan.

Output

If it is possible to cut the cake, print "`YES`" on the first line. On the following n lines, print m characters "`.`", "`A`" or "`B`" so that the figures which consist of cells with characters "`A`" and "`B`" correspondingly specify the partition.

If it is impossible to cut the cake into two equal parts, print "`NO`" on a single line.

Examples

standard input	standard output
3 4 .X.. XXX. ..XX	YES .B.. BBA. ..AA
3 4 XXXX .XXX ..X.	NO

Problem G. Video Arcade Machines

Input file:	*standard input*
Output file:	*standard output*
Time limit:	3 seconds
Memory limit:	512 mebibytes

Little Vitechka and his $n-1$ friends came to the video arcade hall. There were m video arcade machines. Each of n persons immediately decided how many minutes he wanted to play each of m machines. Now they want to do it as quickly as possible, so that they have enough time to watch a film in the cinema.

Help them to develop an optimal strategy.

Each person can simultaneously play at most one machine, and each machine can be simultaneously played by at most one person. Each person can pause playing each arcade machine, and start playing again later, as many times as they want: only the total time playing each machine is important.

Input

The first line contains two integers n and m ($1 \le n, m \le 120$).

Each of the next n lines carries m nonnegative integers not exceeding 10^9. The j-th number in the $(i+1)$-st line equals to the number of minutes which the i-th person wants to play the j-th machine.

Output

Output the strategy as several periods. A period defines the distribution of players among machines and the time allotted for it. The number of such periods must be no greater than $2 \cdot 10^4$.

On the first line, print two integers t и k: the minimum possible time the playing will take and the number of periods.

Each of the next k lines must describe a single period. The description of each period must start with a nonnegative integer: the number of minutes allotted for the period. After that, print n integers defining the distribution. The i-th of these numbers must be equal to the number of the machine which the i-th person will play for the whole time of the period, or zero if that person won't be playing for the whole period.

After your strategy is executed, each person must play each machine exactly as much minutes as he wants.

Example

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

Problem H. Beautiful Pairs

Input file:	*standard input*
Output file:	*standard output*
Time limit:	6 seconds
Memory limit:	512 mebibytes

Little Vitechka loves number theory very much. He considers a pair of positive integer numbers (a, b) beatiful if $a^2 - 1$ is divisible by b and $b^2 - 1$ is divisible by a. Help Vitechka to count the number of beautiful pairs in which every integer belongs to segment from l to r.

Input

The first line contains n, the number of test cases ($1 \le n \le 10^5$). Each of the next n lines contains a description of one test case which consists of two integer numbers l and r ($1 \le l \le r \le 10^{18}$).

Output

For each test, print the answer on a separate line.

Example

standard input	standard output
2 1 6 10 20	19 20

Problem I. Binary Matrices

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Little Vitechka recently learned to program. Now he is writing a library for working with matrices 8×8 over the field Z_2. He writes such a matrix as one unsigned 64-bit integer. In the $(8 \cdot (i-1)+j)$-th bit starting from the lower ones, he stores the number written in the matrix at the intersection of i-th row and j-th column. For example, he writes the matrix

$$\begin{pmatrix} 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

as number 270.

Vitechka wrote functions **sum**(a, b) and **multiply**(a, b) which return sum (element-wise) and product of two matrices. To test the functions, Vitechka uses the following function:

```
calc (n, x, p, q) {
  ans = 0;
  do n times {
    x = x * p + q;
    lhs = x;
    x = x * p + q;
    rhs = x;
    ans = sum(ans, multiply(lhs, rhs));
  }
  return ans;
}
```

In this pseudocode, "+" and "*" are the usual operations with unsigned 64-bit integers.

Now Vitechka want to know the result of this function on specific data.

Input

The first line contains four integers n, x, p and q ($1 \le n \le 10^7$, $0 \le x, p, q \le 10^{18}$). It is guaranteed that in all tests except the examples, the numbers x, p and q are generated uniformly at random.

Output

On a single line, print one integer: the answer for the problem.

Examples

standard input	standard output
1 0 1 1804	5632
2 11111111111111111 22222222222222222 333333333333333333	12247126853369549893

Note

In the first example, we calculate the product $\begin{pmatrix} 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \times \begin{pmatrix} 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$.

Problem J. Quake

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

Little Vitechka tries to pass a Boss in Quake. Every minute one of them kills the other: the Boss dies with probability p percent, and Vitechka dies with probability $100 - p$ percent. If Vitechka kills the Boss n times in total, he wins; and if the Boss kills Vitechka m times in total, Vitechka loses and starts a new game (in this case, his win counter is reset to zero). Additionally, Vitechka can restart the game any moment he likes. Find the expected time required for Vitechka to win, supposing he acts in the optimal way.

Input

The first line contains three integers n, m and p ($1 \le n, m \le 10^3$, $0 < p < 100$).

Output

Print the answer to the problem in minutes on a single line. If the answer is greater than 10^9, print the number 10^9 instead. The absolute or relative error of your answer must not exceed 10^{-6}.

Example

standard input	standard output
2 2 50	4.666666666666666