Problem A. Rails

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

There are n railways in SUA. Each railway consists of two rails, for simplicity, which are represented as two straight lines parallel to each other.

An important parameter of the railway is the track width - the distance between the two rails on which the train is traveling. It is this parameter that determines the types of trains that can travel by rail.

It is known to all the all the railways in SUA has the same track width. However, the track width of the railways is unknown. Your task is to find the minimum track width d such that the rails can be divided into pairs so that in each pair they are parallel to each other and the distance between them is d.

Input

The first line contains an integer n ($1 \le n \le 2000$) – the number of railways in SUA.

Each of the next $2n$ lines contains four integers $x_{i,1}, y_{i,1}, x_{i,2}, y_{i,2}$ ($-1000 \le x_{i,1}, y_{i,1}, x_{i,2}, y_{i,2} \le 1000$) – coordinates of two end points of the i-th rail. Straight lines corresponding to different rails do not coincide.

Output

Output a real number – the minimum possible track width. You answer will be accepted if the relative error or absolute error of your answer is no more than 10^{-6}.

If you can not divided the rails into pairs, output the number -1 instead.

Example

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

Problem B. Square

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

On an infinite chessboard, there is an unusual chess piece - a black and red square. This figure is a square that occupies exactly one square of the board, the surface of which is painted black on one side, and red on the other. Unlike conventional chess pieces, a black and red square leaves traces on the field. Each cell it visited will be painted black or red, depending on which side of the square was on this cell.

In one move the square can roll into the next cell. In this case, it turns over (that is if it was lying with the black side up, then it turns out to be a black side down, and vice versa).

Initially, all board cells are painted white. Find a sequence of moves of the square, after which there will be r red and b black cells on the board. It is guaranteed that at least one such path exists. At the beginning, the square lies with the black side down, as a consequence, the initial cell of the square's path is painted as black.

Input

The first line contains two integers r and b ($0 \le r \le 1000, 1 \le b \le 1000$).

Output

In the first line output the number n - the number of moves made by the square, n should not exceed 10^5.

In the second line output the path of the square itself: a string of length n from the letters 'N', 'S', 'W' or 'E'. These letters denote the moves up, down, left and right, respectively.

If there are several answers, output any of them. It is guaranteed that at least one answer exists.

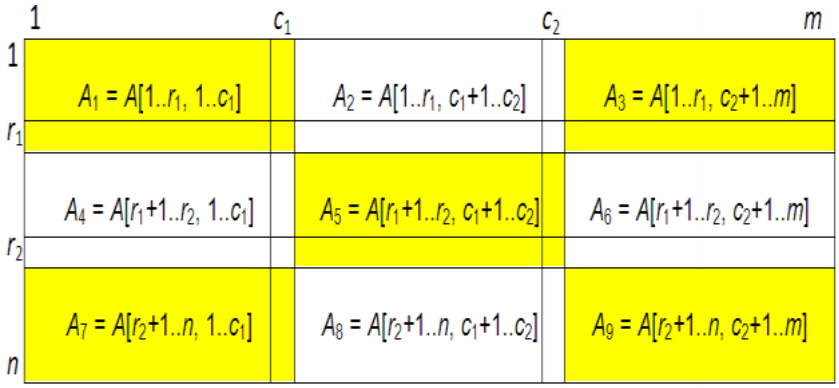
Example

standard input	standard output
0 1	0

Problem C. Table

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Consider a numerical table $A[1..n, 1..m]$ filled with zeros and ones. Any four integers (r_1, r_2, c_1, c_2), such that $1 \le r_1 < r_2 < n$ and $1 \le c_1 < c_2 < m$, specifies the partitioning of the table into nine parts, shown in the figure.



Let $S = sum(A_1) + sum(A_3) + sum(A_5) + sum(A_7) + sum(A_9)$, where $sum(A_i)$ is the sum of the numbers in the part A_i. Your task is to determine for a given table A the number of such partitions that S is even.

Input

The first line contains two integers n and m ($3 \le n, m \le 3000$). Each of the following n lines contains m symbols in each – a description of Table A.

Output

Output the number of (r_1, r_2, c_1, c_2), such that:

- $1 \le r_1 < r_2 < n$ and $1 \le c_1 < c_2 < m$;
- The sum of the numbers in parts of table A with odd numbers is even.

Example

standard input	standard output
3 3 110 101 010	0

Problem D. Black John

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

You are given n cards and on each wrote a fraction p_i/q_i whose absolute value does not exceeding 1. You task is to find some of the cards such that the sum of the fractions of cards equals to 1.

Input

The first line contains an integer n ($1 \le n \le 100$) - the number of cards in the deck.

Each of the following n lines contaisn two integers p_i and q_i ($1 \le q_i \le 21, |p_i| \le q_i$) – the fraction in the i-th card.

Output

In case you can not find a solution, output "NO" (without the quotes) in a single line.

Otherwise, output "YES" (without the quotes) on the first line. In the second line, output the integer m - the number of cards you pick. In the third line output m numbers $k_1, k_2, \ldots, k_m$ – the indices of the cards.

Example

standard input	standard output
4 1 2 -1 6 1 5 2 3	YES 3 1 2 4

Problem E. Paths

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

A *graph* is a mathematical structure which consists of a set of *vertices*, and a set of *edges*, each connecting two vertices. An example of a graph with 4 vertices and 3 edges is shown in the sample explanation below.

A *path* in the graph is defined as an ordered list of 2 or more vertices, such that there are edges between consecutive vertices in the list. In this task we are only interested in *simple paths* in which no vertex occurs more than once. Note that the list is ordered; for example, "`5-6-7`", "`5-7-6`" and "`7-6-5`" are all treated as different paths.

In this task, each vertex in the graph has one of K colors. The task is to find the number of possible (simple) paths in which no two vertices have the same color.

Input

The first line contains three integers: N, M and K ($1 \leq N, M \leq 3 \cdot 10^5, 1 \leq K \leq 5$) – the number of vertices, the number of edges and the number of different colors.

The second line contains N integers between 1 and K – the colors of each vertex (starting with vertex 1 and ending with vertex N).

Each of the following M lines describes an edge and contains two integers a, b ($1 \leq a, b \leq N, a \neq b$) – the two vertices connected by the edge. There will be at most one edge between any two vertices.

Output

Output one integer – the number of paths whose vertices all have distinct colors. This number will always be smaller than 10^{18}.

Examples

standard input	standard output
4 3 3 1 2 1 3 1 2 2 3 4 2	10
9 11 4 1 2 3 4 1 2 1 2 2 1 2 1 3 2 3 2 4 3 6 6 2 6 5 4 3 4 5 7 8 9 8	70

Problem F. Genetics

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.5 seconds
Memory limit:	256 megabytes

For villains that intend to take over the world, a common way to avoid getting caught is to clone themselves. You have managed to catch an evil villain and her $N - 1$ clones, and you are now trying to figure out which one of them is the real villain.

To your aid you have each person's DNA sequence, consisting of M characters, each being either `A`, `C`, `G` or `T`. You also know that the clones are not perfectly made; rather, their sequences differ in exactly K places compared to the real villain's.

Can you identify the real villain?

Input

The first line contains the three integers N, M, and K ($3 \leq N, M \leq 4100, 1 \leq K \leq M$). The following N lines represent the DNA sequences. Each of these lines consists of M characters, each of which is either `A`, `C`, `G` or `T`.

In the input, there is exactly one sequence that differs from all the other sequences in exactly K places.

Warning: this problem has rather large amounts of input, and will require fast IO in Java.

Output

Output an integer – the index of the DNA sequence that belongs to the villain. The sequences are numbered starting from 1.

Examples

standard input	standard output
4 3 1 ACC CCA ACA AAA	3
4 4 3 CATT CAAA ATGA TCTA	4