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.

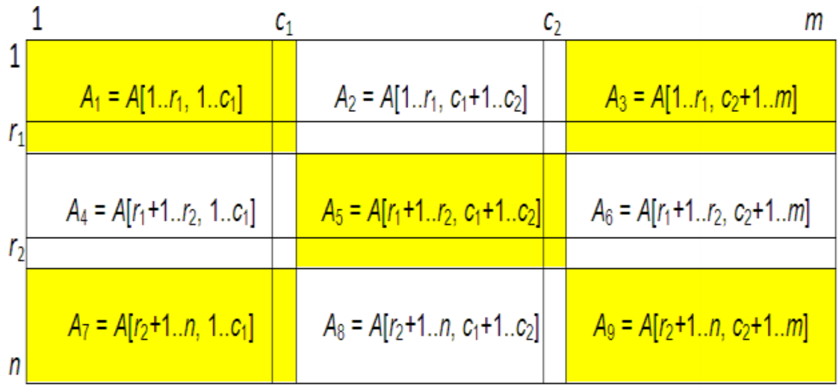
Example

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. Teams Creation

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

Dr Emmett Brown has decided to change his job and is now working as a Computer Science teacher in a high school. The Dr Brown's class has n students. Dr Brown wants to run a programming contest for his students. But his classroom only has k computers, so he needs to run a team contest.

Dr thinks that the teamwork would be good for the students if the students in the team all have close levels of their skills. For each student Emmett Brown knows its skill level a_i. He has decided to create teams in such way that for any two teams there is a number x such that students in one team have skill level at most x, and in the other team all students have skill level at least x. There must be exactly k teams, each team must have at least one student, but there is no upper limit for the number of students in one team.

Help Doctor to find out how many ways are there for him to create the teams. Two ways are different if there are two students that are in the same team in of the them, and in different teams in the other. You should output the number of ways modulo $10^9 + 7$.

Input

The first line contains two integers n and k $(1 \le n, k \le 2000)$ – the number of students in the class and the number of teams that must be created.

The second line contains n integers a_i $(1 \le a_i \le n)$ – the skill levels of all students.

Output

Output one integer – the number of ways to create the teams modulo $10^9 + 7$.

Examples

standard input	standard output
3 2 1 2 3	2
7 3 2 4 3 4 3 3 2	53

Problem F. Barbarians

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	256 megabytes

Life on an island could be dangerous! Recently the country, which territory consists of n islands, was attacked by barbarians. The islands of the country were connected by the bridges in such way that for any two islands there was exactly one way to get from one island to another without visiting any island twice.

The barbarians understood that the bridges were the weak point of the country. So they decided to destroy them one after another. The people of the country got really angry. For the i-th island the initial anger of its people was a_i.

Let us describe how the anger changes when the bridge is destroyed. Consider an island x, let the number of islands that the people from x could reach before some bridge was destroyed be a, and the number of such islands after it was destroyed be b. Then the anger of people at x would be multiplied by $a - b + 1$.

You must develop the system to calculate the current anger of people. You will get several requests, each request contains two integers u and v. Request with integers u and v means that the bridge between $u + res$ and $v + res$ was destroyed, where res is the result of the previous query. For the first query consider $res = 0$.

Let the anger of people at island i after the bridge from the query was destroyed be b_i. Set res to be equal to the sum of all b_i for i from 1 to n, taken modulo $10^9 + 7$, and print this value.

To better understand the queries format, consider the example below.

Initially, the anger of people is: 1 2 3 4 5.

After removing the bridge between 1 and 3, the anger of people at islands 1 and 2 was multiplied by 4, and anger of people at other islands – by 3. So the new angriness values are: 4 8 9 12 15.

The sum of anger values if 48, we assign it to res, print it, and use it to find out that the bridge in the second query was between islands $(-47) + 48 = 1$ and $(-46) + 48 = 2$. The new values of angriness after this destruction are: 8 16 9 12 15.

The sum of anger values is 60. The next bridge to destroy was between islands 3 and 5. The new values of anger are: 8 16 18 24 45.

The sum of anger values is 111. After destroying the last bridge the anger values are: 8 16 36 48 45.

The sum is 153.

Input

The first line contains integer n ($2 \le n \le 2 \times 10^5$) – the number of islands.

The second line contains n integers a_i ($1 \le a_i \le 10^9 + 6$) – the initial angriness of people.

The following $n - 1$ lines contain two integers u_i, v_i each ($1 \le u_i, v_i \le n$) and describe bridges. It is guaranteed that there is exactly one way to get from any island to any other.

The following $n - 1$ lines describe queries. See description in the problem statement to better understand the format of queries. It is guaranteed that queries specify bridges that exist and were not yet destroyed.

Output

For each query print res value, one per line in the order of queries.

Example

standard input	standard output
5 1 2 3 4 5 1 2 1 3 3 4 3 5 3 1 -47 -46 -57 -55 -108 -107	48 60 111 153