Problem A. Graph Theory

Input file:	graph.in
Output file:	graph.out
Time limit:	2 seconds
Memory limit:	256 megabytes

Serge is studying graph theory. Recently he has learned about graph radius and diameter. Consider undirected unweighed connected graph G, let us denote the length of the shortest path between vertices s and t as $\rho(s,t)$. Radius $r(G)$ of the graph is $\min\limits_u \max\limits_v \rho(u,v)$. Diameter $d(G)$ of the graph is $\max\limits_u \max\limits_v \rho(u,v)$.

Intuitively, diameter of the graph is the largest distance that you need to go to get from one vertex to another, and radius is the largest distance you can be forced to go if you choose where you would go from.

The professor on the lecture proved that $d(G)/2 \le r(G) \le d(G)$ for any graph G. Now Serge wonders whether for any values d and r such that $d/2 \le r \le d$ there exists graph G such that $d(G) = d$ and $r(G) = r$. Help him to find that out.

Input

The input file contains two integer numbers d and r ($d/2 \le r \le d \le 50$, $1 \le r$).

Output

If there exists a graph with the given diameter and radius, output "YES" at the first line of the output file. The second line must contain two integer numbers: n and m — the number of vertices and the number of edges ($2 \le n \le 400$). The following m lines must contain two integer numbers each — the vertices connected by the corresponding edge. There must be no loops and no parallel edges.

If there is no such graph, output "NO" at the first line of the output file.

Examples

graph.in	graph.out
1 1	YES 2 1 1 2
3 2	YES 7 9 1 2 2 3 3 4 1 4 4 5 5 6 1 6 6 7 7 2

Problem B. Minimal Matrix

Input file:	`matrix.in`
Output file:	`matrix.out`
Time limit:	4 seconds
Memory limit:	256 megabytes

Research Institute of Given Strings is opening a new department — Research Deparment of Given Matrices. Similarly to a problem of string canonization the new deparment is now working on a problem of matrix canonization.

Consider a matrix $m_{i,j}$ of size $2^n \times 2^n$ containing lowercase letters.

The circular shift of a matrix m is a matrix m' such that $m'_{i,j} = m_{(i+\Delta i) \bmod 2^n, (j+\Delta j) \bmod 2^n}$ from some Δi and Δj (matrices are indexed from 0 to $2^n - 1$).

Matrix p is lexicographically less than matrix q of the same size if there are some i and j such that for $i' < i$, or $i' = i$ and $j' < j$ the equality $p_{i',j'} = q_{i',j'}$ holds, and $p_{i,j} < q_{i,j}$. That is, we compare matrices by rows.

Given matrix m, the problem of its canonization is to find its circular shift such that it is lexicographically less or equal to any other circular shift of m.

Help the researchers in the new department to find the canonization of a given matrix.

Input

The input file contains a matrix m. Its size if $2^n \times 2^n$, $0 \le n \le 9$.

Output

Output the canonization of the given matrix.

Example

matrix.in	matrix.out
baba baab abba bbba	aabb abbb abab bbaa

Problem C. Nothing On TV

Input file:	nothingontv.in
Output file:	nothingontv.out
Time limit:	4 seconds
Memory limit:	256 megabytes

Nothing on TV? Why not join us in a bar for a drink?

Message on TV program in one London hotel

John likes going to London pubs. Unfortunately there is no pub directly in a house he lives, but there are plenty around. John like going to pubs, but it is not any pub that he would go. When going to a pub, John often thinks that he is going to a wrong pub and he should go to another one.

Recently John has met his friend, psychologist and mathematician Jack and told him about his problem. They made an investigation and found out when John thinks that he is going to the wrong pub. Consider pubs as points on a plane, let John's home be located at point $(0, 0)$ and pubs be located at points (x_i, y_i). Consider the i-th pub located at (x_i, y_i), draw a circle with segment $(0, 0) - (x_i, y_i)$ as a diameter.

Let us call such pub *good* if there is no other good pub located inside this circle or on its border. John is feeling good only when he is going to a good pub.

Now John and Jack wonder, what are the pubs that John could go without feeling being wrong. Help them!

Input

The first line of the input file contains n — the number of pubs in John's neighborhood ($1 \le n \le 100\,000$). The following n lines contain two integer numbers x_i and y_i each ($|x_i|, |y_i| \le 30\,000$). No two pubs coincide. There is no pub at $(0, 0)$.

Output

The first line of the output file must contain k — the number of good pubs. The second line must contain k integer numbers — the numbers of these pubs. Pubs are numbered starting from 1 in order they are listed in the input file.

Example

nothingontv.in	nothingontv.out
4 1 0 1 1 -1 4 2 2	2 1 3

Note that there is a pub at $(1, 1)$ inside the circle for pub at $(-1, 4)$, but that pub is not good, so it's not important.

Problem D. Avoiding Partitions

Input file:	`partitions.in`
Output file:	`partitions.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

A partition of a set $S = \{1, 2, \ldots, n\}$ is a collection $\mathcal{P}$ of sets $\mathcal{P} = \{P_1, P_2, \ldots, P_k\}$ such that $\bigcup P_i = S$ and $P_i \cap P_j = \varnothing$ for $i \neq j$. An example of a partition for $n = 5$ is $P_1 = \{1, 3\}$, $P_2 = \{2, 4, 5\}$.

The partition is said to avoid set Q if none of P_i has Q as a subset. For example, the partition above avoids sets $\{1, 2\}$ and $\{3, 4\}$ but doesn't avoid $\{1, 3\}$ nor $\{2\}$.

Given n and a collection of sets $Q_1, Q_2, \ldots, Q_l$ find the number of partitions of S that avoid each of Q_i.

Input

The first line of the input file contains two integer numbers n and l ($1 \le n \le 100$, $0 \le l \le 10$). The following l lines describe sets to avoid. Each line starts with one integer number q_i — the size of the set, followed by q_i numbers — the elements of the set.

Output

Output one integer number — the number of partitions avoiding each of Q_i.

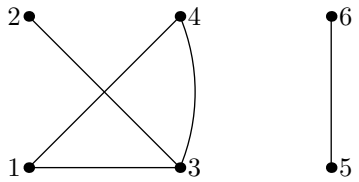
Example

partitions.in	partitions.out
5 2 3 1 2 3 2 2 4	34

Problem E. Points and Lines

Input file:	`points.in`
Output file:	`points.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

Andrew and Betty used to play the game of "Points and Lines" at their Computer Science lesson. They start with a sheet of paper that has n points drawn on it. Players make moves in turn, Andrew moves first. Each move the player must connect two points, not yet directly connected, by a line. For example, on the picture below the player can connect points 1 and 2, 2 and 4, or any of 1, 2, 3, 4 to any of 5, 6.



If after the player's turn all points become connected, i.e. it is possible to get from each point to any other by lines, he wins the game.

Recently Andrew found the sheet of paper with the unfinished game in a heap on his table. He wonders, who would win the game if he was to move next and both players acted optimally. Help him to find that out.

Input

The first line of the input file contains n — the number of points, and m — the number of lines already drawn ($2 \le n \le 150$, $0 \le m \le n(n-1)/2$). The following m lines contain two integer numbers each — the numbers of points connected by a line.

Output

Output "`Andrew`" if Andrew would win the game, or "`Betty`" if Betty would do.

Examples

points.in	points.out
6 5 1 4 2 3 1 3 3 4 5 6	Andrew
5 0	Betty
2 1 1 2	Betty

Problem F. Reversing Prefixes

Input file:	`prefixes.in`
Output file:	`prefixes.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

A reversing prefixes machine (RPM) is being tested in Laboratory of Intelligent Prefixes Algorithms (LIPA). The machine works in the following way: the input to it is a string s of length n and a sequence $1 \le a_1 < a_2 < \ldots < a_k \le n$. Initially the string s is put to the internal register of the machine. After that for each i from 1 to k the machine takes the prefix $[1..a_i]$ of the string that is in the register and reverses it. The string that is in the register after all operations are completed is the output of the machine.

For example, if the input to the machine is $s =$ "`abacaba`" and $a_1 = 2$, $a_2 = 4$, the output of the machine is "`caababa`".

The LIPA scientists want to find output what is the lexicographically minimal string that can be the output of the machine on input s. Help them to find that out.

Input

The input file contains a string s (its length doesn't exceed 500 000). It contains only lowercase letters.

Output

Output the smallest lexicographically string that can be the output of the RPM on input s.

Example

prefixes.in	prefixes.out
abacaba	aaaabcb

Problem G. Inverse Range Minimum Query

Input file:	`rmq.in`
Output file:	`rmq.out`
Time limit:	3 seconds
Memory limit:	256 megabytes

Inverse problems represent a quickly growing area in computer science. Unlike traditional problems, where given some data D, the task is to solve some optimization or calculation problem P, in the inverse problem you are given a problem P and the result R of the optimization/calculation. You have to restore the original data D. In this problem you are asked to solve inverse range minimum query problem.

Consider an array $a[1..n]$. The answer to a range minimum query $Q(i, j)$ is the minimal value among $a[i], \ldots, a[j]$. You are given n and a series of range minimum queries with answers. Restore the original array a.

Input

The first line of the input file contains n — the size of the array, and m — the number of queries ($1 \le n, m \le 100\,000$). The following m lines contain three integer numbers each: numbers i, j and q mean that $Q(i, j) = q$ ($1 \le i \le j \le n$, $-2^{31} \le q \le 2^{31} - 1$).

Output

If data in the input file is inconsistent, i.e. no such array a exists, output "`inconsistent`" at the first line of the output file.

In the other case output "`consistent`" at the first line of the output file. The second line must contain the array. The elements of the array must be integers between -2^{31} and $2^{31} - 1$. If there are several solutions, output any one.

Examples

rmq.in	rmq.out
3 2 1 2 1 2 3 2	consistent 1 2 3
3 3 1 2 1 1 1 2 2 3 2	inconsistent

Problem H. Road Signs

Input file:	`roadsigns.in`
Output file:	`roadsigns.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

Different countries use different background color for road direction signs. For example, in Russia road signs in urban areas have white background, signs in the country have blue background, signs on motorways have green background. In Europe motorways signs sometimes have blue background, in USA most signs have green background.

The king of Flatland once got lost when traveling around the country, and that made him come up with an idea. He is planning to introduce a new rule for background colors of road signs on motorways. There are n cities in Flatland, connected by m bidirectional motorways. There are at most d motorways incident to any city. Following the king's plan the signs on the motorways will have one of $d+1$ background colors. The rule is that no two motorways incident to the same city have the same background color for signs. After the reform whenever you see a sign on a motorway you must only remember the city you departed from, and you immediately understand what city you are going to (at least if you have perfect memory).

Given the plan of motorways in Flatland, help the king to decide which motorway would have which sign background color.

Input

The first line of the input file contains three integer numbers n, m and d ($2 \le n \le 200$, $1 \le m \le 2000$, $1 \le d \le n-1$). The following m lines describe motorways, each motorway is described by two integer numbers ranging from 1 to n — the numbers of cities it connects. No city has more than d motorways incident to it.

Output

If it is impossible to assign colors from 1 to $d+1$ to motorways so that no two motorways incident to the same city were assigned the same color, output -1 at the first line of the output file.

In the other case output m integer numbers ranging from 1 to $d+1$ — the colors that must be assigned to motorways (in order the motorways are described in the input file).

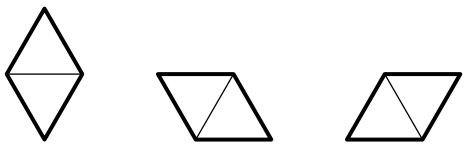
Example

roadsigns.in	roadsigns.out
5 5 2 1 2 2 3 3 4 4 5 1 5	1 2 3 1 2

Problem I. Triangular Tiling

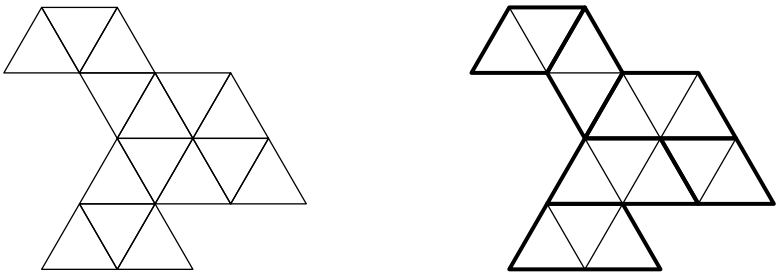
Input file:	`tiling.in`
Output file:	`tiling.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

Triangular domino is a rhombic figure composed of two equilateral triangles.



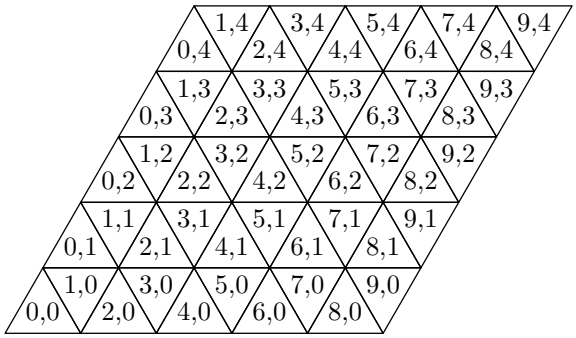
Similarly triangular trimino is a trapezoid composed of three equilateral triangles.

Consider a connected area on a triangular grid composed of unit triangles. You have to detect whether it is possible to tile the area with triangular dominoes and triminoes. Each triangle must be covered by exactly one tiling piece.



Input

The first line of the input file contains n — the number of triangles in the area ($1 \le n \le 500$). The following n lines contain coordinates of the triangles. The coordinates are assigned to the triangles as shown on the following picture. Coordinates do not exceed 500 by their absolute values.



Output

If the tiling is impossible, output "`No solution`" at the first line of the output file. In the other case the first line of the output file must contain k — the number of pieces used. Let the pieces be numbered from 1 to k, the second line must contain n integer numbers, for each triangle of the given area output the number of the piece that it is covered by.

Example

tiling.in	tiling.out
15 0 0 1 0 2 0 0 1 1 1 2 1 3 1 4 1 -1 2 0 2 1 2 2 2 -2 3 -3 3 -4 3	6 1 1 1 2 2 2 3 3 4 5 5 5 4 6 6

Sample output corresponds to the picture in the problem statement.

Problem J. Wikipidia

Input file:	wikipidia.in
Output file:	wikipidia.out
Time limit:	2 seconds
Memory limit:	256 megabytes

This problem statement uses Cyrillic quotation marks « and » instead of " and " in order to not get confused with apostrophes used in the problem.

Ben is working on his new project of non-traditional encyclopedia with the code name "Wikipidia". Now he is going to write the engine for translating wiki pages to html pages. However, he doesn't have enough time, because he is busy with promoting the project. So he hired you to write the engine.

First your engine must only support bold and italic. In wiki bold is surrounded with three apostrophes («'''»), italic is surrounded with two apostrophes («''»). In HTML bold is surrounded with – and italic is surrounded with –. In both wiki and HTML the sequence of bold and italic start/end markers must be well formed and non-recursive — if we replace bold start marker with «(», bold end marker with «)», italic start marker with «[» and italic end marker with «]», we must get a regular brackets sequence, such that no round bracket is inside other round brackets, neither a square bracket is inside other square brackets.

Unlike in HTML in wiki it is sometimes difficult to understand how to apply formatting, because sequences of 5 and more apostrophes can be interpreted in different ways. However, your programming abilities are strong, so you must be able to write the translation engine.

Input

The input file contains one line that contains a sample wikipidia article that contains only letters, punctuation marks («,», «.», «-», «?», «!»,), spaces and apostrophes used to denote bold/italic formatting.

The size of the input article doesn't exceed 100 000 bytes.

Output

Output the translated version of the article. The output file must not contain apostrophes.

To check your answer, the verifying program will make sure that the sequence of – and – tags is well formed and non-recursive, and translate your output back to wiki by replacing and with three apostrophes and and with two apostrophes. The result must exactly coincide with the input text.

If the input article cannot be correctly translated, output «!@#$%» instead.

Examples

wikipidia.in	wikipidia.out
'''''This is''' sample article.''	This is sample article.
'''This is incorrect sample.	!@#$%
''''Funky sample.''''	Funky sample.

Problem K. XOR

Input file:	`xor.in`
Output file:	`xor.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

The team of famous cryptoanalyst professor Ksor is working on breaking new Homogenous Reducible Encryption Network. After long investigations the problem of breaking the network was reduced to the following one.

Given several integer numbers $a_1, a_2, \ldots, a_n$, represent them in binary notation, prepending smaller of them with leading zeroes so that they all had the same number of digits as the largest of them. After that rearrange bits in the numbers to obtain new numbers $b_1, b_2, \ldots, b_n$, such that $b_1 \oplus b_2 \oplus \ldots \oplus b_n = 0$. Here $\oplus$ means bitwise exclusive or.

As a newbie in professor's team, you were assigned to solve the problem.

Input

The first line of the input file contains n ($2 \le n \le 50$). The second line of the input file contains $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^{18}$).

Output

Output $b_1, b_2, \ldots, b_n$.

If there is no solution, output "`impossible`".

Examples

xor.in	xor.out
3 7 10 11	7 12 11
3 7 10 3	impossible

In the first example $a_1 = 7 = 0111_2$, $a_2 = 10 = 1010_2$, $a_3 = 11 = 1011_2$. If we rearrange bits to get $b_1 = 7 = 0111_2$, $b_2 = 12 = 1100_2$, $b_3 = 11 = 1011_2$, we have $b_1 \oplus b_2 \oplus b_3 = 0$.