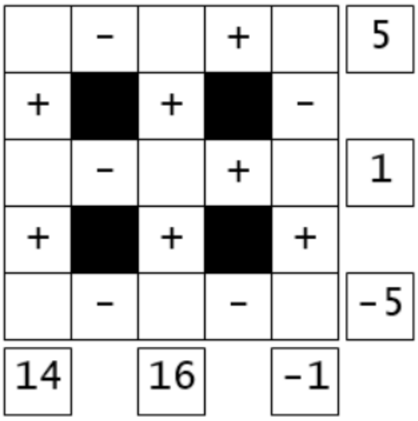
Problem A. Puzzle: Arithmetic Square

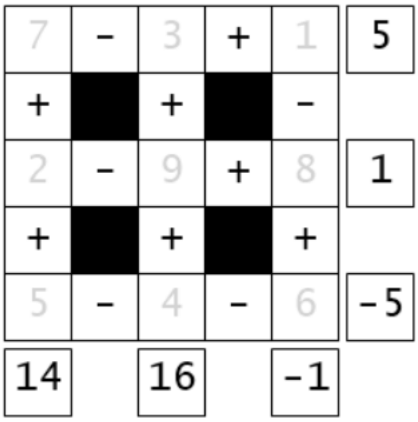
Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	256 megabytes

Grammy is a puzzle master. Today, she is playing a variant of "Arithmetic Square" puzzle.

The puzzle consists of a $(2n - 1) \times (2m - 1)$ grid. The intersection of odd rows and odd columns are empty and needed to be filled in with **pairwise distinct** integers. The intersection of even rows and even columns are blocked. All other cells consists of either "`+`" or "`-`".

Each odd row and odd column forms an expression in the grid. The expressions should evaluate to the clues given in the right of the grid and in the bottom of the grid. The goal is to fill in all the empty squares with pairwise distinct integers so that all of the expressions are satisfied.





The left picture illustrates a 5×5 empty puzzle, and the right picture shows a solution to the puzzle.

Grammy surely knows how to solve the puzzle, but she decided to give you a quiz. Please solve the puzzle.

Input

The first line contains two integers n, m ($2 \le n, m \le 1000$), denoting the size of the grid.

The following $2n - 1$ lines contains $2m - 1$ characters each, denoting the symbols in the grid. "`.`" denotes an empty cell, "`#`" denotes a blocked cell, "`+`" denotes a plus sign, and "`-`" denotes a minus sign.

The next line contains n integers r_i ($-10^9 \le r_i \le 10^9$), denoting the clues for each row on the right of the grid.

The next line contains m integers c_i ($-10^9 \le c_i \le 10^9$), denoting the clues for each column on the bottom of the grid.

Output

If the solution does not exist, output "`NO`" on a single line.

Otherwise, output "`YES`" on the first line, then output n lines, each of which contains m integers a_{ij} ($-10^{15} \le a_{ij} \le 10^{15}$), denoting the numbers filled into the grid.

If there are multiple solutions, output any.

Examples

<table>
<tr><th>standard input</th><th>standard output</th></tr>
<tr><td><pre>3 3
.-.+.
+#+#-
.-.+.
+#+#+
.-.-.
5 1 -5
14 16 -1</pre></td><td><pre>YES
7 3 1
2 9 8
5 4 6</pre></td></tr>
<tr><td><pre>2 3
.+.+.
-#-#-
.+.+.
114 514
19 19 810</pre></td><td><pre>NO</pre></td></tr>
</table>

Problem B. Semi-Puzzle: Brain Storm

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

Given two positive integers a, m. Find a non-negative integer u, where $a^u \equiv u \pmod{m}$.

Input

There are multiple test cases.

The first line contains one integer T $(1 \le T \le 1000)$, representing the number of test cases.

Each of the following T lines contains two integers a, m $(1 \le a < m \le 10^9)$.

Output

For each test case, output a line containing a single integer u $(0 \le u \le 10^{18})$, representing the answer. It is guaranteed that the answer exists.

Example

standard input	standard output
5 1 2 2 3 6 7 12 15 114514 1919810	3 10 36 96 104419494656

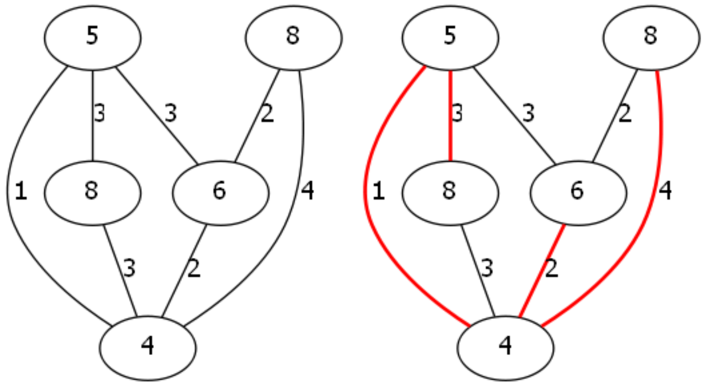
Problem C. Puzzle: Kurodoko (Max)

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

Grammy is a puzzle master. Today, she is playing a variant of "Kurodoko" puzzle.

The puzzle consists of a graph with n vertices and m undirected edges. Each vertex has a clue value a_i, and each edge has a length l_i.

The goal is to find a spanning tree such that for each vertex, the distance to its furthest point on the spanning tree is exactly its clue value a_i.



The left picture illustrates an empty puzzle, and the right picture shows a solution to the puzzle.

Grammy surely knows how to solve the puzzle, but she decided to give you a quiz. Please solve the puzzle.

Input

The first line contains two integers n, m ($2 \le n \le 10^5, n-1 \le m \le 2 \times 10^5$), denoting the number of vertices and the number of edges.

The next line contains n integers a_i ($1 \le a_i \le 10^9$), denoting the clue values of the vertices.

Each of the following m lines contains 3 integers u_i, v_i, l_i ($1 \le u_i, v_i \le n, 1 \le l_i \le 10^4$), denoting an edge of length l_i connecting vertex u_i and vertex v_i.

It is guaranteed that the graph is connected. Note that the graph may contain self-loops and/or multiple edges.

Output

If the solution does not exist, output "`NO`" on a single line.

Otherwise, output "`YES`" on the first line, then output $n-1$ lines, each of which contains 3 integers u_i, v_i, l_i, denoting an edge in the final spanning tree.

If there are multiple solutions, output any.

Example

standard input	standard output
5 7 8 4 5 6 8 1 2 3 1 3 3 2 3 1 2 4 2 3 4 3 2 5 4 4 5 2	YES 2 3 1 2 5 4 3 1 3 2 4 2

Problem D. Non-Puzzle: Error Permutation

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

You are given a permutation P of length n. Find the number of its subsegments $[l \dots r] (l \le r)$ that satisfies the following condition:

- $\forall 1 \le i \le r - l + 1$, the i-th element of this subsegment (that is, P_{l+i-1}) is **not** the i-th smallest element in this subsegment.

Input

There are multiple test cases.

The first line contains one integer T $(1 \le T \le 1000)$, representing the number of test cases.

For each test case, the first line contains a single integer n $(1 \le n \le 5000)$, representing the length of the permutation.

The following line contains n integers $p_1, p_2 \dots p_n$, representing the permutation.

It is guaranteed that the sum of n does not exceed 5000.

Output

For each test case, output a line containing a single integer representing the answer.

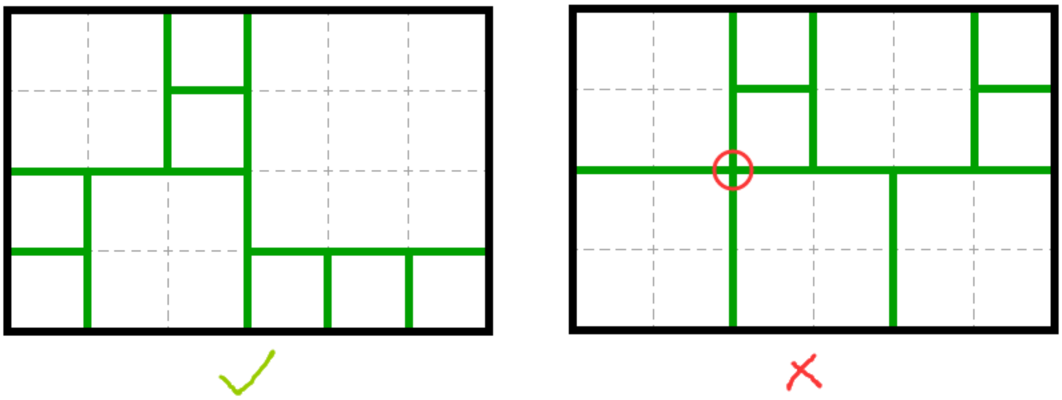
Example

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

Problem E. Puzzle: Square Jam

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

Grammy is a puzzle master. Today, she is playing a variant of "Square Jam" puzzle. Given an $n \times m$ rectangle. The goal is to divide the rectangle into several squares (with integral lengths) such that no point is touched by 4 squares.



The left picture illustrates a solution to a 4×6 puzzle, and the right picture shows an example of what is not allowed in the solution.

Grammy surely knows how to solve the puzzle, but she decided to give you a quiz. Please solve the puzzle.

Input

There are multiple test cases.

The first line contains the number of test cases T $(1 \le T \le 2 \times 10^5)$.

Each of the following T lines contains two positive integers n, m $(1 \le n, m \le 10^5)$, denoting the side lengths of the rectangle.

It is guaranteed that the sum of nm is less than or equal to 2×10^5.

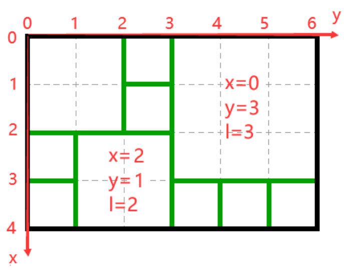
Output

For each test case:

If the solution does not exist, output "`NO`" on a single line.

Otherwise, output "`YES`" on the first line, then output an integer k on the second line, denoting the number of squares divided. Finally, output k lines, each of which contains 3 integers x, y, l, denoting a square of size l having (x, y) as its upper-left corner.

For the details of the coordinates, please refer to the following picture.



If there are multiple solutions, output any.

Example

standard input	standard output
2 4 6 1 1	YES 10 0 0 2 0 2 1 1 2 1 0 3 3 2 0 1 3 0 1 2 1 2 3 3 1 3 4 1 3 5 1 YES 1 0 0 1

Problem F. Non-Puzzle: The Lost Array

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	256 megabytes

You have just lost an integer array a of length n. You only remember that the array satisfies the following conditions:

- $1 \le a_i \le m$.
- For some pairs of (u, v), $a_u \ne v$.
- For some pairs of (u, v), $num_u \ne v$, where num_u represents the number of occurrences of number u. For example, if $a = \{1, 3, 3, 2, 4\}$, then $num_3 = 2$, $num_1 = 1$, $num_2 = 1$, $num_4 = 1$.

Also, you remember an extra information: there is an array B of length m, such that after sorting the array $[num_1, num_2 \dots num_m]$ in non-decreasing order, it will become B.

Please calculate the number of possible arrays under these constraints. Since the answer might be huge, output the answer modulo $10^9 + 7$.

Input

There are multiple test cases.

The first line contains the number of test cases T ($1 \le T \le 16$). The description of the test cases follows.

The first line of each test case contains four integers n, m, x, y ($1 \le n \le 16, 1 \le m \le 30$, $0 \le x \le nm, 0 \le y \le (n+1)m$), representing the length of the array, the upper bound of the numbers, and the number of two types of constraints.

The following line contains m integers, representing $B_1, B_2 \dots B_m$ ($0 \le B_1 \le B_2 \dots \le B_m \le n$, $\sum B_i = n$).

Each of the following x lines contains two integers u, v ($1 \le u \le n, 1 \le v \le m$), representing the constraint $a_u \ne v$.

Each of the following y lines contains two integers u, v ($1 \le u \le m, 0 \le v \le n$), representing the constraint $num_u \ne v$.

Some constraints might be the same. It is guaranteed that the sum of n does not exceed 16.

Output

For each test case, output a single integer, representing the answer modulo $10^9 + 7$.

Example

standard input	standard output
3	9
2 4 1 1	228
0 0 1 1	288459008
2 3	
3 2	
4 5 2 1	
0 0 1 1 2	
2 5	
3 5	
5 4	
10 30 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 1 1 1 1 1 2 3	

Note

In the first example, the possible arrays are $[1,2]$, $[1,4]$, $[2,1]$, $[2,4]$, $[3,1]$, $[3,2]$, $[3,4]$, $[4,1]$, $[4,2]$.

Problem G. Non-Puzzle: Game

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

Alice and Bob are playing a game.

There are n numbers on the black board, where the i-th number is a_i. Alice and Bob play in turns. Alice plays first. The current player can choose two numbers a_i and a_j from the black board (i and j can be equal), and write a new number $a_i \oplus a_j$ on the blackboard, where $\oplus$ denotes bitwise-xor operation. The players cannot skip their turns. The player who writes number k on the blackboard wins.

If no one writes k on the blackboard in 10^{100} rounds, then the game ends in a draw.

Now, assume Alice and Bob both play optimally, determine the outcome of the game (Alice wins, Bob wins, or draw).

Input

There are multiple test cases.

The first line contains one integer T ($1 \le T \le 5 \cdot 10^4$), representing the number of test cases.

For each test case, the first line contains two integers n, k ($1 \le n \le 10^6$,$0 \le k < 2^{30}$).

The following line contains n integers $a_i, a_2 \ldots a_n$ ($0 \le a_i < 2^{30}$).

It is guaranteed that the sum of n does not exceed 10^6.

Output

For each test case, output one line containing "`Alice`", "`Bob`" or "`Draw`", representing the result of the game.

Example

standard input	standard output
5 5 4 1 7 3 2 5 2 0 1 1 5 3 1 5 7 9 5 4 2 6 4 3 1 1 1 1	Alice Alice Draw Alice Bob

Problem H. Puzzle: Herugolf

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	256 megabytes

Grammy is a puzzle master. Today, she is playing a variant of "Herugolf" puzzle.

The puzzle consists of an infinitely large square grid. Initially, there is a golf ball at the origin $(0, 0)$. A strength parameter n is given so that you can hit the ball **at most** n times.

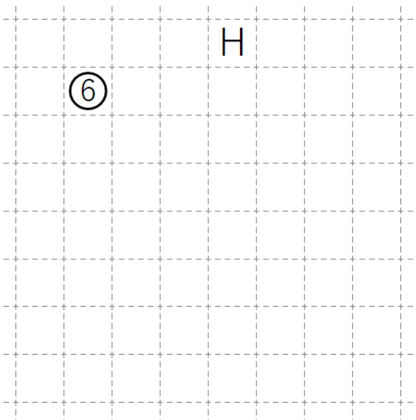
However, assume the ball is at (x_s, y_s) before the i-th hit, there are only 4 possible ways to hit the ball:

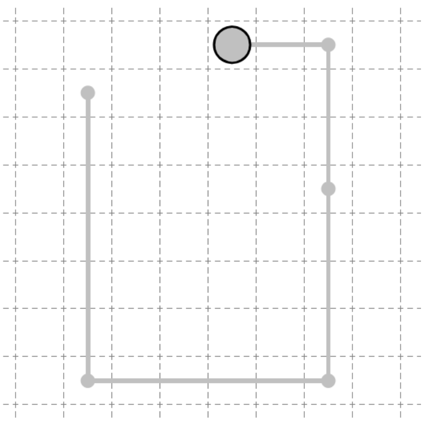
- Move right through segment $(x_s, y_s) - (x_s + n - i, y_s)$, and land on $(x_s + n - i, y_s)$
- Move left through segment $(x_s, y_s) - (x_s - n + i, y_s)$, and land on $(x_s - n + i, y_s)$
- Move up through segment $(x_s, y_s) - (x_s, y_s + n - i)$, and land on $(x_s, y_s + n - i)$
- Move down through segment $(x_s, y_s) - (x_s, y_s - n + i)$, and land on $(x_s, y_s - n + i)$

Note that the ball will **not** fall into the hole on the segment.

Additionally, the ball should not visit a point twice. During a hit, each point on the segment is considered visited by the ball.

The goal is to hit the golf ball into the only hole (x, y).





The left picture illustrates an empty puzzle, and the right picture shows a solution to the puzzle.

Grammy surely knows how to solve the puzzle, but she decided to give you a quiz. Please solve the puzzle.

Input

There are multiple test cases.

The first line contains the number of test cases T $(1 \le T \le 1000)$.

Each of the following T lines contains two positive integers n, x, y $(1 \le n \le 10^5, -\frac{n(n+1)}{2} \le x, y \le \frac{n(n+1)}{2})$, denoting the parameter n

It is guaranteed that there are at most 5 test cases with $n > 50$.

Output

For each test case:

If the solution does not exist, output "`NO`" on a single line.

Otherwise, output “YES” on the first line, then output a string consisting of characters “L”, “R”, “U’, and ‘D’, denoting the directions of each hit.

If there are multiple solutions, output any.

Example

standard input	standard output
2 6 3 1 6 7 7	YES DRUUL NO

Problem I. Non-Puzzle: Segment Pair

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

There are n pairs of segments in the X-axis. The i-th of them is $[l_i, r_i]$ and $[l'_i, r'_i]$.

You should choose **exactly one** segment from each pair (that is, choose either $[l_i, r_i]$ or $[l'_i, r'_i]$ for each i), satisfying that there exists at least one point x, which is included by all the chosen segments.

You need to determine the number of different ways of choosing the segments (over 2^n possible ways) that satisfies the condition, output it modulo $10^9 + 7$.

Two ways are considered different if and only if there exists i, such that $[l_i, r_i]$ is chosen in one way, and $[l'_i, r'_i]$ is chosen in another. Note that even if $[l_i, r_i] = [l'_i, r'_i]$, the two ways are considered different.

Input

The first line contains one integer n ($1 \le n \le 5 \cdot 10^5$).

The following n lines, each line contains four integers l_i, r_i, l'_i, r'_i ($1 \le l_i \le r_i \le 5 \cdot 10^5$, $1 \le l'_i \le r'_i \le 5 \cdot 10^5$).

Output

Output a single integer, representing the number of different ways of choosing the segments, modulo $10^9 + 7$.

Examples

standard input	standard output
3 1 4 6 7 2 5 3 5 1 3 5 7	2
4 1 3 2 5 1 5 1 4 2 3 1 4 1 3 3 5	16
2 1 3 6 7 4 4 5 5	0

Note

For the first example, you can choose $[1, 4]$, $[3, 5]$, $[1, 3]$ (they share a common point 3), or $[1, 4]$, $[2, 5]$, $[1, 3]$ (they share common points $2, 3$). There are no other valid choices.

For the second example, all 2^4 choices are valid.

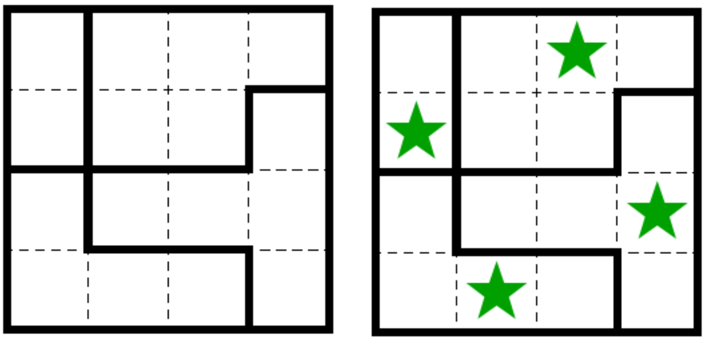
For the third example, it can be proved that there are no valid choices.

Problem J. Puzzle: Star Battle

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

Grammy is a puzzle master. Today, she is playing a variant of "Star Battle" puzzle.

The puzzle consists of a $(4n) \times (4n)$ grid. The grid is divided into $4n$ blocks, but each block may be disconnected. The goal is to place stars into the grid so that each row, each column, and each block contains exactly n stars. Additionally, two stars cannot be adjacent, diagonally or orthogonally. In other words, two stars cannot be placed in two cells that share an edge or a corner.



The left picture illustrates a 4×4 empty puzzle, and the right picture shows a solution to the puzzle.

Grammy surely knows how to solve the puzzle, but she decided to give you a quiz. Please solve the puzzle.

Input

The first line contains a single integer n ($1 \le n \le 300$), denoting the number of stars to place in each row.

Each of the following $4n$ lines contains $4n$ integers g_{rc} ($1 \le g_{rc} \le 4n$), denoting the index of the block which the cell (at row r, column c) belongs to. It is guaranteed that each block contains at least one cell. However, it is **not** guaranteed that each block is an orthogonally connected region.

Output

If the solution does not exist, output "`NO`" on a single line.

Otherwise, output "`YES`" on the first line, then output $4n^2$ lines, each of which contains 2 integers r, c ($1 \le r, c \le 4n$), denoting the coordinates (row r, column c) of each placed star.

If there are multiple solutions, output any.

Example

standard input	standard output
1 1 2 2 2 1 2 2 4 3 4 4 4 3 3 3 4	YES 1 3 2 1 3 4 4 2