Problem B - Flappy Bird

If this is your first time competing, check our instruction page for detailed information on the format of this problem.

Flappy Bird is a *side-scroller* video game in which the goal is to control a bird that moves continuously to the right, along N horizontal positions. To beat a level , the player has to guide the bird until the end of that level passing between N pairs of pipes positioned side by side in the top and bottom of the screen, without the bird hitting any pipe.

In each second the bird moves automatically one unit to the right and the player can only control its vertical movement, that is, it can control the sequence $A_1, A_2, \ldots, A_N$ of (integer) heights along the level. The initial height A_1 of the bird can be anyone chosen by the player, as long as on any horizontal position the bird is located between the upper and lower pipe of that position. Therefore, if at horizontal position i ($1 \leq i \leq N$) the interval of heights delimited by the lower and upper pipes is $[L_i, R_i]$, then is should happen that $L_i \leq A_i \leq R_i$.

You are part of the team that testing the game and your task is to evaluate if it is possible to pass the levels that were invented by the development team.

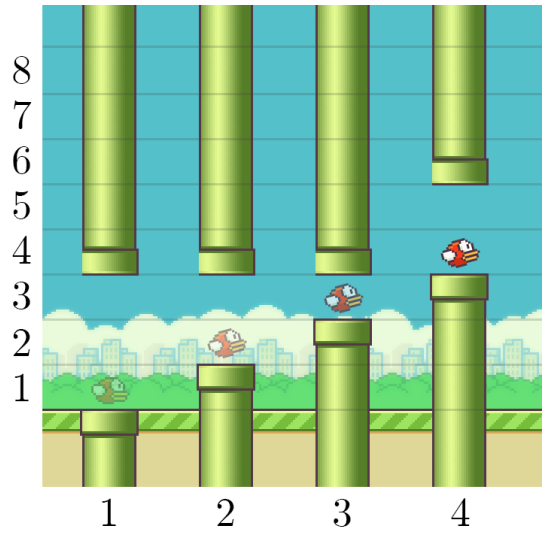
Part I

On this first part, the game is still on a very early development phase and because of that we will only consider levels in which at each second the player is only allowed to make the bird go up 1 vertical unit. Therefore, the height of the bird on a given position will always have the be exactly 1 unit more than the height of the previous position.

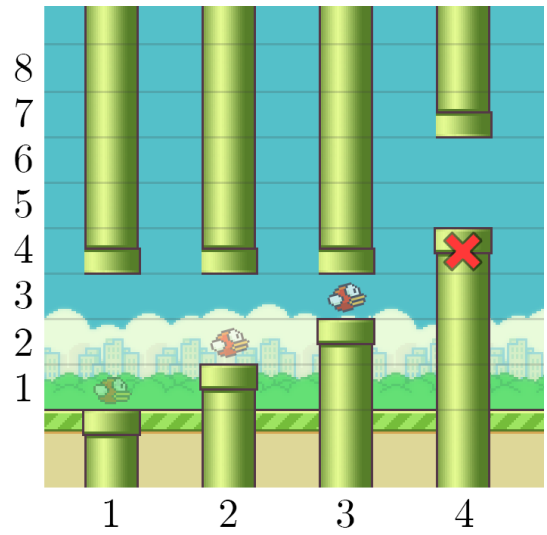
Given T levels, each one containing N intervals of heights $[L_i, R_i]$ in which the bird can be for each horizontal position i ($1 \leq i \leq N$) of a level, determine if it is possible to pass each level. If yes, present an example sequence A of bird heights. (See the Input Format section for more information on how these values will be provided)

Example

If we have $N = 4$, $L = [1, 2, 3, 4]$ and $R = [3, 3, 3, 5]$, one possible sequence of heights for the bird would be $A = [1, 2, 3, 4]$, as illustrated by the following figure:



If on the other hand we have $\boldsymbol{N} = 4$, $\boldsymbol{L} = [1, 2, 3, 5]$ and $\boldsymbol{R} = [3, 3, 3, 6]$, it is impossible to pass the level. The following figure illustrates an incorrect try:



Constraints

The following limits are guaranteed for all test cases of this part that will be given to the program:

$1 \leq \boldsymbol{T} \leq 10$	Number of levels to consider
$1 \leq \boldsymbol{N} \leq 5 \cdot 10^4$	Number of horizontal positions of the level
$1 \leq \boldsymbol{L}_i \leq \boldsymbol{R}_i \leq 10^9$	Allowed interval heights

It is guaranteed that the sum of the positions $\boldsymbol{N}$ of all the $\boldsymbol{T}$ levels does exceed $5 \cdot 10^4$.

The test cases of this part of the problem are organized into two groups with different additional constraints:

Subtask	Points	Additional Constraints
1	15	$\boldsymbol{N} \leq 6$ and $\boldsymbol{R}_i \leq 50$
2	35	No further restrictions

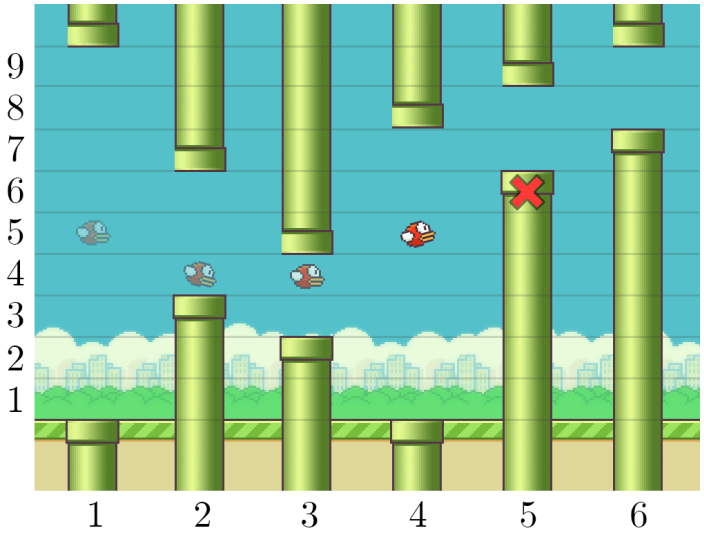
Part II

On the second part of the problem, the game development is already finished and therefore we will consider games in which at each second the player can choose if the bird will remain at the same height, if it will go up one unit or go down one unit. This means that the bird heights of two consecutive positions can differ by, at most, 1 unit.

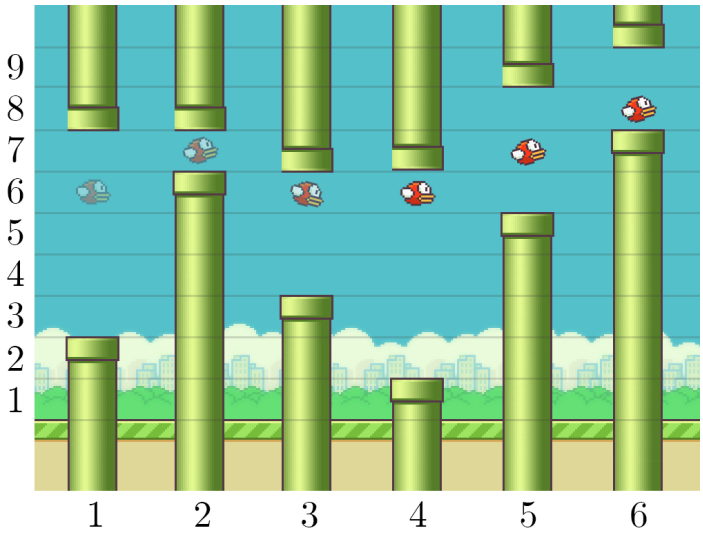
Again, give the height intervals $[\boldsymbol{L}_i, \boldsymbol{R}_i]$ in which the birds can be at each horizontal position i ($1 \leq i \leq \boldsymbol{N}$) of a level, determine if it is possible to beat the level. If yes, present an example sequence $\boldsymbol{A}$ of bird heights.

Example

If we have $\boldsymbol{N} = 6$, $\boldsymbol{L} = [1, 4, 3, 1, 7, 8]$ and $\boldsymbol{R} = [9, 6, 4, 7, 8, 9]$, it is impossible to pass the level. The following figure illustrates an incorrect try:



If on the other hand we have $\boldsymbol{N} = 6$, $\boldsymbol{L} = [3, 7, 4, 2, 6, 8]$ and $\boldsymbol{R} = [7, 7, 6, 6, 8, 9]$, a possible sequence of bird heights would be $\boldsymbol{A} = [6, 7, 6, 6, 7, 8]$, as illustrated by the following figure:



Constraints

The following limits are guaranteed for all test cases of this part that will be given to the program:

$1 \leq \boldsymbol{T} \leq 10$	Number of levels to consider
$1 \leq \boldsymbol{N} \leq 5 \cdot 10^4$	Number of horizontal positions of the level
$1 \leq \boldsymbol{L}_i \leq \boldsymbol{R}_i \leq 10^9$	Allowed interval heights

It is guaranteed that the sum of the positions $\boldsymbol{N}$ of all the $\boldsymbol{T}$ levels does exceed $5 \cdot 10^4$.

The test cases of this part of the problem are organized into two groups with different additional constraints:

Subtask	Points	Additional Constraints
3	15	$\boldsymbol{N} \leq 6$ e $\boldsymbol{R}_i \leq 50$
4	35	No further restrictions

Summary of Subtasks

The test cases for the problem are organized into four groups with different additional restrictions:

Subtask	Points	Part	Additional Constraints
1	15	Part I	$\boldsymbol{N} \leq 6$ e $\boldsymbol{R}_i \leq 50$
2	35	Part I	No further restrictions
3	15	Part II	$\boldsymbol{N} \leq 6$ e $\boldsymbol{R}_i \leq 50$
4	35	Part II	No further restrictions

Input Format

The first line contains an integer $\boldsymbol{P}$, which represents the part that the test case represents. If it is 1, then the test case refers to Part I, if it is 2 then it refers to Part II.

This is followed by a line with an integer $\boldsymbol{T}$, representing the number of levels to test.

Finally, $\boldsymbol{T}$ sets of lines follow indicating the number $\boldsymbol{N}$ of positions of a level and $\boldsymbol{N}$ interval weights $[\boldsymbol{L}_i, \boldsymbol{R}_i]$ of integer heights allowed in each position, respecting the following format:

$\boldsymbol{N}$
$\boldsymbol{L}_1$ $\boldsymbol{R}_1$
...
$\boldsymbol{L_N}$ $\boldsymbol{R_N}$

It is guaranteed that the sum of the positions $\boldsymbol{N}$ of all the $\boldsymbol{T}$ levels does exceed $5 \cdot 10^4$.

Output Format

The output should contain $\boldsymbol{T}$ sets of lines, each one referring to a level, by the order in which they appeared in the input.

Each set should start with the word "`SIM`" or "`NAO`" (without any quotations marks or accents), indicating if it is possible or not to pass that level.

If yes, an additional line should follow with $\boldsymbol{N}$ integers separated by a space corresponding to a possible sequence $\boldsymbol{A}$ of bird heights for that level. Note that there might be several correct sequences; you only need to print one of them.

Notice: there must be exactly one single space between each integer and there should be no space at the end of the line (that is, after the last integer there should only be a line break). If this format is not respected, the result of a submission will be `Presentation Error` (see the instructions for more information).

Example 1 Input

```
1
2
4
1 3
2 3
3 3
4 5
4
1 3
2 3
3 3
5 6
```

Example 1 Output

```
SIM
1 2 3 4
NAO
```

Example 1 Description

This example corresponds to the example mentioned in Part I of the problem statement.

Note that there might be several correct sequences; you only need to print one of them.

Example 2 Input

```
2
2
6
1 9
4 6
3 4
1 7
7 8
8 9
6
3 7
7 7
4 6
2 6
6 8
8 9
```

Example 2 Output

```
NAO
SIM
6 7 6 6 7 8
```

Example 2 Description

This example corresponds to the example mentioned in Part II of the problem statement.

Note that there might be several correct sequences; you only need to print one of them.