Problem A
Anticlockwise Motion
Time limit: 1 second

You have come up with an idea for a board game. The game is played on a board that is made up of $32\,001 \times 32\,001$ numbered squares. The centre square contains the number 1 and the other numbers are arranged in an anticlockwise spiral outwards (first moving downwards, then to the right, then upwards, then to the left, then downwards again, and so on). Figure A.1 displays the 5×5 squares in the middle of the board and Figure A.2 displays the 21×21 squares in the middle of the board for further clarification. When playing the game, players will only be able to move up, left, down and right. To help work out the rules for the game, you would like to know the shortest distance between two squares on the board using only these moves.

21	**20**	**19**	**18**	**17**
22	**7**	**6**	**5**	**16**
23	**8**	**1**	**4**	**15**
24	**9**	**2**	**3**	**14**
25	**10**	**11**	**12**	**13**

Figure A.1: The middle 25 squares.

Input

The input consists of a single line containing two integers a ($1 \leq a \leq 10^9$), which is the starting square, and b ($1 \leq b \leq 10^9$), which is the ending square.

Output

Display the shortest distance between a and b.

Sample Input 1

```
12 2
```

Sample Output 1

```
2
```

Sample Input 2

```
16 24
```

Sample Output 2

```
6
```

Problem B
Balloon Warehouse
Time limit: 7 seconds

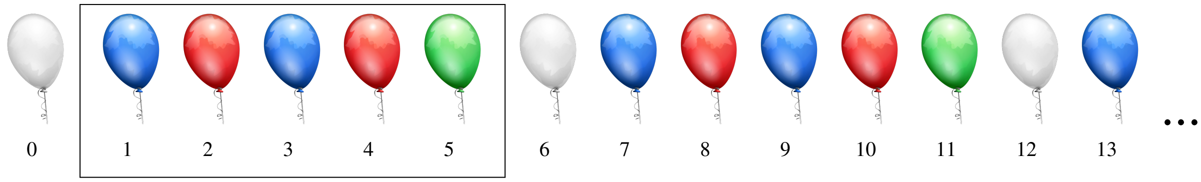


Figure B.1: An infinitely long line of balloons

Darcy has taken over management of a balloon warehouse. Unfortunately, it stocks an infinite supply of balloons, so he has requested your help! At the start of today, the warehouse consists of an infinitely long line of white balloons. In this problem, we describe a coloured balloon by an integer whose value uniquely represents a particular colour, so initially (taking 0 to mean a white balloon) the contents of the line is given by

$$0 \quad 0 \quad 0 \quad \ldots$$

Specific balloons are identified by their 0-indexed position in the line starting from the front of the line $(0, 1, 2, \ldots)$.

Throughout the day, Darcy receives n deliveries of balloons from his supplier. The ith delivery consists of an infinite number of balloons of colour y and comes with the instruction (x, y). If there are any balloons of colour x in the line, then he should insert exactly one balloon of colour y into his infinitely long line immediately after each balloon of colour x already present in the line. Otherwise, he will send the balloons of colour y back.

After all the deliveries of the day are completed, Darcy receives one final instruction from his supplier to check if he has properly followed the instructions he was given: what colour are all the balloons in the positions between l (inclusive) and r (exclusive) in the line? You should help Darcy answer this question.

Consider an example day with four deliveries $(0, 1), (1, 3), (0, 1), (1, 2)$ (for example, it may be that 1 means a blue balloon, 2 means a red balloon and 3 means a green balloon; 0 is white as above). At the end of the day, Darcy's line resembles the line of balloons in Figure B.1; we describe it by

$$0 \quad 1 \quad 2 \quad 1 \quad 2 \quad 3 \quad 0 \quad 1 \quad \ldots$$

If he is asked for $\ell = 1$ and $r = 6$, he should report the numbers `1 2 1 2 3` corresponding to blue, red, blue, red and green balloons in those positions in order.

Input

The first line of the input contains three integers n ($1 \leq n \leq 200\,000$), which is the number of deliveries, ℓ and r ($0 \leq \ell < r \leq 10^6$ and $r - \ell \leq 100\,000$), which are the positions between which to report the balloons' colours at the end of the day.

The next n lines describe the deliveries. Each of these lines contain two distinct integers x ($0 \leq x < 200\,000$) and y ($0 \leq y < 200\,000$), which is the instruction for this delivery.

Output

Display the colours of the balloons between positions ℓ (inclusive) and r (exclusive).

Sample Input 1

```
4 1 6
0 1
1 3
0 1
1 2
```

Sample Output 1

```
1 2 1 2 3
```

Sample Input 2

```
1 101000 101008
0 1
```

Sample Output 2

```
0 1 0 1 0 1 0 1
```

Problem C
Just Terraffic!
Time limit: 3 seconds

The local council is recording traffic flow using a pressure pad laid across the road. The pressure pad tracks whenever the wheels on an axle of a vehicle cross the pressure pad. The only vehicles using the road are cars with two axles. Each vehicle may or may not have a single-axle trailer attached to it. When a car crosses the pressure pad, two times are recorded: one when the front wheels cross and another when the rear wheels cross. If the car is towing a trailer an additional time is recorded when the trailer wheels cross. Given a sequence of times from the recorder, the council wishes to know how many cars without trailers crossed the pad and how many cars with trailers crossed it.

Obviously, there is some ambiguity. For example, a sequence of 6 recordings could be three cars without trailers or two cars with trailers. To reduce such ambiguity, we will make the following two assumptions:

1. Any two successive times with a difference less than or equal to 1000 ms must belong to the same vehicle.
2. Any two successive times with a difference greater than or equal to 2000 ms must be from different vehicles.

Given a sequence of times, determine the number of cars with and without a trailer.

Input

The first line of the input contains a single integer n ($1 \leq n \leq 300\,000$), which is the number of times the pressure pad was triggered. The second line contains n distinct integers $t_1, \ldots, t_n$ ($0 \leq t_i < 2^{30}$) in increasing order, the times that the pressure pad was triggered. The times are in milliseconds.

Output

Display the number of cars with and without trailers. If the number of cars of each type can be uniquely determined, then display two lines of the form

```
Cars without trailers: X
Cars with trailers: Y
```

If there is no interpretation of the times that is consistent with the assumptions, then display `Impossible`. If there are multiple interpretations of the times that give different numbers of cars with and without trailers, then display `Ambiguous`.

Sample Input 1	Sample Output 1
7 10 200 5000 6100 7200 8300 9400	Cars without trailers: 2 Cars with trailers: 1

Sample Input 2	Sample Output 2
6 0 1100 2200 3300 4400 5500	Ambiguous

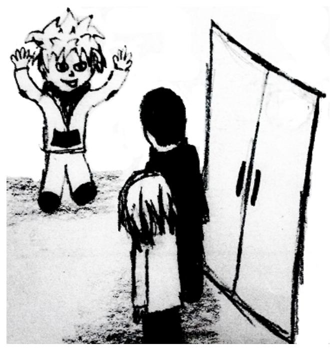
Sample Input 3	Sample Output 3
4 0 1000 2000 3001	Impossible

D. Arpa's overnight party and Mehrdad's silent entering

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Note that girls in Arpa's land are really attractive.

Arpa loves overnight parties. In the middle of one of these parties Mehrdad suddenly appeared. He saw n pairs of friends sitting around a table. i-th pair consisted of a boy, sitting on the a_i-th chair, and his girlfriend, sitting on the b_i-th chair. The chairs were numbered 1 through $2n$ in clockwise direction. There was exactly one person sitting on each chair.



There were two types of food: Kooft and Zahre-mar. Now Mehrdad wonders, was there any way to serve food for the guests such that:

- Each person had exactly one type of food,
- No boy had the same type of food as his girlfriend,
- Among any three guests sitting on consecutive chairs, there was two of them who had different type of food. Note that chairs $2n$ and 1 are considered consecutive.

Find the answer for the Mehrdad question. If it was possible, find some arrangement of food types that satisfies the conditions.

Input

The first line contains an integer n ($1 \le n \le 10^5$) — the number of pairs of guests.

The i-th of the next n lines contains a pair of integers a_i and b_i ($1 \le a_i, b_i \le 2n$) — the number of chair on which the boy in the i-th pair was sitting and the number of chair on which his girlfriend was sitting. It's guaranteed that there was exactly one person sitting on each chair.

Output

If there is no solution, print `-1`.

Otherwise print n lines, the i-th of them should contain two integers which represent the type of food for the i-th pair. The first integer in the line is the type of food the boy had, and the second integer is the type of food the girl had. If someone had Kooft, print 1, otherwise print 2.

If there are multiple solutions, print any of them.

Example

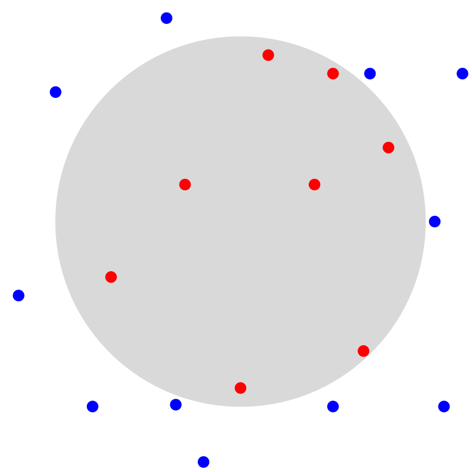
input

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

output

```
1 2
2 1
1 2
```

Problem E
Dendroctonus
Time limit: 8 seconds



Mountain pine beetles (*Dendroctonus ponderosae*) are small pests that bore into trees and cause a huge amount of damage. Recently, a large increase in their population has occurred and scientists would like some more information about the origin of the outbreak(s). In particular, they want to know if there was a single outbreak or multiple outbreaks. If there is more than one outbreak, then they must raise the alert level.

For each outbreak, the beetles start at a single location (known as the *initial infection point*) and slowly work their way outwards. If a tree is inside the infection area, then it is infected. If a tree is outside of the infection area, then it is not infected. If a tree is on the boundary of the infection area, then it may or may not be infected. The infection area is always a circle centred at the initial infection point.

Given the locations of the infected and non-infected trees, the scientists need you to determine if there is enough evidence to raise the alert level.

Input

The first line of the input contains a single integer n ($1 \leq n \leq 100$), which is the number of trees.

The next n lines describe the trees. Each of these lines contains two integers x ($-250 \leq x \leq 250$) and y ($-250 \leq y \leq 250$), which is the location of the tree, as well as a single character p (`I` or `N`), denoting if the tree is infected or not. If p is `I`, then the tree is infected. If p is `N`, then the tree is not infected. Trees are single points on the plane. Note that the initial infection point for an outbreak does not need to be a tree and does not have to be at an integer location. The n trees are at distinct locations.

Output

If it is guaranteed that there is more than one outbreak, display `Yes`. Otherwise, display `No`.

Sample Input 1

```
7
0 0 I
1 0 I
0 1 I
4 4 N
4 -4 N
-4 4 N
-4 -4 N
```

Sample Output 1

```
No
```