Problem A. Nimbers

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

You are given a directed acyclic graph. Find a Nimber (Grundy function) for each vertex.

Input

The first line contains two integers n, m: the number of vertices and edges in the graph ($1 \le n, m \le 100\,000$). Each of the next m lines contains two integers x, y ($1 \le x, y \le n$).

Note that the given graph may contain multiple edges.

Output

Print n integers: the values of Grundy functions for all starting vertices.

Examples

standard input	standard output
3 3 1 2 2 3 1 3	2 1 0
2 1 2 1	0 1

Problem B. Retrograde analysis

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

You are given directed graph of n vertices and m edges. Alice and Bob play a game. Initially vertex i contains a token. On each turn a player can move the token using on of the outcoming edges. The player, which can't make move, loses.

For every vertex i determine, who wins if both players play optimally.

Input

Input consists of one or more testcases. Every testcase contains description of directed graph. Graph is described as follows.

First line contains two integers n ($1 \le n \le 300\,000$) and m ($1 \le m \le 300\,000$). Next m lines contain edges of the graph, each one is described by two integers from 1 to n — starting and ending vertices of an edge. Graph can contain loops and multiple edges.

The sum of n over all testcases in an input doesn't exceed 300 000.

The sum of m over all testcases in an input doesn't exceed 300 000.

Output

For each testcase output n lines. For each vertex i output `FIRST`, `SECOND` or `DRAW`, depending on who wins, if both players play optimally starting the game from vertex i.

Output an empty line after each testcase.

Example

standard input	standard output
5 5 1 2 2 3 3 1 1 4 4 5 2 1 1 2 4 4 1 2 2 3 3 1 1 4	DRAW DRAW DRAW FIRST SECOND FIRST SECOND FIRST FIRST SECOND SECOND

Problem C. A Shooting Problem

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

Schtirlitz and Mueller are shooting targets. There are n targets in a shooting range. Every shot successfully strikes and breaks one of the targets not yet broken. But, if there is a target with all neighboring targets broken, it falls down and breaks too.

They play a game taking turns shooting. The one that cannot make a move, loses. Schtirlitz shoots first. Find the winner of this game assuming optimal play. Additionally, if Schtirlitz wins, find all possible first moves leading to his victory.

Input

The input file contains a single integer n ($2 \leqslant n \leqslant 5\,000$) — the number of targets.

Output

If Mueller wins, print the only word `Mueller`. Otherwise, print `Schtirlitz` in the first line. In the following lines print all possible numbers of targets that Schtirlitz can break in his first move and still win. Print numbers in an increasing order.

Examples

standard input	standard output
3	Schtirlitz 2
4	Mueller

Problem D. Enormous Nim

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	64 megabytes

Petya and Vasya play the Nim game, but this time, it's enormous. They just have too many piles of stones: all their piles are divided into n groups. The i-th group contains piles of sizes from l_i to r_i inclusive.

Help Petya and Vasya determine who wins assuming optimal play.

Input

The first line of the input contains integer n ($1 \le n \le 10^5$), next n lines contain two integers l_i and r_i each ($1 \le l_i \le r_i \le 10^{18}$).

Output

If the first player wins, print `Lose`. If the first player wins — print `Win` in the first line and print any first winning move for the first player. The move is described by two integers, the size of the pile before and after the move was made.

Examples

standard input	standard output
1 1 10	Win 8 3
2 2 5 2 5	Lose

Problem E. Stone Division

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 megabytes

There is a pile with n stones on the table. There is also a set S of m distinct integers $\{a_0, \ldots, a_{m-1}\}$. Two players make turns splitting one of the piles on the table into k piles of equal size if it is possible and if $k \in S$. If a player can't make any valid turn, he loses the game. Determine, which player wins a game if both of them play optimally.

Input

The first line contains two integers n and m denoting the size of the initial pile and the size of the set.

The second line contains m distinct integers a_i.

Constraints

$1 \le n \le 10^{18}$

$1 \le m \le 10$

$2 \le a_i \le 10^{18}$

Output

Output "First"if the first player wins the game and "Second"otherwise.

Example

standard input	standard output
15 3 5 2 3	Second

Note

If the first player splits a pile into 5 piles of size 3, in the next 5 turns players will split these piles. So the first player will lose after 6 turns.

If the first player splits a pile into 3 piles of size 5, in the next 3 turns players will split these piles. So the first player will lose after 4 turns.

Thus, the second player wins the game.

Problem F. Game on Graph

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

Gennady and Georgiy are playing interesting game on a directed graph. The graph has n vertices and m arcs, loops are allowed. Gennady and Georgiy have a token placed in one of the graph vertices. Players take turns moving the token along one of the arcs that starts in the vertex the token is currently in. When there is no such arc, then this player loses the game.

For each initial position of the token and the player who is moving first, your task is to determine what kind of result the game is going to have. Does it seem to be easy? Not so much.

On one side, Gennady is having a lot of fun playing this game, so he wants to play as long as possible. He even prefers a strategy that leads to infinite game to a strategy that makes him a winner. But if he cannot make the game infinite, then he obviously prefers winning to losing.

On the other side, Georgiy has a lot of other work, so he does not want to play the game infinitely. Georgiy wants to win the game, but if he cannot win, then he prefers losing game to making it infinite.

Both players are playing optimally. Both players know preferences of the other player.

Input

In the first line there are two integers — the number of vertices n ($1 \le n \le 100\,000$) and the number of arcs m ($1 \le m \le 200\,000$). In the next m lines there are two integers a and b on each line, denoting an arc from vertex a to vertex b. Vertices are numbered from 1 to n. Each (a, b) tuple appears at most once.

Output

In the first line print n characters — i-th character should denote the result of the game if Gennady starts in vertex i. In the second line print n characters — i-th character should denote the result of the game if Georgiy starts in vertex i. The result of the game is denoted by "`W`" if the starting player wins the game, "`L`" if the starting player loses the game, and "`D`" (draw) if the game runs infinitely.

Example

standard input	standard output
6 7 1 2 2 1 2 3 1 4 4 1 4 5 5 6	WDLDWL DWLLWL

Note

In vertices 3 and 6 the game is already lost. In vertex 5, the only move is to vertex 6, and the player wins. If Georgiy starts in vertex 1, or Gennady in vertices 2 or 4, Gennady can always go to vertex 1, and make the game infinite. If Georgiy starts in vertex 4, he can either go to vertex 1 (which leads to a draw) or to vertex 5, which leads to losing. Georgiy prefers the latter. Similarly, from vertex 2, he prefers to go to 3 and win. From vertex 1, Gennady can go to vertex 2 and lose, or go to vertex 4 and win. He prefers the latter.