Codeforces Round #220 (Div. 2)

A. Inna and Pink Pony

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

Dima and Inna are doing so great! At the moment, Inna is sitting on the magic lawn playing with a pink pony. Dima wanted to play too. He brought an $n \times m$ chessboard, a very tasty candy and two numbers a and b.

Dima put the chessboard in front of Inna and placed the candy in position (i, j) on the board. The boy said he would give the candy if it reaches one of the corner cells of the board. He's got one more condition. There can only be actions of the following types:

- move the candy from position (x, y) on the board to position $(x - a, y - b)$;
- move the candy from position (x, y) on the board to position $(x + a, y - b)$;
- move the candy from position (x, y) on the board to position $(x - a, y + b)$;
- move the candy from position (x, y) on the board to position $(x + a, y + b)$.

Naturally, Dima doesn't allow to move the candy beyond the chessboard borders.

Inna and the pony started shifting the candy around the board. They wonder what is the minimum number of allowed actions that they need to perform to move the candy from the initial position (i, j) to one of the chessboard corners. Help them cope with the task!

Input

The first line of the input contains six integers n, m, i, j, a, b ($1 \le n, m \le 10^6$; $1 \le i \le n$; $1 \le j \le m$; $1 \le a, b \le 10^6$).

You can assume that the chessboard rows are numbered from 1 to n from top to bottom and the columns are numbered from 1 to m from left to right. Position (i, j) in the statement is a chessboard cell on the intersection of the i-th row and the j-th column. You can consider that the corners are: $(1, m)$, $(n, 1)$, (n, m), $(1, 1)$.

Output

In a single line print a single integer — the minimum number of moves needed to get the candy.

If Inna and the pony cannot get the candy playing by Dima's rules, print on a single line "`Poor Inna and pony!`" without the quotes.

Examples

input
5 7 1 3 2 2
output
2

input
5 5 2 3 1 1
output
Poor Inna and pony!

Note

Note to sample 1:

Inna and the pony can move the candy to position $(1 + 2, 3 + 2) = (3, 5)$, from there they can move it to positions $(3 - 2, 5 + 2) = (1, 7)$ and $(3 + 2, 5 + 2) = (5, 7)$. These positions correspond to the corner squares of the chess board. Thus, the answer to the test sample equals two.

B. Inna and Nine

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

Inna loves digit 9 very much. That's why she asked Dima to write a small number consisting of nines. But Dima must have misunderstood her and he wrote a very large number a, consisting of digits from 1 to 9.

Inna wants to slightly alter the number Dima wrote so that in the end the number contained as many digits nine as possible. In one move, Inna can choose two adjacent digits in a number which sum equals 9 and replace them by a single digit 9.

For instance, Inna can alter number 14545181 like this: $14545181 \to 1945181 \to 194519 \to 19919$. Also, she can use this method to transform number 14545181 into number 19991. Inna will not transform it into 149591 as she can get numbers 19919 and 19991 which contain more digits nine.

Dima is a programmer so he wants to find out how many distinct numbers containing as many digits nine as possible Inna can get from the written number. Help him with this challenging task.

Input

The first line of the input contains integer a ($1 \le a \le 10^{100000}$). Number a doesn't have any zeroes.

Output

In a single line print a single integer — the answer to the problem. It is guaranteed that the answer to the problem doesn't exceed $2^{63} - 1$.

Please, do not use the `%lld` specifier to read or write 64-bit integers in C++. It is preferred to use the `cin`, `cout` streams or the `%I64d` specifier.

Examples

input
369727
output
2

input
123456789987654321
output
1

input
1
output
1

Note

Notes to the samples

In the first sample Inna can get the following numbers: $369727 \to 99727 \to 9997$, $369727 \to 99727 \to 9979$.

In the second sample, Inna can act like this:
$123456789987654321 \to 12396789987654321 \to 1239678998769321$.

C. Inna and Dima

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

Inna and Dima bought a table of size $n \times m$ in the shop. Each cell of the table contains a single letter: "D", "I", "M", "A".

Inna loves Dima, so she wants to go through his name as many times as possible as she moves through the table. For that, Inna acts as follows:

1. initially, Inna chooses some cell of the table where letter "D" is written;
2. then Inna can move to some side-adjacent table cell that contains letter "I"; then from this cell she can go to one of the side-adjacent table cells that contains the written letter "M"; then she can go to a side-adjacent cell that contains letter "A". Then Inna assumes that she has gone through her sweetheart's name;
3. Inna's next move can be going to one of the side-adjacent table cells that contains letter "D" and then walk on through name DIMA in the similar manner. Inna never skips a letter. So, from the letter "D" she always goes to the letter "I", from the letter "I" she always goes the to letter "M", from the letter "M" she always goes to the letter "A", and from the letter "A" she always goes to the letter "D".

Depending on the choice of the initial table cell, Inna can go through name DIMA either an infinite number of times or some positive finite number of times or she can't go through his name once. Help Inna find out what maximum number of times she can go through name DIMA.

Input

The first line of the input contains two integers n and m ($1 \le n, m \le 10^3$).

Then follow n lines that describe Inna and Dima's table. Each line contains m characters. Each character is one of the following four characters: "D", "I", "M", "A".

Note that it is not guaranteed that the table contains at least one letter "D".

Output

If Inna cannot go through name DIMA once, print on a single line "Poor Dima!" without the quotes. If there is the infinite number of names DIMA Inna can go through, print "Poor Inna!" without the quotes. Otherwise print a single integer — the maximum number of times Inna can go through name DIMA.

Examples

input
1 2 DI
output
Poor Dima!

input
2 2 MA ID
output
Poor Inna!

input
5 5 DIMAD DIMAI DIMAM DDMAA AAMID
output
4

Note

Notes to the samples:

In the first test sample, Inna cannot go through name DIMA a single time.

In the second test sample, Inna can go through the infinite number of words DIMA. For that, she should move in the clockwise direction starting from the lower right corner.

In the third test sample the best strategy is to start from the cell in the upper left corner of the table. Starting from this cell, Inna can go through name DIMA four times.

D. Inna and Sequence

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Dima's spent much time thinking what present to give to Inna and gave her an empty sequence w. Now they want to fill sequence w with numbers zero and one. For that, they decided to play an amusing game.

Before the game begins, Dima chooses m integers $a_1, a_2, \ldots, a_m$ $(1 \le a_1 < a_2 < \ldots < a_m)$. Then Inna and Dima start playing, that is, adding numbers to sequence w. Each new number they choose is added to the end of the sequence. At some moments of time Dima feels that the game is going to end too soon (and he wants to play with Inna as long as possible), so he hits a table hard with his fist. At that the a_1-th, a_2-th, a_3-th, $\ldots$, a_k-th numbers from the beginning simultaneously fall out of the sequence (the sequence gets k numbers less). Here k is such maximum number that value a_k doesn't exceed the current length of the sequence. If number a_1 is larger than the current length of w, then nothing falls out of the sequence.

You are given the chronological sequence of events in the game. Each event is either adding a number to the end of sequence w or Dima's hit on the table. Calculate the sequence w after all these events happen.

Input

The first line of the input contains two integers n and m $(1 \le n, m \le 10^6)$ showing how many events took place and how many numbers Dima chose.

The next line contains m distinct integers a_i $(1 \le a_i \le 10^6)$ sorted in the increasing order.

Next n lines describe the events in the chronological order. Each line contains a single integer: -1, 0 or 1. Number -1 means that Dima hits the table. Number 0 means that Inna and Dima add number 0 to the end of the sequence. Number 1 means that Inna and Dima add number 1 to the end of the sequence.

Output

In a single line print a sequence of numbers 0 and 1 — the elements of the sequence after all events happen. Print the elements of the sequence in the order from the beginning to the end of the sequence.

If after all events the sequence ends up **empty**, print "`Poor stack!`".

Examples

input
10 3 1 3 6 -1 1 1 0 0 -1 0 1 -1 1
output
011

input
2 1 1 1 -1
output
Poor stack!

E. Inna and Babies

time limit per test: 6 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Inna, Dima and Sereja are in one room together. It's cold outside, so Sereja suggested to play a board game called "Babies".

The babies playing board is an infinite plane containing n blue babies and m red ones. Each baby is a segment that grows in time. At time moment t the blue baby (x, y) is a blue segment with ends at points $(x - t, y + t)$, $(x + t, y - t)$. Similarly, at time t the red baby (x, y) is a red segment with ends at points $(x + t, y + t)$, $(x - t, y - t)$ of the plane. Initially, at time $t = 0$ all babies are points on the plane.

The goal of the game is to find the first integer moment of time when the plane contains a rectangle of a non-zero area which sides are fully covered by some babies. A side may be covered by multiple babies. More formally, each point of each side of the rectangle should be covered by at least one baby of any color. At that, you must assume that the babies are closed segments, that is, they contain their endpoints.

You are given the positions of all babies — help Inna and Dima to find the required moment of time.

Input

The first line of the input contains two integers n and m $(1 \le n, m \le 2000)$.

Next n lines contain the coordinates of the blue babies. The i-th line contains integers x_i, y_i — a baby's coordinates. Next m lines contain the coordinates of m red babies in the similar form.

All coordinates of the input don't exceed 10^6 in their absolute value. Note that all babies stand in distinct points.

Output

In the single line print a single integer — the answer to the problem.

If the rectangle never appears on the plane, print "`Poor Sereja!`" without the quotes.

Examples

input
2 2 2 2 5 5 3 7 5 1
output
3

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