Codeforces Round #260 (Div. 2)

A. Laptops

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

One day Dima and Alex had an argument about the price and quality of laptops. Dima thinks that the more expensive a laptop is, the better it is. Alex disagrees. Alex thinks that there are two laptops, such that the price of the first laptop is less (strictly smaller) than the price of the second laptop but the quality of the first laptop is higher (strictly greater) than the quality of the second laptop.

Please, check the guess of Alex. You are given descriptions of n laptops. Determine whether two described above laptops exist.

Input

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

Next n lines contain two integers each, a_i and b_i $(1 \leq a_i, b_i \leq n)$, where a_i is the price of the i-th laptop, and b_i is the number that represents the quality of the i-th laptop (the larger the number is, the higher is the quality).

All a_i are distinct. All b_i are distinct.

Output

If Alex is correct, print "`Happy Alex`", otherwise print "`Poor Alex`" (without the quotes).

Sample test(s)

input
2 1 2 2 1
output
Happy Alex

B. Fedya and Maths

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

Fedya studies in a gymnasium. Fedya's maths hometask is to calculate the following expression:

$$(1^n + 2^n + 3^n + 4^n) \ mod \ 5$$

for given value of n. Fedya managed to complete the task. Can you? Note that given number n can be extremely large (e.g. it can exceed any integer type of your programming language).

Input

The single line contains a single integer n ($0 \le n \le 10^{10^5}$). The number doesn't contain any leading zeroes.

Output

Print the value of the expression without leading zeros.

Sample test(s)

input
4
output
4

input
124356983594583453458888889
output
0

Note

Operation $x \ mod \ y$ means taking remainder after division x by y.

Note to the first sample:

$$(1^4 + 2^4 + 3^4 + 4^4) \mod 5 = (1 + 16 + 81 + 256) \mod 5 = 354 \mod 5 = 4$$

C. Boredom

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

Alex doesn't like boredom. That's why whenever he gets bored, he comes up with games. One long winter evening he came up with a game and decided to play it.

Given a sequence a consisting of n integers. The player can make several steps. In a single step he can choose an element of the sequence (let's denote it a_k) and delete it, at that all elements equal to $a_k + 1$ and $a_k - 1$ also must be deleted from the sequence. That step brings a_k points to the player.

Alex is a perfectionist, so he decided to get as many points as possible. Help him.

Input

The first line contains integer n ($1 \le n \le 10^5$) that shows how many numbers are in Alex's sequence.

The second line contains n integers $a_1, a_2, ..., a_n$ ($1 \le a_i \le 10^5$).

Output

Print a single integer — the maximum number of points that Alex can earn.

Sample test(s)

input
2 1 2

output
2

input
3 1 2 3

output
4

input
9 1 2 1 3 2 2 2 2 3

output
10

Note

Consider the third test example. At first step we need to choose any element equal to 2. After that step our sequence looks like this $[2, 2, 2, 2]$. Then we do 4 steps, on each step we choose any element equals to 2. In total we earn 10 points.

D. A Lot of Games

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

Andrew, Fedor and Alex are inventive guys. Now they invent the game with strings for two players.

Given a group of n non-empty strings. During the game two players build the word together, initially the word is empty. The players move in turns. On his step player must add a single letter in the end of the word, the resulting word must be prefix of at least one string from the group. A player loses if he cannot move.

Andrew and Alex decided to play this game k times. The player who is the loser of the i-th game makes the first move in the $(i+1)$-th game. Guys decided that the winner of all games is the player who wins the last (k-th) game. Andrew and Alex already started the game. Fedor wants to know who wins the game if both players will play optimally. Help him.

Input

The first line contains two integers, n and k ($1 \le n \le 10^5$; $1 \le k \le 10^9$).

Each of the next n lines contains a single non-empty string from the given group. The total length of all strings from the group doesn't exceed 10^5. Each string of the group consists only of lowercase English letters.

Output

If the player who moves first wins, print "`First`", otherwise print "`Second`" (without the quotes).

Sample test(s)

input
2 3 a b
output
First

input
3 1 a b c
output
First

input
1 2 ab
output
Second

E. Civilization

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

Andrew plays a game called "Civilization". Dima helps him.

The game has n cities and m bidirectional roads. The cities are numbered from 1 to n. Between any pair of cities there either is a single (unique) path, or there is no path at all. A path is such a sequence of distinct cities $v_1, v_2, \ldots, v_k$, that there is a road between any contiguous cities v_i and v_{i+1} ($1 \le i < k$). The length of the described path equals to $(k - 1)$. We assume that two cities lie in the same region if and only if, there is a path connecting these two cities.

During the game events of two types take place:

1. Andrew asks Dima about the length of the longest path in the region where city x lies.
2. Andrew asks Dima to merge the region where city x lies with the region where city y lies. If the cities lie in the same region, then no merging is needed. Otherwise, you need to merge the regions as follows: choose a city from the first region, a city from the second region and connect them by a road so as to minimize the length of the longest path in the resulting region. If there are multiple ways to do so, you are allowed to choose any of them.

Dima finds it hard to execute Andrew's queries, so he asks you to help him. Help Dima.

Input

The first line contains three integers n, m, q ($1 \le n \le 3 \cdot 10^5$; $0 \le m < n$; $1 \le q \le 3 \cdot 10^5$) — the number of cities, the number of the roads we already have and the number of queries, correspondingly.

Each of the following m lines contains two integers, a_i and b_i ($a_i \ne b_i$; $1 \le a_i, b_i \le n$). These numbers represent the road between cities a_i and b_i. There can be at most one road between two cities.

Each of the following q lines contains one of the two events in the following format:

- $1\ x_i$. It is the request Andrew gives to Dima to find the length of the maximum path in the region that contains city x_i ($1 \le x_i \le n$).
- $2\ x_i\ y_i$. It is the request Andrew gives to Dima to merge the region that contains city x_i and the region that contains city y_i ($1 \le x_i, y_i \le n$). Note, that x_i can be equal to y_i.

Output

For each event of the first type print the answer on a separate line.

Sample test(s)

input
6 0 6 2 1 2 2 3 4 2 5 6 2 3 2 2 5 3 1 1

output
4