Overview

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Problem	**factor**	**poproom**	**hotel**
Source	factor.java factor.py factor.c factor.cpp factor.pas factor.hs	poproom.java poproom.py poproom.c poproom.cpp poproom.pas poproom.hs	hotel.java hotel.py hotel.c hotel.cpp hotel.pas hotel.hs
Input file	stdin	stdin	stdin
Output file	stdout	stdout	stdout
Time limit	1 second	1 second	1 second
Number of tests	10	10	10
Points per test	10	10	10
Detailed feedback	Yes	No	No
Total points	**100**	**100**	**100**

The maximum total score is 300 points.

Quadratic factorisation

Timothy Stranex

Introduction

A quadratic polynomial has the form $ax^2 + bx + c$ where a, b and c are numbers. Some examples are $x^2 + 5x + 6$ and $2x^2 - 8x + 8$. Some quadratics can be factorised into the form $p(x - q)(x - r)$ where p, q and r are numbers and $q \le r$. For example, $x^2 + 5x + 6 = (x + 3)(x + 2)$ and $2x^2 - 8x + 8 = 2(x - 2)(x - 2)$. In this problem the numbers a, b, c, p, q and r will all be integers.

Task

Your task is to write a program that will input a quadratic polynomial and factorise it if possible. Note that if it cannot be factorised so that p, q and r are integers, we consider it to be non-factorisable.

Example

For example, $3x^2 - 3x - 6$ is a quadratic polynomial with $a = 3$, $b = -3$ and $c = -6$. This can be factorised into $3(x + 1)(x - 2)$ which has $p = 3$, $q = -1$, $r = 2$ with $q \le r$.

On the other hand, neither $2x^2 - 3x - 2$ nor $x^2 + x + 1$ can be factorised.

Input (stdin)

The input consists of a single line containing three space-separated integers a, b and c. This defines the quadratic polynomial $ax^2 + bx + c$.

Sample input

```
3 -3 -6
```

Output (stdout)

If the quadratic polynomial can be factorised, the output is a single line containing three space-separated integers p, q and r. These are the numbers in the factorised form $p(x - q)(x - r)$ where $q \le r$. If it cannot be factorised, the output is a single line containing 0 0 0.

Sample output

```
3 -1 2
```

Constraints

- $-1\,000 \le a, b, c \le 1\,000$
- $a \ne 0$
- $-1\,000 \le p, q, r \le 1\,000$

Time limit

1 second. Python: 10 seconds.

Detailed feedback

Detailed feedback is enabled for this problem.

Scoring

For each test case, a correct answer will score 100% while an incorrect answer will score 0%.

Fawlty Tower's Finest Room

Ben Steenhuisen and Marco Gallotta

Introduction

The "Most Popular Hotel" competition is under way in Torquay and Basil wants to enter Fawlty Towers. While filling in the application form he realised how difficult it was to determine the most popular room. He has therefore requested your assistance.

Task

Basil will supply you with the history of which room each of his guests have stayed in over the past year. He has decided that a good measure of popularity would be the number of times a room was occupied by a guest during the year. Your task is to determine which room is the most popular using this measure. It is guaranteed that there will never be any ties.

Example

Fawlty Towers has had a most disappointing year, with only five guests staying. They occupied rooms 211, 113, 193, 111 and 113 respectively. Room 113 was occupied twice and is therefore considered the most popular.

Input (stdin)

The first line contains a single integer N, the number of guests. The next N lines each contain a single integer R_i, the room number of the ith guest who stayed in during their visit.

Sample input

```
5
211
113
193
111
113
```

Output (stdout)

Output a single integer, the most frequently used room.

Sample output

```
113
```

Constraints

- $1 \leq N \leq 1\,000\,000$
- $1 \leq R_i < 1\,000\,000$ for all i

Time limit

1 second. Python: 10 seconds.

Scoring

A correct solution will score 100% while an incorrect solution will score 0%.

Hotel

Ben Steenhuisen and Richard Baxter

Introduction

The hotel inspectors have returned! This time they are checking whether too many people have stayed at Fawlty Towers recently. Help Basil prove that Fawlty Towers has not been overcrowded by finding the maximum number of people that have stayed at the hotel on any given day.

Task

Basil has only recorded the check-in and check-out days for each guest. He never kept daily totals of the number of guests in his hotel. He needs to know the number of people that were in his hotel when it was at its fullest. Guests are considered at the hotel on the day of arrival and up until **and including** the day of departure.

The days are numbered from 0 onwards $(0, 1, 2, \ldots)$ and there were no guests in the hotel at the beginning of day 0. Manuel is at reception and he can only handle one departure or arrival per day, so there wil be at most one check-in or check-out on any day.

Example

The hotel has 4 guests in its records. Below are the check-in and check out dates:

Guest	Check-in day	Check-out day
1	2	10
2	7	23
3	9	11
4	3	5

According to the above arrival and departure times the hotel was at it's fullest on day 9, as there were three guests in the hotel on that day.

Input (stdin)

The first line has a single integer N, the number of guests. The next N lines each contain two space-separated integers, the arrival day followed by the departure day of a guest.

Sample input

```
4
2 10
7 23
9 11
3 5
```

Output (stdout)

Sample output

```
3
```

Constraints

- $1 \le N \le 50\,000$

  Additionally, in 50% of the test cases:

- $N \le 5\,000$

Time limit

1 second. Python: 10 seconds.

Scoring

A correct solution will score 100%, while an incorrect solution will score 0%