

# Indian National Olympiad in Informatics, 2008

**Time:** 3 hours

19 January, 2008

## Instructions

- (a) You will have to return this question paper at the end of the examination with relevant parts filled out.
- (b) There are two questions. You have to write working programs in Pascal, C or C++ to solve each of these questions.
  - *Only your source code will be submitted for evaluation. Your program will be recompiled and run on the evaluation computer.*
  - *Make sure your C/C++ programs compile with the GNU C compiler (**djgpp**, under Windows). Programs written using Turbo C++ may not compile and run in the evaluation environment and may hence lose marks.*
- (c) At the end of each question, there is a space to indicate the location of the source code file for your solution. Please fill up this information without fail. Otherwise, your solution cannot be evaluated.
- (d) All input for your programs will come from the keyboard. All output from your programs should be written to the screen.
- (e) Please fill out your contact details on the reverse of this page as completely as you can. Use your serial number as reported in the ZIO results page as your roll number for INOI. Ask your centre supervisor if you do not know your roll number.
- (f) At the beginning of each program, include a comment with your name, roll number and the problem number. For instance, if your name is Sachin Tendulkar, your roll number is 107 and the problem you are writing a C/C++ program for Problem 1, add a comment of the form

```
/* Sachin Tendulkar, 107, Problem 1 */
```

at the top of your file.

*This will help us if files accidentally get mixed up when being sent from the exam centres to the evaluation centre.*

...P.T.O.

Contact details	
Roll Number:	
Name:	
Home Address:	
	PIN Code
Phone Number(s): (with STD code)	
Email address:	

## Question 1 Cultural Programme

The Siruseri Welfare Association has organized a Cultural Programme for families in the area, to build up community spirit. The Cultural Programme is being held at the Siruseri Community Hall. Inside the hall, children perform songs and dances. Outside, local restaurants have set up stalls selling snacks.

As is typical on such an occasion, members of the audience drift in and out of the hall during the programme. An observant office bearer of the Siruseri Welfare Association notes down the times at which people enter and leave the hall. At the end of the day, he wonders what the maximum size of the audience was during the course of the programme.

For convenience, he writes down each time as a single integer, the number of minutes from the start of the programme. Also, the door of the hall is narrow, so at any time, either one person can enter or one person can leave the hall, but not both. Thus, each entry and exit time that is noted down is distinct.

For example, suppose the observations noted down are the following. Each line denotes the entry time and exit time of one person. (The identity of the person is not important—the same person may enter and leave the hall many times. For instance, in the example below, it might well be that the entries and exits recorded at Serial Nos 2 and 5 refer to the same person.)

Serial No	Enters at	Leaves at
1	1	7
2	2	4
3	6	9
4	3	8
5	5	10

In this example, the maximum size of the audience during the programme was 4. This was achieved between time 6 and 7.

Your task is to read the list of entry and exit times and compute the maximum size of the audience during the programme.

### Input format

The first line of input is a single integer,  $N$ , the number of entries and exits recorded. This is followed by  $N$  lines of input. Each of these lines consists of two integers, separated by a space, describing one entry and exit. The first integer is the entry time and the second integer is the exit time.

### Output format

A single integer, denoting the maximum size of the audience during the performance.

### Test data

For all inputs,  $1 \leq N \leq 10^5$ . In 70% of the cases,  $N \leq 5000$ . The entry and exit times for each person are in the range  $\{0, 1, \dots, 10^7\}$ . All entry and exit times are guaranteed to be distinct. For each person, the entry time is guaranteed to be strictly before the exit time.

### Example

#### Sample input

```
5
1 7
2 4
6 9
3 8
5 10
```

#### Sample output

```
4
```

**Note:** Your program should not print anything other than what is specified in the output format. Please remove all diagnostic print statements before making your final submission. A program with extraneous output will be treated as incorrect!

---

---

### Important

Indicate the location of the source code file for your solution to Question 1 in the box below.  
*If you fail to do this, your solution cannot be evaluated!*

**Source file:**

## Question 2 Domino Solitaire

In Domino Solitaire, you have a grid with two rows and many columns. Each square in the grid contains an integer. You are given a supply of rectangular  $2 \times 1$  tiles, each of which exactly covers two adjacent squares of the grid. You have to place tiles to cover all the squares in the grid such that each tile covers two squares and no pair of tiles overlap.

The score for a tile is the difference between the bigger and the smaller number that are covered by the tile. The aim of the game is to maximize the sum of the scores of all the tiles.

Here is an example of a grid, along with two different tilings and their scores.

	<i>Tiling 1</i>	<i>Tiling 2</i>
8	8	8
6	6	6
2	2	2
3	3	3
9	9	9
7	7	7
1	1	1
2	2	2
	<i>Score 12</i>	<i>Score 6</i>

The score for Tiling 1 is  $12 = (9 - 8) + (6 - 2) + (7 - 1) + (3 - 2)$  while the score for Tiling 2 is  $6 = (8 - 6) + (9 - 7) + (3 - 2) + (2 - 1)$ . There are other tilings possible for this grid, but you can check that Tiling 1 has the maximum score among all tilings.

Your task is to read the grid of numbers and compute the maximum score that can be achieved by any tiling of the grid.

### Input format

The first line contains one integer  $N$ , the number of columns in the grid. This is followed by 2 lines describing the grid. Each of these lines consists of  $N$  integers, separated by blanks.

### Output format

A single integer indicating the maximum score that can be achieved by any tiling of the given grid.

### Test data

For all inputs,  $1 \leq N \leq 10^5$ . Each integer in the grid is in the range  $\{0, 1, \dots, 10^4\}$ .

## Example

Here is the sample input and output corresponding to the example discussed above.

### Sample input

```
4
8 6 2 3
9 7 1 2
```

### Sample output

```
12
```

**Note:** Your program should not print anything other than what is specified in the output format. Please remove all diagnostic print statements before making your final submission. A program with extraneous output will be treated as incorrect!

---

---

## Important

Indicate the location of the source code file for your solution to Question 2 in the box below. *If you fail to do this, your solution cannot be evaluated!*

**Source file:**