

Data Structures and Algorithms Lab

03. Structures

Lab Code: 17ECSP201

Lab No: 03

Semester: III

Date: 24 Aug, 2017

Batch: C1

Theme: Life is a Fairly Complex Thing!

Objective: Operating on Structures and Problem Solving Skills

Vishwa has purchased his new house in a multi storied apartment and excited to move in. The house warming ceremony has been a successful event, witnessed amongst his friends and family. The only thing that now remains is 'moving in'!

Its weekend and his friends have gathered around. All his stuff and things have been packed, all ready to move to the new house. They used their cars and unloaded all the packed stuff in front of the new apartment.

The watchmen comes running giving not so good news – “Sir, the lift is under maintenance. You will have to take the steps!”

Vishwa and his friends helplessly look at each other's faces having no other option other than hand carrying all the boxes through the stairs.

Here are some facts:

- The stairway is narrow. It is so narrow that no two persons can pass each other on it.
- All of them have same walking speed. They all take 60 seconds (1 minute) to cover one floor regardless of whether they carry a packed box or not.

Considering that, this is what they all discussed and came up to conclusion:

- One with box in hand is always moving up
- One with empty hands is always moving down
- When two friends meet each other anywhere on stairway, one with box hands it over to one without box. It means the lower one will hand over to upper one.
- Once when exchange happens somewhere, lower one starts walking down and higher one walks up
- The box exchange is immediate and instant
- When one is back on ground floor, a new box is picked and walk towards up begins
- When one reaches the destination floor, box is dropped and walk towards down begins

After a certain point of time, all the friends are spread across the stairway, some of them with boxes in their hands and some without. There are still a number of boxes on the ground floor and Vishwa is wondering how much more time it will take before all the boxes are up.

Now your job is to help him find out how much time it will take.

Solving the Problem

Here are some details on how to solve the problem:

Input

This is how you will give your input:

First line with a positive integer: this will indicate the number of test cases.

Then for each test case,

Second line with three numbers N, F, B.

N is number of persons and $N \geq 1$.

F is number of floors in the apartment, 0 is the ground floor and F is Vishwa's apartment. $F \leq 999$.

B is number of boxes that are still on ground. $1 \leq B \leq 10000$.

Thirdly, N lines with two numbers in it. f_i and b_i . Each f_i is any number between 0 to F and this indicates where the each person is initially. Variable b_i is set to either 1 or 0 and this indicates if they have box in their hand or not. 1 means box and 0 means no box.

Output

Output has to be one line which indicates the number of minutes required to get all the remaining B boxes to the Floor F.

Here is a sample to make things more clear:

Sample Input

```
2
3 10 5
0 0
0 0
0 0
2 5 1
2 1
3 0
```

Sample Output

30

8

Approach:

- Understand the problem, clearly, along with input and output format and meaning
- Solve it by hand with analysis and then try to transfer them to C code
- Pack the relevant variables as member of a structure in the solution
 - You can first design a solution without structures and then pack them later with structure
- The minute wise solution display could be helpful as well

[Marks: 100]

**** May The Force Be With You ****