

Round 2 2010

[A. Elegant Diamond](#)

[B. World Cup 2010](#)

**C. Bacteria**

[D. Grazing Google Goats](#)

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Submissions

Elegant Diamond

4pt	Not attempted <b>540/1183 users</b> correct (46%)
8pt	Not attempted <b>472/531 users</b> correct (89%)

World Cup 2010

10pt	Not attempted <b>1456/1614 users</b> correct (90%)
15pt	Not attempted <b>848/972 users</b> correct (87%)

Bacteria

6pt	Not attempted <b>1655/1870 users</b> correct (89%)
25pt	Not attempted <b>60/294 users</b> correct (20%)

Grazing Google Goats

7pt	Not attempted <b>194/333 users</b> correct (58%)
25pt	Not attempted <b>2/11 users</b> correct (18%)

Top Scores

bmerry	75
ZhukovDmitry	75
winger	75
stgatilov	75
Progbeat	75
pashka	75
halyavin	69
Zhuojie	68
wata	68
rng..58	68

Problem C. Bacteria

This contest is open for practice. You can try every problem as many times as you like, though we won't keep track of which problems you solve. Read the [Quick-Start Guide](#) to get started.

Small input  
6 points

Solve C-small

Large input  
25 points

Solve C-large

Problem

A number of bacteria lie on an infinite grid of cells, each bacterium in its own cell.

Each second, the following transformations occur (all simultaneously):

- 1. If a bacterium has no neighbor to its north and no neighbor to its west, then it will die.
- 2. If a cell has no bacterium in it, but there are bacteria in the neighboring cells to the north and to the west, then a new bacterium will be born in that cell.

Upon examining the grid, you note that there are a positive, finite number of bacteria in one or more rectangular regions of cells.

Determine how many seconds will pass before all the bacteria die.

Here is an example of a grid that starts with 6 cells containing bacteria, and takes 6 seconds for all the bacteria to die. '1's represent cells with bacteria, and '0's represent cells without bacteria.

000010
011100
010000
010000
000000
000000
001110
011000
010000
000000
000000
000110
001100
011000
000000
000000
000010
000110
000000
000000
000000
000000
000000
000010
000000
000000
000000
000000
000000
000000
000000

Input

The input consists of:

- One line containing **C**, the number of test cases.

Then for each test case:

- One line containing **R**, the number of rectangles of cells that initially contain bacteria.
- **R** lines containing four space-separated integers **X<sub>1</sub> Y<sub>1</sub> X<sub>2</sub> Y<sub>2</sub>**. This

indicates that all the cells with X coordinate between  $X_1$  and  $X_2$ , inclusive, and Y coordinate between  $Y_1$  and  $Y_2$ , inclusive, contain bacteria.

The rectangles may overlap.

North is in the direction of decreasing Y coordinate.  
West is in the direction of decreasing X coordinate.

### Output

For each test case, output one line containing "Case #N: T", where N is the case number (starting from 1), and T is the number of seconds until the bacteria all die.

### Limits

$1 \leq C \leq 100$ .

### Small dataset

$1 \leq R \leq 10$   
 $1 \leq X_1 \leq X_2 \leq 100$   
 $1 \leq Y_1 \leq Y_2 \leq 100$

### Large dataset

$1 \leq R \leq 1000$   
 $1 \leq X_1 \leq X_2 \leq 1000000$   
 $1 \leq Y_1 \leq Y_2 \leq 1000000$

The number of cells initially containing bacteria will be at most 1000000.

### Sample

Input	Output
1	Case #1: 6
3	
5 1 5 1	
2 2 4 2	
2 3 2 4	

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