

# IOI Training Camp 2011 – Final 2, 22 June, 2011

## Problem 1 Dilemma [Standard]

*Dilemma* is an ancient computer game played with a rectangular grid of numbers. You click on a cell in the grid and choose a direction—north, south, east or west. The computer will then draw a straight line from your current cell in the direction you have chosen, ending at the first cell in that direction whose value is smaller than the cell you started from.

You then click on the cell in which you have landed and again choose a direction—this could include the direction from which you just came. As before, the computer will generate a straight line in the chosen direction that ends in the first cell whose value is smaller than the cell you started from.

Of course, if there is no cell with a smaller value in the direction that you have chosen, you fall off the grid and the game ends.

Every cell you stop at is *visited* by you. Your aim is to visit as many cells as you can before you fall off the grid. You are allowed to begin the game from any cell on the grid.

For instance, suppose you play this game on the grid on the right. You can visit 8 cells as follows:  $(2, 3) \rightarrow (1, 3) \rightarrow (3, 3) \rightarrow (3, 2) \rightarrow (2, 2) \rightarrow (1, 2) \rightarrow (1, 4) \rightarrow (1, 1)$ . Now, whichever direction you choose, you will fall off the board. The maximum number of cells you can visit in this grid is 8.

1	5	50	2
42	12	60	55
31	22	46	15
8	4	78	43

### Input format

The first line of input contains two integers  $M$  and  $N$ , the number of rows and columns in the grid, respectively. Each of the next  $M$  lines contain  $N$  integers, describing the values in one row of the grid.

### Output format

A single integer denoting the maximum number of cells that can be visited in the grid while playing the game.

### Test Data

Let  $G(i, j)$  denote the value in the grid at row  $i$  and column  $j$ . In all subtasks, no two cells in the grid have the same value, and for all  $1 \leq i \leq M$  and  $1 \leq j \leq N$ ,  $1 \leq G(i, j) \leq 10^9$ .

- *Subtask 1 (15 marks):*  $1 \leq M, N \leq 300$ .
- *Subtask 2 (85 marks):*  $1 \leq M, N \leq 1500$ .

### Sample input

```
4 4
1 5 50 2
42 12 60 55
31 22 46 15
8 4 78 43
```

### Sample output

```
8
```

### Time and memory limits

The time limit for this task is 4 seconds. The memory limit is 256 MB.