

## ZCO 2015, Afternoon Session

### Problem 2 Rectangle

We have a rectangular region that is 100000 units along the  $X$ -axis and 500 units along the  $Y$ -axis.

We assume that the origin  $(0, 0)$  is at the bottom-left corner of this region, so that the top-left corner is at  $(0, 500)$ , the bottom-right at  $(100000, 0)$  and the top-right corner at  $(100000, 500)$ . We are also given the coordinates of a set of  $N$  points inside this region. The points have only integer coordinates and do not appear along the  $X$ -axis or  $Y$ -axis.

We would like to draw a rectangle, with its base on the  $X$ -axis, of maximum area within the region such that it does not contain any of the  $N$  points in its interior. More specifically, the points may appear on the boundary but cannot be properly inside the rectangle.

For example, if there are 5 points:  $(1, 4)$ ,  $(2, 3)$ ,  $(3, 2)$ ,  $(5, 1)$  and  $(5, 2)$ . Then the rectangle whose bottom-left and top-right corners are given by  $(0, 0)$  and  $(2, 3)$  is a possibility and its area is 6. Another possibility is the rectangle with bottom-left and top-right corners at  $(3, 0)$  and  $(5, 500)$  with area 1000. The rectangle with bottom-left at  $(2, 3)$  and top-right at  $(100000, 500)$  is not valid since its base does not lie on the  $X$ -axis. The largest rectangle that meets the requirements in this case is the one with its bottom-left corner at  $(5, 0)$  and top-right at  $(100000, 500)$  with area 49997500.

Your program should take a description of the  $N$  points and output the size of the maximum rectangle satisfying the above property that can be drawn within the  $100000 \times 500$  region.

### Input format

- The first line contains a single integer  $N$ , giving the number of points marked in the region.
- This is followed by  $N$  lines, each containing two integers separated by a space describing the coordinates of one point.

### Output format

Output a single integer giving the area of the largest rectangle that may be drawn with its base on the  $X$ -axis and which does not contain any of the given  $N$  points in its interior.

### Test data

In both subtasks, the  $X$ -coordinate of each of the  $N$  points is in the range 1 to 99999 inclusive, and the  $Y$ -coordinate of each of the  $N$  points is in the range 1 to 499 inclusive.

**Subtask 1 (40 Marks)**  $1 \leq N \leq 5000$ .

**Subtask 2 (60 Marks)**  $1 \leq N \leq 100000$ .

### Sample input

```
5
1 4
2 3
```

3 2  
5 1  
5 2

### Sample output

49997500

### Limits

- *Memory limit* : 256MB
- *Time limit* : 2s