Problem E
Maximum Rectangle Problem

Input File: *testdata.in*
Time Limit: 10 seconds

Problem Description

Maximum Rectangle Problem (MER) is a computational geometry problem, defined by N.L.H. (A. Naamad, D.T. Lee, and W.-L. Hsu), in their paper "on the maimum emprty rectangel problem", Discrete applied mathematics 8(1984), pp. 267-277, North-Holland. The MER problem is to find a maximum empty rectangle from a set of points confined in a given boundary, in which an empty rectangle is a rectangle placed inside the given boundary and containing no points inside the rectangle.

A formal definition of MER problem is as follows. Given a rectangle A, and set of n points $S = \{P_1, P_2, ..., P_n\}$, the objective of the MER problem is to find a empty rectangle(ER) with maximum area inside A. The rectangle $A = (A_t, A_b, A_l, A_r)$ is specified by A_t (top-boundary), A_b(bottom-boundary), A_l(left-boundary), and A_r(right boundary). Each point P_i in S is specified by its X- and Y-coordinates (X_i, Y_i). An empty rectangle(ER) is a rectangle inside A and containing no points in S lying in its interior. In other words, if $B = (B_t, B_b, B_l, B_r)$ is an empty rectangle regarding A and S, then

1. B is inside A. That is, $B_t \leq A_t$, $B_b \geq A_b$, $B_l \geq A_l$, and $B_r \leq A_r$;
2. no points in S lies in its interior. That is, no such a point $P_i = (x_i, y_i) \in S$, $B_l < x_i < B_r$ and $B_b < y_i < B_t$.

A maximum empty rectangle(MER) is an empty rectangle with maximal area, among all the possible empty rectangles with respect to A and S. For instance, let $A = (A_t, A_b, A_l, A_r) = (5, 0, 0, 5)$, and $S = \{P_1, P_2, P_3, P_4, P_5, P_6\} =$

$\{(1,1),(2,1),(2,3),(1,4),(4,5),(4,2)\}$, a possible maximum empty rectangle (MER) $B = (B_t, B_b, B_l, B_r) = (5,0,2,4)$. The area of the MER is $(B_t - B_b) * (B_r - B_l) = (5-0) * (4-2) = 5 * 2 = 10$. Note that there could exist multiple MERs with same area.

Given $A = (A_t, A_b, A_l, A_r)$, the boundary rectangle, and n points $S = \{P_1, P_2, ..., P_n\}$, can you rapidly determine a possible MER regarding A and S?

Technical Specifications

1. All the parameters to specify the rectangle boundary $A = (A_t, A_b, A_l, A_r)$ and the points $\{(x_i, y_i) | (x_i, y_i) \in S\}$, are all non-negative integer.

2. the rectangle boundary is bounded by $(0,0)$ at bottom-left corner, and $(1000, 1000)$ at top-right corner. That is, $0 \leq A_l \leq A_r \leq 1000$, and $0 \leq A_b \leq A_t \leq 1000$.

3. The number of points n in S would satisfy $1 \leq n \leq 1000$.

Input Format

1. The first line of the input file contains an integer indicating the number of test cases.

2. The first line of each test case contains four integers separated by spaces, indicating the rectangle boundary $A = (A_t, A_b, A_l, A_r)$, in the order of top, bottom, left and right boundary respectively.

3. The second line of each test case contains an integer indicating number of points in S to follow. Each point contains two integers x_i and y_i for the point P_i, separated by spaces.

Output Format

1. The first line of each test case contains an integer indicating the area of the MER you found.

2. The second line of each test case contains four integers separated by spaces, indicating the MER, $B = (B_t, B_b, B_l, B_r)$, you found.

Sample Input

```
1
5 0 0 5
6
1 1
2 1
2 3
1 4
4 5
4 2
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Sample Output

```
10
5 0 2 4
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