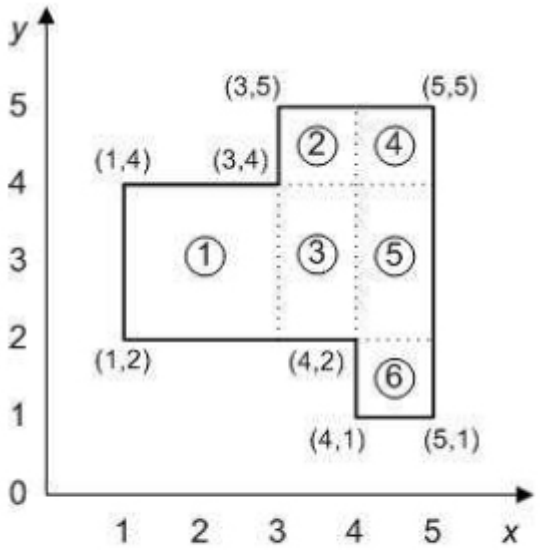
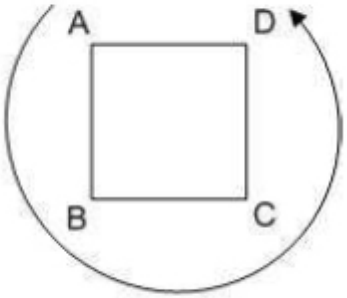
994 POP-Partitioning an Orthogonal Polygon

A *partition* of a polygon P is a decomposition of P in which the component subpolygons do not overlap except at their boundaries. The elements that are obtained by means of the partition of P are called pieces.

A polygon is called *orthogonal* if its edges meet at right angles. If each of the pieces of a partition are rectangular, then the partition is a *rectilinear partition*. A rectilinear partition of an orthogonal polygon can be obtained by extending each edge incident to a *reflex vertex* (the interior angle between its two incident vertices is at least π) of P through the interior of P until it hits the boundary of P (see Figure (a)).



(a)



(b)

Write a program that, given a sequence of vertices, determine the rectilinear partition of a simple orthogonal polygon without holes.

Input

The input file contains several test cases, each of them as described below.

The first line contains an integer N, $6 \leq N \leq 50$, which is the number of vertices in the orthogonal polygon. The following N lines contain two non-negative integers X and Y, $0 \leq X, Y \leq 20$, separated by a space. Each of the pairs (X, Y) specify the x-coordinate and the y-coordinate of a vertex. (See the **Sample Input**, which corresponds to the situation in the Figure (a) above.)

Output

For each test case, the output must follow the description below. The outputs of two consecutive cases will be separated by a blank line.

The output is the rectilinear partition of the polygon, where each set of four lines represent a rectilinear piece. The pieces must be listed from left to right and from top to bottom. The vertexes of each piece must be listed as indicated in Figure (b).

Sample Input

```
8
1 2
4 2
4 1
5 1
5 5
3 5
3 4
1 4
```

Sample Output

```
1 4
1 2
3 2
3 4
3 5
3 4
4 4
4 5
3 4
3 2
4 2
4 4
4 5
4 4
5 4
5 5
4 4
4 2
5 2
5 4
4 2
4 1
5 1
5 2
```