Datenstrukturen & Algorithmen   Programming Exercise 11   FS 13

In this exercise we are going to implement an algorithm that computes the convex hull of a given point set. Let $p_1, ..., p_n \in \mathbb{N}^2$ be points in the plane with integer coordinates and in general position (i.e., no three of them lie on a straight line). The goal is to compute the *convex hull*, defined as the smallest convex set containing all the n points. The following picture shows an example of a convex hull of a point set.
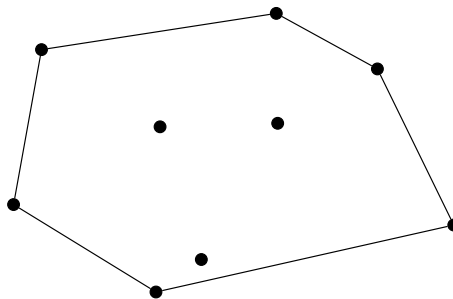
Input   The first line contains only the number t of test instances. After that, we have exactly one line per test instance. Every line contains the sequence $n, x_1, y_1, ..., x_n, y_n$. The number $n \in \mathbb{N}$, $3 \le n \le 1000$, describes the number of points in the set, and for every i, $1 \le i \le n$, the pair $x_i, y_i \in \mathbb{N}_0$, $0 \le x_i, y_i \le 1000$, defines the x- and the y-coordinate of the i-th point.

Output   For every test instance we output only one line. This line contains the list of the coordinates of the vertices of the convex hull in clockwise order, starting from the leftmost point. If two points in the list have the same x-coordinate, then we start from the one with the smallest y-coordinate.

Example

Input:

```
2
3 1 1 2 4 3 9
5 0 0 0 3 2 3 2 0 1 1
```

Output:

```
1 1 3 9 2 4
0 0 0 3 2 3 2 0
```

Hand-in: until Wednesday, 22nd May 2013.