There are n points in 2D space. You're to find a smallest enclosing rectangle of these points. By "smallest" we mean either area or perimeter (yes, you have to solve both problems. The optimal rectangle for these two problems might be different). Note that the sides of the rectangle might not be parallel to the coordinate axes.

Input

There will be at most 10 test cases in the input. Each test case begins with a single integer n ($3 \leq n \leq 100,000$), the number of points. Each of the following n lines contains two real numbers x, y ($-100,000 \leq x, y \leq 100,000$), the coordinates of the points. The points will not be collinear. The last test case is followed by a line with $n = 0$, which should not be processed.

Output

For each line, print the area of the minimum-area enclosing rectangle, and the perimeter of the minimum-perimeter enclosing rectangle, both rounded to two decimal places.

Sample Input

```
5
0 0
2 0
2 2
0 2
1 1
5
1 1
9 0
7 10
0 5
2 11
3
5 3
7 2
6 6
4
6 3
9 1
9 6
8 10
0
```

Sample Output

```
4.00 8.00
95.38 39.19
7.00 11.38
27.00 23.63
```