Code Jam 2009 - World Finals

Min Perimeter

Problem

You will be given a set of points with integer coordinates. You are asked to compute the smallest perimeter of a triangle with distinct vertexes from this set of points.

Input

The first line of the input data gives you the number of cases, **T**. **T** test cases follow. Each test case contains on the first line the integer **n**, the number of points in the set. **n** lines follow, each line containing two integer numbers $\mathbf{x_i}$, $\mathbf{y_i}$. These are the coordinates of the i-th point. There may not be more than one point at the same coordinates.

Output

For each test case, output:

`Case #X: Y`

where **X** is the number of the test case and Y is the minimum perimeter. Answers with a relative or absolute error of at most 10^{-5} will be considered correct. Degenerate triangles — triangles with zero area — are ok.

Limits

Memory limit: 1 GB.

1 <= **T** <= 15
0 <= $\mathbf{x_i}$, $\mathbf{y_i}$ <= 10^9

Small dataset

Time limit: 60 seconds.
3 <= **n** <= 10000

Large dataset

Time limit: 120 seconds.
3 <= **n** <= 1000000

Sample

Sample Input	Sample Output
1 10 0 0 1 1	Case #1: 5.656854

```
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
```