HW1 - The Destined One and His Stick

Time limit: 15 seconds
Memory limit: 256 megabytes
Last updated on: September 16, 2024

Problem Description

You are the Destined One. With your trusty stick (which, let's be honest, is just a fancy name for a glorified twig), you can defeat any foe in your path. From ferocious dragons to mildly annoyed cat, none have stood a chance against your impressive poking techniques.

Now, this stick isn't just any ordinary branch. It has been through countless adventures, and each scratch on its surface tells a tale of past victories. Some say it's imbued with ancient magic; others claim it just has really good balance for swinging. Regardless, it's never let you down.

This stick comes with a peculiar trait—it can change its length at will. Need a sword? It becomes one. Need a ladder? Done. However, this stick comes with a catch: the longer it grows, the harder it is to maneuver. Sure, it's impressive when it stretches to great lengths, but good luck trying to swing it without knocking over everything in your path. To avoid turning your epic journey into an awkward balancing act, you need to find the closest points around you.

By determining the shortest possible distance, your stick will extend just enough to be useful, without becoming a burden. Only then can you wield it with the precision and grace that a true hero like you deserves.

Figure 1: The Destined One

Input Format

The input consists of the following:

- The first line contains a single integer, T ($T \leq 10$), indicating the number of test cases.
- For each test case:
  - The first line contains an integer, n ($2 \leq n \leq 100,000$), which represents the number of points in the surrounding environment.
  - The next n lines each contain two real numbers, x_i and y_i ($-10,000 \leq x_i, y_i \leq 10,000$), denoting the positions of the i-th point as coordinates (x_i, y_i).
  - It is guaranteed that no two points share the same position, meaning that there are no i and j values such that $x_i = x_j$ and $y_i = y_j$.

Output Format

For each test case, you should output a single real number, which represents the distance between the two closest points. Your answer will be accepted if the absolute error or the relative error is less than 10^{-4}.

Sample Input

```
3
3
0 0
0 1
1 0
4
6 4
9 2
8 7
3 9
5
7.377359 3.113089
8.899004 4.047913
3.929112 9.695250
8.377879 7.799725
5.508218 2.498832
```

Sample Output

```
1.000000
3.605551
1.785861
```

Note

The distance between 2 points (x_1, y_1) and (x_2, y_2) is defined by $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$.

- $n \leq 100$ for 20% of test cases
- $n \leq 1,000$ for 40% of test cases
- $n \leq 10,000$ for 60% of test cases
- $n \leq 100,000$ for 100% of test cases