

Algorithms Lab

Exercise – *Antenna*

After the invention of radio, Theirland wants to demonstrate its technological superiority and builds a first radio transmitter. The transmitter must cover the whole population. It is characterized by a location and a transmission radius (within which a reception of the signal is guaranteed). Not surprisingly, transmitters with a higher radius require more advanced technology and more time to build and—last but not least—they cost much more. Thus, the government decided to find a location where the transmission radius is as small as possible, but every single citizen can receive the signal at home. This is not an easy goal to achieve, though...

Input The input contains several test cases. Each of them begins with a line containing one integer n ($1 \leq n \leq 200'000$), denoting the number of citizens. The next n lines contain coordinates x_i y_i of homes of citizens (x_i, y_i integral with $|x_i|, |y_i| < 2^{48}$). All numbers on a single line are separated by a single space. The input is terminated by a single line containing 0 (i.e., an empty testcase).

Output For each input, write on a single line the smallest integral transmission radius needed to cover all citizens.

Sample Input

```
2
1 7
31 -6
5
0 0
1 0
2 0
3 0
4 0
0
```

Sample Output

```
17
2
```