

## Algorithms Lab

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### 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
```