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# Algorithms Lab

## Exercise – *TheeV*

After a successful revolution in Theirland many things need to be reorganized. Until now, everything was centralized and often extremely inefficient. For instance, the local TV—called TheeV—had only one TV transmitter in the capital Their City. A transmitter broadcasts its signal within some disk around its position. As the transmission cost is proportional to the square of the transmission radius, it has become apparent that the cost of transmitting via a single antenna only is (too) high.

And this is exactly what you are hired for. Theirland accounted for some money in order to build one new transmitter, at some location to be chosen. The goal is to make the costs of running the transmitters as low as possible, given that all cities can receive the signal. There are $n$ important cities and one existing transmitter, specified as points in the plane (did we mention that Theirland is completely flat?). Theirland does even have an agreement with other countries that the transmitter can be placed on their soil—if necessary—so borders are not an issue. But for technical reasons both antennas must have the same radius of transmission. The transmission cost of one transmitter per day equals $r^2/2$, where $r$ is the transmission radius. Hence it costs exactly $r^2$ to operate two transmitters for one day. How much would the cheapest transmission with two transmitters cost per day?

**Input** The first line of the input contains the number $t \leq 60$ of test cases. Each of the following $t$ test cases is described as follows. It begins with a line containing one integer $n$ ($1 \leq n \leq 10,000$), denoting the number of cities. The next $n$ lines describe the position of these cities. Each location is defined by two integer coordinates `x y`, separated by a space and so that $|x|, |y| < 2^{25}$. The first city is Their City, which also denotes the position of the existing transmitter.

**Output** For each input, the output appears on a single and separate line. It denotes the total cost of the cheapest transmission with an added second antenna, rounded up to the nearest integer.

**Points** There are three test sets, giving 100 points in total.

1. For the first test set, worth 40 points, you may assume that there are at most 100 cities ($n \leq 100$).
2. For the second test set, worth 40 points, there are no additional assumptions.
3. For the third test set, which is hidden and worth 20 points, there are no additional assumptions.

Corresponding sample test sets are contained in `theevi.in/out`, for $i \in \{1, 2\}$.

**Sample Input**

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

**Sample Output**

```
0
1
```