

Problem 2 - ADA Farm (Programming) (15 points + Bonus 3 points)

Problem Description

Have you ever heard of the ADA farm? It is a great place to visit with your friends (if any)!

The ADA farm is well-known for the enormous number of horses, and you will agree with this after reading the “Input” section. There are N horses in total on the ADA farm, where each horse lives in a different position. However, you noticed that some horses look lonely. After observing them for a while, you know that the horses often visit their friends during their free time. If other horses are really far away, then visiting them becomes time-consuming and tiring so that the horse will be upset.

The way horses move is really unusual. If you consider the ADA farm as a 2-dimensional space, then a horse at coordinate (x, y) has 2 options to move:

1. The well-known way: the horse can spend 2 seconds and jump to one of $\{(x+2, y+1), (x+2, y-1), (x+1, y-2), (x-1, y-2), (x-2, y-1), (x-2, y+1), (x-1, y+2), (x+1, y+2)\}$, like the normal horses.
2. The unusual way: the horse can spend 1 second and walk to one of $\{(x+1, y), (x, y+1), (x-1, y), (x, y-1)\}$, just like a soldier! It's really unbelievable, isn't it?

We assign numbers for these horses from 1 to N with the i -th horse h_i living at a position (x_i, y_i) . Then we can define a *loneliness value* L for each horse h :

$$L(h) = \sum_{i=1}^n d(h, h_i),$$

where $d(a, b)$ is the minimum time cost between the position of the horse a and the horse b . That is, the loneliness of a horse is the sum of the minimum time needed for it to move from its home to another horse's home.

In order to know more about the horses, can you find the loneliness value of each of N horses in the ADA farm?

Input

The first line of the input file contains an integer N , indicating the number of horses in the ADA farm.

For the next N lines, the i -th line contains 2 integers x_i, y_i , indicating the position of i -th horse in the ADA farm.

- $2 \leq N \leq 100,000$
- $0 \leq x_i, y_i \leq 1,000,000$

Subtask 1 (70 %)

- $N = 2$

Subtask 2 (30 %)

- $N \leq 1000$

Subtask 3 (Bonus, 20%) (Very Difficult!)

- no other constraints.

Output

Please output N lines, where the i -th line contains an integer indicating the loneliness of i -th horse.

Sample Input 1

```
2
0 0
1 2
```

Sample Input 2

```
3
0 0
3 3
4 3
```

Sample Output 1

```
2
2
```

Sample Output 2

```
9
5
6
```