

Closest distance

[English](#)

[Vietnamese](#)

The manhattan distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is defined as following:

$$D(A, B) = |x_1 - x_2| + |y_1 - y_2|$$

Given N points A_1, A_2, \dots, A_N , for each point A_i you need to calculate the minimum $D(A_i, A_j)$ ($j \neq i$).

Input

- The first line contains a positive integer N ($1 \leq N \leq 200000$).
- The i -th line of the next N lines contains two integers x and y which are co-ordinates of the i -th point ($0 \leq x, y \leq 10^7$).

Output

- Print N lines, in which the i -th line contains the minimum distance for the i -th point.

Example

Input:

```
4
0 0
0 1
1 0
1 1
```

Output:

```
1
1
1
1
```