Problem K – Kitten Greetings

Catarina loves all cats that live in her neighborhood. Her lifelong dream is to design a large cat-seeing circuit, so that every day she can go out and greet the cats while doing some exercise.

Catarina's neighborhood can be represented as the 2D plane, with the North-South direction aligned with the y-axis. A cat-seeing circuit that visits m cats consists of exactly m steps. Catarina chooses a starting position (x_0, y_0) and faces one of the four cardinal directions. For each step $i = 1, 2, \ldots, m$ the following occurs:

- Catarina chooses a value $k_i > 0$ and walks k_i units from (x_{i-1}, y_{i-1}) straight ahead in her current direction, stopping at the location of a cat that she has not greeted during any previous step.
- Catarina greets the cat, taking some time to appreciate its beauty.
- Without turning around, Catarina walks another k_i units straight ahead in her current direction, stopping at a position (x_i, y_i).
- Catarina turns 90° either clockwise or counterclockwise, facing again one of the four cardinal directions.

After completing all m steps, Catarina must be back to her starting position (x_0, y_0), facing her initial direction. Notice that the length of the cat-seeing circuit is $\sum_{i=1}^{m} 2k_i$. When $m = 0$, the cat-seeing circuit has length 0.

Catarina knows the location of the N cats that live in her neighborhood. Surprisingly, no two cats have the same x-coordinate or the same y-coordinate. Your task is to determine the maximum length that a cat-seeing circuit can have.

Input

The first line contains an integer N ($1 \leq N \leq 4000$) indicating the number of cats.

Each of the next N lines describes a cat with two integers X and Y ($-10^8 \leq X, Y \leq 10^8$), representing that the cat has coordinates (X, Y).

No two cats have the same x-coordinate or y-coordinate (they differ in both of them).

Output

Output a single line with an integer indicating the maximum length that a cat-seeing circuit can have.

Sample Input 1	Sample Output 1
5 1 2 2 1 0 0 -1 -2 -2 -1	0

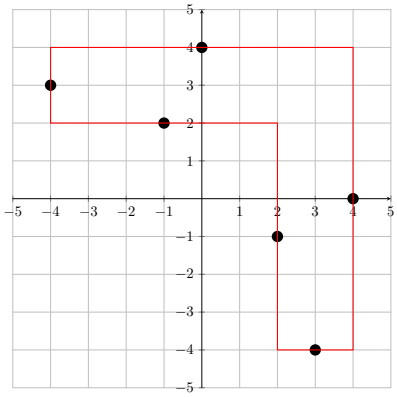
Explanation of Sample 1:

In this case there is a circuit of length 16 that visits all the cats, but it is not a cat-seeing circuit because the cat at coordinates $(0, 0)$ is greeted twice.

Sample Input 2	Sample Output 2
6 4 0 0 4 2 -1 -1 2 -4 3 3 -4	32

Explanation of Sample 2:

The picture below shows the location of the cats with small circles, together with a maximum-length cat-seeing circuit that visits all of them. The length of the circuit is 32.



Sample Input 3	Sample Output 3
7 2 1 0 -1 5 5 3 0 4 4 6 2 1 -2	24

Explanation of Sample 3:

It is possible to visit $m = 6$ of the $N = 7$ cats with a cat-seeing circuit of length 24.