Bus Terminals

PROBLEM

Yong-In city plans to build a bus network with N bus stops. Each bus stop is at a street corner. Yong-In is a modern city, so its map is a grid of square blocks of equal size. Two of these bus stops are to be selected as hubs H_1 and H_2. The hubs will be connected to each other by ~~an~~ a direct ~~express~~ bus line and each of the remaining $N − 2$ bus stops will be connected directly to either H_1 or H_2 (but not to both), but not to any other bus stop.

The distance between any two bus stops is the length of the shortest possible route following the streets. That is, if a bus stop is represented as (x, y) with x-coordinate x and y-coordinate y, then the distance between two bus stops (x_1, y_1) and (x_2, y_2) is $|x_1 − x_2| + |y_1 − y_2|$. If bus stops A and B are connected to the same hub H_1, then the length of the route from A to B is the sum of the distances from A to H_1 and from H_1 to B. If bus stops A and B are connected to different hubs, e.g., A to H_1 and B to H_2, then the length of the route from A to B is the sum of the distances from A to H_1, from H_1 to H_2, and from H_2 to B.

The planning authority of Yong-In city would like to make sure that every citizen can reach every point within the city as quickly as possible. Therefore, city planners want to choose two bus stops to be hubs in such a way that in the resulting bus network the length of the longest route between any two bus stops is as short as possible.

~~Your task is to write a program to compute the minimum length of any longest bus route between any two bus stops in Yong-In for all possible choices of two hubs.~~ One choice P of two hubs and assignments of bus stops to those hubs is better than another choice Q if the length of the longest bus route is shorter in P than in Q. Your task is to write a program to compute the length of this longest route for the best choice P.

INPUT

Your program is to read from standard input. The first line contains one positive integer N, $2 \le N \le 500$, the number of bus stops. Each of the remaining N lines contains the x-coordinate followed by the y-coordinate of a bus stop. The x- and y-coordinates are positive integers ≤ 5000. No two bus stops are at the same location.

OUTPUT

Your program is to write to standard output. The output contains one line with a single positive integer, the minimum length of the longest bus route for the input.

Task Description   **DAY-2**
IOI 2002
Yong-In   **Version BA**
Korea   **bus**

EXAMPLE INPUTS AND OUTPUTS

Example 1:   `input`

```
6
1 7
16 6
12 4
4 4
1 1
11 1
```

`output`

```
20
```

Example 2:   `input`

```
7
7 9
10 9
5 3
1 1
7 2
15 6
17 7
```
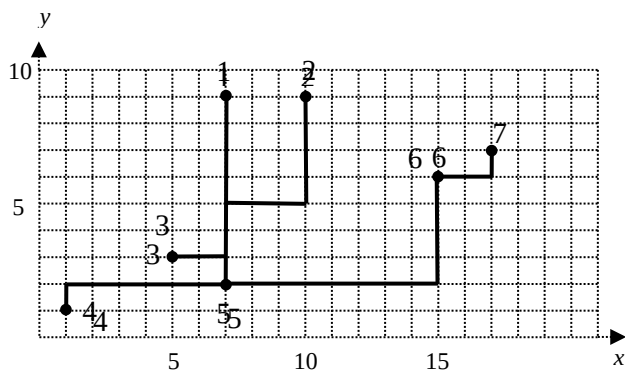
`output`

```
25
```

The following figures show the bus networks for the inputs given above. If in Example 1 bus stops 3 and 4 are selected as hubs then the longest route is either between bus stops 2 and 5 or between bus stops 2 and 1. There is no better choice for the hubs, and the answer is 20.

For the bus network in Example 2, if bus stops 5 and 6 are selected as hubs then the longest route is obtained between bus stops 2 and 7. There is no better choice for the hubs, and the answer is 25.
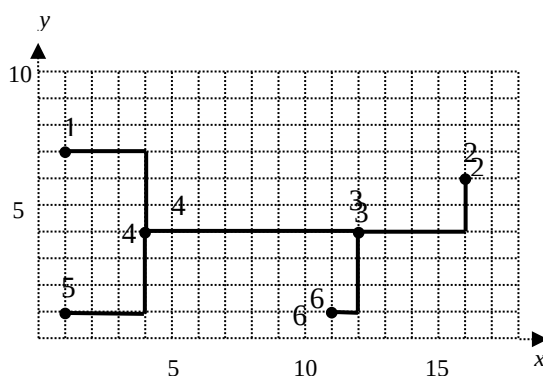
Bus network for Example 1   Bus network for Example 2

SCORING

If your program outputs the correct answer for a test case within the time limit, then you get full points for that test case, and otherwise you get 0 points for that case.