COCI '14 Contest 5 #3 Traktor

Time limit: 1.0s **Memory limit:** 32M

Mirko got a super cool new tractor for Christmas that can even pick mushrooms! The mushrooms grow on a square-shaped meadow that can be placed in a coordinate plane so that its lower left edge is located at $(1, 1)$ and its upper right edge at $(10^5, 10^5)$.

Initially, there are no mushrooms on the meadow, but in total N will grow in a way that each second exactly one new mushroom grows on an empty space on the meadow.

Economical Mirko wants to ride his tractor *only once* and pick at least K mushrooms. His ride begins at one of the points on the meadow and he can move only in directions parallel to its sides or diagonals. Mirko's tractor is super fast and **travels great distances in negligible time.** Because of the enormous speed, Mirko *can't make turns* during the ride.

Help Mirko and determine **the minimal number of seconds** after which he can pick the wanted number of mushrooms.

Input

The first line of input contains the integers N $(2 \leq N \leq 10^5)$ and K $(2 \leq K \leq N)$, the number of mushrooms that will grow and the number of mushrooms Mirko wants to pick.

Each of the following N lines contains two integers X_i and Y_i $(1 \leq X_i, Y_i \leq 10^5)$, the coordinates of the i^{th} mushroom grown on that meadow.

Output

The first and only line of output must contain the required minimal number of seconds. If Mirko can't pick K mushrooms in one ride, output `-1`.

Scoring

In test cases worth $50/110$ total points, it will hold $1 \leq X_i, Y_i \leq 300$.

Note that an additional batch of non-contest data worth 10 marks was added to break solutions the passed in-contest. The issue was noticed by jfiwe, and data were provided by **maxcruickshanks**.

Sample Input 1

```
4 3
1 2
3 4
3 2
4 5
```

Sample Output 1

```
4
```

Explanation for Sample Output 1

Mirko begins his ride at point $(1, 2)$ and moves towards the mushroom located at $(4, 5)$.

Sample Input 2

```
7 4
3 1
2 2
4 1
3 2
2 3
1 4
1 3
```

Sample Output 2

```
6
```

Sample Input 3

```
5 2
1 1
2 1
1 2
1 3
1 4
```

Sample Output 3

```
2
```