Problem J. Joy Of Sleep

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	1024 mebibytes

There are n chameleons residing in the *Chameleon Village* which can be viewed as a two-dimensional plane. The i-th chameleon is located at (x_i, y_i) and has color c_i.

Deep into the night, only the first chameleon is awake, while all the other chameleons are asleep.

Suddenly, an urgent issue has arisen for the n-th chameleon, thus it needs to be awakened. Physical contact is required to wake up a chameleon. Therefore, to wake up a chameleon, other chameleon must either walk to its location, or extend its tongue to touch it.

Chameleons can move in eight directions: up, down, left, right, or diagonally. Specifically, a chameleon at (x, y) can move to one of the following locations in one second: $(x-1, y-1)$, $(x-1, y)$, $(x-1, y+1)$, $(x, y-1)$, (x, y), $(x, y+1)$, $(x+1, y-1)$, $(x+1, y)$, or $(x+1, y+1)$.

Additionally, a chameleon can extend its tongue vertically or horizontally. In other words, a chameleon at (x, y) can extend its tongue to reach locations $(x+c, y)$ or $(x, y+c)$ for any (positive or negative) integer c. Extending the tongue takes no time. However, chameleons of the same color can barely see each other, making it challenging for them to aim, so they cannot extend the tongue towards each other.

When a tongue is extended, it doesn't matter if there are other chameleons along the path; only the chameleon located at the destination of the tongue is awakened, and other chameleons along the path are not disturbed. A chameleon may also walk through another chameleon's position without waking them up.

Since chameleons are sleepy, they immediately fall asleep at their current location after waking up another chameleon.

Determine the minimum number of seconds required to wake up the n-th chameleon.

Input

The first line of input contains two integers: the number of chameleons n and the number of different colors m ($2 \le n \le 10^5$; $1 \le m \le n$).

The i-th of the next n lines contains three integers: the initial coordinates x_i and y_i and the color c_i of the i-th chameleon ($-10^9 \le x_i, y_i \le 10^9$; $1 \le c_i \le m$). No two chameleons start at the same point. There is a chameleon of each of the m colors.

Output

Output the minimum time (in seconds) required to wake up the n-th chameleon.

Example

standard input	*standard output*
7 3 -5 0 1 -3 3 2 6 10000 2 5 3 3 3 -7 3 0 3 2 7 0 1	4

Note

The following is an explanation for the example. In the following way, it is possible to wake up the 7th chameleon in 4 seconds.

- The 1st chameleon wakes up the 2nd chameleon by first walking from $(-5, 0)$ to $(-3, 0)$ in 2 seconds, then extending its tongue to $(-3, 3)$.
- The 2nd chameleon wakes up the 4th chameleon by extending its tongue from $(-3, 3)$ to $(5, 3)$. The 6th chameleon is sleeping in the middle of the path, but it does not get disturbed.
- The 4th chameleon wakes up the 3rd chameleon by first walking from $(5, 3)$ to $(6, 4)$ in 1 second, then extending its tongue to $(6, 10000)$.
- The 3rd chameleon wakes up the 7th chameleon by walking from $(6, 10000)$ to $(7, 9999)$ in 1 second, then extending its tongue to $(7, 0)$.