Problem A. New Home

Time limit: 5 seconds
Memory limit: 1024 megabytes

Wu-Fu Street is an incredibly straight street that can be described as a one-dimensional number line, and each building's location on the street can be represented with just one number. Xiao-Ming the Time Traveler knows that there are n stores of k store-types that had opened, has opened, or will open on the street. The i-th store can be described with four integers: x_i, t_i, a_i, b_i, representing the store's location, the store's type, the year when it starts its business, and the year when it is closed.

Xiao-Ming the Time Traveler wants to choose a certain year and a certain location on Wu-Fu Street to live in. He has narrowed down his preference list to q location-year pairs. The i-th pair can be described with two integers: l_i, y_i, representing the location and the year of the pair. Now he wants to evaluate the life quality of these pairs. He defines the inconvenience index of a location-year pair to be the inaccessibility of the most inaccessible store-type of that pair. The inaccessibility of a location-year pair to store-type t is defined as the distance from the location to the nearest type-t store that is open in the year. We say the i-th store is open in the year y if $a_i \leq y \leq b_i$. Note that in some years, Wu-Fu Street may not have all the k store-types on it. In that case, the inconvenience index is defined as -1.

Your task is to help Xiao-Ming find out the inconvenience index of each location-year pair.

Input

The first line of input contains integer numbers n, k, and q: number of stores, number of types and number of queries ($1 \leq n, q \leq 3 \cdot 10^5$, $1 \leq k \leq n$).

Next n lines contain descriptions of stores. Each description is four integers: x_i, t_i, a_i, and b_i ($1 \leq x_i, a_i, b_i \leq 10^8$, $1 \leq t_i \leq k$, $a_i \leq b_i$).

Next q lines contain the queries. Each query is two integers: l_i, and y_i ($1 \leq l_i, y_i \leq 10^8$).

Output

Output q integers: for each query output its the inconvenience index.

Scoring

Subtask 1 (points: 5)

$n, q \leq 400$

Subtask 2 (points: 7)

$n, q \leq 6 \cdot 10^4$, $k \leq 400$

Subtask 3 (points: 10)

$n, q \leq 3 \cdot 10^5$, $a_i = 1$, $b_i = 10^8$ for all stores.

Subtask 4 (points: 23)

$n, q \leq 3 \cdot 10^5$, $a_i = 1$ for all stores.

Subtask 5 (points: 35)

$n, q \leq 6 \cdot 10^4$

Subtask 6 (points: 20)

$n, q \leq 3 \cdot 10^5$

Examples

input	output
4 2 4 3 1 1 10 9 2 2 4 7 2 5 7 4 1 8 10 5 3 5 6 5 9 1 10	4 2 -1 -1
2 1 3 1 1 1 4 1 1 2 6 1 3 1 5 1 7	0 0 -1
1 1 1 100000000 1 1 1 1 1	99999999

Note

In the first example there are four stores, two types, and four queries.

- First query: Xiao-Ming lives in location 5 in year 3. In this year, stores 1 and 2 are open, distance to store 1 is 2, distance to store 2 is 4. Maximum is 4.
- Second query: Xiao-Ming lives in location 5 in year 6. In this year, stores 1 and 3 are open, distance to store 1 is 2, distance to store 3 is 2. Maximum is 2.
- Third query: Xiao-Ming lives in location 5 in year 9. In this year, stores 1 and 4 are open, they both have type 1, so there is no store of type 2, inconvenience index is -1.
- Same situation in fourth query.

In the second example there are two stores, one type, and three queries. Both stores have location 1, and in all queries Xiao-Ming lives at location 1. In first two queries at least one of stores is open, so answer is 0, in third query both stores are closed, so answer is -1.

In the third example there is one store and one query. Distance between locations is 99999999.