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Railway Trip 2

IOI Railway Company is operating lines on a railway track. There are N stations in a straight line, numbered from 1 to N. For each i ($1 \leq i \leq N-1$), Station i and Station $i+1$ are connected directly by a railway track.

IOI Railway Company is operating M lines, numbered from 1 to M. In Line j ($1 \leq j \leq M$), the starting station is Station A_j, and the terminal station is Station B_j. A train stops at every station. Namely, if $A_j < B_j$ a train of Line j stops at Station A_j, Station $A_j + 1$, ..., Station B_j, in this order. If $A_j > B_j$, a train of Line j stops at Station A_j, Station $A_j - 1$, ..., Station B_j, in this order.

JOI-kun is a traveler. He has Q travel plans. In the k-th plan ($1 \leq k \leq Q$), he travels from Station S_k to Station T_k by taking lines.

However, JOI-kun is tired from a long journey. He wants to take a vacant train and get a seat. Thus, JOI-kun decided that he takes a train of a line at a station only if it is the K-th or earlier stop from the starting station of the line. In other words, if $A_j < B_j$, he can take a train of Line j only at Station A_j, Station $A_j + 1$, ..., Station $\min\{A_j + K - 1, B_j - 1\}$. If $A_j > B_j$, he can take a train of Line j only at Station A_j, Station $A_j - 1$, ..., Station $\max\{A_j - K + 1, B_j + 1\}$. JOI-kun will get out of the train at a station between the station next to where he takes the train and the terminal station, inclusive.

Under these conditions, JOI-kun wants to minimize the number of times of taking trains.

Given the information of the lines of IOI Railway Company and JOI-kun's plans, write a program which calculates, for each of JOI-kun's plans, the minimum number of times of taking trains needed for JOI-kun to achieve it.

Input

Read the following data from the standard input. Given values are all integers.

$N\ K$
M
$A_1\ B_1$
$A_2\ B_2$
$\vdots$
$A_M\ B_M$
Q
$S_1\ T_1$
$S_2\ T_2$
$\vdots$
$S_Q\ T_Q$

Output

Write Q lines to the standard output. The k-th line ($1 \leq k \leq Q$) should contain the minimum number of times of taking trains needed for JOI-kun to achieve the k-th plan. If it is not possible to achieve the k-th plan, output `-1`.

Constraints

- $2 \leq N \leq 100\,000$.
- $1 \leq K \leq N - 1$.
- $1 \leq M \leq 200\,000$.
- $1 \leq A_j \leq N$ $(1 \leq j \leq M)$.
- $1 \leq B_j \leq N$ $(1 \leq j \leq M)$.
- $A_j \neq B_j$ $(1 \leq j \leq M)$.
- $(A_j, B_j) \neq (A_k, B_k)$ $(1 \leq j < k \leq M)$.
- $1 \leq Q \leq 50\,000$.
- $1 \leq S_k \leq N$ $(1 \leq k \leq Q)$.
- $1 \leq T_k \leq N$ $(1 \leq k \leq Q)$.

- $S_k \neq T_k$ $(1 \leq k \leq Q)$.
- $(S_k, T_k) \neq (S_l, T_l)$ $(1 \leq k < l \leq Q)$.

Subtasks

1. (8 points) $N \leq 300$, $M \leq 300$, $Q \leq 300$.
2. (8 points) $N \leq 2\,000$, $M \leq 2\,000$, $Q \leq 2\,000$.
3. (11 points) $Q = 1$.
4. (25 points) $K = N - 1$.
5. (35 points) $A_j < B_j$ $(1 \leq j \leq M)$, $S_k < T_k$ $(1 \leq k \leq Q)$.
6. (13 points) No additional constraints.

Sample Input and Output

Sample Input 1	Sample Output 1
5 2 2 5 1 3 5 3 5 3 3 2 2 1	1 2 -1

In the first plan, JOI-kun travels from Station 5 to Station 3. For example, this plan is achieved if JOI-kun takes a train of Line 1 at Station 5, and get out of the train at Station 3. In total, JOI-kun will take one train. Since it is impossible to achieve the plan by taking less than one train, output 1 in the first line.

In the second plan, JOI-kun travels from Station 3 to Station 2. For example, this plan is achieved if JOI-kun takes a train of Line 2 at Station 3, get out of the train at Station 4, takes a train of Line 1 at Station 4, and get out of the train at Station 2. In total, JOI-kun will take two trains. Since it is impossible to achieve the plan by taking less than two trains, output 2 in the second line.

In the third plan, JOI-kun travels from Station 2 to Station 1. Since it is impossible for JOI-kun to achieve this plan, output -1 in the third line.

This sample input satisfies the constraints of Subtasks 1, 2, 6.

Sample Input 2	Sample Output 2
6 3 2 1 6 5 1 4 5 1 6 3 3 6 2 1	1 -1 1 2

This sample input satisfies the constraints of Subtasks 1, 2, 6.

Sample Input 3	Sample Output 3
6 5 4 3 1 2 4 5 3 4 6 5 1 5 3 2 2 6 6 3 5 4	-1 1 2 -1 1

This sample input satisfies the constraints of Subtasks 1, 2, 4, 6.

Sample Input 4	Sample Output 4
12 1 5 1 7 10 12 3 5 8 10 5 9 7 2 11 5 8 3 12 4 6 1 9 9 10 1 4	-1 1 4 -1 2 -1 1

This sample input satisfies the constraints of Subtasks 1, 2, 5, 6.