

# Maze

Input file:            **standard input**  
Output file:          **standard output**  
Time limit:           4 seconds  
Memory limit:        1024 megabytes

There is an  $(n + 2) \times (n + 2)$  grid, where both coordinates range from 0 to  $n + 1$  inclusive. The outermost cells of the grid are all obstacle cells.

In addition, there are  $m$  more obstacle cells in the grid. The  $i$ -th obstacle cell is located at  $(x_i, y_i)$ . **It is guaranteed that all obstacles (including the outer boundary cells) are 4-connected.** That is, you can move between any two obstacle cells by moving up, down, left, or right through other obstacle cells.

Little L is walking in this maze. He cannot step into any obstacle cell at any time. If Little L is at position  $(x, y)$ , he can make the following moves:

- Move orthogonally to an adjacent cell  $(x + 1, y)$ ,  $(x - 1, y)$ ,  $(x, y + 1)$ , or  $(x, y - 1)$  with a cost of 2.
- Move diagonally to an adjacent cell  $(x + 1, y + 1)$ ,  $(x + 1, y - 1)$ ,  $(x - 1, y + 1)$ , or  $(x - 1, y - 1)$  with a cost of 3.

There are  $q$  queries. For each query, you are given a starting point and an ending point. You need to find the minimum total cost for Little L to travel from the starting point to the ending point. If it is impossible to reach the ending point, output  $-1$ .

## Input

The first line of the input contains three integers  $n$ ,  $m$ , and  $q$  ( $1 \leq n \leq 10^5$ ,  $1 \leq m, q \leq 3 \cdot 10^5$ ).

The next  $m$  lines each contain two integers  $x_i$  and  $y_i$  — the coordinates of the  $i$ -th obstacle cell. It is guaranteed that all obstacle coordinates are distinct, and that all obstacles (including the outer boundary cells) are 4-connected.

The next  $q$  lines each contain four integers  $s_x$ ,  $s_y$ ,  $t_x$ , and  $t_y$  — a query with starting point  $(s_x, s_y)$  and ending point  $(t_x, t_y)$ . It is guaranteed that neither  $(s_x, s_y)$  nor  $(t_x, t_y)$  is an obstacle.

## Output

For each query, output a single integer — the minimum cost to travel from the starting point to the ending point. Or print  $-1$  if it is impossible to do so.

## Example

| standard input | standard output |
|----------------|-----------------|
| 4 4 5          | 2               |
| 2 1            | 16              |
| 2 2            | 11              |
| 3 2            | 10              |
| 3 3            | 11              |
| 1 1 1 2        |                 |
| 1 1 3 1        |                 |
| 4 1 1 4        |                 |
| 4 4 1 1        |                 |
| 2 3 3 1        |                 |

## Note

For the second query, you can move as follows:  $(1, 1) \rightarrow (1, 2) \rightarrow (2, 3) \rightarrow (3, 4) \rightarrow (4, 3) \rightarrow (4, 2) \rightarrow (3, 1)$ . The total cost is  $2 + 3 + 3 + 3 + 2 + 3 = 16$ .