Problem E. Criminals

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	512 mebibytes

In an ancient country, there are $n \times m$ cities, labeled by integers from 1 to $n \cdot m$. The coordinates of the city labeled by $(x-1) \cdot m + y$ are (x, y) ($1 \le x \le n$, $1 \le y \le m$). There are q tourists. Initially, the i-th tourist is at city (x_i, y_i). All tourists want to go out and play in other cities.

Unfortunately, K of the $n \cdot m$ cities are controlled by criminals, so these K cities are unsafe. For safety reasons, a tourist whose initial coordinates are (x_1, y_1) can go to the city (x_2, y_2) if and only if all of the cities (x, y) ($\min(x_1, x_2) \le x \le \max(x_1, x_2)$, $\min(y_1, y_2) \le y \le \max(y_1, y_2)$) are safe.

Now, for each tourist, calculate the number of cities they can reach safely (including their initial city).

Input

The first line of the input contains four integers n, m, K and q ($1 \le n, m, K, q \le 10^5$).

Then K lines follow. Each of these lines contains two integers a_i and b_i: the coordinates of an unsafe city ($1 \le a_i \le n$, $1 \le b_i \le m$). It is guaranteed that each city appears at most once in this list.

Then q lines follow. Each of these lines contains two integers x_i and y_i: the initial city of each tourist ($1 \le x_i \le n$, $1 \le y_i \le m$). It is guaranteed that, initially, each tourist stays at a safe city.

Output

For each tourist, print a single line with a single integer: the number of cities this tourist can reach safely.

Example

standard input	standard output
4 5 4 4 1 2 2 5 3 3 4 5 1 5 2 1 2 4 4 1	3 9 8 9

Note

In the example, the third tourist can reach eight cities: $(1, 4)$, $(2, 4)$, $(3, 4)$, $(4, 4)$, $(1, 3)$, $(2, 3)$, $(2, 2)$ and $(2, 1)$.