Doremy's Paint 2

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	256 megabytes

Doremy has n buckets of paint which is represented by an array a of length n. Bucket i contains paint with color a_i. Initially, $a_i = i$.

Doremy has m segments $[l_i, r_i]$ $(1 \le l_i \le r_i \le n)$. Each segment describes an operation. Operation i is performed as follows:

- For each j such that $l_i < j \le r_i$, set $a_j := a_{l_i}$.

Doremy also selects an integer k. She wants to know for each integer x from 0 to $m-1$, the number of distinct colors in the array after performing operations $x \bmod m+1, (x+1) \bmod m+1, \ldots, (x+k-1) \bmod m+1$. Can you help her calculate these values? Note that for each x individually we start from the initial array and perform only the given k operations in the given order.

Input

The first line of input contains three integers n, m, and k $(1 \le n, m \le 2 \cdot 10^5, 1 \le k \le m)$ — the length of the array a, the total number of operations, and the integer that Doremy selects.

The i-th line of the following m lines contains two integers l_i, r_i $(1 \le l_i \le r_i \le n)$ — the bounds of the i-th segment.

Output

Output m integers. The $(x+1)$-th integer should be the number of distinct colors in the array if we start from the initial array and perform operations $x \bmod m+1, (x+1) \bmod m+1, \ldots, (x+k-1) \bmod m+1$.

Examples

standard input	standard output
7 5 5 3 5 2 3 4 6 5 7 1 2	3 3 3 3 2
10 9 4 1 1 2 3 3 4 7 9 6 8 5 7 2 4 9 10 1 3	6 6 7 6 5 5 7 7 7

Note

In the first test case, the picture below shows the resulting array for the values of $x = 0, 1, 2$ respectively.