

Tile Covering

Time limit: 2 s

Memory limit: 256 MB

Description

Mr. Dengklek has a floor with N cells numbered from 1 to N from left to right. In other words, the i -th cell (for $i > 1$) lies exactly to the right of the $(i - 1)$ -th cell. The size of each cell is 1×1 unit. There is a tile on every cell except on M cells, which are cells numbered A_1, A_2, \dots, A_M . Mr. Dengklek also has several special tiles of size $1 \times K$ unit. Therefore, a special tile is able to cover cells numbered from (i) to $(i + K - 1)$ for $1 \leq i \leq N - K + 1$.

Mr. Dengklek has Q questions numbered from 1 to Q . There are two integers L and R for each question. Mr. Dengklek wonders, in order to cover every cell numbered between L and R , inclusive, with tiles, what is the minimum number of special tiles that Mr. Dengklek has to use. Note that these questions are independent; placing a special tile for a question does not affect the answer for the next question.

A special tile can also be placed even in these situations:

- The special tile covers a cell that has been covered by a tile before, or
- The special tile covers a cell that has been covered by another special tile before, or
- The special tile covers a cell which index is not between L and R , inclusive.

Task

You have to implement `init` and `getNumberOfSpecialTiles` functions:

- `init(N, K, Q, M, A)` - This function will be called by the grader exactly once before any `getNumberOfSpecialTiles(L, R)` calls.
 - N : The number of cells on the floor.
 - K : The size of each special tile.
 - Q : The number of Mr. Dengklek's questions.
 - M : The number of cells with missing tiles.
 - A : A vector with size M . $A[i]$ indicates the value of A_{i+1} .
- `getNumberOfSpecialTiles(L, R)` - This function will be called Q times by the grader, the i -th call to answer the i -th question.
 - L : The leftmost index of the cells that Mr. Dengklek wants to cover.
 - R : The rightmost index of the cells that Mr. Dengklek wants to cover.
 - This function must return an `int` indicating the minimum number of special tiles that Mr. Dengklek has to use to cover every cell numbered between L and R , inclusive, with tiles.

Example

Assume $N = 11$, $K = 3$, $Q = 3$, $M = 5$, $A = \{3, 4, 6, 8, 9\}$. The grader will call `init(N, K, Q, M, A)` first. After that, the `getNumberOfSpecialTiles(L, R)` function will be called 3 times:

- If given $L = 1$, $R = 11$, then `getNumberOfSpecialTiles(L, R)` function must return 3. A possible special tiles placement is as follows:
 - Place a special tile covering cell 2, cell 3, and cell 4.
 - Place a special tile covering cell 5, cell 6, and cell 7.
 - Place a special tile covering cell 7, cell 8, and cell 9.
 - Therefore, the cells with missing tiles are covered.
- If given $L = 5$, $R = 5$, then `getNumberOfSpecialTiles(L, R)` function must return 0.
- If given $L = 5$, $R = 6$, then `getNumberOfSpecialTiles(L, R)` function must return 1. Note that special tiles may cover a cell which index is not between L and R , inclusive, as well.

Subtasks

For every subtask

- $1 \leq K \leq N \leq 10^9$
- $1 \leq M \leq \min(N, 300,000)$
- $1 \leq Q \leq 300,000$
- $1 \leq A_i \leq N$ for every $1 \leq i \leq M$
- $A_i < A_{i+1}$ for every $1 \leq i < M$
- $1 \leq L \leq R \leq N$

Subtask 1 (15 points)

- $1 \leq N \leq 5,000$

Subtask 2 (14 points)

- $1 \leq M \leq \min(N, 5,000)$

Subtask 3 (23 points)

- $1 \leq N \leq 300,000$

Subtask 4 (13 points)

- $K = 1$

Subtask 5 (13 points)

- $Q = 1$

Subtask 6 (22 points)

- No additional constraint

Sample Grader

The provided sample grader will read the input with the following format:

- The first row consists of four integers N, K, M, Q separated by space.
- The second row consists of M integers separated by space. The i -th integer indicates the value of $A[i - 1]$.
- The next Q lines consist of two integers separated by space. The i -th line consists of the value of L and R for the i -th question, respectively.

The provided sample grader will print the output with the following format:

- The first Q lines consist of one integer. The i -th line consists of the integer returned by the i -th `getNumberOfSpecialTiles` function call.

Skeleton

You can download the skeleton for this problem [here](#).