

Task A13. Self-describing

3 s 1024 MB

Author: Ivan Lupov

Elena is yet again tasked with solving a problem involving subarrays with a special property. By now she finds these tasks banal, so she leaves writing a solution to you – the IATI contestants. The problem statement is as follows:

We define a “self-describing” array b_0, b_1, \dots, b_{M-1} – an array in which for all b_i it is true that the number b_i appears *exactly* b_i times in the entire array. $[1, 2, 2]$, $[5, 5, 5, 5, 5]$, $[3, 1, 3, 2, 3, 2]$ are all examples of “self-describing” arrays, while $[100, 1, 2, 2]$ (there is only one occurrence of 100), $[1, 1, 1, 1, 1]$ (there are 5 occurrences of 1) are all examples of non-“self-describing” arrays.

Additionally for an array b_0, b_1, \dots, b_{M-1} we define a “self-describing” subarray as a subarray $b_l, b_{l+1} \dots b_r$ that is itself “self-describing”.

You are given an array a_0, a_1, \dots, a_{N-1} and Q queries (l, r) such that $l \leq r$. For each query you should find the number of “self-describing” subarrays (l', r') for which $l \leq l' \leq r' \leq r$ for all queries.

Implementation details

You should implement the following two procedures:

```
void init(int N, int Q, const std::vector<int>& a)
```

This function will be called once per test and provides your program with the original array as a vector, consisting of the N values a_0, a_1, \dots, a_{N-1} in this order.

```
long long query(int l, int r)
```

This function will be called Q times per test and will correspond to a query for the range (l, r) , it should return the answer to that query.

Local testing

To test your program locally, a local grader and a header file are provided. The local grader reads $N, Q, a_1, a_2, \dots, a_N$ and Q queries (l, r) in this order, calls your `init` and then outputs the answers your program gave to all query calls. You are free to modify the local grader.

Constraints

- $1 \leq N, Q \leq 3 \times 10^5$
- $1 \leq a_i \leq N$ for all $0 \leq i \leq N - 1$
- $0 \leq l \leq r \leq N - 1$ for all queries.

**XVI INTERNATIONAL ADVANCED TOURNAMENT IN INFORMATICS
SHUMEN 2025**

Sample test

Input	Ouput
7 3	3
1 2 1 2 3 3 3	2
0 3	5
2 6	
0 6	

Subtasks

Subtask	Points	Necessary subtasks	N	Q	Other constraints
0	0	—	—	—	Example.
1	6	—	≤ 500	$= 1$	The only query is $[1, N]$.
2	6	1	≤ 5000	$= 1$	
3	39	1 – 2	$\leq 3 \times 10^5$	$= 1$	
4	11	0 – 3	$\leq 3 \times 10^5$	≤ 500	
5	16	0 – 4	$\leq 3 \times 10^5$	$\leq 5 \times 10^4$	—
6	22	0 – 5	$\leq 3 \times 10^5$	$\leq 5 \times 10^5$	—

The points for a subtask are given only if all tests for it and the required subtasks are passed successfully.