Problem F. Bad Sequence

- 2023.11.01 03:40 Update: Strengthened testcases and rejudged solutions.
- Trick or Treat! Added a simpler subtask and Sample 5.

Problem Description

We consider an integer sequence $[c_1, c_2, \ldots, c_m]$, and let the minimum and maximum value of the sequence be x and y, respectively. We call the sequence k-bad if $y - x - m + 1 = k$.

For example, the sequence $[4, 8, 7, 6, 3]$ is 1-bad, and the sequence $[1, 1, 2, 2, 3, 3]$ is (-3)-bad.

Given an array a and an integer k, please count the number of pairs (ℓ, r) $(\ell \leq r)$ such that the sequence $[a_\ell, a_{\ell+1}, \ldots, a_r]$ is k-bad.

Input Format

- line 1: n k
- line 2: a_1 a_2 $\ldots$ a_n

Output Format

- line 1: the number of pairs that is k-bad.

Constraints

- $2 \leq n \leq 500\,000$.
- $0 \leq k \leq n - 2$.
- $1 \leq a_i \leq n$ for $i = 1, 2, \ldots, n$.
- All input values are integers.

Subtasks

1. (5 points) $n \leq 1000$; $\{a_1, a_2, \ldots, a_n\}$ is a permutation of $\{1, 2, \ldots, n\}$.
2. (5 points) $n \leq 1000$.
3. (30 points) $n \leq 80\,000$; $k = 0$; $\{a_1, a_2, \ldots, a_n\}$ is a permutation of $\{1, 2, \ldots, n\}$.
4. (30 points) $n \leq 80\,000$; $\{a_1, a_2, \ldots, a_n\}$ is a permutation of $\{1, 2, \ldots, n\}$.
5. (10 points) $n \leq 80\,000$.
6. (15 points) $\{a_1, a_2, \ldots, a_n\}$ is a permutation of $\{1, 2, \ldots, n\}$.
7. (5 points) No additional constraints.

No.	Testdata Range	Time Limit (ms)	Memory Limit (KiB)
Samples	1-5	2000	262144
1	6-17	2000	262144
2	1-27	2000	262144
3	28-37	2000	262144
4	6-17,28-43	2000	262144
5	1-51	2000	262144
6	6-17,28-43,52-62	2000	262144
7	1-70	2000	262144

Samples

Sample Input 1

```
8 4
8 4 2 6 1 5 3 7
```

This sample input satisfies the constraints of Subtasks 1, 2, 4, 5, 6, 7.

Sample Output 1

```
2
```

The sequence $[8, 4, 2]$ and $[6, 1]$ are 4-bad, and there is no 5-bad sequence.

The number of 0, 1, 2, 3, 4, 5, and 6 bad sequences are 11, 6, 8, 9, 2, 0, and 0, respectively.

Sample Input 2

```
5 1
1 1 1 1 1
```

This sample input satisfies the constraints of Subtasks 2, 5, 7.

```
0
```

- Every subarray of length 1 is 0-bad.
- Every subarray of length 2 is (-1)-bad.
- Every subarray of length 3 is (-2)-bad.
- Every subarray of length 4 is (-3)-bad.
- Every subarray of length 5 is (-4)-bad.

There is no 1-bad sequence.

Sample Input 3

```
15 0
1 15 2 14 3 13 4 12 5 11 6 10 7 9 8
```

This sample input satisfies the constraints of all the subtasks.

Sample Output 3

```
29
```

- There is 29 0-bad sequences.
- There is $(14 - k)$ k-bad sequences for $k = 1, 2, \ldots, 13$.

Sample Input 4

```
20 8
13 17 6 9 19 13 1 15 19 4 4 10 1 1 16 15 9 8 1 14
```

This sample input satisfies the constraints of Subtasks 2, 5, 7.

Sample Output 4

```
17
```

```
9 0
3 4 5 1 2 9 8 7 6
```

This sample input satisfies the constraints of all the subtasks.

```
21
```