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## D. Sum of LDS

time limit per test: 2 seconds

memory limit per test: 256 megabytes

You're given a permutation\*  $p_1, \dots, p_n$  such that  $\max(p_i, p_{i+1}) > p_{i+2}$  for all  $1 \leq i \leq n - 2$ .

Compute the sum of the length of the longest decreasing subsequence† of the subarray  $[p_l, p_{l+1}, \dots, p_r]$  over all pairs  $1 \leq l \leq r \leq n$ .

\* A permutation of length  $n$  is an array consisting of  $n$  distinct integers from 1 to  $n$  in arbitrary order. For example,  $[2, 3, 1, 5, 4]$  is a permutation, but  $[1, 2, 2]$  is not a permutation (2 appears twice in the array), and  $[1, 3, 4]$  is also not a permutation ( $n = 3$  but there is 4 in the array).

† Given an array  $b$  of size  $|b|$ , a decreasing subsequence of length  $k$  is a sequence of indices  $i_1, \dots, i_k$  such that:

- $1 \leq i_1 < i_2 < \dots < i_k \leq |b|$
- $b_{i_1} > b_{i_2} > \dots > b_{i_k}$

### Input

Each test contains multiple test cases. The first line contains the number of test cases  $t$  ( $1 \leq t \leq 10\,000$ ). The description of the test cases follows.

The first line of each test case contains a single integer  $n$  ( $3 \leq n \leq 500\,000$ ).

The second line of each test case contains  $n$  integers  $p_1, p_2, \dots, p_n$  ( $1 \leq p_i \leq n$ ,  $p_i$  are pairwise distinct).

It is guaranteed that  $\max(p_i, p_{i+1}) > p_{i+2}$  for all  $1 \leq i \leq n - 2$ .

The sum of  $n$  over all test cases does not exceed 500 000.

### Output

For each test case, output the sum over all subarrays of the length of its longest decreasing subsequence.

### Example

**input**

```
4
3
3 2 1
4
4 3 1 2
6
6 1 5 2 4 3
3
2 3 1
```

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**output**

```
10
17
40
8
```

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### Note

For any array  $a$ , we define  $\text{LDS}(a)$  as the length of the longest decreasing subsequence of  $a$ .

In the first test case, all subarrays are decreasing.

In the second one, we have

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Language: [GNU G++17 7.3.0](#)

Choose file: [Choose File](#) No file chosen

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### → Last submissions

Submission	Time	Verdict
<a href="#">336063378</a>	Aug/29/2025 01:25	Time limit exceeded on test 4
<a href="#">336061511</a>	Aug/29/2025 00:40	Memory limit exceeded on test 4

### → Contest materials

- Announcement (en) [X](#)
- Tutorial (en) [X](#)

$LDS([4]) = LDS([3]) = LDS([1]) = LDS([2]) = 1$

$LDS([4, 3]) = LDS([3, 1]) = 2, LDS([1, 2]) = 1$

$LDS([4, 3, 1]) = 3, LDS([3, 1, 2]) = 2$

$LDS([4, 3, 1, 2]) = 3$

So the answer is  $1 + 1 + 1 + 1 + 2 + 2 + 1 + 3 + 2 + 3 = 17$ .

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The only programming contests Web 2.0 platform

Server time: Aug/30/2025 14:56:18<sup>UTC-4</sup> (i2).

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