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Sommersemester 2016

Woche 03 – Competitive Programming

Abgabe 10.05.2016 09:00 Uhr, über das Judge-Interface

Aufgabe 2 (time_bomb- $\{s|b\}$). (20 + 80 points - 2.5 seconds timelimit)

Professor Moriarty has lured Dr. Watson into a trap. It did not take long for Holmes to find his missing partner, but—as usual—Moriarty left a surprise.

Watson is tied in chains and there is a bomb lying right next to him. The bomb has a strange timer on it, showing a sequence of n integers (x_1, \dots, x_n) . It would be too simple and boring if these integers would represent seconds or something ordinary. Instead, Moriarty designed a complicated scheme which describes how the sequence changes.

Fortunately, Holmes instantly deduced that the sequence changes each second according to the following procedure.

Algorithm 1 NextSequence

```
1: procedure NEXTSEQUENCE( $x_1, \dots, x_n$ )
2:   for  $i = 1, \dots, n - 1$  do
3:     if  $x_i < x_{i+1}$  then
4:        $t \leftarrow x_i$ 
5:        $x_i \leftarrow x_{i+1}$ 
6:        $x_{i+1} \leftarrow t$ 
7:   return  $(x_1, \dots, x_n)$ 
```

More formally, if at time t seconds the sequence on the timer is s_1, \dots, s_n , then at the time $t + 1$ seconds, it will be NEXTSEQUENCE(s_1, \dots, s_n).

He also figured out that the bomb will explode, once the sequence (s_1, \dots, s_n) satisfies $s_i \geq s_{i+1}$, for all $i \in \{1, \dots, n - 1\}$.

As he is not able to disarm the bomb, Holmes wants to calculate how much time he has to free Watson from the chains.

Input The first line of the input contains the number $t \leq 50$ of test cases. Each of the t test cases is described as follows.

- It starts with a line that contains an integer n such that $1 \leq n \leq 10^5$.

- The following line contains n space separated integers x_1, \dots, x_n such that $1 \leq x_i \leq n$, for all $i \in \{1, \dots, n\}$. Sequence x_1, \dots, x_n represents the timer sequence at time $t = 0$ seconds.

Output For each test case output a line that contains the number of seconds until the bomb explodes. Please note that the result might not fit into 32-bit variable.

Points There are two groups of test sets, worth 100 points in total.

- (a) For the first group of test sets, worth 20 points, you may assume that $2 \leq n \leq 100$.
- (b) For the second group of test sets, worth 80 points, you may assume that $2 \leq n \leq 2000$.

Sample Input

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

Sample Output

```
10
4
0
```

$(5, 3, 1, 3, 4) \rightarrow (5, 3, 3, 1, 4) \rightarrow (5, 3, 3, 4, 1) \rightarrow (5, 3, 4, 3, 1) \rightarrow (5, 4, 3, 3, 1)$

Abbildung 1: Timer sequence until the explosion in the second test case.