CEOI '19 Practice P2 - Separator

Time limit: 0.65s **Memory limit:** 512M

Let $A = (a_1, a_2, \ldots)$ be a sequence of **distinct** integers. An index j is called a **separator** if the following two conditions hold:

- for all $k < j$: $a_k < a_j$,
- for all $k > j$: $a_k > a_j$.

In other words, the array A consists of three parts: all elements smaller than a_j, then a_j itself, and finally all elements greater than a_j.

For instance, let $A = (30, 10, 20, 50, 80, 60, 90)$. The separators are the indices 4 and 7, corresponding to the values 50 and 90.

The sequence A is initially empty. You are given a sequence $a_1, \ldots, a_n$ of elements to append to A, one after another. After appending each a_i, output the current number s_i of separators in the sequence you have.

The input format is selected so that you have to compute the answers **online**. Instead of the elements a_i you should append to A, you are given a sequence b_i.

Process the input as follows:

The empty sequence A contains $s_0 = 0$ separators.

For each i from 1 to n, inclusive:

1. Calculate the value $a_i = (b_i + s_{i-1}) \bmod 10^9$.
2. Append a_i to the sequence A.
3. Calculate s_i: the number of separators in the current sequence A.
4. Output a line containing the value s_i.

Input

The first line contains a single integer n $(1 \leq n \leq 10^6)$: the number of queries to process.

Then, n lines follow. The i-th of these lines contains the integer b_i $(0 \leq b_i \leq 10^9 - 1)$. The values b_i are chosen in such a way that the values a_i you'll compute will all be distinct.

Output

As described above, output n lines with the values s_1 through s_n.

Scoring

Subtask 1 (20 points): $n \leq 100$.

Subtask 2 (30 points): $n \leq 1\,000$.

Subtask 3 (40 points): $n \leq 100\,000$.

Subtask 4 (10 points): no additional constraints.

Sample Input 1

```
7
30
9
20
50
79
58
89
```

Sample Output 1

```
1
0
0
1
2
1
2
```

Sample Input 2

```
10
0
0
0
0
0
0
0
0
0
0
```

Sample Output 2

```
1
2
3
4
5
6
7
8
9
10
```

Note

The first example is described in the problem statement.

The second example is decoded as $A = (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)$.