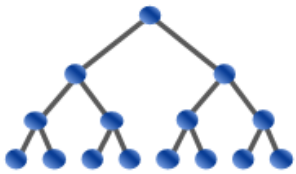
USA Computing Olympiad



USACO 2022 January Contest, Platinum
Problem 2. Counting Haybales

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Time Remaining: **3 hrs, 59 min, 29 sec**

Not submitted yet

English (en)

As usual, Bessie the cow is causing trouble in Farmer John's barn. FJ has N ($1 \leq N \leq 5000$) stacks of haybales. For each $i \in [1, N]$, the ith stack has h_i ($1 \leq h_i \leq 10^9$) haybales. Bessie does not want any haybales to fall, so the only operation she can perform is as follows:

- If two adjacent stacks' heights differ by exactly one, she can move the top haybale of the taller stack to the shorter stack.

How many configurations are obtainable after performing the above operation finitely many times, modulo $10^9 + 7$? Two configurations are considered the same if, for all i, the ith stack has the same number of haybales in both.

INPUT FORMAT (input arrives from the terminal / stdin):

The first line contains T ($1 \leq T \leq 10$), the number of independent test cases, all of which must be solved to solve one input correctly.

Each test case consists of N, and then a sequence of N heights. It is guaranteed that the sum of N over all test cases does not exceed 5000.

OUTPUT FORMAT (print output to the terminal / stdout):

Please output T lines, one for each test case.

SAMPLE INPUT:

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

SAMPLE OUTPUT:

```
4
4
5
15
9
8
19
```

For the first test case, the four possible configurations are:

$$(2,2,2,3), (2,2,3,2), (2,3,2,2), (3,2,2,2).$$

For the second test case, the four possible configurations are:

$$(2,3,3,1), (3,2,3,1), (3,3,2,1), (3,3,1,2).$$

(2,3,3,1), (3,2,3,1), (3,3,2,1), (3,3,1,2).

SCORING:

- Inputs 1-3 satisfy $N \leq 10$.
- Input 4 satisfies $1 \leq h_i \leq 3$ for all i.
- Inputs 5-7 satisfy $|h_i - i| \leq 1$ for all i.
- Inputs 8-10 satisfy $1 \leq h_i \leq 4$ for all i and $N \leq 100$.
- Inputs 11-13 satisfy $N \leq 100$.
- Inputs 14-17 satisfy $N \leq 1000$.
- Inputs 18-21 satisfy no additional constraints.

Problem credits: Daniel Zhang

Language: C

Source File: Choose File No file chosen

Submit Solution