



## USACO 2022 JANUARY CONTEST, GOLD PROBLEM 1. DROUGHT

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English (en) ▾

The grass has dried up in Farmer John's pasture due to a drought. After hours of despair and contemplation, FJ comes up with the brilliant idea of purchasing corn to feed his precious cows.

FJ's  $N$  ( $1 \leq N \leq 100$ ) cows are arranged in a line such that the  $i$ th cow in line has a non-negative integer hunger level of  $h_i$ . As FJ's cows are social animals and insist on eating together, the only way FJ can decrease the hunger levels of his cows is to select two adjacent cows  $i$  and  $i + 1$  and feed each of them a bag of corn, causing each of their hunger levels to decrease by one.

FJ wants to feed his cows until all of them have the same non-negative hunger level. Although he doesn't know his cows' exact hunger levels, he does know an upper bound on the hunger level of each cow; specifically, the hunger level  $h_i$  of the  $i$ -th cow is at most  $H_i$  ( $0 \leq H_i \leq 1000$ ).

Your job is to count the number of  $N$ -tuples of hunger levels  $[h_1, h_2, \dots, h_N]$  that are consistent with these upper bounds such that it is possible for FJ to achieve his goal, modulo  $10^9 + 7$ .

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

The first line contains  $N$ .

The second line contains  $H_1, H_2, \dots, H_N$ .

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

The number of  $N$ -tuples of hunger levels modulo  $10^9 + 7$ .

### SAMPLE INPUT:

```
3
9 11 7
```

### SAMPLE OUTPUT:

```
241
```

There are  $(9 + 1) \cdot (11 + 1) \cdot (7 + 1)$  3-tuples  $h$  that are consistent with  $H$ .

One of these tuples is  $h = [8, 10, 5]$ . In this case, it is possible to make all cows have equal hunger values: give two bags of corn to both cows 2 and 3, then give five bags of corn to both cows 1 and 2, resulting in each cow having a hunger level of 3.

Another one of these tuples is  $h = [0, 1, 0]$ . In this case, it is impossible to make the hunger levels of the cows equal.

### SAMPLE INPUT:

```
4
6 8 5 9
```

### SAMPLE OUTPUT:

```
137
```

### SCORING:

$N$  is even in even-numbered tests and odd in odd-numbered tests.

- Tests 3 and 4 satisfy  $N \leq 6$  and  $H_i \leq 10$ .
- Tests 5 through 10 satisfy  $N \leq 50$  and  $H_i \leq 100$ .
- Tests 11 through 20 satisfy no further constraints.

Problem credits: Arpan Banerjee and Benjamin Qi

Contest has ended. No further submissions allowed.

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