NOI '18 P2 - Inverse

Time limit: 1.0s **Memory limit:** 512M

Consider the bubble sort algorithm:

```
for i = 1 to n do
    for j = 1 to n - 1 do
        if(p[j] > p[j + 1])
            swap(p[j], p[j+1])
```

Let denote $f(p)$ as the number of times the function $swap$ is called when we run the bubble sort algorithm on permutation p. We call p a good permutation if $f(p) = \frac{1}{2}\sum_{i=1}^{n}|i - p_i|$. One can prove $\frac{1}{2}\sum_{i=1}^{n}|i - p_i|$ is a tight lower bound for permutations of length n.

You are given an permutation q and asked to the number of good permutations of length n that is strictly lexicographically larger than q. The output might be too large, so you only need to output the answer under modulo 998244353

Input Specification

The first line contains an integer T, the number of test cases.

For each test case,

- The first line contains an integer n, which is the length of the permutation.
- The second lines contains n integers in the permutation.

Output Specification

For each test case, output the answer under modulo 998244353

Constraints

For all test file, $T = 5$.

n_{max} is the maximum n in a single file. $\sum n$ is the sum of n is a single file.

Sample 1 Input

```
1
3
1 3 2
```

Sample 1 Output

```
3
```

Sample 1 Explanation

All permutation lexicographically larger than "$1\ 3\ 2$" is good except "$3\ 2\ 1$"

Sample 2 Input

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

Sample 2 Output

```
9
```

Subtask

For all data, $T = 5$ is satisfied (sample may not be satisfied).

Denote $n_{\max}$ to denote the maximum value of n in each set of data, and $\sum n$ to denote the sum of n for all data.

test point	$n_{\max} =$	$\sum n \leq$	special properties
1	8	$5\ n_{\max}$	None
2	9	$5\ n_{\max}$	none
3	10	$5\ n_{\max}$	None
4	12	$5\ n_{\max}$	None
5	13	$5\ n_{\max}$	None

test point	$n_{\max} =$	$\sum n \leq$	special properties
6	14	$5\ n_{\max}$	None
7	16	$5\ n_{\max}$	None
8	16	$5\ n_{\max}$	None
9	17	$5\ n_{\max}$	None
10	18	$5\ n_{\max}$	None
11	18	$5\ n_{\max}$	None
12	122	700	$\forall i\ \ q_i = i$
13	144	700	None
14	166	700	None
14	166	700	None
16	233	700	None
17	777	4000	$\forall i\ \ q_i = i$
18	888	4000	None
19	933	4000	None
20	1000	4000	None
21	266666	2000000	$\forall i\ \ q_i = i$
22	333333	2000000	none
23	444444	2000000	None
24	555555	2000000	None
25	600000	2000000	none