Competitive Programming SS24

Submit until end of contest

Problem: hedge (1.0 second timelimit)

We have n rectangular planks, numbered from 1 to n. The planks are of equal width and the k-th plank has a height of k centimeters.

We build a fence by lining up all n planks. Dependent on the order of alignment, we form several sections of consecutive planks of decreasing height. Usually there is more than one section, but it is possible that the whole fence forms one decreasing sequence. It is also possible that some sections consist of only one plank.

For example, if we put down 9 planks so that their heights form the sequence 6, 4, 5, 3, 9, 7, 2, 1, 8, we have the four sections $(6, 4)$, $(5, 3)$, $(9, 7, 2, 1)$ and (8).

Find the number of arrangements with exactly p sections. Since this number can be large, you should calculate it modulo 998244353.

Input The first line contains a single integer t ($1 \leq t \leq 10^5$), the number of testcases.

Each of the following t lines contains two integers n, p ($1 \leq n \leq 2000$, $1 \leq p \leq n$), the numbers mentioned in the problem statement.

Output For each testcase output the number of permutations of n planks such that they form exactly p sections modulo 998244353.

Sample input

```
2
4 3
20 2
```

Sample output

```
11
1048555
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