QCC P3 - Cohorts

Time limit: 2.0s   **Memory limit:** 256M

Due to your superlative performance in online school, you've been employed by CodeVax. Your assignment is as such:

> There are N seats in a line. These seats must be divided into exactly Q cohorts to reduce the transmission of the virus. Each cohort consists of a contiguous segment of exactly K seats. An arrangement of cohorts is considered to be valid if there is at least 1 seat between any two cohorts and no cohort overlaps another.
>
> Find the total number of valid arrangements, modulo $998\,244\,353$.

Input Specification

The first line will contain the integer T, representing the number of test cases.

The next T lines will each contain the integers N_i, K_i and Q_i for the ith test case.

Output Specification

For each test case, output the number of valid arrangements, modulo $998\,244\,353$.

Constraints

$1 \le N \le 10^6$

$1 \le K \le 10^6$

$1 \le Q \le 5 \times 10^5$

$1 \le T \le 10^5$

Note that you will NOT be required to pass all the samples to receive points.

Subtask 1 [5%]

$1 \le T \le 400$

$1 \le N \le 400$

$K = 1$

$Q = 2$

Subtask 2 [15%]

$1 \le T \le 100$

$1 \le N \le 100$

$1 \le Q \le 100$

Subtask 3 [80%]

No additional constraints.

Sample Input 1

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

Sample Output 1

```
3
1
0
3
```

Explanation for Sample 1

Let x represent the spots in the line where the cohorts are and let - represent empty spaces in the line:

For the first test case, the valid cohort arrangements are: x-- , -x- , and --x .

For the second test case, the only valid cohort arrangement is: x-x .

For the third test case, there are no valid cohort arrangements.

For the fourth test case, the valid cohort arrangements are: x-x- , x--x , and -x-x .

Sample Input 2

```
2
111 22 9
400 25 6
```

Sample Output 2

```
0
586572619
```