F - We're teapots

Editorial (/contests/abc418/tasks/abc418_f/editorial)

Time Limit: 3 sec / Memory Limit: 1024 MiB

Score : 550 points

Problem Statement

There are N teapots arranged in a row, numbered from 1 to N from left to right.

There is a sequence of integers $(a_1, \ldots, a_N)$, initially with values $a_1 = \cdots = a_N = -1$.

You will fill each teapot with either tea or coffee so that the following conditions are all satisfied:

- For any two adjacent teapots, at least one of them contains tea.
- For any integer i satisfying $1 \leq i \leq N$, if $a_i \neq -1$, then exactly a_i of teapots $1, \ldots, i$ contain coffee.

You are given Q queries, which you should process in the given order.

The j-th query ($1 \leq j \leq Q$) is as follows:

- Change the value of a_{X_j} to Y_j. Then, print the number, modulo 998244353, of ways to fill the teapots satisfying the conditions.

Constraints

- $2 \leq N \leq 2 \times 10^5$
- $1 \leq Q \leq 2 \times 10^5$
- $1 \leq X_j \leq N$ $(1 \leq j \leq Q)$
- $-1 \leq Y_j \leq X_j$ $(1 \leq j \leq Q)$

- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{ll}
N & Q \\
X_1 & Y_1 \\
\vdots & \\
X_Q & Y_Q
\end{array}
$$

Output

Print Q lines.

The j-th line ($1 \leq j \leq Q$) should contain the value to be printed for the j-th query.

Sample Input 1 Copy

Copy

```
5 6
1 1
4 2
1 0
4 -1
5 1
5 5
```

Sample Output 1 Copy

Copy

```
5
3
1
8
4
0
```

- After the operation in the first query, $a = (1,\ -1,\ -1,\ -1,\ -1)$. The ways to fill the teapots satisfying the conditions are the following five ways:
  - Put coffee in teapot 1, and tea in the others.
  - Put coffee in teapots $1, 3$, and tea in the others.
  - Put coffee in teapots $1, 3, 5$, and tea in the others.
  - Put coffee in teapots $1, 4$, and tea in the others.
  - Put coffee in teapots $1, 5$, and tea in the others.

- After the operation in the second query, $a = (1,\ -1,\ -1,\ 2,\ -1)$. The ways to fill the teapots satisfying the conditions are the following three ways:
  - Put coffee in teapots $1, 3$, and tea in the others.
  - Put coffee in teapots $1, 3, 5$, and tea in the others.
  - Put coffee in teapots $1, 4$, and tea in the others.
- After the operation in the third query, $a = (0,\ -1,\ -1,\ 2,\ -1)$. The ways to fill the teapots satisfying the conditions are the following one way:
  - Put coffee in teapots $2, 4$, and tea in the others.
- After the operation in the fourth query, $a = (0,\ -1,\ -1,\ -1,\ -1)$. The ways to fill the teapots satisfying the conditions are the following eight ways:
  - Put coffee in none of the teapots and tea in all of them.
  - Put coffee in teapot 2, and tea in the others.
  - Put coffee in teapots $2, 4$, and tea in the others.
  - Put coffee in teapots $2, 5$, and tea in the others.
  - Put coffee in teapot 3, and tea in the others.
  - Put coffee in teapots $3, 5$, and tea in the others.
  - Put coffee in teapot 4, and tea in the others.
  - Put coffee in teapot 5, and tea in the others.
- After the operation in the fifth query, $a = (0,\ -1,\ -1,\ -1,\ 1)$. The ways to fill the teapots satisfying the conditions are the following four ways:
  - Put coffee in teapot 2, and tea in the others.
  - Put coffee in teapot 3, and tea in the others.
  - Put coffee in teapot 4, and tea in the others.
  - Put coffee in teapot 5, and tea in the others.
- After the operation in the sixth query, $a = (0,\ -1,\ -1,\ -1,\ 5)$. The number of ways to fill the teapots satisfying the conditions is zero.

/#telegram)

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