Problem D. Two Box

Time limit: 6 seconds
Memory limit: 1024 megabytes

You are given a sequence of non-negative integers $A = (A_1, A_2, \ldots, A_N)$ of length N and Q queries. The i-th query is described as follows:

- Change A_{x_i} to y_i, and then compute the answer to the following problem based on the updated sequence A.

There are two boxes, one white and one black, and M balls numbered from 1 to M. Initially, all balls are in the white box.
You perform the following operation N times:

- Choose an integer x that satisfies $1 \leq x \leq M$. Move ball x from its current box to the other box.

After the i-th operation, all the numbers on the balls in the black box must be less than or equal to A_i. Compute the number of possible sequences of operations that satisfy this condition, modulo 998244353.

Process the queries in order.

Constraints

- $1 \leq N, Q \leq \mathbf{3 \times 10^4}$
- $1 \leq M \leq 15$
- $1 \leq x_i \leq N$
- $1 \leq A_i, y_i \leq M$

Input

The input is given in the following format from standard input:

$N\ M\ Q$
$A_1\ A_2\ \ldots\ A_N$
$x_1\ y_1$
$x_2\ y_2$
$\vdots$
$x_Q\ y_Q$

Output

Output Q lines. On the i-th line, output the answer to the i-th query.

Examples

standard input	standard output
3 3 2 1 3 1 3 2 1 3	5 14
6 8 1 3 8 7 7 1 6 1 4	2100
12 10 8 1 3 2 6 3 6 7 7 5 5 4 7 12 4 7 10 4 2 9 8 9 9 8 3 4 9 10 2	2741280 3007680 1503840 1916160 1972800 728640 1821600 621440

Note

For the first sample case:

For the first query, $A = (1, 3, 2)$. In this case, possible sequences of operations include, for example:

- Choose $x = 1$. Move ball 1 from the white box to the black box. The black box now contains ball 1.
- Choose $x = 3$. Move ball 3 from the white box to the black box. The black box now contains balls 1 and 3.
- Choose $x = 3$. Move ball 1 from the black box back to the white box. The black box now contains ball 1.

Other possible sequences of x are $(1, 1, 1)$, $(1, 1, 2)$, $(1, 2, 1)$, and $(1, 2, 2)$, totaling 4 additional possibilities. Therefore, there are 5 possible sequences of operations.