Problem D. Bracket Sequence

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	1024 megabytes

A sequence is good when it can be represented by several () connected together.

Formally, a sequence s of length $2n$ is good when $s_1 = s_3 = \cdots = s_{2n-1} = ($ and $s_2 = s_4 = \cdots = s_{2n} =)$. In that case, we call n its **depth**.

Given a sequence s of length n which consists of (and). Let $f(l, r, k)$ be the number of good subsequences with depth k in the sequence t formed by $s_l, s_{l+1}, \ldots, s_r$.

You are given q queries, each query contains four numbers op, l, r, k.

- If $op = 1$, you need to calculate $f(l, r, k)$.
- If $op = 2$, you need to calculate $\sum_{l \le l' \le r' \le r} f(l', r', k)$.

Since the answer could be huge, you need to output the answer modulo 998244353.

Input

The first line contains two numbers n, q ($1 \le n \le 10^5$, $1 \le q \le 10^6$).

The second line contains the sequence s of length n.

The following q lines contain four numbers op, l, r, k ($op \in \{1, 2\}$, $1 \le l \le r \le n$, $1 \le k \le 20$).

Output

Output q integers: the answer to each query, modulo 998244353.

Example

standard input	standard output
5 20 (()() 1 1 2 1 1 1 3 1 1 1 4 1 1 1 5 1 1 2 3 1 1 2 4 1 1 2 5 1 1 3 4 1 1 3 5 1 1 4 5 1 2 1 3 1 2 1 4 1 2 1 5 1 2 2 3 1 2 2 4 1 2 2 5 1 2 3 5 1 2 4 5 1 1 1 5 2 2 1 5 2	0 2 2 5 1 1 3 0 1 1 3 6 16 1 2 7 2 1 2 3