DMOPC '19 Contest 6 P3 - Grade 11 Math

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

Serena is learning about binary numbers in math class! She is given a binary number S, and she is also given series of M operations which she must perform on it. In one operation, she sets all bits in the 1-indexed range $[l, r]$ to 1, and outputs the base-10 value of the binary number, modulo $10^9 + 7$.

The base-10 value of a binary number S of length n consisting of digits 0 and 1 is given by the sum of $S_i \times 2^{n-i}$ over all i in $[1, n]$.

Input Specification

The first line contains two space-separated integers, $|S|$ and M, the length of the number and the number of operations.
The next line contains S, the original binary number.
The next M lines contain two space-separated integers, l and r, representing an operation described in the problem statement.

Output Specification

For each operation, output the base-10 value of the binary number after performing the operation, modulo $10^9 + 7$.

Constraints

In all subtasks,
$1 \leq |S| \leq 500\,000$
$1 \leq l \leq r \leq |S|$
$0 \leq M \leq 500\,000$

Subtask 1 [20%]

$1 \leq |S| \leq 20$

Subtask 2 [80%]

No additional constraints.

Sample Input 1

```
5 2
01000
1 3
2 4
```

Sample Output 1

```
28
30
```