Examination 2

JOI-kun goes to IOI High School, where the final exam is held soon. In the exam, students will be tested on whether they can correctly calculate the value of an **IOI function**. An IOI function is a string obtained by one of the following six rules defined by IOI High School, which maps integers between 1 and 10^9 (inclusive) to boolean values, either `True` or `False`.

1. Let a be an integer between 1 and 10^9 (inclusive), then `[a]` is an IOI function (`a` is the string representation of a in decimal notation). This IOI function maps integers greater than or equal to a to `True`, and integers less than a to `False`.
2. Let `f` be an IOI function, then `(f)` is also an IOI function. This IOI function maps the same integers to `True` and `False` as `f` does.
3. Let `f` be an IOI function, then `!f` is also an IOI function. This IOI function maps integers that `f` maps to `True` to `False`, and vice versa.
4. Let `f` and `g` be IOI functions, then `f&g` is also an IOI function. This IOI function maps integers to `True` if both `f` and `g` map them to `True`, and to `False` otherwise.
5. Let `f` and `g` be IOI functions, then `f^g` is also an IOI function. This IOI function maps integers to `True` if exactly one of `f` or `g` maps them to `True`, and to `False` otherwise.
6. Let `f` and `g` be IOI functions, then `f|g` is also an IOI function. This IOI function maps integers to `True` if at least one of `f` or `g` maps them to `True`, and to `False` otherwise.

If an IOI function is obtained using multiple rules, the rule with the higher number determines the boolean value that the IOI function maps integers to. For example, for `[1]&[2]|[3]`, rule 6 is applied to `f = [1]&[2]` and `g = [3]` (rather than applying rule 4 to `f = [1]` and `g = [2]|[3]`). Additionally, for rules 4, 5, and 6, the rule is applied so that `f` becomes as long as possible. For example, for `[4]^[5]^[6]`, rule 5 is applied to `f = [4]^[5]` and `g = [6]` (rather than applying rule 5 to `f = [4]` and `g = [5]^[6]`).

To prepare for the exam, JOI-kun has prepared an IOI function S of length N and intends to practice determining the boolean values that this IOI funcition maps Q integers $X_1, X_2, \ldots, X_Q$ to. He askes for your help, as you are proficient with handling IOI functions, to create a sample solution.

Write a program which, given N, Q, S and $X_1, X_2, \ldots, X_Q$, determines the boolean values that the IOI function S maps integers $X_1, X_2, \ldots, X_Q$ to.

Input

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

N Q
S
X_1
X_2
$\vdots$
X_Q

Output

Print Q lines to Standard Output. i-th line ($1 \leq i \leq Q$) should contain a single boolean value which the IOI function S maps the integer X_i to.

Constraints

- $1 \leq N \leq 1\,000\,000$.
- $1 \leq Q \leq 200\,000$.
- S is an IOI function of length N.
- $1 \leq X_i \leq 10^9$ ($1 \leq i \leq Q$).
- N, Q, and X_i ($1 \leq i \leq Q$) are integers.

Subtasks

1. (5 points) S does not contain `&` or `|`.
2. (20 points) $Q = 1$.
3. (10 points) $N \leq 10\,000$.
4. (6 points) S does not contain `!` or `^`.
5. (12 points) When rule 4 or rule 6 was applied in the process of obtaining S, at least one of `f` or `g` was an IOI function obtained from rule 1.
6. (20 points) $N \leq 400\,000$.
7. (27 points) No additional constraints.

Sample Input and Output

Sample Input 1	Sample Output 1
15 5 (![2]|[3])&![4] 1 2 3 4 5	True False True False False

For some of the IOI functions that appear in the process of obtaining S according to the rules in the problem statement, the boolean values they map integers X_i ($1 \leq i \leq Q$) to are as shown in the following table.

X_i	![2]	[3]	![2]|[3]	![4]	(![2]|[3])&![4]
1	True	False	True	True	True
2	False	False	False	True	False
3	False	True	True	True	True
4	False	True	True	False	False
5	False	True	True	False	False

This sample input satisfies the constraints of subtasks 3, 6 and 7.

Sample Input 2	Sample Output 2
20 4 (!![23])^((([116]))) 54 1 200 89	True False False True

This sample input satisfies the constraints of subtasks 1, 3, 5, 6 and 7.

Sample Input3	Sample Output3
32 4 [2]|[5]&[1]|(([1000000000])|[7]) 4 10 6 1	True True True False

This sample input satisfies the constraints of subtasks 3, 4, 6 and 7.