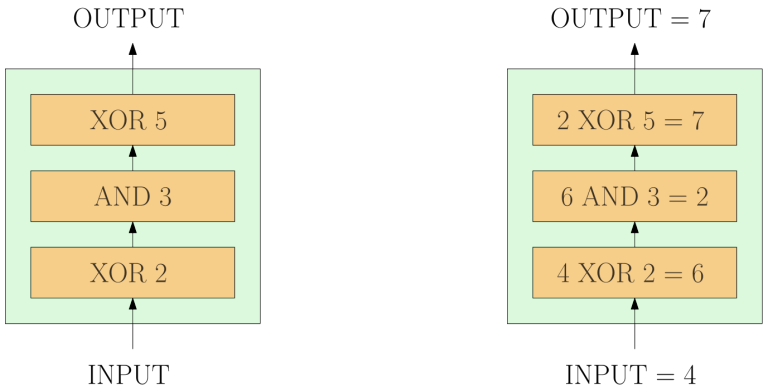
Problem C – Fábrica

Omega Nano Integrated (ONI) is a leading company in electronic circuits due to its production method with thin layers of semiconductor materials. Each layer of the circuit is of type **AND** k or **XOR** k, where k is an integer. An **AND** between two integers (represented by the operator `&` in `C++`) is an operation that compares each corresponding bit of the two numbers, resulting in a new integer where each bit is 1 only if both compared bits are 1. Similarly, a **XOR** between two integers (represented by the operator `^` in `C++`) is an operation that compares each corresponding bit of the two numbers, resulting in a new integer where each bit is 1 only if the bits are different.

During production, layers are added successively. For example, adding the layers **XOR** 2, **AND** 3, and **XOR** 5 in this order results in the circuit shown in the figure below. Executing this circuit with the input 4, we would get the output 7.



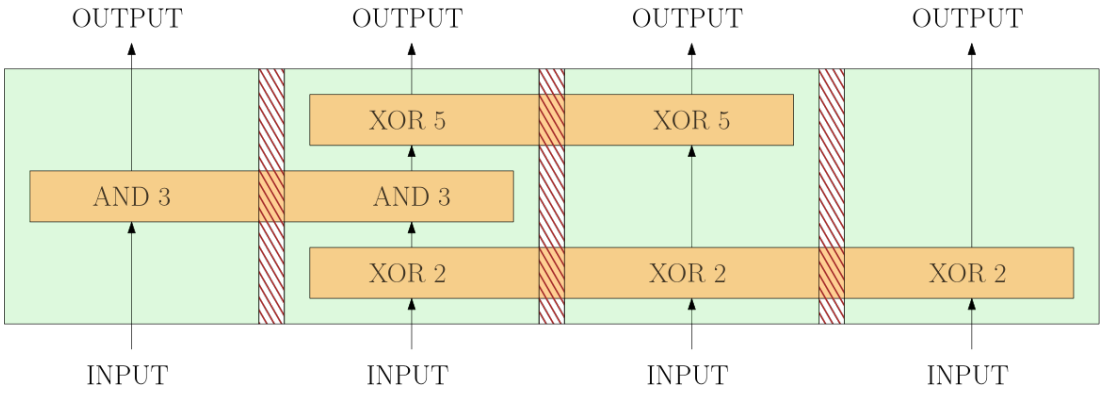
Recently, to speed up its production, ONI decided to start producing $\boldsymbol{N}$ circuits simultaneously arranged in a long assembly line numbered from 1 to $\boldsymbol{N}$. The production method in this factory consists of following $\boldsymbol{M}$ instructions, where each instruction adds a given layer (**AND** k_i or **XOR** k_i) to all devices in a given contiguous segment $[\boldsymbol{l_i}, \boldsymbol{r_i}]$ of the assembly line. The factory's quality control has access to this list of instructions and will perform $\boldsymbol{Q}$ measurements. For each measurement, they will input $\boldsymbol{X_i}$ into the $\boldsymbol{q_i}$-th circuit and record the output. Can you determine the list of numbers that will be recorded?

Example

Let's consider we are producing $\boldsymbol{N} = 4$ circuits and the $\boldsymbol{M} = 3$ instructions are:

- **Instruction 1:** add a **XOR** 2 layer to the circuits in the range $[2, 4]$;
- **Instruction 2:** add **AND** 3 to the circuits in the range $[1, 2]$;
- **Instruction 3:** add **XOR** 5 to the circuits in the range $[2, 3]$.

The figure below shows the final configuration of the circuits on the assembly line.



Next, there are $\boldsymbol{Q} = 3$ measurements:

- **Measurement 1:** input 4 into the circuit with index 2;
- **Measurement 2:** input 5 into the circuit with index 1;
- **Measurement 3:** input 2 into the circuit with index 4;

The result of the first measurement is 7 (note that it matches the previous example). The results of the remaining measurements are 1 and 0, respectively.

Constraints

The following limits are guaranteed in all test cases that will be posed to the program:

$1 \leq \boldsymbol{N} \leq 10^9$	Number of circuits
$1 \leq \boldsymbol{M} \leq 5 \cdot 10^4$	Number of instructions
$1 \leq \boldsymbol{Q} \leq 5 \cdot 10^4$	Number of measurements
$1 \leq \boldsymbol{l_i} \leq \boldsymbol{r_i} \leq \boldsymbol{N}$	Circuit intervals
$0 \leq \boldsymbol{k_i}, \boldsymbol{X_i} < 1024$	Layer configurations/Input measurements

Subtask overview

The test cases for this problem are organized into five groups with different additional restrictions:

Group	Points	Additional Constraints
1	10	$\boldsymbol{N} \leq 10^5$ and $\boldsymbol{M}, \boldsymbol{Q} \leq 2000$
2	15	$\boldsymbol{N} \leq 10^5$ and only **XOR** layers
3	15	$\boldsymbol{N} \leq 10^5$ and only **AND** layers
4	30	$\boldsymbol{N} \leq 10^5$
5	30	No additional constraints

Input Format

The first line contains three integers N, M, and Q, the number of circuits on the assembly line, the number of instructions, and the number of measurements.

The next M lines represent the instructions. The i-th line contains a character Op_i and three integers k_i, l_i, r_i. Op_i is always `A` or `X` and identifies the type of layer: **AND** k_i or **XOR** k_i, respectively. The integers l_i and r_i are the left and right extremes of the segment where this layer will be added. It is guaranteed that $1 \leq l_i \leq r_i \leq N$.

Finally, the next Q lines represent the measurements. The i-th line contains two integers X_i and q_i meaning that this measurement is obtained by inputting the integer X_i into the circuit with index q_i.

Output Format

The output should contain Q lines. On the i-th line, you should print a single integer, the predicted output for the i-th measurement.

Example 1 Input

```
4 3 3
X 2 2 4
A 3 1 2
X 5 2 3
4 2
5 1
2 4
```

Example 1 Output

```
7
1
0
```

Example 1 Description

This example corresponds to the example mentioned in the statement.

Example 2 Input

```
10 6 3
X 780 4 10
X 815 2 9
X 866 1 4
X 283 3 8
X 850 3 7
X 772 1 1
948 4
874 5
997 10
```

Example 2 Output

```
700
256
233
```

Example 3 Input

```
10 6 3
A 268 2 4
A 761 7 9
A 913 1 4
A 612 7 8
A 811 6 8
A 574 2 5
284 10
898 2
743 9
```

Example 3 Output

```
284
0
737
```

Example 4 Input

```
20 8 5
X 366 2 6
A 67 13 19
X 678 2 7
A 1001 1 12
X 96 3 17
A 484 6 17
X 83 9 17
A 525 1 6
121 13
267 5
126 9
265 7
778 20
```

Example 4 Output

```
115
513
83
448
778
```