

Problem B. Conic Section

Input file: *standard input*
Output file: *standard output*
Time limit: 3 seconds
Memory limit: 256 mebibytes

Rikka generates an integer sequence u_1, u_2, \dots as follows: she generates x_1, x_2, \dots , where $x_i = (100\,000\,005 \cdot x_{i-1} + 20\,150\,609) \bmod 998\,244\,353$, and then sets $u_i = \lfloor \frac{x_i}{100} \rfloor$.

Initially, there are n points on the Cartesian plane. The i -th point has coordinates $(i, u_i \bmod 100\,001)$. After that, m operations are performed subsequently. The i -th operation has one of the three types: “C”, “R”, and “Q”.

Let $p_i = \min\{u_{n+2i-1} \bmod n, u_{n+2i} \bmod n\} + 1$ and $q_i = \max\{u_{n+2i-1} \bmod n, u_{n+2i} \bmod n\} + 1$.

- If the i -th operation is of type “C”, transform the $(u_{n+2i-1} \bmod n + 1)$ -th point into $(u_{n+2i-1} \bmod n + 1, u_{n+2i} \bmod 100\,001)$.
- If the i -th operation is of type “R”, for all x such that $p_i \leq x \leq q_i$, transform the point (x, y) into $(x, 100\,000 - y)$.
- If the i -th operation is of type “Q”, consider all currently existing points (x, y) such that $p_i \leq x \leq q_i$ and, given a_i, b_i and c_i , find $\max\{a_i \cdot x + b_i \cdot y + c_i \cdot x \cdot y\}$.

Input

The first line contains three integers: n, m , and x_0 ($1 \leq n \leq 10^5, 1 \leq m \leq 10^6, 0 \leq x_0 < 998\,244\,353, x_0 \neq 340\,787\,122$).

The i -th of the following m lines starts with a character t_i , the type of the operation, which is either “C”, “R”, or “Q”. If t_i is “Q”, three integers a_i, b_i, c_i follow ($0 \leq a_i, b_i < 10^6, 0 \leq c_i < 40$).

It is guaranteed that the number of operations of type Q does not exceed 10^5 .

Output

For each operation of type “Q”, output an integer which denotes the maximum.

Example

standard input	standard output
3 3 2705443	13035048532
C	
R	
Q 872784 195599 7	

Note

Initially, the three points lie in $(1, 91263)$, $(2, 33372)$ and $(3, 10601)$ respectively.

The first operation changes the third point to $(3, 94317)$.