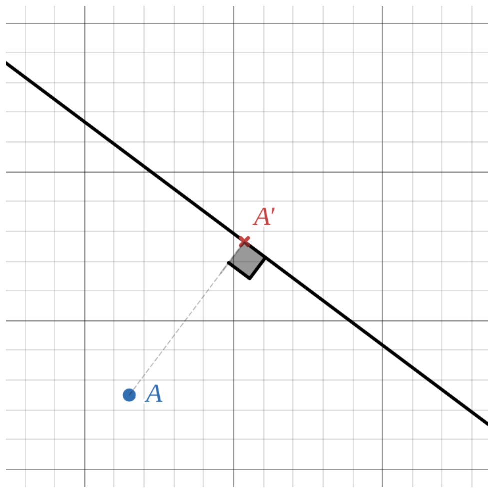
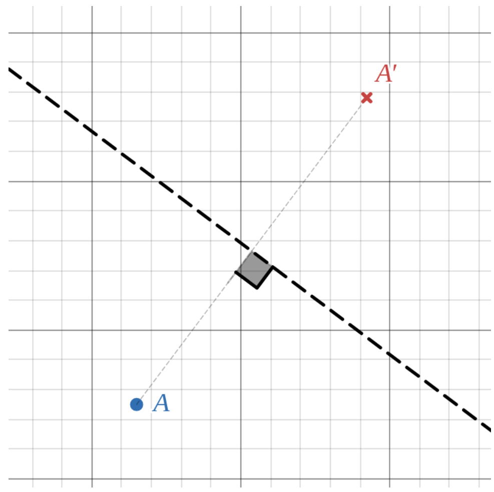
Impulsive Particle Experiment

The scientists have discovered a new kind of particle that can revolutionize transportation. In the ideal environment, if there is a nearby flat object, the particle will shoot itself in the **direction to the closest point** on the object, almost instantly. After that, the particle will be stabilized and rest. The scientists call the flat object *reflector*, and based on the material of the *reflector*, the particle can rest at a different position:

- if the *reflector* is **gold**, the particle's resting position will rest on the *reflector* itself;
- if the *reflector* is **diamond**, the particle's resting position will be directly on the opposite side of the *reflector*, at the same perpendicular distance from it.



Shoot the particle at point A to a **gold** *reflector*



Shoot the particle at point A to a **diamond** *reflector*

The scientists realizes that this can make teleportation become a reality. However, more testing is required to ensure everyone's safety and also to optimize the cost for such a travelling method. So several experiments are conducted.

The experiment's environment can be seen as an Oxy plane. The scientists have prepared n *reflectors*, the i-th *reflector* is made of the material m_i (which is either **gold** or **diamond**) and it is model as a line of form $a_ix + b_iy + c_i = 0$. Then the scientists perform q actions of the following types:

- $1\ j\ m\ a\ b\ c$ – replace the j-th *reflector* with another one, made of the material m, on the line $ax + by + c = 0$.
- $2\ x\ y\ l\ r$ – the scientists place a particle at the position (x, y). For each i from l to r, the scientists shoot the particle to the i-th reflector, moving the particle to a new resting position.

For each action of the second type, please help the scientists find the final resting position of the particle.

Input

The first line contains two integers n and q ($1 \le n, q \le 2 \cdot 10^5$) – the number of *reflectors* and the number of actions to perform.

The i-th of the next n lines contains a character m_i and three integers a_i, b_i, c_i ($m_i \in \{\texttt{G}, \texttt{D}\}$, $|a_i|, |b_i|, |c_i| \le 10^4$, $a_i^2 + b_i^2 > 0$) – the material of the i-th *reflector* (`G` for **gold**, and `D` for **diamond**) and the model line coefficients of the i-th *reflector*.

The i-th of the next q lines describes the actions with the following form:

- `1` j m a b c ($1 \le j \le n$, $m \in \{\texttt{G}, \texttt{D}\}$, $|a|, |b|, |c| \le 10^4$, $a^2 + b^2 > 0$) – description of the action type `1`.
- `2` x y l r ($|x|, |y| \le 10^4$, $1 \le l \le r \le n$) – description of the action type `2`.

Output

For each action of the second type, print two integers x', y' ($0 \le x', y' < 998\,244\,353$) – the coordinates of particle's final resting position, modulo $998\,244\,353$.

Formally, let $M = 998, 244, 353$. It can be shown that every coordinate can be expressed as an irreducible fraction $\frac{\alpha}{\beta}$, where α and β are integers and $\beta \not\equiv 0 \pmod{M}$. Output the integer equal to $\alpha \cdot \beta^{-1} \bmod M$. In other words, output such an integer χ that $0 \le \chi < M$ and $\chi \cdot \beta \equiv \alpha \pmod{M}$.

Sample Input 1

```
2 5
G 1 0 -1
D 0 1 -1
2 3 5 1 1
2 3 5 1 2
1 2 D 1 1 0
2 3 5 1 2
2 6 9 2 2
```

Sample Output 1

```
1 5
1 998244350
998244348 998244352
998244344 998244347
```

Sample Explanation

In the below illustraion, the connected line represents the **gold** *reflector*, while the dashed-line represents the **diamond** *reflector*.

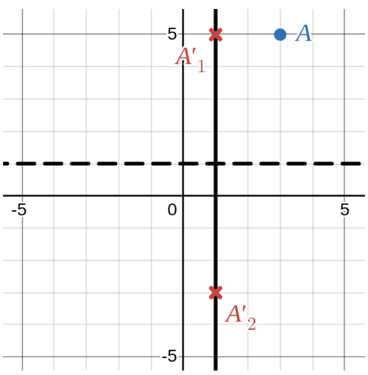


Illustration for the actions 1 and 2.

- The point $A_1' = (1, 5)$ is the answer for the first action.
- The point $A_2' = (1, -3)$ is the answer for the second action.

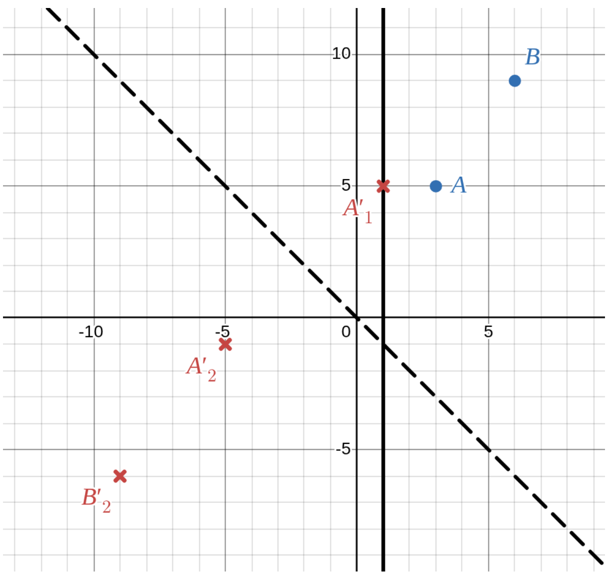


Illustration for the actions 3, 4 and 5.

- The second *reflector* is changed after the 3-rd action.
- The point $A_2' = (-5, -1)$ is the answer for the 4-th action.
- The point $B_2' = (-9, -6)$ is the answer for the 5-th action.

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