D2. Escaping on Beaveractor

Don't put up with what you're sick of! The Smart Beaver decided to escape from the campus of Beaver Science Academy (BSA). BSA is a $b \times b$ square on a plane. Each point x, y $(0 \leq x, y \leq b)$ belongs to BSA. To make the path quick and funny, the Beaver constructed a Beaveractor, an effective and comfortable types of transport.

The campus obeys traffic rules: there are n arrows, parallel to the coordinate axes. The arrows do not intersect and do not touch each other. When the Beaveractor reaches some arrow, it turns in the arrow's direction and moves on until it either reaches the next arrow or gets outside the campus. The Beaveractor covers exactly one unit of space per one unit of time. You can assume that there are no obstacles to the Beaveractor.

The BSA scientists want to transport the brand new Beaveractor to the "Academic Tractor" research institute and send the Smart Beaver to do his postgraduate studies and sharpen pencils. They have q plans, representing the Beaveractor's initial position (x_i, y_i), the initial motion vector w_i and the time t_i that have passed after the escape started.

Your task is for each of the q plans to determine the Smart Beaver's position after the given time.

Input

The first line contains two integers: the number of traffic rules n and the size of the campus b, $0 \leq n$, $1 \leq b$. Next n lines contain the rules. Each line of the rules contains four space-separated integers x_0, y_0, x_1, y_1 — the beginning and the end of the arrow. It is guaranteed that all arrows are parallel to the coordinate axes and have no common points. All arrows are located inside the campus, that is, $0 \leq x_0, y_0, x_1, y_1 \leq b$ holds.

Next line contains integer q — the number of plans the scientists have, $1 \leq q \leq 10^5$. The i-th plan is represented by two integers, x_i, y_i are the Beaveractor's coordinates at the initial time, $0 \leq x_i, y_i \leq b$, character w_i, that takes value U, D, L, R and sets the initial direction up, down, to the left or to the right correspondingly (the Y axis is directed upwards), and t_i — the time passed after the escape started, $0 \leq t_i \leq 10^{15}$.

- to get 30 points you need to solve the problem with constraints $n, b \leq 30$ (subproblem D1);
- to get 60 points you need to solve the problem with constraints $n, b \leq 1000$ (subproblems D1+D2);
- to get 100 points you need to solve the problem with constraints $n, b \leq 10^5$ (subproblems D1+D2+D3).

Output

Print q lines. Each line should contain two integers — the Beaveractor's coordinates at the final moment of time for each plan. If the Smart Beaver manages to leave the campus in time t_i, print the coordinates of the last point in the campus he visited.

Examples

input

```
3 3
0 0 0 1
0 2 2 2
3 3 2 3
12
0 0 L 0
0 0 L 1
0 0 L 2
0 0 L 3
0 0 L 4
0 0 L 5
0 0 L 6
2 0 U 2
```

```
2 0 U 3
3 0 U 5
1 3 D 2
1 3 R 2
```

output

```
0 0
0 1
0 2
1 2
2 2
3 2
3 2
2 2
3 2
1 3
2 2
1 3
```