Down the Rabbit Hole

Alice is feeling bored while sitting on the riverbank with her sister, when she notices a 2D White Rabbit with a 2D pocket watch run past. She follows it down a rabbit hole when suddenly she falls a long way to a curious 2D plane.

In this 2D plane she discovered she can only move using a sequence of *movements*. Those movements are limited to:

- **Scaling**, denoted as S_c (where c is a nonzero rational number). If Alice is currently at (x, y), then S_c takes her to (cx, cy).
- **Translation**, denoted as $T_{a,b}$ (where a and b are rational numbers). If Alice is currently at (x, y), then $T_{a,b}$ takes her to $(a + x, b + y)$.
- **Rotation**, denoted as $R_{a,b}$ (where a and b are rational numbers and $a^2 + b^2 = 1$). If Alice is currently at (x, y), then $R_{a,b}$ takes her to $(ax + by, ay - bx)$. In other words, $R_{a,b}$ is a clockwise rotation about the origin, at an angle θ where $\cos\theta = a$ and $\sin\theta = b$.
- **Flip X-axis**, denoted as F_X. If Alice is currently at (x, y), then F_X takes her to $(x, -y)$.
- **Flip Y-axis**, denoted as F_Y. If Alice is currently at (x, y), then F_Y takes her to $(-x, y)$.
- **Inversion**, denoted as I (more precisely, inversion in the unit circle). If Alice is currently at (x, y), then I takes her to $\left(\frac{x}{x^2 + y^2}, \frac{y}{x^2 + y^2}\right)$.

Also, Alice discovered that when she is at $(0, 0)$ before she performs an inversion, she is taken to a special place called *Wonderland*. In Wonderland, performing any of the other movements (scaling, translation, rotation or flip) will return her to Wonderland, and performing an inversion moves her back to $(0, 0)$.

Now, Alice has a sequence of N such movements to make. Moreover, she performs this sequence of N movements a total of K times. Your task is to determine her final location after her adventure.

If Alice's final location is (x_f, y_f), it's easy to see that x_f and y_f are rational. Let $x_f = A/B$ and $y_f = C/D$ (both in lowest terms). Understandably, A, B, C and D can be really large integers, so instead of asking for x_f and y_f we will only ask for the values $AB^{-1} \bmod (10^9 + 7)$ and $CD^{-1} \bmod (10^9 + 7)$.

Input Format

The first input contains a single integer, T, which is the number of test cases. The next lines contain the descriptions of the T test cases.

The first line of each test case contains four values N, K, x_s and y_s. N and K are integers (described above), and (x_s, y_s) is the initial location of Alice (x_s and y_s are rational numbers).

The next N lines each contains the description of a movement in the sequence, which is one of the following:

- `S c`, which denotes *scaling* (c is a nonzero rational number),
- `T a b`, which denotes *translation* (a and b are rational numbers),
- `R a b`, which denotes *rotation* (a and b are rational numbers and $a^2 + b^2 = 1$),

- `F X`, which denotes *flip X-axis*,
- `F Y`, which denotes *flip Y-axis*, and
- `I`, which denotes *inversion*.

Output Format
If Alice's final location is Wonderland, output `WONDERLAND`.

If Alice's final location is (x_f, y_f), and $x_f = A/B$ and $y_f = C/D$ in irreducible form, then output the two integers $AB^{-1} \bmod (10^9+7)$ and $CD^{-1} \bmod (10^9+7)$ in a line separated by a single space. However, if either B or D is not invertible, also output `WONDERLAND`.

Constraints
$1 \le T \le 10^5$
$1 \le N \le 10^5$
The sum of the N's in a single test file is $\le 10^5$
$1 \le K \le 10^{15}$
Each rational number is expressed in irreducible form A/B with the following constraints:
$-10^9 < A < 10^9$
$1 \le B < 10^9$

Sample Input

```
2
3 2 0/1 0/1
T -2/1 3/1
R 3/5 4/5
I
5 1 2/1 -2/1
F X
S 3/2
T -3/1 -3/1
I
F Y
```

Sample Output

```
881896558 492241383
WONDERLAND
```

Explanation
In the first test case, $(x_s, y_s) = (0, 0)$, $K = 2$ and the sequence of operations is $[T_{-2,3}, R_{3/5,4/5}, I]$.

$$\begin{aligned}
T_{-2,3}: &\quad (0,0) &\to&\quad (-2,3)\\
R_{3/5,4/5}: &\quad (-2,3) &\to&\quad (6/5,17/5)\\
I: &\quad (6/5,17/5) &\to&\quad (6/65,17/65)\\
T_{-2,3}: &\quad (6/65,17/65) &\to&\quad (-124/65,212/65)\\
R_{3/5,4/5}: &\quad (-124/65,212/65) &\to&\quad (476/325,1132/325)\\
I: &\quad (476/325,1132/325) &\to&\quad (119/1160,283/1160)
\end{aligned}$$

Therefore, the final location is $(x_f, y_f) = (119/1160, 283/1160)$. So we print:
$119 \cdot 1160^{-1} \bmod (10^9+7) = 881896558$ and:
$283 \cdot 1160^{-1} \bmod (10^9+7) = 492241383$.

In the second test case, $(x_s, y_s) = (2, -2)$, $K = 1$ and the sequence of operations is $[F_X, S_{3/2}, T_{-3,-3}, I, F_Y]$.

$$
\begin{aligned}
F_X\colon &\quad (2,-2) &\rightarrow&\quad (2,2) \\
S_{3/2}\colon &\quad (2,2) &\rightarrow&\quad (3,3) \\
T_{-3,-3}\colon &\quad (3,3) &\rightarrow&\quad (0,0) \\
I\colon &\quad (0,0) &\rightarrow&\quad \text{Wonderland} \\
F_Y\colon &\quad \text{Wonderland} &\rightarrow&\quad \text{Wonderland}
\end{aligned}
$$

Therefore, the final location is *Wonderland*.