

Problem 12: Big Ben's League of Legends Addiction

12 Points

Problem ID: `soloq`

Rank: 4

Introduction

Big Ben is addicted to [League of Legends](#). He has played over a billion games of Solo Queue with an outstanding 49% winrate in Silver 3. He has noticed that there are two different queues, the "Winners' Queue" for decent human beings and the "Losers' Queue" for [people who just run it down](#). He has also figured out how Riot decides which queue you are in and his winning chance in each of the queues. Can you help Big Ben predict what his LP gain will be in the next billion games?

Problem Statement

Big Ben is going to play N games of League of Legends. He will win X LP each time he wins and will lose Y LP each time he loses. His chance of winning in the Winners' Queue is W_1/W_2 , while his chance of winning in the Losers' Queue is L_1/L_2 . At any given point in time, he is in one of the queues.

Riot Games has a list of K streaks S_1, S_2, \dots, S_K that will swap you between the Winners' and Losers' queues every time a streak on the list matches a suffix of your match history. For example, if you win a game, lose a game, then win two games, both streaks WW and $WLWW$ are matched, but WLW is not.

After playing a game, Riot's Client will check every S_i and will swap you between queues if S_i matches as your streak. Note that you can be swapped multiple times between queues after playing a single game as a result of matching multiple streaks.

Given that Big Ben starts playing in the Winners' Queue, what is the expected amount of LP that Big Ben will win? The answer can be expressed as a rational number p/q where $q > 0$. Output a positive integer $p \cdot q^{-1} \pmod{10^9 + 7}$ where q^{-1} is the modular inverse.

Input Format

The first line of the input contains a single integer T denoting the number of test cases that follow. For each test case:

- The first line contains two integers N, K denoting the number of games that Big Ben plays and the number of streaks the Riot Client has, respectively.
- The second line contains six integers X, Y, W_1, W_2, L_1, L_2 .
- The next K lines each contain a string of w and l that represents each of the Riot Client's special streaks.

Output Format

For each test case, output a single non-negative integer denoting the expected LP that Big Ben will get modulo $10^9 + 7$ as per the format described in the last paragraph of the problem statement.

Constraints

Time Limit: **3 seconds**

$$1 \leq T \leq 10$$

$$1 \leq N \leq 10^{12}$$

$$1 \leq K \leq 15$$

$$1 \leq |S_i| \leq 15 \text{ and only contains } w \text{ and } l \text{ for all } i.$$

$$0 \leq W_1 \leq W_2 \leq 10^9, W_2 \neq 0$$

$$0 \leq L_1 \leq L_2 \leq 10^9, L_2 \neq 0$$

$$0 \leq X, Y \leq 10^9$$

It is guaranteed that the sum of K across all test cases does not exceed 15.

Sample Test Cases

Sample Input

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```
3
10 2
30 28 1 2 1 2
L
W
1000000008 6
36 34 4 7 29 351
L
W
LL
LW
WL
WW
5 3
10 5 1 2 1 2
WWLW
LW
LWLW
```

Sample Output

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```
10
6
500000016
```

Sample Explanations

For test case #1, Big Ben will switch between queues after every game, since his streak will always end in `L` or `W`.

For test case #2, Big Ben will start in the Winners' Queue and will swap to the Losers' Queue after playing a single game since both `L` and `W` belong to the special streaks. After that first game, Big Ben will always stay in the Losers' Queue, since every time he plays two different streaks will be detected, swapping him between queues twice. Poor Big Ben :(