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 Scoreboard

 Solutions

 You advanced to **Round 2!**

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PROBLEMS

Weak Typing

☒ A1: Chapter 1 10 pt

☒ **A2: Chapter 2** 14 pt

☐ A3: Chapter 3 21 pt

☒ B: Traffic Control 18 pt


☐ C: Blockchain 37 pt

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 My Clarifications

Problem A2: Weak Typing - Chapter 2

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Note: This problem shares similarities with Chapters 1 and 3. The solution to any chapter may help with solving the others, so please consider reading all of them first.

Timmy the toddler is training to be a top typist. His teacher has assigned some homework in the form of a list of T string exercises to be typed, consisting of only the uppercase letters "F", "O", and "X".

Timmy is eating a popsicle on a hot summer afternoon, but still hopes to complete his homework. He would like to hold the popsicle with one hand, and type with the other. Unfortunately, Timmy is still a growing boy, and each of his hands is a tad too small to reach all the way across the keyboard. He can only reach the letters "F" and "X" with his left hand, and the letters "F" and "O" with his right.

Consider a string W which Timmy must type. Timmy may start typing with any hand of his choice (with the other holding the popsicle). He must then switch hands as necessary to type out the $|W|$ letters in order, ending on any hand of his choice.

Let $F(W)$ be the minimum number of times Timmy must switch hands to type such a string W .

Given an exercise string S of length N , let $G(S)$ be the sum of $F(W)$ over all substrings W of S . Note that there are $N * (N + 1) / 2$ such substrings. Please help Timmy compute the value of $G(S)$ modulo 1,000,000,007.

Constraints

$$1 \leq T \leq 75$$
$$1 \leq N \leq 800,000$$

Each string consists only of the letters "F", "O", and "X".
The sum of N across all exercises is at most 4,000,000.

Input

Input begins with an integer T , the number of exercises that Timmy has been assigned. For each exercise, there is first a line containing the single integer N , followed by a second line containing the string S of length N .

Output

For the i th exercise, output a line containing "Case # i : " followed by a single integer, $G(S)$ modulo 1,000,000,007.

Sample Explanation

In the first exercise, the only substring of "O" is "O" itself. $F(\text{"O"}) = 0$, as if Timmy begins with his right hand, he can type "O" without needing to switch to his left hand. The answer is therefore 0 modulo 1,000,000,007 = 0.

In the second exercise, there are 6 substrings to consider: "X", "F", "O", "XF", "FO", and "XFO". F has a value of 0 when evaluated on any of the first 5 of these, while $F(\text{"XFO"}) = 1$, as if Timmy begins with his left hand, he can type all 3 letters in order with 1 hand switch (for example, by switching to his right hand after typing the first letter). The answer is therefore $(0 + 0 + 0 + 0 + 0 + 1)$ modulo 1,000,000,007 = 1.

In the third exercise, F has a value of 0 when evaluated on any of the 15 substrings of "FFOFF", as Timmy can type each of them using only his right hand.

In the fourth exercise, F has a value of 0 for 29 of the substrings of S , a value of 1 for another 16 of them, and a value of 2 for the remaining 10 of them. The answer is therefore $(0 * 29 + 1 * 16 + 2 * 10)$ modulo 1,000,000,007 = 36.

Sample Input  

```
5
1
0
3
XFO
5
FFOFF
10
FXXFXF00XF
13
XF0FXF0FXF0FX
```

Sample Output  

```
Case #1: 0
Case #2: 1
Case #3: 0
Case #4: 36
Case #5: 146
```

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