I Love CCPC

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	1024 megabytes

A string t of length k consisting of lowercase letters is called a CCPC (Character-Character-Palindrome-Character) string if and only if it satisfies the following properties:

- The length of t is at least 4, i.e., $k \geq 4$;
- The first character, the second character, and the last character of t are equal, i.e., $t_1 = t_2 = t_k$;
- The remaining part of t is a palindrome, i.e., $t_3 t_4 ... t_{k-1}$ is a palindrome.

For example, `ccpc`, `ppap`, `zzzz`, and `aabcddcba` are all CCPC strings, while `jinan`, `aaa`, and `oovoo` are not.

A substring of a string s can be represented using two indices $1 \leq l \leq r \leq |s|$, corresponding to the content $s_l s_{l+1} \ldots s_r$. In this problem, two substrings are considered different if and only if the chosen indices l, r are not the same. Given a string s that contains only lowercase letters, first calculate the number of CCPC substrings. Then n operations will be applied, where each operation inserts a lowercase letter on the **left or right** side of s. You need to determine the number of CCPC substrings after each insertion.

Input

This problem contains multiple test cases. The first line of input contains an integer T ($1 \leq T \leq 100$), representing the number of test cases.

For each test case:

The first line contains a string s consisting only of lowercase letters ($4 \leq |s| \leq 5 \times 10^5$), representing the initial content of the string.

The next line contains an integer n ($1 \leq n \leq 5 \times 10^5$), representing the number of operations.

The following line contains n strings of length 2, $c_1, c_2, \ldots, c_n$, separated by spaces. Here, c_i indicates the content of the i-th operation: the first character is `L` indicating an insertion on the left side, and `R` indicating an insertion on the right side, while the second character represents the lowercase letter to be inserted.

It is guaranteed that the sum of $|s|$ across all test cases and the sum of n do not exceed 5×10^5.

Output

For each test case, output a line with $n + 1$ integers. The first integer represents the answer in the initial case, followed by n integers, where the i-th integer represents the answer after the first i operations.

Example

standard input	standard output
2 iloveccpc 6 Rj Ri Ln La Ln Ln cpcpccp 9 Lc Lc Rp Rc Lc Lc Rp Rp Rc	1 1 1 1 1 1 2 0 2 3 3 4 5 7 8 8 9

Note

For the second test case, after all operations are completed, the content of the string s is cccccpcpccppcppc. The CCPC substrings include: $s_{1...4}$ = cccc, $s_{1...5}$ = ccccc, $s_{2...5}$ = cccc, $s_{3...10}$ = cccpcpcc, $s_{4...7}$ = ccpc, $s_{4...9}$ = ccpcpc, $s_{9...13}$ = ccppc, $s_{9...16}$ = ccppcppc, and $s_{11...14}$ = ppcp.