

Problem M – May I Add a Letter?

You have a string S of length N and you are asked to perform a sequence of Q updates of two types to S :

- Append a given character to the end of S .
- Delete the last character from S .

Initially and after each update, you must calculate the number of distinct strings that occur at least twice as substrings of S .

For example, if S is initially “ABABC”, the answer is 3, as “A”, “B” and “AB” occur twice as substrings of S . If you are asked to append the character “C”, S will become “ABABCC” and the answer will be 4, as now “C” occurs twice too. If you are asked to append “C” again, S will be “ABABCCC” and the answer will be 5, as “CC” occurs twice now. If you are given a delete operation now, S will become “ABABCC” and the answer will be 4 again.

Input

The first line contains a string S of length N ($1 \leq N \leq 10^5$), indicating the initial value of the string. Each character of S is an uppercase letter. The second line contains a string U of length Q ($1 \leq Q \leq 10^5$), representing the updates to perform. Each character of U is either an uppercase letter indicating that such a letter must be appended, or the character “-” (hyphen) denoting a delete operation. The updates must be applied in the order they appear in U . It is guaranteed that delete operations are not applied to empty strings.

Output

Output $Q + 1$ lines, each line with an integer indicating the number of distinct strings that occur at least twice as substrings of S . Line 1 refers to the initial value of S , while line $i + 1$ refers to the value of S after applying the first i updates ($i = 1, 2, \dots, Q$).

<p>Sample input 1</p> <p>ABABC CC-</p>	<p>Sample output 1</p> <p>3 4 5 4</p>
<p>Sample input 2</p> <p>ABAB A--CC</p>	<p>Sample output 2</p> <p>3 5 3 1 1 2</p>
<p>Sample input 3</p> <p>HAVE FUN</p>	<p>Sample output 3</p> <p>0 0 0 0</p>