

Scary Subsequences

Input file: **standard input**
Output file: **standard output**
Time limit: 1 second
Memory limit: 512 megabytes

In this problem, all strings consist only of four characters: **a**, **b**, **c**, and **d**.

Busy Beaver has three strings x , y , and z that he's really scared of. In particular, he only likes strings that are not a subsequence* of any of them.

Answer Q queries. In query i , you are given a string s_i , such that x , y , and z are all subsequences of s_i and $|s_i| > \max(|x|, |y|, |z|)$. Help Busy Beaver find the length of the shortest subsequence of s_i that is not a subsequence of any of x , y , or z .

Input

The first three lines of the input contain the strings x , y , and z ($1 \leq |x|, |y|, |z| \leq 60$), consisting of characters **a**, **b**, **c**, **d**.

The next line contains a single positive integer Q ($1 \leq Q \leq 1.5 \cdot 10^5$).

The next Q lines each contain a string, the i -th of which is s_i ($\max(|x|, |y|, |z|) < |s_i| \leq 3 \cdot 10^5$), consisting of characters **a**, **b**, **c**, **d** such that s_i has x , y , and z as subsequences.

The sum of $|s_i|$ over all queries does not exceed $3 \cdot 10^5$.

Output

On the i -th line, output a single positive integer — the shortest possible length of a subsequence of s_i that is not a subsequence of any of x , y , or z .

Example

standard input	standard output
abb	2
bcc	1
abcc	3
3	
abcbc	
dabcabc	
abbcc	

Note

In the first query, all length 1 subsequences of **abcbc** are subsequences of one of x , y , or z , but the subsequence **cb** is not, so the answer is 2.

In the second query, **d** is a subsequence of **dabcabc** that is not a subsequence of any of x , y , or z .

In the third query, **bbc** is a subsequence of **abbcc** that is not a subsequence of any of x , y , or z , and it is the shortest such subsequence.

*A string s is a *subsequence* of a string t if s can be obtained from t by deleting some (possibly none or all) characters from t , without reordering the remaining characters.