

5109 Regular Expression Edit Distance

A regular expression is used to describe a set of strings. For this problem the alphabet is limited to 'a' and 'b'. R is a regular expression if:

1. R is 'a' or 'b'
2. R is of the form ' (R_1R_2) ' where R_1 and R_2 are regular expressions
3. R is of the form ' $(R - 1|R_2)$ ' where R_1 and R_2 are regular expressions
4. R is of the form ' (R_1^*) ' where R_1 is a regular expression.

The set of strings recognised by R are as follows:

1. If R is 'a', then the set of strings recognised = {a}
2. If R is 'b', then the set of strings recognised = {b}
3. If R is of the form ' (R_1R_2) ' then the set of strings recognised = all strings which can be obtained by a concatenation of strings s_1 and s_2 where s_1 is recognised by R_1 and s_2 by R_2 .
4. If R is of the form ' $(R - 1|R_2)$ ' then the set of strings recognised = union of the set of strings recognised by R_1 and R_2 .
5. If R is of the form ' (R_1^*) ' then the the strings recognised are the empty string and the concatenation of an arbitrary number of copies of any string recognised by R_1 .

The edit distance between two strings s_1 and s_2 is the minimum number of characters to be inserted/deleted or replaced in s_1 to make it equal to s_2 .

Given two regular expressions R_1 and R_2 , find the minimum edit distance amongst all pairs of strings s_1 and s_2 such that s_1 is recognised by R_1 and s_2 is recognised by R_2 .

Input

The first line contains the number of test cases T . T test cases follow.

Each test case contains two lines containing two regular expressions R_1 and R_2 . There is a blank line after each test case.

Output

Output T lines one corresponding to each test case containing the required answer for the corresponding test case.

Constraints:

- $T \leq 85$
- $1 \leq \text{length}(R_1), \text{length}(R_2) \leq 50$

You are guaranteed that R_1 and R_2 will conform to the definition provided above.

Explanation:

For the first case R_1 recognises all strings over the alphabet 'a' and 'b'. Thus it recognises the string 'abaa' which is also recognised by R_2 .

For the second case the strings 'aababab' and 'ababbb' are recognised by R_1 and R_2 respectively and have edit distance of 2.

Sample Input

```
2
((a|b)*)
(a(b(aa)))

(a((ab)*))
(a(b(((ab)b)b)))
```

Sample Output

```
0
2
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