

Count Strings

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

We define R to be a valid regular expression if:

- 1) R is " a " or " b ".
- 2) R is of the form " $(R_1 R_2)$ ", 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.

Regular expressions can be nested and will always have two elements in the parentheses. ('*' is an element, '|' is not; basically, there will always be pairwise evaluation) Additionally, '*' will always be the second element; '(*a)' is invalid.

The set of strings recognized by R are as follows:

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

Task

Given a regular expression and an integer, L , count how many strings of length L are recognized by it.

Input Format

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

Each test case contains a regular expression, R , and an integer, L .

Constraints

- $1 \leq T \leq 50$
- $1 \leq |R| \leq 100$
- $1 \leq L \leq 10^9$
- It is guaranteed that R will conform to the definition provided above.

Output Format

Print T lines, one corresponding to each test case containing the required answer for the corresponding test case. As the answers can be very big, output them modulo $10^9 + 7$.

Sample Input

```
3
( (ab) | (ba) ) 2
( (a|b)* ) 5
( (a*)(b(a*)) ) 100
```

Sample Output

```
2
32
100
```

Explanation

For the first case, the only strings recognized are "***ab***" and "***ba***". Of the **4** possible strings of length **2**, **2** of them fit that expression.

For the second case, the RegEx recognizes any string of any length containing only ***a***'s and ***b***'s. The number of strings of length **5** recognized by this expression is **$2^5 = 32$** .

For the third case, the RegEx recognizes any string having one ***b***, preceded and followed by any number of ***a***'s. There are **100** strings of length **100** which have a single ***b*** in them.