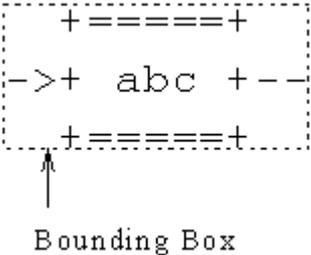


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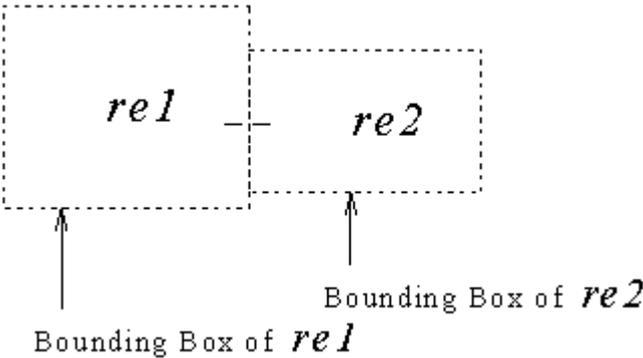
Given a simple syntax for describing regular expressions, one can find a graphical representation for a given regular expression using ASCII characters like '-', ' ', '+', and '/'. The syntax we use can be drawn by using four different patterns:

- "abc" is the terminal string 'abc', represented as



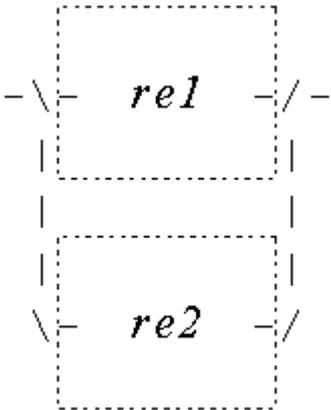
Note that the graphical representation of every expression has a bounding box. This is the smallest rectangle that surrounds the graphic.

- (*re1 re2*) is a sequence of first expression *re1*, then expression *re2*, represented as



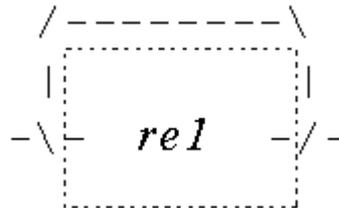
The two expressions *re1* and *re2* have to be concatenated such that the bounding boxes of the two expressions touch and such that the '-' on the right of *re1* matches the '-' on the left of *re2*.

- {*re1 re2*} represents alternatives, either *re1* or *re2*, represented as



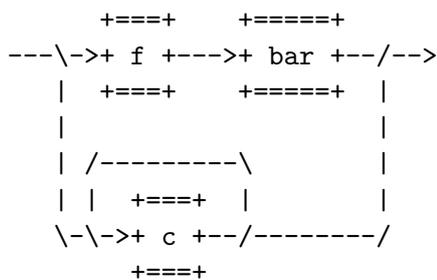
the number of ‘|’ characters that has to be added depends on the shapes of *re1* and *re2*. There has to be exactly one straight blank line between the bounding box of the graphical representation of *re1* and the bounding box of *re2*. If necessary, also a number of ‘-’ characters has to be added on the right side of *re1* or *re2*, to make the drawing possible. Note that the ‘-’ on the left of *re1* and *re2* matches the ‘\’ character and that the ‘-’ on the right of *re1* and *re2* matches the ‘\’ character in the drawing.

4. [*re1*] is a 1-or-more repetition of *re1*, represented as



Note that the ‘-’ on the left of *re1* matches the ‘\’ character and that the ‘-’ on the right of *re1* matches the ‘/’ character in the drawing.

For example the graphical representation for the regular expression {"f" "bar"} ["c"]} looks like:



Write a program that reads syntax rules and prints the size of the graphical representation. For esthetic reasons, the entire graphic has a ‘---’ on the left and a ‘->’ on the right.

Input

The input consists of a line holding the number of test cases, followed by the input expressions (one per line). The expressions are formatted according to the following grammar:

- expression :: sequence | alternatives | repetition | terminal
- sequence :: (ws expression expression) ws
- alternatives :: { ws expression expression } ws
- repetition :: [ws expression] ws
- terminal :: " character* " ws
- ws :: (<space> | <tab>)*
- character :: <any character except " and control-characters (ASCII 0..31)>

Note that the grammar is specified according to the following notational conventions:

- x y* sequence: *x* followed by *y*
- x|y* choice: *x* or *y*
- x** repetition: zero or more occurrences of *x*
- <> used for describing a character

Output

For each expression, output a line of the form ' $X \times Y$ ' with X and Y the width and height of the graphical representation of that expression.

Sample Input

```
1  
{("f" "bar") ["c"]}
```

Sample Output

```
28x8
```