Longwood Invitational(Fall 2011)

Problem 9: Reverse Polish Notation (Contributed by Phillip Poplin)

RPN logic – Reverse Polish Notation – is a method of constructing mathematical expressions that are *parentheses-free.* In RPN notation, the inputs are listed first, then the operation is listed after the inputs. For binary operations (our usual +, −, ∗, /, ^), we use the last two values in the operation.

For example, the RPN representation of the in-line expression $(3 + 7)/2$ is "3 7 + 2 /". This says that we first input 3, then 7, then we add these inputs (to get 10), then 2 is input, and finally the division, which now becomes $10/2 = 5$. Similarly, we can write $3 + (4 + 8) * (6 + 2)$ as "3 4 8 + 6 2 + ∗ +" and $3 - 4 * 5$ as "3 4 5 ∗ −". The expression $3 + 4 + 5$ is written as 3 4 + 5 + in order to preserve the usual left-to-right order of operations.

Note: The order in which input values are listed in RPN is the same as their order in the in-line expression. So $100 - 2^{3*2}$ is input as 100 − 2^(3 ∗ 2) and is output as: 100 2 3 2 ∗ ^ − and not as 100 2 2 3 ∗ ^ −

Input

The input to the problem will be a list of legal in-line expressions built from the the five binary operations { +, −, ∗, /, ^ } with integer arguments. All of the arguments will be positive integers less than 2,000,000,000. The expressions will use standard formatting with no white space between elements of the expression. Each token of the input will be space separated, so the expression $(5 + 3 * 2)$ will be written as (5 + 3 ∗ 2).

Each expression in the list will be on its own line. The input will be terminated by a line containing only the number '0' (which should not be treated is an input even though it is a legal in-line expression).

Output

The output will consist of a series of lines corresponding to the RPN representation of each expression in the input. You should format the output in the same manner as the inputs, placing a single space between each symbol. There should be no white space at the end of the line.

Example

Note: We can write $(3 - 4) * 5$ as "3 4 − 5 ∗" and 100 − 2^(3 ∗ 2) as "100 2 3 2 ∗ ^ −".

Input:

```
( 3 - 4 ) * 5
100 - 2 ^ ( 3 * 2 )
3 + ( 4 + 8 ) * ( 6 + 2 )
3 - 4 * 5
0
```

Output:

```
3 4 - 5 *
100 2 3 2 * ^ -
3 4 8 + 6 2 + * +
3 4 5 * -
```

((6+2)×(4+8))+3

3-(4×5)