2004 - 2005 **American Computer Science League** **Program #6**

All-Star Contest

ACSL FUNCTIONS

PROBLEM: Like our number systems, algebraic functions can have operators, too. Five functions are defined below:

1. SUM: $(f + g)(x) = f(x) + g(x)$
2. DIFFERENCE: $(f - g)(x) = f(x) - g(x)$
3. PRODUCT: $(f * g)(x) = f(x) * g(x)$
4. QUOTIENT: $(f / g)(x) = f(x) / g(x)$ where $g(x) \neq 0$.
5. COMPOSITE: $(f \circ g)(x) = f(g(x))$

As an example if $f(x) = 2x + 3$ and $g(x) = x - 1$ then $(f + g)(x) = 3x + 2$ and $(f \circ g)(x) = f(x - 1) = 2x + 1$.

INPUT: There will be 2 lines of input. Each line will consist of 2 strings. The strings are the algebraic functions in terms of x. The functions will have at most 2 terms.

OUTPUT: For each input print the simplified result of the 5 operations on the two functions listed above and in the order above. Coefficients of 1 and 0 will not be printed. Two operation symbols can't be used in front of any one term. Exponents will be shown using the ^ symbol: ex. $3x^2$ would be shown as 3x^2. If the two functions do not have a common factor, do not calculate the quotient operation, but instead print NONE.

SAMPLE INPUT

1. 4x+2, 2
2. 3x+6, x+2

SAMPLE OUTPUT

1. 4x + 4
2. 4x
3. 8x + 4
4. 2x + 1
5. 10
6. 4x + 8
7. 2x + 4
8. 3x^2 + 12x +12
9. 3
10. 3x + 12