Problem H. Steigung

Input file:	`steigung.in`
Output file:	`steigung.out`
Time limit:	2 seconds
Memory limit:	256 mebibytes

You've just started your research into *trigonometric neural networks*. As the first step, you need to learn to compute gradients of complex trigonometric functions.

More precisely, you have an expression that contains 26 variables, denoted by lowercase English letters, and two operations: addition and sine. For example: `sin(x+y+sin(z+t))`. It contains no extra parentheses except the ones enclosing the arguments of a sine operation.

Given such expression $func$, and the values a_0, b_0, ..., z_0 for all variables, compute the partial derivatives over each variable. For example, for variable p, compute

$$\lim_{p \to p_0} \frac{func(a_0, b_0, ..., o_0, p, q_0, ..., z_0) - func(a_0, b_0, ..., o_0, p_0, q_0, ..., z_0)}{p - p_0}$$

Input

The first line of the input file contains the expression with sines and additions, as described above, without whitespace. The length of the expression is at most 300. The second line of the input file contains 26 space-separated floating-point numbers, each between -10 and 10, with at most 8 digits after the decimal point — the values a_0, b_0, ..., z_0.

Output

Output 26 space-separated floating-point numbers, denoting the partial derivatives of the given expression over each variable in the given point. Your output will be considered correct if each number is within 10^{-8} absolute or relative error of the answer.

Examples

steigung.in	steigung.out
sin(x+x+y)+sin(z) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.23	0.000000000000000 2.000000000000000 1.000000000000000 0.973666395005375