

**DWITE Online Computer Programming Contest
November 2004**

Problem 3

Factoring

Jack is frustrated because he kept on getting factoring questions on Dr. White's tests wrong. Help him out by writing some code on factoring polynomials, so he could port it into his BASIC (Beginner's All-Purpose Symbolic Instruction Calculator) which supports all of C++, Delphi, Java, Pascal, PHP, Turing, VB and VC++, and use it on a test.

Your job is to factorize the general polynomial with integer coefficients:

$$p(x) = a_0 x^n + a_1 x^{n-1} + a_2 x^{n-2} + \dots + a_{n-1} x + a_n$$

into the form:

$$p(x) = (c_1 x - d_1)(c_2 x - d_2) \dots (c_k x - d_k) q(x)$$

where c_i, d_i are integers, $c_i > 0$, $\gcd(c_i, d_i) = 1$

and $q(x)$ does not contain any linear terms with integer coefficients

For example:

$$2x^4 - 3x^3 - 6x^2 + 6x + 4 = (x-2)(2x+1)(x^2-2) \text{ where } x^2-2 \text{ have no rational factors.}$$

The input file (**DATA31.txt** for the first submission and **DATA32.txt** for the second submission) will contain five lines of data. Each line contains several integers, each separated by a single space:

The first integer n is the degree of polynomial. $n+1$ integers a_0, a_1, \dots, a_n follow. You may assume a_0 is positive, $0 < n < 10$, and $-45001 < a_i < 45001$

The output file (**OUT31.txt** for the first submission and **OUT32.txt** for the second submission) will contain five lines of data, corresponding to the input file. For each corresponding input $p(x)$ Output k integers sorted in increasing order, where the i th integer is $a_0 d_i / (c_i)$. There is a single space between each integer. You may assume that $k > 0$.

<u>Sample Input: (only three lines given)</u>	<u>Sample output</u>
4 2 -3 -6 6 4	-1 4
2 1 2 1	-1 -1
1 1 -7	7

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