



Asia Regional Finals–Manila Site
2006 October 27

PROBLEM I

Gaussian Prime Factors

Let a, b, c, d be integers. The complex number $a + bj$, where $j^2 = -1$, is a factor of $c + dj$, if there exist integers e and f such that

$$c + dj = (a + bj)(e + fj)$$

. A complex number $a + bj$ where a and b are integers is a Gaussian prime if the factors are 1, -1 , $-a - bj$ and $a + bj$ only.

The following are Gaussian primes: $1 + j$, $1 - j$, $1 + 2j$, $1 - 2j$, 3 and 7.

The Gaussian prime factors of 5 are:

$1 + 2j$ and $1 - 2j$, or
 $2 + j$ and $2 - j$, or
 $-1 - 2j$ and $-1 + 2j$, or
 $-2 - j$ and $-2 + j$.

Write a program that finds all the Gaussian prime factors of a positive integer.

Input

One line of input per case. The line represents a positive integer n .

Output

One line of output per test case. The line represents the Gaussian prime factors of n . If $a + bj$ is a Gaussian prime factor of n , then $a > 0$, $|b| > a$, if $b \neq 0$. If $b = 0$, the output must be a .

Sample Input

2
5
6
700

Sample Output

Case #1: $1+j$, $1-j$
Case #2: $1+2j$, $1-2j$
Case #3: $1+j$, $1-j$, 3
Case #4: $1+j$, $1-j$, $1+2j$, $1-2j$,
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