# 4270 - Discrete Square Roots

**Asia - Hefei - 2008/2009**

A square root of a number $x$ is a number $r$ such that $r^2 = x$ . A discrete square root of a non-negative integer $x$ is a non-negative integer $r$ such that $r^2 \equiv x \bmod N$ , $0 \leq r < N$ , where $N$ is a specific positive integer and mod is the modulo operation.

It is well-known that any positive real number has exactly two square roots, but a non-negative integer may have more than two discrete square roots. For example, for $N = 12$ , 1 has four discrete square roots 1, 5, 7 and 11.

Your task is to find all discrete square roots of a given non-negative integer $x$ . To make it easier, a known square root $r$ of $x$ is also given to you.

## Input

The input consists of multiple test cases. Each test case contains exactly one line, which gives three integers $x$ , $N$ and $r$ . ($1 \leq x < N$, $2 \leq N < 1,000,000,000$, $1 \leq r < N$) . It is guaranteed that $r$ is a discrete square root of $x$ modulo $N$ . The last test case is followed by a line containing three zeros.

## Output

For each test case, print a line containing the test case number (beginning with 1) followed by a list of corresponding discrete square roots, in which all numbers are sorted increasingly..

## Sample Input

```
1 12 1
4 15 2
0 0 0
```

## Sample Output

```
Case 1: 1 5 7 11
Case 2: 2 7 8 13
```

---

Hefei 2008-2009

**Problemsetter:** Hongcheng Zhu
**Special Thanks:** Wen Sun, Zhikai Fan