# Problem H

## A Research Problem

**Input:** Standard Input
**Output:** Standard Output

A mad researcher was trying to get fund for his research project but it is a pity that after a year he was able to collect **500$** only. So all his research work has gone to ashtray. The mad researcher now wants his revenge, so he wants you to solve his unfinished research problem within a very limited time. You will be happy to know that his research is related to Euler's phi function.

Euler's phi (or totient) function of a positive integer **n** is the number of integers in **{1,2,3,...,n}** which are relatively prime to **n**. This is usually denoted as **φ(n)**. The table below shows the value of phi function for first few numbers.

| **integer *n*** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **phi(*n*)** | 1 | 1 | 2 | 2 | 4 | 2 | 6 | 4 | 6 | 4 | 10 | 4 | 12 | 6 | 8 | 8 |

Given the value of **n**, it is very easy to find the value of **φ(n)** using the formula below:

$$\phi(n) = n\prod_{p|n}\left(1-\frac{1}{p}\right) \quad // \textit{ Here } p \textit{ is a prime}$$

According to this formula $\phi(12) = \phi(2^2 * 3) = 12\left(1-\frac{1}{2}\right)\left(1-\frac{1}{3}\right) = 12 * \frac{1}{2} * \frac{2}{3} = 4$.

But your task is not quite straightforward, given the value of **φ(n)** you will have to find the minimum possible value of **n**.

## Input

The input file contains at most **100** lines of input. Each line contains a positive integer **phi_n (1≤phi_n≤100000000)**. Input is terminated by a line where **phi_n=0**. This line should not be processed.

## Output

For each line of input produce one line of output. This line contains the serial of output followed by two integers **phi_n** and **n**. The first integer is the integer taken as input and the second integer is the minimum possible value of **n**, for which **φ(n)=phi_n**. All the input numbers will be such that for all given input there will be a possible value of **n** less than **200000000**.

| Sample Input | Output for Sample Input |
| --- | --- |
| 12<br>24<br>2280960<br>5000000<br>0 | Case 1: 12 13<br>Case 2: 24 35<br>Case 3: 2280960 2283989<br>Case 4: 5000000 6265625 |

Problem setter: Shahriar Manzoor