Task: REP
Difference Representations

Olimpiada Informatyczna

XXIV OI, Stage I. Source file `rep.*` Available memory: 128 MB. *17.10–14.11.2016*

Let us define an infinite sequence of real numbers $a_1, a_2, a_3, \ldots$ as follows:

$$a_n = \begin{cases} n & \text{for } n \leq 2 \\ 2 \cdot a_{n-1} & \text{for odd } n > 2 \\ a_{n-1} + r_{n-1} & \text{for even } n > 2 \end{cases}$$

where r_{n-1} is the minimum positive integer that cannot be expressed as a difference of two distinct elements from the set $\{a_1, a_2, \ldots, a_{n-1}\}$.

Hence, the initial elements of the sequence are:

$$1, 2, 4, 8, 16, 21, 42, 51, 102, 112, 224, 235, 470, 486, 972, 990, 1980, \ldots$$

For example, to determine a_6, we establish that each of the numbers 1, 2, 3, 4 is a difference of some two elements of the initial elements 1, 2, 4, 8, 16, whereas 5 is not. Thus, $a_6 = a_5 + 5 = 21$.

It is known that for every positive integer x, there is a unique pair of indices (p, q) such that $x = a_p - a_q$. We shall denote such pair of indices with $repr(x)$. For example, $repr(17) = (6, 3)$ and $repr(18) = (16, 15)$. Your task is to determine $repr(x)$ for a given x.

Input

In the first line of the standard input, there is a single integer n that specifies the number of queries. Each of the following n lines contains a single positive integer x. You may assume that the numbers given on input do not repeat.

Output

Exactly n lines should be printed to the standard output. The line corresponding to number x from the input should contain $repr(x) = (p, q)$ written as two integers p and q, separated by a single space.

Example

For the input data:

```
2
17
18
```

the correct result is:

```
6 3
16 15
```

Grading

The set of tests consists of the following subsets. Within each subset, there may be several test groups.

Subset	Property	Score
1	$n \leq 1000$, $x \leq 10^9$, the resulting numbers p and q do not exceed 100	20
2	$n, x \leq 1000$	20
3	$n, x \leq 1\,000\,000$	20
4	$n \leq 100\,000$, $x \leq 10^9$	40