# The Great XOR



Given a long integer x, count the number of values of a satisfying the following conditions:

- $a \oplus x > x$
- 0 < a < x

where a and x are long integers and  $\oplus$  is the bitwise XOR operator.

You are given q queries, and each query is in the form of a long integer denoting x. For each query, print the total number of values of a satisfying the conditions above on a new line.

For example, you are given the value x = 5. Condition 2 requires that a < x. The following tests are run:

- $1 \oplus 5 = 4$
- $2 \oplus 5 = 7$
- $3 \oplus 5 = 6$
- $4 \oplus 5 = 1$

We find that there are 2 values meeting the first condition: 2 and 3.

### **Input Format**

The first line contains an integer q, the number of queries.

Each of the next q lines contains a long integer describing the value of x for a query.

#### **Constraints**

- $1 \le q \le 10^5$
- $1 < x < 10^{10}$

#### **Subtasks**

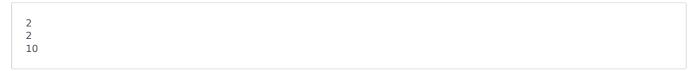
For 50% of the maximum score:

- $1 \le q \le 10^3$
- $1 \le x \le 10^4$

## **Output Format**

For each query, print the number of values of  $\alpha$  satisfying the given conditions on a new line.

## Sample Input 0



#### Sample Output 0



### **Explanation 0**

We perform the following q=2 queries:

1. For x=2 the only value of a satisfying 0 < a < x is 1. This also satisfies our other condition, as

 $1\oplus 2=3$  and 3>x. Because we have one valid a and there are no more values to check, we print 1 on a new line.

2. For  $\emph{x}=10$ , the following values of  $\emph{a}$  satisfy our conditions:

$$1 \oplus 10 = 11$$

$$\mathbf{4}\oplus\mathbf{10}=\mathbf{14}$$

$$5\oplus 10=15$$

$$\mathbf{6}\oplus\mathbf{10}=\mathbf{12}$$

$$7\oplus 10=13$$

There are five valid values of a.