# 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.

# **Function Description**

Complete the *theGreatXor* function in the editor below. It should return an integer that represents the number of values satisfying the constraints.

theGreatXor has the following parameter(s):

• x: an integer

#### **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**

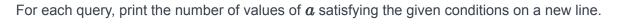
- $1 \le q \le 10^5$
- $1 \le x \le 10^{10}$

#### Subtasks

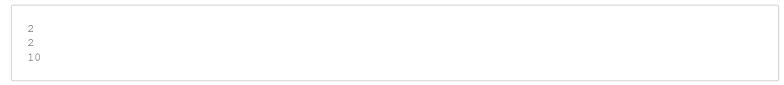
For 50% of the maximum score:

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

# **Output Format**







### Sample Output 0

```
1
5
```

## **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 x=10, the following values of a satisfy our conditions:

```
1 \oplus 10 = 11
```

$$4 \oplus 10 = 14$$

$$5 \oplus 10 = 15$$

$$6 \oplus 10 = 12$$

$$7 \oplus 10 = 13$$

There are five valid values of a.

#### Sample Input 1

```
2
5
100
```

# Sample Output 1

```
2
27
```

# **Explanation 1**

In the first case:

$$2 \oplus 5 = 7$$

$$3 \oplus 5 = 6$$

In the second case, the first 10 values are:

$$1 \oplus 100 = 101$$

$$2 \oplus 100 = 102$$

$$3 \oplus 100 = 103$$

$$8 \oplus 100 = 108$$

 $9\oplus 100=109$  $\mathbf{10} \oplus \mathbf{100} = \mathbf{110}$ 

 $11 \oplus 100 = 111$ 

 $\mathbf{12} \oplus \mathbf{100} = \mathbf{104}$ 

 $\mathbf{13} \oplus \mathbf{100} = \mathbf{105}$ 

 $\mathbf{14} \oplus \mathbf{100} = \mathbf{106}$ 

 $\mathbf{15} \oplus \mathbf{100} = \mathbf{107}$