

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.

Input Format

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

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

Constraints

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

Subtasks

For 50% of the maximum score:

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

Output Format

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

Sample Input 0

```
2
2
10
```

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
```

$$7 \oplus 10 = 13$$

Because there are five valid values of a , we print **5** on a new line.