L. Villain numbers

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

In mathematics, a non-negative integer with an even number of ones in its binary representation is called an evil number (for example, number 5 is evil, as its binary, 0101, has two ones).

These numbers are used in number theory when studying the Morse–Thue sequence and are applied in fractal image compression algorithms.

A positive integer is called a $villain$ if it is even and the number of ones in its binary representation is also even. These are such numbers as 6, 10, 12, 18, 20, etc.

Given t test cases, in each test you will be given a number N, find the number of $villain$ numbers which do not exceed N.

Input

The first line contains one positive integer t $(1 \leq t \leq 10^5)$ — the number of test cases.

The next t lines, each, will contain a number N, $(1 \leq N \leq 10^{15})$ — the number you to need to count $villain$ number up to.

Output

For each test case, you should output a separate line, which is the answer to the query.

Example

input Copy

```
3
20
12
32
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output Copy

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5
3
7
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