Problem H. Horilka

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 seconds
Memory limit:	256 mebibytes

Let us define n_2 for every non-negative integer n as the binary representation of n with infinitely many leading zeroes. Then for every integer $n \geq 0$, let us write n_2 on a new line. Now we have an infinite board like that:

$$
\begin{array}{ccccccccc}
\ldots & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\ldots & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
\ldots & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
\ldots & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\
\ldots & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\
\ldots & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\
\ldots & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\
\ldots & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\
 & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots
\end{array}
$$

Let f be such function that $f(n)$ is a number in which k-th bit is equal to the k-th bit of $n + k$ for every $k \geq 0$. For example, $f(0) = 0$ and $f(3) = 5$. In other words, if we rotate our board at 45° clockwise, then the binary representation of $f(n)$ will be written on n-th row (if 0-th row ends by 0 in the upper-right corner).

$$
\begin{array}{l}
\ldots \\
\ldots\ 0\ 0\ 0\ 0\ 0\ 0\ 0 \\
\ldots\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0 \quad \leftarrow f(0) \\
\ldots\ 0\ 0\ 0\ 0\ 0\ 1\ 1 \quad \leftarrow f(1) \\
\ldots\ 0\ 0\ 0\ 1\ 1\ 0 \quad \leftarrow f(2) \\
\ldots\ 0\ 0\ 1\ 0\ 1 \quad \leftarrow f(3) \\
\ldots\ 0\ 1\ 0\ 0 \quad \leftarrow f(4) \\
\ldots
\end{array}
$$

Let $g(k)$ be the k-th non-negative integer which does not occur in the sequence $f(0), f(1), f(2), \ldots$.

Your task is to find $g(k)$ and print it modulo $10^9 + 7$.

Input

The first line of input contains an integer t $(1 \leq t \leq 10^4)$, the number of test cases.

Each of the following t lines specifies one test case and contains one integer k $(1 \leq k \leq 10^{18})$.

Output

Output t lines. The i-th line should contain the answer for the i-th test case.

Example

standard input	standard output
5 1 2 3 4 5	1 2 7 12 29