Problem J. Dice Game

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 megabytes

Putata and Budada are playing an interesting game. They play this game with a dice having n faces. Every integer between 0 and $n-1$ are written on exactly one face, and when they roll this dice, each side will face up with equal probability. In other words, rolling the dice will result in a uniform random integer between 0 and $n-1$ with equal probability.

The game has two rounds. In the first round, the following happens:

- Putata will roll the dice and get an integer as the result, say x.

In the second round, Budada can choose to do one of the following things:

- End the game, and the score of the game will be x.
- Roll the dice again, let the result be y, and the game will end, the score of the game will be $x \oplus y$. Here $\oplus$ denotes binary exclusive-or operation.

Putata and Budada wants to maximize the score of the game, and they are clever so that they will always make the best choice. Please write a program to calculate for some given n, the expectation of the score of the game.

It can be shown that the answer can be expressed as an irreducible fraction $\frac{x}{y}$, where x and y are integers and $y \not\equiv 0 \pmod{998\,244\,353}$. Output the integer equal to $x \cdot y^{-1} \pmod{998\,244\,353}$. In other words, output such an integer a that $0 \le a < 998\,244\,353$ and $a \cdot y \equiv x \pmod{998\,244\,353}$.

Input

The input contains several test cases. The first line contains an integer T ($1 \le T \le 10^4$).

For the following T lines, each line contains an integer n ($1 \le n \le 998\,244\,352$), denoting one question.

Output

Output T lines, each line denotes the answer for one test case.

Example

standard input	standard output
4 1 2 3 4	0 249561089 776412276 2