Project Euler #232: The Race

This problem is a programming version of Problem 232 from projecteuler.net

Two players share an unbiased coin and take it in turns to play "The Race". On Player 1's turn, he tosses the coin once: if it comes up Heads, he scores one point; if it comes up Tails, he scores nothing. On Player 2's turn, she chooses a positive integer T and tosses the coin T times: if it comes up all Heads, she scores 2^{T-1} points; otherwise, she scores nothing. Player 1 goes first. The winner is the first to n or more points.

On each turn Player 2 selects the number, T, of coin tosses that maximises the probability of her winning.

What is the probability that Player 2 wins? As the number is obviously rational and can be represented as $\frac{p}{q}$ with integer p and q, write the answer as $p \times q^{-1} \pmod{10^9 + 7}$

Input Format

The first line of each test file contains a single integer q, that is the number of queries. q lines follow, each containing a single integer n.

Constraints

- $1 \leq q \leq 100$
- $1 \leq n \leq 175$

Output Format

Print exactly q lines with the answer to the corresponding query on each line.

Sample Input 0

```
1
1
```

Sample Output 0

```
333333336
```

Explanation 0

The answer is $\frac{1}{3}$ which is equal to $333333336 \pmod{10^9 + 7}$