

# How to Solve This DP Problem When $n$ Is Large?

Input file:           standard input  
Output file:         standard output  
Time limit:          12 seconds  
Memory limit:       512 megabytes

Find the number of ways to transform an integer  $x$  from 1 into  $n$  with the following three types of operation:

- $x \rightarrow x + 1$ ;
- $x \rightarrow 2x$ ;
- $x \rightarrow 2x + 1$ .

Two ways vary if and only if they use different numbers of operations, or their  $i$ -th operations are different for at least one  $i$ .

Since the answer may be large, output it modulo 998 244 353.

## Input

The first line contains an integer  $T$  ( $1 \leq T \leq 1000$ ), indicating the number of test cases. For each test case:

The only line contains an integer  $n$  ( $1 \leq n < 10^{1000}$ ).

It is guaranteed that the number of test cases with  $n \geq 10^{18}$  does not exceed 100, and the number of test cases with  $n \geq 10^{100}$  does not exceed 1.

## Output

For each test case, output a line containing an integer, indicating the number of ways modulo 998 244 353.

## Example

standard input	standard output
10	1
1	2
2	3
3	5
4	7
5	10
6	13
7	18
8	23
9	30
10	

## Note

The three ways to transform an integer  $x$  from 1 into  $n$  are listed as follows:

- $1 \xrightarrow{x \rightarrow x+1} 2 \xrightarrow{x \rightarrow x+1} 3$ ;
- $1 \xrightarrow{x \rightarrow 2x} 2 \xrightarrow{x \rightarrow x+1} 3$ ;
- $1 \xrightarrow{x \rightarrow 2x+1} 3$ .