

Problem 11: !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!0

20 Point(s)

Problem ID: `truths`

Rank: 4

Introduction

Ben Bitdiddle has given up on learning the rules of boolean algebra! Instead, he decides to just straight up memorize ALL the true boolean expressions. You try to convince him that this idea is ridiculous, as the number of equations to memorize will grow exponentially with size, but he doesn't believe you! To convince him, you must find some evidence to show how absurdly large a task he has set for himself.

Problem Statement

Count the number of true boolean expressions that use exactly N symbols modulo $10^9 + 7$ (1000000007).

Boolean expressions are strings composed of only the following characters: `01!&|()`, where `0` and `1` are the boolean values for false and true, `!` is the unary prefix NOT operator, `&` is the binary infix AND operator, `|` is the binary infix OR operator, and the parentheses `()` are used to further specify evaluating order.

A boolean expression is true if and only if it is valid and [evaluates](#) to `1`. When evaluating, the standard order of operations should be respected: `()`, then `!`, then `&` and finally `|`.

Since the number of boolean expressions can be large, output your answer modulo $10^9 + 7$.

Input Format

The first line of the input contains a positive integer T denoting the number of test cases that follow. Each test case is described in a single line containing a single integer N denoting the number of symbols for the number of expressions you want to count.

Output Format

For each test case, output a single line containing the number of true boolean expressions that use exactly N symbols modulo $10^9 + 7$ (1000000007).

Constraints

$$1 \leq T \leq 100$$

$$1 \leq N \leq 250$$

Sample Test Cases

Sample Input

5
1
2
3
4
5

Sample Output

1
1
6
11
47

Sample Explanations

For test case #1, there is exactly 1 true boolean expression with length 1: 1

For test case #2, there is exactly 1 true boolean expression with length 2: !0

For test case #3, there are 12 valid boolean expressions with length 3, of which 7 are also true.

They are:

0|1 1&1 1|0 1|1 !!1 (1)

For test case #4, there are 22 valid boolean expressions with length 4, of which 11 are also true. They are:

0|!0 1&!0 1|!0 1|!1 !0&1 !0|0
!0|1 !1|1 !!!0 !(0) (!0)

For test case #5, there are 90 valid boolean expressions with length 5, of which 47 are also true. They are:

0&0|1 0&1|1 0|0|1 0|1&1 0|1|0 0|1|1
0|!!!1 0|(1) 1&0|1 1&1&1 1&1|0 1&1|1
1&!!!1 1&(1) 1|0&0 1|0&1 1|0|0 1|0|1
1|1&0 1|1&1 1|1|0 1|1|1 1|!!!0 1|!!!1
1|(0) 1|(1) !0&!0 !0|!0 !0|!1 !1|!0
!!0|1 !!1&1 !!1|0 !!1|1 !!!!1 !!(1)
!(!1) (0|1) (0)|1 (1&1) (1|0) (1|1)
(1)&1 (1)|0 (1)|1 (!!1) ((1))