

Problem 3: Not Quite Fibonacci

3 Points

Problem ID: `trib`

Rank: 1

Introduction

While listening to Mr. Recursion talk about Fibonacci numbers for the 11235813213455th time, you decided to invent a number sequence of your own! Beginning with -1, 0, and 1, you determine the next number by summing the previous *three* numbers in the sequence instead of the previous two. These are the *Tribonacci* numbers!

Problem Statement

Find the N^{th} Tribonacci number, T_N .

The -1st, 0th, and 1st Tribonacci numbers are defined to be -1, 0, and 1 respectively. All Tribonacci numbers are equal to the sum of the three Tribonacci numbers before it. In other words:

$$T_{-1} = -1, T_0 = 0, T_1 = 1$$

$$T_K = T_{K-1} + T_{K-2} + T_{K-3} \text{ where } K \text{ can be any integer}$$

The first few Tribonacci numbers are as follows:

T_{-1}	T_0	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
-1	0	1	0	1	2	3	6	11	20	37

Input Format

The first line of the input contains a positive integer \mathbf{T} denoting the number of test cases that follow. Each test case is described in a single line containing an integer \mathbf{N} denoting the Tribonacci number you must find, $T_{\mathbf{N}}$.

Output Format

For each test case, output a single line containing an integer denoting the \mathbf{N}^{th} Tribonacci number, $T_{\mathbf{N}}$.

Problem Constraints

$$1 \leq \mathbf{T} \leq 100$$

$\text{abs}(T_i)$, the absolute value of the i th Tribonacci number, is guaranteed to be less than 10^9 for all values of $-60 \leq i \leq 30$.

Main Test Set

$$0 \leq \mathbf{N} \leq 30$$

Bonus Test Set

$$-60 \leq \mathbf{N} \leq 30$$

To find Tribonacci numbers of negative \mathbf{N} , algebraically rearrange the formula to solve for $T_{\mathbf{K}-3}$.

Sample Test Cases

Sample Input

6
0
1
2
5
10
27

Sample Output

0
1
0
3
68
2145013

Sample Explanations

For test cases #1 and #2, this is because the 0th and 1st Tribonacci numbers are defined to be 0 and 1 respectively.

For test case #3, using the formula with $K = 2$, we have $T_2 = T_1 + T_0 + T_{-1} = 1 + 0 + -1 = 0$

For test case #4, using the formula with $K = 5$, we have $T_5 = T_4 + T_3 + T_2 = 2 + 1 + 0 = 3$

For test case #5, using the formula with $K = 10$. we have $T_{10} = T_9 + T_8 + T_7 = 37 + 20 + 11 = 68$

Sample Input

4
-2
-3
-4
-50

Sample Output

2
-1
-2
-3792150

Sample Explanations

Negative Tribonacci numbers are found by rearranging the Tribonacci formula to solve for T_{K-3} . Note that negative **N** values will only appear in the bonus test set.