

## Problem 3: Not Quite Fibonacci

### 3+2 Points

Problem ID: trib

Rank: 1+2

## 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  $N^{\text{th}}$  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  $T$  denoting the number of test cases that follow. Each test case is described in a single line containing an integer  $N$  denoting the Tribonacci number you must find,  $T_N$ .

## Output Format

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

## Problem Constraints

$$1 \leq T \leq 100$$

$\text{abs}(T_i)$ , 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

$$0 \leq N \leq 30$$

### Bonus Test Set

$$-60 \leq N \leq 30$$

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

# 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.