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**NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Introduction to Programming in C (course)**

Announcements (announcements)

**About the Course ([https://swayam.gov.in/nd1\\_noc19\\_cs42/preview](https://swayam.gov.in/nd1_noc19_cs42/preview))** Ask a Question (forum)

Progress (student/home) Mentor (student/mentor)

## A5-Q1

**Due on 2019-09-07, 23:59 IST**[Course outline](#)[How to access the portal](#)[Assignment 0](#)[Introduction - Variables, Expressions and Conditionals](#)[Assignment 1](#)[Loop Constructs in C](#)[Assignment 2](#)[More on Data Types and Operations](#)[Functions](#)[Assignment 3](#)[Arrays and Pointers](#)

**Assignment 4****Recursion****Assignment 5** **A5-Q1**

(/noc19\_cs42/progassignment?name=123)

 A5-Q2

(/noc19\_cs42/progassignment?name=124)

 A5-Q3

(/noc19\_cs42/progassignment?name=125)

 Assignment 5

Solution (unit?unit=122&lesson=147)

**Multidimensional Arrays and File Handling in C****Assignment 6****Structures and Linked Lists****Assignment 7****Extra Topics****Assignment 8****Text Transcripts****Live Session****Weekly Feedback****Sep 25 programming Test - Test Slot 1****Sep 25 programming Test - Test Slot 2**

The Collatz function is defined for a positive integer  $n$  as follows.

$$f(n) = \begin{cases} 3n+1 & \text{if } n \text{ is odd} \\ n/2 & \text{if } n \text{ is even} \end{cases}$$

We consider the repeated application of the Collatz function starting with a given integer  $n$ , as follows:

$$f(n), f(f(n)), f(f(f(n))), \dots$$

It is conjectured that no matter which positive integer  $n$  you start from, this sequence eventually will have 1 in it. It has been verified to hold for numbers up to  $5 \times 2^{60}$  [Wikipedia: Collatz Conjecture].

e.g. If  $n=7$ , the sequence is

1.  $f(7) = 22$
2.  $f(f(7)) = f(22) = 11$
3.  $f(11) = 34$
4.  $f(34) = 17$
5.  $f(17) = 52$
6.  $f(52) = 26$
7.  $f(26) = 13$
8.  $f(13) = 40$
9.  $f(40) = 20$
10.  $f(20) = 10$
11.  $f(10) = 5$
12.  $f(5) = 16$
13.  $f(16) = 8$
14.  $f(8) = 4$
15.  $f(4) = 2$
16.  $f(2) = 1$

Thus if you start from  $n=7$ , you need to apply  $f$  16 times in order to first get 1.

In this question, you will be given a positive number  $\leq 32,000$ . You have to output how many times  $f$  has to be applied repeatedly in order to first reach 1.

**Sample Test Cases**

	Input	Output
Test Case 1	101	25
Test Case 2	100	25
Test Case 3	2463	208
Test Case 4	1	0
Test Case 5	7	16

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Sample solutions (Provided by instructor)

```

1 #include <stdio.h>
2 #include <limits.h>
3
4 int collatz_repeat(int n)

```

```
5 {
6   if ( n == 1 ) {
7     return 0;
8   }else{
9     if ( n % 2 == 1 ) {
10      return 1 + collatz_repeat(3*n+1);
11    }else{
12      return 1 + collatz_repeat(n/2);
13    }
14  }
15 }
16
17
18 int main()
19 {
20   int n;
21   scanf("%d",&n);
22   printf("%d\n", collatz_repeat(n));
23   return 0;
24 }
25
```