

Week 4 Practice Problems

#1. Write a function that takes an integer input and returns an integer equal to the number of digits it has. The function should work with all integers representable on your computer.

You cannot use strings, `math.log()`, or an if-statement. (Hint: use a loop.)

#2. Write a new `flipper()` function from Q1 of Week 2. Use your answer from Q1 above as inspiration.

Write a function that takes an integer as input and returns that integer flipped. Unlike Week 2, the code must work with any integer and a single digit flipped is the number itself. If a number ends in a zero, the flipped number will not have a leading 0. Some examples: 2 -> 2, 34 -> 43, 123450 -> 54321

As above, you cannot use strings, `math.log()`, or an if-statement.

#3. Write a function that takes in an odd number and returns the sum of odd numbers from 1 to N:

$$1 + 3 + 5 + 7 + 9 + \dots + N$$

Write “main” code (i.e., outside of a function) that asks the user for an odd, positive integer. If the user does not enter an odd, positive integer, your code should keep asking until they do. Then call your function, have your function return the result, and then print it out.

#4. Write a program that repeatedly asks a user for integers, *until* the user enters a zero and then prints:

- the number of positive and negative integers that were entered
- the sum of the positive integers
- the sum of the negative integers

For example:

```
Enter an integer (0 to exit): 2
Enter an integer (0 to exit): 14
Enter an integer (0 to exit): -3
Enter an integer (0 to exit): 4
Enter an integer (0 to exit): -5
```

Enter an integer (0 to exit): 0

You entered 3 positive and 2 negative values.

The sum of positive integers is: 20

The sum of negative integers is: -8

#5. The Collatz Conjecture (https://en.wikipedia.org/wiki/Collatz_conjecture) is based on a sequence of numbers generated with the following rules:

- start with an arbitrary positive integer c_0
- if c_i is even then $c_{i+1} = c_i/2$
- if c_i is odd then $c_{i+1} = 3c_i + 1$

The Collatz Conjecture states that this sequence will eventually produce 1. That is $c_j = 1$ for some non-infinite value of j .

- a) Write a function to test the Collatz Conjecture. Your function should accept a value for c_0 and return the minimum number, j , such that $c_j = 1$.
- b) Write "main" code that test the Collatz Conjecture for all numbers from 1 to 100,000 and prints out the number with the longest sequence (i.e., highest j value).

Caution: <https://xkcd.com/710/>