**WEEK 8 LAB EXERCISE**

EXERCISE 1:

Implement a recursive function that calculates the nth Fibonacci number.

A comprehensive description of the Fibonacci sequence of numbers, their history and applications, can be found at:

*https: // en. wikipedia. org/ wiki/ Fibonacci\_ number*

Exercise 2

Implement a recursive solution to the Towers of Hanoi problem.

A comprehensive description of the Towers of Hanoi problem, including its recursive algorithm, can be found at:

*https: // en. wikipedia. org/ wiki/ Tower\_ of\_ Hanoi*

Exercise 3:

Write a Python program to calculate the value of 'a' to the power 'b'.

Exercise 4:

Write a Pyhton program to find the sum of digits of a number using recursion.

*e.g., sum\_digit(124) = 7*

Exercise 5:

Write a Python program to calculate how many digits of a positive integer has.

*e.g., We can determine how many digits a positive integer has by repeatedly dividing by 10 (without keeping the remainder) until the number is less than 10, consisting of only 1 digit. We add 1 to this value for each time we divided by 10. Here is the recursive algorithm:*

*1. If n < 10 return 1.  
2. Otherwise, return 1 + the number of digits in*

*n/10 (ignoring the fractional part).*

Exercise 6

Implement a function lower(), that receives a string as argument, and produces

a string (a list of characters) only with the lowercase characters in the original string.

In your implementation, you should use the built-in filter() function.

*An example of the execution of lower() is as follows.*

*1*

*>>> lower("University")*

*['n', 'i', 'v', 'e', 'r', 's', 'i', 't', 'y']*

Exercise 7

Implement a function check\_all(), that receives two arguments:

1. a boolean function, say f

2. a list, say l

and checks whether all elements in l satisfy f.

It is recommended that you use map() and all().

*An example of the execution of check\_all() is as follows.*

*>>> check\_all(lambda x: x < 10, [3, 5, 7])*

*True*

Exercise 5

Re-implement the factorial() function.

You should now follow an alternative approach:

1. for a number n, you should  first generate the list of numbers from 1 to n;

2. having this list, you should use function functools.reduce() to multiply all the elements in the list.

*An example of the execution of factorial() is as follows.*

*>>> fact(5)*

*120*