Problem Solving Methodology in IT (COMP1001)

Assignment One
(Due at noon on 27 September 2018)

**(Instructions: submit your answers in pdf to Blackboard.
Put your name and student ID on the first line.)**

Rocky K. C. Chang

14 September 2018

1. [Weight = 1] What does the pseudocode below generate?

```
for outer in [1,2] do
    for middle in [3,4,5] do
        for inner in [6,7] do
            print(outer,inner,middle)
```

Function `print(a,b,c)`
Input: three integers a, b, and c
Output: print a first, separated by a space, and then print b, separated by a space, and lastly print c. After that the next print() will start from a new line.

2. [Weight = 1] Another important mathematical constant is called Euler's number (usually denoted by *e*) which is given by

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = \frac{1}{1} + \frac{1}{1} + \frac{1}{1 \cdot 2} + \frac{1}{1 \cdot 2 \cdot 3} + \cdots$$

Let us consider only $n = 0, 1, \ldots, 6$. Convert this decimal number to binary. You may consider only five digits after the radix point in the binary representation.

3. [Weight = 3] To convert a decimal number to binary, as you know already, is to keep dividing the number (or quotient) by 2 and assign the remainder (either 0 or 1) to a_i, where $i + 1 > 0$ is the number of times the division performed until the quotient is 0. In this question, you are asked to write pseudocode for this algorithm. The specification of the function is given below.

Function *dec_to_bin(n)*
Input: *n is a positive integer in decimal.*
Output: *A list L = [a_0, a_1, a_2, ...], where ~~$a_0a_1a_2$...~~ ... $a_2a_1a_0$ is the binary representation of n.*

You may use *L[i]* ← *c*, *c* = 0, 1 for assigning *c* to the *i*th element in *L*. Note that *i* starts from 0. There are also two functions available to you:

Function *mod_2(n)*
Input: *n is a positive integer in decimal.*
Output: *the remainder of n divided by 2.*

Function *div_2(n)*
Input: *n is a positive integer in decimal.*
Output: *the quotient of n divided by 2.*