CS521 hw3
Name: Yuxiao Wu
No collaborators, no late days
Source: Textbook

Problem 1:

1. factorial(5)

```
def factorial(n):
    if n == 0:
        return 1
    else:
        return n * factorial(n-1)
```

n = 5, n != 0
return 5 * factorial(4)
factorial(4)
n = 4, n != 0
return 4 * factorial(3)
……
Factorial(1) = 1 * factorial(0) = 1 * 1 = 1
Factorial(5) = 5 * 4 * 3 * 2 * 1 * 1 = 120

2. factorial(8)
Same as above
Factorial(8) = 8 * factorial(7)
Factorial(7) = 7 * factorial(6)
……
Factorial(2) = 2 * factorial(1)
Factorial(1) = 1 * factorial(0) = 1
Factorial(8) = 8*7*6*….*2*1 = 40320

3. y(8)

```
def x(n):
    if n <= 1:
        return 1
    else:
        return n*(n-1)*x(n-1)
def y(m):
    if m == 1:
        return 1
    else:
        n = x(m - 1)
```

m = 8
n = x(8-1) = x(7)
x(7) -> 7 * 6 * x(6)
x(6) -> 6 * 5 * x(5)
x(5) -> 5 * 4 * x(4)
x(4) -> 4 * 3 * x(3)
x(3) -> 3 * 2 * x(2)
x(2) -> 2 * 1 * x(1)
x(1) = 1
x(7) = 2*6*12*20*30*42 = 3628800

4. tribonacci(4)

```
# Function that finds the nth tribonacci number
def tribonacci(n):
    if n == 1:
        return 0
    elif n == 2:
        return 1
    elif n == 3:
        return 2
    else:
        return tribonacci(n-1) + tribonacci(n-2) + tribonacci(n-3)
```

tribonacci(4) -> tribonacci(4-1) + tribonacci(4-2) + tribonacci(4-3)
tribonacci(4) -> tribonacci(3) + tribonacci(2) + tribonacci(1)
tribonacci(4) -> 2 + 1 + 0 = 3

5. tribonacci(7)
tribonacci(7) -> tribonacci(6) + tribonacci(5) + tribonacci(4)
tribonacci(5) -> tribonacci(4) + tribonacci(3) + tribonacci(2) -> 3 + 2 + 1 = 6
tribonacci(6) -> tribonacci(5) + tribonacci(4) + tribonacci(3) -> 6 + 3 + 2 = 11
tribonacci(7) -> tribonacci(6) + tribonacci(5) + tribonacci(4) -> 11 + 6 + 3 = 20

Problem 2

Find the expected result of the two list comprehension by hand (**show your work**):

```
list_1 = [10-thing for thing in range(20,1,-1)]
list_2 = [val**3 for val in [1,1,2,2,3,3,4,4] if val!=2]
```

1. range(20,1,-1) = [20,19,18,17,……, 4,3,2]
for every thing in range(20,1,-1)
10 – thing -> [10 – 20, 10-19, ……, 10 – 3, 10 – 2]
List_1 = [-10, -9, -8, -7, -6, -5, -4,-3,-2,-1,0,1,2,3,1,4,5,6,7,8]

2. cubic every val in [1,1,2,2,3,3,4,4] except val == 2
list_2 = [1**3, 1**3, 3**3, 3**3, 4**3, 4**3]
list_2 = [1,1,27,27,64,64]