CIS 6 :: Lab 07 - Loop Structures

Student Name: **Naveed Yeganegi**

Task 1: Definitions & Concepts - Homework

Instructions: Answer the questions below.

1. What are the differences between for and while loop?
   => A for loop iterates over an array such as a list or string and iteration is written at the top, whereas the condition for while loops is written at the top and the iteration is done wherever
2. How do you choose between for and while loop?
   => For loops are better when we know the exact length that we want to iterate or want to run through words or lists. While loops are good for true/false situations or when you want something to run until a specific condition is met.

Task 2: Internet Research - Homework

In an app, website or program that you use often, have you noticed a place where it uses loops with decision makings (while loop). If so, where and what? Please discuss it below:

=> If you're watching a video on YouTube or listening to music, most things will use a while loop to continue playing another song or video unless you press a button to stop it.

Task 3: Understanding Programs

1. Give a truth table that shows the (Boolean) value of each of the following Boolean expressions, for every possible combination of "input" values. Hint: including columns for intermediate expressions is helpful.
   a. not (P and Q)

P	Q	P and Q	Not (P and Q)
T	T	T	F
T	F	F	T
F	T	F	T
F	F	F	T

   b. (not P) and Q

P	Q	not P	(Not P) and Q)
T	T	F	F

T	F	F	F
F	T	T	T
F	F	T	F

c. (not P) or (not Q)

P	Q	not P	not Q	(not P) or (not Q)
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

d. (P and Q) or R

P	Q	R	(P and Q) or R
T	T	T	T
T	F	F	F
F	T	T	T
F	F	F	F

e. (P or R) and (Q or R)

P	Q	R	P or R	Q or R	(P or R) and (Q or R)
T	T	T	T	T	T
T	T	F	T	T	T
T	F	T	T	T	T
T	F	F	T	F	F
F	T	T	T	T	T
F	T	F	F	T	F
F	F	T	T	T	T
F	F	F	F	F	F

2. Write a while loop fragment that calculates the following values (write with pseudocodes):
   a. Sum of the first n counting numbers: 1 + 2 + 3 + . . . + n

```
nsum = 0
for i in range (n):
  nsum += i
  print (nsum)
```

   b. Sum of the first n odd numbers: 1 + 3 + 5 + . . . + 2n - 1

```
nsum = 0
for i in range (n):
   i += 1
  nsum +=  2 * i - 1
  print (nsum)
```

   c. Sum of a series of numbers entered by the user until the value 999 is entered. Note: 999 should not be part of the sum.

```
value = int(input())
while value != 999:
    value += int(input())
    print(value)
```

   d. The number of times a whole number can be divided by 2 (using integer division) n before reaching 1 (i.e., log2n).

```
count = 0
while n > 0:
      if n // 2 > 1:
         count = count + 1
 print(count)
```

LAB ASSIGNMENTS

Instructions: Use Python IDLE to write and execute below exercises from the corresponding chapter in the textbook. Attach Snipping photos of your **source code and executions of the code** in Python shell. Make sure to create separate files for each exercise.

Task 1 - Book Chapter 8: Write and execute below program from the book

Task 2 - Chapter 8 - Programming Exercises.

Exercise 1: Fibonacci numbers

fibonacci.py - C:/Users/Admin/Desktop/School/CIS 6/week7/fibonacci.py (3.9.1)

File Edit Format Run Options Window Help

```python
#Program determines the nth number in the Fibonacci sequence

def main():
    print("This program finds the nth number in the Fibonacci sequence")
    num = eval(input("What number in the sequence do you want to find: "))
    print("The answer is: ", fib(num))

def fib(n):
    if n==0:
        return 0
    elif n==1:
        return 1
    else:
        return fib(n-1) + fib(n-2)

main()
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
Python 3.9.1 (tags/v3.9.1:1e5d33e, Dec  7 2020, 17:08:21) [MSC v.1927 64 bit (AM
D64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: C:\Users\Admin\Desktop\School\CIS 6\week 6\fibonacci.py =======
This program finds the nth number in the Fibonacci sequence
What number do you want to find: 5
The answer is:  5
>>>
======= RESTART: C:\Users\Admin\Desktop\School\CIS 6\week 6\fibonacci.py =======
This program finds the nth number in the Fibonacci sequence
What number do you want to find: 7
The answer is:  13
>>>
======== RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/fibonacci.py =======
This program finds the nth number in the Fibonacci sequence
What number in the sequence do you want to find: 9
The answer is:  34
>>>
```

Exercise 3: Double an investment

invest.py - C:/Users/Admin/Desktop/School/CIS 6/week7/invest.py (3.9.1)

File Edit Format Run Options Window Help

```python
#program to calculate how long it would take an investment to double

def invest():
    rate = eval(input("Enter the annualized interest rate: "))
    year = 0
    principal = 1

    while principal < 2:
        interest = (principal * rate * year)
        principal = principal + interest
        year += 1
    print("The number of years it takes for your investment to double is",year)

invest()
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
>>>
========= RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/invest.py =========
Enter the annualized interest rate: .1
0.0
0.1
0.22000000000000003
0.396
0.6864000000000001
The number of years it takes for your investment to double is 5
>>>
```

Ln: 721 Col: 4

Exercise 5: Find if n is a prime number

prime.py - C:/Users/Admin/Desktop/School/CIS 6/week7/prime.py (3.9.1)

File Edit Format Run Options Window Help

```python
#Finds if n is a prime number

num = eval(input("number: "))
if num > 2:
    for i in range(2, int(num/2)+1):
        if (num % i) == 0:
            print(num, "is not a prime number")
            break
    else:
        print(num, "is a prime number")

else:
    print("Enter an integer greater than 2")
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
========================================== RESTART: C:/Users/Admin/Desktop/Sc
hool/CIS 6/week7/test.py ==========================================
number: 3
3 is a prime number
>>>
========================================== RESTART: C:/Users/Admin/Desktop/Sc
hool/CIS 6/week7/test.py ==========================================
number: 8
8 is not a prime number
>>>
========================================== RESTART: C:/Users/Admin/Desktop/Sc
hool/CIS 6/week7/test.py ==========================================
number: 11
11 is a prime number
>>>
```

Ln: 2391 Col: 4

Exercise 6: Find all of the prime number up to n

prime.py - C:/Users/Admin/Desktop/School/CIS 6/week7/prime.py (3.9.1)

File Edit Format Run Options Window Help

```python
#Finds if n is a prime number
import math

num = int(input("Enter number of primes: "))
primes = [2, 3]

def is_prime(n):
    for i in range(2, int(math.sqrt(n)+ 1)):
        if (n % i) == 0: #if number evenly divides then it's not a prime
            return False
        else:
            return True

if num > 2:
    for i in range (2, num + 1):
        if is_prime(i) == True: #add number to list if prime
            print(i)
            primes.append(i)
    print("Here are prime numbers up to", num,"\n", primes)

else:
    print("Enter an integer greater than 2")
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
''''
========== RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/prime.py =========
Enter number of primes: 7
5
7
Here are prime numbers up to 7
 [2, 3, 5, 7]
>>>
========== RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/prime.py =========
Enter number of primes: 3
Here are prime numbers up to 3
 [2, 3]
>>>
```

Ln: 180 Col: 4

Exercise 9: Fuel efficiency

gaseff.py - C:/Users/Admin/Desktop/School/CIS 6/week7/gaseff.py (3.9.1)

File Edit Format Run Options Window Help

```python
#program to calculate gas efficiency across a multi leg trip

print("Calculates fuel effieciency.")
odom1 = eval(input("Enter starting odometer value: "))
miles = []
gas_total = []

print("Enter a blank line when ready to calculate total.")
stop = input("Enter next odometer reading and gas used seperated by space: ")
while stop != "":
    odom2, gas = stop.split() #splits up 2 numbers seperated by space and assigns to variables
    odom2 = eval(odom2) #turn numbers from str to int
    gas = eval(gas)
    miles.append(odom2 - odom1) #add data from each leg onto lists
    gas_total.append(gas)
    odom1 = odom2
    stop = input("Enter next odometer reading and gas used seperated by space: ")

for i in range(len(miles)):
    mpg = miles[i] / gas_total[i] #calculates total for each leg
    print("Leg",i,"your mpg was:",mpg)
miles_total = sum(miles)
gas_sum = sum(gas_total)
print("Total MPG:",miles_total/gas_sum) #calculates and displays total mpg
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
>>>
============= RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/gaseff.py ============
Calculates fuel effieciency.
Enter starting odometer value: 0
Enter a blank line when ready to calculate total.
Enter next odometer reading and gas used seperated by space: 50 6
Enter next odometer reading and gas used seperated by space: 100 4
Enter next odometer reading and gas used seperated by space:
Leg 0 your mpg was: 8.333333333333334
Leg 1 your mpg was: 12.5
Total MPG: 10.0
>>>
```

Ln: 247 Col: 4

Exercise 10: Fuel efficiency with user input

gaseff2.py - C:/Users/Admin/Desktop/School/CIS 6/week7/gaseff2.py (3.9.1)

File Edit Format Run Options Window Help

```python
#program to calculate gas efficiency across a multi leg trip from trip.txt file

print("Calculates fuel effieciency.")
miles = []
gas_total = []
odom1 = 0

infile = open("trip.txt", "r")

for line in infile:
    odom2, gas = line.split() #splits up 2 numbers seperated by space and assign
    odom2 = eval(odom2) #turn numbers from str to int
    gas = eval(gas)
    miles.append(odom2 - odom1) #add data from each leg onto lists
    gas_total.append(gas)
    odom1 = odom2

for i in range(len(miles)):
    mpg = miles[i] / gas_total[i] #calculates total for each leg
    print("Leg",i,"your mpg was:",mpg)
miles_total = sum(miles)
gas_sum = sum(gas_total)
print("Total MPG:",miles_total/gas_sum) #calculates and displays total mpg
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
>>>
========= RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/gaseff2.py ========
Calculates fuel effieciency.
Leg 0 your mpg was: 8.333333333333334
Leg 1 your mpg was: 12.5
Total MPG: 10.0
```

trip - Notepad

File Edit Format View Help

```
50 6
100 4
```

Ln 2, Col 6 | 100% | Windows (CRLF) | UTF-8

Exercise 11: Heating and cooling degree days

heatingdays.py - C:/Users/Admin/Desktop/School/CIS 6/week7/heatingdays.py (3.9.1)

File Edit Format Run Options Window Help

```python
#program to calculate hot and cool days given average daily temps

def main():
    print("Hot/Cold day calculator")

    day = 1
    cooldays = 0
    hotdays = 0

    while True:
        temp = eval(input("Enter average temperature for day " + str(day) + " or enter -100 to total: "))
        if temp != -100:
            if temp < 60:
                hotdays += 60 - temp
            elif temp > 80:
                cooldays += temp - 80
            day += 1
        else:
            break
    print("Cooling degree days:", cooldays)
    print("Heating degree days:", hotdays)

main()
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
>>>
======================= RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/heatingdays.py =======================
Hot/Cold day calculator
Enter average temperature for day 1 or enter -100 to total: 67
Enter average temperature for day 2 or enter -100 to total: 89
Enter average temperature for day 3 or enter -100 to total: 99
Enter average temperature for day 4 or enter -100 to total: 32
Enter average temperature for day 5 or enter -100 to total: 44
Enter average temperature for day 6 or enter -100 to total: -100
hi
Cooling degree days: 28
Heating degree days: 44
>>>
```

Ln: 853 Col: 4

Exercise 12: Heating and cooling degree days with user input

heatingdays.py - C:/Users/Admin/Desktop/School/CIS 6/week7/heatingdays.py (3.9.1)

File Edit Format Run Options Window Help

```python
#program to calculate hot and cool days given average daily temps in a file

def main():
    print("Hot/Cold day calculator")

    day = 1
    cooldays = 0
    hotdays = 0

    infile = open("temps.txt", "r")

    for line in infile:
        temp = eval(line)
        if temp != -100:
            if temp < 60:
                hotdays += 60 - temp
            elif temp > 80:
                cooldays += temp - 80
            day += 1
        else:
            break
    print("Cooling degree days:", cooldays)
    print("Heating degree days:", hotdays)

main()
```

IDLE Shell 3.9.1

File Edit Shell Debug Options Window Help

```
======================== RESTART: C:/Users/Admin/Desktop/School/CIS 6/week7/heatingdays.py =====
=================
Hot/Cold day calculator
Cooling degree days: 28
Heating degree days: 44
```

Ln: 858 Col: 4

temps - Notepad

File Edit Format View Help

```
67
89
99
32
44
-100
```

Ln 2, Col 3 | 100% | Windows (CRLF) | UTF-8