Intro to Python – Lesson 13 and 14

Today we are going to expand our control structures. We started with **Sequence** – statements are executed in order one after the other, then we looked at **Selection** – using the IF Statement to execute one block of code or another, and finally we are going to look at **Iteration** – setting up a loop to repeat a block of statements. Start by viewing the following video – the video does include Collections which we will look at after loops but is easy to follow. It also looks at a couple of shortcuts for calculations that you may find useful.

https://www.youtube.com/watch?v=WPF5M_Ic6Fc&t=1198s

Try a few of these examples and we will discuss in class.

- Prepare a loop that will execute 10 times. Each time the loop executes, print the number. The output of the program will appear as follows:

```
1
2
:
9
10
```

- Edit the program above so that for each number, display the number, the square of the number, and the cube of the number. Change the loop to execute 25 times? 100 times?

- Allow the user to enter 5 values between 1 and 10 **or** generate 5 random numbers between 1 – 10. Display a graph so that a * is printed to represent each number. The graph may appear as follows – note that a loop is required for each line.

```
***
********
**
******
****
```

- Write a program that will process temperatures in Celsius between -20 to +30. For each Celsius temperature, calculate the temperature in Fahrenheit using the formula F = 9 / 5 * Celsius + 32. Print the temperature in Celsius and the temperature in Fahrenheit. Include a heading for the two columns at the beginning. Output will appear as follows:

```
Celsius   Fahrenheit
-------------------------
 -20          -4
 -19          -2.2
          :
  29          84.2
  30          86.0
-------------------------
```

- Expanding on a previous program: Write a temperature conversion program that will process Celsius temperatures from -100 degrees to 100 degrees. For each temperature the program will calculate the corresponding temperature in Fahrenheit using the formula F = (9/5)C + 32, and the corresponding temperature in Kelvin using the formula K = C + 273.15. If the temperature in Celsius is -90 degrees, a message will read "Lowest Recorded Temperature", if the temperature in Celsius is 0 degrees, a message will read "Freezing Point of Water", if the temperature in Celsius is 20 degrees, a message will read "Average Room Temperature", and if the temperature in Celsius is 100 degrees, a message will read "Boiling Point of Water". No message will be assigned for the other temperatures. Display all values to the screen including the temperature in Celsius, Fahrenheit, Kelvin, and the message.

```
Temperature Conversion Chart

Celsius Fahrenheit Kelvin         Message
-----------------------------------------------
  100     212.0     373.2  Boiling Point of Water
                        :
-----------------------------------------------
```

- Prepare a program that will allow the user to enter a loan amount, and the reason for the loan. Create a loop that will execute for the number of Years between 1 and 10. For each year, calculate interest using the equation I = PRT where P is the amount of the loan, R is the interest rate, and T is the number of years. Add the interest to the loan amount for the total amount to be repaid. Finally, calculate the monthly payment by dividing the amount to be repaid by the number of months (years multiplied by 12). Print the year, the loan amount, the total to be repaid, and the monthly payment for each year. Use a standard interest rate of 6.5% per year.

```
Loan Options for 10 Years on $#,###.##

Years   Interest  Total Amt  Mon Payment
---------------------------------------
  #    $#,###.##  $#,###.##    $#,###.##
                     :
  #    $#,###.##  $#,###.##    $#,###.##
---------------------------------------
```

A program can also be set up to repeat until the user has finished and wants to end.

- Write a program that allows the user to enter an employee name, and a yearly salary. For each employee, calculate the weekly gross pay (divide the yearly salary by 52), and display their name, yearly salary, and weekly gross pay. **The program will repeat until the user enters the word "END" for the employee's name**.

OR

- Write a program that allows the user to enter an employee name, and a yearly salary. For each employee, calculate the weekly gross pay (divide the yearly salary by 52), and display their name, yearly salary, and weekly gross pay. **Prompt the user "Do you want to continue (Y/N):". If the user enters a "Y" you continue, and an "N" you will end the program.**

Additional Looping Exercise

A St. John's holiday company, Cruise Vacations, requires a program to determine the total cost of a vacation. Allow the program to repeat until the user specifies END for the first name, or prompt the user and ask if they would like to continue (Y / N) at the end of the program.

Input includes the customer's first name, the last name, the vacation destination, the departure date, the number of persons, the cost per week, the number of weeks, and a value to represent if the customer needs a connector flight to Toronto (Y or N). Make the screen easy to read with headings and prompts.

Determine the vacation cost as the number of person's times the cost per week times the number of weeks. Also include a fee of $350.00 per person for the connecting flight to Toronto if required. Sales tax is 13% of the cost, and the total cost is the vacation cost plus the sales tax. If the total cost is over $2000.00 or the length of the vacation is over 2 weeks, give the customer a 5% discount on the vacation cost only.

Display all input values, and all calculated results. Only display the discount if one is given between the tax and the total. Make it look like a receipt with headings and formatted results.

The company also offers its customers the option of paying for the vacation in equal monthly payments at 6.5% yearly interest. **Simple interest** is calculated as the Principal Loan Amount * Yearly Interest Rate * Number of years. For 3 months use the Number of Months / 12 to make it yearly. Add the interest to the principal loan amount, then calculate the payment as the total / number of months.

Display the payments based on a single payment, or payments for 3, 6, 9, 12, or 15 month terms. Use a loop and display the payments based on the following table at the end of your receipt.

# Payments	Monthly Payment
3	$9,999.99
6	$9,999.99
9	$9,999.99
12	$9,999.99
15	$9,999.99

BONUS: You can also calculate the monthly payment using **compound interest** to calculate the monthly payment where P is the calculated monthly payment, PV is the principal amount of the loan, r is the monthly rate in decimal form – divide the rate / 1200, and n is the number of months.

$$P = \frac{r(PV)}{1-(1+r)^{-n}}$$

$P = Payment$
$PV = Present\ Value$
$r = rate\ per\ period$
$n = number\ of\ periods$