Name: Jahnke _____ **Partner(s):** _____

Python Activity: Looping Structures -- Nested Loops

Part 1

Learning Objectives
Students will be able to:
Content:
- Read and write nested FOR loops
- Identify inner and outer loops

Process:
- Write code that uses a nested FOR loop

Prior Knowledge
- Python concepts from Activities 1-10

FYI: A loop within another loop is known as a **nest loop.** Proper indentation is essential for the loops to work properly..

1. Enter and execute the following code:

```
name = input("What is your name: ")
for x in range(5):
    for x in range(3):
        print(name + " ", end=" ")
    print()
```

a. What does the program display?

What is your name: Ivan
Ivan Ivan Ivan
Ivan Ivan Ivan
Ivan Ivan Ivan
Ivan Ivan Ivan
Ivan Ivan Ivan

b. How many FOR loops are in this code? 2 Is one loop completely executed before the next loop begins? no What do you call this type of loop? nested loop

c. How many times is the following line of code executed in the program? 15

```
print(name + " ", end=" ")
```

d. Identify or label the **inner loop** and the **outer loop**.

e. What does the **inner loop** do? Iterate thru range(0, 3) & print name 3x

f. What does the **outer loop** do? Iterate thru range (0, 5), execute inner loop 5x

g. What is the purpose of the print() statement inside the outer loop?

Adds a new line to start the next row of 3x name prints

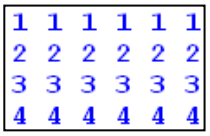
2. If you were asked to create a Python program that displayed the adjacent rectangle, you could easily do it with a set of print statements. You can also create it with a FOR loop and a print statement. This exercise will go through the steps to create a program that will print similar output but allows the user to determine the length and width of the figure when they execute the program.

a. Create a code segment that prompts the user for a number between 1 and 10 and then prints that many asterisks (*) on one line. Use a FOR loop. Although you should test the user input to be sure it is in range (between 1 & 10), you do not need to do that here.

b. You want the program to create several lines of asterisks. Extend the code in "a." to also prompt the user for how many rows to print. Use an "outer" loop to print that many lines of asterisks. Write the revised code below.

Refer to code - pogil04_kwj_csci160_spr22.py

c. Edit the program so that it prints numbers instead of asterisks. Write the line of code that was changed.



print(row + 1, end=" ") --> Refer to code

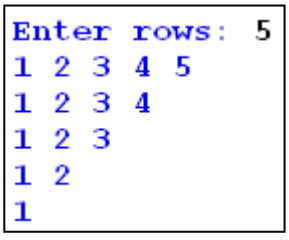
3. Examine the following code and determine the output. Indicate the changes in memory as the program is executed. Assume the user input is **5.**

```
height = int(input("Enter height: "))
for row in range(1, height+1):
    for column in range(row):
        print(row, end=" ")
    print()
```

Variable	Memory
Height	5
Row	1 / 2 / 3 / 4 / 5
Column	0 / 0,1 / 0,1,2 / 0,1,2,3 / 0,1,2,3,4

Application Questions: Use the Python Interpreter to check your work

4. Create a *Python* program that prompts the user for a number and then prints an inverted right triangle containing that many rows similar to the output to the right.



Part 2

Write a program that will continue to ask a user to enter a temperature in Celsius until the user enters 999:

a) When a temperature is entered, determine the range it falls in from below:
   - Extremely cold - [`-25 or below`]
   - Cold - [`-24 - 10`]
   - Warm – [`11 – 32`]
   - Extremely hot – [`33 or above`]

b) Display how far off is the temperature above or below from the average temp of 20 degrees Celsius. This will be displayed as a positive value. And no, I have no idea if the average temp is 20 degrees Celsius, just go with it for this assignment.

c) Display the temperature in degree Fahrenheit with no places after the decimal point. As a reminder `F = C * 1.8 + 32` or `F = C *(9/5) + 32`

For example, this could be the outcome from running the program (user entered data in bold)

```
Enter a temperature:  32
The temperature entered is: Cold
The temperature is 12 degrees away from the average temperature
The temperature 32 Celsius is 90 in Fahrenheit

Enter a temperature:  0
The temperature entered is: Extremely cold
The temperature is 30 degrees from the average temperature
The temperature 0 Celsius is 32 in Fahrenheit

Enter a temperature:  999
<<program ends>>
```

5. Write a program the prompts the user for information for three students. For each student prompt for the student ID and three quiz grades. Use a nested loop, where the inner loop prompts for the three quiz grades. Print the student's name and average – formatted to two decimal places. View the sample output as a guide.

```
Enter name of student 1: Mary Jones
Enter score 1: 78
Enter score 2: 90
Enter score 3: 91
Name:  Mary Jones
Average:  86.33

Enter name of student 2: Kevin Smith
Enter score 1: 90
Enter score 2: 77
Enter score 3: 85
Name:  Kevin Smith
Average:  84.00

Enter name of student 3: Lauri Reiner
Enter score 1: 79
Enter score 2: 83
Enter score 3: 92
Name:  Lauri Reiner
Average:  84.67
```