

Name: _____

Partner: _____

Python Activity 9: Looping Structures: FOR Loops

Learning Objectives

Students will be able to:

Content:

- Explain the difference between **while loop** and a **FOR loop**
- Explain the syntax of a **FOR loop**
- Explain how to use the **range()** function in a **FOR loop**
- Explain an **accumulator** in a **FOR loop**

Process:

- Write code that includes **FOR loop**
- Write code that uses **FOR loops** within functions

Prior Knowledge

- Python concepts from Activities 1-8

Critical Thinking Questions:

1. Enter and execute the following two Python programs.

```
WHILE LOOP -- Python Program
2 name = input("Enter your name: ")
3 x = 0
4 while(x < 20):
5     print(name)
6     x += 1

FOR LOOP – Python Program
9 name = input("Enter your name: ")
10 for x in range(20):
11     print(name)
```

- a. What is the output for each program?

- b. Both programs produce the same output. Which code fragment is more concise?

FYI: The Python predefined function - **range()** - is used to define a series of numbers and can be used in a FOR loop to determine the number of times the loop is executed..

2. Enter and execute the following code fragments and state the output:

- a. `for x in range(5):`
`print(x, end=" ")` _____
- b. `for x in range(1,5):`
`print(x, end=" ")` _____

```

c.   for x in range(3,20,2):
      print(x, end=" ")
      _____
d.   numIterations = 6
      for x in range(numIterations):
          print(x, end=" ")
          _____
e.   numIterations = 6
      for x in range(1, numIterations+1):
          print(x, end=" ")
          _____

```

3. After examining the five code fragments in #2, explain how the **range()** function works. Include an explanation of the arguments.

FYI: In a FOR loop you can include a list of values in place of the **range()** function.

4. Enter and execute the following code.

```

for x in [3,6,9,12,15,18]:
    print(x, end=" ")

```

a. Rewrite this code using the **range()** function.

b. Why would you use the **range()** function when you could just list the numbers?

FYI: The **str()** function converts what is the parentheses () to a String.

5. Read through the code and determine what it does.

```

favorite = input("Enter your favorite ice cream flavor: ")
for x in range(1,5):
    print(str(x) + ". ", favorite, end="\t")

```

a. What do you think the program does? _____

b. Enter and execute the code to determine if you were correct. What does the program actually do? Provide a detailed explanation.

c. Why is the **str()** function needed in the print statement?

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6. Complete the arguments in the following range function so that the code prints the even numbers between 100 and 200 inclusive.

```
for x in range(_____) :  
    print(x)
```

7. Complete the arguments in the following range function so that the code prints: 5 4 3 2 1 0.

```
for x in range(_____) :  
    print(x)
```

FYI: An **accumulator** is a variable that stores the sum of a group of values.

8. Examine the following code segment.

```
total = 0  
for x in range(5):  
    number = int(input("Enter a number: "))  
    total += number  
print("The total is:", total)
```

- a. Why is the variable **total** initialized to 0 in the first line of code?

- b. Explain what the following code does:

```
number = int(input("Enter a number: "))
```

- c. Explain what the following code does: `total += number`

- d. How many numbers does the program prompt for? _____

- e. What is the **accumulator** in the code segment? _____

9. Is it better to use a **FOR loop** when you know the number of times the loop should be executed or when you do not know? _____

Application Questions: Use the Python Interpreter to check your work

1. Write a code segment using a FOR loop that prints multiples of 5 from 5 to 500, one on a line.

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Python Activity 10: Looping Structures -- Nested Loops

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?

- b. How many FOR loops are in this code? _____ Is one loop completely executed before the next loop begins? _____ What do you call this type of loop? _____

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

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

- d. Label the **inner loop** and the **outer loop**.

- e. What does the **inner loop** do? _____

- f. What does the **outer loop** do? _____

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.

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

```

1 1 1 1 1 1
2 2 2 2 2 2
3 3 3 3 3 3
4 4 4 4 4 4

```

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.

<pre> height = int(input("Enter height: ")) for row in range(1, height+1): for column in range(row): print(row, end=" ") print() </pre>	<table border="1"> <thead> <tr> <th>Variable</th> <th>Memory</th> </tr> </thead> <tbody> <tr> <td>height</td> <td></td> </tr> <tr> <td>row</td> <td></td> </tr> <tr> <td>column</td> <td></td> </tr> </tbody> </table>	Variable	Memory	height		row		column	
Variable	Memory								
height									
row									
column									

Application Questions: Use the Python Interpreter to check your work

1. 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.

```

Enter rows: 5
1 2 3 4 5
1 2 3 4
1 2 3
1 2
1

```

