


ISAT 252—Analytical Methods IV
Programming and Problem Solving
Python Lab #5 Repetition Structures: Loops
(40 points Total)

Due Date: Wednesday March 4, 2015

Objectives:

- Use looping to solve programming problems
- Know the differences between different types of looping
- Be able to identify and implement the most appropriate type of looping in various situations

Deliverables:

1. Soft copies on FTP Site:
    a. Your planning documents (pseudo-code or flowchart)
    b. Your working program and source code
2. Soft copies on Canvas:
    a. Your planning documents (pseudo-code or flowchart)
    b. Your answer to the worksheet questions

The Scenario: Friends of the Shenandoah River Revisited

Problem 1: Celsius to Fahrenheit Table
Write a program that displays a table of the Celsius temperatures 0 through 20 and their Fahrenheit equivalents. The formula for converting a temperature from Celsius to Fahrenheit is

$$F = 9/5\ C + 32$$

where F is the Fahrenheit temperature and C is the Celsius temperature. Your program must use a loop to display the table.

Problem 2: Average Rainfall
Write a program that uses nested loops to collect data and calculate the average rain-fall over a period of years. The program should first ask for the number of years. The outer loop will iterate once for each year. The inner loop will iterate twelve times, once for each month. Each iteration of the inner loop will ask the user for the inches of rain- fall for that month. After all iterations, the program should display the number of months, the total inches of rainfall, and the average rainfall per month for the entire period.

Problem 3: Population

Write a program that predicts the approximate size of a population of organisms. The application should use text boxes (the input function) to allow the user to enter: the starting number of organisms, the average daily population increase (as a percentage), and the number of days to multiply the organisms. For example, assume that the user enters the following values:

Starting number of organisms: 2
Average daily increase: 30%
Number of days to Multiply: 10

The program should display the following table of data:

Day Approximate	Population
1	2
2	2.6
3	3.38
4	4.394
5	5.7122
6	7.42586
7	9.653619
8	12.5497
9	16.31462
10	21.209

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Worksheet #5: Loops

True or False (1 Point each)

1. _____A condition-controlled loop always repeats a specific number of times.

2. _____The while loop is a pretest loop.

3. _____It is not necessary to initialize accumulator variables.

4._____ In a nested loop, the inner loop goes through all of its iterations for every single iteration of the outer loop.

5._____To calculate the total number of iterations of a nested loop, add the number of iterations of all the loops.

6. _____The process of input validation works as follows: when the user of a program enters invalid data, the program should ask the user "Are you sure you meant to enter that?" If the user answers "yes," the program should accept the data.

Algorithm Workbench (2 points each)

1. Write a for loop that displays the following set of numbers:
   0, 10, 20, 30, 40, 50 . . . 1000

2. Write code that prompts the user to enter a number in the range of 1 through 100 **and validates the input**.