**Every Boiler Engineering Code – Entry Level Programming**

**Week 3 – Programming Exercises**

**(Note: The sample of the statements for input is given, only the RED numbers should be typed in by user.)**

1. **(15 points Sum and average of numbers)** Write a Python program with a loop that asks the user to enter a series of positive numbers. The user should enter a negative number to signal the end of the series. After all the positive numbers have been entered, the program should display their sum and average (**format the precision of results as 2.**)

**Use the following numbers to test (Only type in the red numbers in interactive mode):**

|  |  |
| --- | --- |
| **Sample Input** | **Expected Output** |
| **Enter a positive number (negative to quit): 9**  **Enter a positive number (negative to quit): 7**  **Enter a positive number (negative to quit): 5**  **Enter a positive number (negative to quit): 6**  **Enter a positive number (negative to quit): 4**  **Enter a positive number (negative to quit): 2**  **Enter a positive number (negative to quit): 1**  **Enter a positive number (negative to quit): -1** | **Sum = 34.00**  **Average = 4.86** |
| **Enter a positive number (negative to quit): 2.333**  **Enter a positive number (negative to quit): 12.56**  **Enter a positive number (negative to quit): 2.175**  **Enter a positive number (negative to quit): -0.01** | **Sum = 17.07**  **Average = 5.69** |

1. **(15 points)** Write a program that uses nested loops to collect data and calculate the average rainfall 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 rainfall 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. (**format the precision of total and average rainfall as 2.**)

**Use the following numbers to test (Only type in the red numbers in interactive mode):**

|  |  |
| --- | --- |
| **Sample Input** | **Expected Output** |
| **Enter the number of years: 2**  **For year No.1 :**  **Enter the rainfall amount for Jan.: 1.93**  **Enter the rainfall amount for Feb.: 1.73**  **Enter the rainfall amount for Mar.: 2.91**  **Enter the rainfall amount for Apr.: 3.78**  **Enter the rainfall amount for May.: 3.86**  **Enter the rainfall amount for Jun.: 4.02**  **Enter the rainfall amount for Jul.: 3.82**  **Enter the rainfall amount for Aug.: 4.02**  **Enter the rainfall amount for Sept.: 2.64**  **Enter the rainfall amount for Oct.: 2.95**  **Enter the rainfall amount for Nov.: 2.91**  **Enter the rainfall amount for Dec.: 2.76**  **For year No.2 :**  **Enter the rainfall amount for Jan.: 1.925**  **Enter the rainfall amount for Feb.: 1.859**  **Enter the rainfall amount for Mar.: 2.600**  **Enter the rainfall amount for Apr.: 3.584**  **Enter the rainfall amount for May.: 4.761**  **Enter the rainfall amount for Jun.: 4.092**  **Enter the rainfall amount for Jul.: 4.215**  **Enter the rainfall amount for Aug.: 3.628**  **Enter the rainfall amount for Sept.: 2.863**  **Enter the rainfall amount for Oct.: 3.031**  **Enter the rainfall amount for Nov.: 3.237**  **Enter the rainfall amount for Dec.: 2.449** | **There are 24 months.**  **The total rainfall is 75.57 inches.**  **The monthly average rainfall is 3.15 inches.** |
| **Enter the number of years: 0** | **Invalid input.** |

1. **(15 points)** Write a program that predicts the approximate size of a population of organisms. The application should allow the user to enter the starting number of organisms, the average daily population increase (as a percentage), and the number of days the organisms will be left to multiply. For example, assume the user enters the following value:

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 2.0000

2 2.6000

3 3.3800

4 4.3940

5 5.7122

6 7.4259

7 9.6536

8 12.5497

9 16.3146

10 21.2090

(**format the precision of population as 4.**) (**Hint**: **use ‘\t’ to print tabs to align the numbers and the words)**

**Use the following numbers to test (Only type in the red numbers in interactive mode):**

|  |  |
| --- | --- |
| **Sample Input** | **Expected Output** |
| **Starting number of organisms: 2**  **Average daily increase, in percent: 30**  **Number of days to multiply: 15** | **Day Approximate Population**  **1 2.0000**  **2 2.6000**  **3 3.3800**  **4 4.3940**  **5 5.7122**  **6 7.4259**  **7 9.6536**  **8 12.5497**  **9 16.3146**  **10 21.2090**  **11 27.5717**  **12 35.8432**  **13 46.5962**  **14 60.5750**  **15 78.7475** |
| **Starting number of organisms: 4**  **Average daily increase, in percent: 15**  **Number of days to multiply: 12** | **Day Approximate Population**  **1 4.0000**  **2 4.6000**  **3 5.2900**  **4 6.0835**  **5 6.9960**  **6 8.0454**  **7 9.2522**  **8 10.6401**  **9 12.2361**  **10 14.0715**  **11 16.1822**  **12 18.6096** |

1. **(15 points)** Write a Python program that **uses nested loops** to draw this pattern:

**\*\*\*\*\*\*\***

**\*\*\*\*\*\***

**\*\*\*\*\***

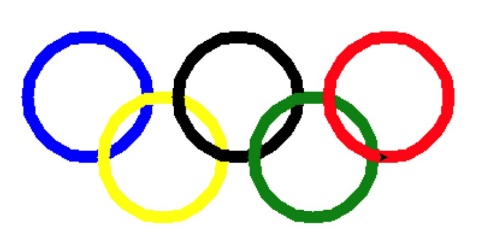
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1. (**15 points**) Use the turtle graphics library to write a program that reproduces the following design (Set pen size as 10, circle radius as 50, x start point as -100, y start point as 0. The horizontal distance between the centers of the blue circle and yellow circle is 1.25 times of the circle radius, and the vertical distance between the centers of the blue circle and yellow circle should be equal to the circle radius. Your graph may look bigger than the following one.)



1. **(Bonus question, 15 points)** Write a Python program that **uses nested loops** to draw this pattern with a given number lines, which is input by user:

##

# #

# #

# #

# #

# #

# #

# #

# #

. .

. .

. .

**Use the following numbers to test (Only type in the red numbers in interactive mode):**

|  |  |
| --- | --- |
| **Sample Input** | **Expected Output** |
| **Enter the number of lines: 15** | **##**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #**  **# #** |