**PROJECT Loops and Repetition - Bank Account Activity 50 points**

**Objective** To write a program that will show bank account balances over time.

***PROJECT DESCRIPTION***

Write a program that will prompt a user for an initial bank account balance and an annual interest rate, which the bank allows for their clients.

Once the user has supplied the initial deposit amount and interest rate for the account, your program should then proceed to calculate the new balance for the account  
 ( including interest earned ) over a twelve - month period ( taking into account the additional amount the interest earned for each month ) . A simple way of handling the calculation of the balance for each month of the investment period is shown below as an example.

**balance = balance + monthly deposit amount**

**interest = balance ( current ) × ( interest rate / 12 )**

**balance ( new ) = balance ( current ) + interest**

Note that the interest rate is per annum (across the entire year), so the interest rate percentage for each month is equivalent to the yearly interest rate divided by 12 .   
 Your program should then display the new balance calculated for each month for a total of 12 months. A sample snapshot of this follows in **Figure 1** below.

***Information about This Project***

Here is an example of the above programming scenario:

Consider an initial bank balance of $ 2,000 and an annual interest rate of 4 % and the first three months of account activity.

Month 1 ( ending balance ) $ 2,000 + ( 4 % / 12 ) × $ 2,000 = $ 2,006.67

Month 2 ( ending balance ) $ 2,006.67 + ( 4 % / 12 ) × $ 2,006.67 = $ 2,013.36

Month 3 ( ending balance ) $ 2,013.36 + ( 4 % / 12 ) × $ 2,013.36 = $ 2,020.07

Here is some information and examples on some looping structures that can be useful when writing your program statements for this project.

**[ for Loop in Python ]**

**start = 1**

**stop = 5**

**for count in range(start, stop + 1) :**

**# start loop body**

**print ("iteration number: ", count)**

**# end loop body**

**[ Output ]**

**iteration number: 1**

**iteration number: 2**

**iteration number: 3**

**iteration number: 4**

**iteration number: 5**

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**[ While Loop in Python ]**

**count = 1**

**while (count < 5) :**

**# start loop body**

**print ("the count is: ", count)**

**count = count + 1**

**# end loop body**

**[ Output ]**

**the count is: 1**

**the count is: 2**

**the count is: 3**

**the count is: 4**

**[ Repetitive Program Control ]**

The three types of program control include sequential, selection and repetition. Repetitive program control arises when the execution of some programming statements occurs in a repetitive or looping fashion.

***Steps to Complete This Project***

**STEP 1**  **Open Visual Studio or Python IDLE IDE and Write the Program Code**

Open the MS Visual Studio, Python IDLE IDE ( Integrated Development Environment ) or similar Python development environment on your computer.

Within your development environment, create a new Python file that will hold your program source code.

You can name your file as: **BankAccount.py**

**STEP 2**  **View the Sample Program Run**

**Figure 1** shows a sample program run of this project ( prior to the project modification ) . Study the input and output values of the sample program run.

The sample program run will assist you in understanding the required code statements that are necessary to complete this project.

**STEP 3**  **Write Your Program Code**

Here are some suggestions, in top - down fashion, to write your program code for this project.

• Use a comment block that will display your name, date and course information.

• Declare, and initialize to 0 , a variable, such as bankBalance , to hold the user’s bank balance.

• Declare, and initialize to 0 , a variable, such as intRate , to hold the user’s account interest rate.

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• Prompt the user for and read the bankBalance .

• Prompt the user for and read the intRate .

• Open a looping structure that will display the running balance for each of the twelve months in the year.

**for index in range(1, 13) :**

• Within the **for** loop, display a new monthly balance by incrementing the

current balance by the product of the interest rate ( divided by 12 ) and the current balance.

• Display the month number and the current balance.

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**Figure 1 Sample Program Run ( Prior to the Project Modification )**

|  |
| --- |
| **Enter an initial bank balance 2000**  **Include annual interest rate ( as a decimal ) 0.04**  **Month: 1 New Monthly bal: $2006.67**  **Month: 2 New Monthly bal: $2013.36**  **Month: 3 New Monthly bal: $2020.07**  **Month: 4 New Monthly bal: $2026.80**  **Month: 5 New Monthly bal: $2033.56**  **Month: 6 New Monthly bal: $2040.33**  **Month: 7 New Monthly bal: $2047.14**  **Month: 8 New Monthly bal: $2053.96**  **Month: 9 New Monthly bal: $2060.81**  **Month: 10 New Monthly bal: $2067.68**  **Month: 11 New Monthly bal: $2074.57**  **Month: 12 New Monthly bal: $2081.48** |

**STEP 4 Modify Your Program Code**

Once your program is fully working, modify your program by creating a loop that will allow a user 3 tries to enter in a pin number, which if correct, will allow the user to enter information such as their initial balance and desired annual interest rate as demonstrated above.

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Include, in your code, an error message if an incorrect pin number was entered in and state how many tries the user has left to correctly input their pin number to gain access to the rest of the program.

Show a snapshot of your running program where a person enters an incorrect pin as well as the correct pin ( pin has to be some alphanumeric number at least 4 digits in length ) along with the inputs for an initial balance and an annual interest rate and resulting monthly displays of new balances.

A pseudocode segment of the pin number entrance to your bank balance program will follow below.

Some coding suggestions to complete this portion of your code are:

• Before your bank balance segment of this application, use a statement such as the following to track the user’s success of entering the correct PIN number.

**success = False**

• Define a **for** loop that will execute exactly three times.

• Within the **for** loop, prompt the user for the PIN number and verify that it is the correct one. If so, assign your **success** variable to **True** and

**break** from the loop. Otherwise, prompt the user again for the correct PIN number.

• If the PIN number was correctly entered by the user, pass the program control to your code segment that displays the bank balances. Of course, the bank balances will only be displayed if the **success** variable is assigned to **True** .

**STEP 5**  **Submit Your Program**

When completed, your program source code ( .py file ) as well as include

snapshots of your running program input / output results along with your name

and course number, date / time etc. into a MS Word document. Submit your files to the appropriate course submittal area when complete.

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**[ Pseudocode: Three Attempts Password Entry Program Segment ]**

**pin = 1234**

**yourNum = 0**

**loop count = 1 to 3**

**print ("please enter your PIN number")**

**if read yourNum**

**if (yourNum == pin) then**

**print ("you are in!!")**

**Remark: perform some task**

**Remark: perform another task**

**else**

**print ("invalid PIN - try again!")**

**end loop**

**print ("enjoy your day!!")**

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\*Grads include a summary at the end of the program showing total dollars

accumulated plus the total interest accumulated all rounded to two decimal

places. Present data in a columnar fashion with headings such as the

month #, interest amount, and the new balance.

Ex.

Month # Interest Amt Balance

1 6.67 2006.67

2 6.69 2013.36

:: :: ::

Include the above result in your output snapshot for full credit.

**STEP 6 Questions and Answers Concerning this Computer Laboratory Project**

Answer the following questions in your own words.

Open MS Word and, within a new document, place your responses to each of these questions. Submit your completed MS Word document for credit.

**(1)** Explain how looping techniques ( repetitive program control ) are used in this program application.

**(2)** Loops often incorporate accumulating variables which amass a sum that builds every time the loop is executed. Did your application include any accumulating variables? What amount(s) were accumulated?

**(3)** Prior to their use in a looping structure, accumulating variables are often declared and initialized. For an accumulating sum variable, what is the typical value for which the variable is initialized?

**(4)** Which datatype is the following variableassociated with?

**success = False**

**(5)** What have you learned from performing and coding for this lab assignment?