COMP 2710: Project 1

Points Possible: 100
Deadline: 11:59pm Friday June 2nd, 2023

Goals:

- To learn how to implement the concept of “Flow of Control” in C++
- To write a very simple C++ program

Description:

You have just purchased a stereo system that cost $1000 on the following credit plan: no down payment, an interest rate of 18% per year (and hence 1.5% per month), and monthly payments of $50. The monthly payment of $50 is used to pay the interest, and whatever is left is used to pay part of the remaining debt. Hence, the first month you pay 1.5% of $1000 in interest. That is $15 in interest. The remaining $35 is deducted from your debt, which leaves you with a debt of $965.00. The next month you pay interest of 1.5% of $965.00, which is $14.48. Hence, you can deduct $35.52 (which is $50–$14.48) from the amount you owe.

Write a program that will tell you how many months it will take you to pay off this loan in particular and any loan in general. Your program also needs to calculate the total amount of interest paid over the life of any loan. Use a loop to calculate the amount of interest and the size of the debt after each month. Your program must output the monthly amount of interest paid and remaining debt. Use a variable to count the number of loop iterations and hence the number of months until the debt is zero. You may want to use other variables as well. The last payment may be less than $50 if the debt is small, but do not forget the interest. If you owe $50, then your monthly payment of $50 will not pay off your debt, although it will come close. One month’s interest on $50 is only 75 cents.

Here is a sample dialog (where the user input is depicted as **Bold**, but you do not need to display user input in bold.):

```
Loan Amount: 1000
Interest Rate (% per year): 18
Monthly Payments: 50
```

```
************************************************************
        Amortization Table
************************************************************
Month   Balance   Payment       Rate    Interest   Principal
0       $1000.00  N/A           N/A     N/A         N/A
1       $965.00   $50.00        1.50    $15.00      $35.00
2       $929.47   $50.00        1.50    $14.47      $35.53
3       $893.42   $50.00        1.50    $13.94      $36.06
4       $856.82   $50.00        1.50    $13.40      $36.60
5       $819.67   $50.00        1.50    $12.85      $37.15
6       $781.97   $50.00        1.50    $12.30      $37.70
7       $743.70   $50.00        1.50    $11.73      $38.27
8       $704.85   $50.00        1.50    $11.16      $38.84
9       $665.42   $50.00        1.50    $10.57      $39.43
10      $625.40   $50.00        1.50    $9.98       $40.02
11      $584.79   $50.00        1.50    $9.38       $40.62
12      $543.56   $50.00        1.50    $8.77       $41.23
13      $501.71   $50.00        1.50    $8.15       $41.85
14      $459.24   $50.00        1.50    $7.53       $42.47
15      $416.13   $50.00        1.50    $6.89       $43.11
16      $372.37   $50.00        1.50    $6.24       $43.76
17      $327.95   $50.00        1.50    $5.59       $44.41
18      $282.87   $50.00        1.50    $4.92       $45.08
19      $237.11   $50.00        1.50    $4.24       $45.76
20      $190.67   $50.00        1.50    $3.56       $46.44
21      $143.53   $50.00        1.50    $2.86       $47.14
22      $95.68    $50.00        1.50    $2.15       $47.85
23      $47.12    $50.00        1.50    $1.44       $48.56
24      $0.00     $47.83        1.50    $0.71       $47.12
************************************************************

It takes 24 months to pay off the loan.
Total interest paid is: $197.83
```

Your program's output should match the style of the sample output (including a left lined-up style).

In what follows, you find a second case used to test the correctness of your program.

```
Loan Amount: 2000
Interest Rate (% per year): 12
Monthly Payments: 80
```

```
********************************************************
       Amortization Table
********************************************************
Month  Balance        Payment Rate   Interest Principal
0      $2,000.00      N/A     N/A    N/A       N/A
1      $1,940.00      $80.00  1.00   $20.00    $60.00
2      $1,879.40      $80.00  1.00   $19.40    $60.60
3      $1,818.19      $80.00  1.00   $18.79    $61.21
4      $1,756.38      $80.00  1.00   $18.18    $61.82
5      $1,693.94      $80.00  1.00   $17.56    $62.44
6      $1,630.88      $80.00  1.00   $16.94    $63.06
7      $1,567.19      $80.00  1.00   $16.31    $63.69
8      $1,502.86      $80.00  1.00   $15.67    $64.33
9      $1,437.89      $80.00  1.00   $15.03    $64.97
10     $1,372.27      $80.00  1.00   $14.38    $65.62
11     $1,305.99      $80.00  1.00   $13.72    $66.28
12     $1,239.05      $80.00  1.00   $13.06    $66.94
13     $1,171.44      $80.00  1.00   $12.39    $67.61
14     $1,103.15      $80.00  1.00   $11.71    $68.29
15     $1,034.19      $80.00  1.00   $11.03    $68.97
16     $964.53        $80.00  1.00   $10.34    $69.66
17     $894.17        $80.00  1.00   $9.65     $70.35
18     $823.11        $80.00  1.00   $8.94     $71.06
19     $751.35        $80.00  1.00   $8.23     $71.77
20     $678.86        $80.00  1.00   $7.51     $72.49
21     $605.65        $80.00  1.00   $6.79     $73.21
22     $531.70        $80.00  1.00   $6.06     $73.94
23     $457.02        $80.00  1.00   $5.32     $74.68
24     $381.59        $80.00  1.00   $4.57     $75.43
25     $305.41        $80.00  1.00   $3.82     $76.18
26     $228.46        $80.00  1.00   $3.05     $76.95
27     $150.75        $80.00  1.00   $2.28     $77.72
28     $72.25         $80.00  1.00   $1.51     $78.49
29     $0.00          $72.98  1.00   $0.72     $72.25
********************************************************

It takes 29 months to pay off the loan.
Total interest paid is: $312.98
```

Special Cases:

1. Please think about how to deal with the **last payment**, which is smaller than regular payment. For example, in the above table, the regular payments are $80.00 whereas the last payment is only 72.98.
2. Your program needs to ensure that **regular payments are larger than any monthly interest**. For example, in the above amortization table, your program must test if the regular monthly payment (i.e., $80.00) is larger than the monthly interest (e.g., $20.00 in the first month).
3. Make sure that the **loan amount and monthly payment are positive numbers** and **interest rate is non-negative number**.
4. If you do not address the above issues, your program may not terminate in some special cases and you will lose marks. See the example below:

```
Loan Amount: 2000
Interest Rate (% per year): 49.2
Monthly Payments: 80

***********************************************************
        Amortization Table
***********************************************************
Month   Balance         Payment Rate    Interest Principal
0       $2,000.00       N/A     N/A     N/A       N/A
1       $2,002.00       $80.00  4.10    $82.00    -$2.00
2       $2,004.08       $80.00  4.10    $82.08    -$2.08
3       $2,006.25       $80.00  4.10    $82.17    -$2.17
4       $2,008.51       $80.00  4.10    $82.26    -$2.26
5       $2,010.85       $80.00  4.10    $82.35    -$2.35
6       $2,013.30       $80.00  4.10    $82.45    -$2.45
7       $2,015.84       $80.00  4.10    $82.55    -$2.55
8       $2,018.49       $80.00  4.10    $82.65    -$2.65
9       $2,021.25       $80.00  4.10    $82.76    -$2.76
10      $2,024.12       $80.00  4.10    $82.87    -$2.87
11      $2,027.11       $80.00  4.10    $82.99    -$2.99
12      $2,030.22       $80.00  4.10    $83.11    -$3.11
13      $2,033.46       $80.00  4.10    $83.24    -$3.24
14      $2,036.84       $80.00  4.10    $83.37    -$3.37
15      $2,040.35       $80.00  4.10    $83.51    -$3.51
16      $2,044.00       $80.00  4.10    $83.65    -$3.65
17      $2,047.80       $80.00  4.10    $83.80    -$3.80
18      $2,051.76       $80.00  4.10    $83.96    -$3.96
19      $2,055.89       $80.00  4.10    $84.12    -$4.12
...     ...             ...             ...       ...
```

Programming Environment:

Write a short program in C++. Compile and run it using AU server. Instructions for accessing the AU server from off-campus can be found at the following link: "https://www.eng.auburn.edu/admin/ens/helpdesk/off-campus/access-information.html". (no matter what kind of text editor you use, please make sure your code could run on AU server, the only test bed we accept is AU server).

Requirements:

1. (5 points) **Use comments to provide a heading at the top of your code** containing your name, Auburn UserID, filename, and how to compile your code. Also describe any help or sources that you used (as per the syllabus).
2. (5 points) Your source code file should be named as "**project1_LastName_UserID.cpp**". (e.g. project1_Pham_tmp0038.cpp)
   Note: You will not lose any point if Canvas automatically changes your file name (e.g. project1_LastName_UserID-2.cpp) due to your resubmissions.
3. (40 points) No compilation error and no warning messages.
4. (10 points) Usability of your program (e.g., input and output).
5. (40 points) Quality of your source code.

You will **lose points** if you: do not use the specific program file name, or do not have a comment block on **EVERY** program you hand in. You will lose **at least 40 points** if there are compilation errors or warning messages when we compile your source code.

Deliverables:

- A heading at the top of your code contains your name, Auburn UserID, filename, and how to compile your code.
- Submit your source code file named as "project1_LastName_UserID.cpp" through the Canvas system.
- For more than one submission, the system will automatically add a hyphen to your file name. i.e. project1_LastName_UserID-#.cpp. Please ignore this issue.

Late Submission Penalty:

- No late submission is allowed. After 11:59pm on the due date, you can't submit your assignment anymore.

Rebuttal period:

- You will be given a period of 2 business days to read and respond to the comments and grades of your homework or project assignments. The TA may use this opportunity to address any concern and question you have. The TA also may ask for additional information from you regarding your homework or project.