

## COMP 2710: Homework 2

Due: 2/7/2018 at 11:50 pm

Points Possible: 100

**Note: You DO NOT need to submit hard copies.**

### Goals:

- To learn how to utilize the concepts 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 in **Bold**; however, 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  1.5    $15.00  $35.00
2      $929.48 $50.00  1.5    $14.48  $35.53
3      $893.42 $50.00  1.5    $13.94  $36.06
4      $856.82 $50.00  1.5    $13.40  $36.60
5      $819.67 $50.00  1.5    $12.85  $37.15
6      $781.97 $50.00  1.5    $12.30  $37.70
7      $743.70 $50.00  1.5    $11.73  $38.27
8      $704.85 $50.00  1.5    $11.16  $38.84
9      $665.42 $50.00  1.5    $10.57  $39.43
10     $625.40 $50.00  1.5    $9.98   $40.02
11     $584.79 $50.00  1.5    $9.38   $40.62
12     $543.56 $50.00  1.5    $8.77   $41.23
13     $501.71 $50.00  1.5    $8.15   $41.85
14     $459.24 $50.00  1.5    $7.53   $42.47
15     $416.13 $50.00  1.5    $6.89   $43.11
16     $372.37 $50.00  1.5    $6.24   $43.76
17     $327.95 $50.00  1.5    $5.59   $44.41
18     $282.87 $50.00  1.5    $4.92   $45.08
19     $237.11 $50.00  1.5    $4.24   $45.76
20     $190.67 $50.00  1.5    $3.56   $46.44
21     $143.53 $50.00  1.5    $2.86   $47.14
22     $95.68  $50.00  1.5    $2.15   $47.85
23     $47.12  $50.00  1.5    $1.44   $48.56
24     $0.00   $47.83  1.5    $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.**

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	\$20.00	\$60.00
2	\$1,879.40	\$80.00	1	\$19.40	\$60.60
3	\$1,818.19	\$80.00	1	\$18.79	\$61.21
4	\$1,756.38	\$80.00	1	\$18.18	\$61.82
5	\$1,693.94	\$80.00	1	\$17.56	\$62.44
6	\$1,630.88	\$80.00	1	\$16.94	\$63.06
7	\$1,567.19	\$80.00	1	\$16.31	\$63.69
8	\$1,502.86	\$80.00	1	\$15.67	\$64.33
9	\$1,437.89	\$80.00	1	\$15.03	\$64.97
10	\$1,372.27	\$80.00	1	\$14.38	\$65.62
11	\$1,305.99	\$80.00	1	\$13.72	\$66.28
12	\$1,239.05	\$80.00	1	\$13.06	\$66.94
13	\$1,171.44	\$80.00	1	\$12.39	\$67.61
14	\$1,103.15	\$80.00	1	\$11.71	\$68.29
15	\$1,034.19	\$80.00	1	\$11.03	\$68.97
16	\$964.53	\$80.00	1	\$10.34	\$69.66
17	\$894.17	\$80.00	1	\$9.65	\$70.35
18	\$823.12	\$80.00	1	\$8.94	\$71.06
19	\$751.35	\$80.00	1	\$8.23	\$71.77
20	\$678.86	\$80.00	1	\$7.51	\$72.49
21	\$605.65	\$80.00	1	\$6.79	\$73.21
22	\$531.70	\$80.00	1	\$6.06	\$73.94
23	\$457.02	\$80.00	1	\$5.32	\$74.68
24	\$381.59	\$80.00	1	\$4.57	\$75.43
25	\$305.41	\$80.00	1	\$3.82	\$76.18
26	\$228.46	\$80.00	1	\$3.05	\$76.95
27	\$150.75	\$80.00	1	\$2.28	\$77.72
28	\$72.25	\$80.00	1	\$1.51	\$78.49
29	\$0.00	\$72.98	1	\$0.72	\$72.25
*****					
It takes <b>29</b> months to pay off the loan.					
Total interest paid is: <b>\$312.98</b>					

### 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. If you do not address the above issues, your program may not terminate in some special cases. 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	
1	\$2,002.00	\$80.00	4.1	\$82.00	-\$2.00
2	\$2,004.08	\$80.00	4.1	\$82.08	-\$2.08
3	\$2,006.25	\$80.00	4.1	\$82.17	-\$2.17
4	\$2,008.51	\$80.00	4.1	\$82.26	-\$2.26
5	\$2,010.85	\$80.00	4.1	\$82.35	-\$2.35
6	\$2,013.30	\$80.00	4.1	\$82.45	-\$2.45
7	\$2,015.84	\$80.00	4.1	\$82.55	-\$2.55
8	\$2,018.49	\$80.00	4.1	\$82.65	-\$2.65
9	\$2,021.25	\$80.00	4.1	\$82.76	-\$2.76
10	\$2,024.12	\$80.00	4.1	\$82.87	-\$2.87
11	\$2,027.11	\$80.00	4.1	\$82.99	-\$2.99
12	\$2,030.22	\$80.00	4.1	\$83.11	-\$3.11
13	\$2,033.46	\$80.00	4.1	\$83.24	-\$3.24
14	\$2,036.84	\$80.00	4.1	\$83.37	-\$3.37
15	\$2,040.35	\$80.00	4.1	\$83.51	-\$3.51
16	\$2,044.00	\$80.00	4.1	\$83.65	-\$3.65
17	\$2,047.80	\$80.00	4.1	\$83.80	-\$3.80
18	\$2,051.76	\$80.00	4.1	\$83.96	-\$3.96
19	\$2,055.89	\$80.00	4.1	\$84.12	-\$4.12
...	...	...	...	...	...

### **Programming Environment:**

Write a program in C++. Compile and run it using the g++ compiler on a Linux box (either in computer labs in Shelby, your home Linux machine, a Linux box on a virtual machine, or using an emulator like Cygwin).

### **Requirements:**

1. (5 points) **Use comments to provide a heading at the top of your code** containing your name, Auburn user id, 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 "hw2.cpp".
3. (40 points) No compilation errors 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 user id, filename, and how to compile your code.
- Submit your source code file named as “hw2.cpp” through Canvas.

**Late Submission Penalty:**

- Ten percent (10%) penalty per day for late submission. For example, an assignment submitted after the deadline but up to 1 day (24 hours) late can achieve a maximum of 90% of points allocated for the assignment. An assignment submitted after the deadline but up to 2 days (48 hours) late can achieve a maximum of 80% of points allocated for the assignment.
- Assignment submitted more than 3 days (72 hours) after the deadline will not be graded.

**Rebuttal period:**

- You will be given a period of 7 days to read and respond to the comments and grades of your homework or project assignment. The TA may use this opportunity to address any concerns and questions you have. The TA also may ask for additional information from you regarding your homework or project.