

---

# CSCI 1380 Homework 3

**Due Date: see the course webpage**  
**Instructor: Xiang Lian**

---

**Assignment:**

- (1) Design a modular program to solve the following problem.
- (2) Enter and successfully run the program in the Visual C++ environment

**Problem (100 points):**

You are to write a loan program for the River Bank. This program will print an amortization table for a loan, given the amount of the loan, the interest rate, and the number of payments. This process will be repeated until the customer asks to quit. The following is the list of tasks that your program has to complete.

Print a welcome message.

Loop until the user wants to leave the program. In this loop, the program executes the following three tasks.

- An input section which asks for some information including amount of the loan, the number of payments (in terms of months), and the annual interest rate.
- A calculation section which calculates and prints an amortization table similar to the following for the input received from the first function. For example, given the amount of the loan is 10000, the annual interest rate is 8% and the number of payments is 12, a table similar to the following will be generated (may not be exact the same as yours due to floating point errors).

<b>Amortized Payment Schedule</b>			
month	paid principal	paid interest	new balance
1	803.22	66.67	9196.78
2	808.57	61.31	8388.21
3	813.96	55.92	7574.25
4	819.39	50.49	6754.86
5	824.85	45.03	5930.01
6	830.35	39.53	5099.65
7	835.89	34.00	4263.77
8	841.46	28.43	3422.31
9	847.07	22.82	2575.24
10	852.72	17.17	1722.52
11	858.40	11.48	864.12
12	864.12	5.76	-0.00

- An output section to print out other results such as monthly interest rate, monthly payment, accumulated interest payment over the loan period, and total payment, along with the input parameters. For the above example,

(see next page)

Customer: John Doe  
 loan amount: 10000.00  
 annual interest rate: 8.00%  
 number of payments: 12  
 monthly interest: 0.6667% (Note: 4 decimal places!)  
 accumulated interest: 438.61  
 monthly payment: 869.89  
 total payment: 10438.61

To calculate and print the above table, your program needs to calculate the monthly interest rate, the monthly payment, and the interest portion of the payment. The following formulas are needed:

Monthly interest rate

$$MonIntRate = (AnnualRate / 100) / 12$$

Monthly payment (you will need the function pow(x,y) for this)

$$MonthPayment = LoanAmount * MonIntRate * \frac{(1 + MonIntRate)^{NumMonths}}{(1 + MonIntRate)^{NumMonths} - 1}$$

Amount paid to interest in each month is

$$MonthPaidInt = Balance * MonIntRate$$

Amount paid to the principal in each month is

$$MonthPrincipal = MonthPayment - MonthPaidInt$$

So the new balance is given by

$$Balance = Balance - MonthPrincipal$$

At the end of the main loop, your program asks the customer if they would like to have another run of the program. The loop stops if the user selects to quit. When the user quits, a farewell message should be printed. Both the amortization table and the final print-out (total payment etc.) should be recorded in an output file for you to hand in.

Test data:

Amount	\$10,000	\$10,000	\$10,000	\$20,000
Interest Rate	8%	7.5%	7%	7%
Months	12	12	24	24

---

**Extra Bonus Part A (10 points).** This part is optional. If you can get it done, you will receive 10 extra points.

---

Modify the program of Assignment 3 that you have completed so that the Amortized Payment Schedule Table can have three more columns: (1) “paid principal subtotal”, this adds all the payments to the principal that have been made up to the current month; (2) “paid interest subtotal”, this adds all the payments to the interest that have been made up to the current month; and (3) “total payment

subtotal”, this add all the payments to both the principal and the interest that have been made up to the current month.

---

---

**Extra Bonus Part B (20 points).** This part is optional. If you can get it done, you will receive 20 extra points.

---

---

Once you have completed Extra Bonus Part A, you can add another component to compare two different loan payment schedules. That is, for the same amount of the principal, one load has a 15 years payment schedule, and other has a 30 year payment schedule. Assume that the interest rate is the same (In reality, the 30-year schedule usually has a higher interest rate than the 15-year schedule.) Compare two schedules to see which one will save more money for the borrower.

---

---

### **Submission guidelines**

---

---

- Submit printed copies of all the programs and their execution results for given test data under the door of the instructor's office (ENGR 3.275).
- Submit electronic copies of all the programs that you wrote for this assignment via Blackboard.
- Both paper and electronic copies must be submitted before or in class by the due date posted on the course webpage.
- Note that this assignment must be completed by each student individually (no teamwork please!).