ComS 207: Programming I
Homework 7
Out: Wed. Oct 11, 2006
Due: Fri. Oct 20, 2006 (Online submission *ONLY*)

Student Name:

Recitation Section:

Some of these problems came from your textbook. The text is reproduced here for your convenience.

1. **Review Questions**

   [**Exercise 5.7**] What output is produced by the following code fragment?

   ```
   int num = 0, max = 20;
   while (num < max)
   {
     System.out.println (num);
     num += 4;
   }
   ```

   [**Exercise 5.9**] What output is produced by the following code fragment?

   ```
   for (int num = 0; num <= 200; num += 2)
     System.out.println(num);
   ```

[**Exercise 5.8**] What output is produced by the following code fragment?

```
int num = 1, max = 20;
while (num < max)
{
  if (num%2 == 0)
    System.out.println (num);
  num++;
}
```

[**Exercise 5.10**] What output is produced by the following code fragment?

```
for(int val = 200; val >= 0; val -= 1)
  if (val % 4 != 0)
    System.out.println(val);
```

[**Exercise 5.11**] Transform the following while loop into an equivalent do loop (make sure it produces the same output).

```
int num = 1;
while (num < 20)
{
  num++;
  System.out.println(num);
}
```

[**Exercise 5.12**] Transform the while loop from the previous exercise into an equivalent for loop (make sure it produces the same output)

[**Exercise 5.13**] What is wrong with the following code fragment? What are three distinct ways it could be changed to remove the flaw?

```
count = 50;
while (count >= 0)
{
  System.out.println(count);
  count = count + 1;
}
```

2. **Programming Projects**

Choose ***three of the following five*** programming projects and implement them. Your grade will NOT depend on which ones you choose. Just puck the ones that you like.

(a) [Programming Project 7.3] Design and implement an application that creates a histogram that allows you to visually inspect the frequency distribution of a set of values. The program should read in an arbitrary number of integers that are in the range 1 to 100 inclusive, then produce a chart similar to the one below that indicates how many input values fell in the range 1 to 10, 11 to 20, and so on. Print one asterisk for each value entered.

```
1   -  10 | ****
11  -  20 | **
21  -  30 | ******************
31  -  40 |
41  -  50 | ***
51  -  60 | ********
61  -  70 | **
71  -  80 | *****
81  -  90 | *******
91  -  100| *********
```

(b) [Programming Project 7.5] Design and implement an application that computes and prints the mean and standard deviation of a list of integers x_1 through x_n. Assume that there will be no more than 60 input values. Compute using the following formulas:

$$mean = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$sd = \sqrt{\frac{\sum_{i=1}^{n}(x_i - mean)^2}{n-1}}$$

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(c) [Programming Project 7.8] Design and implement an application that reads a sequence of up to 25 pairs of names and postal (ZIP) codes for individuals. Store the data in an object designed to store a first name (String), last name (String), and postal code (integer). Assume each line of input will contain two strings followed by an integer value, each separated by a tab character. Then ,after the input has been read in, sort the list of objects by increasing postal code and print the sorted list in an appropriate format to the screen.

(d) [Dealing Cards] Write a class Card that represents a playing card. Create a class called DeckOfCards that stores 52 objects of the Card class. Include methods to shuffle the deck, deal a card, and report the number of cards left in the deck. The shuffle method should assume a full deck. Create a driver class with a main method that deals each card from a shuffled deck, printing each card as it is dealt.

The driver class should ask the user to select from two possible card games (poker and bridge). Depending on the user's input the program will then deal 4 sets of 5 cards (for poker) or 4 sets of 13 cards (for bridge).

For Poker, the output should look something like this:

```
Player 1:  A-diamonds, Q-spades, 2-clubs, 3-clubs, J-hearts
Player 2:  Q-clubs, K-hearts, K-spades, K-diamonds, Q-diamonds
Player 3:  2-spades, 3-spades, 10-diamonds, 9-diamonds, 4-diamonds
Player 4:  J-spades, 10-spades, J-clubs, A-hearts, A-clubs
```

Similar to Programming Project 7.7

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(e) [**Matrix Multiplication**] Write a program which prompts the user to enter three 3x3 matrices denoted with A, B, and C. The program must store the elements of each matrix in three 2D array of doubles. After the matrices are entered the program must add matrix A and matrix B and store the result in a temporary matrix called Temp. The program must then multiply Temp with the matrix C, assign the result to the matrix Result, and print the resulting matrix. In other words, the program must calculate the following:

$$Result = (A + B)C$$

Example: Suppose that the user entered the following values for the three matrices.

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$$

In that case the final result will be

$$Temp = A + B = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix} + \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix} = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix}$$

$$Result = Temp\ C = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 20 & 15 & 16 \\ 26 & 20 & 22 \\ 32 & 25 & 28 \end{bmatrix}$$

3. *** For Advanced (or Bored) Students Only!**

[**Matrix Class**] (This is similar to the above programming project but uses objects).

Write a class called Matrix33 which implements the functionality for a 3x3 matrix. The class should provide methods for setting and getting the matrix entries. It should also provide methods for printing a matrix, adding two matrices, and multiplying two matrices (using the matrix multiplication rules). Write a driver program MatrixTester which reads three matrices A, B, and C from the keyboard. As in the previous project, the program must then calculate

$$Result = (A + B)C$$

4. **What to Submit**

   ONLINE ELECTRONIC SUBMISSION ONLY USING WebCT!!!

   PLEASE, DO NOT SUBMIT PRINTOUTS.

   For part 1 submit a text file with your answers.

   DEADLINE: Friday, October 20, (before the start of class).

   IMPORTANT: Once again, no late homeworks will be accepted.

   That's it. Good Luck!