CPSC 1150 – Program Design

Assignment #2

Total Marks: 52 marks (2 marks is bonus marks)

Goals

This assignment gives students more experience on:

- Problem Solving
- Writing Algorithms, using flowchart or pseudocode
- Testing Algorithms
- Writing Java programs

Exercises

1. **Counting ones : [20 marks]** We would like to have a program to count the number of ones in the binary representation of a given integer by user. The program must take an integer (in base ten) between 0 and 99 from the user. (Do not worry about dealing with non-number inputs.) The program must display the number of '1's in the binary representation of the number entered by the user.
   For example, if the input is 14, the number of 1's is 3 since the binary representation of 14 is 1110.

   A. **[10 marks]** Let us create the blueprint. Answer the following questions:
   Input: What are the inputs? (name, type, source), Do we need any user input? If so, what should we prompt for?
   Output: What information are the outputs? (name, type, source)
   Calculations: What kinds of calculations might we need to do? Should we look up relevant formulas? What operators will we need to use?
   Variables: What variables will we need? What types should they be?
   Constants: Do we need any constants? If so, what type(s)?

   B. **[6 marks]** Design an algorithm for the above program and represent it by a flowchart.
   C. **[4 marks]** Test your algorithm with different numbers such as -5, 14, 100, 0.

   To submit your answers for this question, use a file named **answers.pdf.**

2. **Palindrome numbers: [12 marks]** A number is palindrome if it reads the same from right to left and from left to right. For example, 121 is a palindrome but 443 is not. We would like to have program that generates a 3-digits random integer number and determines whether it is a palindrome number.
   A. **[5 marks]** Design an algorithm to solve the problem, use pseudocode to represent your algorithm? (**answers.pdf**)
   B. **[2 marks]** Test your algorithm with 2 random number where one is palindrome and the other one is not. (**answers.pdf**)

C. **[5 marks]** Write a java program for your algorithm named **Palindrome.java**. Here are 2 sample runs of this program:

```
121 is a palindrome.
```

```
443 is not a palindrome.
```

3. **Card Game: [10 marks]** Write a java program named **CardGame.java** that simulates picking a card from a deck of 52 cards. Your program should display the rank (Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King) and suit (Clubs, Diamonds, Hearts, Spades) of the card. Here is a sample run of the program:

```
The card has been picked is Jack of Hearts.
```

Hint: your program needs to generate a random number between 1 to 52 and decides about the rank and suit of card based on the value of random number. You can also use two switch statements.

4. **Guessing Game:[10 marks]** Write a java program names **GuessingGame.java** that generates a random integer number between 1 and 10. Then it prompts user to enter a guess ("What is your guess?"). First it verifies if the guess is between 1 and 10, If it isn't then prints a message "Well, if you're not going to "try", I'm not playing". Otherwise, it checks whether user has guessed the number correctly. If so, it prints "Hurray. You win!". Otherwise, it displays the random number, and then it determines if the number was close. Close means within three numbers before and after random number. It then prints the message "You missed it by the miles" Or "It was close" depends on the result. Finally, the program wishes the user good luck by "Better luck next time."
Here is the sample run:

```
What is your guess? 2
The number was 10.
You missed it by the miles
Better luck next time
```

Note: You are not supposed to handle non-integer guesses.

Grading

The programming questions are marked based on correctness, style of program and documentations. Add the external documentations in **answers.pdf**.

Submission

Submit a zip file named **Firstname-Surname-StudentId.zip** including **Palindrome.java, CardGame.java, GuessingGame.java** and **answers.pdf** on Brightspace.