CS101- Algorithms and Programming I

Lab 05

Lab Objectives: static methods.

IMPORTANT:

- For all labs in CS 101, your solutions must conform to the CS101 style guidelines (rules!).
- You should not use break statements in your solution.
- Before implementing your programs, you should analyse the problem and plan and write the algorithm you will use to solve the problem.
- You may not use data structures such as ArrayLists and arrays in your solution. Only use tools discussed in CS101 to date.

1. Write a Java program, Lab05_Q1, that includes the following method and functionality:
   a. Write a method, `persistence`, that accepts a positive int parameter, `num`, and returns its multiplicative persistence, which is the number of times you must multiply the digits in `num` until you reach a single digit.

      Here are some examples:
      `persistence(93)  => 3` because 9*3 = 27, 2*7 = 14, 1*4=4 and 4 has only one digit.
      `persistence(999) => 4` because 9*9*9 = 729, 7*2*9 = 126, 1*2*6 = 12, and 1*2 = 2.
      `persistence(4)  => 0` because 4 is already a one-digit number.

   b. Implement the main method and test your function according to the sample runs shown below.

Sample Run 1:	**Sample Run 2:**
Enter a positive integer: -231 Enter a positive integer: abc Enter a positive integer: 0 Enter a positive integer: 345 multiplicative persistence of 345 is 2	Enter an int: **2677889** multiplicative persistence of 2677889 is 8

2. Write a program, Lab05_Q2.py, that converts a given string using the key given below.

   Copy the line below in your program and use it as a global variable. Declare it as static inside the class, but outside of all methods.

   static final String KEY = "a@bpdqi!l1mwnuo0s5t+z2A4B8E3G6WM"

   a. Write a method, `convertChar`, which takes a character as a parameter and returns the converted version using the key. The black characters are converted to the following red characters. For instance, if the character 'a' is passed as a parameter, the function returns the '@' character, for 'b', it will return 'p'. Note: the character 'p' WILL NOT be converted to the character 'd'. If the character is not found in the key it should be returned without conversion.

   b. Write a method, `convertText`, which takes a string as a parameter and, using the `convertChar` function, converts the given string. For instance, 'Trials' should be converted to 'Tr!@15' as the return value.

   c. Write a method, `countNumbers`, which takes a string as a parameter and returns the count of numeric characters in it. E.g. For the text 'Tr!@15', it should return 2.

   d. Your program should display appropriate messages as shown in the sample runs below.

Sample Run 1: *(User inputs are in red)*	Enter a phrase for conversion: **Funniest Game** Text you entered: 'Funniest Game' After conversion: **'Fuuu!e5+ 6@we'**
Sample Run 2: *(User inputs are in red)*	Enter a phrase for conversion: **barbeque party** Text you entered: 'barbeque party' After conversion: **'p@rpeque p@r+y'** **!! Attention !! There is no number in this text**
Sample Run 3:	Enter a phrase for conversion: **published quote** Text you entered: 'published quote' After conversion: **'pup1!5heq qu0+e'**
Sample Run 4:	Enter a phrase for conversion: **R2D2 & C3PO** Text you entered: 'R2D2 & C3PO' After conversion: **'R2D2 & C3PO'** **No conversion happened.**
Sample Run 5:	Enter a phrase for conversion: **No phrase entered.**

3. Write a program, Lab05_Q3, that uses your solution from Lab 4, and organizes the code into methods. Most of the functionality is already in your solution from Lab 4, you just need to organize it into the methods below and implement the application.

   Your program should include the following methods:

   - `displayMenu()`: displays the menu shown in the sample run.
   - `getChoice()`: inputs and returns the integer menu choice.
   - `sameBirthday()`: takes an int group size as a parameter and returns the probability of a same birthday in a group with the given size.
   - `findMax()`: takes an integer as a parameter and returns the maximum digit in the integer.
   - `displayChart()`: takes a String chartData as a parameter, and displays the chart using the parameter data.
   - `isValidNumeric()`: takes a String as a parameter and returns true if all characters are numeric, false if not.
   - `countLetter()`: takes a string and an int index as parameters, and counts and returns the number of times the character at the given index appears in the string.
   - `convertWord()`: takes a string word as a parameter and converts the word according to the logic shown in menu choice 3 (question 3 from lab 4).

Sample Run:

```
1 - Find Probability of Same Birthday
2 - Draw Chart
3 - Convert Word
4 - QUIT
Enter choice: 1
Enter the group size: 50
The probability of two people in a group of 50 having the same birthday
is 1.00

1 - Find Probability of Same Birthday
2 - Draw Chart
3 - Convert Word
4 - QUIT
Enter choice: 2
Enter chart data: 43927
   review 1  review 2  review 3 review 4  review 5
                         ***
                         ***
                         ***                 ***
                         ***                 ***
                         ***                 ***
       ***               ***                 ***
       ***       ***     ***                 ***
       ***       ***     ***       ***       ***
       ***       ***     ***       ***       ***
```

```
1 - Find Probability of Same Birthday
2 - Draw Chart
3 - Convert Word
4 - QUIT
Enter choice: 3
Enter word to convert: sunshine
Original word: sunshine Converted word: )())(()(

1 - Find Probability of Same Birthday
2 - Draw Chart
3 - Convert Word
4 - QUIT
Enter choice: 5
Invalid choice

1 - Find Probability of Same Birthday
2 - Draw Chart
3 - Convert Word
4 - QUIT
Enter choice: 4
GOODBYE!
```