Workshop 2 (Week 3) - White Box Testing

The purpose of this workshop is to practice and develop an understanding of White Box testing.

1. Concepts

I. How many branches are there in an if statement?

II. What does a loop look like in a Control Flow Graph?

III. Explain statement coverage, branch coverage, and path coverage.

2. The Compute Median Example

Consider the following function that computes the Median value among three inputs:

1) Design test cases to achieve 100% statement, branch, and path coverage.
2) Any bug in this program?

Note: The branch coverage here means the Brach Decision Coverage, i.e., considering the entire expression in an IF statement as a whole).

```
public static int median(int x, int y, int z){
      int median = 0;
      if(x >= y && x <= z){
         median = x;
      } else if(x >= z && x <= y){
         median = x;
      } else if(y >=x && y < z){
         median = z;
      } else if(y >= z && y <= x){
         median = y;
      } else {
         median = z;
      }
      return median;
   }
}
```

3. Password Tester

Based on the source code file PassworTester.java (see Appendix A), answer the following questions:

I. Draw a Control Flow Diagram for the method PasswordTester.isStrong(String).

II. How many branches are there?

III. How many paths are there? Are they all feasible paths?

IV. How many test inputs are needed to cover all statements?

V. How many test inputs are needed to cover all branches?

4. jUnit Exercise

Implement the test cases for Question 3) in jUnit and execute the test cases

If jUnit is not installed at your computer, install it from: https://junit.org/. You can also refer to a tutorial at: Prepare for testing—IntelliJ IDEA (https://www.jetbrains.com/help/idea/testing.html).

Appendix A: PasswordTester.Java

```
import java.util.regex.Pattern;
public class PasswordTester {
   public static boolean isStrong(String password) {
      boolean isStrong = true;
      if(password.length() < 8) {
         System.out.println("Notice: Your password has less than 8 characters.");
         isStrong = false;
      }
      if(!Pattern.compile("[a-z]").matcher(password).find()) {
         System.out.println("Notice: Your password does not contain a lower case letter.");
         isStrong = false;
      }
      if(!Pattern.compile("[A-Z]").matcher(password).find()) {
         System.out.println("Notice: Your password does not contain an upper case letter.");
         isStrong = false;
      }
      if(!Pattern.compile("[0-9]").matcher(password).find()) {
         System.out.println("Notice: Your password does not contain a number.");
         isStrong = false;
      }
      if(!Pattern.compile("[!@#\\$%\\^&\\*\\(\\)]").matcher(password).find()) {
         System.out.println("Notice: Your password does not contain a special.");
         isStrong = false;
      }
      if(isStrong) {
         System.out.println("Result: Strong password.");
      } else {
         System.out.println("Result: Weak Password.");
      }
      return isStrong;
   }
}
```