CSC 220 – Lab 8

Objective
Complete several small programs in Java based on examples in class. In this lab, you will play with the class design, toString() method, and String.

Java programs:

- **StopWatch:** One of the hallmarks of object-oriented programming is the idea of easily modeling real-world objects by creating abstract programming objects. As a simple example, consider StopWatch, which implements the following functions. After you create one object, you can use method start() to start the watch, then you can use method stop() to stop the watch. You can use method getElapsedTimeSecs() to calculate how many seconds elapsed. You also can use method getElapsedTime() to calculate how many milliseconds elapsed.

The code is listed in the following:

```java
public class StopWatch {

    private long startTime = 0;
    private long stopTime = 0;
    private boolean running = false;


    public void start() {
        this.startTime = System.currentTimeMillis();
        this.running = true;
    }


    public void stop() {
        this.stopTime = System.currentTimeMillis();
        this.running = false;
    }


    //elaspsed time in milliseconds
    public long getElapsedTime() {
        long elapsed;
        if (running) {
            elapsed = (System.currentTimeMillis() - startTime);
        }
        else {
            elapsed = (stopTime - startTime);
        }
        return elapsed;
    }
```

```java
    //elaspsed time in seconds
    public long getElapsedTimeSecs() {
        long elapsed;
        if (running) {
            elapsed = ((System.currentTimeMillis() - startTime) / 1000);
        }
        else {
            elapsed = ((stopTime - startTime) / 1000);
        }
        return elapsed;
    }
    //sample usage
    public static void main(String[] args) {
        StopWatch s = new StopWatch();

        s.start();
        double z =0.0;
        //use scanner to get an string from keyboard

        s.stop();
        System.out.println("elapsed    time    in    milliseconds:"    +
s.getElapsedTime());
    }
}
```

Add two functions to this sample code:

1. First, please add several statements inside main() method to read one string from keyboard. Then type string "abc". This program will return how many milliseconds you spend on typing.

    $ java StopWatch
    abc
    elapsed time in milliseconds: 2399

2. Second, add method toString() to the StopWatch class. This method result a string, which contains the elapsed time in millisecond. In addition to that, replace the following statement in main method
    ```java
    System.out.println("elapsed    time    in    milliseconds:    "    +
    s.getElapsedTime());
    ```

    With
    ```java
    System.out.println("elapsed time in milliseconds: " + s);
    ```

    Whenever we refer to an object, JAVA will execute the toString method automatically. In this case, object s will be replaced by the method toString(). If we run this program, we will have
    $ java StopWatch
    abc

elapsed time in milliseconds: 1018

Compiling and running Java programs (reminder):
1. Compile your program using the command `javac filename`
   For example: `java myProgram.java`
   If you receive errors during the compilation phase, re-edit the source code file and attempt to correct them.

2. Once a file successfully compiles, execute it using the `java` program.
   For example: `java MyProgram`

What to turn in:
JAR your `*.java` files into a file called `Lab8.jar`. When you're done, submit the file to Canvas by the deadline. No extensions.