Introduction to Programming - Lab Exercises for Week 07

1. You have already seen methods to convert temperatures from Fahrenheit to Celsius and vice versa. Write a program which calls a method to display a menu which asks the user which conversion they would like to do and then calls the relevant method.

```
public static double FtoC(double F) {
        return (F-32) * 5 / 9;
}

public static double CtoF(double C) {
        return (32 + (9 * C / 5));
}
```

   Your **main** method should have a call to the **menu** method.

```
public static void main(String[] args ) {
        menu();
} //
```

2. Extend your program to include two more methods, each of which return an array of double which holds a set of converted temperatures:

```
public static double[] convertedFtoC() {
        double[] tempCelsius = new double[11];

        // In this part fill the array so that
        //   tempCelsius[0] is the Celsius for 0 degrees Fahrenheit
        //   tempCelsius[1] is the Celsius for 10 degrees Fahrenheit
        //   tempCelsius[2] is the Celsius for 20 degrees Fahrenheit
        //   …
        //   tempCelsius[10] is the Celsius for 100 degrees Fahrenheit

        return tempCelsius;
}

public static double[] convertedCtoF() {
        double[] tempFahrenheit = new double[11];

        // In this part fill the array so that
        //   tempFahrenheit[0] is the Fahrenheit for 0 degrees Celsius
        //   tempFahrenheit[1] is the Fahrenheit for 10 degrees Celsius
        //   tempFahrenheit[2] is the Fahrenheit for 20 degrees Celsius
        //   …
        //   tempFahrenheit[10] is the Fahrenheit for 100 degrees Celsius

        return tempFahrenheit;
}
```

Amend your program to add to the menu an option to display a table of Celsius to Fahrenheit conversions and an option to display a table of Fahrenheit to Celsius conversions and have the menu call these methods to obtain the converted temperatures to display.

You can use this method to format and display the table. It uses TextIO.putf() to format the output for each row of the table:

```
public static void displayTable(double[] table, String header1, String header2) {
        TextIO.put(header1, 15);  // display header for column 1 in 15 character field
        TextIO.putln(header2, 15); // display header for column 2 in 15 character field
        for (int i=0; i < table.length; i++) {
                TextIO.putf("%15d %13.2f %n", i*10, table[i]);
                // The first parameter is a format string. The first % instruction
                // applies to the first argument after the string, the second to the
                // second etc.
                // %15d – display an integer right justified in 15 character field
                // %15.2f – display a floating point number with 2 places after the
                //              point right justified in 15 character field
                // %n – output a newline
        }
        TextIO.putln();
}
```

The menu can call this method, for example, like this:

```
displayTable(convertedCtoF(), "Celsius", "Fahrenheit");
```

3. Write and test a program which uses methods to calculate the area of a circle and the area of a rectangle. There should also be a menu method which allows the user to select which shape to calculate the area for, and enter the appropriate parameters (radius **or** length and breadth)

```
areaCircle = Math.PI * radius * radius;
areaRectangle = length * breadth;
```

4. In the lab for week 6 you produced a simple calculator program. Update this program to use methods to carry out the calculator functions and display the result.

5. How many times do you have to roll a pair of dice before they come up snake eyes? You could do the experiment by rolling the dice by hand. Write a computer program that simulates the experiment. The program should report the number of rolls that it makes before the dice come up snake eyes. (Note: “Snake eyes” means that both dice show a value of 1.) The lab exercises for Week02 explained how to simulate rolling a pair of dice.