Object Oriented Programming: Java

Programming Assignment – Week 2

All solution files [Exercises 1 – 5] must be submitted in Moodle (Link at Weekly Assignments tab) for grading on or before 24th of January 2022 at 11:59 PM

Exercise 1

Write a program that asks a user to input a number between **100 and 999** (3 digits- int only) and adds all the digits in the integer. For example: if the user input is 149, then the sum of all its digits is 14. The sample run is here: You must use % and / operators to attain the solution.

```
<terminated> Exercise1_W2 [Java Application] C:\Program
Enter a number between 100 and 999:456
15
```

Exercise 2

Write a program that calculates the energy needed to heat water from an initial temperature to a final temperature. Your program should prompt the user to enter the amount of water in kilograms, the initial, and final temperatures of the water. The formula to compute the energy is:

Q = M * (final temperature – initial temperature) * 4184

where M is the weight of water in kilograms, temperatures are in Celsius degrees, and energy Q is measured in joules. Here is a sample run:

Enter the amount of water in kilograms:55.5
Enter the initial temperature:3.5
Enter the final temperature:10.5
The energy needed is 1625484.0

Exercise 3

Static methods are type of methods that can be called in *main()* method which is also a static in Java without creating an object of a class. These methods can be void (that does not return any value) or return a value but data type of the method must be defined in the declaration. Check the example given below.

method's return value is double: function

```
3  public class samplew2 {
4      public static double PoundstoKg(double p) {
5          double kg = p*0.454;
6          return kg;
7      }
8      public static void main(String[] args) {
9          Scanner sc = new Scanner(System.in);
10         System.out.println("Enter pounds: ");
11         double p = sc.nextDouble();
12          System.out.println("Kilograms: "+PoundstoKg(p));
13     }
14 }
15
16
```

```
Console  Problems  Debug Shell
<terminated> samplew2 [Java Application] C:\Program Files\Java\jdk-17.0.1\bin\javaw
Enter pounds:
120
Kilograms: 54.480000000000004
```

Write code that contains two public static methods namely;

(i) ***areaOfSquare(int a)*** that takes side of square as an argument and prints area of the square (procedure).

$$area = a^2$$

(ii) ***volOfSphere()*** that prompts the user to enter radius of sphere and *return its' volume*.

$$V = \frac{4}{3}\pi r^3$$

Here, ∏ value must be defined as static constant (PI =3.14) in the class and used at ***volOfSphere()*** method. Similarly, instance of *Scanner* class must be defined as static in the class (not in the *main()* method).

The **main()** method prompts the user to enter side of square as input and call aforenoted methods for execution. The sample run is here.

```
Enter side of Square:
5
area of Square:25
Enter radius:
5,5
Volume of Sphere:696.5566666666666
```

Exercise 4

The IF statement is a decision making/selection statement that direct code to execute block of decisions/statements based on specific condition/criteria. The if-else structure is:

```
if (booleanExpression) {
 statement(s);
}
```

```
if (radius >= 0) {
  area = radius * radius * PI;
  System.out.println("The area"
    + " for the circle of radius "
    + radius + " is " + area);
}
```

```
if (booleanExpression) {
  statement(s)-for-the-true-case;
}
else {
  statement(s)-for-the-false-case;
}
```

```
if (radius >= 0) {
  area = radius * radius * 3.14159;

  System.out.println("The area for the "
    + "circle of radius " + radius +
    " is " + area);
}
else {
  System.out.println("Negative input");
}
```

Write a program that execute the following based on user input (**char** data type).

If the user input is **'a'** then:

Prompt the user to enter miles as input and display it in converted meters.

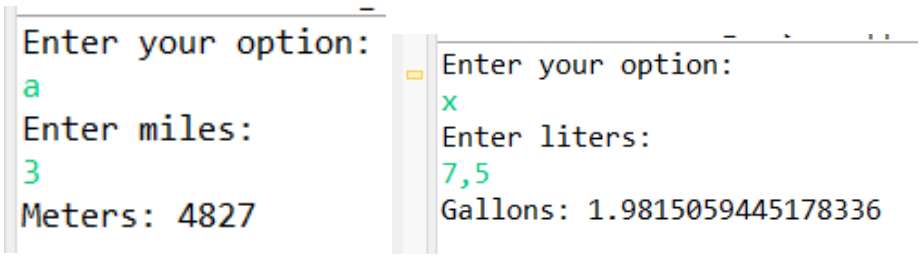
Any other character:

Prompt the user to enter liters as input and print its equivalent gallon(s).

Use the constants 1 mile = 1609 meters (MILE) and 1 gallon = 3.785 liters (GALLON).

That is, MILE and GALLON must be defined as constant values like we did for ∏ (Refer lecture slides)

The sample run is here:



Exercise 5 (No multiple submission)

Draw a UML diagram for ATM machine as part of OOP paradigm which represents a real-world object. Your UML diagram must contain ATM's valid data fields and associated methods. You are allowed to make any reasonable assumptions. However, you are required to justify them by providing self-report entered below UML diagram. Submit your work as **.pdf** file in the Moodle for manual evaluation.
[Hint: Refer video → "How to draw UML diagrams" at lecture tab in Moodle]

Exercise / task Number	File name that should be uploaded in the CodeGrade-Moodle*	Points / Marks
1	Exercise1.java → Exercise1_Week2 link	10
2	Exercise2.java→ Exercise2_Week2 link	20
3	Exercise3.java→ Exercise3_Week2 link	30
4	Exercise4.java → Exercise4_Week2 link	20
5	Exercise5.pdf → Exercise5_Week2 link/Moodle	20
* You are free to define own filenames (class) for each exercise		