Lab 6: OOP Who can do this?

Sol Ben-Ishay

Question 1. You want to provide simple mathematical operations for a beginner. Write a class called **SimpleMath** that will have **static methods** for the following operations:

a. Create a package called **lab6**
b. Create your class **SimpleMath** under the package **lab6**
c. Implement an *average* method where you have a parameter n. Read *n* floating point numbers and return the average of them.
d. Implement another *average* method where you have 3 floating point numbers as the parameters and returns the average of these numbers.
e. Implement a *max* method where you have a parameter n. Read *n* floating point numbers and return the maximum of them.
f. Implement another *max* method where you have 3 floating point numbers as the parameters and returns the maximum of these numbers.
g. Implement a *min* method where you have a parameter n. Read *n* floating point numbers and return the minimum of them.
h. Implement another *min* method where you have 3 floating point numbers as the parameters and returns the minimum of these numbers.
i. In the *main* demonstrate how your methods run.
j. Create another class **SimpleMathDemo** under the package **lab6.** In the *main* demonstrate how your methods run.

Input:

SimpleMath.java

```
package lab6;

import java.util.Scanner;

public class SimpleMath {

    /* Implement an average method where you have a parameter n. Read n
floating point numbers
    and return the average of them.
     */
    public static float average_n(int n) {
        int i;
        float sum = 0;
        Scanner scnr = new Scanner(System.in);
        System.out.println("Enter the first number: ");
        float first_num = scnr.nextFloat();
        sum = sum + first_num;
        for (i=1;i<n;i++) {
            System.out.println("Enter the next number: ");
```

```
            float number = scnr.nextFloat();
            sum = sum + number;
        }
        return (sum/n);
    }

    /*Implement another average method where you have 3 floating
point numbers as the
    parameters and returns the average of these numbers.
     */
    public static float average_three(float a, float b, float c)
{
        float average = (a+b+c)/3;
        return average;
    }

    /*Implement a max method where you have a parameter n. Read
n floating point numbers and return
    the maximum of them.
     */
    public static float max_n(int n) {
        int i;
        Scanner scnr = new Scanner(System.in);
        System.out.println("Enter the first number: ");
        float max = scnr.nextFloat();
        for (i=1;i<n;i++) {
            System.out.println("Enter the next number: ");
            float number = scnr.nextFloat();
            if (number > max) {
                max = number;
            }
        }
        return max;
    }

    /*Implement another max method where you have 3 floating
point numbers as the parameters and
    returns the maximum of these numbers.
     */
    public static float max_three(float a, float b, float c) {
        if ((a>b) && (a>c)) {
            return a;
        }
        else if ((b>a) && (b>c)) {
            return b;
        }
        else {
            return c;
```

```
        }
    }

    /*Implement a min method where you have a parameter n. Read
n floating point numbers and return
    the minimum of them.
     */
    public static float min_n(int n) {
        int i;
        Scanner scnr = new Scanner(System.in);
        System.out.println("Enter the first number: ");
        float min = scnr.nextFloat();
        for (i=1;i<n;i++) {
            System.out.println("Enter the next number: ");
            float number = scnr.nextFloat();
            if (number < min) {
                min = number;
            }
        }
        return min;
    }

    /*Implement another min method where you have 3 floating
point numbers as the parameters and
    returns the minimum of these numbers.
     */
    public static float min_three(float d, float e, float f) {
        int i;
        if ((d<e) && (d<f)) {
            return d;
        }
        else if ((e<d) && (e<f)) {
            return e;
        }
        else {
            return f;
        }
    }

    public static void main(String[] args) {
        average_n(5);
        average_three(3,6,4);
        max_n(4);
        max_three(4,10,20);
        min_n(3);
        min_three(20,22,5);
    }
```

```
}
```

Output:

IN SCREENSHOT ON PAGE BELOW, NO OTHER WAY TO PUT OUTPUT NICELY IN WORD DOCUMENT.

File - SimpleMathDemo

```
/Library/Java/JavaVirtualMachines/jdk-15.0.2.jdk/
Contents/Home/bin/java -javaagent:/Users/
solbenishay/Desktop/IntelliJ IDEA CE.app/Contents/
lib/idea_rt.jar=56041:/Users/solbenishay/Desktop/
IntelliJ IDEA CE.app/Contents/bin -Dfile.encoding=
UTF-8 -classpath /Users/solbenishay/Desktop/Lab 6/
out/production/Lab 6:/usr/local/Cellar/python@3.9/3
.9.2_4/Frameworks/Python.framework/Versions/3.9/lib
/python3.9:/usr/local/Cellar/python@3.9/3.9.2_4/
Frameworks/Python.framework/Versions/3.9/lib/
python3.9/lib-dynload:/Users/solbenishay/Library/
Python/3.9/lib/python/site-packages:/usr/local/lib/
python3.9/site-packages:/Users/solbenishay/Library/
Caches/JetBrains/IdeaIC2020.3/python_stubs/-
1199943124:/Users/solbenishay/Library/Application
Support/JetBrains/IdeaIC2020.3/plugins/python-ce/
helpers/python-skeletons:/Users/solbenishay/Library
/Application Support/JetBrains/IdeaIC2020.3/plugins
/python-ce/helpers/typeshed/stdlib/3.9:/Users/
solbenishay/Library/Application Support/JetBrains/
IdeaIC2020.3/plugins/python-ce/helpers/typeshed/
stdlib/3.7:/Users/solbenishay/Library/Application
Support/JetBrains/IdeaIC2020.3/plugins/python-ce/
helpers/typeshed/stdlib/3:/Users/solbenishay/
Library/Application Support/JetBrains/IdeaIC2020.3/
plugins/python-ce/helpers/typeshed/stdlib/2and3:/
Users/solbenishay/Library/Application Support/
JetBrains/IdeaIC2020.3/plugins/python-ce/helpers/
typeshed/third_party/3:/Users/solbenishay/Library/
Application Support/JetBrains/IdeaIC2020.3/plugins/
python-ce/helpers/typeshed/third_party/2and3 lab6.
SimpleMathDemo
Enter the first number:
3
Enter the next number:
4
Enter the next number:
6
Enter the next number:
9
Enter the next number:
10
6.4
4.3333335
```


File - SimpleMathDemo

```
Enter the first number:
2
Enter the next number:
8
Enter the next number:
12
Enter the next number:
20
20.0
20.0
Enter the first number:
22
Enter the next number:
23
Enter the next number:
25
22.0
5.0

Process finished with exit code 0

```

Question 2. You want to design a program for geometric shapes. Let's start with a simple one, Rectangle. Later we can add others. The rectangles are typically represented by the *length* and *width*. If the length and width are equal, we can name this rectangle as a *square*. Anyone dealing with the rectangles may want to calculate the *area* and *perimeter*. Write a class for the rectangles as follows: a. Create your class **Rectangle** under the package **lab6**
b. Declare two *private* instance variables, namely *length* and *width.*
c. Implement 2 constructors: One has no parameter, and one has 2 parameters.
d. Implement setters/getters(mutators/accessors)
e. Implement a method for calculating the *area* of the rectangle as length x width and return.
f. Implement a method for calculating the *perimeter* of the rectangle as 2 x (length + width) and return.
g. Implement a method for determining the squares. The name of the method will be *isSquare* and it will return true if the *length=width*.
h. In the *main* create instances of *Rectangle* class and demonstrate how your methods run.
i. Create another class **RectangleDemo** under the package **lab6.** In the *main* demonstrate how your methods run.

Input:

Rectangle.java

```java
package lab6;

public class Rectangle {

    private float height;
    private float width;

    // Constructor w/o parameters
    //public Rectangle() {
    //    this.height = height;
    //    this.width = width;
    //}

    //Constructor w/ parameters
    public Rectangle(float height, float width) {
        this.height = height;
        this.width = width;
    }
```

```
    //Mutator for height
    public float setHeight(float height) {
        return this.height=height;
    }

    //Mutator for weight
    public float setWidth(float width) {
        return this.width=width;
    }

    //Accessor for height
    public float getHeight() {
        return height;
    }

    //Accessor for weight
    public float getWidth() {
        return width;
    }

    //Method for calculating area
    public float calcArea() {
        return (height * width);
    }

    //Method for calculating perimeter
    public float calcPerimeter() {
        return (2 * (height * width));
    }

    //Method for determining if square
    public String isSquare() {
        if (height==width) {
            return "Square";
        }
        else {
            return "Rectangle";
        }
    }

    public static void main(String[] args) {
        //Test 1
        Rectangle rec1 = new Rectangle(3,4);
        System.out.println("Results for Rectangle 1:");
        System.out.println("Height: " + rec1.getHeight());
        System.out.println("Width: " + rec1.getWidth());
```

```
        System.out.println("Area: " + rec1.calcArea());
        System.out.println("Perimeter: " +
rec1.calcPerimeter());
        System.out.println("");
        //Test 2
        Rectangle rec2 = new Rectangle(10,10);
        System.out.println("Current dimensions are " +
rec2.getHeight() + " tall and " + rec2.getWidth() + " in width."
);
        System.out.println("Setting new height...");
        rec2.setHeight(20);
        System.out.println("New height is " + rec2.getHeight());
        System.out.println("Setting new width...");
        rec2.setWidth(20);
        System.out.println("New width is " + rec2.getWidth());
        System.out.println("This shape is a " +
rec2.isSquare());
    }

}
```

Output:

IN SCREENSHOT ON PAGE BELOW, NO OTHER WAY TO PUT OUTPUT NICELY IN WORD DOCUMENT.

File - RectangleDemo

```
 1 /Library/Java/JavaVirtualMachines/jdk-15.0.2.jdk/
   Contents/Home/bin/java -javaagent:/Users/
   solbenishay/Desktop/IntelliJ IDEA CE.app/Contents/
   lib/idea_rt.jar=56145:/Users/solbenishay/Desktop/
   IntelliJ IDEA CE.app/Contents/bin -Dfile.encoding=
   UTF-8 -classpath /Users/solbenishay/Desktop/Lab 6/
   out/production/Lab 6:/usr/local/Cellar/python@3.9/3
   .9.2_4/Frameworks/Python.framework/Versions/3.9/lib
   /python3.9:/usr/local/Cellar/python@3.9/3.9.2_4/
   Frameworks/Python.framework/Versions/3.9/lib/
   python3.9/lib-dynload:/Users/solbenishay/Library/
   Python/3.9/lib/python/site-packages:/usr/local/lib/
   python3.9/site-packages:/Users/solbenishay/Library/
   Caches/JetBrains/IdeaIC2020.3/python_stubs/-
   1199943124:/Users/solbenishay/Library/Application
   Support/JetBrains/IdeaIC2020.3/plugins/python-ce/
   helpers/python-skeletons:/Users/solbenishay/Library
   /Application Support/JetBrains/IdeaIC2020.3/plugins
   /python-ce/helpers/typeshed/stdlib/3.9:/Users/
   solbenishay/Library/Application Support/JetBrains/
   IdeaIC2020.3/plugins/python-ce/helpers/typeshed/
   stdlib/3.7:/Users/solbenishay/Library/Application
   Support/JetBrains/IdeaIC2020.3/plugins/python-ce/
   helpers/typeshed/stdlib/3:/Users/solbenishay/
   Library/Application Support/JetBrains/IdeaIC2020.3/
   plugins/python-ce/helpers/typeshed/stdlib/2and3:/
   Users/solbenishay/Library/Application Support/
   JetBrains/IdeaIC2020.3/plugins/python-ce/helpers/
   typeshed/third_party/3:/Users/solbenishay/Library/
   Application Support/JetBrains/IdeaIC2020.3/plugins/
   python-ce/helpers/typeshed/third_party/2and3 lab6.
   RectangleDemo
 2 Results for Rectangle 1:
 3 Height: 3.0
 4 Width: 4.0
 5 Area: 12.0
 6 Perimeter: 24.0
 7
 8 Current dimensions are 10.0 tall and 10.0 in width.
 9 Setting new height...
10 New height is 20.0
11 Setting new width...
12 New width is 20.0
13 This shape is a Square
```


File - RectangleDemo

```
14
15 Process finished with exit code 0
16
```