Homework 2 - Lab Algorithm and Data Structures

Ramzy Izza Wardhana - 21/472698/PA/20322

Problem 2.1 - Completing code Rectangle.java & TestRectange.java

1.) Insert the code to display the information of height, width, and area with the Rectangle object that was inferred by rect0 and rect1 variables.

Rectangle.java

```
public class Rectangle {
    double width;
    double height;
    double area; //added a new field
}
```

TestRectangle.java

```
public class TestRectangle {
    public static void main (String[] args){

        Rectangle rect0 = new Rectangle();
        rect0.width = Math.random();
        rect0.height = Math.random();

        Rectangle rect1 = new Rectangle();
        rect1.width = Math.random();
        rect1.height = Math.random();

        //Declare new variables (area) for each instances
        rect0.area = rect0.width * rect0.height;
        rect1.area = rect1.width * rect1.height;


        System.out.println("rect0");
        System.out.println("width: " + rect0.width);
        System.out.println("height: " + rect0.height);
        System.out.println("area: " + rect0.area);

        System.out.println("rect1");
        System.out.println("width: " + rect1.width);
        System.out.println("height: " + rect1.height);
        System.out.println("area: " + rect1.area);
    }
}
```

Output

```
rect0
width: 0.7520698926227369
height: 0.08016972432815128
area: 0.060293235967067156
rect1
width: 0.3244411802749353
height: 0.052353097824058614
area: 0.016985500849086725
```

```
PS C:\Users\themi\Downloads\java-prak-asd\second-meet>
onMessages' '-cp' 'C:\Users\themi\AppData\Roaming\Code\U
ond-meet_c35ad9e8\bin' 'TestRectangle'
rect0
width: 0.7520698926227369
height: 0.08016972432815128
area: 0.060293235967067156
rect1
width: 0.3244411802749353
height: 0.052353097824058614
area: 0.016985500849086725
PS C:\Users\themi\Downloads\java-prak-asd\second-meet>
```

2.) Rewrite the code from number 1 and implement array rects[] that can store two objects of Rectangle.

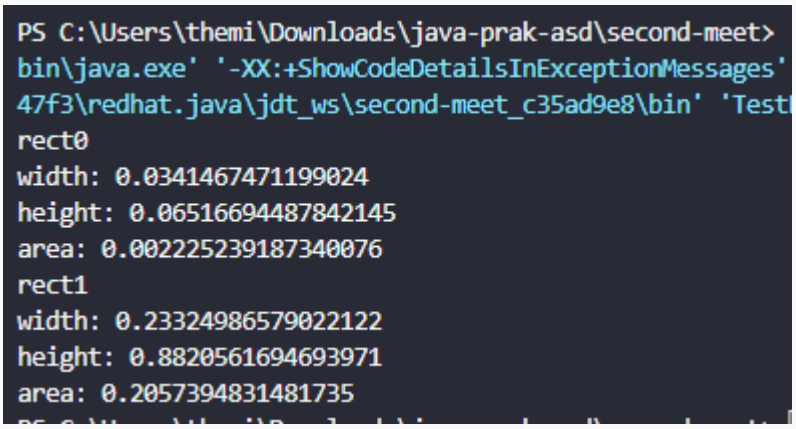
TestRectangle.java (Updated)

```
public class TestRectangle {
    public static void main (String[] args){

        Rectangle rect0 = new Rectangle();
        rect0.width = Math.random();
        rect0.height = Math.random();

        Rectangle rect1 = new Rectangle();
        rect1.width = Math.random();
        rect1.height = Math.random();

        //Questions Number 1 - Area
        rect0.area = rect0.width * rect0.height;
        rect1.area = rect1.width * rect1.height;

        // Questions Number 2 - Insert Array
        Rectangle[] rects = new Rectangle[2];
        rects[0] = rect0;
```

```
        rects[1] = rect1;

        for(int i = 0; i < 2; i++){
            System.out.println("rect" + i);
            System.out.println("width: " + rects[i].width);
            System.out.println("height: " + rects[i].height);
            System.out.println("area: " + rects[i].area);
        }
    }
}
```

Output

```
rect0
width: 0.0341467471199024
height: 0.06516694487842145
area: 0.002225239187340076
rect1
width: 0.23324986579022122
height: 0.8820561694693971
area: 0.2057394831481735
```



3.) Modify the code from number 2 so that the array is able to store 10 different objects of Rectangle inside the array. For all objects that were inferred by each array element, display its width, height, and area.

TestRectangle.java (Modified)

```
public class TestRectangle {
    public static void main (String[] args){
        Rectangle[] rects = new Rectangle[10];
        for(int i = 0; i < 10; i++){
```

```
            rects[i] = new Rectangle();
            rects[i].width = Math.random();
            rects[i].height = Math.random();
            rects[i].area = rects[i].width * rects[i].height;

            System.out.println("rect" + i);
            System.out.println("width: " + rects[i].width);
            System.out.println("height: " + rects[i].height);
            System.out.println("area: " + rects[i].area + '\n');
        }
    }
}
```

Output

```
rect0
width: 0.6234125431763891
height: 0.8499891269727999
area: 0.5298938833183919

rect1
width: 0.87201271343143
height: 0.49923921645278446
area: 0.43534294379037364

rect2
width: 0.5850083014122928
height: 0.6688022458041033
area: 0.3912548657985852

rect3
width: 0.7630338973793187
height: 0.836688938463161
area: 0.6384220216097106

rect4
width: 0.3615341249106586
height: 0.7591193334492168
area: 0.27444754392132503

rect5
width: 0.18303062734719777
height: 0.11767138518554832
area: 0.021537467451324663

rect6
width: 0.8934221106460871
height: 0.30873098280606626
area: 0.27582708628043656
```

```
rect7
width: 0.6154125105609964
height: 0.3726745874118218
area: 0.22934860346139277

rect8
width: 0.752788036166615
height: 0.7295001701622679
area: 0.5491590004796651

rect9
width: 0.34331123130747965
height: 0.7723001367397632
area: 0.265139310883063
```

```
rect0
width: 0.6234125431763891
height: 0.8499891269727999
area: 0.5298938833183919

rect1
width: 0.87201271343143
height: 0.49923921645278446
area: 0.43534294379037364

rect2
width: 0.5850083014122928
height: 0.6688022458041033
area: 0.3912548657985852

rect3
width: 0.7630338973793187
height: 0.836688938463161
area: 0.6384220216097106

rect4
width: 0.3615341249106586
height: 0.7591193334492168
area: 0.27444754392132503
```

```
rect5
width: 0.18303062734719777
height: 0.11767138518554832
area: 0.021537467451324663

rect6
width: 0.8934221106460871
height: 0.30873098280606626
area: 0.27582708628043656

rect7
width: 0.6154125105609964
height: 0.3726745874118218
area: 0.22934860346139277

rect8
width: 0.752788036166615
height: 0.7295001701622679
area: 0.5491590004796651

rect9
width: 0.34331123130747965
height: 0.7723001367397632
area: 0.265139310883063
```

4.) Modify the code from number 3 so that it displays the information of which is the largest and the smallest Rectangle.

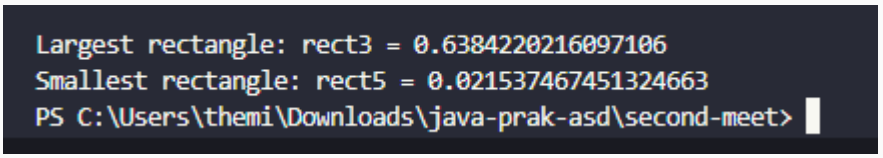
TestRectangle.java (Modified [2])

```
public class TestRectangle {
    public static void main (String[] args){
        Rectangle[] rects = new Rectangle[10];
        for(int i = 0; i < 10; i++){
            rects[i] = new Rectangle();
            rects[i].width = Math.random();
            rects[i].height = Math.random();
            rects[i].area = rects[i].width * rects[i].height;
        }

        //Find the maximum and minimum value and output it
        double max = rects[0].area;
        double min = rects[0].area;
        int indexMax = 0;
        int indexMin = 0;
        for (int i = 0; i < 10; i ++){
            if (rects[i].area < min){
                min = rects[i].area;
```

```
                indexMin = i;
            }
            if (rects[i].area > max){
                max = rects[i].area;
                indexMax = i;
            }
        }
        System.out.println("Largest rectangle: rect" + indexMax + " =
" + max);
        System.out.println("Smallest rectangle: rect" + indexMin + " =
" + min);

    }
}
```

Output

```
Largest rectangle: rect3 = 0.6384220216097106
Smallest rectangle: rect5 = 0.021537467451324663
```



Problem 2.2 - Create the java code according to the questions 1-5

Buku.java

```
public class Buku {
    String judul;
    String penulis;
    float harga;
}
```

TestBook.java

```
public class TestBook {
    public static void main(String[] args) {
        //Create instances inside array with size 3
        Buku[] book = new Buku[3];
        for(int i = 0; i < 3; i++){
            book[i] = new Buku();
        }
        //Input the information
        book[0].judul = "Introduction to Java Programming and Data
Structure";
        book[0].penulis = "Daniel Liang";
```

```
        book[0].harga = 355000;

        book[1].judul = "Advanced Java Programming";
        book[1].penulis = "Uttam Roy";
        book[1].harga = 236250;

        book[2].judul = "Practical Java Programming";
        book[2].penulis = "Perry Xiao";
        book[2].harga = 95000;

        System.out.println("\nPrice BEFORE Update:");
        for (int i = 0, j = 1; i < book.length; i++) {
            System.out.println("Book " + j + " Title: " +
book[i].judul);
            System.out.println("Book " + j + " Author: " +
book[i].penulis);
            System.out.println("Book " + j + " Price: Rp." +
book[i].harga);
            System.out.println();
            j++;
        }

        //Update the instance price to also include 10% tax
        for(int i = 0; i < book.length; i++){
            book[i].harga =  (float) (book[i].harga * 1.1);
        }

        System.out.println("\nPrice AFTER Update:");
        for (int i = 0, j = 1; i < book.length; i++) {
            System.out.println("Book " + j + " Title: " +
book[i].judul);
            System.out.println("Book " + j + " Author: " +
book[i].penulis);
            System.out.println("Book " + j + " Price: Rp." +
book[i].harga);
            System.out.println();
            j++;
        }
    }
}
```

Output

```
Price BEFORE Update:
Book 1 Title: Introduction to Java Programming and Data Structure
Book 1 Author: Daniel Liang
Book 1 Price: Rp.355000.0
```

```
Book 2 Title: Advanced Java Programming
Book 2 Author: Uttam Roy
Book 2 Price: Rp.236250.0

Book 3 Title: Practical Java Programming
Book 3 Author: Perry Xiao
Book 3 Price: Rp.95000.0

Price AFTER Update:
Book 1 Title: Introduction to Java Programming and Data Structure
Book 1 Author: Daniel Liang
Book 1 Price: Rp.390500.0

Book 2 Title: Advanced Java Programming
Book 2 Author: Uttam Roy
Book 2 Price: Rp.259875.0

Book 3 Title: Practical Java Programming
Book 3 Author: Perry Xiao
Book 3 Price: Rp.104500.0
```

```
Price BEFORE Update:
Book 1 Title: Introduction to Java Programming and Data Structure
Book 1 Author: Daniel Liang
Book 1 Price: Rp.355000.0

Book 2 Title: Advanced Java Programming
Book 2 Author: Uttam Roy
Book 2 Price: Rp.236250.0

Book 3 Title: Practical Java Programming
Book 3 Author: Perry Xiao
Book 3 Price: Rp.95000.0


Price AFTER Update:
Book 1 Title: Introduction to Java Programming and Data Structure
Book 1 Author: Daniel Liang
Book 1 Price: Rp.390500.0

Book 2 Title: Advanced Java Programming
Book 2 Author: Uttam Roy
Book 2 Price: Rp.259875.0

Book 3 Title: Practical Java Programming
Book 3 Author: Perry Xiao
Book 3 Price: Rp.104500.0
```

Problem 2.3 - Complete the java code snippets according to the given code base (Point.java, Line.java, and LineLength.java)

Point.java

```
public class Point {
    int x;
    int y;
}
```

Line.java

```
public class Line {
    Point p0;
    Point p1;
}
```

LineLength.java

```
public class LineLength{
    public static void main(String[] args) {
        Line line = new Line();
        line.p0 = new Point();
        line.p0.x = 5;
        line.p0.y = 4;
        line.p1 = new Point();
        line.p1.x = 13;
        line.p1.y = 9;

        double d;
        double x = (line.p0.x - line.p1.x) * (line.p0.x - line.p1.x);
        double y = (line.p0.y - line.p1.y) * (line.p0.y - line.p1.y);
        d = x + y;

        System.out.println("the length of the line is: " +
Math.sqrt(d));
    }
}
```

Output

```
the length of the line is: 9.433981132056603
```