Course: Principals of Software Development – ENSF 409
Lab 5
Instructor: M. Moshirpour
Student Name: Mitchell Sawatzky
Date Submitted: Feb 12, 2016

Exercise A

Geometry2.java

```java
// import java.util.Iterator;
// import java.util.TreeSet;
/*
 * started by: M. Moussavi
 * Date: Feb 2015
 * Modified by: Mitchell Sawatzky
 */
public class Geometry2{

        public static void main(String[] args) {
                Rectangle r1 = new Rectangle(3.0, 4.0, 5.0, 6.0, "R1", new Colour("Black"));
        Circle c1 = new Circle (13.0, 14.0, 15.0, "C1",new Colour ("Green"));
        System.out.println("\nHere are the original values in r1:");
        System.out.println(r1);
        System.out.println("\nHere are the original values in c1:");
        System.out.println(c1);

                Rectangle r2 = new Rectangle(23.0, 24.0, 25.0, 26.0, "R2", new Colour("Black"));
        Circle c2 = new Circle (33.0, 34.0, 35.0, "C2", new Colour("Yellow"));
        System.out.println("\nHere are the original values in r2:");
        System.out.println(r2);
        System.out.println("Here are the original values in c2:");
        System.out.println(c2);

                Prism p1 = new Prism(43.0, 44.0, 45.0, 46.0, 47.0, "P1", new Colour("White"));
        Prism p2 = new Prism (53.0, 54.0, 55.0, 56.0, 57.0, "P2", new Colour("Gray"));
        System.out.println("\nHere are the original values in p1:");
        System.out.println(p1);
        System.out.println("\nHere are the original values in p2:");
        System.out.println(p2);

// THE FOLLOWING CODE SEGMENT MUST BE UNCOMMENTED ONLY FOR EXERCISE A in Lab 5
// EXERCISE_A_BEGINS

        System.out.println("\n\nMaking r1 copy of r2, c1 copy of c2, p1 copy of p2:");
        try {
            r1 = (Rectangle)r2.clone();
            c1 = (Circle)c2.clone();
            p1 = (Prism)p2.clone();
        } catch (CloneNotSupportedException e) {
            System.out.println("Can't clone!");
        }

        r2.set_length(1000.0);
        r2.getOrigin().setx(88.0);
        r2.getOrigin().sety(99.0);
        r2.name.setText("");
        c2.set_radius(2000.00);
        c2.getOrigin().setx(188.0);
        c2.getOrigin().sety(199.0);
        c2.name.setText("");
        p2.set_height(3000.0);
        p2.getOrigin().setx(88.0);
        p2.getOrigin().sety(99.0);
        p2.name.setText("");

        System.out.println("\nHere are values for r1 after trying to make it a copy of r2:");
        System.out.println(r1);
        System.out.println("\nHere are values for c1 after trying to make it a copy of c2:");
        System.out.println(c1);
        System.out.println("\nHere are values for p1 after trying to make it a copy of p2:");
        System.out.println(p1);

// EXERCISE_A_ENDS



// THE FOLLOWING CODE SEGMENT MUST BE UNCOMMENTED ONLY FOR EXERCISE B in Lab 5
// EXERCISE_B_BEGINS
/*
        try{

          r1.enlarge(2.0);
          r1.name.enlarge(3.0);
          c1.shrink(2.0);
          p1.enlarge(0.5);
        } catch(SizeFactorException e){
        System.out.println(e.getMessage());

        }

        System.out.println("\nHere are values for r1 after calling enlarge(2.0):");
        System.out.println(r1);
        System.out.println("\nHere is the font size for r1.name after calling enlarge(3.0):");
        System.out.println(r1.name.getFontSize());
        System.out.println("\nHere are values for c1 after calling shrink (2.0):");
        System.out.println(c1);
        System.out.println("\nHere are values for p1 after calling shrink (0.5):");
        System.out.println(p1);

        try{
          p1.enlarge(0.5);
        } catch(SizeFactorException e){
        System.out.println(e.getMessage());

        }

        System.out.println("\nHere are values for p1 after calling shrink (0.5) -- UNCHANGED:");
        System.out.println(p1);
 */
// EXERCISE_B_ENDS

        }
}
```

Prism.java

```
class Prism extends Rectangle implements Cloneable {
        private Double height;

        public Prism(Double x, Double y, Double l, Double w, Double h, String  name, Colour colour)
        {
                super(x, y, l, w, name, colour);
                height = h;
        }

    public Object clone() throws CloneNotSupportedException {
        return super.clone();
    }

        public void  set_height(Double h)
        {
                height = h;
        }
        public Double  height()
        {
                return height;
        }

        public Double  area()
        {
                return  2 * (length * width) + 2 * (height * length) + 2 * (height * width);
        }

        public Double  perimeter()
        {
                return  width  * 2 + length * 2;
        }

        public Double  volume()
        {
                return  width  * length * height;
        }



        public String toString()
        {
                String s = super.toString()+ "\nheight: " + height;
                return s;
        }
}
```

Rectangle.java

```
/*
 * started by: M. Moussavi
 * Date: Feb 2015
 * Modified by: Mitchell Sawatzky
 */


class Rectangle extends Shape implements Cloneable
{
        protected Double width, length;


        public Rectangle(Double x_origin, Double y_origin, Double newlength, Double newwidth, String name, Colour colour){
                super(x_origin, y_origin, name, colour);
                length= newlength;
                width =newwidth;
        }

    public Object clone() throws CloneNotSupportedException {
        return super.clone();
    }

        protected void  set_length(Double newlength){
                length = newlength;
        }

        protected Double  get_length() {
                return length;
        }

        protected Double  area(){
                return  width *length;
        }

        protected Double  perimeter(){
                return  width  * 2 + length * 2;
        }

        protected Double  volume(){
                return 0.0;
        }

        @Override
        public String toString(){
                String s = super.toString()+ "\nWidth: " + width + "\nLength: " + length;
                return s;
        }

}
```

Shape.java

```
/*
 * started by: M. Moussavi
 * Date: Feb 2015
 * Modified by: Mitchell Sawatzky
 */
```

```
abstract class Shape implements Cloneable
{
        protected Point origin;
        protected Text name;
        abstract protected Double area();
        abstract protected Double perimeter();
        abstract protected Double volume();

        protected Shape(Double x_origin, Double y_origin, String name, Colour colour){

                origin = new Point(x_origin,y_origin, colour);
                this.name = new Text(name);
        }

        protected Point  getOrigin()
        {
                return origin;
        }

    public Object clone() throws CloneNotSupportedException {
        Shape obj = (Shape)super.clone();
        obj.origin = (Point)origin.clone();
        obj.name = (Text)name.clone();

        return obj;
    }

        protected  Double distance(   Shape  other)
        {
                return origin.distance(other.origin);
        }

        protected Double  distance(   Shape  a,    Shape  b)
        {
                return Point.distance(a.origin, b.origin);
        }


        protected void  move(Double dx, Double dy)
        {
                origin.setx(origin.getx()+dx);
                origin.sety(origin.gety()+dy);
        }

        @Override
        public String toString(){
                String s = "\nShape name: " + name + "\nOrigin: " + origin;
                return s;
        }

}
```

Text.java

```
/*
 * started by: M. Moussavi
 * Date: Feb 2015
 * Modified by: Mitchell Sawatzky
 */
class Text implements Cloneable
{

        private final Double DEFAULT_SIZE = 10.0;

    private Colour colour;
    private Double fontSize;

    private String text;


        public Text(String text) {
       this.text = text;
       fontSize = DEFAULT_SIZE;
        }

    public Object clone() throws CloneNotSupportedException {
        Text obj = (Text)super.clone();
        if (colour != null)
            obj.colour = (Colour)colour.clone();

        return obj;
    }

        public Double getFontSize(){
                return fontSize;
        }


        public void setColour(String s){
                colour = new Colour(s);
        }


        public void setText(String newText){
                text = newText;
        }


        public String getText(){
                return text ;
        }


        @Override
        public String toString(){
                return (text);
        }



}
```

Point.java

```
/*
 * started by: M. Moussavi
 * Date: Feb 2015
 * Modified by: Mitchell Sawatzky
 */

class Point implements Cloneable
{
        private Colour colour;
        private Double xCoordinate, yCoordinate;



        public Point(Double a, Double b, Colour c){
                colour = (c);
                xCoordinate = a;
                yCoordinate = b;
        }

    public Object clone() throws CloneNotSupportedException {
        Point obj = (Point)super.clone();
        obj.colour = (Colour)colour.clone();

        return obj;
    }

    @Override
        public String toString()   {
                String s;
                s = "X_coordinate: " + xCoordinate +  "\nY-coordinate: " + yCoordinate +
                                "\n" + colour + " point" ;
                return s;
        }

        public Double  getx()   {
                return xCoordinate;
        }

        void  setx(Double newvalue){
                xCoordinate = newvalue;
        }

        public Double  gety()   {
                return yCoordinate;
        }

        public void  sety(Double newvalue){
                yCoordinate = newvalue;
        }

        public Double  distance(Point  other){
                Double dist_x = other.xCoordinate - xCoordinate;
                Double dist_y = other.yCoordinate - yCoordinate;

                return (Math.sqrt(Math.pow(dist_x, 2) + Math.pow(dist_y, 2)));
        }

        static Double  distance (Point  that, Point  other){
                Double dist_x = other.xCoordinate - that.xCoordinate;
                Double dist_y = other.yCoordinate - that.yCoordinate;

                return (Math.sqrt(Math.pow(dist_x, 2) + Math.pow(dist_y, 2)));
        }
}
```

Colour.java

```
/*
 * started by: M. Moussavi
 * Date: Feb 2015
 * Modified by: Mitchell Sawatzky
 */
class Colour implements Cloneable
{
    private String colour;

        public Colour(String s) {
                colour = new String(s);
        }

    public Object clone() throws CloneNotSupportedException {
        return super.clone();
    }

    public void setColour(String newColour){
        colour = newColour;
    }

        @Override
        public String toString(){
                return colour;
        }

}
```

Circle.java

```

class Circle extends Shape implements Cloneable
{
        private Double radius;

        Circle(Double x_origin, Double y_origin, Double newradius,  String name, Colour colour){
                super(x_origin, y_origin, name, colour);
                radius = newradius;
        }

    public Object clone() throws CloneNotSupportedException {
        return super.clone();
    }

        public void set_radius(Double newradius){
                radius = newradius;
        }

        public Double get_radius() {
                return radius;
        }

        public Double area() {
                return Math.PI * Math.pow(radius, 2);
        }

        public Double perimeter() {
                return 2 * Math.PI * radius;
        }

        public Double  volume(){
                return 0.0;
        }



        public String toString(){
                String s = super.toString()+ "\nRadius: " + radius;
                return s;
        }

}
```

Terminal Output:

```
        Here are the original values in r1:


        Shape name: R1
        Origin: X_coordinate: 3.0
```

```
Y-coordinate: 4.0
Black point
Width: 6.0
Length: 5.0

Here are the original values in c1:

Shape name: C1
Origin: X_coordinate: 13.0
Y-coordinate: 14.0
Green point
Radius: 15.0

Here are the original values in r2:

Shape name: R2
Origin: X_coordinate: 23.0
Y-coordinate: 24.0
Black point
Width: 26.0
Length: 25.0
Here are the original values in c2:

Shape name: C2
Origin: X_coordinate: 33.0
Y-coordinate: 34.0
Yellow point
Radius: 35.0

Here are the original values in p1:

Shape name: P1
Origin: X_coordinate: 43.0
Y-coordinate: 44.0
White point
Width: 46.0
Length: 45.0
height: 47.0

Here are the original values in p2:

Shape name: P2
```

```
Origin: X_coordinate: 53.0

Y-coordinate: 54.0

Gray point

Width: 56.0

Length: 55.0

height: 57.0



Making r1 copy of r2, c1 copy of c2, p1 copy of p2:

Here are values for r1 after trying to make it a copy of r2:

Shape name: R2

Origin: X_coordinate: 23.0

Y-coordinate: 24.0

Black point

Width: 26.0

Length: 25.0

Here are values for c1 after trying to make it a copy of c2:

Shape name: C2

Origin: X_coordinate: 33.0

Y-coordinate: 34.0

Yellow point

Radius: 35.0

Here are values for p1 after trying to make it a copy of p2:

Shape name: P2

Origin: X_coordinate: 53.0

Y-coordinate: 54.0

Gray point

Width: 56.0

Length: 55.0

height: 57.0
```