Assignment-7

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1.

```
class Person{
    private String name;
    private String address;
    Person(){}
    Person(String n, String a){
        name = n;
        address = a;
    }
    String getName(){
        return address;
    }
    String getAddress(){
        return address;
    }
    void setName(String n){
        name = n;
    }
    void setAddress(String a){
        address = a;
    }
    String tostring(){
        return name+"("+address+")";
    }
}
class studdent extends Person{
    private int numCourses;
    private String courses[];
    private int grades[];
    studdent(){}
    studdent(String n, String a){
        setName(n);
        setAddress(a);
    }
    void addCourseGrade(String c[], int g[]){
        numCourses = c.length;
        courses = c;
        grades = g;
    }
    void printGrades(){
        System.out.println("Number of courses = "+numCourses);
        for(int i=0;i<grades.length;i++)
        System.out.println((i+1)+":\t"+courses[i]+" :- "+grades[i]);
    }
    double getAverageGrade(){
        int sum = 0;
    for(int i=0;i<numCourses;i++)
        sum += grades[i];
        return 1.0*sum/numCourses;
    }
    String tostring(){
        return "studdent: "+super.tostring();
    }
}
class Teacher extends Person{
    private int numCourses;
    private String courses[];
    Teacher(String n,String a){
    setName(n);
    setAddress(a);
}
boolean addCourse(String c){
    for(int i=0;i<numCourses;i++)
        if(courses[i]==c)
            return false;
    numCourses += 1;
    String temp[] = new String[numCourses];
    for(int i=0;i<numCourses-1;i++)
        temp[i] = courses[i];
    temp[numCourses-1] = c;
    courses = temp;
    return true;
}
boolean removeCourse(String c){
    for(int i=0;i<numCourses;i++)
    if(courses[i]==c){
        int k=0;
    String temp[] = new String[numCourses-1];
    for(i=0;i<numCourses;i++)
    if(courses[i]!=c)
        temp[k++] = courses[i];
        return true;
    }
    return false;
}
    String tostring(){
        return "Teacher: "+super.tostring();
    }
}
class personDriver{
public static void main(String[] args){
    studdent stud = new studdent("jyotikrish","silicon");
    String c[] = {"course A","course B","course C"};
    int grad[] = {40,78,97};
    stud.addCourseGrade(c,grad);
    stud.printGrades();
    System.out.println("Average : "+stud.getAverageGrade()+"\n"+stud.tostring());
    Teacher th = new Teacher("theacher one", "bbsr2");
    System.out.println(th.addCourse("course-1"));
    System.out.println(th.addCourse("course-2"));
    System.out.println(th.addCourse("course-1"));
    System.out.println(th.addCourse("course-3"));
    System.out.println(th.removeCourse("course-3"));
    System.out.println(th.removeCourse("course-5"));
    System.out.println(th.tostring());
    }
}
```

2.

```
class Shape{
    String color;
    boolean filled;
    Shape(){
        setCOLOR("green");
        setFILLED(true);
    }
    Shape(String color1,boolean filled1){
        setCOLOR(color1);
        setFILLED(filled1);
    }
    String getCOLOR(){
        return color;
    }
    void setCOLOR(String color1){
        color=color1;
    }
    boolean getFILLED(){
        return filled;
    }
    void setFILLED(boolean filled1){
        filled=filled1;
    }
    String tostring(){
        return "A shape with color of"+getCOLOR()+" and "+getFILLED();
    }
}
class Circle extends Shape{
    double radius;
    Circle(){setRADIUS(1.0);}
    Circle(double radius1){
        setRADIUS(radius1);
    }
    double getRADIUS(){
        return radius;
    }
    void setRADIUS(double radius1){
        radius=radius1;
    }
    double getArea(){
        return 3.14*radius*radius;
    }
    double getPerimeter(){
        return 2*3.14*radius;
    }
    String tostring(){
        return "A Circle with radius ="+getRADIUS()+" which is a subclass of 
"+super.tostring();
    }
}
class Rectangle extends Shape{
    double width,length;
    Rectangle(){
        setWIDTH(1.0);
        setLENGTH(1.0);
    }
    Rectangle(double width1,double length1){
        setWIDTH(width1);
        setLENGTH(length1);
    }
    double getWIDTH(){
        return width;
    }
    double getLENGTH(){
        return length;
    }
    void setWIDTH(double width1){
        width=width1;
    }
    void setLENGTH(double length1){
        length=length1;
    }
    double getArea(){
        return width*length;
    }
    double getPerimeter(){
        return 2*(width+length);
    }
    String tostring(){
        return "A Rectangle with width ="+getWIDTH()+" and length"+getLENGTH()+" which is a 
subclass of "+super.tostring();
    }
```

```
}
class Square extends Rectangle{
    Square(){}
    Square(double side){
        super(side,side);
    }
    String tostring(){
        return "A Square with side ="+getWIDTH()+" which is a subclass of "+super.tostring();
    }
    void setLENGTH(double l)
    {
        super.setLENGTH(l);
    }

    void setWIDTH(double w)
    {
        super.setWIDTH(w);
    }
}

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

        Shape s = new Shape();
        Circle p1 = new Circle(50);
        System.out.println(p1.tostring());
        Rectangle r1 =new Rectangle(2.0,4.0);
        System.out.println(r1.tostring());
        Square s1= new Square(2.0);
        System.out.println(s1.tostring());
    }
}
```

3.

```
//i changed the variable name (not as in question) as they were conflicting with previous program...

abstract class absShape{
    protected String color;
    protected boolean filled;
    absShape(){
        setCOLOR("green");
        setFILLED(true);
    }
```

```java
    absShape(String color1,boolean filled1){
        setCOLOR(color1);
        setFILLED(filled1);
    }
    String getCOLOR(){
        return color;
    }
    void setCOLOR(String color1){
        color=color1;
    }
    boolean isFILLED(){
        return filled;
    }
    void setFILLED(boolean filled1){
        filled=filled1;
    }
    abstract String tostring();
    //{
    //  return "A shape with color of"+getCOLOR()+" and "+isFILLED();
    //}
    abstract double getArea();
    abstract double getPerimeter();

}
class Circle extends absShape{
    protected double radius;
    Circle(){setRADIUS(0.0);}
    Circle(double radius1){
        setRADIUS(radius1);
    }
    Circle(double radius1,String color1,boolean filled1){
        setRADIUS(radius1);
        setCOLOR(color1);
        setFILLED(filled1);
    }
    double getRADIUS(){
        return radius;
    }
    void setRADIUS(double radius1){
        radius=radius1;
    }
    double getArea(){
        return 3.14*radius*radius;
    }
    double getPerimeter(){
        return 2*3.14*radius;
    }
    String tostring(){
        return "A Circle with radius ="+getRADIUS()+" which is a subclass of "+tostring();
    }
```

```
}
class Rectangle extends absShape{
    protected double width,length;
    Rectangle(){
        setWIDTH(0.0);
        setLENGTH(0.0);
    }
    Rectangle(double width1,double length1){
        setWIDTH(width1);
        setLENGTH(length1);
    }
    Rectangle(double width1,double length1,String color1,boolean filled1){
        setWIDTH(width1);
        setLENGTH(length1);
        setCOLOR(color1);
        setFILLED(filled1);
    }
    double getWIDTH(){
        return width;
    }
    double getLENGTH(){
        return length;
    }
    void setWIDTH(double width1){
        width=width1;
    }
    void setLENGTH(double length1){
        length=length1;
    }
    double getArea(){
        return width*length;
    }
    double getPerimeter(){
        return 2*(width+length);
    }
    String tostring(){
        return "A Rectangle with width ="+getWIDTH()+" and length"+getLENGTH()+" which is a
subclass of "+tostring();
    }
}
class Square extends Rectangle{
    double side;
    Square(){}
    Square(double side){
        setSIDE(side);
    }
    Square(double side1,String color1,boolean filled1){
        setSIDE(side1);
        setCOLOR(color1);
        setFILLED(filled1);
    }
    double getSIDE(){
        return side;
    }
    void setSIDE(double side1){
        side=side1;
    }
    String tostring(){
        return "A Square with side ="+getSIDE()+" which is a subclass of "+tostring();
    }
    void setLENGTH(double side)
    {
        super.setLENGTH(side);
    }

    void setWIDTH(double side)
    {
        super.setWIDTH(side);
    }
}

class ptDriver1
{
    public static void main(String[] args) {

        absShape s1 = new Circle(5.5, "RED", false);
        System.out.println(s1);
        System.out.println(s1.getArea());
        System.out.println(s1.getPerimeter());
        System.out.println(s1.getCOLOR());
        System.out.println(s1.isFILLED());
        //System.out.println(s1.getRADIUS());//here error occurs as it protected
        Circle c1 = (Circle)s1;
        System.out.println(c1);
        System.out.println(c1.getArea());
        System.out.println(c1.getPerimeter());
        System.out.println(c1.getCOLOR());
        System.out.println(c1.isFILLED());
        System.out.println(c1.getRADIUS());
        //absShape s2 = new absShape();//abstract class cant be instantiated
        absShape s3 = new Rectangle(1.0, 2.0, "RED", false);
        System.out.println(s3);
        System.out.println(s3.getArea());
        System.out.println(s3.getPerimeter());
        System.out.println(s3.getCOLOR());
        //System.out.println(s3.getLENGTH());
        Rectangle r1 = (Rectangle)s3; // downcast
        System.out.println(r1);
        System.out.println(r1.getArea());
        System.out.println(r1.getCOLOR());
```

```java
        System.out.println(r1.getLENGTH());
        absShape s4 = new Square(6.6); // Upcast
        System.out.println(s4);
        System.out.println(s4.getArea());
        System.out.println(s4.getCOLOR());
        //System.out.println(s4.getSIDE());
        Rectangle r2 = (Rectangle)s4;
        System.out.println(r2);
        System.out.println(r2.getArea());
        System.out.println(r2.getCOLOR());
        //System.out.println(r2.getSIDE());
        System.out.println(r2.getLENGTH());
    }
}
```