Teknik Pemrograman

W5 - Inheritance, Abstract Class and Interface

Oleh:

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1. Soal 1
   - Circle.java :

```
package Exercise1;

/*
* The Circle class models a circle with a radius and color.
*/
public class Circle { // Save as "Circle.java"
    // private instance variable, not accessible from outside this class
    private double radius;
    private String color;

    // Constructors (overloaded)
    /** Constructs a Circle instance with default value for radius and
color */
    public Circle() { // 1st (default) constructor
        radius = 1.0;
        color = "red";
    }

    /** Constructs a Circle instance with the given radius and default
color */
    public Circle(double r) { // 2nd constructor
        radius = r;
        color = "red";
    }

    /** Penambahan constructs dengan ketentuan Constructor Circle(radius :
double, color : string)*/
    public Circle(double r, String c) { // 2nd constructor
        radius = r;
        color = c;
    }

    /** Returns the radius */
    public double getRadius() {
        return radius;
    }

    /** Penambahan void untuk set radius */
    public void setRadius(double r) {
        this.radius = r;
    }

    /** Penambahan modul untuk return color */
    public String getColor() {
        return color;
    }
```

   - Cylinder.java :

```
package Exercise1;

public class Cylinder extends Circle { // Save as "Cylinder.java"
    private double height; // private variable

    // Constructor with default color, radius and height
    public Cylinder() {
        super(); // call superclass no-arg constructor Circle()
        height = 1.0;
    }
```

```
    // Constructor with default radius, color but given height
    public Cylinder(double height) {
        super(); // call superclass no-arg constructor Circle()
        this.height = height;
    }

    // Constructor with default color, but given radius, height
    public Cylinder(double radius, double height) {
        super(radius); // call superclass constructor Circle(r)
        this.height = height;
    }

    // Penambahan Constructor with but given radius, height, color
    public Cylinder(double radius, double height, String color) {
        super(radius, color); // call superclass constructor Circle(r)
        this.height = height;
    }

    // A public method for retrieving the height
    public double getHeight() {
        return height;
    }

    /** Penambahan void untuk set height */
    public void setHeight(double h) {
        this.height = h;
    }

    @Override
    public double getArea() {
        return ((2 * Math.PI * getRadius() * this.height) + (2 *
super.getArea()));
    }

    // A public method for computing the volume of cylinder
    // use superclass method getArea() to get the base area
    public double getVolume() {
        return getArea()*height;
    }

    @Override
    public String toString() { // in Cylinder class
        return "Cylinder: subclass of " + super.toString() // use Circle's
toString()
        + " height=" + height;
    }
}
```

- TestCylinder :

```
package Exercise1;

public class TestCylinder { // save as "TestCylinder.java"
    public static void main (String[] args) {
    // Declare and allocate a new instance of cylinder
    // with default color, radius, and height
    Cylinder c1 = new Cylinder();
    System.out.println("Cylinder:"
    + " radius=" + c1.getRadius()
    + " height=" + c1.getHeight()
    + " base area=" + c1.getArea()
    + " volume=" + c1.getVolume()
    + c1.toString());
```

```
        // Declare and allocate a new instance of cylinder
        // specifying height, with default color and radius
        Cylinder c2 = new Cylinder(10.0);
        System.out.println("Cylinder:"
        + " radius=" + c2.getRadius()
        + " height=" + c2.getHeight()
        + " base area=" + c2.getArea()
        + " volume=" + c2.getVolume()
        + c2.toString());

        // Declare and allocate a new instance of cylinder
        // specifying radius and height, with default color
        Cylinder c3 = new Cylinder(2.0, 10.0);
        System.out.println("Cylinder:"
        + " radius=" + c3.getRadius()
        + " height=" + c3.getHeight()
        + " base area=" + c3.getArea()
        + " volume=" + c3.getVolume()
        + c3.toString());

        // Declare and allocate a new instance of cylinder
        // specifying radius and height, with default color
        Cylinder c4 = new Cylinder(2.0, 10.0, "blue");
        System.out.println("Cylinder:"
        + " radius=" + c4.getRadius()
        + " height=" + c4.getHeight()
        + " base area=" + c4.getArea()
        + " volume=" + c4.getVolume()
        + " color=" +c4.getColor()
        + c4.toString());
        }

}
```

2. Soal 2
   - Circle.java :

```
package Exercise2;

public class Circle extends Shape {
/*
The Circle class models a circle with a radius and color.
*/
// private instance variable, not accessible from outside this class
private double radius;
private String color;

// Constructors (overloaded)
/** Constructs a Circle instance with default value for radius and color
*/
public Circle() { // 1st (default) constructor
this.radius = 1.0;
this.color = "red";
}

/** Constructs a Circle instance with the given radius and default color
*/
public Circle(double r) { // 2nd constructor
this.radius = r;
this.color = "red";
}
```

```
/** Penambahan constructs dengan ketentuan Constructor Circle(radius :
double, color : string)*/
public Circle(double r, String c, Boolean f) { // 2nd constructor
this.radius = r;
setColor(c);
setFilled(f);
}

/** Returns the radius */
public double getRadius() {
return this.radius;
}

/** Penambahan void untuk set radius */
public void setRadius(double r) {
this.radius = r;
}

/** Returns the area of this Circle instance */
public double getArea() {
return this.radius*this.radius*Math.PI;
}

/** Returns the perimeter of this Circle instance */
public double getPerimeter() {
return 2*this.radius*Math.PI;
}

/** Penambahan modul untuk return color */
public String getColor() {
return color;
}

/** Penambahan void untuk set color */
public void setColor(String c) {
this.color = c;
}

/** Return a self-descriptive string of this instance in the form of
Circle[radius=?,color=?] */
public String toString() {
return  "Circle[color="  +  this.color  +  ",filled="  +  isFilled()  +
",radius=" + getRadius() + "]";
}
}
```

- Rectangle.java :

```
package Exercise2;

public class Rectangle extends Shape {
    /*
    * The Circle class models a circle with a radius and color.
    */
    // private instance variable, not accessible from outside this class
    private double width;
    private double length;

    // Constructors (overloaded)
    /** Constructs a Circle instance with default value for radius and
color */
    public Rectangle() { // 1st (default) constructor
        this.width = 1.0;
        this.length = 1.0;
    }
```

```
    /** Constructs a Circle instance with the given radius and default
color */
    public Rectangle(double w, double l) { // 2nd constructor
        this.width = w;
        this.length = l;
    }

    /**   Penambahan   constructs   dengan   ketentuan   Constructor
Circle(radius : double, color : string)*/
    public Rectangle(double w, double l, String c, Boolean f) { // 2nd
constructor
        this.width = w;
        this.length = l;
        setColor(c);
        setFilled(f);
    }

    /** Returns the width */
    public double getWidth() {
        return this.width;
    }

    /** Penambahan void untuk set width */
    public void setWidth(double w) {
        this.width = w;
    }

    /** Returns the length */
    public double getLength() {
        return this.length;
    }

    /** Penambahan void untuk set length */
    public void setLength(double l) {
        this.length = l;
    }

    /** Returns the area of this Circle instance */
    public double getArea() {
        return this.width*this.length;
    }

    /** Returns the perimeter of this Circle instance */
    public double getPerimeter() {
        return (2*(this.width+this.length));
    }

    /** Return a self-descriptive string of this instance in the form
of
    Circle[radius=?,color=?] */
    public String toString() {
        return  "Rectangle[Shape[color="  +getColor()  +  ",filled="  +
isFilled() + ",width=" + this.width + ",length=" + this.length + "]]";
    }
}
```

- Shape.java :

```
package Exercise2;

public class Shape {
    // private instance variable, not accessible from outside this class
```

```
    private String color;
    private boolean filled;

    // Constructors (overloaded)
    /** Constructs a Circle instance with default value for radius and
color */
    public Shape() { // 1st (default) constructor
        color = "red";
        filled = true;
    }

    /** Penambahan constructs dengan ketentuan Constructor Circle(radius :
double, color : string)*/
    public Shape(String c, Boolean f) { // 2nd constructor
        color = c;
        filled = f;
    }

    /** Penambahan untuk get color */
    public String getColor() {
        return this.color;
    }

    /** Penambahan void untuk set color */
    public void setColor(String c) {
        this.color = c;
    }

    /** Penambahan untuk set Filled */
    public boolean isFilled() {
        return this.filled;
    }

    /** Penambahan void untuk set filled */
    public void setFilled(boolean f) {
        this.filled = f;
    }

    /** Penambahan untuk to string */
    public String toString() {
        return "Shape[color=" + this.color + ",filled=" + this.filled +
"]";
    }
}
```

- Square.java :

```
package Exercise2;

public class Square extends Rectangle {
    /*
    * The Circle class models a circle with a radius and color.
    */
    // private instance variable, not accessible from outside this class

    // Constructors (overloaded)
    /** Constructs a Circle instance with default value for radius and
color */
    public Square() { // 1st (default) constructor
        super();
    }
```

```
    /** Constructs a Circle instance with the given radius and default
color */
    public Square(double s) { // 2nd constructor
        super(s, s);
    }

    /** Penambahan constructs dengan ketentuan Constructor Circle(radius :
double, color : string)*/
    public Square(double s, String c, Boolean f) { // 2nd constructor
        super(s, s, c, f);
    }

    /** Returns the side */
    public double getSide() {
        return getWidth();
    }

    /** Penambahan void untuk set side */
    public void setSide(double s) {
        setWidth(s);
        setLength(s);
    }

    /** Penambahan void untuk set length */
    @Override
    public void setLength(double s) {
        super.setLength(s);
    }

    /** Penambahan void untuk set width */
    @Override
    public void setWidth(double s) {
        super.setWidth(s);
    }

    /** Return a self-descriptive string of this instance in the form of
     Circle[radius=?,color=?] */
    @Override
    public String toString() {
        return "Square[Rectangle[Shape[color=" +getColor() + ",filled=" +
isFilled() + ",width=" + getWidth() + ",length=" + getLength() + "]]]";
    }
}
```

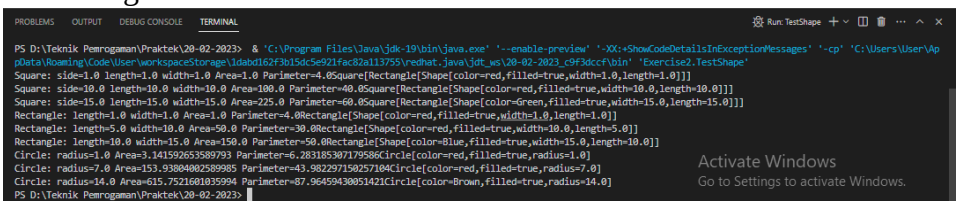
- TestShape.java :

```
package Exercise2;

public class TestShape {
    public static void main (String[] args) {
    // Declare and allocate a new instance of Square
    // with default side, color, and boolean
    Square s1 = new Square();
    System.out.println("Square:"
    + " side=" + s1.getSide()
    + " length=" + s1.getLength()
    + " width=" + s1.getWidth()
    + " Area=" + s1.getArea()
    + " Parimeter=" + s1.getPerimeter()
    + s1.toString());

    // Declare and allocate a new instance of Square
    // specifying side
```

```
Square s2 = new Square(10.0);
System.out.println("Square:"
+ " side=" + s2.getSide()
+ " length=" + s2.getLength()
+ " width=" + s2.getWidth()
+ " Area=" + s2.getArea()
+ " Parimeter=" + s2.getPerimeter()
+ s2.toString());

// Declare and allocate a new instance of Square
// specifying side, color, and boolean
Square s3 = new Square(15.0, "Green", true);
System.out.println("Square:"
+ " side=" + s3.getSide()
+ " length=" + s3.getLength()
+ " width=" + s3.getWidth()
+ " Area=" + s3.getArea()
+ " Parimeter=" + s3.getPerimeter()
+ s3.toString());

// Declare and allocate a new instance of rectangle
// with default color, length and width
Rectangle r1 = new Rectangle();
System.out.println("Rectangle:"
+ " length=" + r1.getLength()
+ " width=" + r1.getWidth()
+ " Area=" + r1.getArea()
+ " Parimeter=" + r1.getPerimeter()
+ r1.toString());

// Declare and allocate a new instance of rectangle
// specifying length, width
Rectangle r2 = new Rectangle(10.0, 5.0);
System.out.println("Rectangle:"
+ " length=" + r2.getLength()
+ " width=" + r2.getWidth()
+ " Area=" + r2.getArea()
+ " Parimeter=" + r2.getPerimeter()
+ r2.toString());

// Declare and allocate a new instance of rectangle
// specifying length, width ,color, and boolean
Rectangle r3 = new Rectangle(15.0, 10.0, "Blue", true);
System.out.println("Rectangle:"
+ " length=" + r3.getLength()
+ " width=" + r3.getWidth()
+ " Area=" + r3.getArea()
+ " Parimeter=" + r3.getPerimeter()
+ r3.toString());

// Declare and allocate a new instance of cylinder
// with default color, radius, and height
Circle c1 = new Circle();
System.out.println("Circle:"
+ " radius=" + c1.getRadius()
+ " Area=" + c1.getArea()
+ " Parimeter=" + c1.getPerimeter()
+ c1.toString());

// Declare and allocate a new instance of Circle
// specifying radius
Circle c2 = new Circle(7.0);
System.out.println("Circle:"
```

```
        + " radius=" + c2.getRadius()
        + " Area=" + c2.getArea()
        + " Parimeter=" + c2.getPerimeter()
        + c2.toString());

        // Declare and allocate a new instance of Circle
        // specifying radius,color, and boolean
        Circle c3 = new Circle(14.0, "Brown", true);
        System.out.println("Circle:"
        + " radius=" + c3.getRadius()
        + " Area=" + c3.getArea()
        + " Parimeter=" + c3.getPerimeter()
        + c3.toString());
        }

    }
```

- Hasil Program :



3. Soal 3

- Case 1 :


```
package Exercise3;

public class Employee extends Sortable {
    public int compare(Sortable b){
        Employee eb = (Employee) b;
        if (salary<eb.salary) return -1;
        if (salary>eb.salary) return +1;
        return 0;
    }

}
```

```
            package Exercise3;

public class ManagerTest {
    public static void main(String[] args) {
        Employee[] staff = new Employee[3];
```

```
        staff[0] = new Employee("Antonio Rossi", 2000000, 1, 10, 1989);
        staff[1] = new Manager("Maria Bianchi", 2500000, 1, 12, 1991);
        staff[2] = new Employee("Isabel Vidal", 3000000, 1, 11, 1993);
        Sortable.shell_sort(staff);

        int i;
        for (i = 0; i < 3; i++) {
            staff[i].raiseSalary(5);
        }
        for (i = 0; i < 3; i++) {
            staff[i].print();
        }
    }

}
```

- Case 2

  Imagine that we want to order the Managers in a similar way : class Managers extends Employee extends Sortable

```
public class Manager extends Employee extends Sortable {
    public Manager(String n, double s, int d, int m, int y) {
        super(n, s, d, m, y);
        secretaryName = "";
    }
```

  Keterangan: Error, tidak bisa secara langsunga (tidak bisa extends 2 parents secara langsung)

```
public class Manager extends Employee {
    public Manager(String n, double s, int d, int m, int y) {
        super(n, s, d, m, y);
        secretaryName = "";
    }

public class Employee extends Sortable {
    private String name;
    private double salary;
    private int hireday;
    private int hiremonth;
    private int hireyear;
```

  Keterangan: Kecuali seperti ini, Manager extends Employee dan Employee extends Sortable