INHERITANCE, ABSTRACT CLASS AND INTERFACE

LAPORAN

Diajukan untuk memenuhi Tugas Mata Kuliah Pemrograman Berorientasi Objek

Disusun Oleh
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PERSOALAN

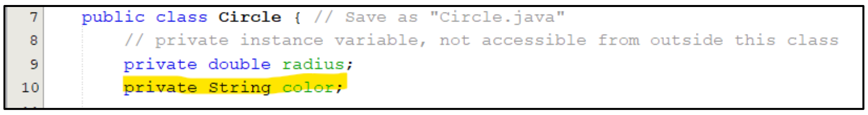
Link Repository : https://github.com/HafizhAuliansyah/211511047_M-Hafizh-A_PraktikumPBO.git

1.1. Exercise 1

Jawaban Soal :

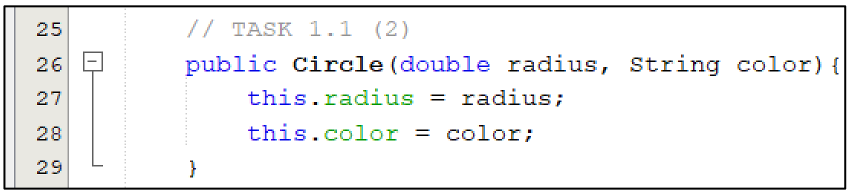
- Task 1.1 *(in Circle.java)*

  (1) Add variabel String Color



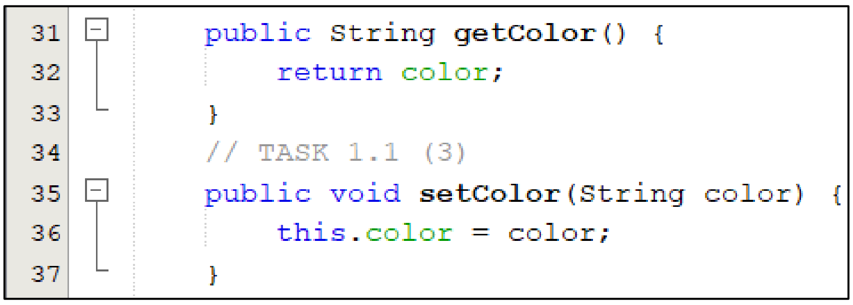
```java
public class Circle { // Save as "Circle.java"
    // private instance variable, not accessible from outside this class
    private double radius;
    private String color;
```

  (2) Constructor Circle(radius : double, color : string)



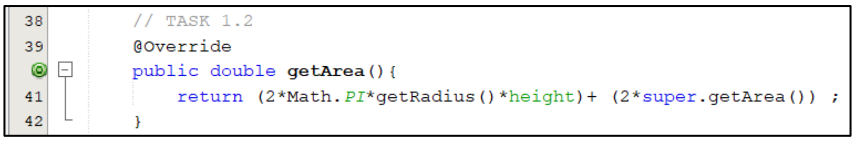
```java
    // TASK 1.1 (2)
    public Circle(double radius, String color){
        this.radius = radius;
        this.color = color;
    }
```

  (3) Getter and setter for color



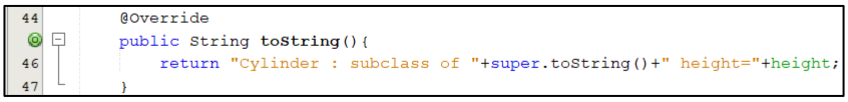
```java
    public String getColor() {
        return color;
    }
    // TASK 1.1 (3)
    public void setColor(String color) {
        this.color = color;
    }
```

- Task 1.2 *(in Cylinder.java)*



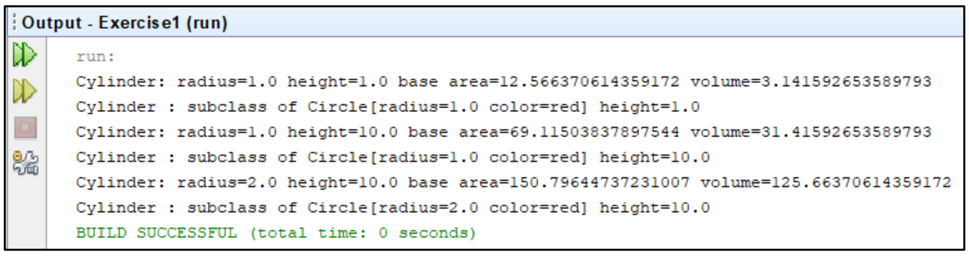
```java
    // TASK 1.2
    @Override
    public double getArea(){
        return (2*Math.PI*getRadius()*height)+ (2*super.getArea()) ;
    }
```

- Task 1.3 *(in Cylinder.java)*



```java
    @Override
    public String toString(){
        return "Cylinder : subclass of "+super.toString()+" height="+height;
    }
```

Hasil Akhir *(Run TestCylinder.java)* :



Output - Exercise1 (run)

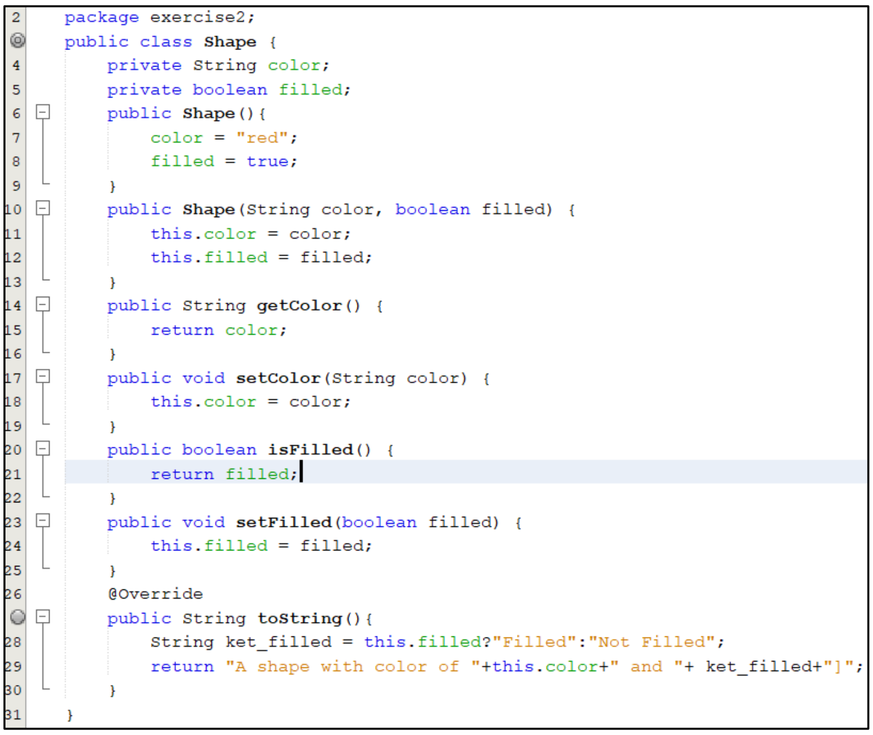
```
run:
Cylinder: radius=1.0 height=1.0 base area=12.566370614359172 volume=3.141592653589793
Cylinder : subclass of Circle[radius=1.0 color=red] height=1.0
Cylinder: radius=1.0 height=10.0 base area=69.11503837897544 volume=31.41592653589793
Cylinder : subclass of Circle[radius=1.0 color=red] height=10.0
Cylinder: radius=2.0 height=10.0 base area=150.79644737231007 volume=125.66370614359172
Cylinder : subclass of Circle[radius=2.0 color=red] height=10.0
BUILD SUCCESSFUL (total time: 0 seconds)
```

Permasalahan yang dihadapi : -
Solusi : -
Teman yang membantu : -

1.2. Exercise 2

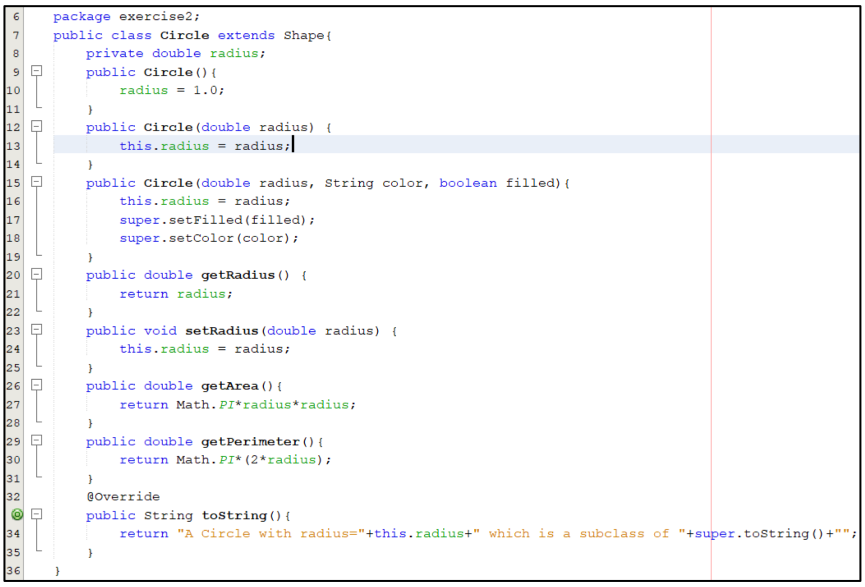
Jawaban Soal :

In Shape.java



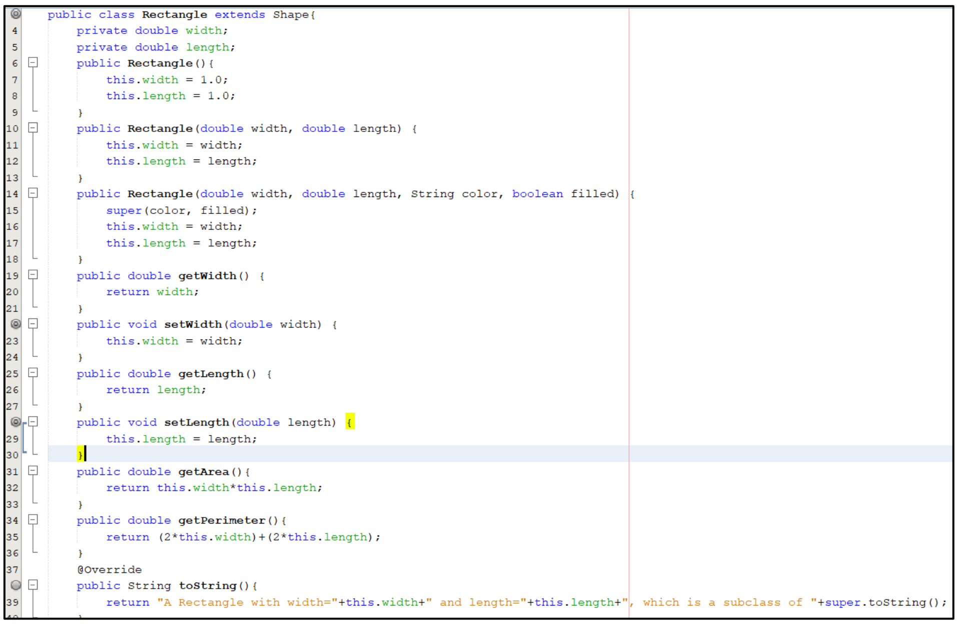
```java
package exercise2;
public class Shape {
    private String color;
    private boolean filled;
    public Shape(){
        color = "red";
        filled = true;
    }
    public Shape(String color, boolean filled) {
        this.color = color;
        this.filled = filled;
    }
    public String getColor() {
        return color;
    }
    public void setColor(String color) {
        this.color = color;
    }
    public boolean isFilled() {
        return filled;
    }
    public void setFilled(boolean filled) {
        this.filled = filled;
    }
    @Override
    public String toString(){
        String ket_filled = this.filled?"Filled":"Not Filled";
        return "A shape with color of "+this.color+" and "+ ket_filled+"]";
    }
}
```

In Circle.java



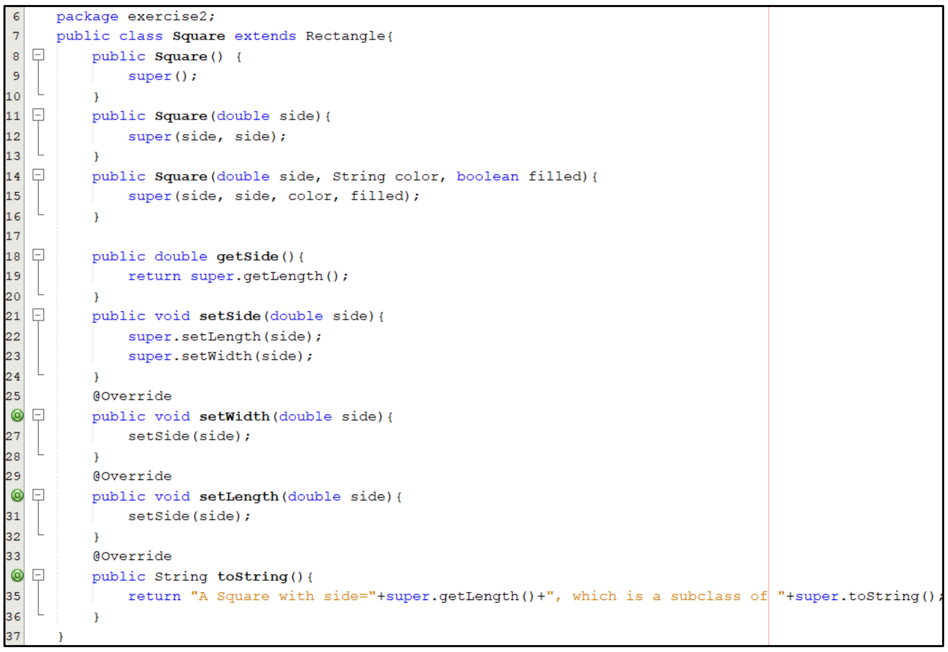
```java
package exercise2;
public class Circle extends Shape{
    private double radius;
    public Circle(){
        radius = 1.0;
    }
    public Circle(double radius) {
        this.radius = radius;
    }
    public Circle(double radius, String color, boolean filled){
        this.radius = radius;
        super.setFilled(filled);
        super.setColor(color);
    }
    public double getRadius() {
        return radius;
    }
    public void setRadius(double radius) {
        this.radius = radius;
    }
    public double getArea(){
        return Math.PI*radius*radius;
    }
    public double getPerimeter(){
        return Math.PI*(2*radius);
    }
    @Override
    public String toString(){
        return "A Circle with radius="+this.radius+" which is a subclass of "+super.toString()+"";
    }
}
```

In Rectangle.java



```java
public class Rectangle extends Shape{
    private double width;
    private double length;
    public Rectangle(){
        this.width = 1.0;
        this.length = 1.0;
    }
    public Rectangle(double width, double length) {
        this.width = width;
        this.length = length;
    }
    public Rectangle(double width, double length, String color, boolean filled) {
        super(color, filled);
        this.width = width;
        this.length = length;
    }
    public double getWidth() {
        return width;
    }
    public void setWidth(double width) {
        this.width = width;
    }
    public double getLength() {
        return length;
    }
    public void setLength(double length) {
        this.length = length;
    }
    public double getArea(){
        return this.width*this.length;
    }
    public double getPerimeter(){
        return (2*this.width)+(2*this.length);
    }
    @Override
    public String toString(){
        return "A Rectangle with width="+this.width+" and length="+this.length+", which is a subclass of "+super.toString();
```

In Square.java

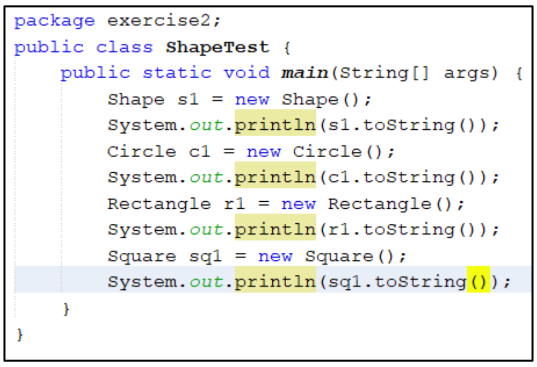


```java
package exercise2;
public class Square extends Rectangle{
    public Square() {
        super();
    }
    public Square(double side){
        super(side, side);
    }
    public Square(double side, String color, boolean filled){
        super(side, side, color, filled);
    }

    public double getSide(){
        return super.getLength();
    }
    public void setSide(double side){
        super.setLength(side);
        super.setWidth(side);
    }
    @Override
    public void setWidth(double side){
        setSide(side);
    }
    @Override
    public void setLength(double side){
        setSide(side);
    }
    @Override
    public String toString(){
        return "A Square with side="+super.getLength()+", which is a subclass of "+super.toString();
    }
}
```

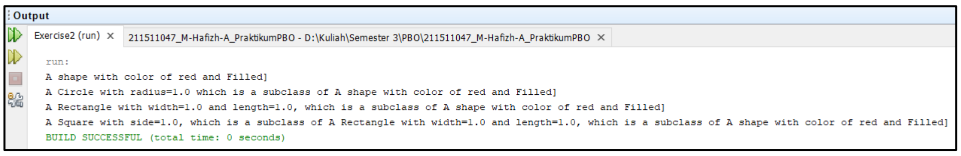
Hasil Akhir :

Create ShapeTest.java



```java
package exercise2;
public class ShapeTest {
    public static void main(String[] args) {
        Shape s1 = new Shape();
        System.out.println(s1.toString());
        Circle c1 = new Circle();
        System.out.println(c1.toString());
        Rectangle r1 = new Rectangle();
        System.out.println(r1.toString());
        Square sq1 = new Square();
        System.out.println(sq1.toString());
    }
}
```

Output :



```
Output
Exercise2 (run) ×   211511047_M-Hafizh-A_PraktikumPBO - D:\Kuliah\Semester 3\PBO\211511047_M-Hafizh-A_PraktikumPBO ×
run:
A shape with color of red and Filled]
A Circle with radius=1.0 which is a subclass of A shape with color of red and Filled]
A Rectangle with width=1.0 and length=1.0, which is a subclass of A shape with color of red and Filled]
A Square with side=1.0, which is a subclass of A Rectangle with width=1.0 and length=1.0, which is a subclass of A shape with color of red and Filled]
BUILD SUCCESSFUL (total time: 0 seconds)
```

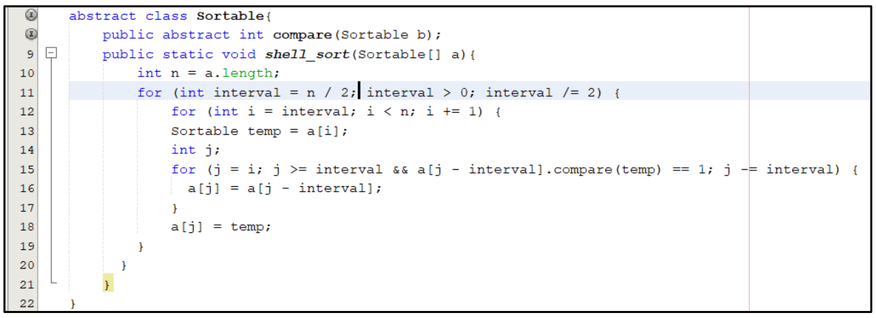
Permsalahan : Bingung cara menyesuaikan length dan width saat setWidth dan setLength supaya sama
Solusi : Cukup dengan memanggil setSide, maka lenth dan width akans selalu sama
Teman yang membantu : M Rizki Halomoan

1.3. Exercise 3

Jawaban Soal :

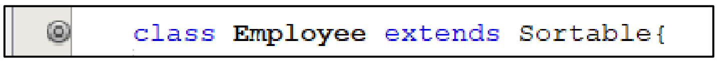
- Case 1

  In Sortable.java

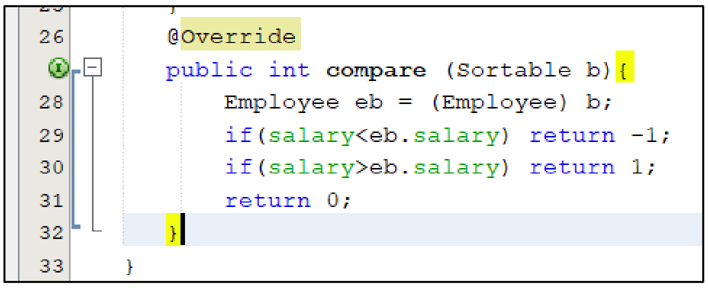


```java
abstract class Sortable{
    public abstract int compare(Sortable b);
    public static void shell_sort(Sortable[] a){
        int n = a.length;
        for (int interval = n / 2; interval > 0; interval /= 2) {
            for (int i = interval; i < n; i += 1) {
            Sortable temp = a[i];
            int j;
            for (j = i; j >= interval && a[j - interval].compare(temp) == 1; j -= interval) {
              a[j] = a[j - interval];
            }
            a[j] = temp;
        }
      }
    }
}
```

  In Employee.java

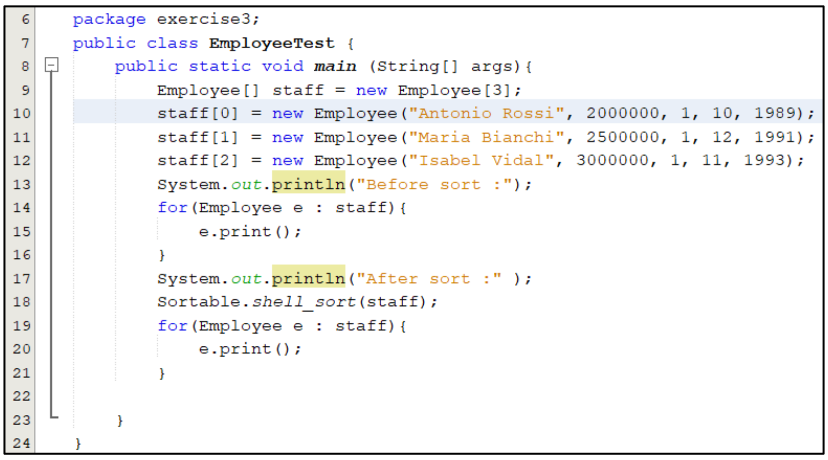


```java
class Employee extends Sortable{
```



```java
@Override
public int compare (Sortable b){
    Employee eb = (Employee) b;
    if(salary<eb.salary) return -1;
    if(salary>eb.salary) return 1;
    return 0;
}
}
```

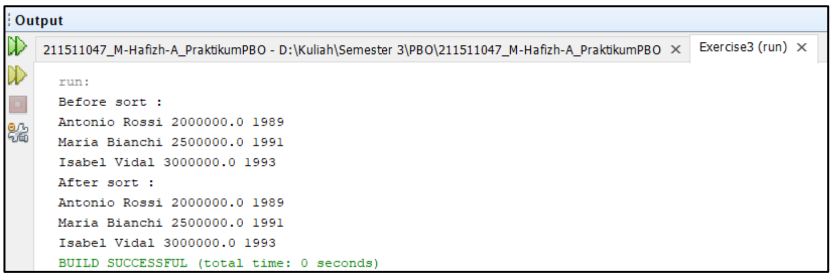
In EmployeeTest.java



```
package exercise3;
public class EmployeeTest {
    public static void main (String[] args){
        Employee[] staff = new Employee[3];
        staff[0] = new Employee("Antonio Rossi", 2000000, 1, 10, 1989);
        staff[1] = new Employee("Maria Bianchi", 2500000, 1, 12, 1991);
        staff[2] = new Employee("Isabel Vidal", 3000000, 1, 11, 1993);
        System.out.println("Before sort :");
        for(Employee e : staff){
            e.print();
        }
        System.out.println("After sort :" );
        Sortable.shell_sort(staff);
        for(Employee e : staff){
            e.print();
        }

    }
}
```

Output :



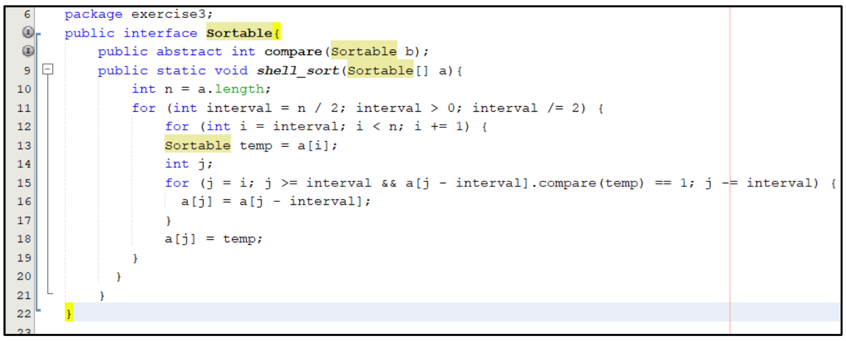
Output

211511047_M-Hafizh-A_PraktikumPBO - D:\Kuliah\Semester 3\PBO\211511047_M-Hafizh-A_PraktikumPBO × | Exercise3 (run) ×

```
run:
Before sort :
Antonio Rossi 2000000.0 1989
Maria Bianchi 2500000.0 1991
Isabel Vidal 3000000.0 1993
After sort :
Antonio Rossi 2000000.0 1989
Maria Bianchi 2500000.0 1991
Isabel Vidal 3000000.0 1993
BUILD SUCCESSFUL (total time: 0 seconds)
```

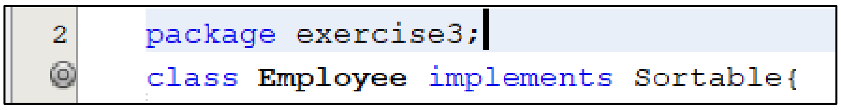
- Case 2

  Langkah 1 : *Mengubah Sortable dari abstract class menjadi interface (Sortable.java)*



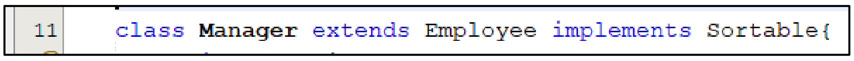
```
package exercise3;
public interface Sortable{
    public abstract int compare(Sortable b);
    public static void shell_sort(Sortable[] a){
        int n = a.length;
        for (int interval = n / 2; interval > 0; interval /= 2) {
            for (int i = interval; i < n; i += 1) {
            Sortable temp = a[i];
            int j;
            for (j = i; j >= interval && a[j - interval].compare(temp) == 1; j -= interval) {
              a[j] = a[j - interval];
            }
            a[j] = temp;
          }
        }
    }
}
```

  Langkah 2 : *Mengubah "extends Sortable" menjadi "implements Sortable" (Employee.java)*



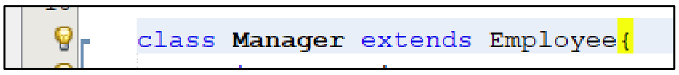
```
package exercise3;
class Employee implements Sortable{
```

Langkah 3 (Cara 1) : *Menambahkan "extends Employee implements Sortable" pada class Manager (Manager.java)*



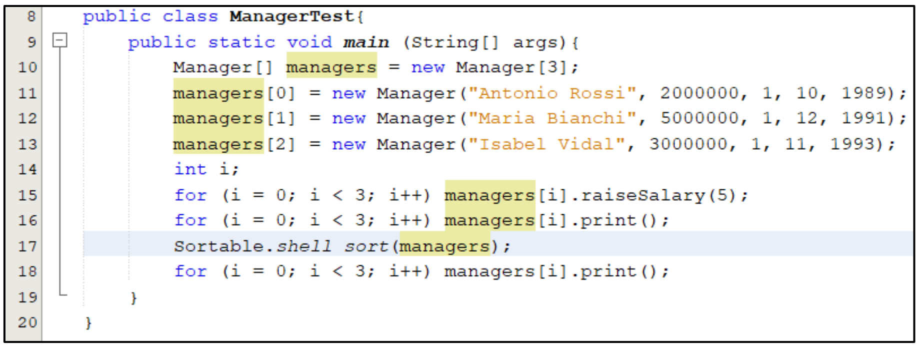
```java
    class Manager extends Employee implements Sortable{
```

Langkah 3 (Cara 2) : Jika mengikuti case 1, maka cukup tambahkan "extends Employee" maka Manager sudah implements Sortable

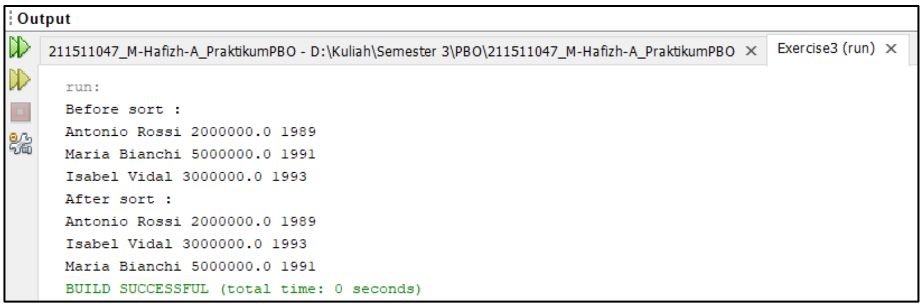


```java
    class Manager extends Employee{
```

Langkah 4 : Pengujian (ManagerTest.java)



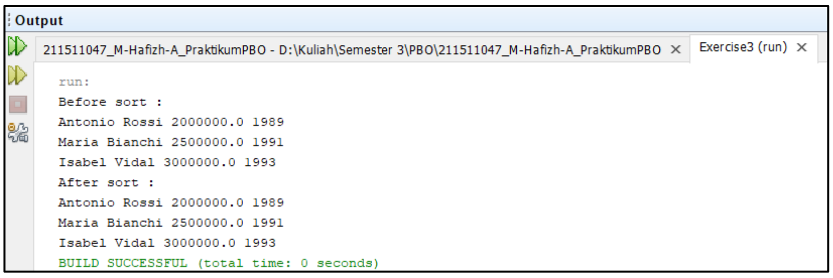
```java
public class ManagerTest{
    public static void main (String[] args){
        Manager[] managers = new Manager[3];
        managers[0] = new Manager("Antonio Rossi", 2000000, 1, 10, 1989);
        managers[1] = new Manager("Maria Bianchi", 5000000, 1, 12, 1991);
        managers[2] = new Manager("Isabel Vidal", 3000000, 1, 11, 1993);
        int i;
        for (i = 0; i < 3; i++) managers[i].raiseSalary(5);
        for (i = 0; i < 3; i++) managers[i].print();
        Sortable.shell_sort(managers);
        for (i = 0; i < 3; i++) managers[i].print();
    }
}
```


Output
211511047_M-Hafizh-A_PraktikumPBO - D:\Kuliah\Semester 3\PBO\211511047_M-Hafizh-A_PraktikumPBO
Exercise3 (run)

```
run:
Before sort :
Antonio Rossi 2000000.0 1989
Maria Bianchi 5000000.0 1991
Isabel Vidal 3000000.0 1993
After sort :
Antonio Rossi 2000000.0 1989
Isabel Vidal 3000000.0 1993
Maria Bianchi 5000000.0 1991
BUILD SUCCESSFUL (total time: 0 seconds)
```

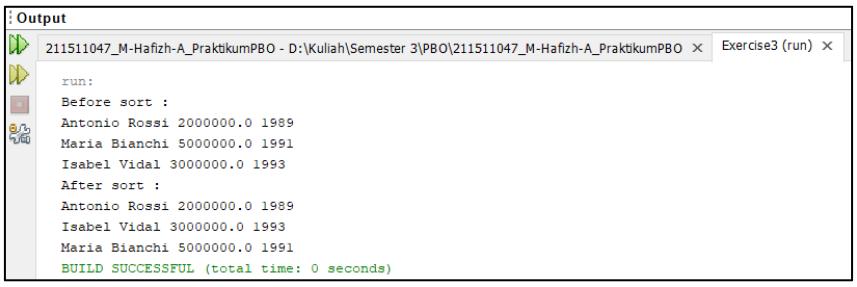
Hasil Akhir :

- Case 1


Output
211511047_M-Hafizh-A_PraktikumPBO - D:\Kuliah\Semester 3\PBO\211511047_M-Hafizh-A_PraktikumPBO
Exercise3 (run)

```
run:
Before sort :
Antonio Rossi 2000000.0 1989
Maria Bianchi 2500000.0 1991
Isabel Vidal 3000000.0 1993
After sort :
Antonio Rossi 2000000.0 1989
Maria Bianchi 2500000.0 1991
Isabel Vidal 3000000.0 1993
BUILD SUCCESSFUL (total time: 0 seconds)
```

- Case 2


Output
211511047_M-Hafizh-A_PraktikumPBO - D:\Kuliah\Semester 3\PBO\211511047_M-Hafizh-A_PraktikumPBO
Exercise3 (run)

```
run:
Before sort :
Antonio Rossi 2000000.0 1989
Maria Bianchi 5000000.0 1991
Isabel Vidal 3000000.0 1993
After sort :
Antonio Rossi 2000000.0 1989
Isabel Vidal 3000000.0 1993
Maria Bianchi 5000000.0 1991
BUILD SUCCESSFUL (total time: 0 seconds)
```

Permasalahan : Code shell sort yang didapat berdasarkan tipe data integer tidak sesuai kasus
Solusi : Memahami code dan mengubah kondisi komparasi dengan memanfaatkan fungsi Compare()
Teman yang membantu : -