W6 - FUNDAMENTAL PROGRAMMING STRUCTURES IN JAVA

LAPORAN PRAKTIKUM

Disusun untuk memenuhi tugas Mata Kuliah Pemrograman Berorientasi Objek

Disusun oleh

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PROGRAM STUDI D3 TEKNIK INFORMATIKA

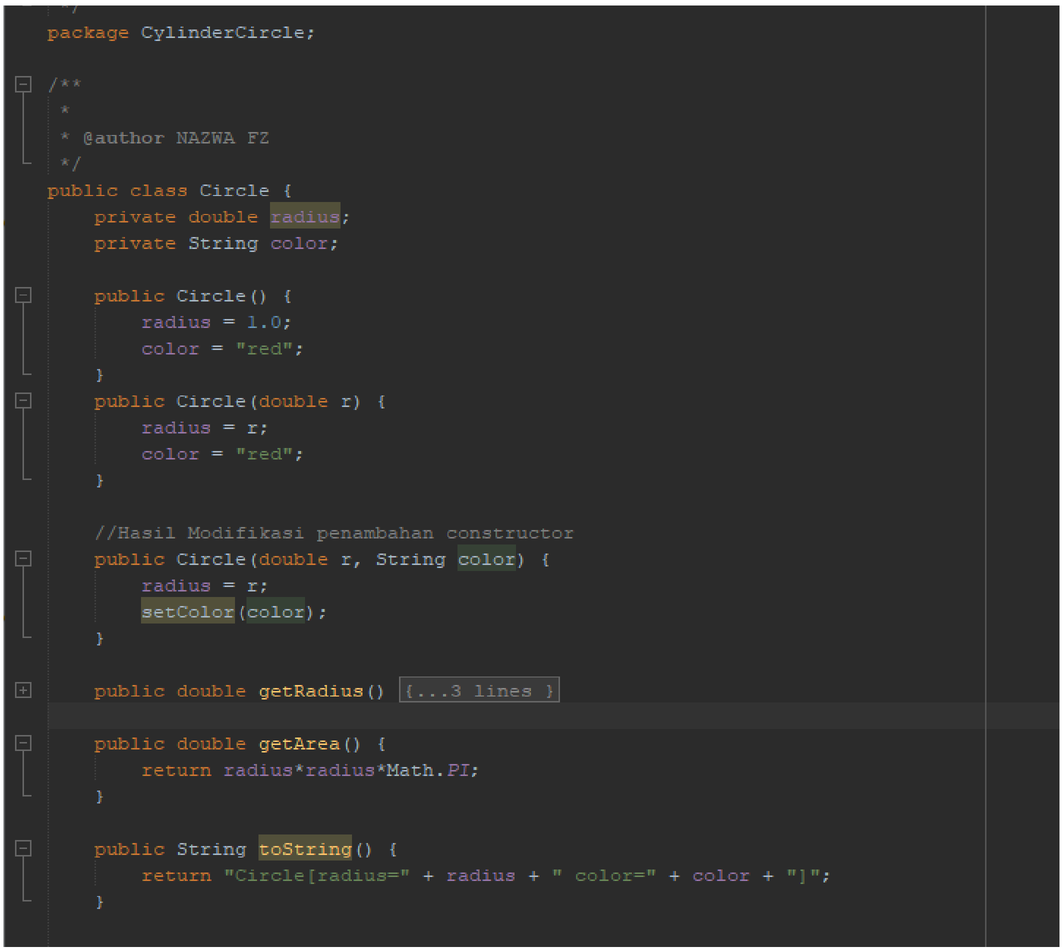
JURUSAN TEKNIK KOMPUTER DAN INFORMATIKA

POLITEKNIK NEGERI BANDUNG

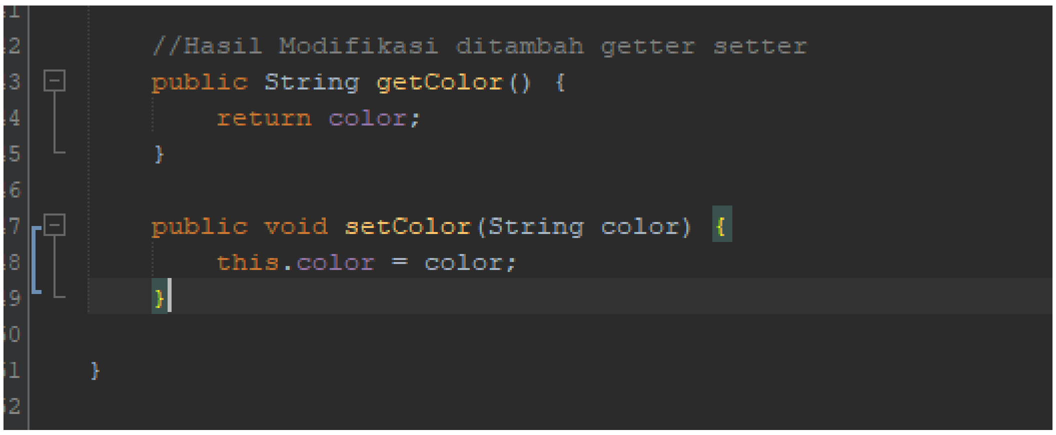
2022

A. Exercise 1

a.) Task 1.1 Modify class Circle



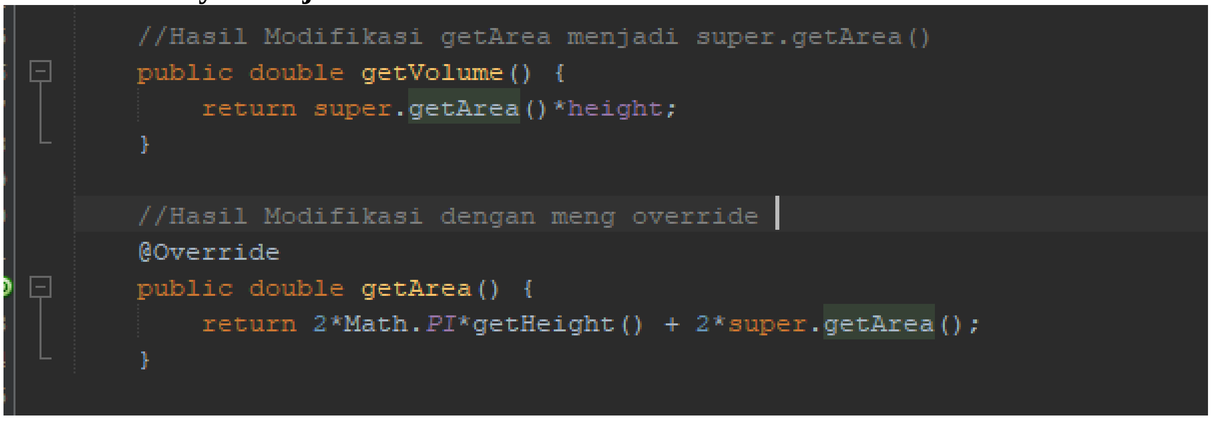
```
package CylinderCircle;

/**
 *
 * @author NAZWA FZ
 */
public class Circle {
    private double radius;
    private String color;

    public Circle() {
        radius = 1.0;
        color = "red";
    }
    public Circle(double r) {
        radius = r;
        color = "red";
    }

    //Hasil Modifikasi penambahan constructor
    public Circle(double r, String color) {
        radius = r;
        setColor(color);
    }

    public double getRadius() {...3 lines }

    public double getArea() {
        return radius*radius*Math.PI;
    }

    public String toString() {
        return "Circle[radius=" + radius + " color=" + color + "]";
    }
```



```
    //Hasil Modifikasi ditambah getter setter
    public String getColor() {
        return color;
    }

    public void setColor(String color) {
        this.color = color;
    }

}
```

b.) Task 1.2 Overiding the getArea() methode

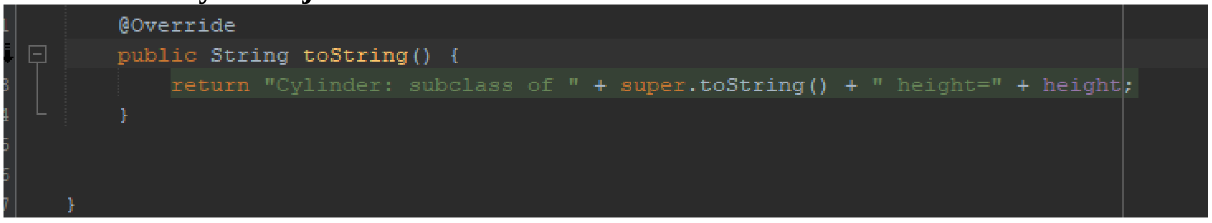
//Cylinder.java



```java
//Hasil Modifikasi getArea menjadi super.getArea()
public double getVolume() {
    return super.getArea()*height;
}

//Hasil Modifikasi dengan meng override
@Override
public double getArea() {
    return 2*Math.PI*getHeight() + 2*super.getArea();
}
```

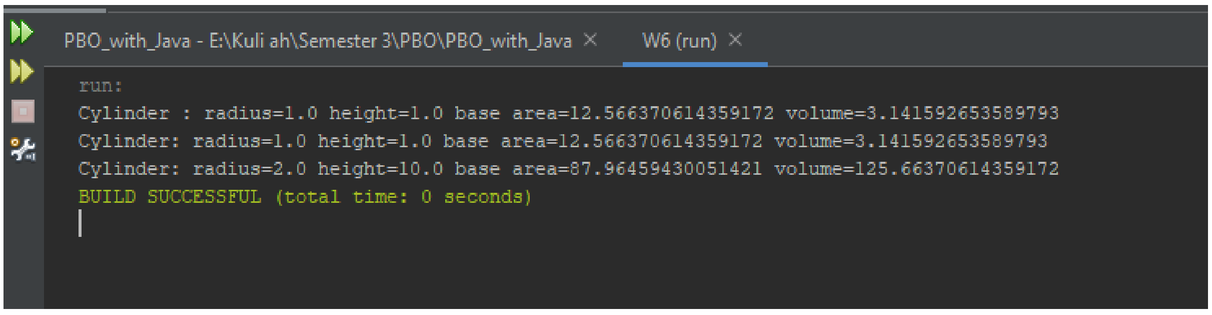
c.) Task 1.3 Provide a toString() methode

//Cylinder.java



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


}
```

Hasil Output :

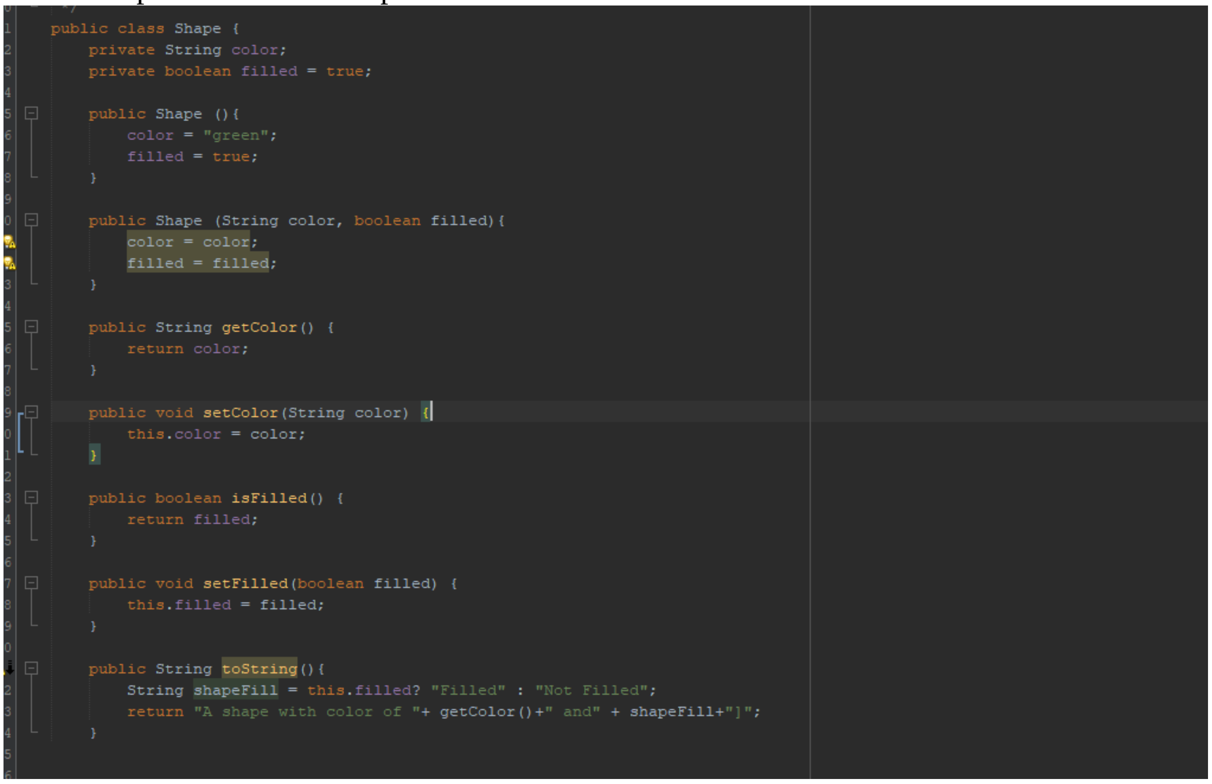


```
run:
Cylinder : radius=1.0 height=1.0 base area=12.566370614359172 volume=3.141592653589793
Cylinder: radius=1.0 height=1.0 base area=12.566370614359172 volume=3.141592653589793
Cylinder: radius=2.0 height=10.0 base area=87.96459430051421 volume=125.66370614359172
BUILD SUCCESSFUL (total time: 0 seconds)
```

B. Exercise 2

a.) Task 2.1

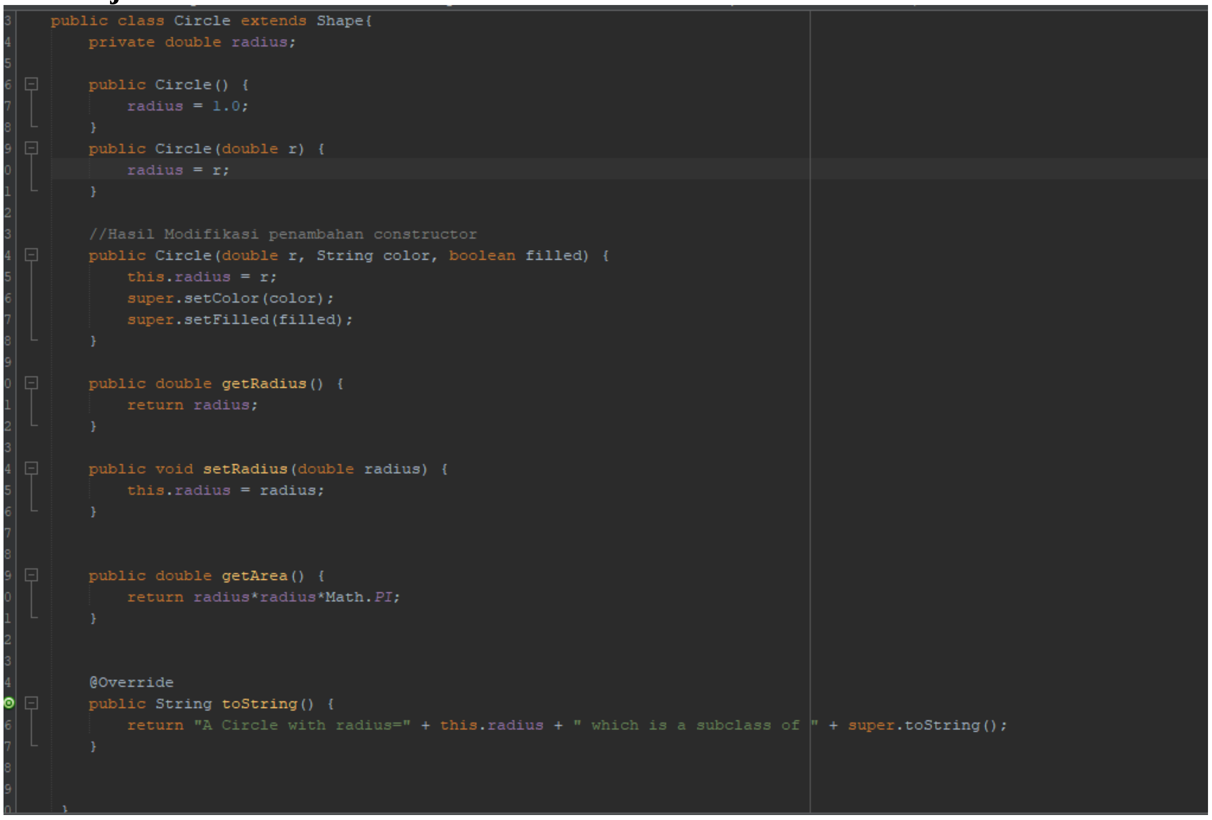
Write a superclass called Shape



```java
public class Shape {
    private String color;
    private boolean filled = true;

    public Shape (){
        color = "green";
        filled = true;
    }

    public Shape (String color, boolean filled){
        color = color;
        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;
    }

    public String toString(){
        String shapeFill = this.filled? "Filled" : "Not Filled";
        return "A shape with color of "+ getColor()+" and" + shapeFill+"]";
    }
```

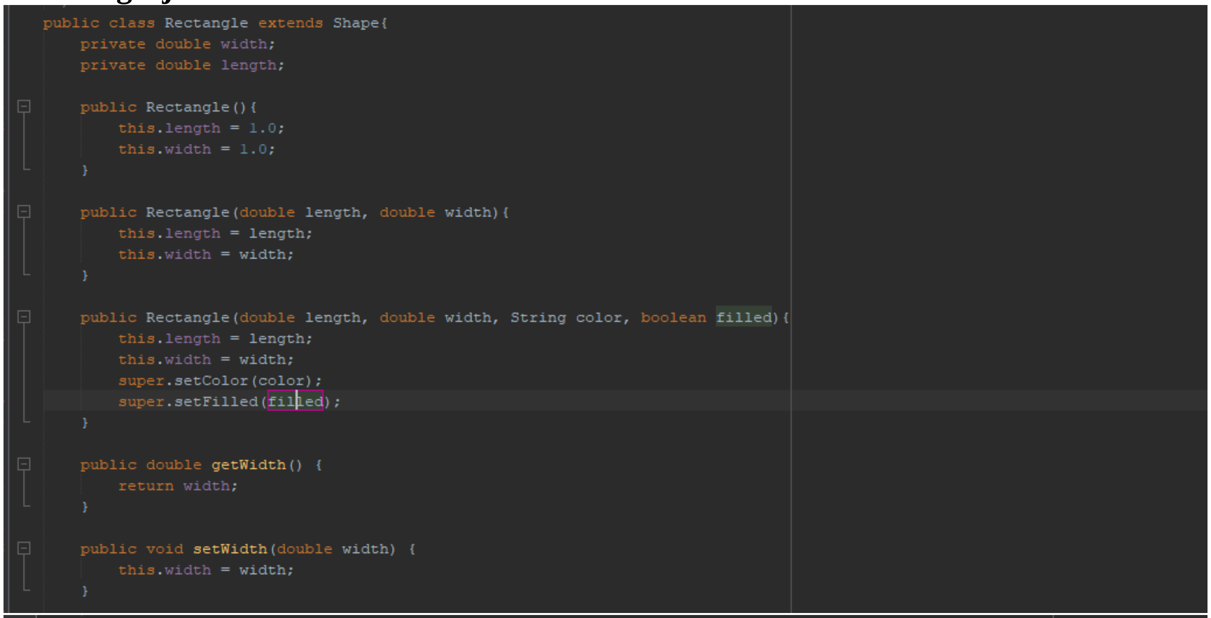
Write two subclasses of Shape called Circle and Rectangle

//Circle.java

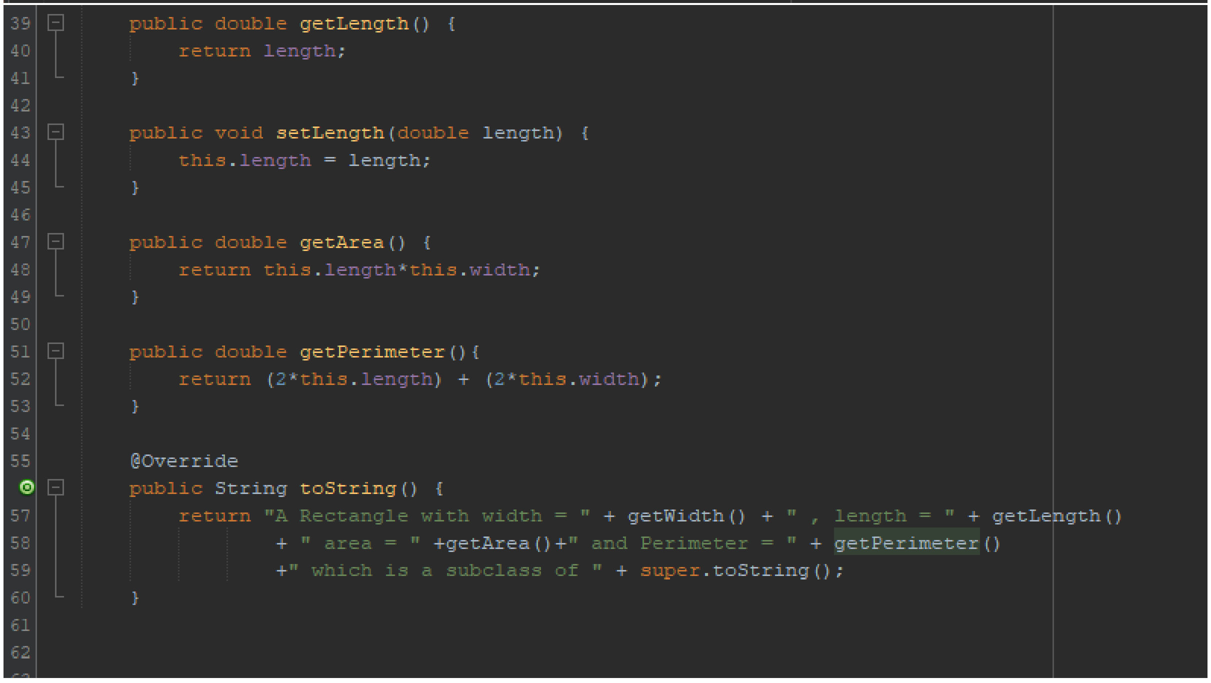


```java
public class Circle extends Shape{
    private double radius;

    public Circle() {
        radius = 1.0;
    }
    public Circle(double r) {
        radius = r;
    }

    //Hasil Modifikasi penambahan constructor
    public Circle(double r, String color, boolean filled) {
        this.radius = r;
        super.setColor(color);
        super.setFilled(filled);
    }

    public double getRadius() {
        return radius;
    }

    public void setRadius(double radius) {
        this.radius = radius;
    }


    public double getArea() {
        return radius*radius*Math.PI;
    }


    @Override
    public String toString() {
        return "A Circle with radius=" + this.radius + " which is a subclass of " + super.toString();
    }


}
```

//Rectangle.java

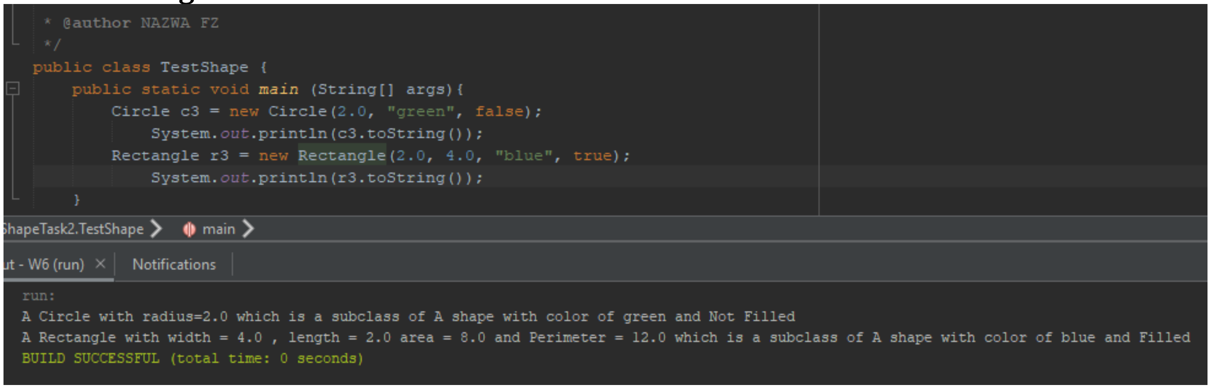


```java
public class Rectangle extends Shape{
    private double width;
    private double length;

    public Rectangle(){
        this.length = 1.0;
        this.width = 1.0;
    }

    public Rectangle(double length, double width){
        this.length = length;
        this.width = width;
    }

    public Rectangle(double length, double width, String color, boolean filled){
        this.length = length;
        this.width = width;
        super.setColor(color);
        super.setFilled(filled);
    }

    public double getWidth() {
        return width;
    }

    public void setWidth(double width) {
        this.width = width;
    }
```



```java
    public double getLength() {
        return length;
    }

    public void setLength(double length) {
        this.length = length;
    }

    public double getArea() {
        return this.length*this.width;
    }

    public double getPerimeter(){
        return (2*this.length) + (2*this.width);
    }

    @Override
    public String toString() {
        return "A Rectangle with width = " + getWidth() + " , length = " + getLength()
                + " area = " +getArea()+" and Perimeter = " + getPerimeter()
                +" which is a subclass of " + super.toString();
    }
```

Hasil running :

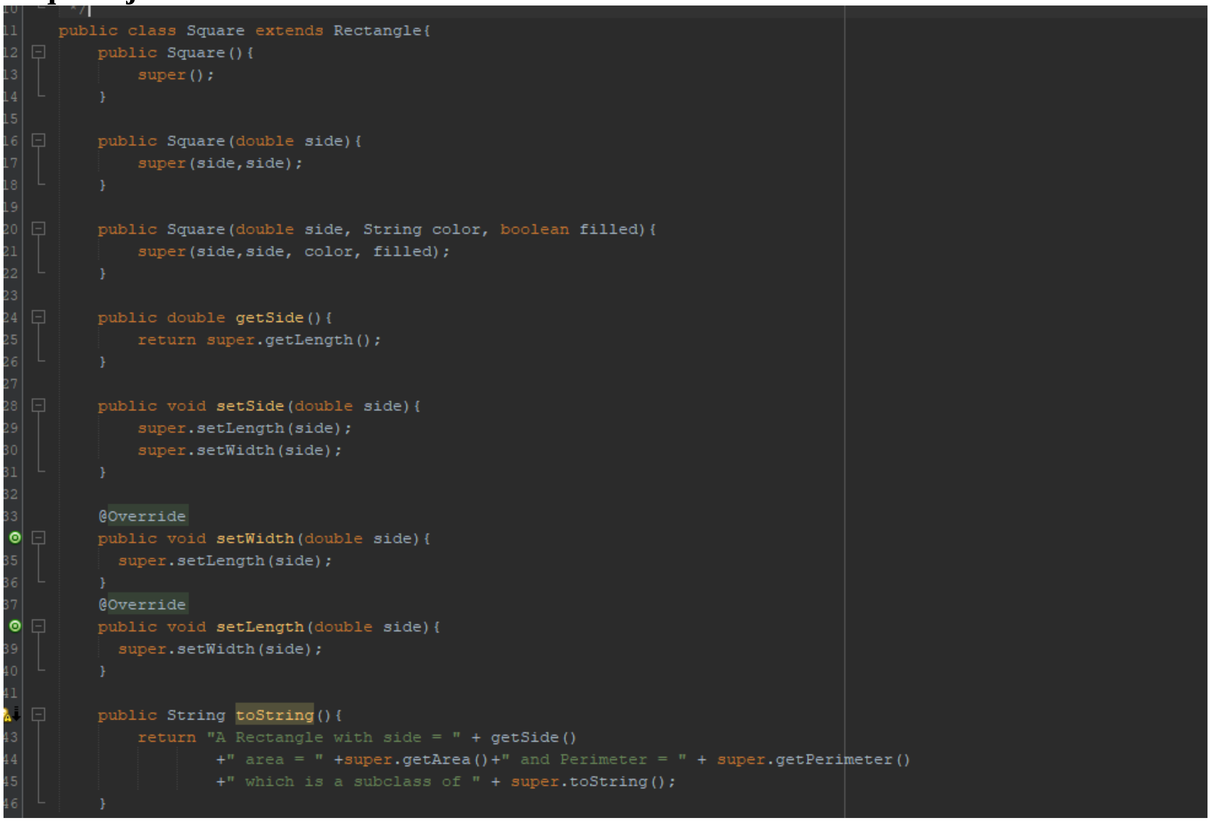


```java
 * @author NAZWA FZ
 */
public class TestShape {
    public static void main (String[] args){
        Circle c3 = new Circle(2.0, "green", false);
            System.out.println(c3.toString());
        Rectangle r3 = new Rectangle(2.0, 4.0, "blue", true);
            System.out.println(r3.toString());
    }
```

```
run:
A Circle with radius=2.0 which is a subclass of A shape with color of green and Not Filled
A Rectangle with width = 4.0 , length = 2.0 area = 8.0 and Perimeter = 12.0 which is a subclass of A shape with color of blue and Filled
BUILD SUCCESSFUL (total time: 0 seconds)
```

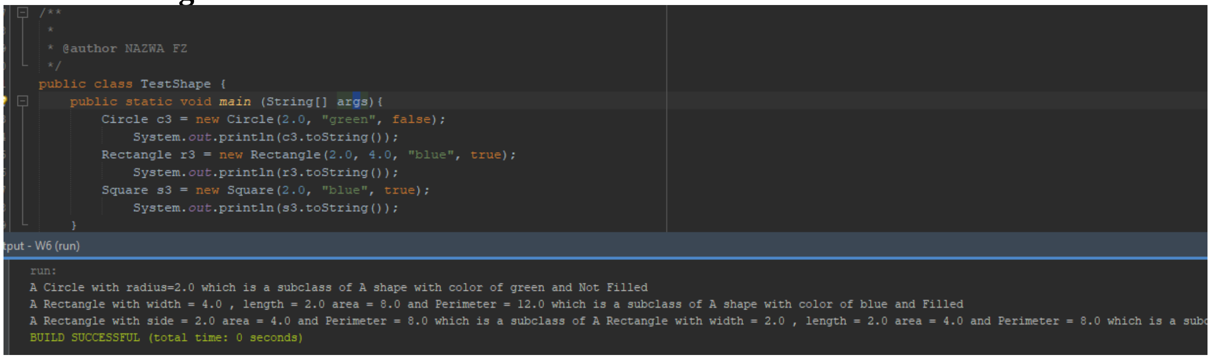
Write a class called Square, as a subclass of Rectangle

//Square.java



```java
 */
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){
      super.setLength(side);
    }
    @Override
    public void setLength(double side){
      super.setWidth(side);
    }

    public String toString(){
        return "A Rectangle with side = " + getSide()
                +" area = " +super.getArea()+" and Perimeter = " + super.getPerimeter()
                +" which is a subclass of " + super.toString();
    }
```

Hasil running :



```java
/**
 *
 * @author NAZWA FZ
 */
public class TestShape {
    public static void main (String[] args){
        Circle c3 = new Circle(2.0, "green", false);
            System.out.println(c3.toString());
        Rectangle r3 = new Rectangle(2.0, 4.0, "blue", true);
            System.out.println(r3.toString());
        Square s3 = new Square(2.0, "blue", true);
            System.out.println(s3.toString());
    }
```

tput - W6 (run)

```
run:
A Circle with radius=2.0 which is a subclass of A shape with color of green and Not Filled
A Rectangle with width = 4.0 , length = 2.0 area = 8.0 and Perimeter = 12.0 which is a subclass of A shape with color of blue and Filled
A Rectangle with side = 2.0 area = 4.0 and Perimeter = 8.0 which is a subclass of A Rectangle with width = 2.0 , length = 2.0 area = 4.0 and Perimeter = 8.0 which is a subc
BUILD SUCCESSFUL (total time: 0 seconds)
```

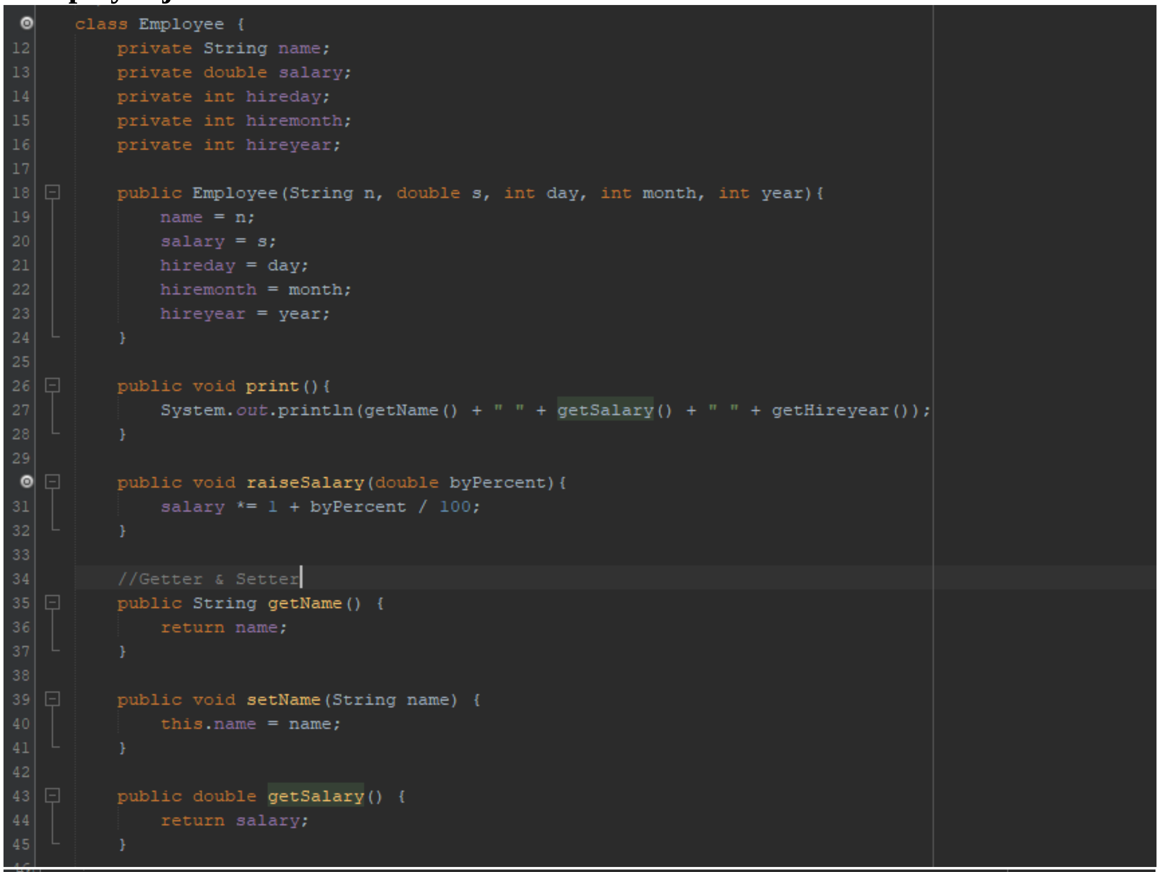
C. Exercise 3

a.) Task 3.1

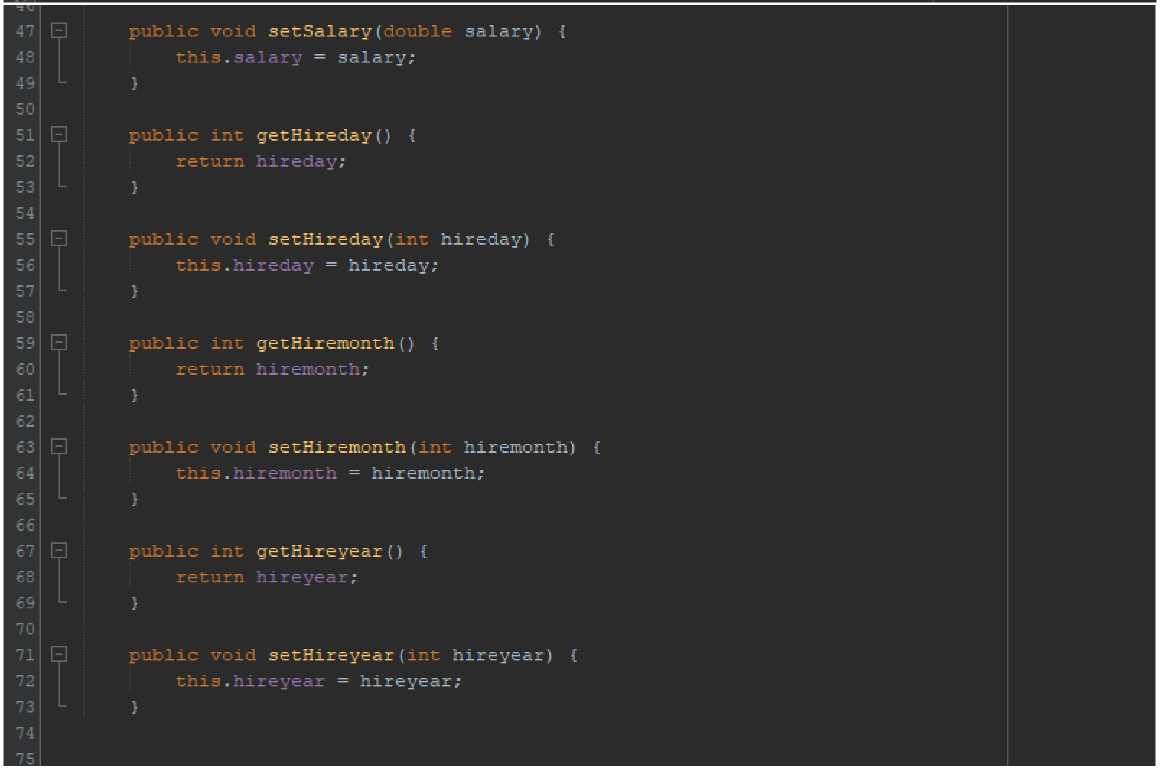
Write code above, and analyzed how it work

Berikut code yang telah di modifikasi

//Employee.java

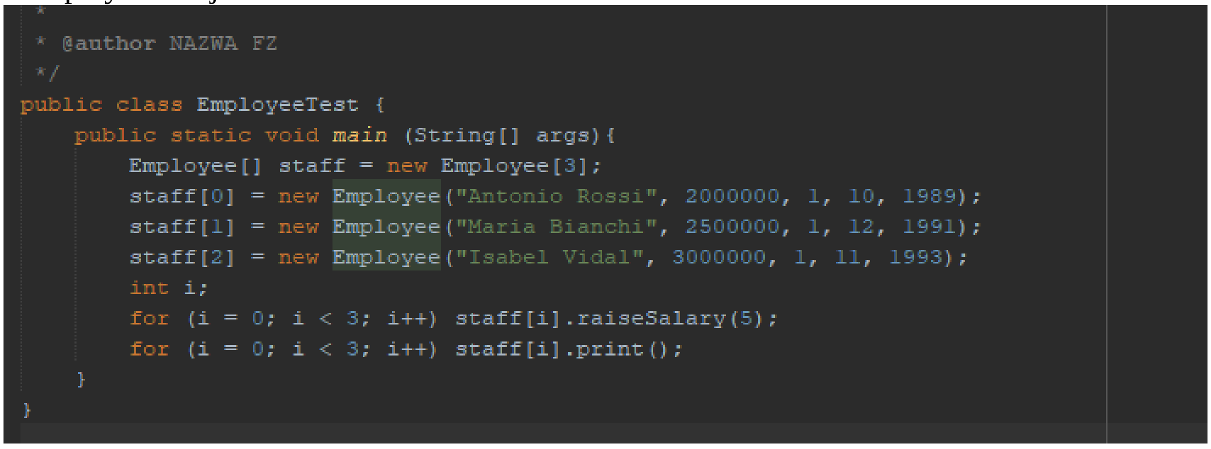


```java
class Employee {
    private String name;
    private double salary;
    private int hireday;
    private int hiremonth;
    private int hireyear;

    public Employee(String n, double s, int day, int month, int year){
        name = n;
        salary = s;
        hireday = day;
        hiremonth = month;
        hireyear = year;
    }

    public void print(){
        System.out.println(getName() + " " + getSalary() + " " + getHireyear());
    }

    public void raiseSalary(double byPercent){
        salary *= 1 + byPercent / 100;
    }

    //Getter & Setter
    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public double getSalary() {
        return salary;
    }
```

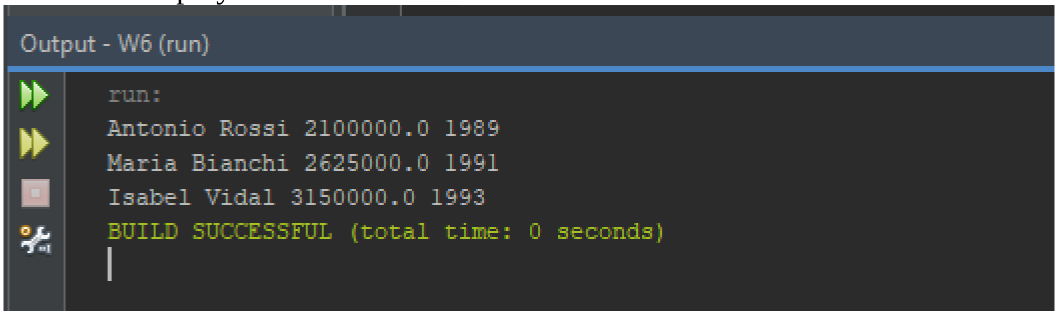


```java
    public void setSalary(double salary) {
        this.salary = salary;
    }

    public int getHireday() {
        return hireday;
    }

    public void setHireday(int hireday) {
        this.hireday = hireday;
    }

    public int getHiremonth() {
        return hiremonth;
    }

    public void setHiremonth(int hiremonth) {
        this.hiremonth = hiremonth;
    }

    public int getHireyear() {
        return hireyear;
    }

    public void setHireyear(int hireyear) {
        this.hireyear = hireyear;
    }

```

//EmployeeTest.java


```
 *
 * @author NAZWA FZ
 */
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);
        int i;
        for (i = 0; i < 3; i++) staff[i].raiseSalary(5);
        for (i = 0; i < 3; i++) staff[i].print();
    }
}
```

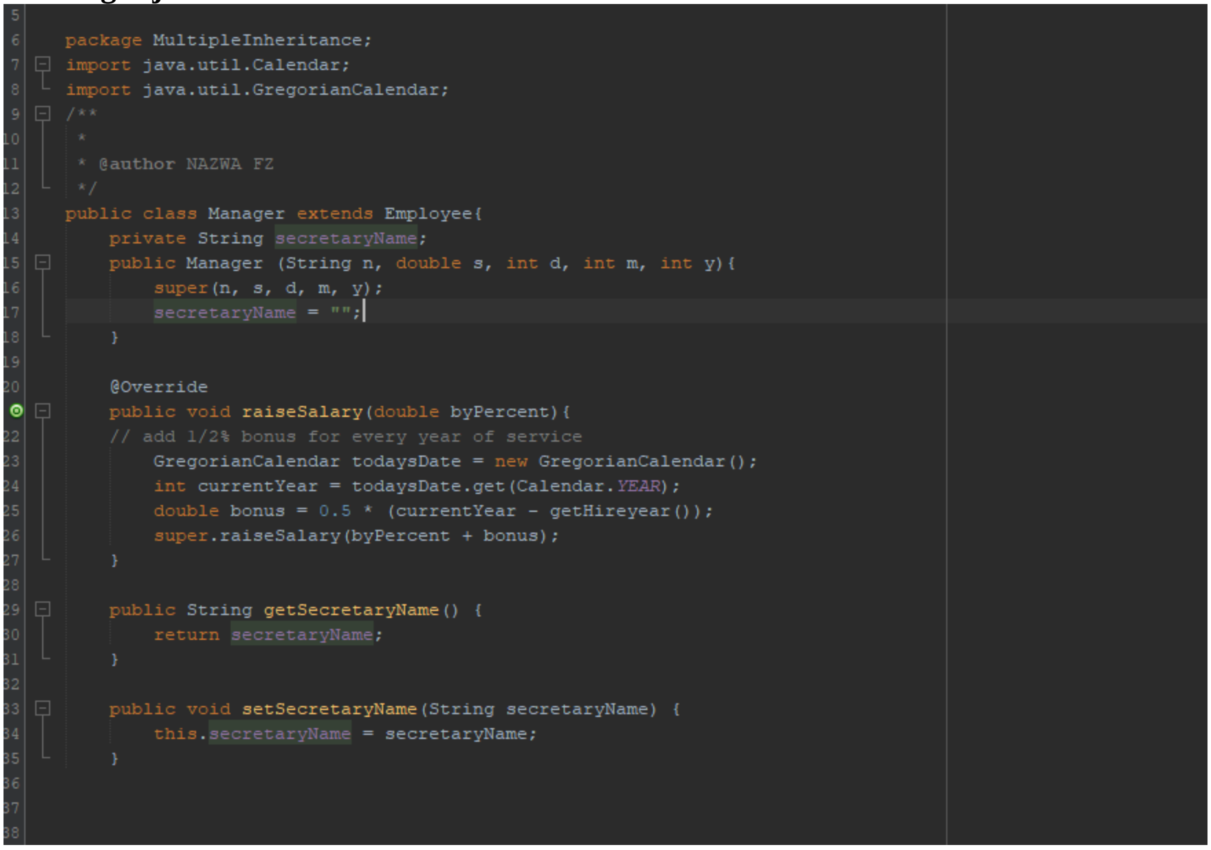
Hasil test Employee :



```
run:
Antonio Rossi 2100000.0 1989
Maria Bianchi 2625000.0 1991
Isabel Vidal 3150000.0 1993
BUILD SUCCESSFUL (total time: 0 seconds)
```

Gaji pegawai naik sebanyak 5%

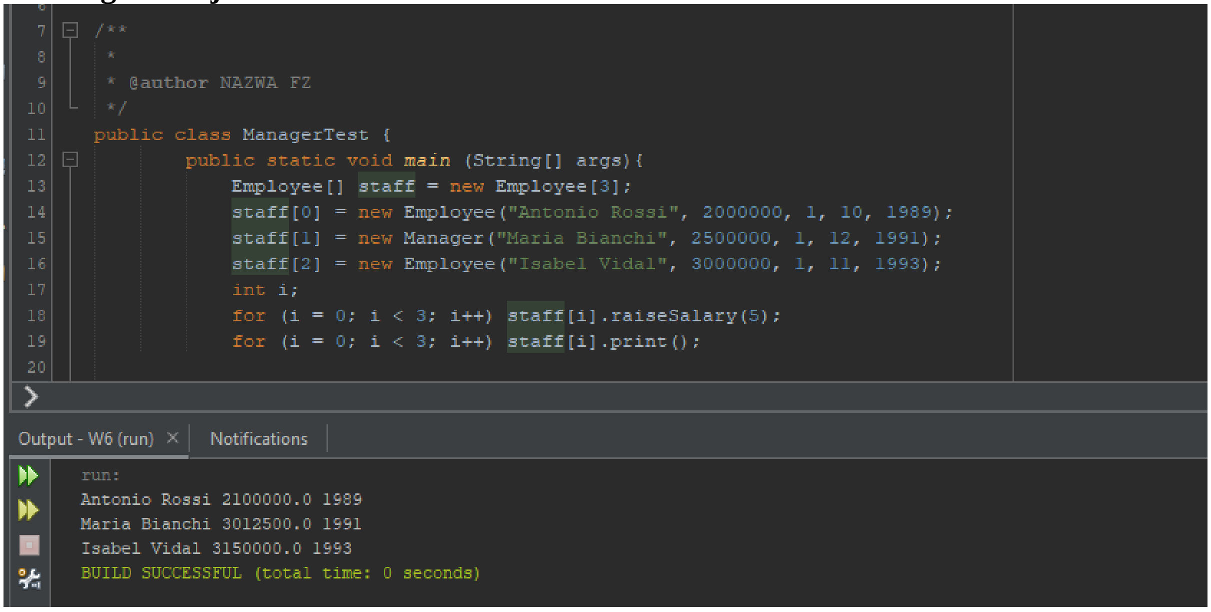
//Manager.java



```java
package MultipleInheritance;
import java.util.Calendar;
import java.util.GregorianCalendar;
/**
 *
 * @author NAZWA FZ
 */
public class Manager extends Employee{
    private String secretaryName;
    public Manager (String n, double s, int d, int m, int y){
        super(n, s, d, m, y);
        secretaryName = "";
    }

    @Override
    public void raiseSalary(double byPercent){
    // add 1/2% bonus for every year of service
        GregorianCalendar todaysDate = new GregorianCalendar();
        int currentYear = todaysDate.get(Calendar.YEAR);
        double bonus = 0.5 * (currentYear - getHireyear());
        super.raiseSalary(byPercent + bonus);
    }

    public String getSecretaryName() {
        return secretaryName;
    }

    public void setSecretaryName(String secretaryName) {
        this.secretaryName = secretaryName;
    }
```

Dicobakan apabila staf merupakan manager

//ManagerTest.java



```java
/**
 *
 * @author NAZWA FZ
 */
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);
            int i;
            for (i = 0; i < 3; i++) staff[i].raiseSalary(5);
            for (i = 0; i < 3; i++) staff[i].print();
```

```
run:
Antonio Rossi 2100000.0 1989
Maria Bianchi 3012500.0 1991
Isabel Vidal 3150000.0 1993
BUILD SUCCESSFUL (total time: 0 seconds)
```

Dapat dilihat perbedaannya, bahwa gaji manager lebih besar naiknya dibanding karyawan lainnya. Di dalam class manager riseSalary khusus manager dilakukan override, sehingga manager mendapatkan bonus. Kenaikan gaji manager itu, (5% dari gaji saat ini)+ (lama tahun bekerja x 0,5). Sehingga disini untuk manager dengan lama bekerja 31 tahun mendapatkan kenaikan gaji sebesar 20,5%.

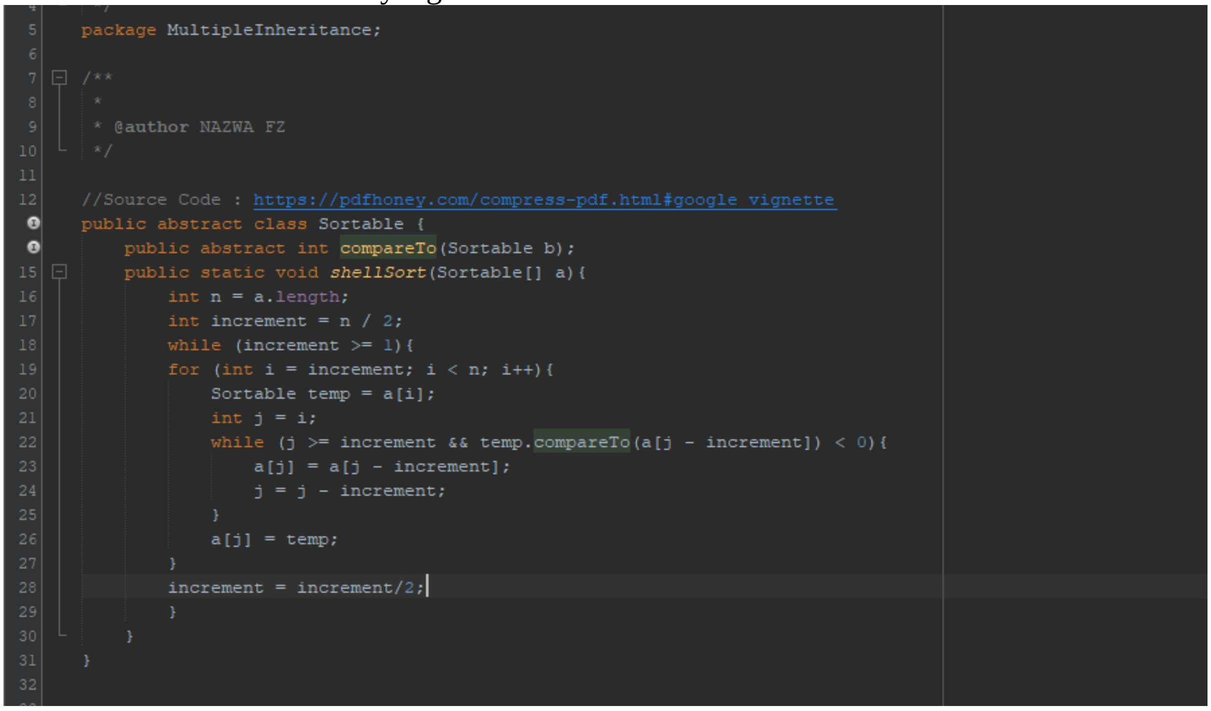
Perhitungannya :

lama bekerja = 31 tahun
persentase gaji = 5%
gaji semula = 2.500.000

gaji total =((kenaikan gaji + (lama bekerja/2)%) * gaji semula) + gaji semula
gaji total = (5%+ 15,5%)*2.500.000 + 2.500.000
gaji total = (20,5% * 2.500.000) + 2.500.000
gaji total = 512.000 + 2.500.000
gaji total = 3.012.500

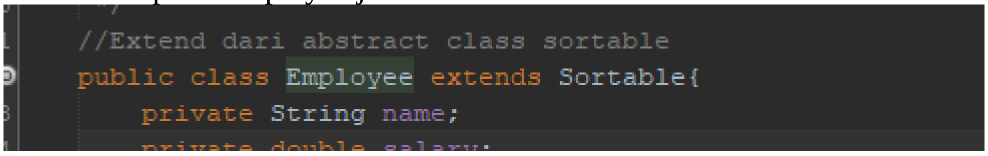
[CASE 1]

*Add abstract class Sortable
Berikut adalah class sortable yang telah ditambahkan

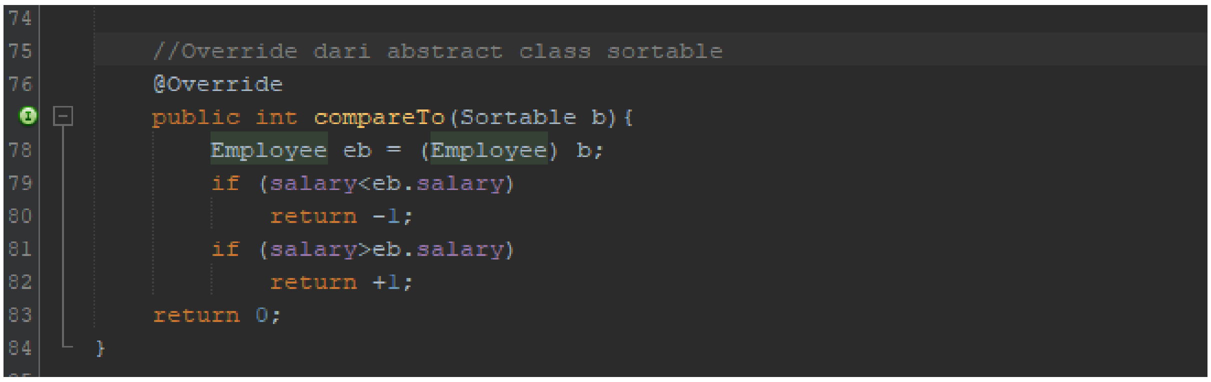


```java
package MultipleInheritance;

/**
 *
 * @author NAZWA FZ
 */

//Source Code : https://pdfhoney.com/compress-pdf.html#google_vignette
public abstract class Sortable {
    public abstract int compareTo(Sortable b);
    public static void shellSort(Sortable[] a){
        int n = a.length;
        int increment = n / 2;
        while (increment >= 1){
        for (int i = increment; i < n; i++){
            Sortable temp = a[i];
            int j = i;
            while (j >= increment && temp.compareTo(a[j - increment]) < 0){
                a[j] = a[j - increment];
                j = j - increment;
            }
            a[j] = temp;
        }
        increment = increment/2;
        }
    }
}
```

Modifikasi pada Employee.java

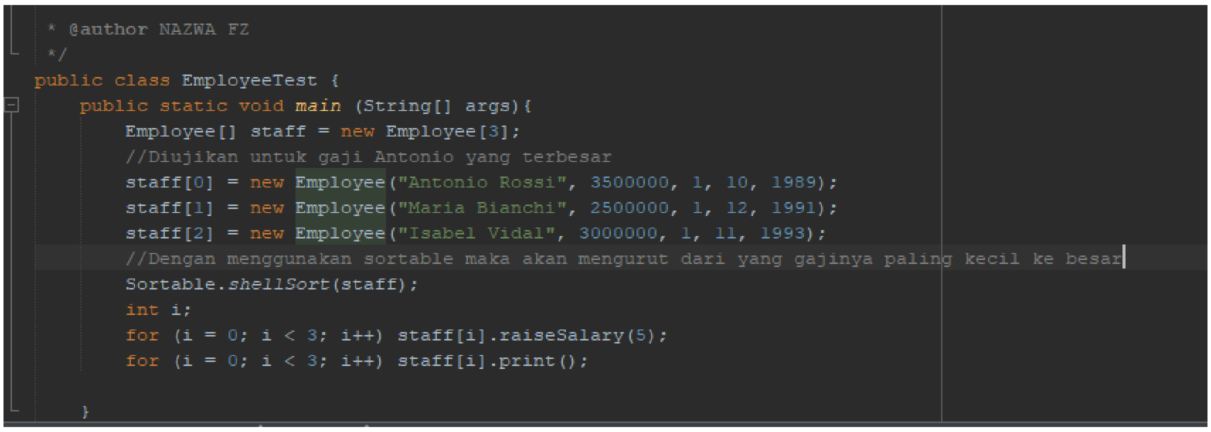


```java
//Extend dari abstract class sortable
public class Employee extends Sortable{
    private String name;
    private double salary;
```



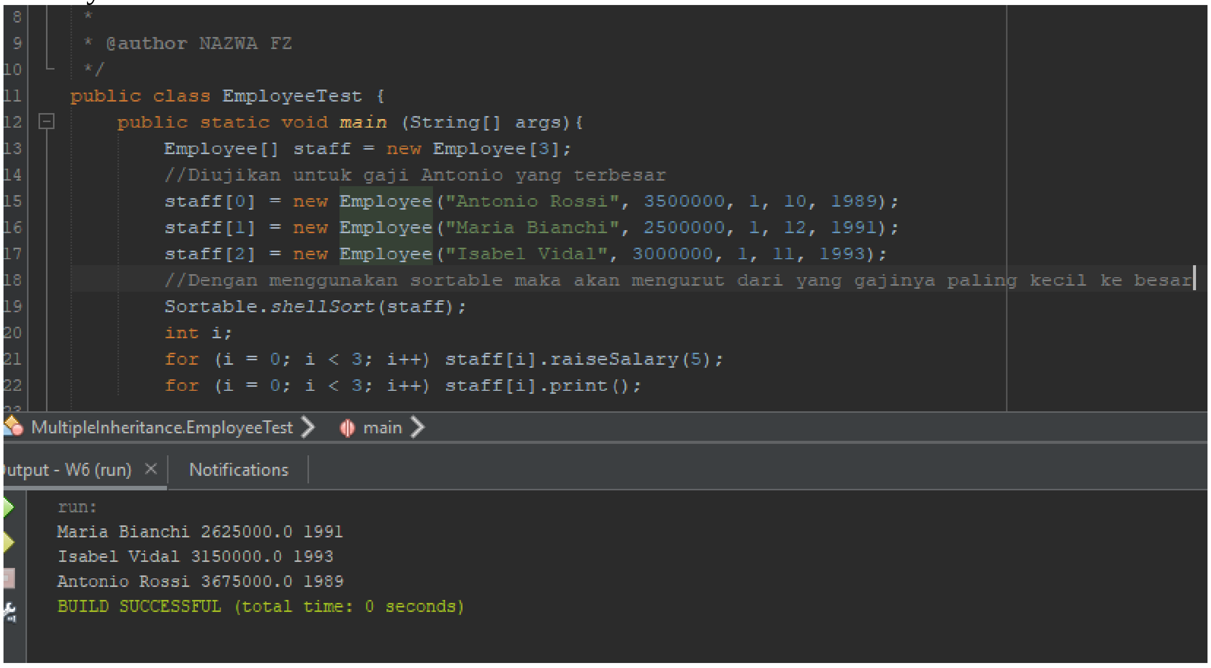
```java

    //Override dari abstract class sortable
    @Override
    public int compareTo(Sortable b){
        Employee eb = (Employee) b;
        if (salary<eb.salary)
            return -1;
        if (salary>eb.salary)
            return +1;
    return 0;
}
```

Pemanggilan method pada EmployeeTest.java



```java
 * @author NAZWA FZ
 */
public class EmployeeTest {
    public static void main (String[] args){
        Employee[] staff = new Employee[3];
        //Diujikan untuk gaji Antonio yang terbesar
        staff[0] = new Employee("Antonio Rossi", 3500000, 1, 10, 1989);
        staff[1] = new Employee("Maria Bianchi", 2500000, 1, 12, 1991);
        staff[2] = new Employee("Isabel Vidal", 3000000, 1, 11, 1993);
        //Dengan menggunakan sortable maka akan mengurut dari yang gajinya paling kecil ke besar
        Sortable.shellSort(staff);
        int i;
        for (i = 0; i < 3; i++) staff[i].raiseSalary(5);
        for (i = 0; i < 3; i++) staff[i].print();

    }
```

Hasilnya :

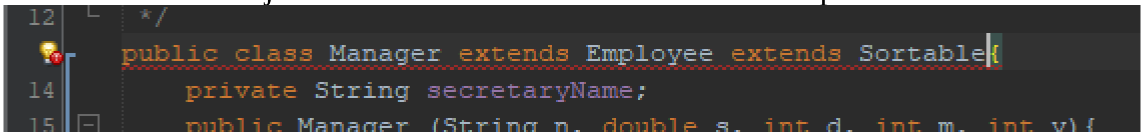


```java
 *
 * @author NAZWA FZ
 */
public class EmployeeTest {
    public static void main (String[] args){
        Employee[] staff = new Employee[3];
        //Diujikan untuk gaji Antonio yang terbesar
        staff[0] = new Employee("Antonio Rossi", 3500000, 1, 10, 1989);
        staff[1] = new Employee("Maria Bianchi", 2500000, 1, 12, 1991);
        staff[2] = new Employee("Isabel Vidal", 3000000, 1, 11, 1993);
        //Dengan menggunakan sortable maka akan mengurut dari yang gajinya paling kecil ke besar
        Sortable.shellSort(staff);
        int i;
        for (i = 0; i < 3; i++) staff[i].raiseSalary(5);
        for (i = 0; i < 3; i++) staff[i].print();
```

```
run:
Maria Bianchi 2625000.0 1991
Isabel Vidal 3150000.0 1993
Antonio Rossi 3675000.0 1989
BUILD SUCCESSFUL (total time: 0 seconds)
```

Pegawai diurutkan menurut besar gajinya dari gaji terkecil ke gaji terbesar.

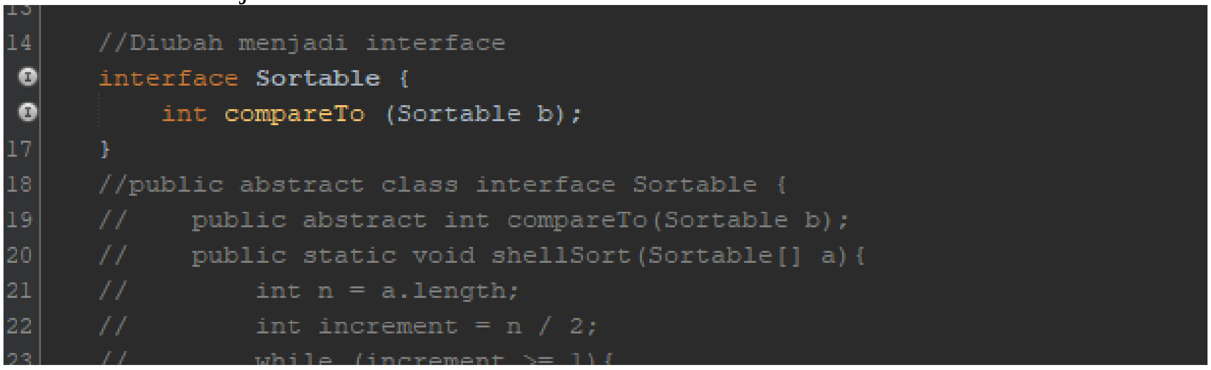
[CASE 2]
Imagine that we want to order the Managers in a similar way
It will be work?
→ Tidak akan bekerja karena satu class tidak boleh memiliki 2 parent



```java
 */
public class Manager extends Employee extends Sortable{
    private String secretaryName;
    public Manager (String n, double s, int d, int m, int y){
```

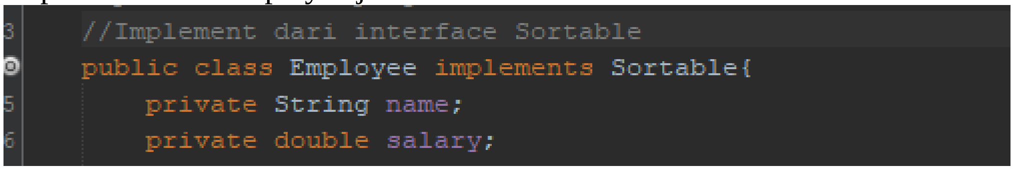
What is your solution?
→ Dengan mengubah Sortable menjadi Interface

Interface Sortable.java



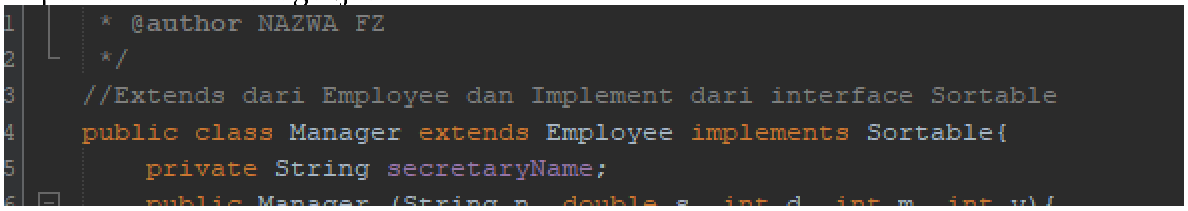
```java
//Diubah menjadi interface
interface Sortable {
    int compareTo (Sortable b);
}
//public abstract class interface Sortable {
//    public abstract int compareTo(Sortable b);
//    public static void shellSort(Sortable[] a){
//        int n = a.length;
//        int increment = n / 2;
//        while (increment >= 1){
```

Implementasi di Employee.java



```java
//Implement dari interface Sortable
public class Employee implements Sortable{
    private String name;
    private double salary;
```

Implementasi di Manager.java



```java
 * @author NAZWA FZ
 */
//Extends dari Employee dan Implement dari interface Sortable
public class Manager extends Employee implements Sortable{
    private String secretaryName;
    public Manager (String n, double s, int d, int m, int y){
```

Kendala : Dikarenakan di teori belum sampai materi interface sehingga kesulitan saat menggerjakan tugas ini
Solusi : Mencari di Internet mengenai interface
Sumber : https://pdfhoney.com/compress-pdf.html#google_vignette
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