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SOLID PRINCIPLES ASSIGNMENT

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Question

Identify how the following code violates the Liskov Substitution Principle? Also, correct the code in order it to be correct as per the Liskov Substitution Principle.

Code:

```
class Rectangle{
  int m_width;
  int m_height;

  public void setWidth(int width){
    m_width = width;
  }

  public void setHeight(int h) {
    m_height = h;
  }

  public int getWidth() {
    return m_width;
  }

  public int getHeight() {
    return m_height;
  }

  public int getArea() {
    return m_width * m_height;
  }
}

class Square extends Rectangle {
  public void setWidth (int width) {
    m_width = width;
    m_height = width;
  }

  public void setHeight (int height) {
    m_width = height;
    m_height = height;
  }
}
```

Solution

In the given Code it violates the Liskov Substitution Principle. Liskop Substitution Principle state that the child class behave like parent class.

- This code violates the behaviour of Rectangle class. As we know that LSP principle states that any instance of subtype should be able to used in place of parent class.
- However in this code an object of **Square class has both set width and set height**, it **will affect** the code which is **not** follow the **Liskov Substitution Principle**.
- That's why we have to add the **setSquareSide** in the **Square class** and pass only single parameter in it.

Solution

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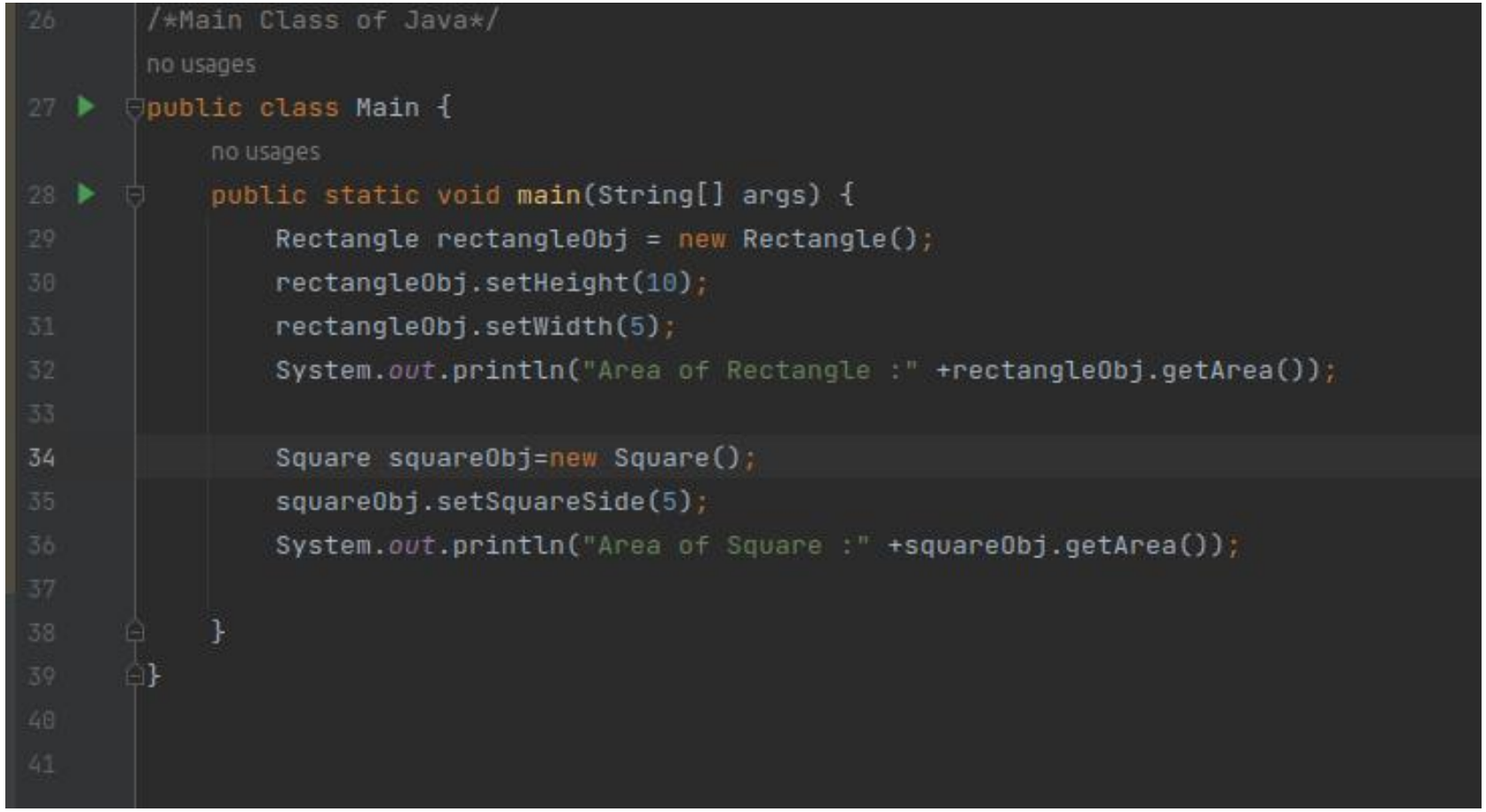
```
3 usages  1 inheritor
class Rectangle{
    4 usages
    int width;
    4 usages
    int height;
    1 usage
    public void setWidth(int width){
        this.width = width;
    }
    1 usage
    public void setHeight(int height) {
        this.height = height;
    }
    no usages
    public int getWidth() {
        return this.width;
    }
    no usages
    public int getHeight() {
        return this.height;
    }
    2 usages
    public int getArea() {
        return this.width * this.height;
    }
}
2 usages
class Square extends Rectangle{
    1 usage
    public void setSquareSide(int side){
        width = side;
        height = side;
    }
}
```

Solution

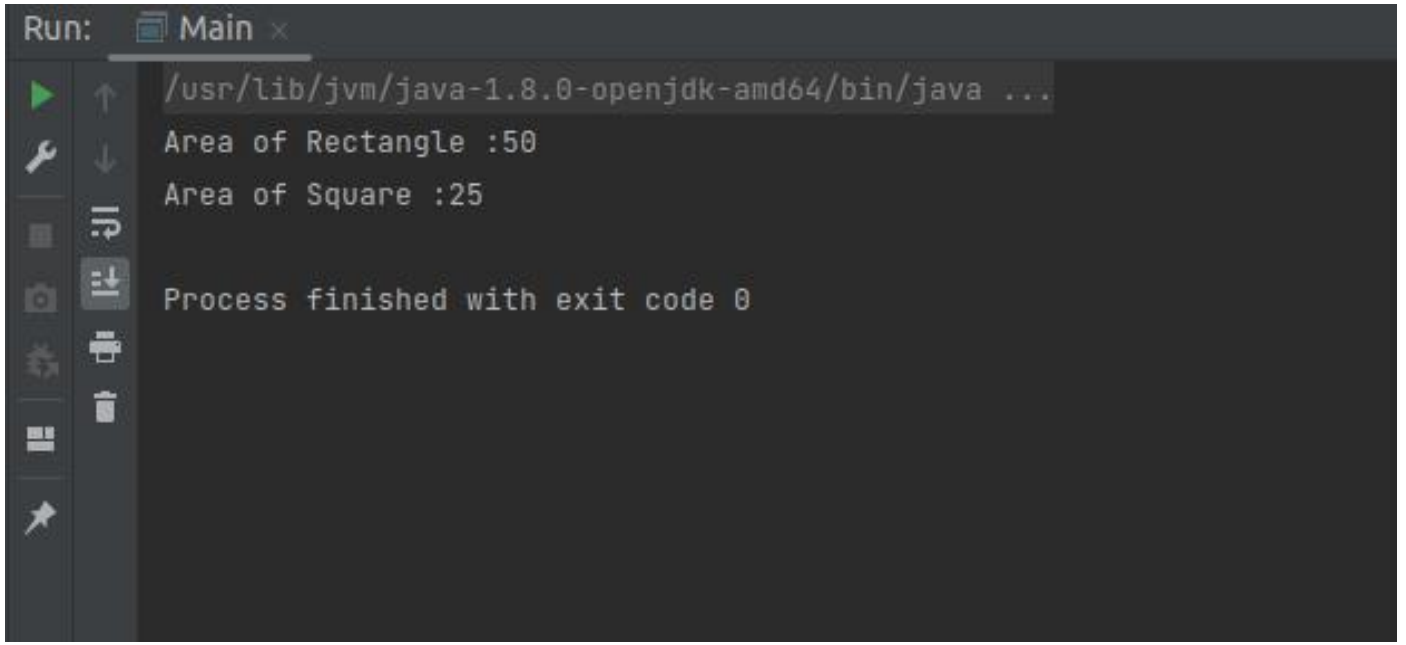


```java
/*Main Class of Java*/
no usages
public class Main {
    no usages
    public static void main(String[] args) {
        Rectangle rectangleObj = new Rectangle();
        rectangleObj.setHeight(10);
        rectangleObj.setWidth(5);
        System.out.println("Area of Rectangle :" +rectangleObj.getArea());

        Square squareObj=new Square();
        squareObj.setSquareSide(5);
        System.out.println("Area of Square :" +squareObj.getArea());

    }
}
```

Output


Run:
Main
/usr/lib/jvm/java-1.8.0-openjdk-amd64/bin/java ...
Area of Rectangle :50
Area of Square :25
Process finished with exit code 0

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THANK YOU

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