

Lab Sheet 7

Exercise 01:

1. `final class Student`: The `Student` class is declared as `final`, which means it cannot be subclassed. It is the final class in this hierarchy and cannot be extended by any other class.
2. `final int marks = 100`:: The variable `marks` is declared as `final`, which means it cannot be changed once initialized. It acts as a constant and has the value 100.
3. `final void display()`: The method `display()` is declared as `final`, which means it cannot be overridden in any subclass. Once a method is marked as `final`, it cannot be further modified in any subclass.
4. `class Undergraduate extends Student { }`: The `Undergraduate` class is a subclass of the `Student` class. As the `Student` class is marked as `final`, it cannot be subclassed, so the attempt to create a subclass called `Undergraduate` will result in a compilation error.

Outcome:

The code will result in a compilation error due to the attempt to create a subclass of the final class `Student`. The error will occur in the `Undergraduate` class, as it is not allowed to extend a final class. Additionally, if there were an attempt to override the final method `display()` in the subclass, it would also result in a compilation error.

Exercise 02:

Shape class

```
package com.mycompany.shapemain;

abstract class Shape
{
    protected String name;

    public Shape(String name)
```

```
{  
    this.name = name;  
}  
  
abstract void calculateArea();  
  
void display() {  
    System.out.println("The shape is: " + name);  
}  
}
```

Rectangle class

```
package com.mycompany.shapemain;  
  
import java.awt.*;  
  
class Rectangle extends Shape  
{  
    private int length;  
    private int width;  
  
    public Rectangle(String name, int length, int width)  
    {  
        super(name);  
        this.length = length;  
        this.width = width;  
    }  
  
    @Override  
    void calculateArea()  
    {
```

```
int area = length * width;

System.out.println("The area of the rectangle is: " + area);

}

}
```

Circle class

```
package com.mycompany.shapemain;

import java.awt.*;

class Circle extends Shape
{
    private int radius;

    public Circle(String name, int radius)
    {
        super(name);
        this.radius = radius;
    }

    @Override
    void calculateArea()
    {
        double area = Math.PI * radius * radius;

        System.out.println("The area of the circle is: " + area);
    }
}
```

MAIN

```
package com.mycompany.shapemain;

import java.awt.*;

public class ShapeMain {

    public static void main(String[] args)
    {
        Shape circle = new Circle("Circle", 10);

        circle.display();

        circle.calculateArea();

        Shape rectangle = new Rectangle("Rectangle", 20, 30);

        rectangle.display();

        rectangle.calculateArea();
    }
}
```