SLTC Research University

BSC. (HONS) IN ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING

ECS2301-Software Engineering and Project

LAB ASSIGNMENT NO. : 04

INDEX NUMBER **:** 23UG1- 0152_Akindu Randira

15th FEBRUARY 2025

1. Create a class 'Degree' having a method 'getDegree' that prints "I got a degree". It has two subclasses namely 'Undergraduate' and 'Postgraduate' each having a method with the same name that prints "I am an Undergraduate" and "I am a Postgraduate" respectively. Call the method by creating an object of each of the three classes.

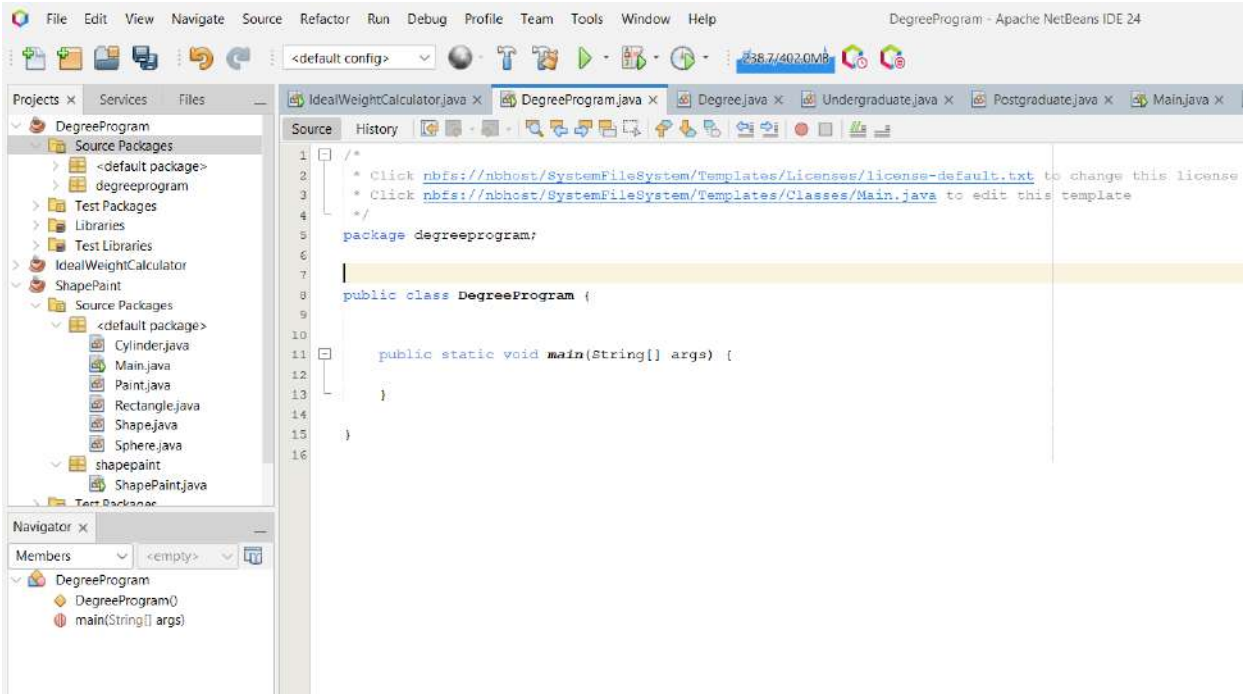

Figure 1 : DegreeProgram Class

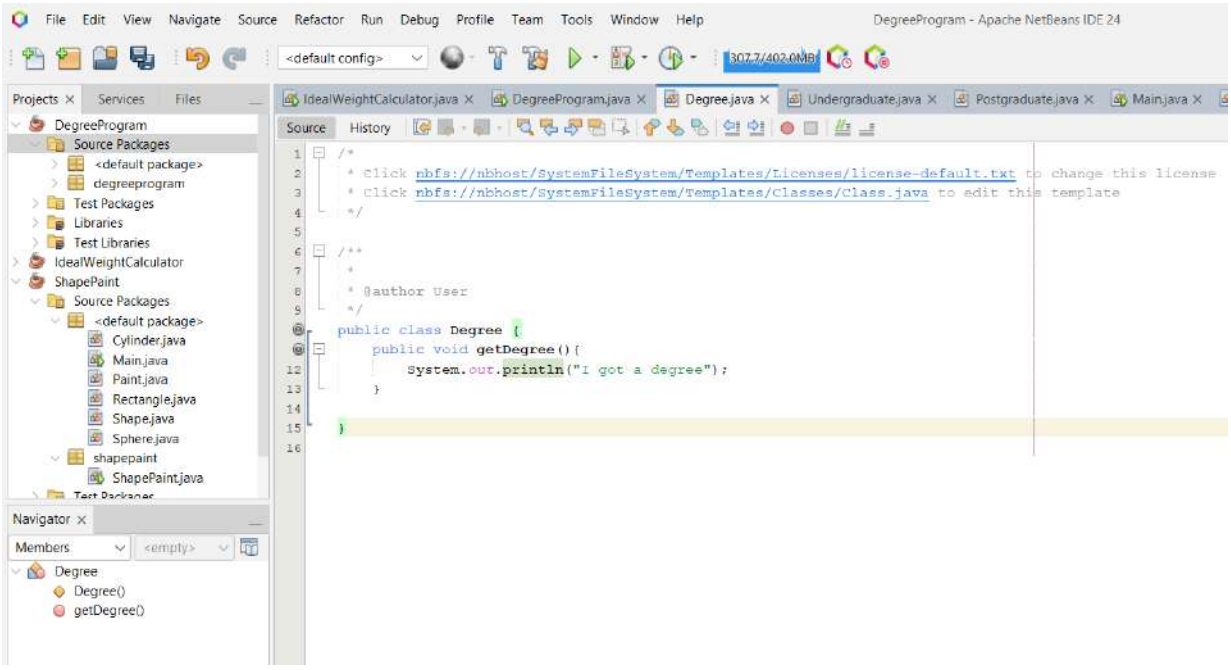

Figure 2 : Degree Class

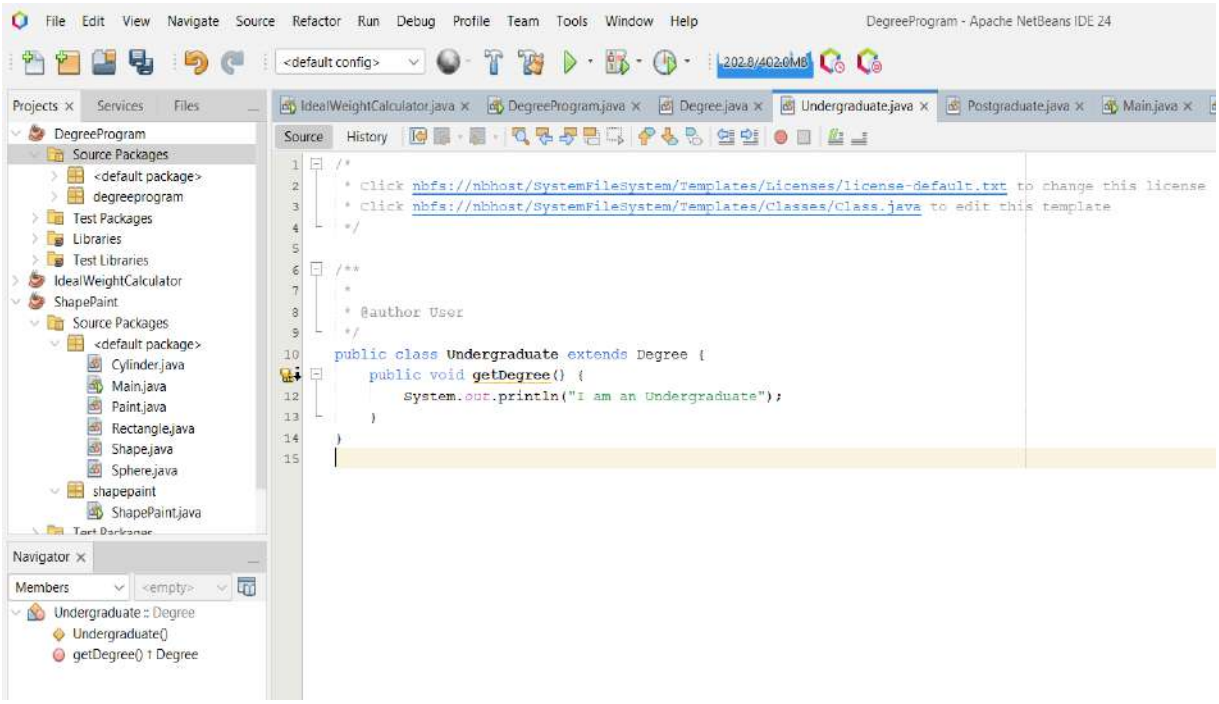

Figure 3 : Undergraduate Class

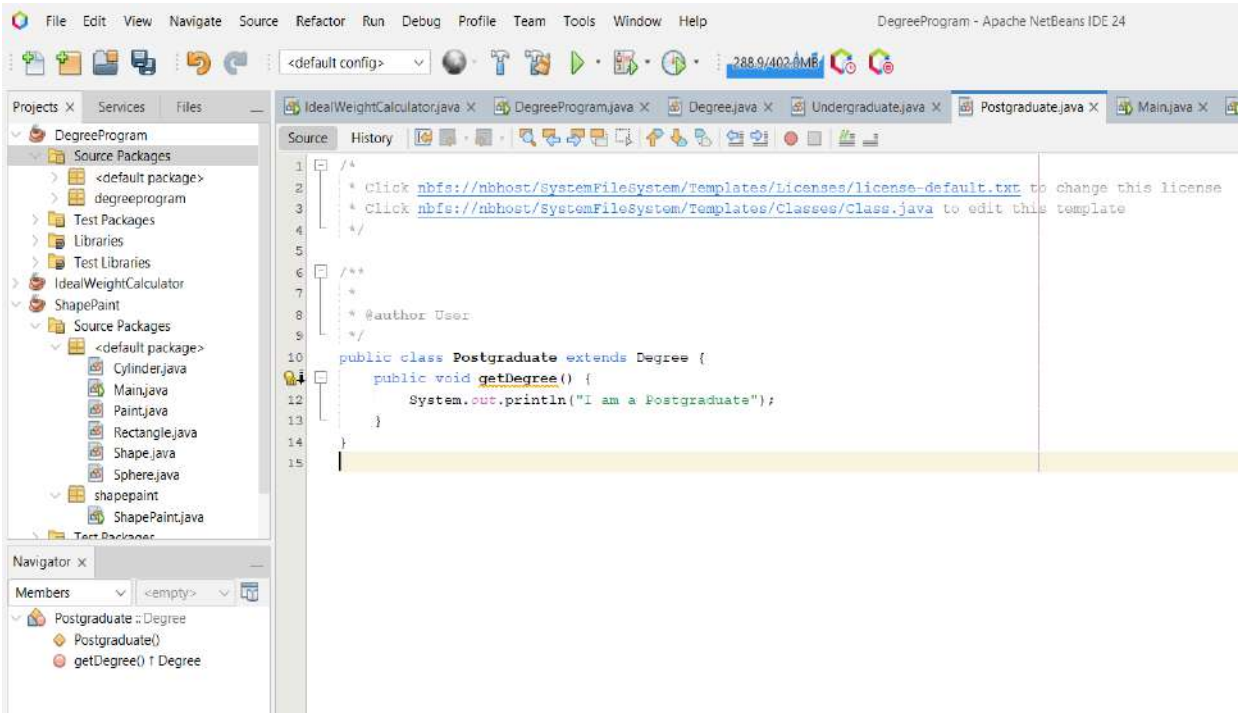

Figure 4 : Postgraduate Class

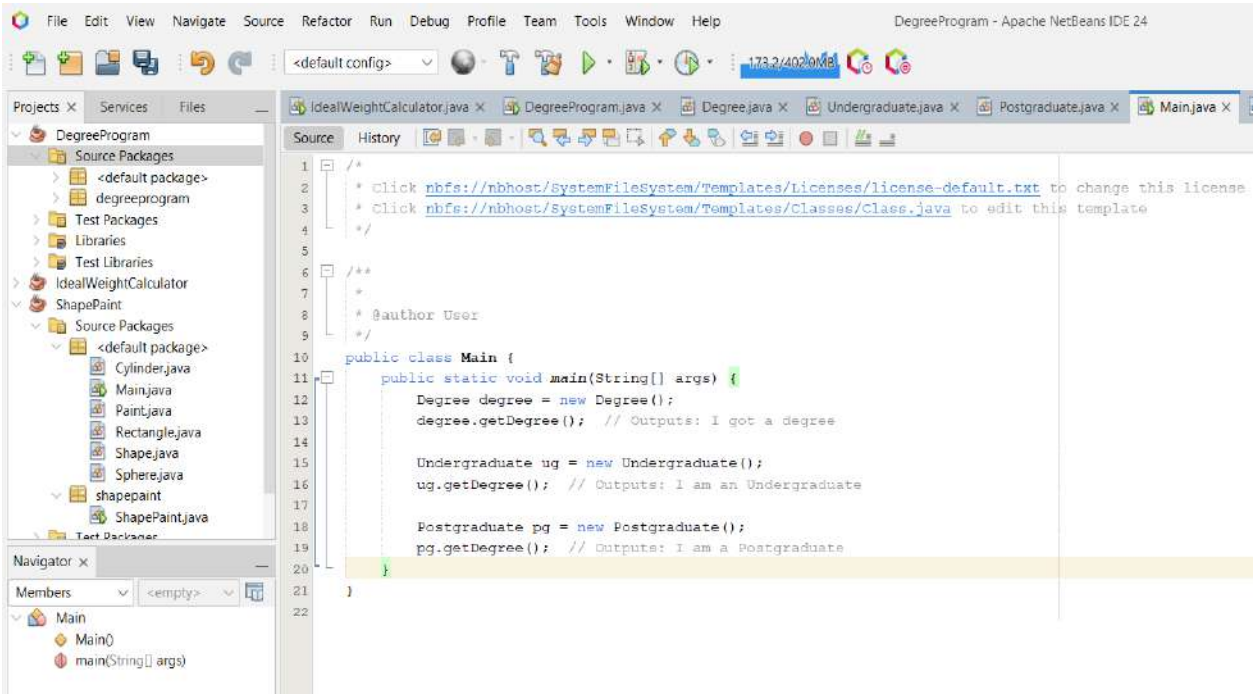

Figure 5 : Main Class

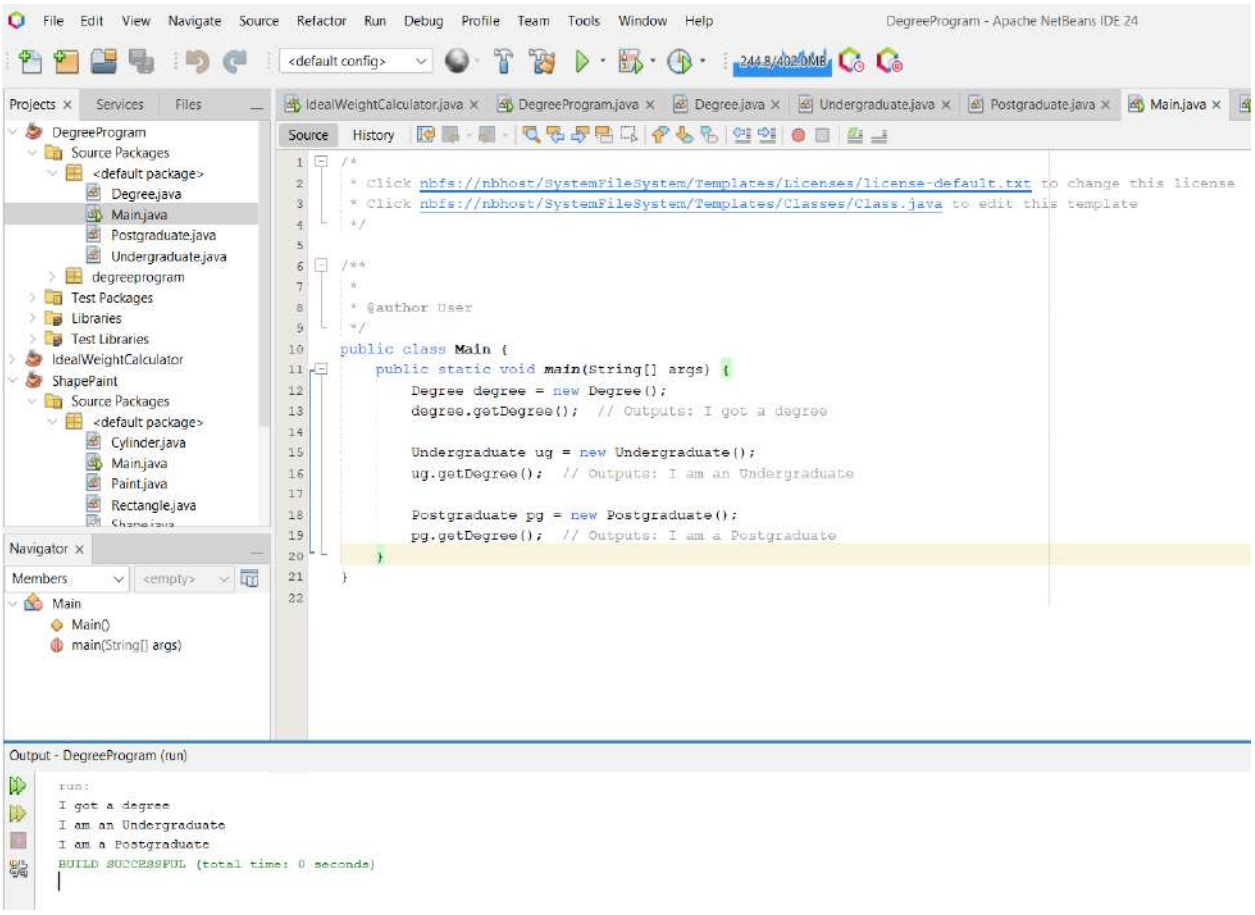

Figure 6 : Output

2. Develop a class hierarchy of shapes and write a program that computes the amount of paint needed to paint different objects. The hierarchy will consist of a parent class Shape with three derived classes - Sphere, Rectangle, and Cylinder. For the purposes of this exercise, the only attribute a shape will have is a name and the method of interest will be one that computes the area of the shape (surface area in the case of three-dimensional shapes). Do the following.

a) Write an abstract class Shape with the following properties:

- An instance variable shapeName of type String
- An abstract method area()
- A toString method that returns the name of the shape

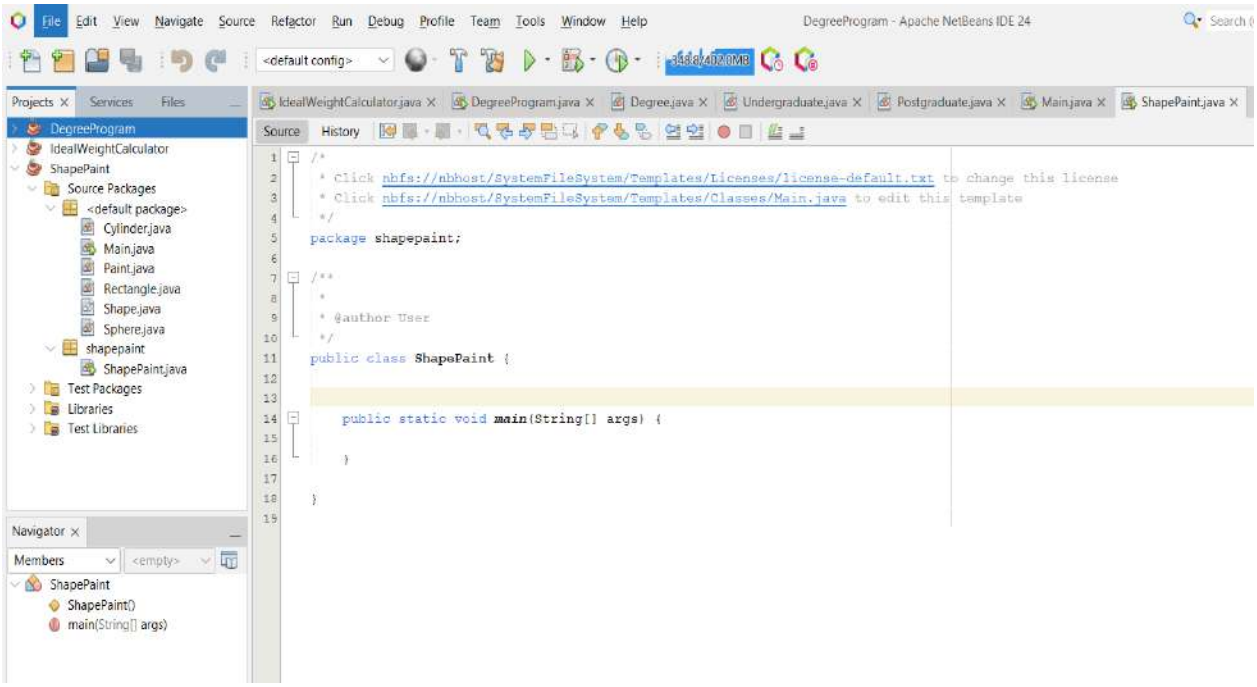

Figure 7 : ShapePaint Class

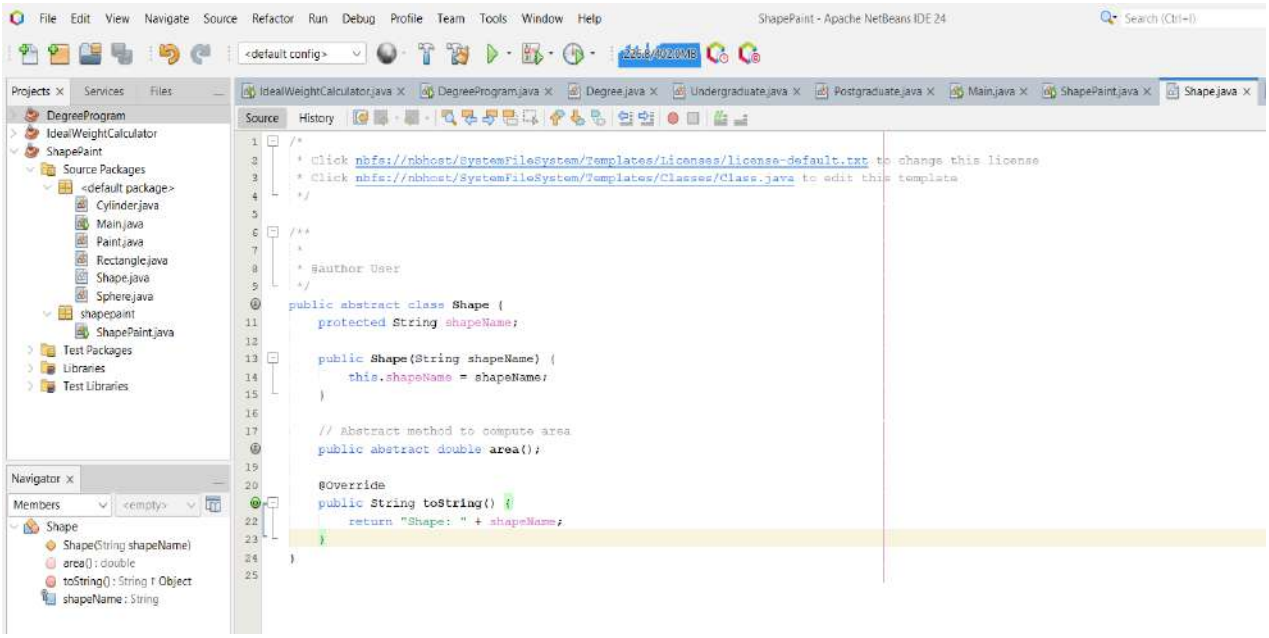

Figure 8 : Shape Class

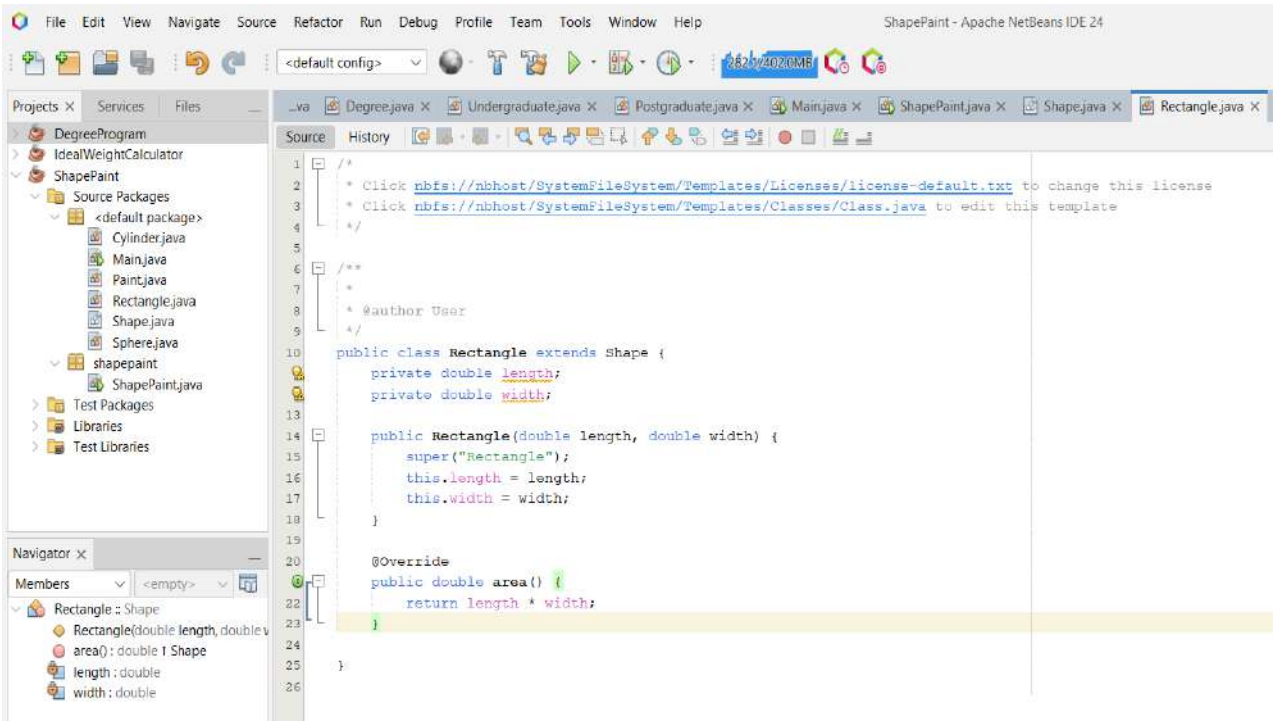

Figure 9 : Rectangle Class

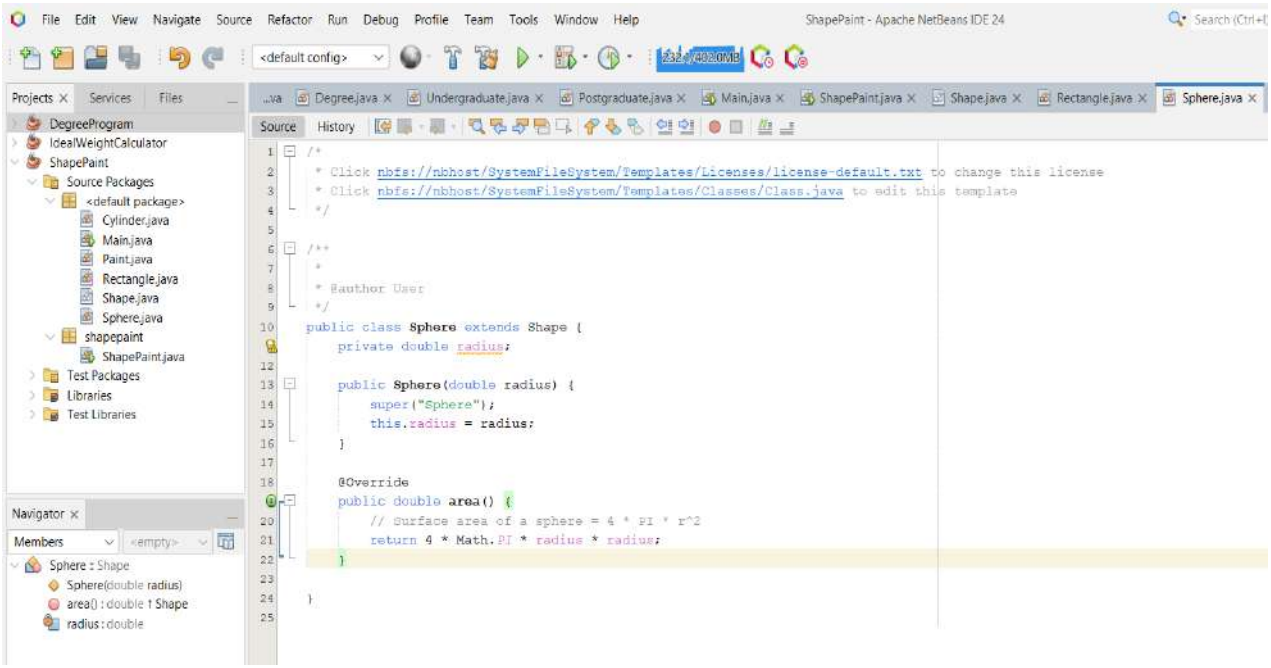

Figure 10 : Sphere Class

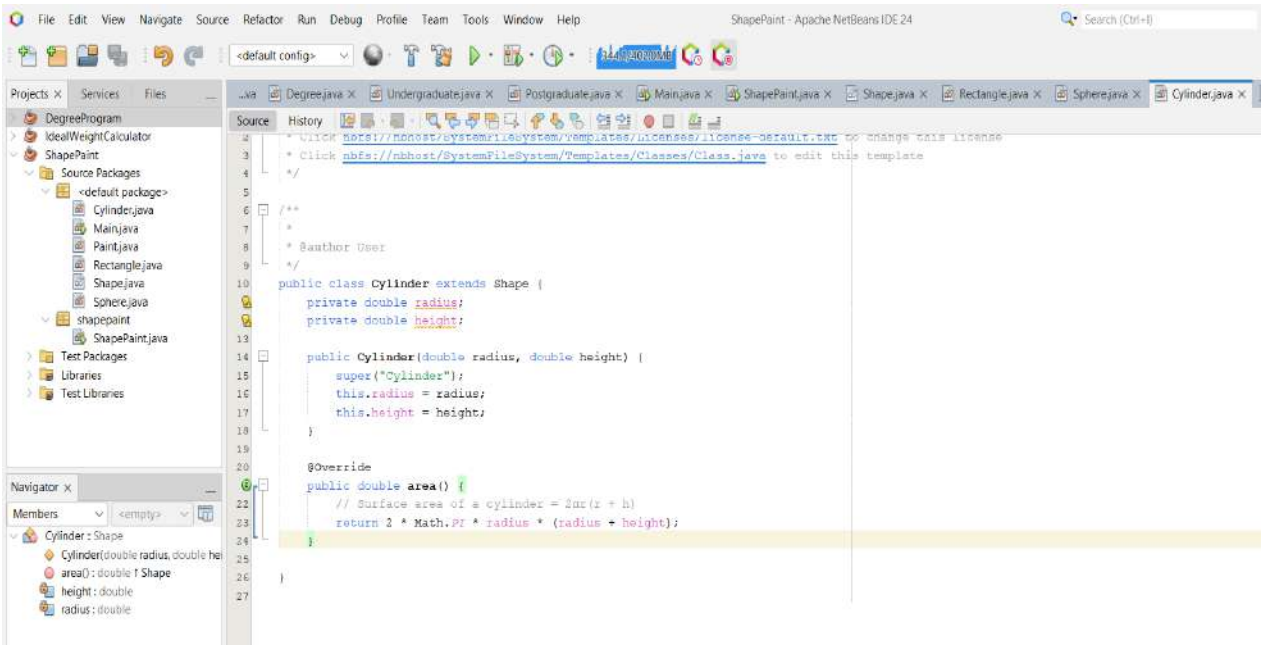

Figure 11 : Cylinder Class

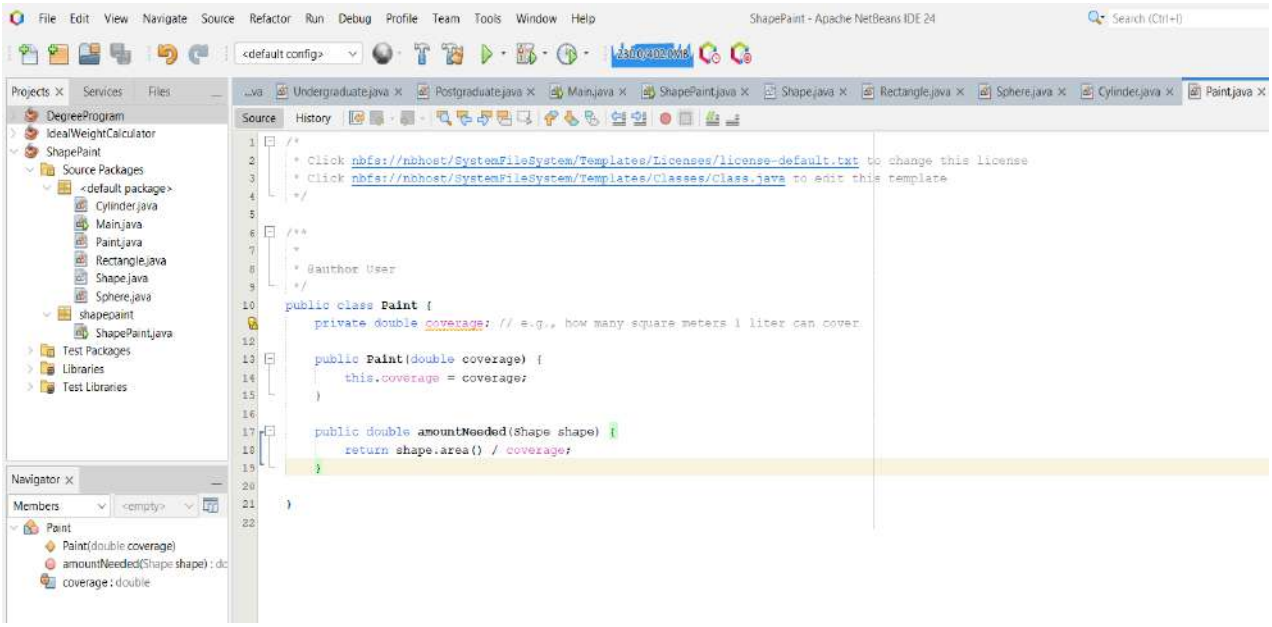

Figure 12 : Paint Class

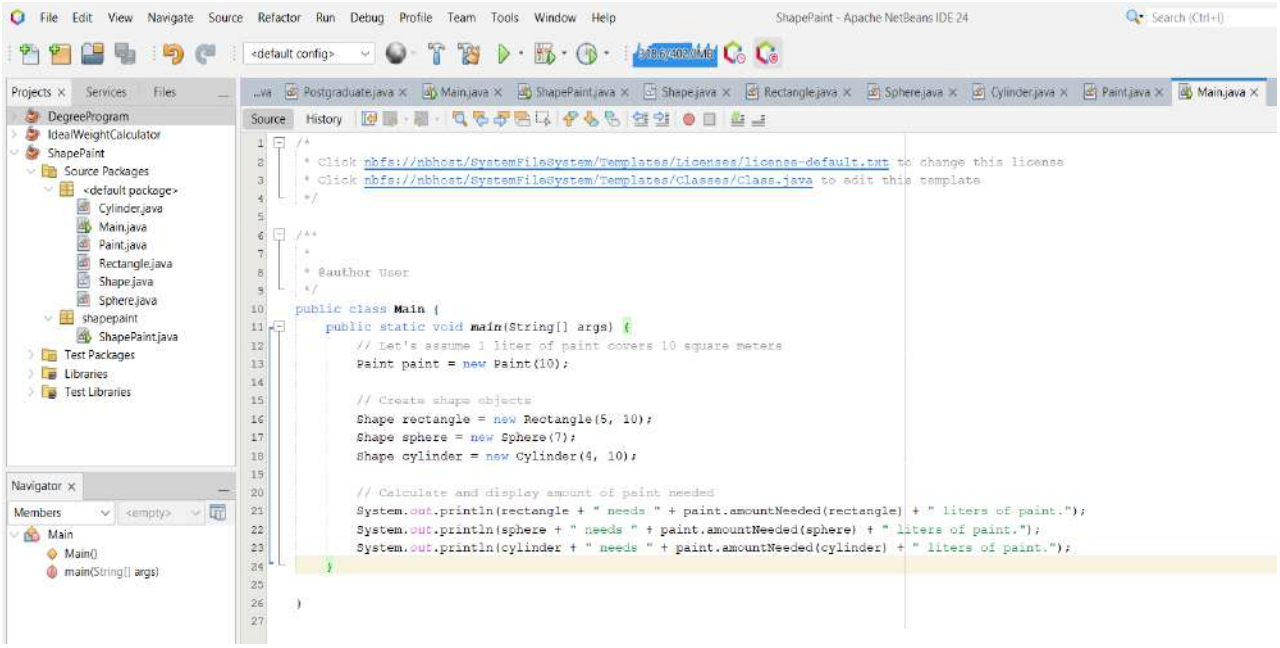

Figure 13 : Main Class

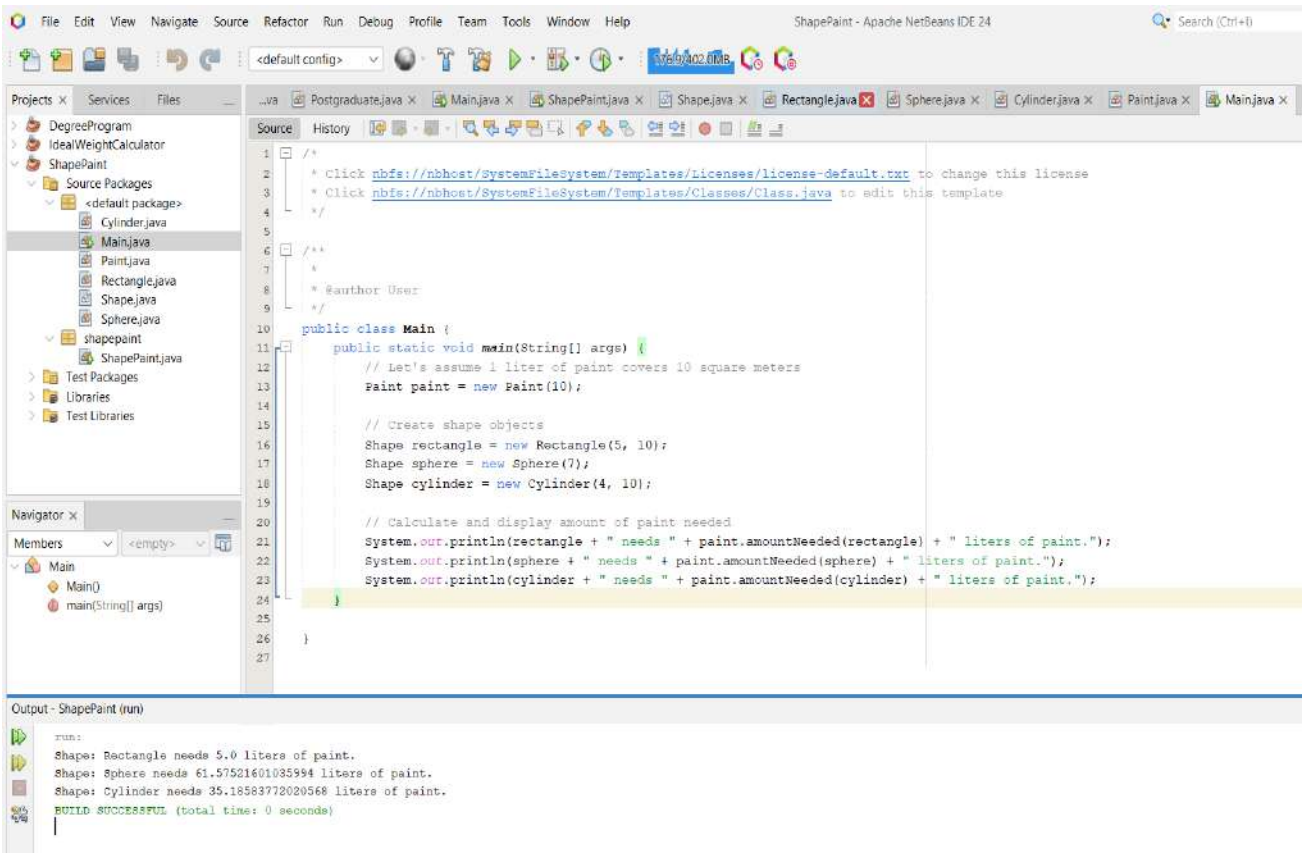

Figure 14 : Output

b) The file Sphere.java contains a class for a sphere which is a descendant of Shape. A sphere has a radius and its area (surface area) is given by the formula 4*PI*radius^2. Define similar classes for a rectangle and a cylinder. Both the Rectangle class and the Cylinder class are descendants of the Shape class. A rectangle is defined by its length and width and its area is length times width. A cylinder is defined by a radius and height and its area (surface area) is PI*radius^2*height. Define the toString method in a way similar to that for the Sphere class.

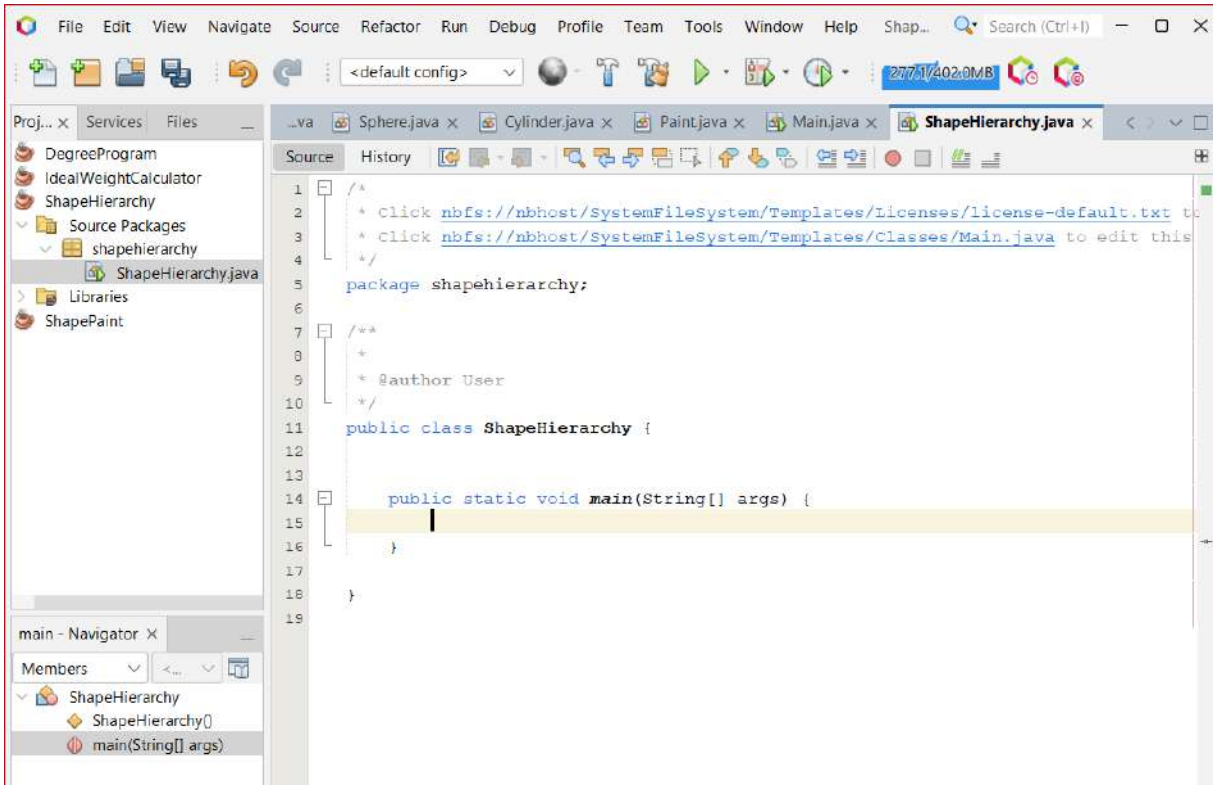

Figure 15 : ShapeHierarchy Class

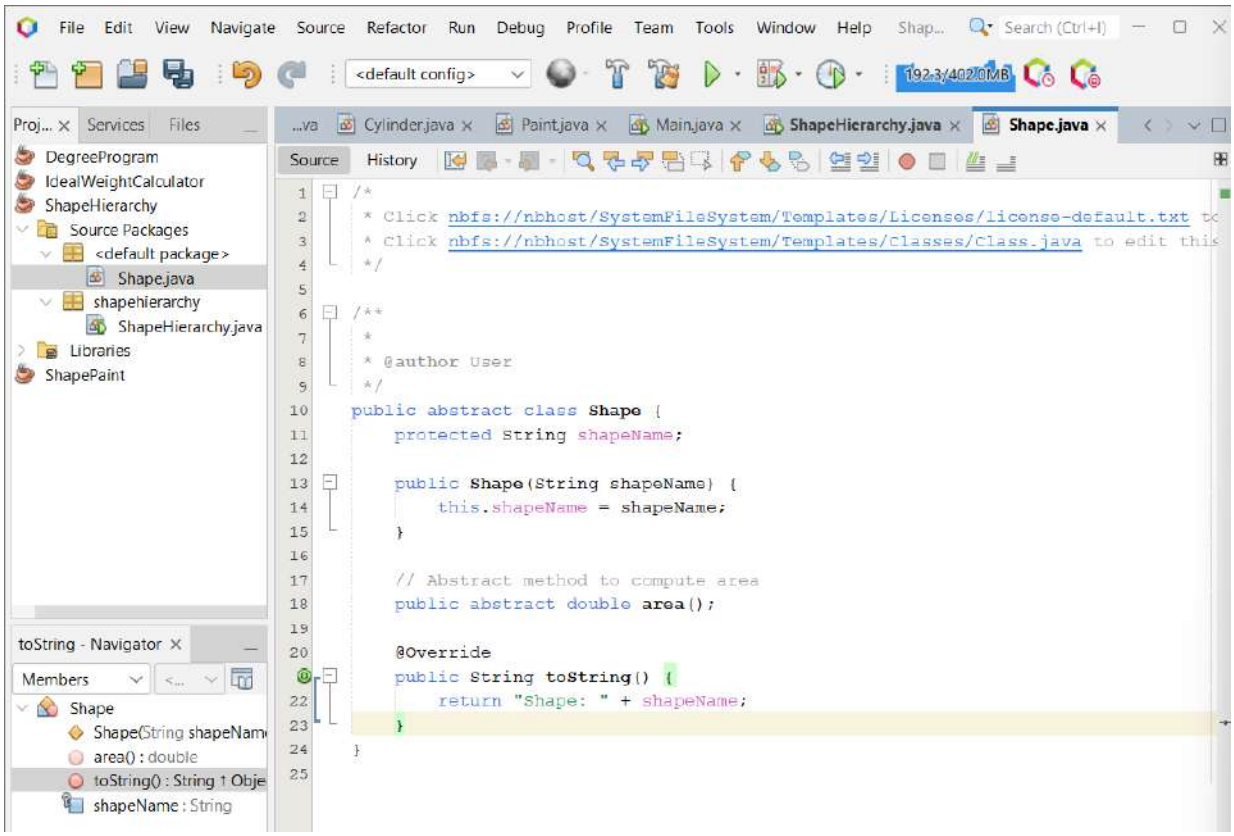

Figure 16 : Shape Class

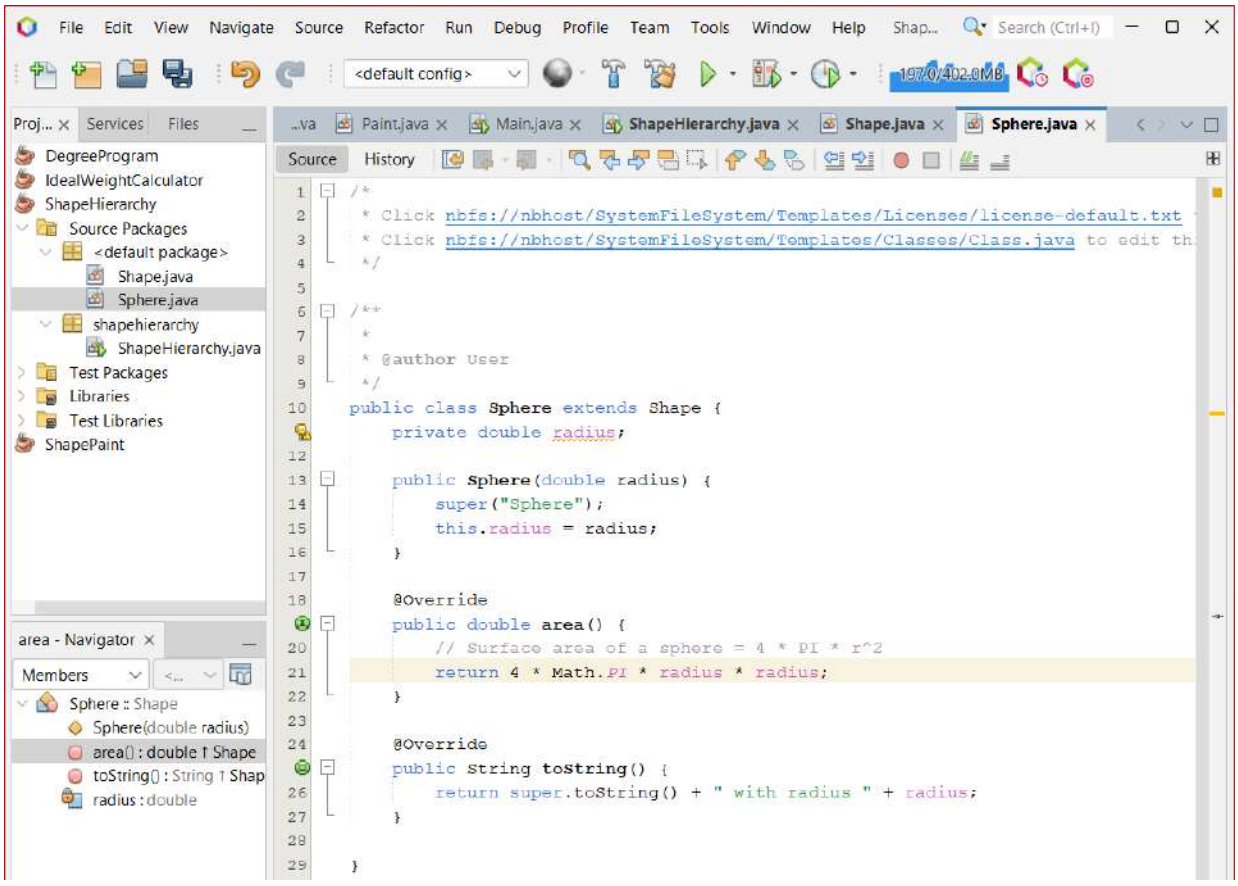

Figure 17 : Sphere Class

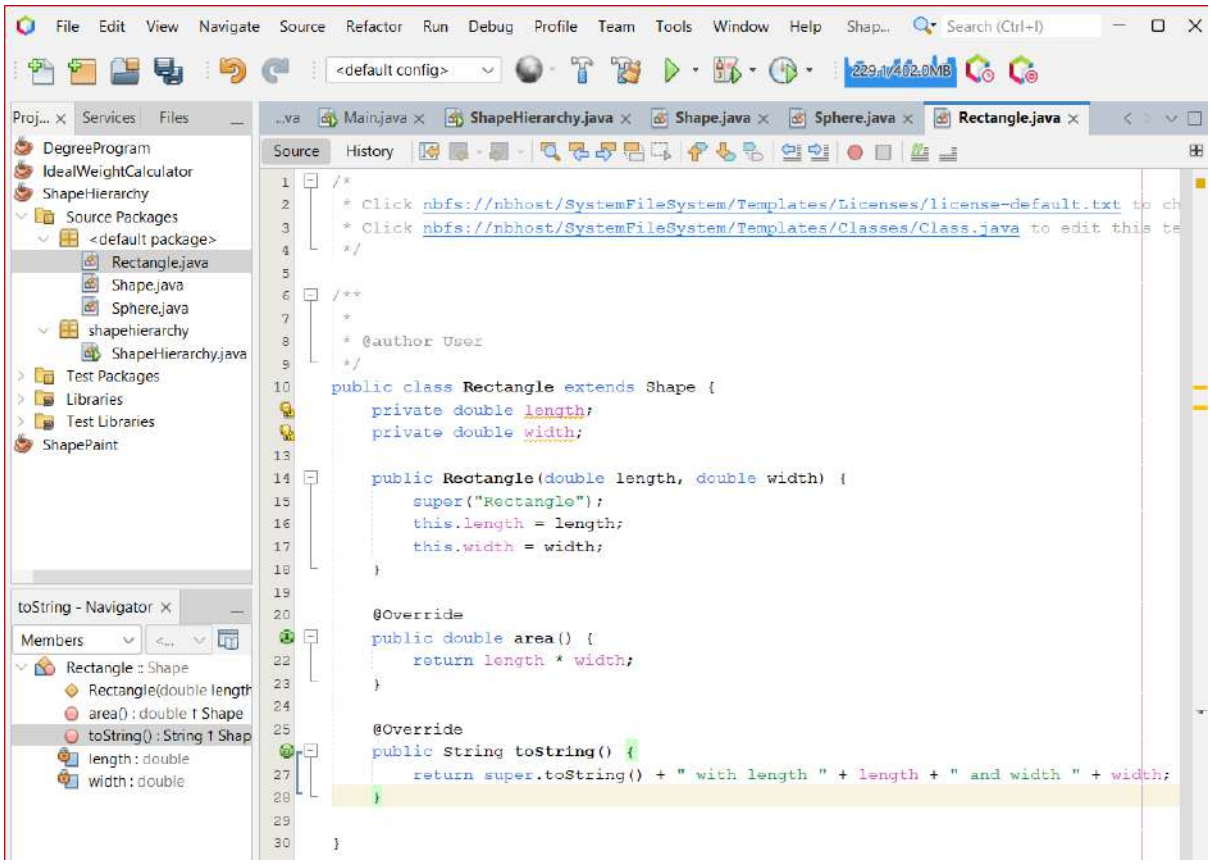

Figure 18 : Rectangle Class

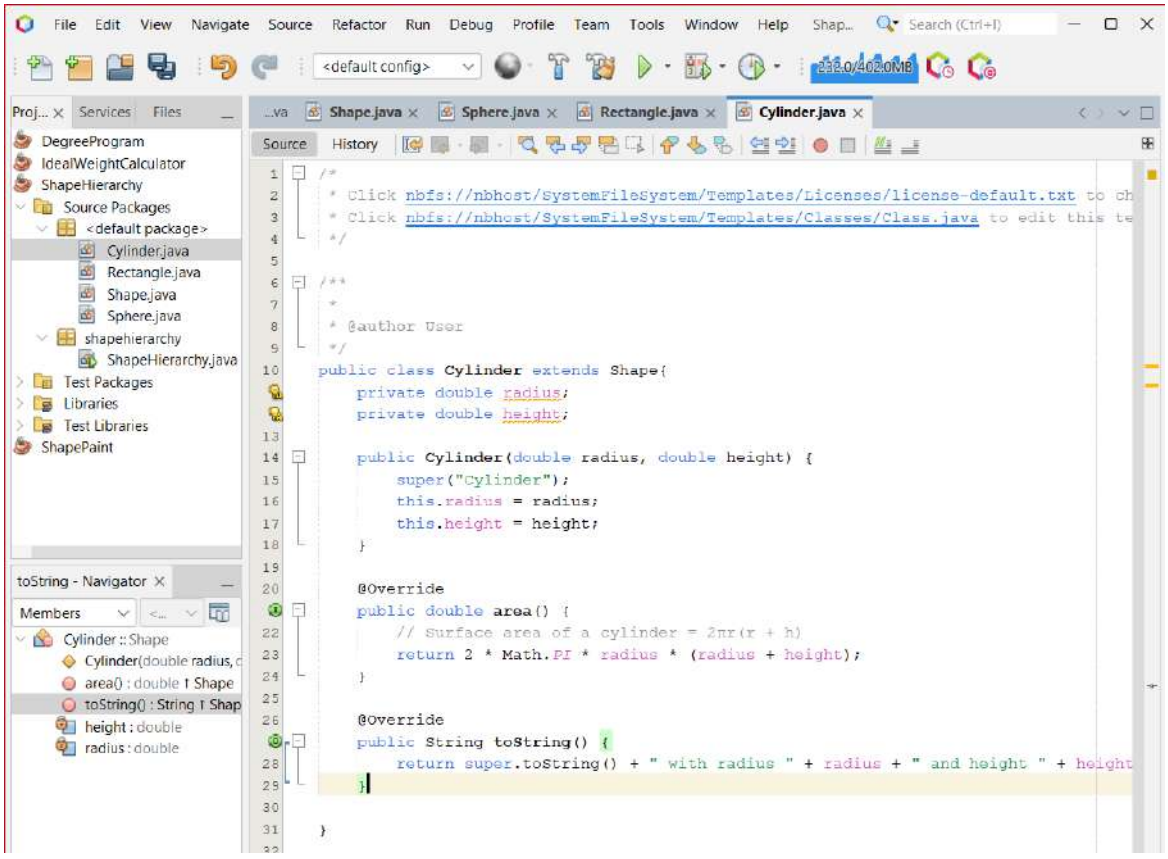

Figure 19 : Cylinder Class

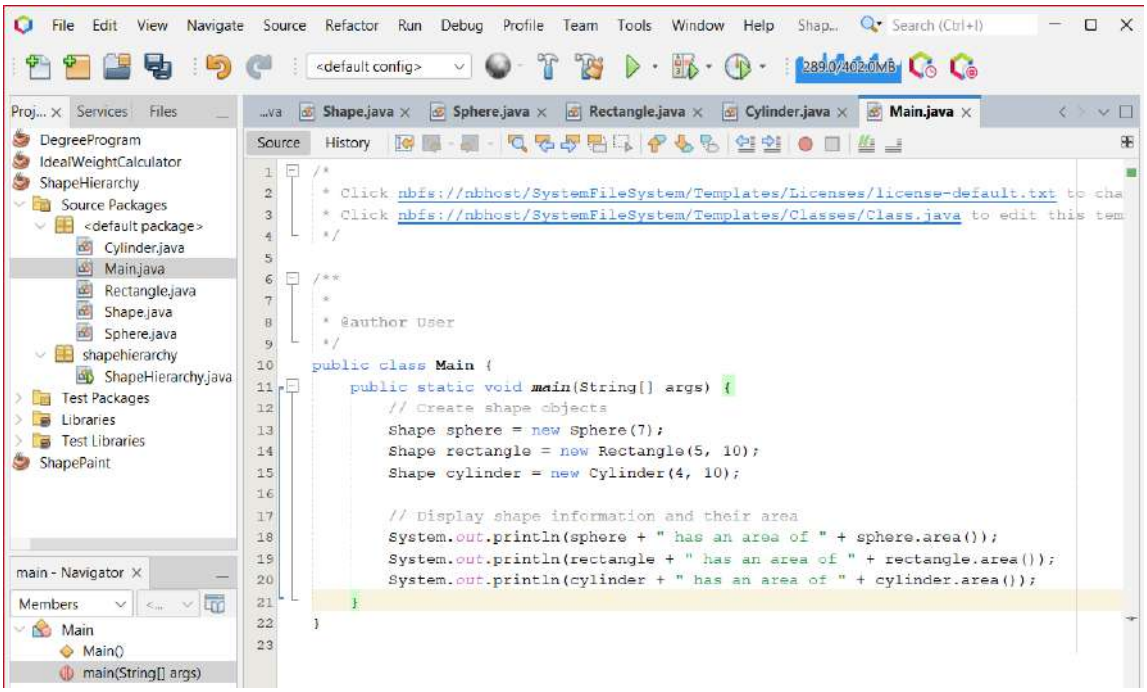

Figure 20 : Main Class

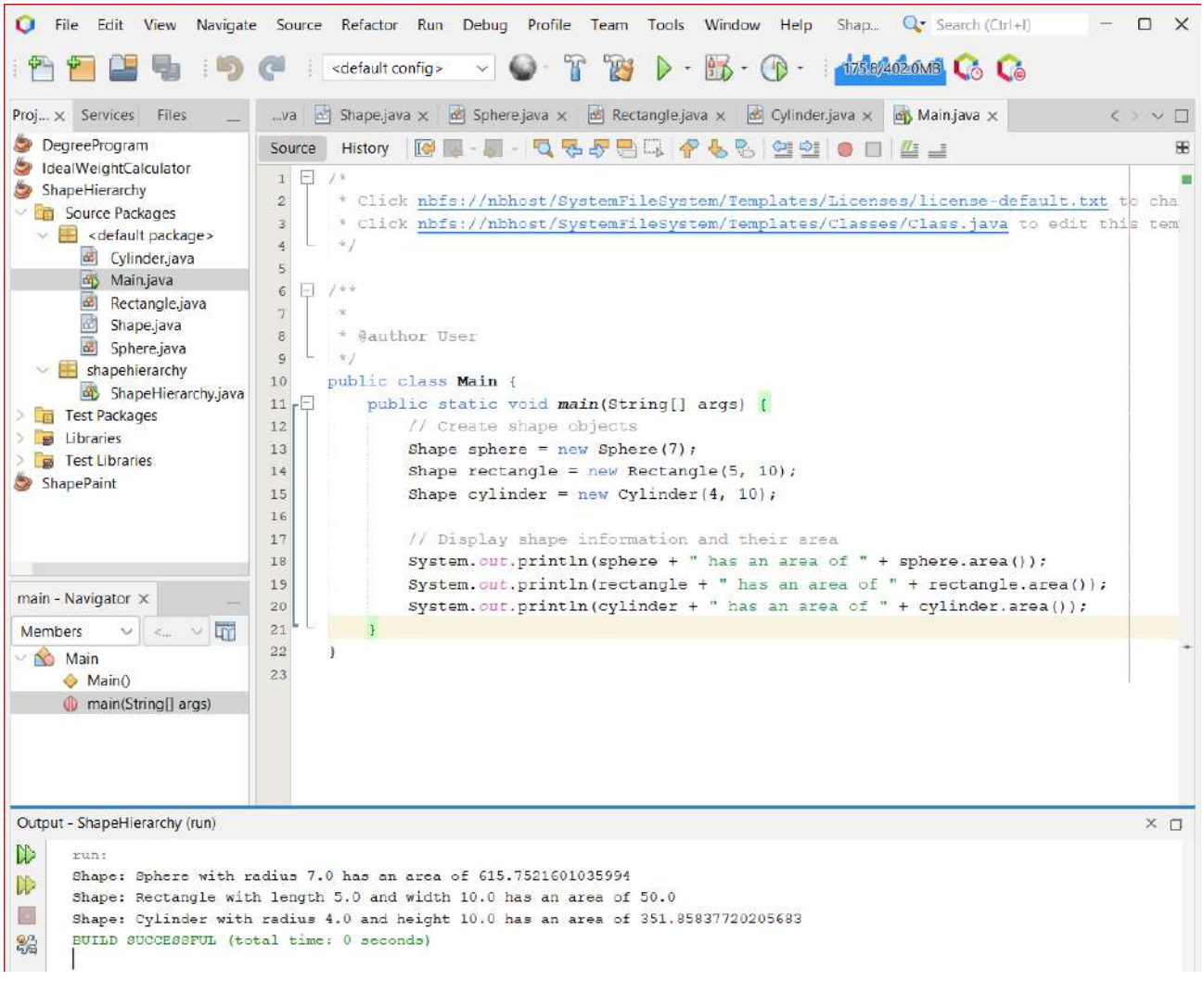

Figure 21 : Output

c) The file Paint.java contains a class for a type of paint (which has a "coverage" and a method to compute the amount of paint needed to paint a shape). Correct the return statement in the amount method so the correct amount will be returned. Use the fact that the amount of paint needed is the area of the shape divided by the coverage for the paint. (NOTE: Leave the print statement - it is there for illustration purposes, so you can see the method operating on different types of Shape objects.)

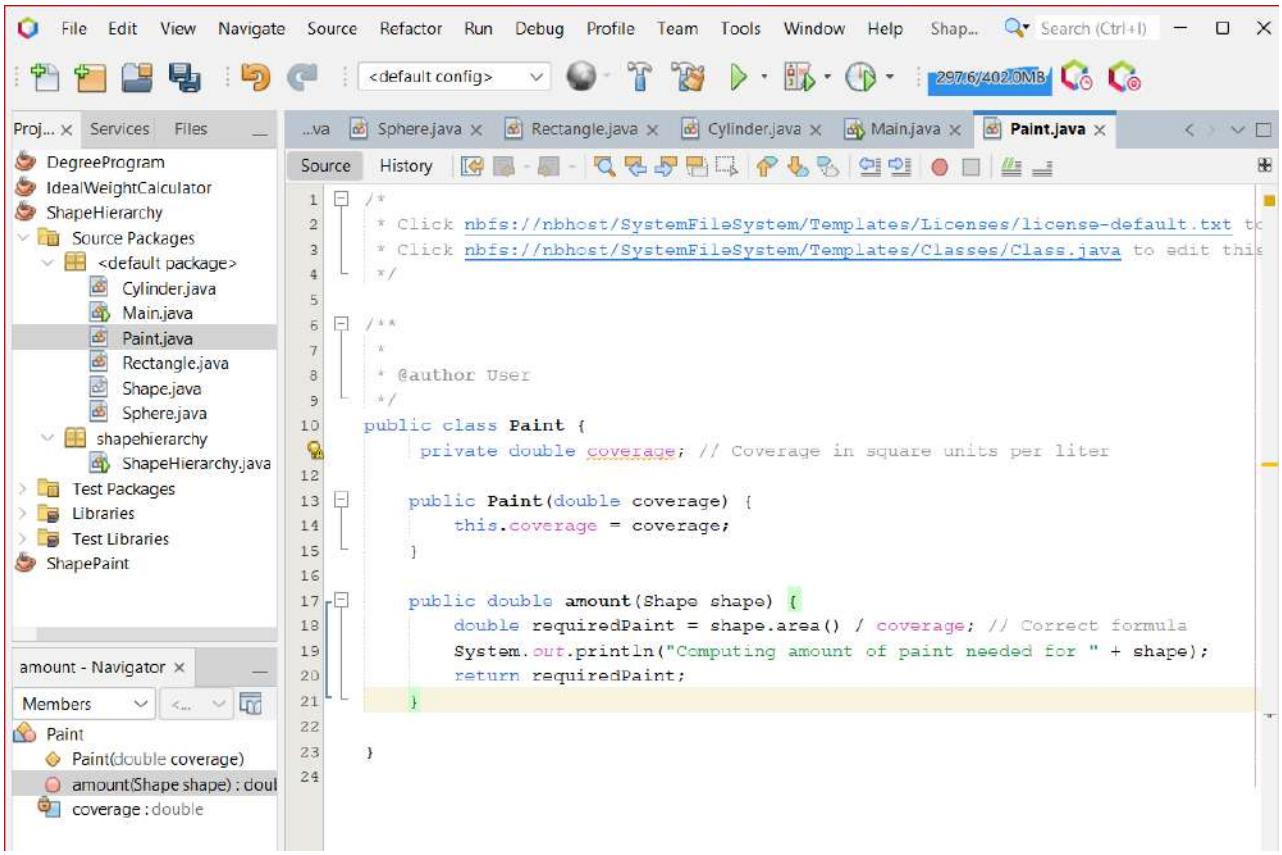

Figure 22 : Paint Class

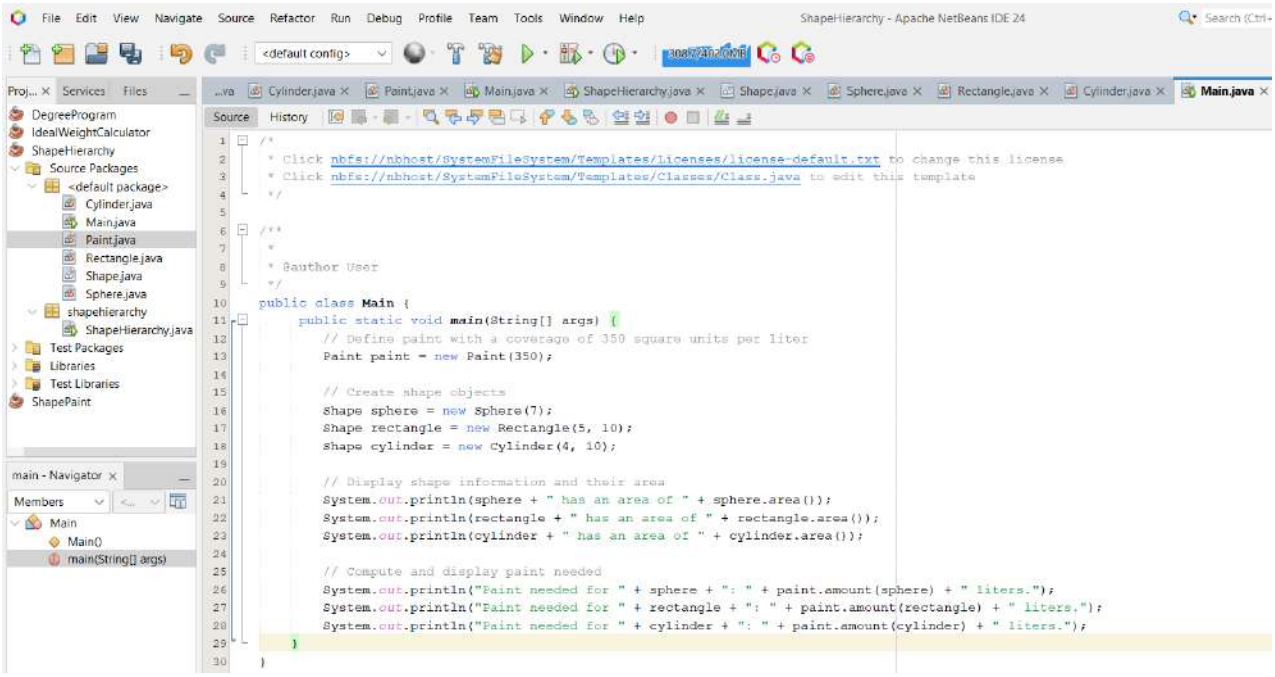

Figure 23 : Main Class

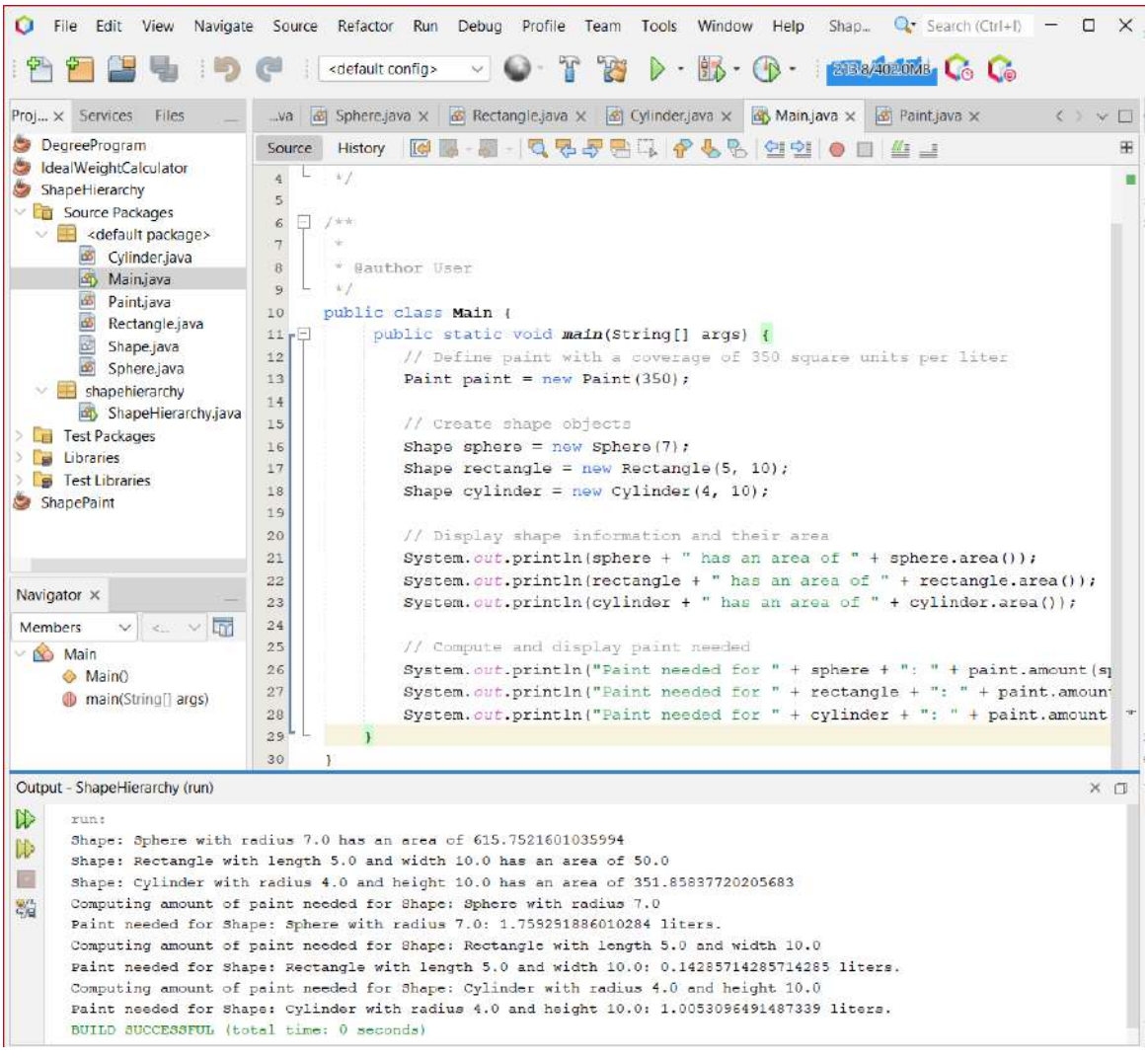

Figure 24 : Output

d) The file PaintThings.java contains a program that computes the amount of paint needed to paint various shapes. A paint object has been instantiated. Add the following to complete the program: Instantiate the three shape objects: deck to be a 20 by 35 foot rectangle, bigBall to be a sphere of radius 15, and tank to be a cylinder of radius 10 and height 30. Make the appropriate method calls to assign the correct values to the three amount variables. Run the program and test it. You should see polymorphism in action as the amount method computes the amount of paint for various shapes.

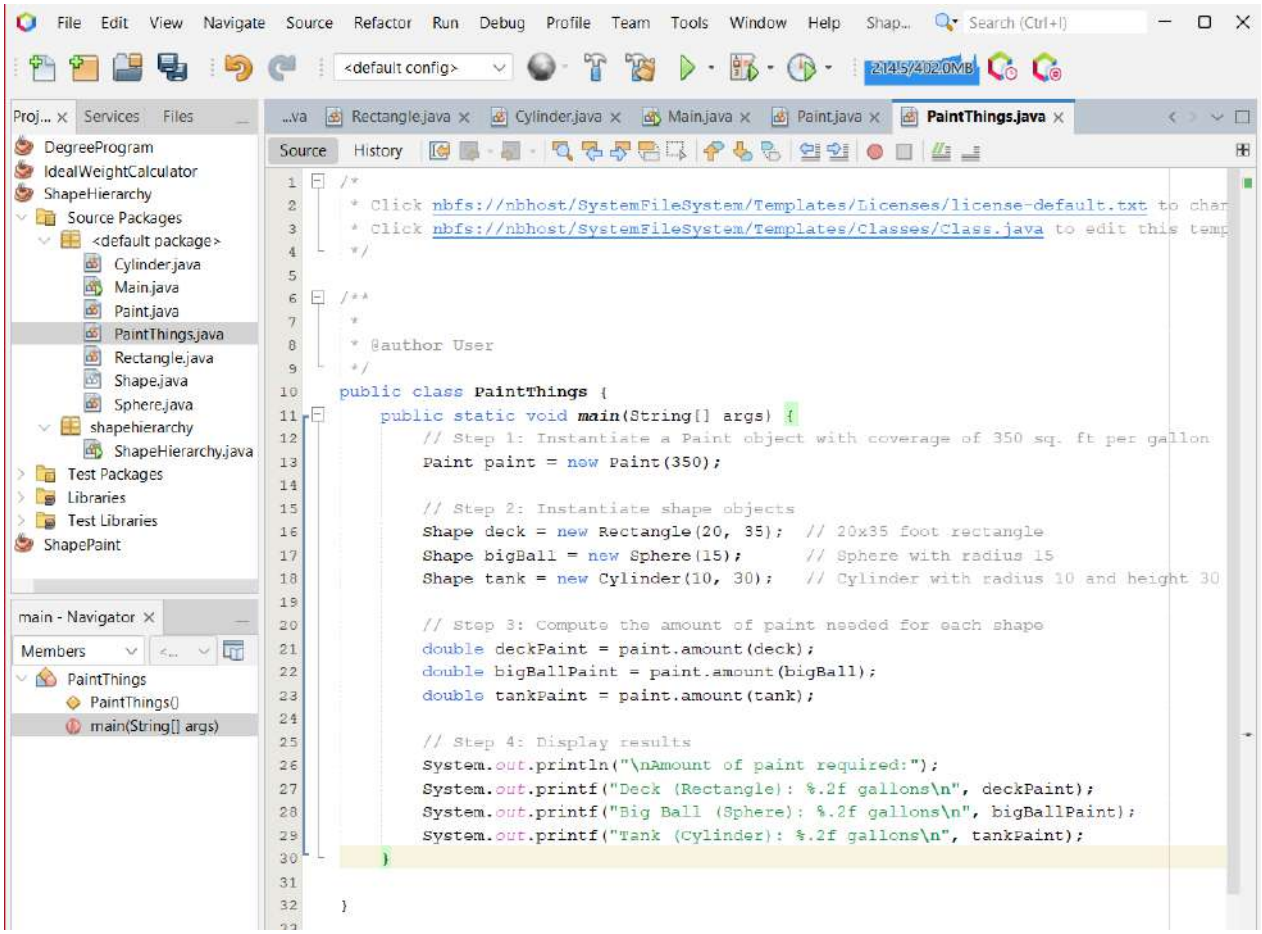

Figure 25 : PaintThings Class

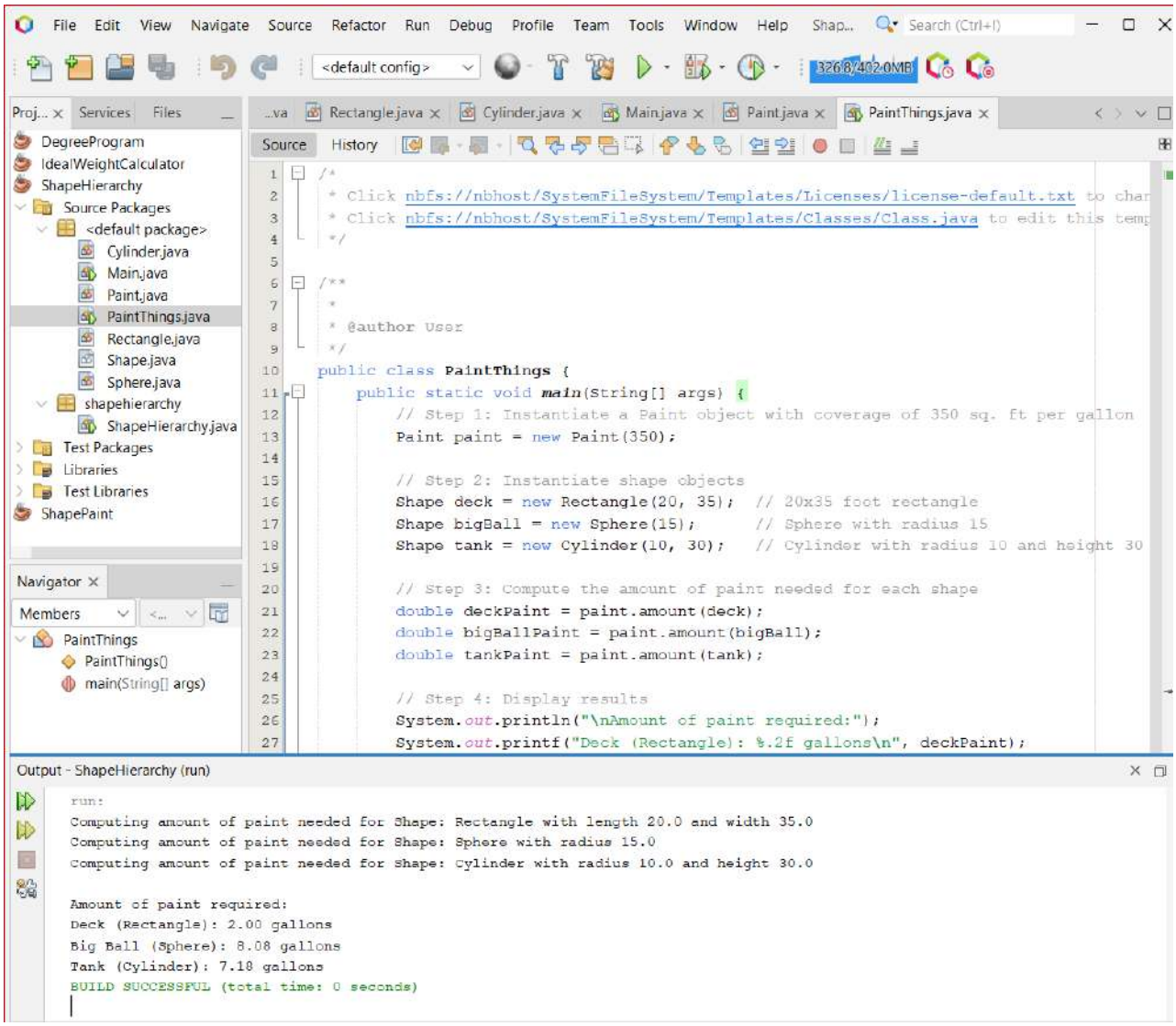

Figure 26 : Output