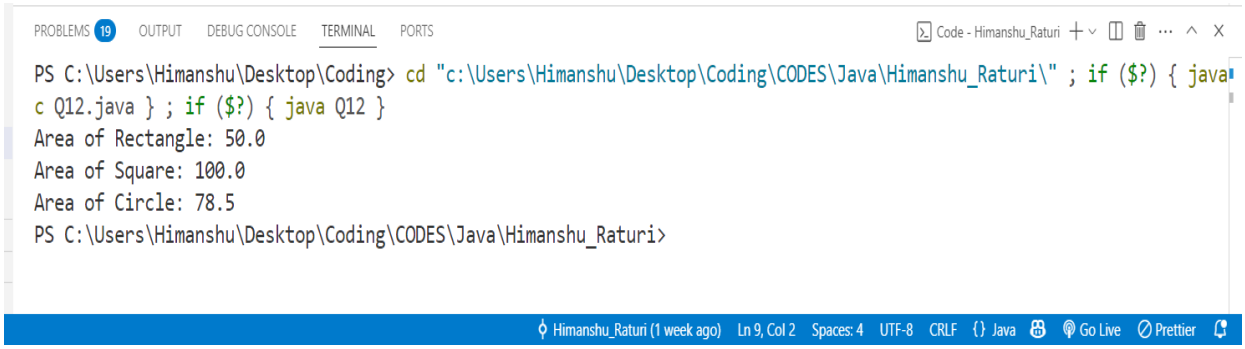
Practical No. 12: Write a java program to calculate the area of a rectangle, a square and a circle. Create an abstract class 'Shape' with three abstract methods namely rectangleArea() taking two parameters, squareArea() and circleArea() taking one parameter each.Now create another class ‘Area’ containing all the three methods rectangleArea(),squareArea() and circleArea() for printing the area of rectangle, square and circle respectively. Create an object of class Area and call all the three methods.

Source Code:

```
abstract class Shape
{
   abstract void rectangleArea(double l, double b);
   abstract void squareArea(double side);
   abstract void circleArea(double radius);
}
class Area extends Shape
{
   void rectangleArea(double l, double b)
   {
      double area = l * b;
      System.out.println("Area of Rectangle: " + area);
   }
   void squareArea(double side)
   {
      double area = side * side;
      System.out.println("Area of Square: " + area);
   }
   void circleArea(double radius)
   {
      double area = 3.14 * radius * radius;
      System.out.println("Area of Circle: " + area);
   }
```

```
}
public class Q12 {
    public static void main(String args[])
    {
        Shape obj = new Area();
        obj.rectangleArea(10, 5);
        obj.squareArea(10);
        obj.circleArea(5);
    }
}
```

OUTPUT:


PROBLEMS 19
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Code - Himanshu_Raturi
PS C:\Users\Himanshu\Desktop\Coding> cd "c:\Users\Himanshu\Desktop\Coding\CODES\Java\Himanshu_Raturi\" ; if ($?) { javac Q12.java } ; if ($?) { java Q12 }
Area of Rectangle: 50.0
Area of Square: 100.0
Area of Circle: 78.5
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Himanshu_Raturi>
Himanshu_Raturi (1 week ago)
Ln 9, Col 2
Spaces: 4
UTF-8
CRLF
{} Java
Go Live
Prettier

Practical No. 13: Write a java program to implement abstract class and abstract method with following details:
Create a **abstract Base Class Temperature** Data members: double temp;

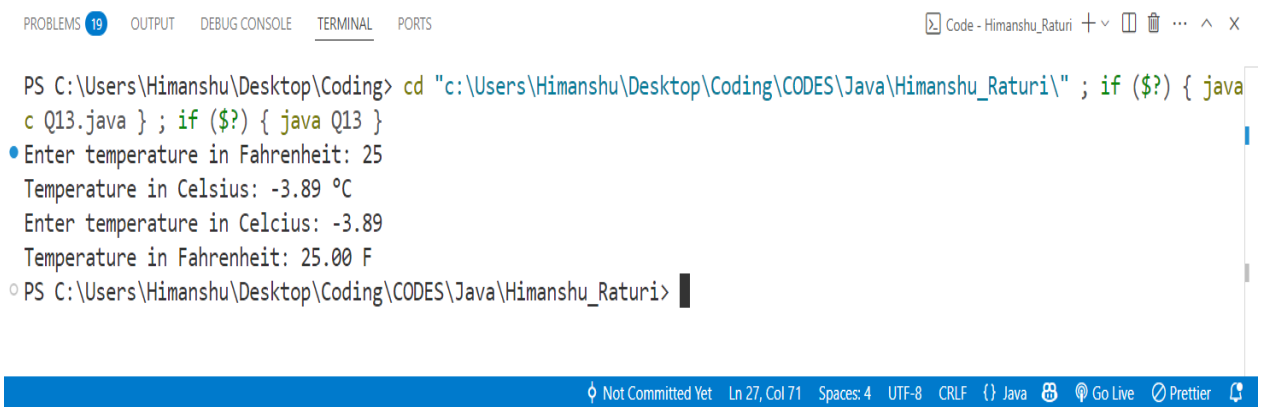
Method members: void setTempData(double), abstact void changeTemp()
Sub Class Fahrenheit (subclass of Temperature) Data members:double ctemp;
method member: Override abstract method changeTemp() to convert Fahrenheit temperature into degree Celsius by using formula C=5/9*(F-32) and display converted temperature .
Sub Class Celsius (subclass of Temperature) Data member: double ftemp;
Method member: Override abstract method changeTemp() to convert degree Celsius into Fahrenheit temperature by using formula F=9/5*c+32 and display converted temperature.

Source Code:

```
package CODES.Java.Himanshu_Raturi;

import java.util.Scanner;

abstract class Temperature

{

   double temp;

   void setTempData(double t)

   {

      temp = t;

   }

   abstract void changeTemp();

}

class Fahrenheit extends Temperature

{

   double ctemp;

   void changeTemp()

   {

      ctemp = 5.0/9 * (temp - 32);

      System.out.println("Temperature in celcius : " + ctemp + " °C");

   }

}

class Celsius extends Temperature
```

```
{
    double ftemp;
    void changeTemp()
    {
        ftemp = (9.0/5) * temp + 32;
        System.out.println("Temperature in Fahrenheit: " + ftemp + " °C");
    }
}
public class Q13 {
    public static void main(String args[])
    {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter temperature in Fahrenheit: ");
        double ftemp = sc.nextDouble();
        Temperature f = new Fahrenheit();
        f.setTempData(ftemp);
        f.changeTemp();

        System.out.print("Enter temperature in Celcius: ");
        double ctemp = sc.nextDouble();
        Temperature c = new Celsius();
        c.setTempData(ctemp);
        c.changeTemp();
        sc.close();
    }
}
```

OUTPUT:


PROBLEMS 19
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Code - Himanshu_Raturi
PS C:\Users\Himanshu\Desktop\Coding> cd "c:\Users\Himanshu\Desktop\Coding\CODES\Java\Himanshu_Raturi\" ; if ($?) { javac Q13.java } ; if ($?) { java Q13 }
Enter temperature in Fahrenheit: 25
Temperature in Celsius: -3.89 °C
Enter temperature in Celcius: -3.89
Temperature in Fahrenheit: 25.00 F
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Himanshu_Raturi>
Not Committed Yet
Ln 27, Col 71
Spaces: 4
UTF-8
CRLF
{} Java
Go Live
Prettier

Practical No. 14: Write a java program to create an interface that consists of a method to display volume () as an abstract method and redefine this method in the derived classes to suit their requirements. Create classes called Cone, Hemisphere and Cylinder that implements the interface. Using these three classes, design a program that will accept dimensions of a cone, cylinder and hemisphere interactively and display the volumes.
Volume of cone = (1/3)πr2h
Volume of hemisphere = (2/3)πr3
Volume of cylinder = πr2h

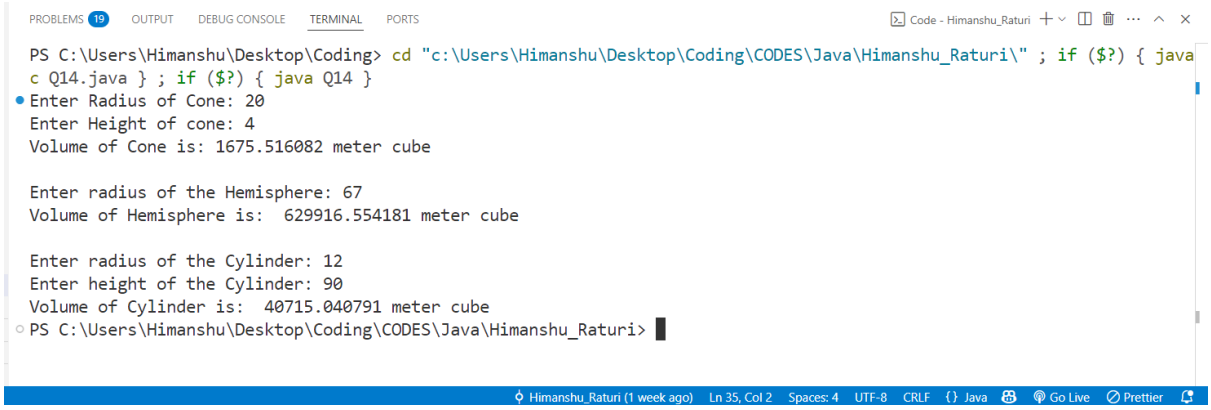
Source Code:

```
import java.util.Scanner;

interface Shape

{

   void volume();

}

class Cone implements Shape

{

   double radius , height;

   Cone(double radius , double height)

   {

      this.radius = radius;

      this.height = height;

   }

   public void volume()

   {

      double vol = (1.0/3) * Math.PI * Math.pow(radius, 2.0) * height;

      System.out.printf("Volume of Cone is: %2f meter cube\n",vol);

   }

}

class Hemisphere implements Shape

{

   double radius;
```

```
    Hemisphere(double radius)
    {
        this.radius = radius;
    }
    public void volume()
    {
        double vol = (2.0/3)* Math.PI * Math.pow(radius, 3.0);
        System.out.printf("Volume of Hemisphere is:  %2f meter cube\n",vol);
    }
}
class Cylinder implements Shape
{
    double radius , height;
    Cylinder(double radius , double height)
    {
        this.radius = radius;
        this.height = height;
    }
    public void volume()
    {
        double vol = Math.PI * Math.pow(radius, 2.0) * height;
        System.out.printf("Volume of Cylinder is:  %2f meter cube\n",vol);
    }
}
public class Q14 {
    public static void main(String args[])
    {
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter Radius of Cone: ");
        double cradius = sc.nextDouble();
        System.out.print("Enter Height of cone: ");
        double cheight = sc.nextDouble();
        Shape cone = new Cone(cradius, cheight);
        cone.volume();

        System.out.print("\nEnter radius of the Hemisphere: ");
        double hemisphereRadius = sc.nextDouble();
        Shape hemisphere = new Hemisphere(hemisphereRadius);
        hemisphere.volume();

        System.out.print("\nEnter radius of the Cylinder: ");
        double cylinderRadius = sc.nextDouble();
        System.out.print("Enter height of the Cylinder: ");
        double cylinderHeight = sc.nextDouble();
        Shape cylinder = new Cylinder(cylinderRadius, cylinderHeight);
        cylinder.volume();
        sc.close();
    }
}
```

OUTPUT:


PROBLEMS 19
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Code - Himanshu_Raturi
PS C:\Users\Himanshu\Desktop\Coding> cd "c:\Users\Himanshu\Desktop\Coding\CODES\Java\Himanshu_Raturi\" ; if ($?) { javac Q14.java } ; if ($?) { java Q14 }
Enter Radius of Cone: 20
Enter Height of cone: 4
Volume of Cone is: 1675.516082 meter cube
Enter radius of the Hemisphere: 67
Volume of Hemisphere is: 629916.554181 meter cube
Enter radius of the Cylinder: 12
Enter height of the Cylinder: 90
Volume of Cylinder is: 40715.040791 meter cube
PS C:\Users\Himanshu\Desktop\Coding\CODES\Java\Himanshu_Raturi>
Himanshu_Raturi (1 week ago)
Ln 35, Col 2
Spaces: 4
UTF-8
CRLF
Java
Go Live
Prettier

Practical No. 15: Design a student management system using Java packages. The system should manage information about students, courses, and their enrolments. You will organize the functionality across multiple packages and use object-oriented principles such as encapsulation.

1. In the student package, create a Student class with fields for studentId, name, and age. Include a constructor to initialize these fields and a getStudentInfo() method to return the student's details.
2. In the course package, create a Course class with fields for courseId, courseName, and credits. Include a constructor and a getCourseInfo() method to return the course's details.
3. In the enrollment package, create an Enrollment class that holds references to Student and Course objects. Include a constructor and a getEnrollmentInfo() method to return the enrollment details.

4. In the default package, create instances of Student, Course, and Enrolment, then print details using the getStudentInfo(), getCourseInfo(), and getEnrollmentInfo() methods.

Source Code:
student package

```
package student;

public class Student

{

   int Studentid;

   String name;

   int age;

   public Student(int Studentid ,String name , int age)

   {

      this.Studentid = Studentid;

      this.name = name;

      this.age = age;

   }

   public String getStudentInfo()

   {

      return "Student Id: " + Studentid + " Name: " + name + " Age: "+ age;

   }

}
```

course package

```
package course;
public class Course
{
   int courseId;
   String courseName;
   int credits;
   public Course(int courseId , String courseName, int credits)
   {
      this.courseId = courseId;
      this.courseName = courseName;
      this.credits = credits;
   }
   public String getCourseInfo()
   {
      return "Course ID: " + courseId + " Course Name: " + courseName + " Credits: " +
credits;
   }
}
```

enrollment package

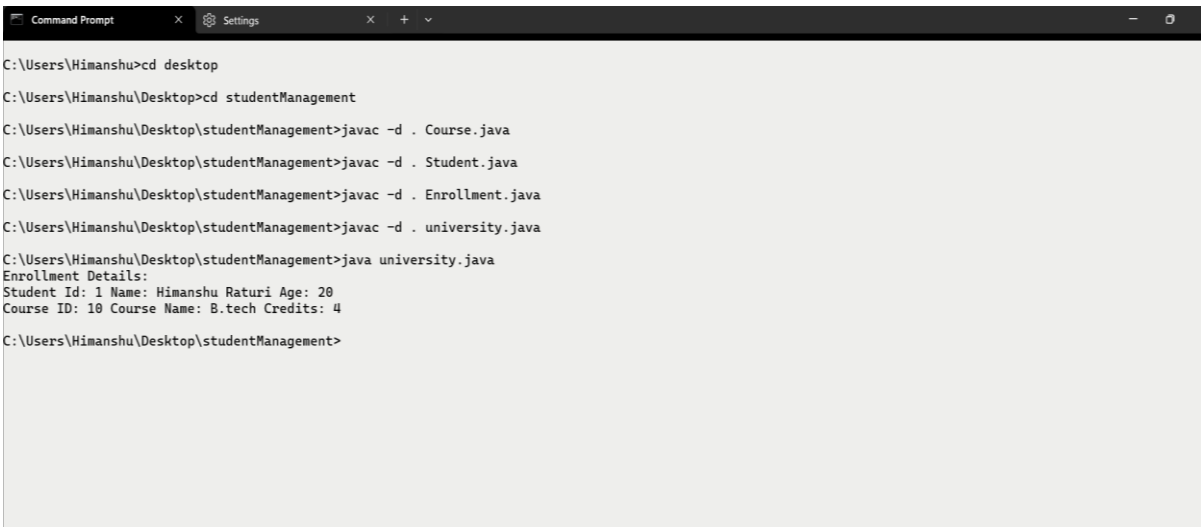
```
package Enrollement;
import student.Student;
import course.Course;
public class Enrollment {
   Student std;
   Course crs;
   public Enrollment(Student student, Course course) {
      std = student;
```

```
        crs = course;
    }
    public String getEnrollmentInfo() {
        return "Enrollment Details:\n" + std.getStudentInfo() + "\n" + crs.getCourseInfo();
    }
}
```

default package

```
import student.Student;
import Enrollement.Enrollment;
import course.Course;
public class university
{
    public static void main(String[] args)
    {
        Student s1 = new Student(1 , "Himanshu Raturi" , 20);
        Course c1 = new Course(10 , "B.tech" , 4);
        Enrollment e1 = new Enrollment(s1,c1);
        System.out.println(e1.getEnrollmentInfo());
    }
}
```

OUTPUT:


Command Prompt
Settings
C:\Users\Himanshu>cd desktop
C:\Users\Himanshu\Desktop>cd studentManagement
C:\Users\Himanshu\Desktop\studentManagement>javac -d . Course.java
C:\Users\Himanshu\Desktop\studentManagement>javac -d . Student.java
C:\Users\Himanshu\Desktop\studentManagement>javac -d . Enrollment.java
C:\Users\Himanshu\Desktop\studentManagement>javac -d . university.java
C:\Users\Himanshu\Desktop\studentManagement>java university.java
Enrollment Details:
Student Id: 1 Name: Himanshu Raturi Age: 20
Course ID: 10 Course Name: B.tech Credits: 4
C:\Users\Himanshu\Desktop\studentManagement>