**ABHISHEK SHARMA**

**CS 2ND YEAR**

**SECTION : “I”**

**ROLL NO.: 01**

**ENROLLMENT NO.: 12019009001127**

**OBJECT ORIENTED PROGRAMMING USING JAVA**

**DAY 14**

**ASSIGNMENT : 5**

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**Platform used : Visual Studio Code and JDK 15**

University of Engineering & Management, Kolkata

*Department of Computer Science and Engineering*

**Q1. Write a Java program to implement the concept of inheritance.**

// Author : Abhishek Sharma

class Employee{

    float salary=40000;

   }

   class Programmer extends Employee{

    int bonus=10000;

    public static void main(String args[]){

      Programmer p=new Programmer();

      System.out.println("Programmer salary is: "+p.salary);

      System.out.println("Bonus of Programmer is: "+p.bonus);

   }

}

**Output :**

Programmer salary is: 40000.0

Bonus of Programmer is: 10000

**Q2. Write a Java program to show method overloading.**

// Author : Abhishek Sharma

class Adder{

    static int add(int a,int b)

        {

            return a+b;

        }

    static int add(int a,int b,int c)

        {

            return a+b+c;

        }

    }

    class TestOverloading1{

    public static void main(String[] args){

    System.out.println(Adder.add(11,11));

    System.out.println(Adder.add(11,11,11));

    }

}

**Output :**

22

33

**Q3. Write a Java program to show method overriding.**

// Author : Abhishek Sharma

class Vehicle{

    void run()

    {

        System.out.println("Vehicle is running");

    }

}

  class Bike extends Vehicle{

    public static void main(String args[]){

    Bike obj = new Bike();

    obj.run();

    }

}

**Output :**

Vehicle is running

**Q4. Write a Java program to show method hiding.**

// Author : Abhishek Sharma

class Parent {

    public static void sleep() {

      System.out.println("Sleeps at 11 PM");

    }

  }

class Child extends Parent {

    public static void sleep() {

      System.out.println("Sleeps at 9 PM");

    }

  }

public class q1 {

    public static void main(String[] args) {

      Parent p = new Parent();

      Parent c = new Child();

      p.sleep();

      c.sleep();

    }

}

**Output :**

Sleeps at 11 PM

Sleeps at 11 PM

**Q5. Create a general class ThreeDObject and derive the classes Box, Cube, Cylinder and Cone from it. The class ThreeDObject has methods wholeSurfaceArea ( ) and volume ( ). Override these two methods in each of the derived classes to calculate the volume and whole surface area of each type of three-dimensional objects. The dimensions of the objects are to be taken from the users and passed through the respective constructors of each derived class. Write a main method to test these classes.**

// Author : Abhishek Sharma

abstract class ThreeDObject{

    abstract int SurfaceArea(int h, int w, int l);

    abstract int volume(int h, int w, int l);

}

class Box extends ThreeDObject{

    int SurfaceArea(int h, int w, int l) {

        return (2\*(h\*w)+2\*(h\*l)+2\*(w\*l));

    }

int volume(int h, int w, int l) {

    return (h\*w\*l);

    }

}

class Cube extends ThreeDObject{

    int SurfaceArea(int a,int b,int c) {

        return (6\*a\*b);

    }

int volume(int a,int b,int c) {

    return (a\*b\*c);

    }

}

class Cone extends ThreeDObject{

    int SurfaceArea(int h,int r,int a) {

        return (int) (Math.PI\*a\*(r+Math.sqrt(Math.pow(h, 2)+Math.pow(r, 2))));

}

    int volume(int h,int r,int a) {

        return (int) (Math.PI\*a\*r\*(h/3));

    }

}

class Cylinder extends ThreeDObject{

    int SurfaceArea(int h,int r,int a) {

        return (int) (2\*Math.PI\*r\*h+2\*Math.PI\*r\*a);

    }

    int volume(int h,int r,int a) {

        return (int) (Math.PI\*r\*a\*h);

    }

}

public class q1 {

    public static void main(String args[])

    {

        ThreeDObject obj=new Box();

        ThreeDObject obj1=new Cube();

        ThreeDObject obj2=new Cone();

        ThreeDObject obj3=new Cylinder();

        System.out.println("Box surface area "+obj.SurfaceArea(10,20,30));

        System.out.println("Cube surface area "+obj1.SurfaceArea(10,10,10));

        System.out.println("Cone surface area "+obj2.SurfaceArea(10,20,20));

        System.out.println("Cylinder surface area "+obj3.SurfaceArea(10,20,20));

        System.out.println("Box volume " +obj.volume(10,20,30));

        System.out.println("Cube volume "+obj1.volume(10,10,10));

        System.out.println("Cone volume "+obj2.volume(10,20,20));

        System.out.println("Cylinder volume "+obj3.volume(10,20,20));

    }

}

**Output :**

Box surface area 2200

Cube surface area 600

Cone surface area 2661

Cylinder surface area 3769

Box volume 6000

Cube volume 1000

Cone volume 3769

Cylinder volume 12566

**Q6. Write a program to create a class named Vehicle having protected instance variables regnNumber, speed, color, ownerName and a method showData ( ) to show “This is a vehicle class”. Inherit the Vehicle class into subclasses named Bus and Car having individual private instance variables routeNumber in Bus and manufacturerName in Car and both of them having showData ( ) method showing all details of Bus and Car respectively with content of the super class’s showData ( ) method.**

// Author : Abhishek Sharma

class Vehicle\_Main {

    protected int regnNumber; protected int speed; protected String color; protected String ownerName;

    public Vehicle\_Main(int regnNumber, int speed, String color, String ownerName) {

        this.regnNumber = regnNumber;

        this.speed = speed;

        this.color = color;

        this.ownerName = ownerName;

        }

    }

    class Bus extends Vehicle\_Main{

    int routeNumber;

    public Bus(int regnNumber, int speed, String color, String ownerName, int routeNumber) {

        super(regnNumber, speed, color, ownerName);

        this.routeNumber = routeNumber;

    }

    public String ShowData() {

        return "Bus [routeNumber = " + routeNumber + ", regnNumber = " + regnNumber + ", speed = " + speed + ", color = "+ color + ", ownerName = " + ownerName + "]";

        }

    }

    class Car extends Vehicle\_Main{ String manufacturerName ;

    public Car(int regnNumber, int speed, String color, String ownerName, String manufacturerName ) {

        super(regnNumber, speed, color, ownerName);

        this.manufacturerName = manufacturerName ;

    }

    public String ShowData() {

        return "Car [manufacturerName = " + manufacturerName + ", regnNumber = " + regnNumber + ", speed = " + speed + ", color = " + color + ", ownerName = " + ownerName + "]";

        }

    }

public class q1 {

    public static void main(String args[]) {

        Bus obj=new Bus(1010,70,"Black","Abhishek Sharma",199); System.out.println(obj.ShowData());

        Car obj1=new Car(1010,70,"Black","Abhishek Sharma","TATA"); System.out.println(obj1.ShowData());

    }

}

**Output :**

Bus [routeNumber = 199, regnNumber = 1010, speed = 70, color = Black, ownerName = Abhishek Sharma]

Car [manufacturerName = TATA, regnNumber = 1010, speed = 70, color = Black, ownerName = Abhishek Sharma]

**Q7. An educational institution maintains a database of its employees. The database is divided into a number of classes whose hierarchical relationships are shown below. Write all the classes and define the methods to create the database and retrieve individual information as and when needed.**

**Write a driver program to test the classes.**

***Staff* (code, name) *Teacher* (subject, publication) is a Staff**

***Officer* (grade) is a Staff *Typist* (speed) is a Staff**

***RegularTypist* (remuneration) is a Typist *CasualTypist* (daily wages) is a Typist.**

// Author : Abhishek Sharma

import java.io.\*;

class staff

{

         String code,name;

         void getStaff()

         {

              try{

                  BufferedReader obj = new BufferedReader(new InputStreamReader(System.in));

                  System.out.print("Enter Code : ");

                  System.out.flush();

                  code=obj.readLine();

                  System.out.print("Enter Name : ");

                  System.out.flush();

                  name=obj.readLine();

                 }

            catch(Exception e)

                {    }

        }

    void displayStaff()

    {

           System.out.println("\nCODE :  "+code);

           System.out.println("NAME  :  "+name);

    }

}

class teacher extends staff

{

         String subject,publication;

          void getTeacher()

           {

                 getStaff();

                 try{

                    BufferedReader obj = new BufferedReader(new InputStreamReader(System.in));

                    System.out.print("Enter Subject : ");

                    System.out.flush();

                    subject=obj.readLine();

                    System.out.print("Enter Publication : ");

                    System.out.flush();

                    publication=obj.readLine();

                  }

             catch (Exception e)

                {    }

          }

        void displayTeacher()

        {

            displayStaff();

           System.out.println("SUBJECT :  "+subject);

           System.out.println("PUBLICATION  :  "+publication);

        }

}

class typist extends staff

{

        String speed;

         void getTypist()

         {

            getStaff();

            try{

                  BufferedReader obj = new BufferedReader(new InputStreamReader(System.in));

                  System.out.print("Enter Speed : ");

                  System.out.flush();

                  speed=obj.readLine();

                  }

            catch(Exception e)

                {    }

        }

    void displayTypist()

    {

            displayStaff();

           System.out.println("SPEED :  "+speed);

    }

}

class officer extends staff

{

     String grade;

      void getOfficer()

         {

              getStaff();

              try{

                  BufferedReader obj = new BufferedReader(new InputStreamReader(System.in));

                  System.out.print("Enter Grade : ");

                  System.out.flush();

                  grade=obj.readLine();

                }

            catch(Exception e)

                {    }

        }

    void displayOfficer()

    {

           displayStaff();

           System.out.println("GRADE :  "+grade);

    }

}

class regular extends typist

{

}

class casual extends typist

{

      String wages;

       void getCasual()

         {

              getTypist();

              try

                {

                    BufferedReader obj = new BufferedReader(new InputStreamReader(System.in));

                    System.out.print("Enter Daily Wages : ");

                    System.out.flush();

                    wages=obj.readLine();

                }

            catch(Exception e)

                { }

        }

    void displayCasual()

    {

           displayTypist();

           System.out.println("WAGES :  "+wages);

    }

}

class Education

{

      public static void main(String args[])

      {

           int choice=1;

           String str;

           while(choice!=0){

                 System.out.println("\n\nChoose Your Choice...");

                 System.out.println("1) Teacher Details");

                 System.out.println("2) Typist Details ");

                 System.out.println("3) Officer Details");

                 System.out.println("Press 0 (ZERO) to exit ");

                 System.out.print("Enter your choice :  ");

                 System.out.flush();

                 try{

                       BufferedReader obj = new BufferedReader(new InputStreamReader(System.in));

                       str=obj.readLine();

                       choice=Integer.parseInt(str);

                }catch(Exception e) {}

                  if(choice==0)

                  {

                      System.out.println("\n\nThanks for Visiting\nDo Visit next time....\n");

                       System.exit(1);

                  }

                 switch(choice){

                       case 1 :

                            System.out.println("\n=====TEACHER DETAILS=====");

                            System.out.println("\nInputing Data");

                            teacher obj\_teacher=new teacher();

                            obj\_teacher.getTeacher();

                            System.out.println("\nDisplaying Data");

                            obj\_teacher.displayTeacher();

                            break;

                        case 2 :

                            System.out.println("\n=====TYPIST DETAILS=====\n");

                            System.out.println("\nInputing Data");

                            casual obj\_casual=new casual();

                            obj\_casual.getCasual();

                            System.out.println("\nDisplaying Data");

                            obj\_casual.displayCasual();

                            break;

                        case 3 :

                            System.out.println("\n=====OFFICER DETAILS=====\n");

                            System.out.println("\nInputing Data");

                            officer obj\_officer=new officer();

                            obj\_officer.getOfficer();

                            System.out.println("\nDisplaying Data");

                            obj\_officer.displayOfficer();

                            break;

                }

          }

    }

}

**Output :**

Choose Your Choice...

1) Teacher Details

2) Typist Details

3) Officer Details

Press 0 (ZERO) to exit

Enter your choice : 1

=====TEACHER DETAILS=====

Inputing Data

Enter Code : 001

Enter Name : Prof. Suklayan Goswami

Enter Subject : Computer Networks

Enter Publication : nil

Displaying Data

CODE : 001

NAME : Prof. Suklayan Goswami

SUBJECT : Computer Networks

PUBLICATION : nil

Choose Your Choice...

1) Teacher Details

2) Typist Details

3) Officer Details

Press 0 (ZERO) to exit

Enter your choice : 0

Thanks for Visiting

Do Visit next time....

**Q8. Create a base class Building that stores the number of floors of a building, number of rooms and it’s total footage. Create a derived class House that inherits Building and also stores the number of bedrooms and bathrooms. Demonstrate the working of the classes.**

// Author : Abhishek Sharma

import java.io.\*;

import java.lang.\*;

import java.util.\*;

class building {

    public void print\_value()

    {

        int floor = 5;

        int room = 25;

        int footage = 4500;

        System.out.println("No. of Floors : "+floor);

        System.out.println("No of rooms : "+room);

        System.out.println("Total footage : "+ footage + " sq. ft.");

    }

}

class house extends building {

    public void print\_house()

    {

        int bedroom = 16;

        int bathroom = 10;

        System.out.println("No. of bedrooms : " + bedroom);

        System.out.println("No. of bathrooms : " + bathroom);

    }

}

public class q8 {

    public static void main(String[] args)

    {

        house g = new house();

        g.print\_value();

        g.print\_house();

    }

}

**Output :**

No. of Floors : 5

No of rooms : 25

Total footage : 4500 sq. ft.

No. of bedrooms : 16

No. of bathrooms : 10

**Q9. In the earlier program, create a second derived class Office that inherits Building and stores the number of telephones and tables. Now demonstrate the working of all three classes.**

// Author : Abhishek Sharma

import java.io.\*;

import java.lang.\*;

import java.util.\*;

class building1 {

    public void print\_building()

    {

        int floor = 5;

        int room  = 25;

        int footage = 7500;

        System.out.println("No of floor : " + floor + "\nNo. of rooms : " + room + "\nTotal footage = " + footage + " sq. ft.");

    }

}

class house1 extends building1 {

    int bedroom = 10;

    int bathroom = 12;

    public void print\_house()

    {

        System.out.println("No of bedrooms : " + bedroom + "\nNo. of bathrooms : " + bathroom );

    }

}

class office extends house1 {

    public void print\_office()

    {

        int telephone = 40;

        int table = 12;

        System.out.println("No of telephones : " + telephone + "\nNo. of tables : " + table );

    }

}

public class q9 {

    public static void main(String[] args)

    {

        office g = new office();

        g.print\_building();

        g.print\_house();

        g.print\_office();

    }

}

**Output :**

No of floor : 5

No. of rooms : 25

Total footage = 7500 sq. ft.

No of bedrooms : 10

No. of bathrooms : 12

No of telephones : 40

No. of tables : 12

**Q10. Write a Java program which creates a base class Num and contains an integer number along with a method shownum() which displays the number. Now create a derived class HexNum which inherits Num and overrides shownum() which displays the hexadecimal value of the number. Demonstrate the working of the classes.**

// Author : Abhishek Sharma

import java.io.\*;

import java.lang.\*;

import java.util.\*;

class num {

    public void showNum(int n)

    {

        System.out.println("\nYou have entered : "+n);

    }

}

class hexNum extends num {

    public void showNum(int n)

    {

        System.out.println("Hexadecimal value : " + Integer.toHexString(n));

    }

}

public class q10 {

    public static void main(String[] args)

    {

        int n;

        System.out.print("Enter the number : ");

        Scanner sc = new Scanner(System.in);

        n = sc.nextInt();

        num g1 = new num();

        g1.showNum(n);

        hexNum g = new hexNum();

        g.showNum(n);

    }

}

**Output :**

Enter the number : 11

You have entered : 11

Hexadecimal value : b

**Q11. Write a Java program which creates a base class Num and contains an integer number along with a method shownum() which displays the number. Now create a derived class OctNum which inherits Num and overrides shownum() which displays the octal value of the number. Demonstrate the working of the classes.**

// Author : Abhishek Sharma

import java.io.\*;

import java.lang.\*;

import java.util.\*;

class num {

    public void showNum(int n)

    {

        System.out.println("\nYou have entered : "+n);

    }

}

class OctNum extends num {

    public void showNum(int n)

    {

        System.out.println("Octal value : " + Integer.toOctalString(n));

    }

}

public class q11 {

    public static void main(String[] args)

    {

        int n;

        System.out.print("Enter the number : ");

        Scanner sc = new Scanner(System.in);

        n = sc.nextInt();

        num g1 = new num();

        g1.showNum(n);

        OctNum g = new OctNum();

        g.showNum(n);

    }

}

**Output :**

Enter the number : 8

You have entered : 8

Octal value : 10

**Q12. Combine Question number 10 and 11 and have all the three classes together. Now describe the working of all classes.**

// Author : Abhishek Sharma

import java.io.\*;

import java.lang.\*;

import java.util.\*;

class num {

    public void showNum(int n)

    {

        System.out.println("\nYou have entered : "+n);

    }

}

class OctNum extends num {

    public void showNum(int n)

    {

        System.out.println("Octal value : " + Integer.toOctalString(n));

    }

}

class HexNum extends OctNum{

    public void showNum (int n){

        System.out.println("Hexadecimal value : " + Integer.toHexString(n));

    }

}

public class q12 {

    public static void main(String[] args)

    {

        int n;

        System.out.print("Enter the number : ");

        Scanner sc = new Scanner(System.in);

        n = sc.nextInt();

        num g1 = new num();

        g1.showNum(n);

        OctNum g = new OctNum();

        g.showNum(n);

        HexNum g2 = new HexNum();

        g2.showNum(n);

    }

}

**Output :**

Enter the number : 11

You have entered : 11

Octal value : 13

Hexadecimal value : b

**Q13. Create a base class Distance which stores the distance between two locations in miles and a method travelTime(). The method prints the time taken to cover the distance when the speed is 60 miles per hour. Now in a derived class DistanceMKS, override travelTime() so that it prints the time assuming the distance is in kilometers and the speed is 100 km per second. Demonstrate the working of the classes.**

// Author : Abhishek Sharma

import java.io.\*;

import java.lang.\*;

import java.util.\*;

class distance {

    public void TravelTime(float n)

    {

        double mtime = n/60;

        System.out.println("Time taken while travelling 60 miles/hr : "+ String.format("%.2f", mtime)+ " hours");

    }

}

class distanceMKS extends distance {

    public void TravelTime(float n)

    {

        double km = n \* 1.60934;

        double kmtime = km/100;

        System.out.println("Time taken while travelling 100 km/hr : " + String.format("%.2f", kmtime) + " hours");

    }

}

public class q13 {

    public static void main(String[] args)

    {

        float n;

        System.out.print("Enter the distance in miles : ");

        Scanner sc = new Scanner(System.in);

        n = sc.nextFloat();

        distance g1 = new distance();

        g1.TravelTime(n);

        distanceMKS g = new distanceMKS();

        g.TravelTime(n);

    }

}

**Output :**

Enter the distance in miles : 100

Time taken while travelling 60 miles/hr : 1.67 hours

Time taken while travelling 100 km/hr : 1.61 hours

**Q14. Create a base class called “vehicle” that stores number of wheels and speed.**

**Create the following derived classes –**

**“car” that inherits “vehicle” and also stores number of passengers.**

**“truck” that inherits “vehicle” and also stores the load limit.**

**Write a main function to create objects of these two derived classes and display all**

**the information about “car” and “truck”. Also compare the speed of these two**

**vehicles - car and truck and display which one is faster.**

import java.util.\*;

// Author : Abhishek Sharma

class Vehicle{

    int wheels;

    double speed;

}

class Car extends Vehicle{

    int pass;

    void input(){

        Scanner sc=new Scanner(System.in);

        System.out.println("Enter the car's details:\nNo. of wheels:");

        wheels=sc.nextInt();

        System.out.println("Speed of Car(Km/hr):");

        speed=sc.nextDouble();

        System.out.println("No. of passengers:");

        pass=sc.nextInt();

    }

    void display(){

        System.out.println("No. of wheels:"+wheels+"\nSpeed:"+speed+"km/hr\nNo. of passengers:"+pass);

    }

}

class Truck extends Vehicle{

    double limit;

    void input()  {

        Scanner sc=new Scanner(System.in);

        System.out.println("Enter the Truck's details:\nNo. of wheels:");

        wheels=sc.nextInt();

        System.out.println("Speed of Truck(Km/hr):");

        speed=sc.nextDouble();

        System.out.println("Load limit:");

        limit=sc.nextDouble();

    }

    void display()  {

        System.out.println("No. of wheels:"+wheels+"\nSpeed:"+speed+"km/hr\nLoad limit:"+limit);

    }

}

class q14{

    public static void main(String ts7[]){

        Car ob1= new Car();

        Truck ob2=new Truck();

        ob1.input();

        ob2.input();

        if(ob1.speed>ob2.speed)

            System.out.println("Car is faster");

        else

            System.out.println("Truck is faster");

        ob1.display();

        ob2.display();

    }

}

**Output :**

Enter the car's details:

No. of wheels:

4

Speed of Car(Km/hr):

50

No. of passengers:

3

Enter the Truck's details:

No. of wheels:

6

Speed of Truck(Km/hr):

40

Load limit:

60

Car is faster

No. of wheels:4

Speed:50.0km/hr

No. of passengers:3

No. of wheels:6

Speed:40.0km/hr

Load limit:60.0

**Q15. Write a Java program to explain “multilevel inheritance.”**

// Author : Abhishek Sharma

import java.io.\*;

import java.lang.\*;

import java.util.\*;

class one {

    public void print\_fname()

    {

        System.out.println("Abhishek");

    }

}

class two extends one {

    public void print\_lname()

    {

        System.out.println("Sharma");

    }

}

class three extends two {

    public void print\_dept()

    {

        System.out.println("Department of Computer Science and Engineering");

    }

}

public class q15 {

    public static void main(String[] args)

    {

        three g = new three();

        g.print\_fname();

        g.print\_lname();

        g.print\_dept();

    }

}

**Output :**

Abhishek

Sharma

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