MultiLevel Inheritance

1) Area & Volume

```
import java.util.*;
class Area
{
double r,A;
Area(double r)
{this.r=r;}

void cal_area()
{
A=3.14*r*r;
System.out.println("Area="+A);
}
}

class volume extends Area
{
double h,v;
volume(double r,double h)
{
super(r);
this.h=h;
}
void cal_vol()
{
cal_area();
v=A*h;
System.out.println("Volume="+v);
}
}

class volume1 extends volume
{
double l,v1;
volume1(double r,double h,double l)
{
super(r,h);
this.l=l;
}
void cal_vol1()
{
cal_vol();
v1=v*l;
```

```
System.out.println("Volume1="+v1);
}
}
public class Main
{
	public static void main(String[] args)
{
		double r,h,l;
		Scanner sc=new Scanner (System.in);
		System.out.println("Enter r & h l");
		r=sc.nextDouble();
		h=sc.nextDouble();
		l=sc.nextDouble();
		volume1 v1=new volume1(r,h,l);
		v1.cal_vol1();
	}
}
```

O/P:

```
Enter r & h l
1.5
2
4
Area=7.0649999999999995
Volume=14.129999999999999
Volume1=56.519999999999996
```

2) Student(id,name) display()
Marks(id,name,m1,m2,m3)show(){ m1 m2 m3 super.display();}
Result(id,name, m1,m2,m3)

```
import java.util.*;
class Student{
   int id;
   String name;
   Student(int id, String name){
      this.id=id;
      this.name=name;
   }
   void display(){
      System.out.println("ID="+id);
      System.out.println("Name="+name);
   }
}
class Marks extends Student{
   int m1,m2,m3;
```

```
    String name;
    Marks(int id,String name,int m1,int m2,int m3){
        super(id,name);
        this.m1=m1;
        this.m2=m2;
        this.m3=m3;
    }
    void show(){
        super.display();
        System.out.println("First subject mark="+m1);
        System.out.println("Second subject mark="+m2);
        System.out.println("Third subject mark="+m3);
    }
}
class Result extends Marks{
    int total,per;
    Result(int id,String name,int m1,int m2,int m3){
        super(id,name,m1,m2,m3);
    }
    int cal_total(){
        super.show();
        total=m1+m2+m3;
        return total;
    }
    double cal_per(){
        per=total/3;
        return per;
    }
    void cal_class(){
        if(per>=75 && per<=100){
            System.out.println("Class A");
        }
        else if(per>=65 && per<75){
            System.out.println("Class B");
        }
        else if(per>=50 && per<65){
            System.out.println("Class C");
        }
        else if(per>=35 && per<50){
            System.out.println("Class D");
        }
        else{
            System.out.println("Fail");
        }
```

```
   }
}
public class Main
{
        public static void main(String[] args)
   {
      int id,m1,m2,m3;
      String name;
      Scanner sc=new Scanner(System.in);
      System.out.println("Enter student id, name, m1, m2, m3");
      id=sc.nextInt();
      name=sc.next();
      m1=sc.nextInt();
      m2=sc.nextInt();
      m3=sc.nextInt();
      Result r=new Result(id,name,m1,m2,m3);
      System.out.println("Total="+r.cal_total());
      System.out.println("Percentage="+r.cal_per());
      r.cal_class();
         }
}
```

O/P:

```
Enter student id, name, m1, m2, m3
12
vj
78
54
90
ID=12
Name=vj
First subject mark=78
Second subject mark=54
Third subject mark=90
Total=222
Percentage=74.0
Class B
```

3) Write a program for multilevel inheritance such that the country is inherited from the continent. State is inherited from the country. Display the place, state, country and continent.

```
import java.util.*;
class Continent{
   int continentId;
   String continentName;
```

```
    double continentArea;
    Continent(int continentId,String continentName,double continentArea){
        this.continentId=continentId;
        this.continentName=continentName;
        this.continentArea=continentArea;
    }
    void displayContinent(){
        System.out.println("Continent Id:"+continentId);
        System.out.println("Continent Name:"+continentName);
        System.out.println("Continent Area:"+continentArea);
    }
}
class Country extends Continent{
    int countryId;
    String countryName;
    double countryArea;
    Country(int continentId,String continentName,double continentArea,int countryId,String
countryName,double countryArea){
        super(continentId,continentName,continentArea);
        this.countryId=countryId;
        this.countryName=countryName;
        this.countryArea=countryArea;
    }
    void displayCountry(){
        super.displayContinent();
        System.out.println("Country Id:"+countryId);
        System.out.println("Country Name:"+countryName);
        System.out.println("Country Area:"+countryArea);
    }
}
class State extends Country{
    int stateId;
    String stateName,stateLanguage;
    double stateArea;
    State(int continentId,String continentName,double continentArea,int countryId,String
countryName,double countryArea,int stateId,String stateName,String stateLanguage,double
stateArea){
        super(continentId,continentName,continentArea,countryId,countryName,countryArea);
        this.stateId=stateId;
        this.stateName=stateName;
        this.stateLanguage=stateLanguage;
        this.stateArea=stateArea;
    }
    void displayState(){
```

```
        super.displayCountry();
        System.out.println("State Id:"+stateId);
        System.out.println("State Name:"+stateName);
        System.out.println("State Language"+stateLanguage);
        System.out.println("State Area:"+stateArea);
    }
}
class City extends State{
    int cityId,cityPopulation;
    String cityName;
    double cityArea;
    City(int continentId,String continentName,double continentArea,int countryId,String
countryName,double countryArea,int stateId,String stateName,String stateLanguage,double
stateArea,int cityId,String cityName,int cityPopulation,double cityArea){

super(continentId,continentName,continentArea,countryId,countryName,countryArea,stateId,sta
teName,stateLanguage,stateArea);
        this.cityId=cityId;
        this.cityName=cityName;
        this.cityPopulation=cityPopulation;
        this.cityArea=cityArea;
    }
    void displayCity(){
        super.displayState();
        System.out.println("City Id:"+cityId);
        System.out.println("City Name:"+cityName);
        System.out.println("City Population"+cityPopulation);
        System.out.println("City Area:"+cityArea);
    }
}
class Place extends City{
    String placeName;
    double placeArea;
    Place(int continentId,String continentName,double continentArea,int countryId,String
countryName,double countryArea,int stateId,String stateName,String stateLanguage,double
stateArea,int cityId,String cityName,int cityPopulation,double cityArea,String placeName,double
placeArea){

super(continentId,continentName,continentArea,countryId,countryName,countryArea,stateId,sta
teName,stateLanguage,stateArea,cityId,cityName,cityPopulation,cityArea);
        this.placeName=placeName;
        this.placeArea=placeArea;
    }
    void displayPlace(){
```

```
        super.displayCity();
        System.out.println("Place Name:"+placeName);
        System.out.println("Place Area:"+placeArea);
    }
}
public class Main
{
        public static void main(String[] args) {
            int continentId,countryId,stateId,cityId,cityPopulation;
            String continentName,countryName,stateName,stateLanguage,cityName,placeName;
            double continentArea,countryArea,stateArea,cityArea,placeArea;
            Scanner sc=new Scanner(System.in);
            System.out.println("Enter Contient Id,Name,Area");
            continentId=sc.nextInt();
            continentName=sc.next();
            continentArea=sc.nextDouble();
            System.out.println("Enter Country Id,Name,Area");
            countryId=sc.nextInt();
            countryName=sc.next();
            countryArea=sc.nextDouble();
            System.out.println("Enter State Id,Name,Langugae,Area");
            stateId=sc.nextInt();
            stateName=sc.next();
            stateLanguage=sc.next();
            stateArea=sc.nextDouble();
            System.out.println("Enter City Id,Name,Population,Area");
            cityId=sc.nextInt();
            cityName=sc.next();
            cityPopulation=sc.nextInt();
            cityArea=sc.nextDouble();
            System.out.println("Enter Place Name,Area");
            placeName=sc.next();
            placeArea=sc.nextDouble();
                Place p=new
Place(continentId,continentName,continentArea,countryId,countryName,countryArea,stateId,sta
teName,stateLanguage,stateArea,cityId,cityName,cityPopulation,cityArea,placeName,placeArea
);
                p.displayPlace();
        }
}
```

O/P:

```
Enter Contient Id,Name,Area
1,
Asia
```

12321000
Enter Country Id,Name,Area
91
India
34210000
Enter State Id,Name,Langugae,Area
7
Maharashtra
Hindi Marathi
231000
Enter City Id,Name,Population,Area
Solapur Pune 12
Pune
7890000
5432100 0
Enter Place Name,Area
Sa hanivarVada
50
Continent Id:1
Continent Name:Asia
Continent Area:1.2321E7
Country Id:91
Country Name:India
Country Area:3.421E7
State Id:7
State Name:Maharashtra
State LanguageMarathi
State Area:231000.0
City Id:12
City Name:Pune
City Population7890000
City Area:54320.0
Place Name:Shaniwar Wada
Place Area:50.0

Hierarchical Inheritance

1) Employee(eid,ename,designation)
PartTime(n_hr,hr_rate,salary)
FullTime(n_day,day_rate,salary)

```
import java.util.Scanner;
class Emp
{
  double id;
  String name,desg;
```

```
    Emp(Double id,String name,String desg)
    {
        this.id=id;
        this.name=name;
        this.desg=desg;
    }

            public void display()
    {
        System.out.println("id:"+id);
        System.out.println("name :"+name);
        System.out.println("Designation :"+desg);
    }
}
class part_time extends Emp
{
    double hr_rate,sal;
    int n_hr;

    part_time(Double id,String name,String desg,int n_hr,double hr_rate)
    {
        super( id,name,desg);
        this.n_hr=n_hr;
        this.hr_rate=hr_rate;
    }
    public void  cal_sal()
    {
        System.out.println("No of hr:"+n_hr);
        System.out.println("Hr rate:"+hr_rate);
sal=(n_hr*hr_rate);
        System.out.println("Salary:"+sal);
    }
}
class Full_time extends Emp
{
    double day_rate,sal;
    int n_day;
    Full_time(Double id,String name,String desg,int n_day,double day_rate)
    {
        super(id,name,desg);
        this.n_day=n_day;
        this.day_rate=day_rate;
    }
    public void  cal_sal()
```

```
    {
        System.out.println("No of hr:"+n_day);
        System.out.println("Hr rate:"+day_rate);
        System.out.println("Salary:"+(n_day*day_rate));
    }
}
public class Main
{
        public static void main(String[] args)
        {
                double id;
                  String name,desg;
                  double hr_rate;
                  int n_hr,ch;
                  double day_rate;
                  int n_day;
                  Scanner sc=new Scanner(System.in);
                  do
                  {
                System.out.println("1:Accept details of part time empl");
                System.out.println("2:Accept details of full time empl");
                System.out.println("3:Exit");
                System.out.println("enter u r choice");
                 ch = sc.nextInt();

                switch(ch)
                {
                case 1:
                   System.out.println("Enter id,name & desg,n0f hr,hr rate");
                   id=sc.nextDouble();
                   name=sc.next();
                   desg=sc.next();
                   n_hr=sc.nextInt();
                   hr_rate=sc.nextDouble();
                   part_time p1=new part_time(id, name, desg, n_hr, hr_rate);
                   p1.display();
                   p1.cal_sal();

                  break;
                case 2:
                   System.out.println("Enter id,name & desg,n0f day,day rate");
                   id=sc.nextDouble();
                   name=sc.next();
                   desg=sc.next();
```

```
                    n_day=sc.nextInt();
                    day_rate=sc.nextDouble();
                    Full_time f1=new Full_time(id, name, desg, n_day, day_rate);
                    f1.display();
                    f1.cal_sal();
                    break;
                case 3:
                    System.exit(0);
                    break;
                    default:System.out.println("Invalid choice");
                }
                      }while(ch<=3);
}
}
```

O/P:

```
1:Accept details of part time empl
2:Accept details of full time empl
3:Exit
enter u r choice
1
Enter id,name & desg,n0f hr,hr rate
123
vj
CEO
2
1500
id:123.0
name :vj
Designation :CEO
No of hr:2
Hr rate:150.0
Salary:300.0
1:Accept details of part time empl
2:Accept details of full time empl
3:Exit
enter u r choice
```

2) Write a Java program to create a superclass Vehicle having members Company and price. Derive 2 different classes LightMotorVehicle (members – mileage) and HeavyMotorVehicle (members – capacity-in-tons). Accept the information for n vehicles and display the information in appropriate form. While taking data, ask the user about the type of vehicle first.(n no of object)

```
import java.util.*;
class Vehicle{
```

```
    String company;
    double price;
    Vehicle(String company,double price){
        this.company=company;
        this.price=price;
    }
    void display(){
        System.out.println("Company:"+company);
        System.out.println("Price:"+price);
    }

}
class LightMotorVehicle extends Vehicle{
    int mileage;
    LightMotorVehicle(String company,double price,int mileage){
        super(company,price);
        this.mileage=mileage;
    }
    void show(){
        super.display();
        System.out.println("Mileage:"+mileage);
    }
}
class HeavyMotorVehicle extends Vehicle{
    double capacity;
    HeavyMotorVehicle(String company,double price,double capacity){
        super(company,price);
        this.capacity=capacity;
    }
    void show(){
        super.display();
        System.out.println("Capacity in tons:"+capacity);
    }
}
public class Main
{
        public static void main(String[] args) {
                String company;
                double price,capacity;
                int mileage,size,i,ch;
                Scanner sc=new Scanner(System.in);
                do{
                    System.out.println("1.Light Motor Vehicle\n2.Heavy Motor Vehicle\n3.Exit");
                    System.out.println("Enter U R choice");
```

```
                    ch=sc.nextInt();
                    switch(ch){
                       case 1:
                          System.out.println("Enter array size");
                          size=sc.nextInt();
                          LightMotorVehicle[] lv=new LightMotorVehicle[size];
                          for(i=0;i<size;i++){
                             System.out.println("Enter vehicle Company,Price,Mileage");
                             company=sc.next();
                             price=sc.nextDouble();
                             mileage=sc.nextInt();
                             lv[i]=new LightMotorVehicle(company,price,mileage);
                             lv[i].show();
                          }
                          break;
                       case 2:System.out.println("Enter array size");
                          size=sc.nextInt();
                          HeavyMotorVehicle[] hv=new HeavyMotorVehicle[size];
                          for(i=0;i<size;i++){
                             System.out.println("Enter vehicle Company,Price,capacity in tons");
                             company=sc.next();
                             price=sc.nextDouble();
                             capacity=sc.nextDouble();
                             hv[i]=new HeavyMotorVehicle(company,price,capacity);
                             hv[i].show();
                          }
                          break;
                       case 3:System.exit(0);
                          break;
                       default:System.out.println("Invalid type");
                          break;
                    }
                 }while(ch<=3);
        }
}
```

O/P:

```
1.Light Motor Vehicle
2.Heavy Motor Vehicle
3.Exit
Enter U R choice
1
Enter array size
2
Enter vehicle Company,Price,Mileage
```

```
Honda
120000
55
Company:Honda
Price:120000.0
Mileage:55
Enter vehicle Company,Price,Mileage
Hero
90000
65
Company:Hero
Price:90000.0
Mileage:65
1.Light Motor Vehicle
2.Heavy Motor Vehicle
3.Exit
Enter U R choice
3
```

3) Write a program which has class Movie(title,amount,no_of_ticket) and inherit Following classes TaxedMovie(tax,finalAmount) and TaxFreeMovie(finalAmount). Use calculateTicketAmount() method in both subclasses. Create objects of TaxedMovie and TaxFreeMovie in the main class using super class reference print movies info with final amount for both the objects.

```
import java.util.*;
class Movie{
   String title;
   double amount;
   int noOfTicket;
   Movie(String title,double amount,int noOfTicket){
      this.title=title;
      this.amount=amount;
      this.noOfTicket=noOfTicket;
   }
   void display(){
      System.out.println("Movie Name:"+title);
      System.out.println("Amount:"+amount);
      System.out.println("Number of tickets:"+noOfTicket);
   }
}
class TaxedMovie extends Movie{
   double tax=0.18,finalAmount;
   TaxedMovie(String title,double amount,int noOfTicket){
      super(title,amount,noOfTicket);
```

```
    }
    double total_amt(){
        super.display();
        finalAmount=noOfTicket*amount;
        finalAmount=finalAmount+(finalAmount*tax);
        return finalAmount;
    }
}
class TaxFreeMovie extends Movie{
    double finalAmount;
    TaxFreeMovie(String title,double amount,int noOfTicket){
        super(title,amount,noOfTicket);
    }
    double total_amt(){
        super.display();
        finalAmount=noOfTicket*amount;
        return finalAmount;
    }
}
public class Main
{
        public static void main(String[] args) {
                String title;
                double amount,finalAmount;
                int noOfTicket,ch;
                Scanner sc=new Scanner(System.in);
                do{
                    System.out.println("1.Taxed Movie\n2.Tax Free Movie\n3.Exit");
                    System.out.println("Enter U R choice");
                    ch=sc.nextInt();
                    switch(ch){
                        case 1:System.out.println("Enter Movie name,amount,no of tickets");
                            title=sc.next();
                            amount=sc.nextDouble();
                            noOfTicket=sc.nextInt();
                            TaxedMovie tax=new TaxedMovie(title,amount,noOfTicket);
                            System.out.println("Total amount:"+tax.total_amt());
                            break;
                        case 2:
                            System.out.println("Enter Movie name,amount,no of tickets");
                            title=sc.next();
                            amount=sc.nextDouble();
                            noOfTicket=sc.nextInt();
                            TaxFreeMovie tfm=new TaxFreeMovie(title,amount,noOfTicket);
```

```
                    System.out.println("Total amount:"+tfm.total_amt());
                    break;
                case 3:System.exit(0);
                    break;
                default:System.out.println("Invalid choice");
                    break;
            }

        }while(ch<=3);
    }
}
```

O/P:

```
1.Taxed Movie
2.Tax Free Movie
3.Exit
Enter U R choice
1
Enter Movie name,amount,no of tickets
ABCD
100
2
Movie Name:ABCD
Amount:100.0
Number of tickets:2
Total amount:236.0
1.Taxed Movie
2.Tax Free Movie
3.Exit
Enter U R choice
2
Enter Movie name,amount,no of tickets
PK
120
4
Movie Name:PK
Amount:120.0
Number of tickets:4
Total amount:480.0
1.Taxed Movie
2.Tax Free Movie
3.Exit
Enter U R choice
3
```

4) Create an class “order” having members id,description.Create two subclasses “Purchase Order” and “Sales Order” having members vendor name and customer name respectively.Define methods accept and display in all cases. Create 3 objects each of Purchase Order and Sales Order and accept and display details.

```
import java.util.*;
class Order {
    int id;
    String description;

    void accept(Scanner sc) {
        System.out.print("Enter Order ID: ");
        id = sc.nextInt();
        sc.nextLine();
        System.out.print("Enter Order Description: ");
        description = sc.nextLine();
    }

    void display() {
        System.out.println("Order ID: " + id);
        System.out.println("Order Description: " + description);
    }
}

class PurchaseOrder extends Order {
    String vendorName;
    void accept(Scanner sc) {
        super.accept(sc);
        System.out.print("Enter Vendor Name: ");
        vendorName = sc.nextLine();
    }
    void display() {
        super.display();
        System.out.println("Vendor Name: " + vendorName);
    }
}

class SalesOrder extends Order {
    String customerName;
    void accept(Scanner sc) {
        super.accept(sc);
        System.out.print("Enter Customer Name: ");
        customerName = sc.nextLine();
    }
    void display() {
```

```
        super.display();
        System.out.println("Customer Name: " + customerName);
    }
}

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        PurchaseOrder[] purchaseOrders = new PurchaseOrder[3];
        SalesOrder[] salesOrders = new SalesOrder[3];

        System.out.println("Enter details for Purchase Orders:");
        for (int i = 0; i < 3; i++) {
            purchaseOrders[i] = new PurchaseOrder();
            purchaseOrders[i].accept(sc);
        }

        System.out.println("\nEnter details for Sales Orders:");
        for (int i = 0; i < 3; i++) {
            salesOrders[i] = new SalesOrder();
            salesOrders[i].accept(sc);
        }

        System.out.println("\nDisplaying Purchase Orders:");
        for (int i = 0; i < 3; i++) {
            System.out.println("Purchase Order " + (i + 1) + ":");
            purchaseOrders[i].display();
            System.out.println();
        }

        System.out.println("Displaying Sales Orders:");
        for (int i = 0; i < 3; i++) {
            System.out.println("Sales Order " + (i + 1) + ":");
            salesOrders[i].display();
            System.out.println();
        }
        sc.close();
    }
}
```