**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();

}

}