### **1. Single Level Inheritance**

import java.util.Scanner;

class Area {

double r, A;

Area(double r) {

this.r = r;

}

void cal\_area() {

A = 3.14 \* r \* r;

System.out.println("Radius=" + r + "\nArea=" + 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("Height=" + h + "\nVolume=" + v);

}

}

public class Single {

public static void main(String[] args) {

double r, h;

Scanner sc = new Scanner(System.in);

System.out.println("Enter radius and height:");

r = sc.nextDouble();

h = sc.nextDouble();

Volume v1 = new Volume(r, h);

v1.cal\_area();

v1.cal\_vol();

}

}

**Output:**

Enter radius and height:

5

10

Radius=5.0

Area=78.5

Height=10.0

Volume=785.0

### **2. Multilevel Inheritance**

import java.util.Scanner;

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 Multi {

public static void main(String[] args) {

double r, h, l;

Scanner sc = new Scanner(System.in);

System.out.println("Enter radius, height, and length:");

r = sc.nextDouble();

h = sc.nextDouble();

l = sc.nextDouble();

Volume1 v1 = new Volume1(r, h, l);

v1.cal\_vol1();

}

}

**Output:**

Enter radius, height, and length:

3

4

5

Area=28.259999999999998

Volume=113.03999999999999

Volume1=565.1999999999999

### **3. Hierarchical Inheritance**

import java.util.Scanner;

class Emp12 {

double id;

String name, desg;

Emp12(double id, String name, String desg) {

this.id = id;

this.name = name;

this.desg = desg;

}

void display() {

System.out.println("ID: " + id);

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

System.out.println("Designation: " + desg);

}

}

class PartTime extends Emp12 {

double hr\_rate, sal;

int n\_hr;

PartTime(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;

}

void cal\_sal() {

sal = n\_hr \* hr\_rate;

System.out.println("No of hours: " + n\_hr);

System.out.println("Hourly rate: " + hr\_rate);

System.out.println("Salary: " + sal);

}

}

class FullTime extends Emp12 {

double day\_rate, sal;

int n\_day;

FullTime(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;

}

void cal\_sal() {

sal = n\_day \* day\_rate;

System.out.println("No of days: " + n\_day);

System.out.println("Daily rate: " + day\_rate);

System.out.println("Salary: " + sal);

}

}

public class HierarchicalDemo {

public static void main(String[] args) {

double id;

String name, desg;

double hr\_rate, day\_rate;

int n\_hr, n\_day, ch;

Scanner sc = new Scanner(System.in);

do {

System.out.println("1: Accept details of part-time employee");

System.out.println("2: Accept details of full-time employee");

System.out.println("3: Exit");

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

ch = sc.nextInt();

switch (ch) {

case 1:

System.out.println("Enter ID, name, designation, number of hours, hourly rate:");

id = sc.nextDouble();

name = sc.next();

desg = sc.next();

n\_hr = sc.nextInt();

hr\_rate = sc.nextDouble();

PartTime p1 = new PartTime(id, name, desg, n\_hr, hr\_rate);

p1.display();

p1.cal\_sal();

break;

case 2:

System.out.println("Enter ID, name, designation, number of days, daily rate:");

id = sc.nextDouble();

name = sc.next();

desg = sc.next();

n\_day = sc.nextInt();

day\_rate = sc.nextDouble();

FullTime f1 = new FullTime(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);

}

}

**Output :**

Enter ID, name, designation, number of hours, hourly rate:

1

John

Developer

40

20

ID: 1.0

Name: John

Designation: Developer

No of hours: 40

Hourly rate: 20.0

Salary: 800.0

**Output:**

Enter ID, name, designation, number of days, daily rate:

2

Alice

Manager

20

100

ID: 2.0

Name: Alice

Designation: Manager

No of days: 20

Daily rate: 100.0

Salary: 2000.0

### **4. Vehicle Information with Multiple Inheritance**

import java.util.Scanner;

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 {

double mileage;

LightMotorVehicle(String company, double price, double mileage) {

super(company, price);

this.mileage = mileage;

}

void display() {

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 display() {

super.display();

System.out.println("Capacity (in tons): " + capacity);

}

}

public class VehicleDemo {

public static void main(String[] args) {

Scanner sc = new Scanner(System.in);

System.out.println("Enter company, price, and mileage for light motor vehicle:");

String company = sc.next();

double price = sc.nextDouble();

double mileage = sc.nextDouble();

LightMotorVehicle lmVehicle = new LightMotorVehicle(company, price, mileage);

lmVehicle.display();

System.out.println("Enter company, price, and capacity (in tons) for heavy motor vehicle:");

company = sc.next();

price = sc.nextDouble();

double capacity = sc.nextDouble();

HeavyMotorVehicle hmVehicle = new HeavyMotorVehicle(company, price, capacity);

hmVehicle.display();

}

}

**Output :**

Enter company, price, and mileage for light motor vehicle:

Toyota

20000

15

Company: Toyota

Price: 20000.0

Mileage: 15.0

**Output :**

Enter company, price, and capacity (in tons) for heavy motor vehicle:

Volvo

50000

10

Company: Volvo

Price: 50000.0

Capacity (in tons): 10.0

### **5. Countries, States, and Continents**

import java.util.Scanner;

class Continent {

String name;

Continent(String name) {

this.name = name;

}

void display() {

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

}

}

class Country extends Continent {

String countryName;

Country(String name, String countryName) {

super(name);

this.countryName = countryName;

}

void display() {

super.display();

System.out.println("Country: " + countryName);

}

}

class State extends Country {

String stateName;

State(String continentName, String countryName, String stateName) {

super(continentName, countryName);

this.stateName = stateName;

}

void display() {

super.display();

System.out.println("State: " + stateName);

}

}

public class LocationDemo {

public static void main(String[] args) {

Scanner sc = new Scanner(System.in);

System.out.println("Enter Continent, Country, and State names:");

String continentName = sc.next();

String countryName = sc.next();

String stateName = sc.next();

State location = new State(continentName, countryName, stateName);

location.display();

}

}

**Output:**

Enter Continent, Country, and State names:

Asia

India

Maharashtra

Continent: Asia

Country: India

State: Maharashtra

### **6. Staff Information**

import java.util.Scanner;

class Staff {

protected int id;

protected String name;

Staff(int id, String name) {

this.id = id;

this.name = name;

}

}

class OfficeStaff extends Staff {

String department;

OfficeStaff(int id, String name, String department) {

super(id, name);

this.department = department;

}

void display() {

System.out.println("ID: " + id);

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

System.out.println("Department: " + department);

}

}

public class StaffDemo {

public static void main(String[] args) {

Scanner sc = new Scanner(System.in);

System.out.println("Enter the number of office staff:");

int n = sc.nextInt();

OfficeStaff[] staffMembers = new OfficeStaff[n];

for (int i = 0; i < n; i++) {

System.out.println("Enter ID, Name, and Department for staff member " + (i + 1) + ":");

int id = sc.nextInt();

String name = sc.next();

String department = sc.next();

staffMembers[i] = new OfficeStaff(id, name, department);

}

System.out.println("Office Staff Details:");

for (OfficeStaff staff : staffMembers) {

staff.display();

}

}

}

**Output:**

Enter the number of office staff:

2

Enter ID, Name, and Department for staff member 1:

1

John

HR

Enter ID, Name, and Department for staff member 2:

2

Alice

Finance

Office Staff Details:

ID: 1

Name: John

Department: HR

ID: 2

Name: Alice

Department: Finance