**Multiple classes:**

The way of including classes inside other classes is also referred as *class composition* or *has a relation*. That is similar to car is composed of engine, tyres and seats or room has a fan etc.,.

There is no limit on the level of composition. An apartment contains multiple flats, a flat contains multiple rooms, rooms contain fans and lights and fans contain motor, wings etc.,.  
Similar to primitive data types, the dot(.) operator can also be used to access the variables of user defined types (non primitive types). Since there is no limit on the level to which classes can composed, there is also no limit on the number of levels to which the dot operators can be used.  
The below program shows how classes can be composed of other classes and how those objects can be accessed.

class ClassComposition  
{  
    public static void main(String arg[])  
    {  
        Room hall = new Room("Hall"); // LINE A  
        hall.area = 200.0;  
        hall.paintColor = "Voilet";  
        hall.flooring = "Marble";  
          
        hall.ceilingFan = new Fan("Bajaj"); // LINE B  
        hall.ceilingFan.speed = 500;     // LINE B1  
        hall.ceilingFan.numberOfSpeeds = 5;  
          
        hall.tube = new Light("Hall tube light"); // LINE C  
        hall.tube.color = "White";  
        hall.tube.watts = 40;  
        hall.tube.tube = true;    // LINE C1  
          
        Light bl = new Light("Yellow bed light"); // LINE D  
        hall.bedLight = bl;  
        hall.bedLight.color = "Yellow";  
        hall.bedLight.watts = 50;  
        hall.bedLight.tube = false;  
          
        System.out.println("Hall fan speed : " + hall.ceilingFan.speed);  
        System.out.println("Bed Light color : " + hall.bedLight.color);      
    }  
}  
  
class Fan  
{  
    String name;  
    double speed;  
    String color;  
    int numberOfSpeeds;  
  
    Fan(String name)  
    {  
        this.name = name;  
    }  
}  
  
class Light  
{  
    String name;  
    String color;  
    int watts;  
    boolean tube;  
  
    Light(String name)  
    {  
        this.name = name;  
    }  
}  
  
class Room  
{  
    String name;  
    double area;  
    String paintColor;  
    String flooring;  
    Fan ceilingFan;  
    Light tube;  
    Light bedLight;  
  
    Room(String name)  
    {  
        this.name = name;  
    }  
}

**Creating classes for data validation**

class ClassDataValidation  
{  
    public static void main(String arg[])  
    {  
        Student adarsh = new Student("Adarsh");  
        adarsh.setSection('B');  
        adarsh.setMarks(80);  
        adarsh.print("LINE A");    // LINE A  
          
        adarsh.setSection('Z'); // LINE B  
        adarsh.print("LINE B");  
          
        adarsh.setMarks(150); // LINE C  
        adarsh.print("LINE C");  
          
        adarsh.setDetails(90, 'C'); // LINE D  
        adarsh.print("LINE D");      
    }  
}  
  
class Student  
{  
    String name;  
    int marks;  
    char section;  
  
    Student(String name)  
    {  
        this.name = name;  
    }  
  
    void setMarks(int marks)  
    {  
        if( marks >= 0 && marks <= 100 )  
        {  
            this.marks = marks;  
        }  
    }  
  
  
    void setSection(char section)  
    {  
        if( section == 'A' || section == 'B' || section == 'C' || section == 'D')  
        {  
            this.section = section;  
        }  
    }  
  
    void setDetails(int marks, char section)  
    {  
        setMarks(marks);  
        setSection(section);  
    }  
  
    void print(String prefix)  
    {  
        System.out.println(prefix + " : " + name + " - " + marks + " - " + section);  
    }  
  
}

**Programs:**

**Area of Rectangle:**

class FindRectangleArea  
{  
    public static void main(String arg[])  
    {  
        Rectangle rect = new Rectangle(10, 5);  
          
        System.out.println("Length = " + rect.length);  
        System.out.println("Breadth = " + rect.breadth);  
        System.out.println("Area = " + rect.getArea());  
        System.out.println("Perimeter = " + rect.getPerimeter());  
      
    }  
}  
  
class Rectangle  
{  
    double length;  
    double breadth;  
  
    Rectangle(double length, double breadth)  
    {  
        this.length = length;  
        this.breadth = breadth;  
    }  
  
    double getArea()  
    {  
        return length \* breadth;  
    }  
  
    double getPerimeter()  
    {  
        return 2 \* (length + breadth);  
    }  
}

**Find Area of various Shapes**

class FindLargestShape  
{  
    public static void main(String arg[])  
    {  
        Rectangle r = new Rectangle(10, 4);  
        Square s = new Square(7);  
        Circle c = new Circle(3.5);  
          
        System.out.println("Rectangle Area : " + r.getArea());  
        System.out.println("Square Area : " + s.getArea());  
        System.out.println("Circle Area : " + c.getArea());  
        System.out.println();  
          
        if ((r.getArea() > c.getArea()) && (r.getArea() > s.getArea()))  
        {  
            System.out.println("Rectangle has the largest area.");  
        }  
        else if( s.getArea() > c.getArea() )  
        {  
            System.out.println("Square has the largest area.");  
        }  
        else  
        {  
            System.out.println("Circle has the largest area.");  
        }      
    }  
}  
  
class Rectangle  
{  
    double length;  
    double breadth;  
  
    Rectangle(double length, double breadth)  
    {  
        this.length = length;  
        this.breadth = breadth;  
    }  
  
    double getArea()  
    {  
        return length \* breadth;  
    }  
}  
  
class Square  
{  
    double side;  
  
    Square(double side)  
    {  
        this.side = side;  
    }  
  
    double getArea()  
    {  
        return side \* side;  
    }  
}  
  
class Circle  
{  
    double radius;  
  
    Circle(double radius)  
    {  
        this.radius = radius;  
    }  
  
    double getArea()  
    {  
        return (22.0/7.0) \* radius \* radius;  
    }  
}

**Program to Compare Entertainments**

class CompareEntertainments  
{  
    public static void main(String arg[])  
    {  
        Movie julai = new Movie();  
        julai.name = "Julai";  
        julai.director = "Trivikram";  
        julai.stuntMaster = "Peter Hein";  
        julai.numberOfArtists = 57;  
        julai.releaseDate = "15-Aug-2012";  
          
        julai.collectionsFirstWeek = 215467.8;  
        julai.collectionsRestOfTheDays = 541132.5;  
          
        Drama ramayan = new Drama();  
        ramayan.name = "Ramayana";  
        ramayan.writer = "Valmiki";  
        ramayan.stageSetter = "Anjaneya";  
        ramayan.numberOfArtists = 200000;  
        ramayan.releaseDate = "17-Mar-1659 BC";  
          
        ramayan.collectionsFirstWeek = 3282937242.86;  
        ramayan.collectionsRestOfTheDays = 93488272349.51;  
          
          
        Circus jumbo = new Circus();  
        jumbo.name = "Jumbo";  
        jumbo.ringMaster = "Antony";  
        jumbo.numberOfArtists = 316;  
        jumbo.releaseDate = "16-Dec-1997";  
          
        jumbo.collectionsFirstWeek = 2123132.21;  
        jumbo.collectionsRestOfTheDays = 234936725.09;  
          
        if((jumbo.getTotalCollections() > julai.getTotalCollections()) && (jumbo.getTotalCollections() > ramayan.getTotalCollections()))  
        {  
            jumbo.print();  
        }  
        else if ( julai.getTotalCollections() > ramayan.getTotalCollections())  
        {  
            julai.print();  
        }  
        else  
        {  
            ramayan.print();  
        }  
      
    }  
}  
  
class Movie  
{  
    String name;  
    String director;  
    String stuntMaster;  
    int numberOfArtists;  
    String releaseDate;  
    double collectionsFirstWeek;  
    double collectionsRestOfTheDays;  
  
    double getTotalCollections()  
    {  
        return collectionsFirstWeek + collectionsRestOfTheDays;  
    }  
  
    void print()  
    {  
        System.out.println( name + " got the following collections " );  
        System.out.println("First Week : " + collectionsFirstWeek);  
        System.out.println("Rest Of The Days : " + collectionsRestOfTheDays);  
        System.out.println("Total Collections : " + getTotalCollections());  
        System.out.println("Total Actors : " + numberOfArtists);  
        System.out.println("Release Date : " + releaseDate);  
        System.out.println("Director : " + director);  
        System.out.println("Stunt Master : " + stuntMaster);  
    }  
}  
  
class Drama  
{  
    String name;  
    String writer;  
    String stageSetter;  
    int numberOfArtists;  
    String releaseDate;  
    double collectionsFirstWeek;  
    double collectionsRestOfTheDays;  
  
    double getTotalCollections()  
    {  
        return collectionsFirstWeek + collectionsRestOfTheDays;  
    }  
  
    void print()  
    {  
        System.out.println( name + " got the following collections " );  
        System.out.println("First Week : " + collectionsFirstWeek);  
        System.out.println("Rest Of The Days : " + collectionsRestOfTheDays);  
        System.out.println("Total Collections : " + getTotalCollections());  
        System.out.println("Total Actors : " + numberOfArtists);  
        System.out.println("Release Date : " + releaseDate);  
        System.out.println("Writer : " + writer);  
        System.out.println("Stage Setter : " + stageSetter);  
    }  
}  
  
class Circus  
{  
    String name;  
    String ringMaster;  
    int numberOfArtists;  
    String releaseDate;  
  
    double collectionsFirstWeek;  
    double collectionsRestOfTheDays;  
  
    double getTotalCollections()  
    {  
        return collectionsFirstWeek + collectionsRestOfTheDays;  
    }  
  
    void print()  
    {  
        System.out.println( name + " got the following collections " );  
        System.out.println("First Week : " + collectionsFirstWeek);  
        System.out.println("Rest Of The Days : " + collectionsRestOfTheDays);  
        System.out.println("Total Collections : " + getTotalCollections());  
        System.out.println("Total Actors : " + numberOfArtists);  
        System.out.println("Release Date : " + releaseDate);  
        System.out.println("Ring Master : " + ringMaster);  
    }  
}