## 第九章

### 程序清单9-1

package work4;  
  
public class TestCircle {  
 public static void main(String[] args) {  
 Circle circle1 = new Circle();  
 System.out.println("The area of the circle of radius " + circle1.radius + " is " + circle1.getArea());  
  
 Circle circle2 = new Circle(25);  
 System.out.println("The area of the circle of radius " + circle2.radius + " is " + circle2.getArea());  
  
 Circle circle3 = new Circle(125);  
 System.out.println("The area of the circle of radius " + circle3.radius + " is " + circle3.getArea());  
  
 circle2.radius = 100;  
 System.out.println("The area of the circle of radius " + circle2.radius + " is " + circle2.getArea());  
 }  
}  
  
// Define the circle class with the two constructors  
class Circle {  
 double radius;  
  
 Circle() {  
 radius = 1.0;  
 }  
  
 Circle(double newRadius) {  
 radius = newRadius;  
 }  
  
 double getRadius() {  
 return radius;  
 }  
  
 double getArea() {  
 return radius \* radius \* Math.PI;  
 }  
  
 double getPerimeter() {  
 return 2 \* radius \* Math.PI;  
 }  
  
 void setRadius(double newRadius) {  
 radius = newRadius;  
 }  
}

### 程序清单9-2

package work4;  
  
public class AlternativeCircle {  
 public static void main(String[] args) {  
 AlternativeCircle circle1 = new AlternativeCircle();  
 System.out.println("The area of the circle of radius " + circle1.radius + " is " + circle1.getArea());  
  
 AlternativeCircle circle2 = new AlternativeCircle(25);  
 System.out.println("The area of the circle of radius " + circle2.radius + " is " + circle2.getArea());  
  
 AlternativeCircle circle3 = new AlternativeCircle(125);  
 System.out.println("The area of the circle of radius " + circle3.radius + " is " + circle3.getArea());  
  
 circle2.radius = 100;  
 System.out.println("The area of the circle of radius " + circle2.radius + " is " + circle2.getArea());  
 }  
  
 double radius;  
  
 AlternativeCircle() {  
 radius = 1;  
 }  
  
 AlternativeCircle(double newRadius) {  
 radius = newRadius;  
 }  
  
 double getArea() {  
 return radius \* radius \* Math.PI;  
 }  
  
 double getPerimeter() {  
 return 2 \* radius \* Math.PI;  
 }  
  
 void setRadius(double newRadius) {  
 radius = newRadius;  
 }  
}

### 程序清单9-3

package work4;  
  
public class TV {  
 int channel = 1;  
 int volumeLevel = 1;  
 boolean on = false;  
  
 public TV() {  
 }  
  
 public void turnOn() {  
 on = true;  
 }  
  
 public void turnOff() {  
 on = false;  
 }  
  
 public void setChannel(int newChannel) {  
 if (on && newChannel >= 1 && newChannel <= 120) {  
 channel = newChannel;  
 }  
 }  
  
 public void setVolume(int newVolumeLevel) {  
 if (on && newVolumeLevel >= 1 && newVolumeLevel <= 7) {  
 volumeLevel = newVolumeLevel;  
 }  
 }  
  
 public void channelUp() {  
 if (on && channel < 120)  
 channel++;  
 }  
  
 public void channelDown() {  
 if (on && channel > 1)  
 channel--;  
 }  
  
 public void volumeUp() {  
 if (on && volumeLevel < 7)  
 volumeLevel++;  
 }  
  
 public void volumeDown() {  
 if (on && volumeLevel > 1)  
 volumeLevel--;  
 }  
}

### 程序清单9-4

package work4;  
  
public class TestTV {  
 public static void main(String[] args) {  
 TV tv1 = new TV();  
 tv1.turnOn();  
 tv1.setChannel(30);  
 tv1.setVolume(3);  
  
 TV tv2 = new TV();  
 tv2.turnOn();  
 tv2.channelUp();  
 tv2.channelUp();  
 tv2.volumeUp();  
  
 System.out.println("tv1's channel is " + tv1.channel + " and volume is " + tv1.volumeLevel);  
 System.out.println("tv2's channel is " + tv2.channel + " and volume is " + tv2.volumeLevel);  
 }  
}

### 程序清单9-5

package work4;  
  
import java.util.Scanner;  
  
public class TestPoint2D {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
  
 System.out.print("Enter point1's x-, y-coordinates: ");  
 double x1 = input.nextDouble();  
 double y1 = input.nextDouble();  
 System.out.print("Enter point2's x-, y-coordinates: ");  
 double x2 = input.nextDouble();  
 double y2 = input.nextDouble();  
  
 Point2D p1 = new Point2D(x1, y1);  
 Point2D p2 = new Point2D(x2, y2);  
 System.out.println("p1 is " + p1.toString());  
 System.out.println("p2 is " + p2.toString());  
 System.out.println("The distance between p1 and p2 is " + p1.distance(p2));  
 System.out.println("The midpoint between p1 and p2 is " + p1.midpoint(p2).toString());  
  
 input.close();  
 }  
  
}

### 程序清单9-6

package work4;  
  
public class CircleWithStaticMembers {  
 double radius;  
 static int numberOfObjects = 0;  
  
 CircleWithStaticMembers() {  
 radius = 1;  
 numberOfObjects++;  
 }  
  
 CircleWithStaticMembers(double newRadius) {  
 radius = newRadius;  
 numberOfObjects++;  
 }  
  
 static int getNumberOfObjects() {  
 return numberOfObjects;  
 }  
  
 double getArea() {  
 return radius \* radius \* Math.PI;  
 }  
}

### 程序清单9-7

package work4;  
  
public class TestCircleWithStaticMembers {  
 public static void main(String[] args) {  
 System.out.println("Before creating objects");  
 System.out.println("The number of Circle objects is " + CircleWithStaticMembers.numberOfObjects);  
  
 CircleWithStaticMembers c1 = new CircleWithStaticMembers();  
 System.out.println("\nAfter creating c1");  
 System.out.println("c1: radius (" + c1.radius + ") and number of Circle objects is (" + c1.numberOfObjects + ")");  
  
 CircleWithStaticMembers c2 = new CircleWithStaticMembers(5);  
  
 c1.radius = 9;  
  
 System.out.println("\nAfter creating c2 and modifying c1");  
 System.out.println("c1: radius (" + c1.radius + ") and number of Circle objects is (" + c1.numberOfObjects + ")");  
 System.out.println("c2: radius (" + c2.radius + ") and number of Circle objects is (" + c2.numberOfObjects + ")");  
 }  
}

### 程序清单9-8

package work4;  
  
public class CircleWithPrivateDataFields {  
 private double radius = 1;  
 private static int numberOfObjects = 0;  
  
 public CircleWithPrivateDataFields() {  
 numberOfObjects++;  
 }  
  
 public CircleWithPrivateDataFields(double newRadius) {  
 radius = newRadius;  
 numberOfObjects++;  
 }  
  
 public double getRadius() {  
 return radius;  
 }  
  
 public void setRadius(double newRadius) {  
 radius = (newRadius >= 0) ? newRadius : 0;  
 }  
  
 public static int getNumberOfObjects() {  
 return numberOfObjects;  
 }  
  
 public double getArea() {  
 return radius \* radius \* Math.PI;  
 }  
}

### 程序清单9-9

package work4;  
  
public class TestCircleWithPrivateDataFields {  
 public static void main(String[] args) {  
 CircleWithPrivateDataFields myCircle = new CircleWithPrivateDataFields(5.0);  
 System.out.println("The area of the circle of radius " + myCircle.getRadius() + " is " + myCircle.getArea());  
  
 myCircle.setRadius(myCircle.getRadius() \* 1.1);  
 System.out.println("The area of the circle of radius " + myCircle.getRadius() + " is " + myCircle.getArea());  
  
 System.out.println("The number of objects created is " + CircleWithPrivateDataFields.getNumberOfObjects());  
  
 }  
}

#### 程序清单9-10

package work4;  
  
public class TestPassObject {  
 public static void main(String[] args) {  
 Circle myCircle = new Circle(1);  
  
 int n = 5;  
 printAreas(myCircle, n);  
  
 System.out.println("\n" + "Radius is " + myCircle.getRadius());  
 System.out.println("n is " + n);  
 }  
  
 public static void printAreas(Circle c, int times) {  
 System.out.println("Radius \t\tArea");  
 while (times >= 1) {  
 System.out.println(c.getRadius() + "\t\t" + c.getArea());  
 c.setRadius(c.getRadius() + 1);  
 times--;  
 }  
 }  
}

### 程序清单9-11

package work4;  
  
public class TotalArea {  
 public static void main(String[] args) {  
 Circle[] circleArray;  
  
 circleArray = createCircleArray();  
  
 printCircleArray(circleArray);  
 }  
  
 public static Circle[] createCircleArray() {  
 Circle[] circleArray = new Circle[5];  
 for (int i = 0; i < circleArray.length; i++) {  
 circleArray[i] = new Circle(Math.random() \* 100);  
 }  
 return circleArray;  
 }  
  
 public static void printCircleArray(Circle[] circleArray) {  
 System.out.printf("%-30s%-50s\n", "Radius", "Area");  
 for (int i = 0; i < circleArray.length; i++) {  
 System.out.printf("%-30f%-15f\n", circleArray[i].getRadius(), circleArray[i].getArea());  
 }  
 System.out.println("-------------------------------------------");  
 System.out.printf("%-30s%-15f\n", "The total area of circle is", sum(circleArray));  
 }  
  
 public static double sum(Circle[] circleArray) {  
 double sum = 0;  
 for (int i = 0; i < circleArray.length; i++) {  
 sum += circleArray[i].getArea();  
 }  
 return sum;  
 }  
}