**Exercise 1：**

**Main:**

**public class Exercise1 {  
 public static void main(String[] args) {  
 Shape[] shapes = new Shape[4];  
 shapes[0] = new Circle(2.3);  
 shapes[1] = new Square(4.8);  
 shapes[2] = new Sphere(5.2);  
 shapes[3] = new Cube(9.5);  
  
 for (int i = 0; i < 4; i++) {  
 if (shapes[i].getDimension() == 2) {  
 System.out.println("Two dimensional shape: " + shapes[i].getShape() + ". Its " + shapes[i].getElementName() + " is " + shapes[i].getElement()+", area is: " + shapes[i].getArea() + ".");  
 } else {  
 System.out.println("Three dimensional shape: " + shapes[i].getShape() + ". Its " + shapes[i].getElementName() + " is " + shapes[i].getElement()+", area is: " + shapes[i].getArea() + ", volume is " + shapes[i].getVolume() + ".");  
 }  
 }  
 }  
}**

**Shape:**

**public class Shape {  
 double area;  
 double volume;  
 double element;  
 int dimension;  
 String shape;  
 String elementName;  
  
 public int getDimension(){  
 return dimension;  
 }  
  
 public String getShape(){  
 return shape;  
 }  
  
 public String getElementName(){  
 return elementName;  
 }  
  
 public double getElement(){  
 return element;  
 }  
  
 public double getArea(){  
 return area;  
 }  
  
  
 public double getVolume(){  
 return volume;  
 }  
}**

**TwoDimensionalShape:**

**public class TwoDimensionalShape extends Shape{  
 int dimension=2;  
  
 public int getDimension(){  
 return dimension;  
 }  
  
 public double getArea(TwoDimensionalShape a){  
 return area;  
 }  
}**

**ThreeDimensionalShape:**

**public class ThreeDimensionalShape extends Shape{  
 int dimension=3;  
  
 public int getDimension(){  
 return dimension;  
 }  
  
 public double getArea(ThreeDimensionalShape a){  
 return area;  
 }  
  
 public double getVolume(ThreeDimensionalShape a){  
 return volume;  
 }  
}**

**Circle:**

**public class Circle extends TwoDimensionalShape{  
 double element;  
  
 Circle(double r){  
 element=r;  
 }  
  
 public double getArea(){  
 return Math.PI\*Math.pow(element,2)/2;  
 }  
  
 public String getShape(){  
 return "Circle";  
 }  
  
 public String getElementName(){  
 return "radius";  
 }  
  
 public double getElement(){  
 return element;  
 }  
}**

**Square:**

**public class Square extends TwoDimensionalShape{  
 double element;  
  
 Square(double l){  
 element=l;  
 }  
  
 public double getArea(){  
 return element\*element;  
 }  
  
 public String getShape(){  
 return "Square";  
 }  
  
 public String getElementName(){  
 return "length";  
 }  
  
 public double getElement(){  
 return element;  
 }  
}**

**Sphere:**

**public class Sphere extends ThreeDimensionalShape{  
 double element;  
  
 Sphere(double r){  
 element=r;  
 }  
  
 public double getArea(){  
 return Math.pow(element,2)\*4;  
 }  
  
 public double getVolume(){  
 return Math.pow(element,3)\*4/3;  
 }  
  
 public String getShape(){  
 return "Sphere";  
 }  
  
 public String getElementName(){  
 return "radius";  
 }  
  
 public double getElement(){  
 return element;  
 }  
}**

**Cube:  
public class Cube extends ThreeDimensionalShape{  
 double element;  
  
 Cube(double l){  
 element=l;  
 }  
  
 public double getArea(){  
 return Math.pow(element,2)\*6;  
 }  
  
 public double getVolume(){  
 return Math.pow(element,3);  
 }  
  
 public String getShape(){  
 return "Cube";  
 }  
  
 public String getElementName(){  
 return "length";  
 }  
  
 public double getElement(){  
 return element;  
 }  
}**

