**Worksheet 11.1**

# ArrayList

1. The following program utilizes the ArrayList and Point2D.Double classes. The Point2D.Double class encapsulates X and Y coordinate values into a single point object (storing each value as a double). ArrayList is then used to create a list of coordinate points. For more information on the usage of Point2D.Double, as well as other Java classes, refer to:

<http://java.sun.com/j2se/1.5.0/docs/api/>

Explore this code and determine its exact output if the following points are read from the keyboard:

(1.5, 2.1), (9.7, 2.1), (9.7, 7.3), (1.5, 7.3).

These points represent consecutive vertices of a rectangle and must be entered in consecutive order!

**import** java.awt.geom.\*; // for Point2D.Double

**import** java.util.\*; // for ArrayList

**class** Rectangle {

**public** Rectangle()

{}

**public void** input(ArrayList myRect){

System.out.println("We need four vertices for our rectangle.");

System.out.println("Please provide them in consecutive order.");

Scanner in = **new** Scanner();

**for** (char ch = 'A'; ch <= 'D'; ch++){

System.out.print("Give me the x coordinate for point " + ch + ": ");

**double** x = in.nextDouble();

System.out.print("Give me the y coordinate for point " + ch + ": ");

**double** y = in.nextDouble();

Point2D.Double myPoint = **new** Point2D.Double(x,y);

myRect.add(myPoint);

}

}

**public void** output(ArrayList myRect){

**for** (**char** ch = 'A'; ch <= 'D'; ch++){

Point2D.Double pt = (Point2D.Double)myRect.get(ch - 65);

System.out.println("Point " + ch + " is (" + pt.getX() + ","

+ pt.getY() + ")");

}

}

**public** **double** calculateArea(ArrayList myRect){

Point2D.Double ptA = (Point2D.Double)myRect.get(0);

Point2D.Double ptB = (Point2D.Double)myRect.get(1);

Point2D.Double ptC = (Point2D.Double)myRect.get(2);// not needed

Point2D.Double ptD = (Point2D.Double)myRect.get(3);

**double** base = ptA.distance(ptB);

**double** height = ptA.distance(ptD);

**return** base \* height;

}

}

**public** **static** **void** main(String[] args){

Rectangle app = **new** Rectangle();

ArrayList myRectangle = **new** ArrayList();

app.input(myRectangle);

app.output(myRectangle);

**double** area = app.calculateArea(myRectangle);

System.out.printf("%s%5.2f”,”The area of the rectangle is ", area);

}

2. Revise this program by adding the methods *input5thPoint* and *calculateTriangleArea*. The method *input5thPoint* should prompt the user to add a 5th point on the line segment connecting points A and B (i.e. the first two points entered). Within this method, the point should be added to the ArrayList *myRectangle*. The method *calculateTriangleArea* should calculate the area of the triangle formed by this 5th point and the points A and D.