

## 1. PROGRAM 4 INSTRUCTIONS, CS102, PROF. LOFTIN

You are given a class `Pair`, which stores a pair of integers. You must write `Point`, a subclass of `Pair`, and `LabeledPoint`, a subclass of `Point`.

## 2. POINT CLASS

Implement the following public methods:

```
Point(int xx, int yy)
String toString()
double distance()
double distance(Point p)
```

- The constructor can just invoke the one for `Pair`, using `super`.
- The `toString()` method should distinguish a `Point` from a `Pair` (see the sample output below).
- The first `distance()` method find the distance from the current `Point` (represented by `this`) to the origin; the second returns the distance from the current `Point` to `p`.
- The distance between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by the formula

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

In particular, the distance from a point  $(x_1, y_1)$  to the origin  $(0, 0)$  is given by

$$\sqrt{x_1^2 + y_1^2}$$

## 3. LABELEDPOINT CLASS

Implement the following public methods:

```
protected String label; // New instance variable
LabeledPoint(String s, Point p) // set label to s
String toString()
```

## 4. SUBMISSION

You should submit your `Point.java` and `LabeledPoint.java` as email attachments to `loftin@rutgers.edu`.

## 5. DUE DATE: OCTOBER 12, 2009

## 6. PAIR.JAVA

```
public class Pair{
    protected int x, y;
    Pair(int xx, int yy){x=xx;y=yy;}
    public String toString(){
        return "Pair["+x+", "+y+"]";
    }
}
```

## 7. THE DRIVER CLASS MAIN.JAVA

```
public class Main{
    public static void main(String[] args){
        Pair pair=new Pair(1,2);
        System.out.println(pair);
        Point point=new Point(3,4);
        System.out.println(point);
        System.out.println(point.distance());
        Point point2=new Point(-3,5);
        System.out.println(point2);
        System.out.println(point2.distance());
        System.out.println(point.distance(point2));
        System.out.println(point2.distance(point));
        Point origin=new LabeledPoint("Origin",new Point(0,0));
        System.out.println(origin);
        Point p2=new LabeledPoint("Point 2",point2);
        System.out.println(p2);
        System.out.println(p2.distance());
    }
}
```

## 8. OUTPUT OF THE DRIVER CLASS

```
Pair[1,2]
Point[3,4]
5.0
Point[-3,5]
5.830951894845301
6.082762530298219
6.082762530298219
LabeledPoint[Origin,0,0]
LabeledPoint[Point 2,-3,5]
5.830951894845301
```