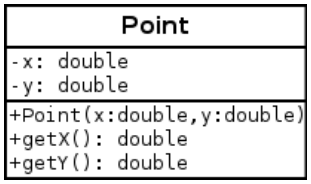
Examination 3

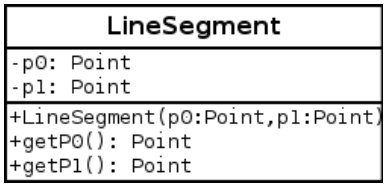
CSC140 Foundations of Computer Science

27 February 2015

1. Define a class that models a point in the plane.



2. Define a class that models a line segment in the plane.



3. Write a loop that computes n equally spaced angles in the range 0 to 2π.

4. Write code that calls makePoints(), makeLines(), and drawLines() in succession to create and draw a curve.

```
private static Point[] makePoints(int n, double a, double b) {
        Point[] points = new Point[n];

        for (int i = 0; i < n; i++) {
            double fraction = ((double) i) / (n - 1);
            double angle = fraction * 2.0 * Math.PI;

            double x = (a + b) * Math.cos(angle)
                    - b * Math.cos((a / b + 1) * angle);
            double y = (a + b) * Math.sin(angle)
                    - b * Math.sin((a / b + 1) * angle);
            Point p = new Point(x, y);

            points[i] = p;
        } // for
```

```
    return points;
} // makePoints( int )

private static LineSegment[] makeLines(Point[] points) {
    LineSegment[] lines = new LineSegment[points.length - 1];
    for (int i = 0; i < points.length - 1; i++) {
        lines[i] = new LineSegment(points[i], points[i + 1]);
    } // for
    return lines;
} // makeLines( Point [] )

private static void drawLines(LineSegment[] lines) {
    for (LineSegment segment : lines) {
        double x0 = segment.getP0().getX();
        double y0 = segment.getP0().getY();
        double x1 = segment.getP1().getX();
        double y1 = segment.getP1().getY();
        StdDraw.line(x0, y0, x1, y1);
    } // for
} // drawLines( LineSegment [] )
```

5. What does this code accomplish?

```
double xmin = points[0].getX();
double ymin = points[0].getY();
double xmax = points[0].getX();
double ymax = points[0].getY();

for( int i  = 1; i < points.length; i++ ) {
  double x = points[i].getX();
  double y = points[i].getY():

  if( x < xmin ) {
    xmin = x;
  } // if

  if( x > xmax ) {
    xmax = x;
  } // if

  if( y < ymin ) {
    ymin = y;
  } // if

  if( y > ymax ) {
```

```
        ymax = y;
      } // if
    } // for
```

6. Provide the code that is called for in the comments in this fragment of a program.

```
public class Curve {

    private static final int WIDTH = 512;
    private static final int HEIGHT = 512;
    private static final double X_MIN = -4.0;
    private static final double X_MAX = +4.0;
    private static final double Y_MIN = -4.0;
    private static final double Y_MAX = +4.0;
    private static final Color BG_COLOR = new Color(172, 248, 206);
    private static final Color FG_COLOR = Color.BLUE;

    public static void main(String[] args) {
        StdDraw.setCanvasSize(WIDTH, HEIGHT);
        StdDraw.setXscale(X_MIN, X_MAX);
        StdDraw.setYscale(Y_MIN, Y_MAX);

        // compute x coordinate of window's center
        // compute y coordinate of window's center
        // compute half of window's width
        // compute half of window's height

        StdDraw.setPenColor(BG_COLOR);
        StdDraw.filledRectangle(cx, cy, halfWidth, halfHeight);

    } // main( String [] )

} // Curve
```

7. The word "maintenance" means something different when we speak of the maintenance of an automobile on the one hand and maintenance of software on the other hand. What is the difference?

8. Experience and study has helped software engineers develop better ways of working together in efforts to deliver high-quality products on time and within budget. Through our discussions and through your reading, you learned a little about the disciplines that software engineers use. Explain how you might apply one of the lessons that you learned in your own work.