Module 7 - Classes and Objects

CMPT220L
Due on Oct 30, 2020 by 11:59 PM
Points: 100

Problems

1. *(Intersecting point)* Write the following method that returns the intersecting point between two lines (p1, p2) and (p3, p4):

   ```
   public static Point getIntersectingPoint(Point p1, Point p2, Point p3, Point p4);
   ```

   You'll also need to create a `Point` class with two private data fields `x` and `y` to represent a point.

   The intersection point between two lines can be found by solving the following linear equations provided that $ad - bc$ is not 0:

   $$(y_1 - y_2)x - (x_1 - x_2)y = (y_1 - y_2)x_1 - (x_1 - x_2)y_1 \tag{1}$$

   $$(y_3 - y_4)x - (x_3 - x_4)y = (y_3 - y_4)x_3 - (x_3 - x_4)y_3 \tag{2}$$

   This can be solved using Cramer's rule to solve a 2×2 system of linear equations:

   $$ax + by = e \tag{3}$$

   $$cx + dy = f \tag{4}$$

   $$x = \frac{ed - bf}{ad - bc} \qquad y = \frac{af - ec}{ad - bc} \tag{5}$$

   The method returns null if the two lines are parallel. Write a test program that prompts the user to enter three points and displays the center point. Here is a sample run.

   ```
   Enter x1, y1, x2, y2, x3, y3, x4, y4: 2 2 5 -1.0 4.0 2.0 -1.0 -2.0
   The intersecting point is at (2.88889, 1.1111)

   Enter x1, y1, x2, y2, x3, y3, x4, y4: 2 2 7 6.0 4.0 2.0 -1.0 -2.0
   The two lines are parallel
   ```

2. *(Center of a triangle)* Write the following method that returns the center of a triangle:

   ```
   public static Point getCenterPoint(Point p1, Point p2, Point p3);
   ```

   Write a test program that prompts the user to enter three points and displays the center point. Here is a sample run: (*Hint*: Use what you created for the previous problem).

   ```
   Enter x1, y1, x2, y2, x3, y3: 2.5 2 5 -1.0 4.0 2.0
   The center point is at (3.8333333333333335, 1.0)
   ```

3. *(Geometry: area of a triangle)* Write a method for computing the area of a triangle using the following method:

   ```
   public static double getTriangleArea(Point p1, Point p2, Point p3)
   ```

   Write a program that prompts the user to enter three points of a triangle and displays the triangle's area. Here is a sample run of the program:

   ```
   Enter x1, y1, x2, y2, x3, y3: 2.5 2 5 -1.0 4.0 2.0
   The area of the triangle is 2.25

   Enter x1, y1, x2, y2, x3, y3: 2 2 4.5 4.5 6 6
   The three points are on the same line
   ```

Submission

Make sure you create one Java file per project. Place your `.java` files under the corresponding folder in your local copy of the GitHub repository, commit and push it to the remote repository. Make sure that the professor has access to the repository (`jfac65-marist`).

```
cmpt220lastname\
   hw\
      7\
         Problem1.java
         Problem2.java
         Problem3.java
         Problem4.java
```