

## Problem Set 1 Exercise #16: Triangle Incenter

**Reference:** Lecture 2 notes

**Learning objective:** Writing methods; Math class method

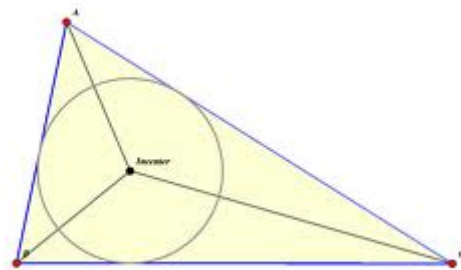
**Estimated completion time:** 30 minutes

### Problem statement:

In geometry, the incircle (or inscribed circle) of a triangle is the largest circle contained in the triangle; it touches (is tangent to) the three sides. The center of the incircle is called the triangle's incenter.

Write a program **PS1\_Ex16\_TriangleIncenter.java** to read in the coordinates (of type **double**) of 3 vertices of a triangle and compute the coordinates of its incenter.

Your program should contain a method **computeLength()** that returns the length of a side of triangle given its two vertices.



### Useful tips:

The Cartesian coordinates of the incenter are a weighted average of the coordinates of the three vertices using the side lengths of the triangle as weights. If the three vertices are located at  $(x_a, y_a)$ ,  $(x_b, y_b)$ , and  $(x_c, y_c)$ , and the sides opposite these vertices have corresponding lengths **a**, **b** and **c**, then the incenter is at

$$\left( \frac{ax_a + bx_b + cx_c}{p}, \frac{ay_a + by_b + cy_c}{p} \right)$$

where **p** = **a** + **b** + **c**.

An incenter calculator is available on this website:

<http://www.had2know.com/academics/centroid-circumcenter-orthocenter-incenter-triangle.html>

Search online for more information if needed.

**Sample run #1:**

```
Coordinates of 1st vertex: -1 0
Coordinates of 2nd vertex: 3 0
Coordinates of 3rd vertex: 1 5
Coordinates of incenter = (1.00, 1.35)
```

**Sample run #2:**

```
Coordinates of 1st vertex: 63.2 21.8
Coordinates of 2nd vertex: -15 -6
Coordinates of 3rd vertex: -19.2 5.7
Coordinates of incenter = (-11.52, 1.34)
```