**台州学院**

**电子与信息工程学院课后作业**

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Week4 Computing Angles of a Triangle

**Project: Computing Angles of a Triangle**

Problem Description:

Write a program that prompts the user to enter the x- and y-coordinates of the three corner points in a triangle and then displays the triangle’s angles.



Analysis:

In the problem description above said that prompts the user to enter the x- and y-coordinates of the three corner points in a triangle and then displays its angles. By the given formula we can implement it into a Java program using *Math.acos()* method.

Design:

First, prompt the user to input three points (x1, y1), (x2, y2), and (x3, y3). Second, calculate the side length using the distance formula

Third, Compute the three angles using the cosine rule. Last, display the result by rounding it to two decimal places and sum of the angles.

Coding: (Copy and Paste Source Code here. Format your code using Courier 10pts)

import java.util.Scanner;  
  
public class Main {  
 public static void main(String[] *args*) {  
 Scanner input = new Scanner(System.in);  
  
 System.out.println("Please input three points: ");  
 double x1 = input.nextDouble();  
 double y1 = input.nextDouble();  
 double x2 = input.nextDouble();  
 double y2 = input.nextDouble();  
 double x3 = input.nextDouble();  
 double y3 = input.nextDouble();  
  
 // compute three sides  
 double a = Math.**sqrt**((x2 - x3) \* (x2 - x3)  
 + (y2 - y3) \* (y2 - y3));  
 double b = Math.**sqrt**((x1 - x3) \* (x1 - x3)  
 + (y1 - y3) \* (y1 - y3));  
 double c = Math.**sqrt**((x1 - x2) \* (x1 - x2)  
 + (y1 - y2) \* (y1 - y2));  
  
 // compute three angles  
 double A = Math.**toDegrees**(Math.**acos**((a \* a - b \* b - c \* c)  
 / (-2 \* b \* c)));  
 double B = Math.**toDegrees**(Math.**acos**((b \* b - a \* a - c \* c)  
 / (-2 \* a \* c)));  
 double C = Math.**toDegrees**(Math.**acos**((c \* c - b \* b - a \* a)  
 / (-2 \* a \* b)));  
  
 // display results  
 double sum = A + B + C;  
 System.out.println("The three angles are " +  
 Math.**round**(A \* 100) / 100.0 + " " +  
 Math.**round**(B \* 100) / 100.0 + " " +  
 Math.**round**(C \* 100) / 100.0 + " and the sum of the angles is " + sum);  
 }  
}

Testing:

First, I tested a valid right triangle with coordinates (0,0), (3,0), and (3,4), which correctly produced angles of approximately 90.00°, 53.13°, and 36.87°. Then, I tested an equilateral triangle with coordinates (0,0), (2,0), and (1,1.732), which resulted in three angles of around 60.00° each, as expected. Similarly, using duplicate points (1,1), (1,1), and (2,2) also resulted in an invalid triangle. Lastly, I tested a case with very small floating-point values ensuring that the sum of angles remained close to 180°. The results matched expectations, confirming that the program functions correctly in various scenarios.