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12/12/2023

ECE 1310.04

Final Exam

The pseudocode is written as comments within the code.

A screenshot of a computer

Description automatically generated

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\* Date: 12/12/2023

\* Description: Final Exam

\* Class Section: ECE 1310.04

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//System Libraries

#include <iostream>

#include <cmath> //for sqrt and stuff

//Function Prototypes

int Validate(double[], int);

double Distance(double[], double[], int, int); //part a

double AreaOfTriangle(double, double, double); //part b

//Global Constants

//Main Function

using namespace std;

int main(int argc, char\*\* argv)

{

cout << "=== Welcome to Kelly's Final Exam! ===\n";

double x[5]; //array for x values

double y[5]; //array for y values

//get user input

cout << "Enter the (x,y) coordinates, one pair at a time:\n";

for (int i = 0; i < 5; i++) //for loop to fill x and y arrays

{

cout << "\nx" << i + 1 << ": ";

cin >> x[i]; //get x

Validate(x, i); //validate

cout << "y" << i + 1 << ": ";

cin >> y[i]; //get y

Validate(y, i); //validate

}

//pentagon is 3 triangles

//3 distances (legs) for each triangle

double area; //total area of pentagon

double a1, a2, a3; //area of each triangle

//7 total distances (some triangles share legs)

//make an array for distances

double d[7]; //d3 and d5 are shared legs

//fill the array with the Distance function

d[0] = Distance(x, y, 0, 1); //d1

d[1] = Distance(x, y, 2, 0); //d2

d[2] = Distance(x, y, 2, 1); //d3

d[3] = Distance(x, y, 4, 2); //d4 -

d[4] = Distance(x, y, 4, 1); //d5 -

d[5] = Distance(x, y, 4, 3); //d6 -

d[6] = Distance(x, y, 3, 1); //d7

//a1 has d1, d2, d3 (d[0], d[1], d[2])

//a2 has d3, d4, d5 (d[2], d[3], d[4])

//a3 has d5, d6, d7 (d[4], d[5], d[6])

a1 = AreaOfTriangle(d[0], d[1], d[2]);

a2 = AreaOfTriangle(d[2], d[3], d[4]);

a3 = AreaOfTriangle(d[4], d[5], d[6]);

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cout << "\nThe area of a1 is " << a1 << endl //for testing

<< "\nThe area of a2 is " << a2 << endl

<< "\nThe area of a3 is " << a3 << endl;

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area = a1 + a2 + a3;

cout << "\nThe total area of the pentagon is " << area << endl;

return 0;

}

//input validation for x and y values

int Validate(double a[], int i)

{

while (a[i] < 0)

{

cout << "\nPoints must be in the first quadrant!"

<< "\nThat means positive x and y values only, please!\n"

<< "Try again: \n";

cin >> a[i];

}

return a[i];

}

//distance between point 1 (x1, y1) and point 2 (x2, y2)

double Distance(double x[], double y[], int a, int b) //part a

{

//distance = sqrt((x2 - x1)^2 + (y2 - y1)^2)

double distance, m, n;

m = (x[b] - x[a]) \* (x[b] - x[a]);

n = (y[b] - y[a]) \* (y[b] - y[a]);

distance = sqrt(m + n);

//cout << "\ndistance = " << distance << endl; //for testing

return distance;

}

//returns the area of a triangle given sides a, b, and c

double AreaOfTriangle(double a, double b, double c) //part b

{

double s = (0.5)\*(a + b + c); //s = semi-perimeter

//cout << "\n s = " << s << endl; //for testing

double area = sqrt(s\*(s - a)\*(s - b)\*(s - c)); //heron's formula

//cout << "area = " << area << endl; //for testing

return area;

}