Lab # 4

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CPSC 1150 - 003
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Lab Title: Triangle Lab
Date submitted: June 13 2023
Department: CPSC

Program Bank Account
File Name: Lab4.java
Purpose: takes in the coordinates of the triangle and outputs the area and perimeter of the triangle while checking if it's a line and all the coordinates are within the range.
Input: coordinates of 3 points.
Output: coordinates of the triangle and perimeter and area if the inputs are in the range. Outputs the coordinates of the points that are not within the range. Outputs that the coordinates form a line if the points form a line.

Technical Information:
(You should fill the following information based on compiler and computer you are using).
Compiler: IntelliJ IDEA Community Edition 2023.1.1
Computer: (R) Core(TM) i7-10870H CPU @ 2.20GHz 2.21 GHz, 16 GB of RAM
Operating System: Windows 10 Home Single Language
Language: Java

Program Logic (Pseudocode)

verify_input (int x, int y)

Algorithm: Checks if the coordinates are in the range (0,40)

(definition)

0.1 x = x-coordinates of the point

0.2 y = y-coordinates of the point

START

1. IF (x > = 0 AND y >= 0)
   RETURN x<=40 AND y<=40
   ELSE RETURN false

END

distance (int x1, int y1, int x2, int y2)

Algorithm: Calculates the distance between the 2 points passed as parameters.

(definition)

0.1 x1 = x-coordinates of the first point

0.2 y1 = y-coordinates of the first point

0.3 x2 = x-coordinates of the second point

0.4 y2 = y-coordinates of the second point

START

2. A ← (x2-x1)^2
3. B ← (y2-y1)^2
4. RETURN sqrt(A+B) // This is the distance between the 2 points.

END

perimeter (int xA, int yA, int xB, int yB, int xC, int yC)

Algorithm: Calculates the perimeter of the triangle formed by the 3 points.

(definition)

0.1 xA = x-coordinate of the first point

0.2 yA = y-coordinate of the first point

0.3 xB = x-coordinate of the second point

0.4 yB = y-coordinate of the second point

0.5 xC = x-coordinate of the third point

0.6 yC = y-coordinate of the third point

START

1. RETURN distance(xA, yA, xB, yB) + distance(xA, yA, xC, yC) + distance(xB, yB, xC, yC) // This is the perimeter of the triangle formed by the 3 points.

END

area (int xA, int yA, int xB, int yB, int xC, int yC)

Algorithm: Calculates the area of the triangle formed by the 3 points.

(definition)

0.1 xA = x-coordinate of the first point

0.2 yA = y-coordinate of the first point

0.3 xB = x-coordinate of the second point

0.4 yB = y-coordinate of the second point

0.5 xC = x-coordinate of the third point

0.6 yC = y-coordinate of the third point

START

1. S ← perimeter(xA, yA, xB, yB, xC, yC)/2
2. RETURN sqrt(s * (s - distance(xA, yA, xB, yB)) * (s - distance(xB, yB, xC, yC)) * (s - distance(xA, yA, xC, yC)))
   // This calculate the area of the triangle using Heron's formula

END

isLine (double xA, double yA, double xB, double yB, double xC, double yC)

Algorithm: Checks if the 3 points form a line

(definition)

0.1 xA = x-coordinate of the first point

0.2 yA = y-coordinate of the first point

0.3 xB = x-coordinate of the second point

0.4 yB = y-coordinate of the second point

0.5 xC = x-coordinate of the third point

0.6 yC = y-coordinate of the third point

START

1. M1 ← (yB - yA)/(xB - xA)
2. M2 ← (yC - yA)/(xC - xA)
3. M3 ← (yC - yB)/(xC - xB)
4. RETURN m1 == m2 OR m2 == m3 OR m1 == m3 // Checks if the points form a line by checking if the any of the slope are the same

END

userInput()

Algorithm: Prompts the user for input of the coordinates of the points and verifies the input in each step

(definition)

0.1 xA = x-coordinate of the first point

0.2 yA = y-coordinate of the first point

0.3 xB = x-coordinate of the second point

0.4 yB = y-coordinate of the second point

0.5 xC = x-coordinate of the third point

0.6 yC = y-coordinate of the third point

0.7 v1 = boolean value of verification if the coordinates of the first point is in the range (0,40)

0.8 v2 = boolean value of verification if the coordinates of the second point is in the range (0,40)

0.9 v3 = boolean value of verification if the coordinates of the third point is in the range (0,40)

0.11 is_line = boolean value if the points formed a line

START

1. OUTPUT “Enter the coordinates of the triangle ABC”
2. OUTPUT “x-coordinate of A: “
3. xA ← INPUT
4. OUTPUT “y-coordinate of A: “
5. yA ← INPUT
6. v1 ← verify_input(xA, yA)
7. OUTPUT “x-coordinate of B: “
8. xB ← INPUT
9. OUTPUT “y-coordinate of B: “

10. yA ← INPUT
11. v2 ← verify_input(xB, yB)
12. OUTPUT “x-coordinate of C: “
13. xC ← INPUT
14. OUTPUT “y-coordinate of C: “
15. yC ← INPUT
16. v3 ← verify_input(xC, yC)
17. is_line ← isLine(xA, yA, xB, yB, xC, yC)
18. main2(v1, v2, v3, xA, yA, xB, yB, xC, yC, is_line)

END

retry()

Algorithm: asks if the user wants to restart the program by prompting the user to input 1 or 2 (1 to restart the program and 2 to end the program). The method restarts the program by calling the "userInput" method again.

START

1. OUTPUT "Would you like to repeat the program (1 for yes, 2 for no)? "
2. choice ← INPUT
3. IF (CHOICE == 2)
   OUTPUT “End of program”
4. ELSE
   userInput()

main2(v1, v2, v3, xA, yA, xB, yB, xC, yC, is_line)

Algorithm: This method takes in 10 parameters which are the coordinates of 3 points and the boolean value of the verification if the coordinates are in the range (0,40) and boolean value of the verification if the points form a line. The method outputs the perimeter and area of the triangle if all the criteria are met. The method also outputs the coordinates that are not in the range and outputs that the points form a line if the points form a line.

(definition)

0.1 xA = x-coordinate of the first point

0.2 yA = y-coordinate of the first point

0.3 xB = x-coordinate of the second point

0.4 yB = y-coordinate of the second point

0.5 xC = x-coordinate of the third point

0.6 yC = y-coordinate of the third point

0.7 v1 = boolean value of verification if the coordinates of the first point is in the range (0,40)

0.8 v2 = boolean value of verification if the coordinates of the second point is in the range (0,40)

0.9 v3 = boolean value of verification if the coordinates of the third point is in the range (0,40)

0.11 is_line = boolean value if the points formed a line

START

1. IF (v1 AND v2 AND v3 == TRUE)

        IF (is_Line == FALSE)

            OUTPUT "Triangle: A(" + xA + ", " + yA + "), B(" + xB + ", " + yB + "), and C(" + xC + ", " + yC + ")"

            perim ← perimeter(xA, yA, xB, yB, xC, yC)

            OUTPUT "Perimeter = " + perim

            area ← area(xA, yA, xB, yB, xC, yC)

            OUTPUT "Area = " + area + "\n"

            retry()

        ELSE

            OUTPUT "With the coordinates, it forms a line and not a triangle."

            retry()

2. ELSE IF (v1 AND v2 AND v3 == FALSE)

        OUTPUT "\ncoordinate (" + xA + ", " + yA + ") is not in acceptable range"

        OUTPUT "coordinate (" + xB + ", " + yB + ") is not in acceptable range"

        OUTPUT "coordinate (" + xC + ", " + yC + ") is not in acceptable range\n"

        retry()

3. ELSE IF (v1 AND v3 == FALSE)

        OUTPUT "\ncoordinate (" + xA + ", " + yA + ") is not in acceptable range"

        OUTPUT "coordinate (" + xC + ", " + yC + ") is not in acceptable range\n"

        retry()

4. ELSE IF (v1 AND v2 == FALSE)

        OUTPUT "\ncoordinate (" + xA + ", " + yA + ") is not in acceptable range"

        OUTPUT "coordinate (" + xB + ", " + yB + ") is not in acceptable range"

retry()

5. ELSE IF (v2 AND v3 == FALSE)

   OUTPUT "\ncoordinate (" + xB + ", " + yA + ") is not in acceptable range"

   OUTPUT "coordinate (" + xC ", " + yC + ") is not in acceptable range"

   retry()

6. ELSE IF (v2 == FALSE)

   OUTPUT "coordinate (" + xB + ", " + yB + ") is not in acceptable range\n"

   retry()

7. ELSE IF (v3 == FALSE)

   OUTPUT "coordinate (" + xC + ", " + yC + ") is not in acceptable range\n"

   retry()

8. ELSE

   OUTPUT "\ncoordinate (" + xA + ", " + yA + ") is not in acceptable range"

   retry()

Generate your test cases based on the specifications in your lab assignment. Follow following format for each test case: (Refer to external document of your first lab)

purpose
input
output
expected value
passed or failed

Test Cases:

Test Case 1: The coordinates are in the range
xA = 5

yA = 5

xB = 6

yB = 7

xC = 8

yC = 5

Output: Triangle: A(5, 5), B(6, 7), and C(8, 5)
Perimeter = 8.064495
Area = 2.999999
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.

Expected Value Triangle: A(5, 5), B(6, 7), and C(8, 5)
Perimeter = 8.064495
Area = 2.999999
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.

Passed

Test Case 2: The coordinates of the first point aren't in the range
xA = 5

yA = 50

xB = 6

yB = 7

xC = 8

yC = 5

Output: coordinate (5,50) is not in acceptable range
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.

Expected Value: coordinate (5,50) is not in acceptable range
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.

Passed

Test Case 3: The coordinates of the second point aren't in the range
xA = 5

yA = 5

xB = 6

yB = -7

xC = 8

yC = 5

Output: coordinate (6,-7) is not in acceptable range
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.

Expected Value: coordinate (6,-7) is not in acceptable range
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.
Passed

Test Case 4: The coordinates of the third point aren't in the range
xA = 5

yA = 5

xB = 6

yB = 7

xC = -8

yC = 5

Output: coordinate (-8,5) is not in acceptable range
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.

Expected Value: coordinate (-8,5) is not in acceptable range
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of the program.
Passed

Test Case 5: The coordinates of the first and second point aren't in the range
xA = 5

yA = -5

xB = 6

yB = -7

xC = 8

yC = 5

Output: coordinate (5, -5) is not in acceptable range
coordinate (6, -7) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program
Expected Value: coordinate (5, -5) is not in acceptable range
coordinate (6, -7) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program
Passed

Test Case 5: The coordinates of the first and third point aren't in the range
xA = 5

yA = -5

xB = 6

yB = 7

xC = -8

yC = 5

Output: coordinate (5, -5) is not in acceptable range
coordinate (-8, 5) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program
Expected Value: coordinate (5, -5) is not in acceptable range
coordinate (-8, 5) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program
Passed

Test Case 5: The coordinates of the second and third point aren't in the range
xA = 5

yA = 5

xB = -6

yB = 7

xC = -8

yC = 5

Output: coordinate (-6, 7) is not in acceptable range
coordinate (-8, 5) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program

Expected Value: coordinate (-6, 7) is not in acceptable range
coordinate (-8, 5) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program
Passed

Test Case 5: The points form a line
xA = 1

yA = 2

xB = 2

yB = 4

xC = 3

yC = 6

Output: With the coordinates, it forms a line and not a triangle.
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program
Expected Value: With the coordinates, it forms a line and not a triangle.
Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program
Passed

Test Case 5: You run the program again
xA = 5

yA = 5

xB = 6

yB = 7

xC = 8

yC = 5

Output: Triangle: A(5, 5), B(6, 7), and C(8, 5)
Perimeter = 8.06449510224598
Area = 2.999999999999999

Would you like to repeat the program (1 for yes, 2 for no)? 1
Expected Value: Triangle: A(5, 5), B(6, 7), and C(8, 5)
Perimeter = 8.06449510224598
Area = 2.999999999999999

Would you like to repeat the program (1 for yes, 2 for no)? 1
xA = 5

yA = 50

xB = 6

yB = -7

xC = 8

yC = 5

Output: coordinate (5, 50) is not in acceptable range
coordinate (6, -7) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program

Expected Value: coordinate (5, 50) is not in acceptable range
coordinate (6, -7) is not in acceptable range

Would you like to repeat the program (1 for yes, 2 for no)? 2
End of program

Passed