CSCI 1301 – Programming Principles I
Georgia Southern University
Department of Computer Science
Fall 2024

Assignment 4
Point Value: 20 points
Due: Friday September 27, 2024, start of lab

NOTE: Gradescope will give input test cases for any problems that require it. Use the Scanner's nextDouble(), nextInt(), etc. methods discussed in class to prompt the user for input and Gradescope will act as the user when your program requests it. In other words, just code user input like normal—as if a human were going to test your program.

Description
Write a Java program that prompts the user to enter:

- rectangle width and rectangle height

If a rectangle with a non-positive dimension is entered, do not perform any calculations and output an error message.

If given a valid rectangle, prompt the user to enter:

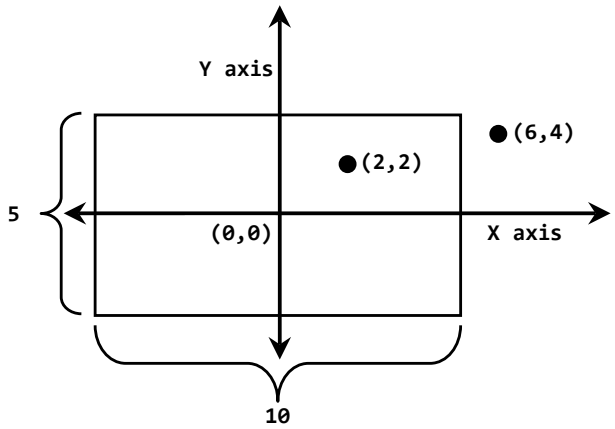
- x and y coordinates for the center of the rectangle. This should be entered as a String value with two numbers (any number of digits) separated by a comma only, e.g. 2,2
- x and y coordinates for the point to test. This should be entered as a String value with two numbers (any number of digits) separated by a comma only, e.g. 6,4

Using built-in String methods, "break" the two ordered pairs into four individual x and y values. Note that these values will need to be numeric for future calculations.

The program should then check whether the point at the user-entered x and y values is within the rectangle centered at the user-entered x and y values with the specified width and height.

Do not try to error check the String input; assume all input will be given in the correct format with a comma and no spaces. You may also assume all numbers entered by the user are whole numbers.

For example, (2, 2) is inside the rectangle centered at (0, 0) with width 10 and height 5. The point (6, 4) is outside the rectangle, as shown in the following figure:



The distance formula to determine absolute distance between points (x_1, y_1) and (x_2, y_2) is:

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

To determine only the horizontal or vertical distance, do not add the corresponding component before taking the square root.

Horizontal distance: $\sqrt{(testX - centerX)^2}$

Vertical distance: $\sqrt{(testY - centerY)^2}$

A point is in the rectangle if:

- its horizontal distance to (centerX, centerY) is less than or equal to width/2:

  $(Dist_{hor} \rightarrow (centerX, centerY)) \leq (\frac{width_{Rectangle}}{2})$ AND
- its vertical distance to (centerX, centerY) is less than or equal to height/2:

  $(Dist_{vert} \rightarrow (centerX, centerY)) \leq (\frac{height_{Rectangle}}{2})$.

Use System.out.printf() to format your output as shown in the Sample Run/Expected Output.

NOTES

- Use token-based input for all input (you should not use Scanner's .nextLine() method at all). When asking the user for the coordinates, Scanner's .next() method will read up to a space OR an "Enter".
- There are NO spaces between the x,y values in the input; you must "break" them apart using code. They can contain any number of digits, do not "break" them based on any fixed position values.
- Use the provided formulas as shown; do not attempt to simplify them.

- There may be additional test cases in Gradescope not illustrated here. Your program should pass all test cases. Use the provided ones to make sure your program behaves correctly as required.

Sample Run/Expected Output, point in rectangle (do NOT hard code your output):

```
Enter width for rectangle: 15
Enter height for rectangle: 20
Enter x,y value for center point of rectangle: 10,20
Enter x,y value for test point: 11,17
(11, 17) is in the rectangle centered at (10, 20) with width 15 and height 20
```

Sample Run/Expected Output, point not in rectangle (do NOT hard code your output):

```
Enter width for rectangle: 10
Enter height for rectangle: 5
Enter x,y value for center point of rectangle: 0,0
Enter x,y value for test point: 4,10
(4, 10) is not in the rectangle centered at (0, 0) with width 10 and height 5
```

Sample Run/Expected Output, invalid rectangle size (do NOT hard code your output):

```
Enter width for rectangle: 25
Enter height for rectangle: -3
Your rectangle must have a positive height and width.
```

Code

Use the provided template for this assignment. Make any necessary modifications to classes and class headers to complete this assignment.

```
public class PAssign04 {
	public static void main(String[] args)  {
		// add your code here

	}
}
```

Deliverables

Name your program PAssign04.java. Programming Assignment 4 is to be individual work. Submit the program by the specified due date. Submit each file to its corresponding assignment on Gradescope.

See and follow the Programming Assignment Format document for submission requirements.

Use a utility similar to https://www.diffchecker.com/ and the Expected Output to compare your program's output with the requested output as well as the unit tests provided within Gradescope. Programming is in the details, so double check punctuation, spacing, and case if your output does not match. When copying and pasting, be aware that Microsoft Word sometimes replaces normal quotes with Smart Quotes, which may need to be edited.

Last modified: September 16, 2024