CS 152: Data Structures with Java
Points: Inside or Outside

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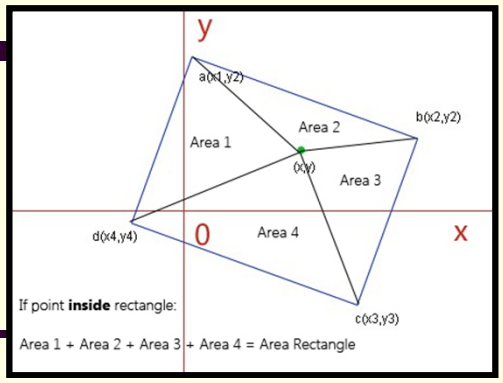

Textbook: 3.22

Question: Write a program that prompts the user to enter a point (x, y) and checks whether the point is within the circle centered at (0,0) with a radius 10.

Analysis:

- A circle is the set of points that are equal distant from a given point (called the center).
- Any point less than that distance (the radius) from the center is within the circle.
- The equation for the distance between two points is:

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

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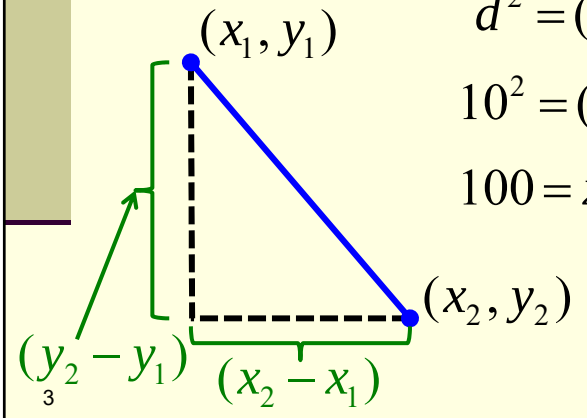
When is the Distance Between $(x_1,y_1)=(0,0)$ and (x_2,y_2) Less Than 10?

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



$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

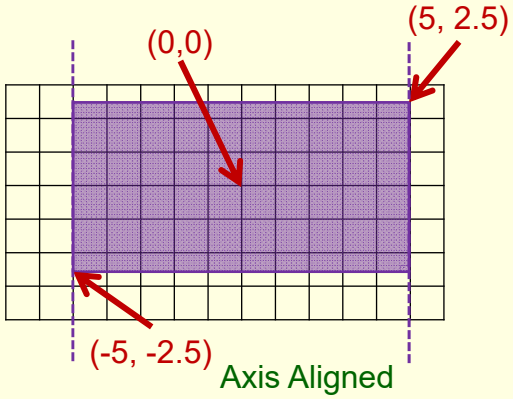
$$10^2 = (x_2 - 0)^2 + (y_2 - 0)^2$$

$$100 = x_2^2 + y_2^2$$

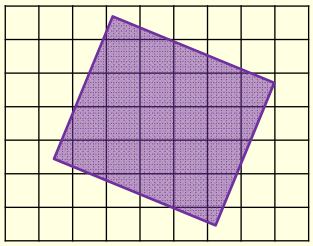
3

Textbook: 3.23

Question: Write a program that prompts the user to enter a point (x, y) and checks whether the point is within the [***axis aligned***] rectangle centered at (0,0) with width 10 and height 5.



Axis Aligned



Not Axis Aligned

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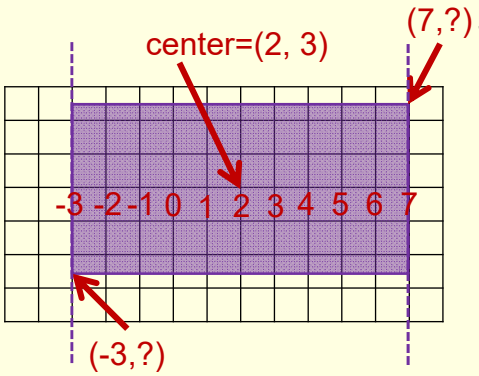
Rectangle Not Centered at (0,0)

Question: Write a program that prompts the user to enter a point (x, y) and checks whether the point is within the *axis aligned* rectangle centered at **(2,3)** with width 10 and height 5.



The x-coordinate of the left most edge of the rectangle equals:

the x coordinate of the center of the rectangle minus the width divided by 2.

rectCenterX - rectWidth/2

rectCenterX + rectWidth/2

5

```
double circleRadius = 10;
double circleRadius2 = circleRadius*circleRadius;

//Get input point.
Scanner input = new Scanner(System.in);
System.out.print("Enter two integers: ");
double x = input.nextDouble();
double y = input.nextDouble();

//Check if outside circle.
if (x*x + y*y > circleRadius2)
{
   System.out.println("The point ("+x + ", " + y +
                      ") is outside the circle");
}
else
{
   System.out.println("The point ("+x + ", " + y +
                      ") is on or inside the circle");
}
```

Note: This crashes on bad input. OK for lab 3

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```
//Get input point.....
//Check if outside circle......


//Check if outside rectangle
if (x < -5 || x > 5)
{
  System.out.println("The point ("+x + ", " + y +
                     ") is outside the rectangle");
}
else if (y < -2.5 || y > 2.5)
{
  System.out.println("The point ("+x + ", " + y +
                     ") is outside the rectangle");
}
else
{
  System.out.println("The point ("+x + ", " + y +
                    ") is on or inside the rectangle");
}
```

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