

COS125 - Precept 3 (Conditionals)

1 Truth Tables

Write the truth tables for the following boolean expressions.

a	b	a && b
true	true	
true	false	
false	true	
false	false	

a	b	(!a) b
true	true	
true	false	
false	true	
false	false	

a	b	c	a && (b c)
true	true	true	
true	true	false	
true	false	true	
true	false	false	
false	true	true	
false	true	false	
false	false	true	
false	false	false	

2 Quadrants of the Cartesian plane

Please write a program `Quadrants.java` that takes two `double` command-line arguments, x and y , corresponding to the coordinates of a point in the Cartesian plane, and prints the quadrant that contains the point (x, y) .

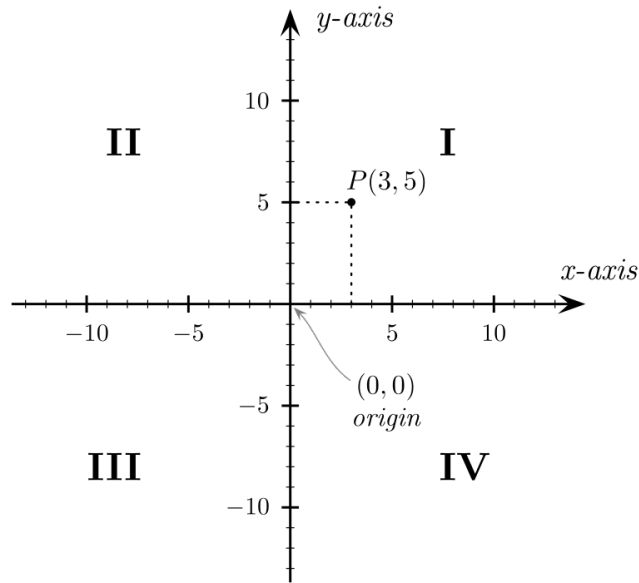


Figure 1: Quadrants of the Cartesian plane.

We consider the x and y axes to not belong to any quadrant. Thus, if (x, y) lies in one of the axes, your program should identify this and print accordingly; and likewise if (x, y) is the origin $(0, 0)$. See Figure 1 for a picture of the quadrants.

The following table shows examples of possible inputs to `Quadrants.java` alongside the expected output:

x	y	Output
0.0	0.0	Origin
1.0	0.0	x-axis
0.0	12.5	y-axis
12.5	12.5	Quadrant I
42.0	-12.5	Quadrant IV

3 ReLu and Leaky ReLu

The rectifier, or ReLu, function has been widely used in fields such as computer vision and deep learning. It is defined as

$$f(x) = \begin{cases} x & \text{if } x > 0, \\ 0 & \text{otherwise.} \end{cases}$$

Similar to this function, we also have the Leaky ReLu, which still has a positive gradient when $x < 0$. The Leaky ReLu is defined as

$$g(x) = \begin{cases} x & \text{if } x > 0, \\ 0.01x & \text{otherwise.} \end{cases}$$

Please write a program `ReLUOptions.java` that takes two command-line arguments: a `double` `x` and a `String` `functionType`. If `functionType` is either "leaky" or "reLu", it should print the result of applying the corresponding function to `x`. Otherwise, it should print "Not a valid function".

4 Wordle Feedback

In the game of [Wordle](#), you try to guess the 5-letter word of the day. When your attempt is wrong, the game tells you which letters you guessed correctly.

We will create a program `WordleFeedback.java` that, in a similar scenario, gives a more limited form of feedback. The word of the day should be stored in the variable `WORD_OF_THE_DAY`, and in this example will have the value "SHARE".

Our program will receive one command-line argument corresponding to the user's current attempt. It should then print the letters that were guessed correctly in the correct position, and print a dash otherwise. For example, if the user guessed `SNAIL`, our program should print `S-A--`; and if the user guessed `PHASE`, our program should print `-HA-E`.

You may want to use `s.charAt(index)`, a Java method that returns the character at position `index` in the string `s`.

Credits

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