

Computer Science 111L Intro to Algorithms and Programming: Lab  
Programming Project #1 – Algorithm Writing and Simple Programming  
Exercises (30 points)

Due 9/9/19

## Part I

Algorithms are precise step-by-step instructions that describe how to accomplish a desired task. A formal algorithm for use with computers or in mathematics must be very detailed and must resolve the ambiguities that we take for granted in everyday life. The first exercise in Project 1 involves writing an algorithm.

Example Problem: Write an algorithm to compute and output the area of a circle given its radius.

Example Solution:

```
01 Steps for CircleArea with Radius
02 Set the value of Area to 3.14159 * Radius * Radius
03 Output the value of Area
04 Stop
```

**TriangleArea (4 points):** Using any text editor, write an algorithm named **TriangleArea** which calculates and outputs the area, **Area**, of a triangle given its base, **Base** and its height, **Height**. Formula:  $\text{Area} = \frac{1}{2} \text{Base} \times \text{Height}$ . Save your algorithm as a plain text file named '**Algorithm1.txt**'.

**MilesToKilometers (5 points):** After you have written an algorithm, you must test the algorithm to verify that the step-by-step instructions achieve a correct result. Testing an algorithm involves following the steps of your algorithm exactly as they are listed, and performing the algorithm's computations on paper. The second exercise in Project 1 involves testing an algorithm.

The following algorithm should compute the number of kilometers in 100 miles. But as it is written, the algorithm contains a number of errors:

```

01 Steps for MilesToKilometers with Miles
02 Set the value of Kilometers_per_mile to 1.609
03 Set the value of Kilometers to Miles * Kilometers_per_mile
04 Stop

```

Test the algorithm, determine the errors in the algorithm, and then rewrite the algorithm so that it works as intended. Save your rewritten algorithm as a plain text file named '**Algorithm2.txt**'.

## Part II

This portion of the project assumes you have completed the sample assignment and can submit an assignment via Canvas. If you have NOT done this, STOP, go back and do the sample assignment. Additionally, make sure you read section 1.11, “Developing Java Programs Using NetBeans” in the textbook prior to starting work on this project.

Create a folder on your flash drive or your laptop’s hard drive for ALL of your Java projects. Something like 'e:\JavaProjects' or 'c:\JavaProjects', although your drive letter will probably be different. If you are using the lab computer hard drive, you MUST save the code to external storage when you are done.

**DisplayAPattern (4 points):** Create a NetBeans project named '**Project1**'. Create a main class with the name '**DisplayAPattern**'. In the main method insert print statements which display something similar to the following pattern:

```

      J      A      V      V      A
      J      A A      V      V      A A
J      J      AAAAA      V V      AAAAA
J J      A      A      V      A      A

```

**Use exactly four (4) print line statements to complete this exercise.**

**PrintATable (5 points):** DO NOT create another project, we are going to add a new file to 'Project1'. From the NetBeans '**File**' menu select '**New File**'. In the dialog box under '**File Type**' select '**Java Main Class**' and click '**Next**'. Create a main class with the name '**PrintATable**', verify it is part of 'Project1' and click the '**Finish**' button. In the main method insert print statements which display the following table:

a	a^2	a^3
1	1	1
2	4	8
3	9	27
4	16	64

**MyInitials (8 points):** DO NOT create another project, we are going to add a new file to 'Project1'. From the NetBeans **'File'** menu select **'New File'**. In the dialog box under **'File Type'** select **'Java Main Class'** and click **'Next'**. Create a main class with the name **'MyInitials'**, verify it is part of 'Project1' and click the **'Finish'** button. In the main method insert print statements to display your initials (2-3 letters) using an 8 X 8 pattern. For example, here is an 8 X 8 pattern for my initials, 'BR':

```
BBBBBBB      RRRRRRRR
B          B  R          R
B          B  R          R
BBBBBBB      RRRRRRRR
B          B  R          R
B          B  R          R
BBBBBBB      R          R
```

**Use exactly eight (8) print line statements to complete this exercise.** From the Project Navigator you can run the new program by right clicking on the file name and selecting 'Run File' or if the file is active in the editor window press 'Shift - F6'.

**CircleAreaPerimeter (4 points):** DO NOT create another project, we are going to add a new file to 'Project1'. From the NetBeans **'File'** menu select **'New File'**. In the dialog box under **'File Type'** select **'Java Main Class'** and click the 'Next' button. Create a main class with the name **'CircleAreaPerimeter'**, verify it is part of 'Project1' and click 'Finish'. In the main method, write statements which compute and display the area and perimeter of a circle that has a radius of 5.5 using the following formulas. **Assume a value of 3.14159 for  $\pi$ :**

$$perimeter = 2 \times radius \times \pi$$

$$area = radius \times radius \times \pi$$

From the Project Navigator you can run the new program by right clicking on the file name and selecting 'Run File' or if the file is active in the editor window press 'Shift - F6'.

**When you have completed all of the programming exercises, let me know, I will read your two algorithms and ask you to test run your programs, then will either suggest changes or will give your project a score.**