# **Assignment xx Algorithmic Design Document**

Make a copy before you begin (File -> Make a copy). Add the Assignment # above and complete the sections below BEFORE you begin to code and submit with your Assignment to D2L (File -> Download -> PDF). The sections will expand as you type.

## zyBooks

Add your zyBooks screenshots for the % and assigned zyLabs completions below. Required percentages: all assigned zyLabs, Challenge Activity with at least 70%, and Participation Activity with at least 80%.

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| **zyLabs, Challenge, and Participation % Screenshot:** |
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| **Assigned zyLabs completion Screenshot:** |
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## Assignment

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| **Program description:** |
| This program will take a list of numbers that you enter, and normalize them based on the largest number |

Before you begin coding, **you must first plan out the logic** and think about what data you will use to test your program for correctness. All programmers plan before coding - this saves a lot of time and frustration! Use the steps below to identify the inputs and outputs, calculations, and steps needed to solve the problem.

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| **Algorithmic design:** |
| 1. Identify all of the user input. What are the data types of the inputs? Define the input variables. |
| Integer numVals //Gets the total array size to check  Integer userInput //Repeatedly called to add data to array |
| 1. Describe the program output. What is displayed to the user? What are the data types of the output? Define the output variables. |
| Basic text outputs:  Welcome!  Instruction to enter numVals  Instruction to enter userInput  List of all numbers after normalization (“5 0 9 2 etc…”)  Goodbye!  Error handling text (on trigger):  Error: Input can not be negative.  Error: Error: Number cannot be negative, zero, or greater than 20 |
| 1. What calculations do you need to do to transform inputs into outputs? List all formulas needed, if applicable. If there are no calculations needed, state there are no calculations for this algorithm. |
| Basic arithmetic:  valueMax – userNumber //normalization calculation |
| 1. Design the logic of your program using pseudocode or flowcharts. See pseudocode syntax at the bottom of this document. Here is where you would use conditionals, loops, functions or array constructs (if applicable) and list the steps in transforming inputs into outputs. Walk through your logic steps with the test data from the assignment document. |
| START  FUNCTION GetUserInput(Int numVals)  - - DECLARE Int i  - -  - - FOR i = 0 TO i == numVals  - - - - DISPLAY Enter number {i}  - - - - INPUT userValues[i]  - -  - - RETURN userValues  FUNCTION Int GetMaxInt(Int listInts[], Int numVals)  - - DECLARE Int valueMax  - - DECLARE Int i  - -  - - SET valueMax = listInts[0]  - - FOR i = 1 TO i <= listInts[0]  - - - - IF listInts[i] > valueMax  - - - - - - valueMax = listInts[i]  - -  - - RETURN valueMax  FUNCTION Int MakeNormals(Int userValues[], Int valueMax, Int numVals)  - - DECLARE Int i  - - DECLARE listNormals[numVals]  - -  - - FOR i = 0 TO i == numValues  - - - - SET listNormals[i] = valueMax - userValues[i]  - -  - - RETURN listNormals  FUNCTION Int OutputData(Int listNormals, Int numVals)  - - DECLARE Int i  - -  - - DISPLAY The normalized data values are:  - - FOR i = 0 TO i == numVals  - - - - DISPLAY {listNormals[i]}  - - DISPLAY  FUNCTION Int main (void)  - - DECLARE Int userValues  - - DECLARE Int valueMax  - - DECLARE Int numVals  - - DECLARE Int listNormals[20]  - -  - - DISPLAY "Hello! Welcome to my data normalization program!"  - -  - - DO  - - - - DISPLAY Please enter amount of numbers to be normalized (ex: 5 for five-following numbers)  - - - - INPUT numVals  - - - -  - - - - IF numVals > 12 || numVals <= 0  - - - - - - DISPLAY Error: Number cannot be less than zero or greater than 20  - - - -  - - WHILE numVals > 0 AND numVals < 20  - -  - - SET userValues = GetUserInput(numValues)  - -  - - SET valueMax = GetMaxInt(userValues, numVals)  - -  - - SET listNormals = MakeNormals(userValues, valueMax, numVals)  - -  - - OutputData(listNormals, numVals)  - -  - - DISPLAY Thank you for using this normalization program!  - -  - - RETURN 0  END |
| 1. Include 2 Sample Program Runs for your program using your own set of data. This data set must be different from my Sample Runs in the Assignment document. This process is similar to Unit Testing and will help you test your program better. |
| Sample Program Run 1:    Sample Program Run 2: |

## Pseudocode Syntax

Think about each step in your algorithm as an action and use the verbs below:

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| **To do this:** | **Use this verb:** | **Example:** |
| Create a variable | DECLARE | DECLARE integer num\_dogs |
| Print to the console window | DISPLAY | DISPLAY “Hello!” |
| Read input from the user into a variable | INPUT | INPUT num\_dogs |
| Update the contents of a variable | SET | SET num\_dogs = num\_dogs + 1 |
| **Conditionals** | | |
| Use a single alternative conditional | IF *condition* THEN  *statement*  *statement*  END IF | IF num\_dogs > 10 THEN  DISPLAY “That is a lot of dogs!”  END IF |
| Use a dual alternative conditional | IF *condition* THEN  *statement*  *statement*  ELSE  *statement*  *statement*  END IF | IF num\_dogs > 10 THEN  DISPLAY “You have more than 10 dogs!”  ELSE  DISPLAY “You have ten or fewer dogs!”  END IF |
| Use a switch/case statement | SELECT *variable or expression*  CASE *value\_1:*  *statement*  *statement*  CASE *value\_2:*  *statement*  *statement*  CASE *value\_2:*  *statement*  *statement*  DEFAULT:  *statement*  *statement*  END SELECT | SELECT num\_dogs  CASE 0: DISPLAY “No dogs!”  CASE 1: DISPLAY “One dog..”  CASE 2: DISPLAY “Two dogs..”  CASE 3: DISPLAY “Three dogs..”  DEFAULT: DISPLAY “Lots of dogs!”  END SELECT |
| **Loops** | | |
| Loop while a condition is true - the loop body will execute 0 or more times. | WHILE *condition*  *statement*  *statement*  END WHILE | SET num\_dogs = 1  WHILE num\_dogs < 10  DISPLAY num\_dogs, “ dogs!”  SET num\_dogs = num\_dogs + 1  END WHILE |
| Loop while a condition is true - the loop body will execute 1 or more times. | DO  *statement*  *statement*  WHILE *condition* | SET num\_dogs = 1  DO  DISPLAY num\_dogs, “ dogs!”  SET num\_dogs = num\_dogs + 1  WHILE num\_dogs < 10 |
| Loop a specific number of times. | FOR *counter = star*t TO *end*  *statement*  *statement*  END FOR | FOR count = 1 TO 10  DISPLAY num\_dogs, “ dogs!”  END FOR |
| **Functions** | | |
| Create a function | FUNCTION *return\_type name (parameters)*  *statement*  *statement*  END FUNCTION | FUNCTION Integer add(Integer num1, Integer num2)  DECLARE Integer sum  SET sum = num1 + num2  RETURN sum  END FUNCTION |
| Call a function | CALL *function\_name* | CALL add(2, 3) |
| Return data from a function | RETURN *value* | RETURN 2 + 3 |