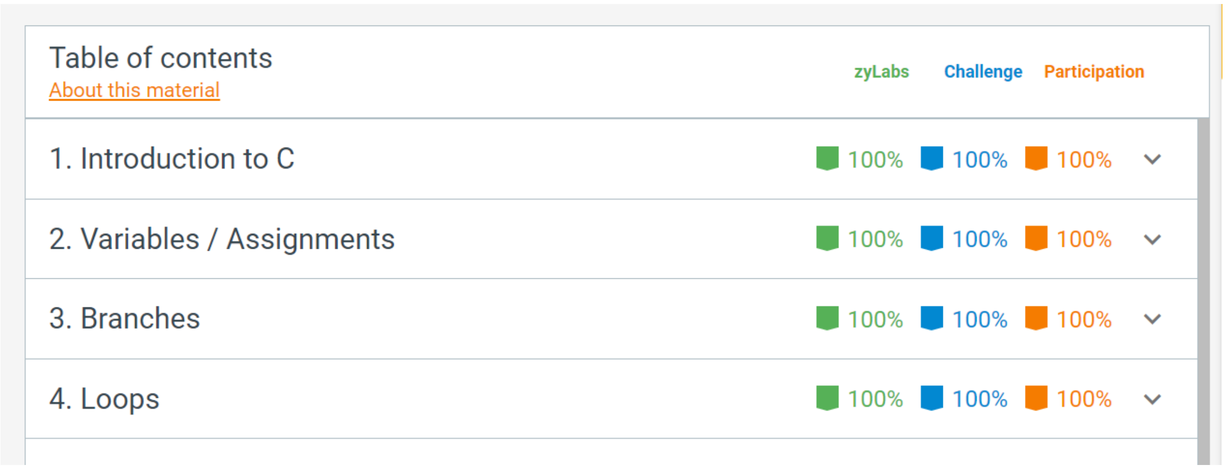
Assignment xx Algorithmic Design Document

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%.

zyLabs, Challenge, and Participation % Screenshot:



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About this material

	zyLabs	Challenge	Participation
1. Introduction to C	🟩 100%	🟦 100%	🟧 100%
2. Variables / Assignments	🟩 100%	🟦 100%	🟧 100%
3. Branches	🟩 100%	🟦 100%	🟧 100%
4. Loops	🟩 100%	🟦 100%	🟧 100%

Assigned zyLabs completion Screenshot:

N/A

Assignment

Program description:

This program will take a low number, a high number, and a multiples number to get the amount of times that multiple can fit in the range of the program.

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.

Algorithmic design:

a. Identify all of the user input. What are the data types of the inputs? Define the input variables.

Int userLow; // The low number
Int userHigh; // The high number
Int userMult; // the value to check multiples of
Char userChoice; // Char to check the Y/N continue question against

b. Describe the program output. What is displayed to the user? What are the data types of the output? Define the output variables.

All data out will be strings. We have the following blocks of output given based on the conditions.

Error conditions:
“Invalid entry, the {low/high/multi} number {first/second/third} must be less than the {compare}”
“Invalid entry, the {low/high/multi} number {first/second/third} can not be a negative number.”
“Please try again”

Success condition:
“The number of multiples of userMult between userLow and userHigh is: {numDivCount}”

c. 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.

numDivCount = (numDiff % userMult); // Get remainders

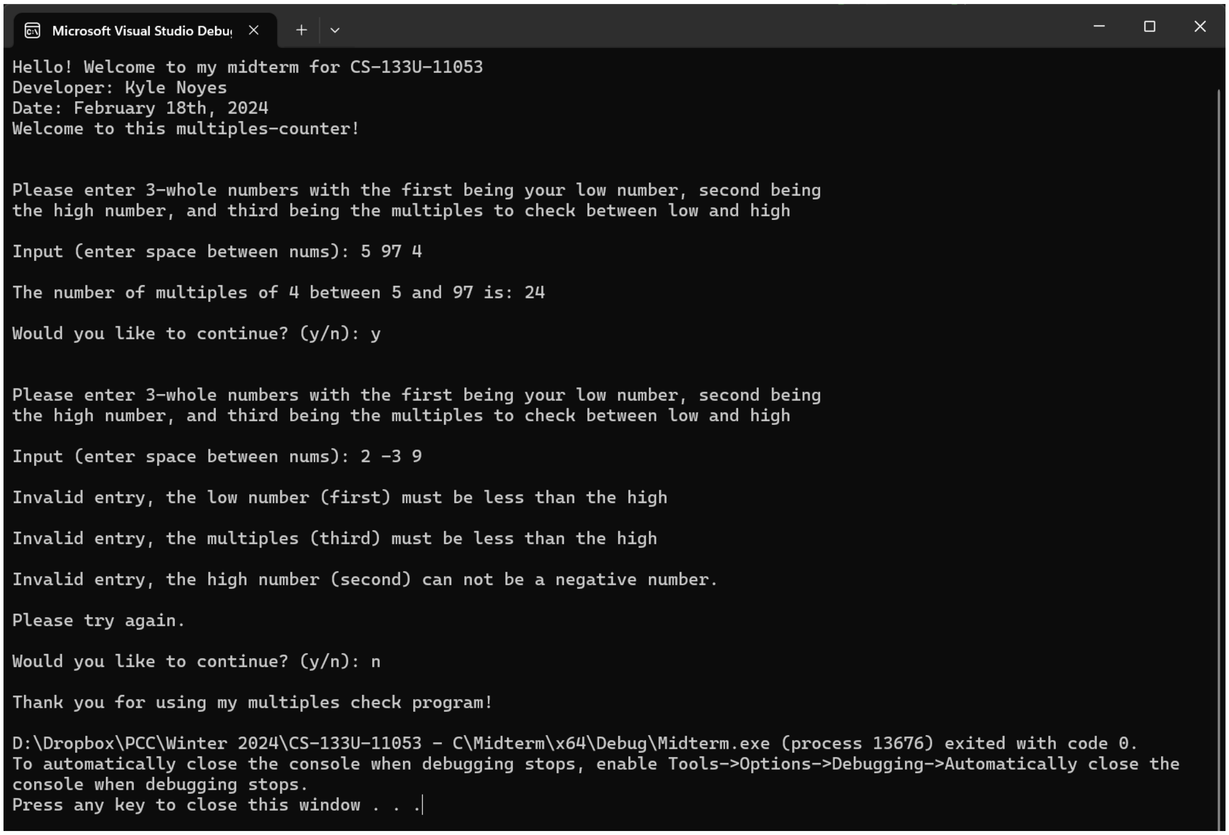
d. Design the logic of your program using pseudocode or flowcharts. See pseudocode syntax at the bottom of this document. Here is where you would use conditionals, loops, functions or array constructs (if applicable) and list the steps in transforming inputs into outputs. Walk through your logic steps with the test data from the assignment document.

```
START

DECLARE Int userLow;
DECLARE Int userHigh;
DECLARE Int userMult;
DECLARE Int numDiff;
DECLARE Int numDivCount;
DECLARE Str userChoice[256] = "0";
DECLARE keepGoing;

DISPLAY "Hello! Welcome to my midterm for CS-133U-11053"
DISPLAY "Developer: Kyle Noyes"
DISPLAY "Date: February 18th, 2024"

DISPLAY "Welcome to this multiples-counter."

WHILE userChar != "n"
```

```
- - keepGoing = 0
- - DISPLAY "Please enter 3-whole numbers with the first being your low number, second being"
- - DISPLAY "the high number, and third being the multiples to check between low and high"
- -
- - DISPLAY "Input: "
- - INPUT userLow, userHigh, userMult
- -
- - // Validate data inputs
- - IF userLow >= userHigh
- - - - DISPLAY "Invalid entry, the low number (first) must be less than the high"
- - - - DISPLAY "number. Please try again."
- - - - keepGoing = 1
- -
- - IF userMult >= userHigh
- - - - DISPLAY "Invalid entry, the multiples (third) must be less than the high"
- - - - DISPLAY "number. Please try again."
- - - - keepGoing = 1
- -
- - IF userMult >= userHigh
- - - - DISPLAY "Invalid entry, the multiples (third) can not be zero."
- - - - DISPLAY "number. Please try again."
- - - - keepGoing = 1
- -
- - IF userLow < 0
- - - - DISPLAY "Invalid entry, the low number (first) can not be a negative"
- - - - DISPLAY "number. Please try again."
- - - - keepGoing = 1
- -
- - IF userHigh < 0
- - - - DISPLAY "Invalid entry, the high number (second) can not be a negative"
- - - - DISPLAY "number. Please try again."
- - - - keepGoing = 1
- -
- - IF userMult < 0
- - - - DISPLAY "Invalid entry, the multiples number (third) can not be a negative"
- - - - DISPLAY "number. Please try again."
- - - - keepGoing = 1
- -
- - IF keepGoing == 0:
- - - - SET numDiff = userHigh - userLow
- - - - SET numDivCount = numDiff / userMult
- - - - DISPLAY "The number of multiples of {userMulti} between {userLow} and {userHigh} is: {numDivCount}"
- -
- - ELSE:
- - - - PASS
- -
- - DISPLAY "Would you like to continue? ("Y/N")"
- - INPUT userChoice

DISPLAY "Thank you for using my multiples check program!"

END
```

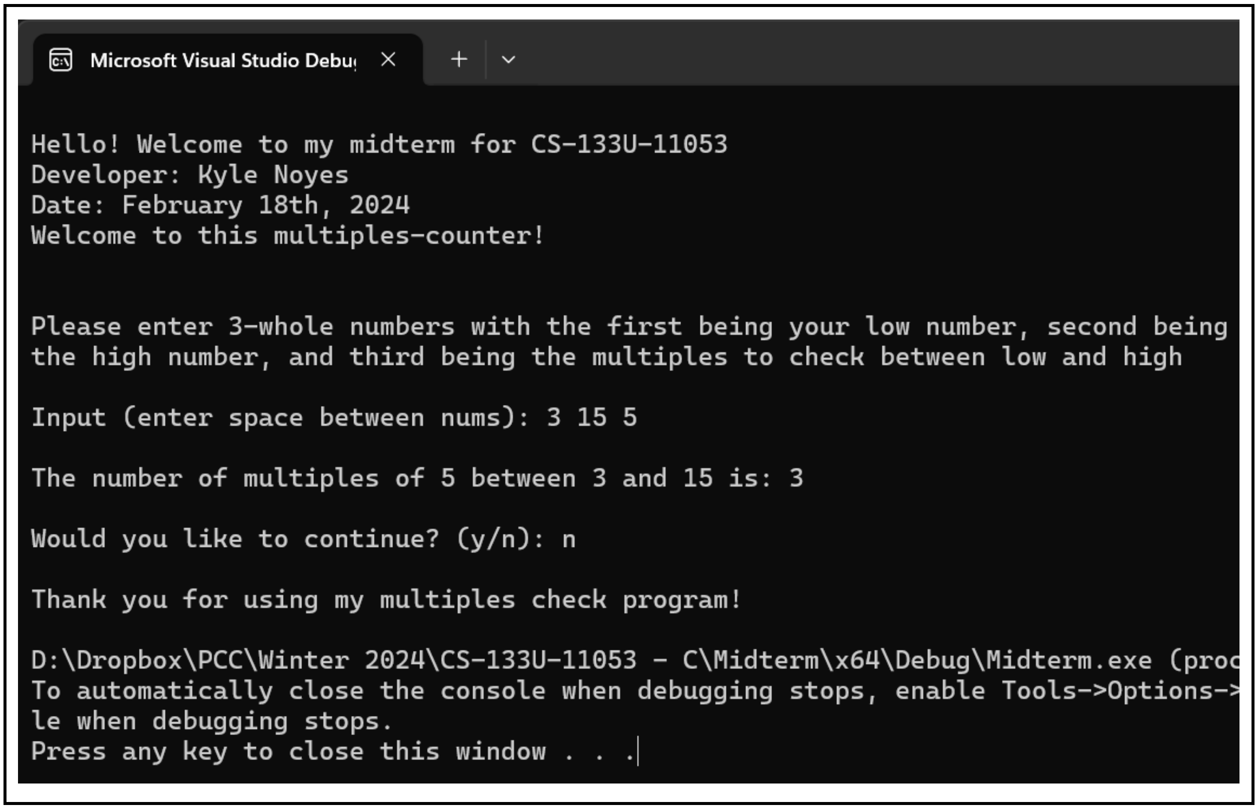
e. Include 2 Sample Program Runs for your program using your own set of data. This data set must be different from my Sample Runs in the Assignment document. This process is similar to Unit Testing and will help you test your program better.

Sample Program Run 1:



```
Hello! Welcome to my midterm for CS-133U-11053
Developer: Kyle Noyes
Date: February 18th, 2024
Welcome to this multiples-counter!


Please enter 3-whole numbers with the first being your low number, second being
the high number, and third being the multiples to check between low and high

Input (enter space between nums): 5 97 4

The number of multiples of 4 between 5 and 97 is: 24

Would you like to continue? (y/n): y


Please enter 3-whole numbers with the first being your low number, second being
the high number, and third being the multiples to check between low and high

Input (enter space between nums): 2 -3 9

Invalid entry, the low number (first) must be less than the high

Invalid entry, the multiples (third) must be less than the high

Invalid entry, the high number (second) can not be a negative number.

Please try again.

Would you like to continue? (y/n): n

Thank you for using my multiples check program!

D:\Dropbox\PCC\Winter 2024\CS-133U-11053 - C\Midterm\x64\Debug\Midterm.exe (process 13676) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the
console when debugging stops.
Press any key to close this window . . .
```

Sample Program Run 2:



```
Hello! Welcome to my midterm for CS-133U-11053
Developer: Kyle Noyes
Date: February 18th, 2024
Welcome to this multiples-counter!


Please enter 3-whole numbers with the first being your low number, second being
the high number, and third being the multiples to check between low and high

Input (enter space between nums): 3 15 5

The number of multiples of 5 between 3 and 15 is: 3

Would you like to continue? (y/n): n

Thank you for using my multiples check program!

D:\Dropbox\PCC\Winter 2024\CS-133U-11053 - C\Midterm\x64\Debug\Midterm.exe (proc
To automatically close the console when debugging stops, enable Tools->Options->
le when debugging stops.
Press any key to close this window . . .
```

Pseudocode Syntax

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

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* = *start* 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`