Introduction

Welcome Back to your favorite Programming Lab students. In this lab manual, we shall work together to learn and implement new programming concepts.

Skills to be learned:

- Decompose the problem into small set of problems and then use arrays to solve them

Let's do some coding.

Skill: Decompose the problem into small set of problems and then use arrays to solve them

Introduction

By this week, you have learned how to write a program that contains functions, loops, arrays and conditional structures. In this class, we will learn how to decompose difficult problems into small sets of easy problems and then solve them easily.

Task 01(CP): To train for an upcoming marathon, Kaka goes on one long-distance run each Saturday. He wants to track how often the number of miles he runs this Saturday exceeds the number of miles run the previous Saturday. This is called a progress day.
Create a program that takes in an array of miles run every Saturday and returns Kaka's total number of progress days.

Test Cases:

Input	Output	Explanation
[3, 4, 1, 2]	2	There are two progress days, (3->4) and (1->2)
[10, 11, 12, 9, 10]	3	
[6, 5, 4, 3, 2, 9]	1	
[9, 9]	0	

Skill: Decompose the problem into small set of problems and use arrays to solve them

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Task 02(CP): Declare a String array and take input from the user.

Suppose the user has entered the following data in the array.

`{"programming", "is", "my", "life", "now"}`

Now, ask the user to Enter a letter.

Suppose the user has entered the letter "o".

Now your task is to count the number of times a particular letter shows up in the array search.

Test Cases:

Input	Output
Enter how many words you want to Enter: 5 Enter word 1: programming Enter word 2: is Enter word 3: my Enter word 4: life Enter word 5: now Enter the letter you want to count: o	o shows up 2 times in the data.
Enter how many words you want to Enter: 5 Enter word 1: programming Enter word 2: is Enter word 3: my Enter word 4: life Enter word 5: now Enter the letter you want to count: m	m shows up 3 times in the data.

Task 03(CP): Write a program that stores all the elements in an array that are strictly greater than their adjacent left and right neighbors in a new array and then display that array.

Note:

- Do not count boundary numbers, since they only have one left/right neighbor.
- If no such numbers exist, display "No Peak found".

Test Cases:

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Input	Output
How many Elements you want to Enter: 8 [4, 5, 2, 1, 4, 9, 7, 2]	[5, 9] //5 has neighbours 4 and 2, both are less than 5.
How many Elements you want to Enter: 9 [1, 2, 1, 1, 3, 2, 5, 4, 4]	[2, 3, 5]
How many Elements you want to Enter: 6 [1, 2, 3, 4, 5, 6]	"No Peak found"

Task 04(CP): Take input from the user in a globally declared array and the length of cycle in local variable. You are tasked with writing a function that takes in 1 input as parameter: The length of each cycle.

Return the boolean value true if the array is a repeating cycle, and false if the array is a non-repeating cycle. All cycles begin with the first element of the array. Return true if the cycle length is greater than the array length.

Test Cases:

Input	Output	Explanation
Array Length: 7 [1, 2, 3, 1, 2, 3, 1] isRepeatingCycle(3)	true	// Since the first two elements of [1, 2, 3] equals [1, 2]
Array Length: 5 [1, 2, 3, 1, 3] isRepeatingCycle(3)	fasle	// Since [1, 2, 3] != [1, 3]
Array Length: 7 [1, 2, 3, 4, 2, 3, 1] isRepeatingCycle(4)	false	
Array Length: 5 [1, 2, 1, 2, 2] isRepeatingCycle(6)	true	

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Array Length: 4 [1, 1, 1, 1] isRepeatingCycle(3)	true	

Task 05(CP): Given an array of boxes, create a program that displays the total volume of all those boxes combined together. A box is represented by consecutive 3 elements in the array: length, width and height.

For instance, [2, 3, 2, 6, 6, 7, 1, 2, 1] should display 266 since (2 x 3 x 2) + (6 x 6 x 7) + (1 x 2 x 1) = 12 + 252 + 2 = 266.

Test Cases:

Input	Output
[4, 2, 4, 3, 3, 3, 1, 1, 2, 2, 1, 1]	63
[2, 2, 2, 2, 1, 1]	10
[1, 1, 1]	1

Notes
- You will be given at least one box.
- Each box will always have three dimensions included.

Task 06(CP): Imagine you are a warehouse manager and you have a list of 10 packages with their respective weights. Your task is to sort the packages in ascending order of weight so that the lighter packages can be loaded onto delivery trucks first. How would you sort the packages based on their weight in the same array? Write a C++ program to sort the same array in ascending order.

Input	Output
Here is an example of the data in the array of packages: [120, 45, 78, 23, 56, 89, 34, 67, 101, 243]	Here is the same sorted array in ascending order: [23, 34, 45, 56, 67, 78, 89, 101, 120, 243]

Task 07(CP): Given an input string, reverse the string word by word, the first word will be the last, and so on.
Test Cases:

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reverseWords("the sky is blue") ➡ "blue is sky the"

reverseWords("hello world!") ➡ "world! hello"

reverseWords("a good example") ➡ "example good a"

Good Luck and Best Wishes !!
Happy Coding ahead :)