



# National University of Computer and Emerging Sciences, Lahore Campus

## Object Oriented Programming Assignment 1

**Section:**

**Due Date:** 16<sup>th</sup> Sept 2023

### **Instructions:**

**Please read the following instructions carefully before submitting the assignment.**

1. Save your file with your Roll Number and Name
2. Submit your assignment in Google Classroom
3. It should be clear that your assignment will not get any credit if:
  - The assignment is submitted after the due date.
  - Assignment is copied (partial or full) from any source (websites, forums, students, etc.)

### **Important Note:**

1. In exercises given below, subscript operator `[]` is not allowed to traverse the array. Use only offset notation. i.e instead of using `myArray[i]` use `*(myArray+i)` to read/write an element.
2. There shouldn't be any memory leakage in your program.
3. Make separate functions for input and output of arrays. Your main should be a sequence of function calls only
4. You are not allowed to use global variables and goto instruction
5. All allocations of 1D/2D pointers should be dynamic.
6. Delete the array when it is no longer needed.
7. All the data will be given by user.
8. Pass the pointers to functions instead of `[]`.
9. Make proper functions to solve the problems.
10. Debug your code to find errors/bugs.

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### **Task 1:**

Write a function that will take a string and return a count of each letter in the string. For example, "my dog ate my homework" contains 3 m's, 3 o's, 2 e's, 2 y's and one each of d, g, a, t, h, w, r and k. 2 Your

function should take a single string argument and return a dynamically allocated array of 26 integers representing the count of each of the letters a . . z respectively. Your function should be case insensitive, i.e., count 'A' and 'a' as the occurrence of the letter a. [Hint: use the letter to integer conversion functions.] Do not count non-letter characters (i.e., spaces, punctuation, digits, etc.) Write a program that will solicit a string from the user using getline, call your letter frequency function and print out the frequency of each letter in the string. Do not list letters that do not occur at least once. Example:

**Enter a string:**

my dog at my homework

**Letter frequency**

a 1  
d 1  
e 1  
g 1  
h 1  
k 1  
m 3  
o 3  
r 1  
t 1  
w 1  
y 2

## Task 2 [2D Array]

**Exercise 1:** Write a function **int\*\* AllocateMemory(int& rows, int& cols)** that takes size of matrix (rows and columns) from user, allocates memory for the matrix and return its pointer.

What is the advantage of sending the two parameters by reference?

**Exercise 2:** Write a function **void InitializeMatrix(int\*\* matrix, const int& rows, const int& cols)** that initializes the matrix elements to 0. You may use subscript operator to initialize elements of matrix (only for this exercise).

Why are we passing the parameters as const?

**Exercise 3:** Write a function **void DisplayMatrix(int\*\* matrix, const int& rows, const int& cols)** that displays the matrix in proper format.

**Exercise 4:** Write a function **void DeallocateMemory(int\*\* matrix, const int& rows)** that deallocates all the memory.

Test your program. An example run is given below.

Enter total rows:4 Enter  
total columns:3 The array  
is:  
0 0 0  
0 0 0  
0 0 0  
0 0 0

### Task 3:

You are given a 2D array having some elements as shown below. Your task is to remove all zero elements from the array by making a new 2D array and assign it only the non-zero elements. Assume that rows and columns of the input array are defined by the user.

2	3	1	0	0	0
0	0	0	1	1	0
1	0	0	0	0	0
1	1	1	2	0	2
5	0	0	0	10	0

**Output Array:**

2	3	1	
1	1		
1			
1	1	2	2
5	10		

### Task 4:

Write a program that creates 2D dynamic array in main function where the columns in each row should be of different length and both values should be positive. Create a function **fillArray**. This function should receive the 2D array from main function and prompt the user to provide data. Your program should only accept positive values to fill the array. Decide the remaining parameters and return type of this function at your own. . Create a function **twoDimToOneDim**. This function should receive the 2D array from main function and creates a dynamic 1D array long enough to store the data of 2D array into this 1D array. This function should return the address of dynamically created 1D array to main function. Decide the remaining parameters of this function at your own. Create a function **SortArr**. This function should receive the 1D array from main function and sort its data in ascending order. Decide the remaining parameters and return type at your own. Create a function **showArr**. This function should receive the sorted 1D array and display its contents of console. Make sure that this function should not update the contents of array.

**Sample Output:**

Enter the size of rows: 3

Enter the columns for row#0: 4

Enter the columns for row#1: 2

Enter the columns for row#2: 3

Assume that following data is stored in 2D array:

87	61	92	14
56	29		
5	78	45	

Contents of Sorted 1D array are: 5, 14, 29, 45, 56, 61, 78, 87, 92

Best Of Luck ;)