NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCES
ISLAMABAD CAMPUS
PROGRAMMING FUNDAMENTALS (CS118) – FALL 2018
ASSIGNMENT-5

Due Date: November 17, 2018 (11:30pm)
Instructions:

1. *Write the C++ programs for all the question.*
2. *Solution to all the problems should be written in a separate (.cpp) file.*
3. *Submit the source code via **Google classroom**. Submissions via email will not be accepted.*
4. *Use proper naming convention to name the file containing source code.*
   For example, the file containing the source code for first question of the first assignment should be named as i18xxxx_assignment4_q1.pp, replace i18xxxx with your roll number.
5. *Place all your files in a folder. Zip it, rename the folder with your roll number and upload that folder on Google classroom*
6. ***The output should be well presented.** There will be marks of the presentation.*
7. ***Use proper checks where required**. There will be marks of proper checks too.*
8. *Do not **plagiarize**. Use efficient, simple and clean logics and codes.*
9. *Use proper **indentation** in your code. Indentation improves **readability** and helps in **debugging**.*
10. *Use appropriate naming conventions for **variable names**.*
11. *Note: You have to follow the submission instructions to the letter. Failing to do so can get a zero in assignment. We are not going accept any file without the specified naming convention whatever the reason will be.*

1. Write a C++ program that inputs a N size array from user. Sorts it using **bubble sort** and searches a value from it using **binary search**.

2. Write a program that lets the user enter the total rainfall for each of 12 months into an array of double s. The program should calculate and display the total rainfall for the year, the average monthly rainfall, and the months with the highest and lowest amounts. **Input Validation: Do not accept negative numbers for monthly rainfall figures**.

3. Suppose X, Y, Z are arrays of integers of size M, N, and M + N respectively. The elements in array X and Y appear in ascending order. Write a C++ program to produce third array Z by merging elements arrays X and Y in descending order.
Example:
Array X is {1,3,5,6}
Array Y is {2,4,8}
Array Z should be {8, 6, 5, 4, 3, 2, 1}
Note : Do not use Merge then sort strategy. Array Z should be merged in sorted order.

4. Write a program that lets the user enter four quarterly sales figures for six divisions of a company. The figures should be stored in a two-dimensional array. Once the figures are entered, the program should display the following data for each quarter:

- A list of the sales figures by division
- Each division s increase or decrease from the previous quarter (This will not be displayed for the first quarter.)
- The total sales for the quarter

- The company s increase or decrease from the previous quarter (This will not be displayed for the first quarter.)
- The average sales for all divisions that quarter
- The division with the highest sales for that quarter

The program should be modular, with functions that calculate the statistics above. **Input Validation: Do not accept negative numbers for sales figures.**

5. Write a program that uses the following arrays:

- **empId** : an array of seven long integers to hold employee identification numbers. The array should be initialized with the following numbers:
  5658845 4520125 7895122 8777541 8451277 1302850 7580489
- **hours** : an array of seven integers to hold the number of hours worked by each employee.
- **payRate** : an array of seven double s to hold each employee s hourly pay rate
- **wages** : an array of seven double s to hold each employee s gross wages

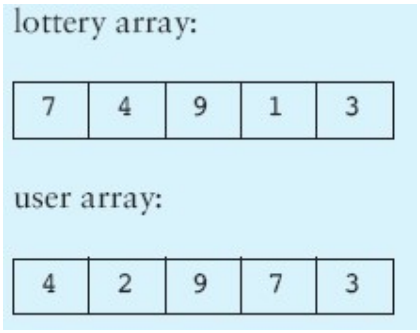
The program should relate the data in each array through the subscripts. For example, the number in element 0 of the hours array should be the number of hours worked by the employee whose identification number is stored in element 0 of the **empId** array. That same employee s pay rate should be stored in element 0 of the **payRate** array. The program should display each employee number and ask the user to enter that employees hours and pay rate. It should then calculate the gross wages for that employee (hours times pay rate) and store them in the wages array. After the data has been entered for all the employees, the program should display each employee s identification number and gross wages. **Input Validation: Do not accept negative values for hours or numbers less than 6.00 for pay rate.**

6. Write a program that finds the smallest and largest substring in a given string. For example, if string contains following value = 'My Village is a beautiful place', your program should print "a" and “beautiful”.

7. Write a program that filters positive elements out of a list. The program should build a new filtered list while the original list should remain unchanged. For example, if a list containing the elements 2, −16, 2, −5, 0, 1, −2, −3 is used in the program, the program should build a new list containing -16, -5, -2, -3. Note the original ordering of the non-negative values is unchanged in the result.

8. Write a C++ Program to Multiply Two Matrix Using Multi-dimensional Arrays. This program takes two matrices of order r1*c1 and r2*c2 respectively. Then, the program multiplies these two matrices (if possible) and displays it on the screen.

9. Write a program that simulates a lottery. The program should have an array of five integers named lottery , and should generate a random number in the range of 0 through 9 for each element in the array. The user should enter five digits which should be stored in an integer array named user . The program is to compare the corresponding elements in the two arrays and keep a count of the digits that match. For example, the following shows the lottery array and the user array with sample numbers stored in each. There are two matching digits (elements 2 and 4).



The program should display the random numbers stored in the lottery array and the number of matching digits. If all of the digits match, display a message proclaiming the user as a grand prizewinner.

10. Write a Menu Driven C++ program that creates a two-dimensional array/Matrix of size 3 **X 3** and initialize it with user. The program should do following Tasks using Menu:

- **Total**: Calculate the total/sum of all the values in the array.
- **Average:** Calculates average of all the values in the array.
- **RowTotal**: Calculates total/sum of the values in the specified row.
- **ColumnTotal**: Calculates total/sum of the values in the specified column.
- **HighestInRow**: Finds highest value in the specified row of the array.
- **LowestInRow:** Finds lowest value in the specified row of the array.
- **Transpose:** Find Transpose of array.
- **LeftDiagonalTotal:** Calculates total/sum of the values in the left Diagonal of array.
- **RightDiagonalTotal: :** Calculates total/sum of the values in the right Diagonal of array.
- **Multiply:** Take another 3 X 3 array as input from user and multiply both.

Note: Make all code separately and then merge them all in a menu. Use switch statement for menu.

11. Write a Menu Driven C++ program that creates a character array/string by taking input from user and perform following tasks by displaying menu to user:

- **Calculate length of string.**
- **Count number of words in string.**
- **Check a string is palindrome or not.**
- **Find a word within the array. If found display its starting position.**
- **Convert a string in lowercase.**
- **Convert a string in uppercase.**

Note: Make all code separately and then merge them all in a menu. Use switch statement for menu.

12. Write C++ program that takes sorted array and a number x, find the pair in array whose sum is closest to x.

Examples:

Input: arr[] = {10, 22, 28, 29, 30, 40}, x = 54
Output: 22 and 30

Input: arr[] = {1, 3, 4, 7, 10}, x = 15
Output: 4 and 10

13. Write C++ program that Split the array and add the first part to the end. Given an array and split it from a specified position, and move the first part of array add to the end.
Input: arr[] = {10, 22, 28, 29, 30, 40}, Split Point = 2
Output: {28, 29, 30, 40, 10, 22}

14. Write C++ program that do partitioning of the array. Partitioning process involves picking an element from an array randomly. Picked element is called pivot x. The task is to put x at its correct position in sorted array and put all smaller elements (smaller than x) before x, and put all greater elements (greater than x) after x.
Input: arr[] = {9,12,9,2,17,1,6} partition Point = 6
Output : {1,2,6,9,12,9,17}

15. Write a C++ programs that operates by counting the number of objects that have distinct key value, and using arithmetic on those counts to determine the positions of each key value in the output sequence. The algorithm loops over the items, computing a histogram of the number of times each key occurs within the input collection. It then places the values according to the keys in array.

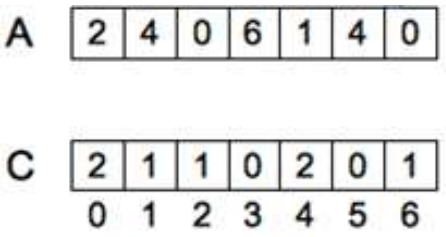
1. A	6. B	11. A	16. C
2. C	7. C	12. D	17. B
3. A	8. A	13. C	18. B
4. A	9. C	14. A	19. D
5. D	10. B	15. D	20. A

Example : For the given input array A[] (note that k = 6, i.e. the largest value in the array) the first and second C[] arrays are shown along with the reordering which show '0' will come two times '1' comes one times hence the first two positions are for '0' and so on.

16. Write a C++ program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings.
Sample List: ['abc', 'xyz', 'aba', '1221']
Expected Result : 2

17. Write a C++ program to get a list, sorted in increasing order by the last element from a given list.
Sample List: [[2, 5], [1, 2], [4, 4], [2, 3], [2, 1]]
Expected Result : [[2, 1], [1, 2], [2, 3], [4, 4], [2, 5]]

18. Write a C++ program to create a list by concatenating a given list which range goes from 1 to n.
Sample list: ['p', 'q']
n =5
Sample Output : ['p1', 'q1', 'p2', 'q2', 'p3', 'q3', 'p4', 'q4', 'p5', 'q5']



19. Write a code that prints the most frequently occurring element of a list of integers. Break ties by choosing the lower value. For example, if the list passed contains the values [27, 15, 15, 11, 27], your method should return 15.

20. Islamabad Traffic office has asked you to create an application that grades the written portion of the driver's license exam. The exam has 20 multiple-choice questions. Here are the correct answers:

Your program should store these correct answers in a list. The program should read the student's answers for each of the 20 questions and store the answers in another list. After the student's answers have been read, the program should display a message indicating whether the student passed or failed the exam. (A student must correctly answer 15 of the 20 questions to pass the exam.) It should then display the total number of correctly answered questions, the total number of incorrectly answered questions, and a list showing the question numbers of the incorrectly answered questions.