The American University in Cairo
Computer Science & Engineering Department
Spring 2021 - CSCE 1101-Sec 03/04

Assignment 1
Review on CSCE1001

Notes:

- Answer each question on your compiler to make sure it is correct and free of errors. For each question, if any program is not compiling (has errors), you may lose marks.
- For each question, submit your C++ files (.cpp extensions) along with screenshot(s) of your program running with different test samples.
- Make sure your program is user friendly as much as possible; as an example, use cout before cin so the user knows what should be entered.
- Make sure you compress all your work (.cpp files and screenshots) in a zipped folder with your name, your id, and the assignment number. For example: Name-ID-Assignment1
- Upload your zipped folder to Blackboard.
- The Assignments should be your own original work. Collaboration with ***other students or copying answers from online sources is prohibited*** by the AUC academic integrity code. Any violation of academic integrity will result in a very negative consequence.
- It is highly recommended

The assignment has 20+ marks as a BONUS.

Problem 1 (20 pts)

Given an example of an array of chars {'a', 'b', 'a', 'a', 'd', b'} and target = 'a'

1. Write a function *int CountOccurences(char A[], int N, char target)* that returns the number of occurrences for a given character known as target in an array of a given size.

2. Solve the same problem above but with a void as a return type. To explain, we would still get the same number of occurrences but with a different function
   (Hint: think about call by reference)

Problem 2 (30 pts)

Write a program that has the following:

1. Create a function *int* GenerateRandomArray(int N)* that takes an integer N and returns a pointer to an array of size N initialized with random values between 1 and N. For example, if N equals to 10, calling the function from the main would result in returning a pointer to the array with random numbers between 1 and 10.
2. Create a function *int* ReverseArray(int* A, int N) or int* ReverseArray(int A[], int N)* returns a pointer of the reversed array of A. For example, if the array contains elements 1,2,3,4,and 5, the reserved array will contain 5,4,3,2,and 1.
3. Create a function *void DisplayArray(int* A, int N)* or *void DisplayArray(int A[], int N)* that displays the elements of the given array.
4. ***From your main function do the following:***
   - Creates dynamic 1D array. You can create one or more array.
   - Call GenerateRandomArray() function
   - Call DisplayArray() function

- Call ReverseArray() function
- Call DisplayArray() function

Look up this URL for assistance:
C++ correct way to return pointer to array from function - Stack Overflow

Problem 3 (30 pts)

A book normally has attributes like a title, number of pages, and a genre ("Horror", or "Sci-Fic"). You own 3 horror books and 5 sci-fi books. You decided to place a bookshelf in your room where it will hold your book collection. Your bookshelf can hold a maximum of 20 books, no more.

Given the description above, please do the following:

- Create a *Book* class with its attributes, getters/setters functions. Optionally, you may include any suitable functions.
- Create *Book_Shelf* class that is an array of objects for class books with the following methods:
  - *int CountBooksByGenre(string genre).*This function counts the number of books by a given genre.
  - *int CountTotalBooks().* This function counts how many Books the Bookshelf has.
  - *int CountRemainingSlots()*. This function counts the number of free slots at the Bookshelf given that the maximum Bookshelf slots will be 20.
- Test your code from your main function to create the objects for the classes, and to test the methods of the Bookshelf class and to display the results.

Look up this URL for assistance:
C++ array of objects : CodesDope

Problem 4 (40 pts):

A house contains necessary information like floor number, space in meters squared, price per meter squared and an address. Those information are private. If a user wants to access or change details about the house, they would have to use setter or getter methods.

Example:

set_floor(int) takes the floor number from the user and sets it to the private variable floor in the House.

A house has a method called calculate_total() that uses the house information to calculate the total price of the house based on the space and price per meter squared. The calculated total should be set to a private variable called total_price in the class that doesn't have a setter function.

1. Given the description above, write a C++ class for the House with the attributes and the necessary methods.
2. In your main function, write a C++ program that takes the information of 5 houses from a user and prints the information of the house with the lowest total price. It is possible to achieve the same by creating a class called House_Comparison that has -but not limited to- this function. This will be an extra Bonus.