COMP 322
Winter Semester 2018

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Assignment 1: Exploring arrays and pointers.

Due date: 12 February 2018, 11:59 PM.

Before you start:

- Collaboration and research for similar problems on the internet are recommended. However, your submission should reflect individual work and personal effort.
- Some of the topics may not be covered in class due to our limited time. You are encouraged to find answers online. You can also reach to your instructor or TAs for guidance.
- Please do submit your assignment before the due date to avoid penalties or worse risking your assignment being rejected.
- Submit only .cpp and .h files. If some questions require you to develop and explain, you can embed your text in a C++ comment style.
- Make sure your code is clear and readable. Readability of your code as well as the quality of your comments will be graded.
- No submission by email. Submit your work to mycourse.
- Be happy when working on your assignment, because a happy software developer has more inspiration than a sad one :).

So it begins …

A matrix in algebra is an array of numbers arranged in rows and columns. In C++, it is common to implement Matrices using two dimensional arrays. We will be focusing on manipulating a fixed size 5x5 square matrix (5 rows and 5 columns).

In the following questions you will be asked to write multiple functions doing each a specific task. In addition, **you are required to provide one main function that calls all the functions that you have created one by one and print the corresponding results to the screen.**

Question 1 (5 pts)

Can a function in C++ return an array? If yes please explain how, and if no please explain why.

Question 2 (10 pts)

Write a function that will fill a 5x5 matrix by randomly generated numbers. You can use **rand()** and **srand()** functions provided by **<cstdlib>** library to generate random numbers.

The signature of the function is:

void fillMatrix(int matrix[rows][cols]);

rows and cols are global constants defined as follow:

const int rows = 5;

const int cols = 5;

Question 3 (10 pts)

Write a function that given a 5x5 matrix as parameter, will print each row of the matrix to the screen line by line.

The signature of the function is:

void PrintMatrix(int matrix[rows][cols]);

You can test your function by feeding it a randomly generated matrix from question 2.

Question 4 (15 pts)

In algebra, a transpose of a matrix is a matrix whose rows are the columns of the original. Write a function that will take a 5x5 matrix as parameter and then transpose it in-place which means without the use of an extra or a temporary matrix while transposing.

The signature of the function is:

void transposeMatrix(int matrix[rows][cols]);

You can test your function by feeding it a randomly generated matrix from question 2.

Question 5 (15 pts)

Write an iterative function that given two 5x5 matrices as parameters, will return a third 5x5 matrix holding the result of the product of the 2 matrices.

You can test your function by feeding it two randomly generated matrices from question 2.

Question 6 (15 pts)

Rewrite the same function from question 5 but using recursion.

Question 7 (15 pts)

Rewrite the same functions from question 2, question 3 and question 4 (fillMatrix, printMatrix and transposeMatrix) using the pointer notation instead of the array notation. Note that you should be using double pointers to allocate the needed 2-dimensional arrays.

Question 8 (15 pts)

Is it possible to use a 1-dimensional array instead of 2-dimensional array to implement a matrix? If yes rewrite the functions from question 2 and question 3 (fillMatrix and printMatrix) using 1-dimensional array. If no, please explain why.