Lab 1

Graded During Lab
A copy of graded solution must be submitted on Brightspace

Objective:

- Practice recursion, pointers, and arrays
- Understand memory

Learning outcomes:

- The acquisition, application and integration of knowledge
- Research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
- Literacy and numeracy skills
- Interpersonal and communications skills

Part A – Recursion and Memory

Exercise 1: Create a recursive function for the following problems:

- Factorial of a number N
    - Definition:
        - N! = 1x2x3x…x(N-1)xN
- Power of a number
    - Definition:
        - X is a real number and N is an integer
        - Compute X^N

Exercise 2: Draw the stack until the last base case is reached for the functions created in Exercise 1 with the following inputs:

- Factorial(3)
- Power(0.5, 4)

Part B – Arrays

Create a main function that will populate two NxN arrays, A and B, with random values between 0 and 50. Complete the following exercises using this setup (call each exercise's function in main). Consider printing the arrays and returned values of exercises.

Exercise 1: Matrix multiplication. Create a function to compute and return the matrix multiplication AB. *Hint: Recall that the stack doesn't allow for local variables to be returned so you must create the variable in main's stack frame.*

Exercise 2: Create a function to swap all values between to matrices. The function should swap each individual entry.

Exercise 3: Create a function to swap two matrices. Unlike exercise 2, you should swap the entire matrix. This means making a temporary matrix and using it to swap. Consider an additional function called 'copy' which will copy all values of one matrix to another.

Part C – Pointers

Set up the main function as done in Part B. In addition, make two pointers, PA and PB, that reference A and B, respectively.

Exercise 1: Make a function to swap PA and PB.

Exercise 2: Make a function to search for a value within a provided matrix. You should pass a pointer to a matrix and the element you're searching for. When you find the element, return a pointer to that element, or return NULL if not found. In main, print the element if found, otherwise print an error message 'not found'.

Grading

- You must request to be graded during the lab. Any requests outside of the lab or during the wrong lab session will not be considered. You cannot attend multiple labs, you will receive the lowest graded mark as the final grade.
- When requesting a grade, you receive 2% and the remaining 3% is based on lab performance. Even if you have no content to show, you will receive the 2% for the request.
- Lab performance is based on an understanding of the lab contents. When you present your solution, the grader will check the code and ask a series of questions. You will receive the full 3% if you're able to answer the grader's questions, or 0% otherwise.
- If the grader feels you need to rework a solution, you can continue to work without penalty. All grading is final within the last 30 minutes of the lab.
- After being graded, you must submit your work on brightspace. This is to keep a record of your lab work after being graded. If you don't submit your labs, you will receive 0% for the lab.