Lab 7
Loops (continued) - Functions

1 Lab Objectives

- More practice on loops and Arrays.
- Introduction to using functions.
- Verify your solutions on hackerrank https://www.hackerrank.com/programming-lab-7-f2018.

2 Problem 1 - Max Row at the Top

Write a C program that given a two-dimensional array, reorders the rows such that the row with the highest row sum is the first row. The program should read N and M which are the number of rows and columns respectively. You can assume that $1 \leq n, m, \leq 20$. Then it will read in NxM integers that form the array. It should search for the row with the maximum sum and swap it with the first row.

If the program will be called with the following array
1 3 5 1
2 50 9 9
2 2 3 4

The output should be
2 50 9 9
1 3 5 1
2 2 3 4

3 Problem 2 - Matrix Multiplication

In this problem you are required to write a program to reads 2 matrices (of dimensions N x M and M x L), multiplies them and displays the output.

For example: $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$ X $\begin{pmatrix} 7 & 8 \\ 9 & 10 \\ 11 & 12 \end{pmatrix} = \begin{pmatrix} 58 & 64 \\ 139 & 154 \end{pmatrix}$

Your program should print both the input matrices and the multiplication result in any appropriate format.

4 Problem 3 - Sine x (revisited!)

The sine of x can be calculated approximately by summing the first N terms of the infinite series:

$sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + ...$ **(x in radians)**

You are required to solve the sin(x) problem from previous lab with the following restrictions:

1. Write a *function* that takes the angle in degrees and converts it to radian.
2. Write a *function* that takes an input n. Calculates and returns its factorial ($n!$).
3. Write your own power *function: double power(double n, int m)*, that takes two arguments n, m. Calculates and returns n^m as *double*.
4. Write a *function* that takes in an angle in degrees and computes its sine, using the above formula. Your function should call the above three functions.

5 Problem 4 - Simple function one

write a function that computes the value of the following polynomial: $3x^5+2x^4-5x^3-x^2+7x-6$ Write a program that scans the value of x, calls the function to compute the value of the polynomial, and then displays the value returned by the function.

6 Problem 5 - Simple function two

Write a function digit(n, k) that returns the k^{th} digit (from the right) in n (a positive integer). For example, digit(829, 1) returns 9, digit(829, 2) returns 2, and digit(829, 3) returns 8. If k is greater than the number of digits in n, have the function return 0.

7 Problem 6 - BigInteger Multiplication

given two positive numbers x and y multiply them. You should solve this problem using functions.

Input Format :
first line contains integer n
second line contains integer x which consists of n digits
first line contains integer m
second line contains integer y which consists of m digits

Constraints :
$1 \leq n, m \leq 1000$
each digit d is $0 \leq d \leq 9$. Most significant digit is not 0 (except for 0).

Output Format :
x * y without any leading zeros (except for 0)

Sample Input :
10
1234554321
10
5432112345

Sample Output :
67062377676771927 45

Explanation :
1234554321 X 5432112345 = 6706237767677192745

8 Notes

- Read the problem statement **carefully** and stick exactly to what's required.
- You are required to bring your C programs for all problems to the lab on your laptop or on a flash memory.
- Cheating will be severely penalized (for both parties). So, it is better to deliver nothing than deliver a copy!
- You are encouraged to ask any questions on Piazza, or in person.

Good Luck isA :)