

Programming -1: Assignment #1



Notes:

1. Each Student will deliver his assign solution to his/her TA in the lab.
2. The due date for submission is the week starting from **26 April**. such that each student will deliver in his/her group lab. **No allowed submission after this date, no excuses.**
3. You should use **Pointers and functions** in each program
4. **Cheaters will be graded -100**
5. You must **NOT** use **CIN** or **COUT** inside the functions. **USE CIN AND COUNT INSIDE main function ONLY**

Question 1:

Write a Matrix Calculator program which takes number of columns and number of rows then create two 2D arrays and ask the user to enter values of the two arrays. After filling the two arrays, perform the following operations:

1. **Matrix addition:** You have to implement the following function, which adds two matrices, **check for the validity of matrixes addition.**
int addMatrices(int** matrix1, int** matrix2, int rows1, int columns1, int rows2, int columns2);**
2. **Matrix multiplication:** You have to implement the following function, which multiplies two matrices, **check for the validity of matrixes multiplication.**
int multiplyMatrices(int** matrix1, int** matrix2, int rows1, int columns1, int rows2, int columns2);**
3. **Matrix determinant:** You have to implement the following function, which calculates the determinant of one matrix. You should call this method twice for each matrix
int matrixDeterminant(int matrix, int rows, int columns);**
4. **Matrix Transpose:** You have to implement the following function, which calculates the transpose of one matrix. You should call this method twice for each matrix
Int matrixTranspose(int** matrix, int rows, int columns);**
5. **Identity Matrix:** You have to implement the following function which checks if a matrix is identity or not. You should call this method twice for each matrix
bool isIdentityMatrix (int matrix, int rows, int columns);**
6. **Orthogonal Matrix:** You have to implement the following function which checks if a matrix is orthogonal or not. You should call this method twice for each matrix
bool isOrthogonalMatrix (int matrix, int rows, int columns);**

Matrix Q is orthogonal if: $Q^T Q = Q Q^T = I$, I is the identity matrix

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Sample Input/ Output:

Number of rows: 2

Number of columns: 2

Matrix #1:

3 8

4 6

Matrix #2:

5 9

2 7

Matrix Addition:

8 17

6 13

Matrix 1 and Matrix 2 can be multiplied...

Matrix Multiplication:

31 83

32 78

Matrix Determinant #1 = -14 & Matrix Determinant #2 = 17

Matrix #1 Transpose:

3 4

8 6

Matrix #2 Transpose:

5 2

9 7

Matrix #1 is not orthogonal

Matrix #2 is not orthogonal

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Question 2:

You're required to write a program for FCI which calculates the student grades. First, ask the user to enter number of subjects and number of students then create 2D array of type *Double* for the students and their subjects. Ask the user to enter the grade of each student for each subject then perform the following operations (You should write a function for each operation):

1. *Display the GPA for each subject for each student:* create a function which takes the 2D array of student grades and return 2D array of type String which contains the GPA of each subject for each student
2. *Display the average grade and GPA for each student:* create a function which takes the 2D array and return 1D array
3. *Display the average GPA for each subject:* create a function which takes the 2D array and return 1D array for the GPAs.

Sample Input / Output:

of students: **2**
of subjects: **2**
Enter grade of Subject#1 for Student#1: **70**
Enter grade of Subject#2 for Student#1: **90**
Enter grade of Subject#1 for Student#2: **50**
Enter grade of Subject#2 for Student#2: **30**

GPA of Subject#1 for Student#1: **C+**
GPA of Subject#2 for Student#1: **A+**
GPA of Subject#1 for Student#2: **D**
GPA of Subject#2 for Student#2: **F**

Average grade and GPA for student#1: **80 -> B+**
Average grade and GPA for student#2: **40 -> F**

Average GPA for subject#1: **D+**
Average GPA for subject#2: **D+**

ENJOY