CTIS151 – Introduction to Programming
Fall 2024 - 2025

Lab Guide #16 – Week 12 - 2

OBJECTIVES : Two-dimensional Arrays and Matrix operations
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Q1. a) Write a C program that will declare and initialize a 3x3 integer matrix as follows;

```
int array[SIZE][SIZE] = { {75, 20, 77},
                          {71, 23, 45},
                          {67, 89, 98} };
```

Example Run:

```
75 20 77
71 23 45
67 89 98
```

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Project Name: LG16_Q1a
File Name: Q1a.cpp

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b) Modify the program **Q1a.cpp** so the program reads integer numbers from the user and inserts these numbers into a 3x3 integer matrix in a **row-wise** operation. Then the program will display the content of the array, as shown below.

Example Run:
```
Enter the value for cell [0][0]: 10
Enter the value for cell [0][1]: 20
Enter the value for cell [0][2]: 30
Enter the value for cell [1][0]: 40
Enter the value for cell [1][1]: 50
Enter the value for cell [1][2]: 60
Enter the value for cell [2][0]: 70
Enter the value for cell [2][1]: 80
Enter the value for cell [2][2]: 90

 10  20  30
 40  50  60
 70  80  90
```

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Project Name: LG16_Q1b
File Name: Q1b.cpp

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c) Modify the program **Q1b.cpp** so the program fills the 8x8 matrix reading the values from the text file **"nums.txt"**. then, prints the contents of the array on screen, as shown below.

Example Run:

```
The content of the matrix is:
 1   2   3   4   5   6   7   8
 2   4   6   8  10  12  14  16
 3   6   9  12  15  18  21  24
 4   8  12  16  20  24  28  32
 5  10  15  20  25  30  35  40
 6  12  18  24  30  36  42  48
 7  14  21  28  35  42  49  56
 8  16  24  32  40  48  56  64
```

nums.txt

1	2	3	4	5	6	7	8
2	4	6	8	10	12	14	16
3	6	9	12	15	18	21	24
4	8	12	16	20	24	28	32
5	10	15	20	25	30	35	40
6	12	18	24	30	36	42	48
7	14	21	28	35	42	49	56
8	16	24	32	40	48	56	64

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Project Name: LG16_Q1c
File Name: Q1c.cpp

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Q2. Write a C program that creates a square matrix 4X4. First, it sets major diagonal elements to 1 and then sets minor diagonal elements of that matrix to 1 as in the example run.

Example Run:
```
MAJOR DIAGONAL
**************
  1  0  0  0
  0  1  0  0
  0  0  1  0
  0  0  0  1

MAJOR AND MINOR DIAGONAL
************************
  1  0  0  1
  0  1  1  0
  0  1  1  0
  1  0  0  1
```

Project Name: LG16_Q2
File Name: Q2.cpp

Q3. Write a C program that reads letters from a text file named **"words.txt"** into a two-dimensional array. In each column of the array, there is an English word. For example, the word "banker" is written in the second column, and "deluxe" is written in the fourth column. The program will input a number and display the corresponding word from the two-dim. array.

Example_Run #1:
```
Which word do you want to display? 2

The word -> banker
```

Example_Run #2:
```
Which word do you want to display? 6

The word -> golden
```

words.txt
```
a b c d e g
c a h e l o
c n e l i l
e k e u x d
n e r x i e
t r s e r n
```

Project Name: LG16_Q3
File Name: Q3.cpp

Q4. There are 5 players in the bowling game and they make 5 shots. Gamers.txt contains 5 players and 5 shots. Write a C program that gets 5 players and 5 shots from the file into a two-dimensional array. The program finds each player's total score and stores them in a one-dim scores array. The third shot is important for the game, if the player's third shot is greater than or equal to 8, that player gets an extra 5 points. The program also makes the extra point calculation and displays each player's final score.

Example Run:
```
1. player score: 35
2. player score: 29
3. player score: 32
4. player score: 14
5. player score: 43
```

gamers.txt
```
6 8 7 8 6
9 8 7 2 3
1 2 8 9 7
3 4 2 3 2
8 9 8 7 6
```

Project Name: LG16_Q4
File Name: Q4.cpp

Additional Questions

AQ1. Five friends play an Xbox game and they try to lose weight. Daily waste calories lost in a week are stored in a text file named **"calories.txt".**

Write a C program that reads IDs and waste calories from the text file into a two-dimensional array, finds the average waste calorie of each person in a week and stores these averages in a one-dim array. The program also decides whether they can lose weight according to the average waste calorie. If the average waste calorie is higher than 2200, it means that S/he can lose weight. Then, it writes these IDs, averages, and the decision to the text file named **"output.txt"** as in the example run.

calories.txt

```
111 1300.2   2500.4   2800.6   3400.1   4200.0
222 890.9    1400.2   2100.5   2600.3   3000.1
333 2600.4   2001.8   2140.3   1900.4   1435.9
444 2400.1   2600.3   2800.2   2950.9   3015.3
555 1800.0   2001.8   2170.8   2300.4   3000.1
```

output.txt

```
ID     AVERAGE    LOSE WEIGHT
**************************
111    2840.3        Y
222    1998.4        N
333    2015.8        N
444    2753.4        Y
555    2254.6        Y
```

Project Name: LG16_AQ1
File Name: AQ1.cpp

AQ2. Write a C program that reads IDs and 5 quiz grades of several students from **grades.txt** to calculate the average of each quiz, as well as the average of each student. These calculated values of the ID and the average of each student should be written onto a new file named **average.txt** while the averages of each quiz should be displayed on screen, as shown in the example run below.

Project Name: LG16_AQ2
File Name: AQ2.cpp

grades.txt:

Stu_ID	Quiz1	Quiz2	Quiz3	Quiz4	Quiz5
1111	45.5	80.5	82	95	55
2222	60	50	70	75	55.5
3333	40	30.5	10	45	60
4444	0	5	10.5	2	10
5555	90	85	100	90	93
6666	35	89	47.5	94	74
7777	20.5	14	12	50	65
8888	85	69	74	83	91.5
9999	74	45	89	46	38
1212	59.5	54	69	87	83

average.txt:

```
1111   71.6
2222   62.1
3333   37.1
4444    5.5
5555   91.6
6666   67.9
7777   32.3
8888   80.5
9999   58.4
1212   70.5
```

Example Run:

```
Quiz Number      Average
     1            50.95
     2            52.20
     3            56.40
     4            66.70
     5            62.50
```