

Department of Information Systems and Technologies

CTIS 152 – Algorithms and Data Structure

FALL 2024 - 2025

Lab Guide #3 – Week 3 - 2

OBJECTIVE : One-Dimensional Arrays, Two-Dimensional Arrays with Pointers and Dynamic Memory Allocation

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Use pointer notation instead of subscript notation!

Q1.

Suppose that a C program contains the following statement:

```
double array[4][3] = { { 69.11,25.23,48.79 }, { 81.25,63.47,42.14 }, { 99.1,52.63,38.21 },  
                      { 11.23,45.58,12.49 } };
```

a. According to the statement, examine the values of:

- array
- (array + 1)
- *(array + 1)
- (*(array) + 1)
- (*(array) + 1)
- (*(array + 1))
- (*(array) + 1) + 2
- (*(array + 1) + 2)
- (*(array + 1) + 2)

b. According to the statement, examine the values of:

- *(array[0] + 1)
- *(array[1] + 0)
- *(array[0] + 1) + 2
- *(array[1] + 2)

Check the results by the program.

Project Name: LG3_Q1

File Name: Q1.cpp

Q2.

Write a C program that will initialize a two-dimensional integer array of size 3 by 3 with the numbers like 3, 9, 27, ...

When completed, the program should also give an output of these values to the text file result.txt in the given format below, including their addresses and pointer iterations.

Example Run:

Successful! Please see the result.txt file for the output.

Content of the result.txt file

| Element Name | Value | Address |
|-------------------|-------|----------|
| ----- | ---- | ----- |
| *(*(arr + 0) + 0) | 3 | 0135FE5C |
| *(*(arr + 0) + 1) | 9 | 0135FE60 |
| *(*(arr + 0) + 2) | 27 | 0135FE64 |
| *(*(arr + 1) + 0) | 81 | 0135FE68 |
| *(*(arr + 1) + 1) | 243 | 0135FE6C |
| *(*(arr + 1) + 2) | 729 | 0135FE70 |
| *(*(arr + 2) + 0) | 2187 | 0135FE74 |
| *(*(arr + 2) + 1) | 6561 | 0135FE78 |
| *(*(arr + 2) + 2) | 19683 | 0135FE7C |

Project Name: LG3_Q2

File Name: Q2.cpp

Q3.

Write a C program that gets the number of grades from the user and creates an integer array **dynamically** to keep them. It will continue until a non-positive number is given. The program will calculate and display 40% of the total grade for each student.

Write the following functions;

- **input:** inputs a given number of integer values into a dynamic memory area whose address is received as a pointer.
- **findGrade:** receives the address of a dynamic integer memory area together with size, and returns 40% of the total grade.

Example Run:

```
How many grades? 2
Enter 2 grades: 69 78
The 40% of the total grade : 58.80
```

```
How many grades? 3
Enter 3 grades: 98 45 16
The 40% of the total grade : 63.60
```

```
How many grades? -1
```

Project Name: LG3_Q3

File Name: Q3.cpp

Q4.

Write a C program that reads a list of integers from a text file named **numbers.txt** into a **dynamically** created one-dim array. Then, it displays the array content and writes the prime numbers into the **prime.txt** (Using the functions below). Finally, it displays the file content and the number of prime numbers. (The first data of the file consists of the count of numbers.)

Write the following functions;

- **readFromFile:** takes the file pointer and the array as parameters, reads the numbers from the file into the specified array.
- **display:** takes the array and its size as input parameters and displays the content of the array.
- **isPrime:** decides whether an integer is prime or not.

Prime number is a number only divisible by 1 and the number itself. For example; 7 is prime number because, its divisors are 1 and 7.

- **findPrime:** takes the array and its size as input parameters. Then, it finds the prime numbers in the array and stores them in another array. The function should return the number of primes.

- **writeToFile:** takes the output file pointer and the array which keeps the prime numbers and its size as parameters, writes the prime numbers into the file.

numbers.txt

| |
|---|
| 20 12 6 54 11 96 12 14 52 63 13 8 34 28 94 36 8 9 82 24 7 |
|---|

prime.txt

| |
|---------|
| 11 13 7 |
|---------|

Example Run:

The list of numbers in the file:

```
12  6  54  11  96  12  14  52  63  13  8  34  28  94  36  8  9  82  24  7
```

There are 20 numbers in the array, 3 of them are prime numbers

Project Name: LG3_Q4

File Name: Q4.cpp

Additional Question

AQ.

Write a C program that reads the account ID and balance for several customers from the file “**customers.txt**” into two parallel arrays. Then the program allows a credit manager to obtain the list of the customer’s accounts with zero balances (balance equals 0) and the customer having the maximum balance. The program displays a menu and allows the credit manager to choose one of them. Apply the appropriate operations according to the choice by using a **function** for each.

Write the following functions;

- **dispMenu:** displays a menu as follows. Then, it validates and returns the credit manager’s choice;
 1. List the accounts with zero balances
 2. Display the account which has the maximum balance
 3. Exit
- **readFile:** takes a file pointer, ID, and the balance arrays to read each customer’s information in the arrays from the file.
- **displayZeroBalances:** takes the balanced array and its size as input parameters stores and returns the indexes of the accounts with zero balances in another array and its size.
- **findMaxBalance:** takes the balanced array and the number of customers as input parameters then it finds and returns the index of the account which has the maximum balance.

customers.txt

```
111 24.98
222 345.67
333 0.00
444 -42.16
555 2524.62
666 1245.78
777 950.85
789 0.00
888 324.54
999 0.00
```

Example Run:

```

      MENU
-----
1- List the accounts with zero balances
2- Display the account which has the maximum balance
3- Exit
Enter your request: 9
Enter your request: 0
Enter your request: 1

Accounts with zero balances:
333
789
999

      MENU
-----
1- List the accounts with zero balances
2- Display the account which has the maximum balance
3- Exit
Enter your request: 2

Account Info which has the maximum balance:
555      2524.62

      MENU
-----
1- List the accounts with zero balances
2- Display the account which has the maximum balance
3- Exit
Enter your request: 3
```

Project Name: LG3_AQ
File Name: AQ.cpp