Programming Fundamental

Lab Manual - Week 13

Introduction

Welcome Back to your favorite Programming Lab students. In this lab manual, we shall work together to learn and implement new programming concepts.

Skill: Learning the use of 2D Arrays to store data

Let's do some coding.

Introduction

Students, you can think of a 2D Array as an array of array. These arrays are often referred as matrix where you can store data in rows and columns.

Consider the following task for better understanding.

Task 01(WP): Create a program that stores the following data in your program.

	Red	Black	Brown	Blue	Gray
Suzuki	10	7	12	10	4
Toyota	18	11	15	17	2
Nissan	23	19	12	16	14
BMW	7	12	16	0	2
Audi	3	5	6	2	1

We can use the Parallel Arrays to store this data. However, this gets even more complex as our data and its different attributes increase.

```
{
    string color[5] = {"Red", "Black", "Brown", "Blue", "Grey"};
    int suzukiQuantity[5] = {10, 7, 12, 10, 4};
    int toyotaQuantity[5] = {18, 11, 15, 17, 2};
    int nissanQuantity[5] = {23, 19, 12, 16, 14};
    int bmwQuantity[5] = {7, 12, 16, 0, 2};
    int audiQuantity[5] = {3, 5, 6, 2, 1};
}
```

Therefore, we can use the 2D array to store this data.

```
int carData[5][5] = {
    {10, 7, 12, 10, 4},
    {18, 11, 15, 17, 2},
    {23, 19, 12, 16, 14},
    {7, 12, 16, 0, 2},
    {3, 5, 6, 2, 1}
};
```

Task 02(WP):

(a) Write a program that Prints all the values in matrix form.
(b) Print only the Toyota Blue cars available in carriage.
(c) Print total number of "Red" cars in carriage
(d) print total number of "Nissan" cars in carriage
(e) Write a program that pass color as parameter into function named as "converter" and return index of that column and sum total number of cars of that color available.
(f) print the matrix but convert the rows into column and vise versa

Task 03(OP):

Write a program that read 3x3 matrix and show sum of element of that matrix.

Input	**Output**
2 4 5 6 7 1 0 1 2	28

Task 04(CP):

Write a program that read 3x3 matrix and check whether the matrix is identity matrix or not.

Note: the identity matrix of size n is the n × n square matrix with ones on the main diagonal and zeros elsewhere

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Task 05(CP):

Remember the game Battleship? Ships are floating in a matrix. You have to fire torpedoes at their suspected coordinates, to try and hit them.

Create a function that takes a coordinate as a string. If the coordinate contains only water " . ", return "splash" and if the coordinate contains a ship " * ", return "BOOM".

Notes:

- The provided matrix is always a square.
- The provided matrix will not be larger than 5 * 5 (A1 * E5).

Test Cases:

[[" ", " ", " ", "*", "*"], [" ", "*", " ", " ", " "], [" ", "*", " ", " ", " "], [" ", "*", " ", " ", " "], [" ", " ", "*", "*", " "],]	fire("A1") ➞ "splash" fire("A4") ➞ "BOOM" fire("D2") ➞ "BOOM"

Task 06(CP):

In (American) Football, a team can score if they manage to kick a ball through the goal (i.e. above the crossbar and between the uprights).

Create a function that returns true if the ball 0 goes through the goal. You will be given a 2D array.

[[" # # "], [" # # "], [" # # "], [" ####### "], [" # 0 "], [" # "], [" # "]	isGoalScored() ➞ false

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]	
[[" # # "], [" # 0 # "], [" # # "], [" ####### "], [" # "], [" # "], [" # "]]	isGoalScored() ➞ True

Task 07(CP):

Create a function that checks 4x3 2D array and returns a count of the total number of identical rows.

Input	**Output**
[[0, 0, 0], [0, 1, 2], [0, 0, 0], [2, 1, 0]]	countIdenticalArrays() ➞ 2
[[0, 1, 0], [0, 1, 2], [0, 2, 0], [2, 1, 0]]	countIdenticalArrays() ➞ 0
[[0, 1, 2], [0, 1, 2], [0, 1, 2],	countIdenticalArrays() ➞ 3

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[2, 1, 0]]	

Good Luck and Best Wishes !!

Happy Coding ahead :)