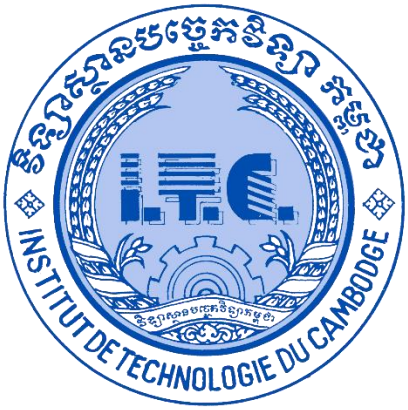

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Institute of Technology of Cambodia

TP-09

Working with Array (Part-II)

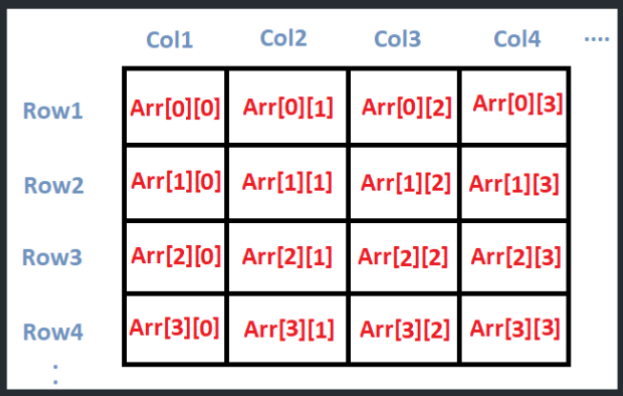
in C++

Academic Year: 2020 - 2021

C + +

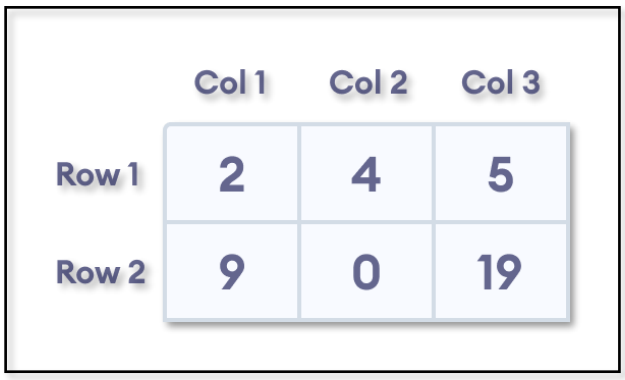
2-Dimensional Arrays

- 2-D Arrays can be defined as an array of arrays,
- It can also represent a Matrix,
- Each element is represented as Arr[row][column], where Arr[][] is the 2D array.



Example:

```
int test[2][3] = { {2, 4, 5}, {9, 0, 19} };
```



Example 1: Two Dimensional Array

```cpp
// C++ Program to display all elements
// of an initialized two-dimensional array

#include <iostream>
using namespace std;

int main() {
    int test[3][2] = {{2, -5},
                      {4, 0},
                      {9, 1}};

    // use of nested for loop
    // access rows of the array
    for (int i = 0; i < 3; ++i) {

        // access columns of the array
        for (int j = 0; j < 2; ++j) {
            cout << "test[" << i << "][" << j << "] = " << test[i][j] << endl;
        }
    }

    return 0;
}
```

Output

```
test[0][0] = 2
test[0][1] = -5
test[1][0] = 4
test[1][1] = 0
test[2][0] = 9
test[2][1] = 1
```

Example 2: Taking Input for Two-Dimensional Array

```cpp
#include <iostream>
using namespace std;

int main() {
    int numbers[2][3];

    cout << "Enter 6 numbers: " << endl;

    // Storing user input in the array
    for (int i = 0; i < 2; ++i) {
        for (int j = 0; j < 3; ++j) {
            cin >> numbers[i][j];
        }
    }

    cout << "The numbers are: " << endl;

    // Printing array elements
    for (int i = 0; i < 2; ++i) {
        for (int j = 0; j < 3; ++j) {
           cout << "numbers[" << i << "][" << j << "]: " << numbers[i][j] << endl;
        }
    }

    return 0;
}
```

Output

```
Enter 6 numbers:
1
2
3
4
5
6
The numbers are:
numbers[0][0]: 1
numbers[0][1]: 2
numbers[0][2]: 3
numbers[1][0]: 4
numbers[1][1]: 5
numbers[1][2]: 6
```

Problem1:

Write a program which displays the letters in a string (sequence of character / array of character / char array) in reverse order. The program asks a user for a string.

E.g: **Input**: covid19 vaccine

⇨ **Output**: eniccav 91divoc

```
s.length()
for (k = s.length() - 1; ... ) {
  cout << s[k]  ;
}
```

Problem2:

Write a program to fill data in the 2D (two-dimensional) array as the following:

```
1   2   3   4   5
6   7   8   9   10
11  12  13  14  15
16  17  18  19  20
21  22  23  24  25
```

Then make your program to be able to:

a) Display all data above.
b) Display the data in reverse order for each row.
c) Sum all data in the 2D array and display the sum.

⇨ **Output** of b)

```
5   4   3   2   1
10  9   8   7   6
15  14  13  12  11
20  19  18  17  16
25  24  23  22  21
```

Problem3:

Write a C program to find largest and second largest element in an array. The program asks the user to input 7 numbers and store in an array. Find and display the largest and second largest number in the array.

E.g: **Input**: 20 10 9 80 -9 3 80

⇨ **Output**: largest: 80
second largest: 20

Find max
Find max2nd
if(n[k] > max2nd && n[k] < max)
max2nd = n[k]

Problem4:

Write a program to search an element in an array, say **myArray**. The program asks the user to input 8 numbers (each number is in between 1 to 9) and store in an array. Then ask the user to input another number, say **n**. The program searches for the position of n in **myArray** and display how many **n** is appearing in **myArray** and its positions.

E.g: **Input**: 7 8 9 4 7 6 1 1

n: 1

⇨ **Output**: There are 2 times in array.
They are located in positions 7 and 8.

n: 5

⇨ **Output**: No data found!

for(k...
if(n == myarray[k])

Problem5:

Randomize 9 numbers and store in the two 3x3 matrices, say m1 and m2. Each matrix is a 2D array of 3 rows and 3 columns.

int m1[3][3], m2[3][3];

a) Find the matrix m3 which is the summation of these two matrices. (m3 = m1+m2)
b) Find and display the max and min numbers in m3.
c) Find and display the average in m3 (find sum of all numbers in, then divide by 9)

---

1 3 9 2 4 6
2 7 9 3 7 8
1 2 3

⇨ **Output**: (min=1, max=9)
sum=?
average=?
