National University of Computer and Emerging Sciences

Lab Manual # 10

Programming Fundamentals

(Section BCS-1B)

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Objectives

The objectives of this lab are to cover the following:

- 2D int arrays

Question No 1 (2-D int array):

Write a function in C++ called Trace(int data[][size]) that calculates and returns the trace of a square matrix. The trace of a square matrix is the sum of values present in its diagonal.

Question No 2 (2-D int array):

A local zoo wants to keep track of how many pounds of food each of its three monkeys eats each day during a typical week. Write a program that stores this information in a two dimensional 3x5 array, where each row represents a different monkey and each column represents a different day of the week. The program should first have the user input the data for each monkey. Then it should create a report that includes the following information:

- Average amount of food eaten per day by the whole family of monkeys.
- The least amount of food eaten during the week by any one monkey.
- The greatest amount of food eaten during the week by any one monkey.

Input Validation: Do not accept negative numbers for pounds of food eaten.

Question No 3:

An amateur meteorologist wants to keep track of weather conditions during the past year's three-month summer season and has designated each day as either rainy ('R'), cloudy ('C'), or sunny ('S'). Write a program that stores this information in a 3X30 array of characters, where the row indicates the month (0 = June, 1 = July, 2 = August) and the column indicates the day of the month. Note that data are not being collected for the 31st of any month.

It should create a report that displays, for each month and for the whole three-month period, how many days were rainy, how many were cloudy, and how many were sunny. It should also report which of the three months had the largest number of rainy days.

Question No 4:

Write a function in C++ called

bool Exists(int data[][6], int pattern[][3])

that accepts a 2-dimensional integer array called *data* of size 6x6 and another 2-D integer array called *pattern* of size 3x3 as input parameters. It returns true if it finds the *pattern*within the array *data* and false otherwise.

So e.g. if data carries the following values

```
1 2 7 8 9 6
2 2 3 4 5 6
3 2 3 4 5 6
4 2 3 4 5 6
5 2 9 8 7 6
6 2 7 4 5 6
```

And pattern has the values as below

```
3 4 5
3 4 5
3 4 5
```

Then your function should return true as the 3X3 matrix exists at data[1][2].