11th October, 2023.

CPEN201: C++ PROGRAMMING

LAB1

Arrays

Lab 1a: Using an array

An array is a data structure that groups data together into a collection of elements. Each element has its own index or position within the array. These elements can be initialized, accessed, modified, and printed. Type the code below in your text editor (CodeBlocks). Then click on the “Build and Run” button to see the resulting output.

```
string classes[] = {"Math", "English", "Science", "Social
        Studies", "Spanish"};

classes[4] = "French";

for (int i = 0; i < sizeof(classes)/sizeof(classes[0]); i++) {
  cout << classes[i] << endl;
}
```

Program Summary

1. An array called classes is created and initialized with elements (i.e. "Math", "English", etc.).

2. At index 4, "Spanish" is modified and replaced with "French". Keep in mind that array indices start at 0, not 1.

3. A for loop iterates through the elements in the array. It starts at index 0, ends right before index 5, and increments by 1 aft er each iteration.

4. Each element from index 0 through index 4 gets printed with a newline.

Task 1a

Modify the code to;

1. Print only **Math** from the *classes* array.
2. Print only **the first three** elements of the *classes* array.
3. Print the **index** of **Science**.

Lab 1b: Using a 2D Array

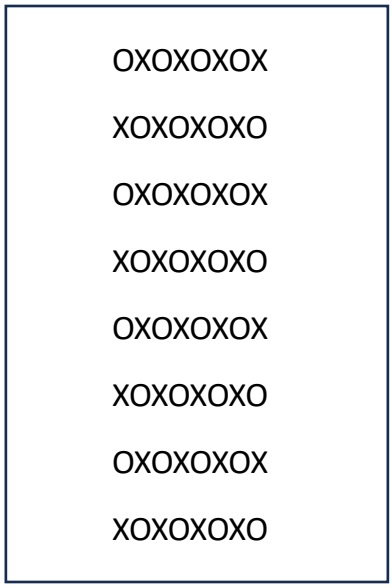
A 2D array is an array inside another array. This data structure can be visually compared to a table where there are rows and columns and each element exists inside each "cell." To access or modify elements, both the row index and column index are needed. Like arrays, 2D arrays are static so, elements cannot be added or removed after initialization. Type the code below in your text editor (CodeBlocks). Then click on the "Build and Run" button to see the resulting output.

```
int coordinates[5][2] = { {-4, 3},
                          {2, 1},
                          {0, -8},
                          {-11, 9},
                          {-5, -7} };

int row = sizeof(coordinates) / sizeof(coordinates[0]);
int col = sizeof(coordinates[0]) / sizeof(int);

for (int i = 0; i < row; i++) {
  for (int j = 0; j < col; j++) {
    if (j == 1) {
      cout << coordinates[i][j] << endl;
    }
    else {
      cout << coordinates[i][j] << " ";
    }
  }
}
```

Lab 1 Challenge: 2D Chessboard

2D Chessboard

You are trying to create a chessboard representation using the alphabetical letters O and X. The O represents the lighter spaces while the X represents the darker spaces.



Type the following code into the text editor (CodeBlocks).

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

int main() {

  string chessboard[8][8];

  int row = sizeof(chessboard) / sizeof(chessboard[0]);
  int col = sizeof(chessboard[0]) / sizeof(string);

  //add code below this line



  //add code above this line

  for (int i = 0; i < row; i++) {
    for (int j = 0; j < col; j++) {
      if (j == col - 1) {
        cout << chessboard[i][j] << endl;
      }
      else {
        cout << chessboard[i][j];
      }
    }
  }

  return 0;

}
```

Task

For this challenge, you will use your knowledge of 2D arrays to produce the chessboard pattern:

```
OXOXOXOX
XOXOXOXO
OXOXOXOX
XOXOXOXO
OXOXOXOX
XOXOXOXO
OXOXOXOX
XOXOXOXO
```

Requirement:

Your program cannot make any changes to the existing code in the program. If you do, you will not earn any credit for this challenge. If you accidentally delete any existing code, you can copy the original code shown above back into your program.

Hint: It is probably much easier to use nested for loops in your code to populate the 2D array with either O or X than to go through each (row, column) index to modify the elements.