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Introduction to 2D Arrays

ELEC1006: ENGINEERING COMPUTING

Two-Dimensional (2D) Arrays

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- Can define one array for multiple sets of data.
- Like a table in a spreadsheet
- Use two size declarators in definition:

```
const int ROWS = 4, COLS = 3;
int exams[ROWS][COLS];
```

- First declarator is number of rows; second is number of columns

2D Array Representation

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```
const int ROWS = 4, COLS = 3; int exams[ROWS][COLS];
```

columns

rows

exams[0][0]	exams[0][1]	exams[0][2]
exams[1][0]	exams[1][1]	exams[1][2]
exams[2][0]	exams[2][1]	exams[2][2]
exams[3][0]	exams[3][1]	exams[3][2]

- Use two subscripts to access element:

```
exams[2][2] = 86;
```

Example 1

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```
1  // This program demonstrates a two-dimensional array.
2  #include <iostream>
3  #include <iomanip>
4  using namespace std;
5
6  int main()
7  {
8     const int NUM_DIVS = 3;           // Number of divisions
9     const int NUM_QTRS = 4;           // Number of quarters
10    double sales[NUM_DIVS][NUM_QTRS]; // Array with 3 rows and 4 columns.
11    double totalSales = 0;            // To hold the total sales.
12    int div, qtr;                     // Loop counters.
13
14    cout << "This program will calculate the total sales of\n";
15    cout << "all the company's divisions.\n";
16    cout << "Enter the following sales information:\n\n";
17
```

(program continues)

Example 1 (continued)

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```
18      // Nested loops to fill the array with quarterly
19      // sales figures for each division.
20      for (div = 0; div < NUM_DIVS; div++)
21      {
22         for (qtr = 0; qtr < NUM_QTRS; qtr++)
23         {
24            cout << "Division " << (div + 1);
25            cout << ", Quarter " << (qtr + 1) << ": $";
26            cin >> sales[div][qtr];
27         }
28         cout << endl; // Print blank line.
29      }
30
31      // Nested loops used to add all the elements.
32      for (div = 0; div < NUM_DIVS; div++)
33      {
34         for (qtr = 0; qtr < NUM_QTRS; qtr++)
35            totalSales += sales[div][qtr];
36      }
37
38      cout << fixed << showpoint << setprecision(2);
39      cout << "The total sales for the company are: $";
40      cout << totalSales << endl;
41      return 0;
42   }
```

Example 1 (output)

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Program Output with Example Input Shown in Bold

```
This program will calculate the total sales of
all the company's divisions.
Enter the following sales data:

Division 1, Quarter 1: $31569.45 [Enter]
Division 1, Quarter 2: $29654.23 [Enter]
Division 1, Quarter 3: $32982.54 [Enter]
Division 1, Quarter 4: $39651.21 [Enter]

Division 2, Quarter 1: $56321.02 [Enter]
Division 2, Quarter 2: $54128.63 [Enter]
Division 2, Quarter 3: $41235.85 [Enter]
Division 2, Quarter 4: $54652.33 [Enter]

Division 3, Quarter 1: $29654.35 [Enter]
Division 3, Quarter 2: $28963.32 [Enter]
Division 3, Quarter 3: $25353.55 [Enter]
Division 3, Quarter 4: $32615.88 [Enter]

The total sales for the company are: $456782.34
```

More info

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[1] cplusplus.com: Arrays
https://www.cplusplus.com/doc/tutorial/arrays/

[2] leanrcpp.com: 6.1 – Arrays (Part I)
https://www.learncpp.com/cpp-tutorial/61-arrays-part-i/

[3] learncpp.com: 6.2 – Arrays (Part II)
https://www.learncpp.com/cpp-tutorial/62-arrays-part-ii/

[4] learncpp.com: 6.3 – Arrays and loops
https://www.learncpp.com/cpp-tutorial/63-arrays-and-loops/