**Computer Programming (b)**

**E1124**

# Lecture 2

# Multidimensional Arrays

**INSTRUCTOR**

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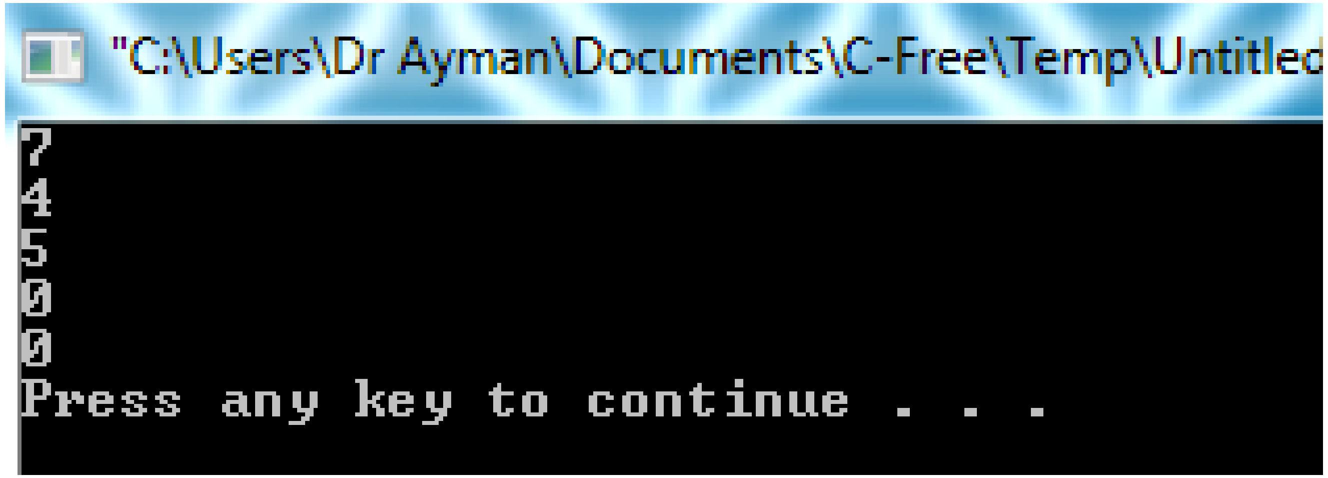
## ➢ Introduction

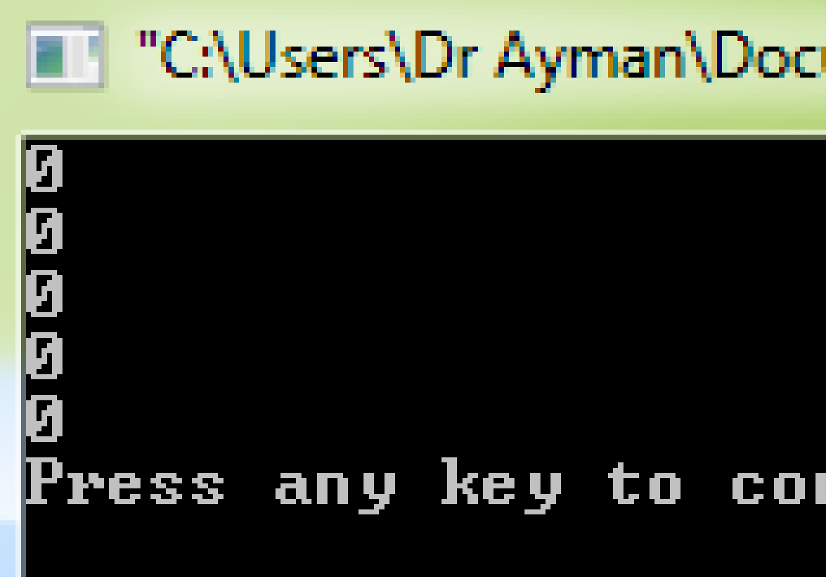
```
#include <iostream.h>
 int main()
{
   int array[5]={ 7, 4, 5 }; // only initialize first 3 elements
    cout << array[0] << '\n';
   cout << array[1] << '\n';
   cout << array[2] << '\n';
   cout << array[3] << '\n';
   cout << array[4] << '\n';
    return 0;
}
```



```
7
4
5
0
0
Press any key to continue . . .
```

# ➢ Example 1

```
#include <iostream.h>
 int main()
{
    int array[5]={}; // only initialize all elements to zero
     cout << array[0] << '\n';
    cout << array[1] << '\n';
    cout << array[2] << '\n';
    cout << array[3] << '\n';
    cout << array[4] << '\n';
     return 0;
}
```

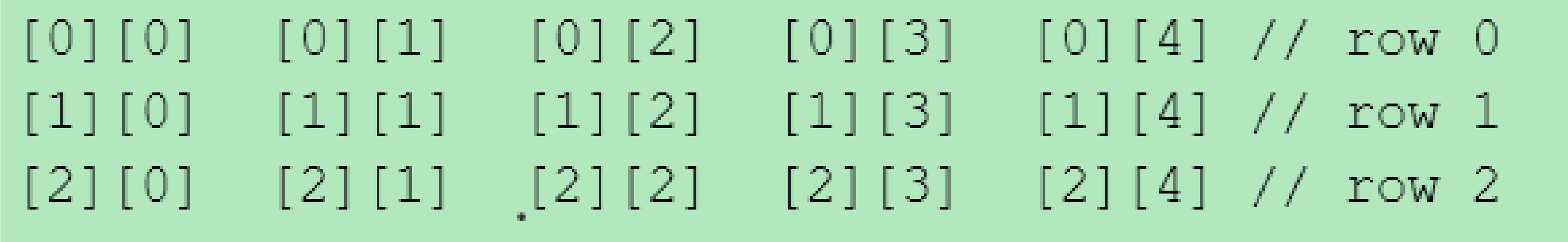


```
0
0
0
0
0
Press any key to co
```

# ➢ Multidimensional Arrays

- ❑ Arrays could be more than one dimension.

```
int array[3][5]; // declaration of a 3*5 element array
```



```
[0][0]   [0][1]   [0][2]   [0][3]   [0][4] // row 0
[1][0]   [1][1]   [1][2]   [1][3]   [1][4] // row 1
[2][0]   [2][1]   [2][2]   [2][3]   [2][4] // row 2
```

- ❑ To access the elements of a two-dimensional array, simply use two subscripts:

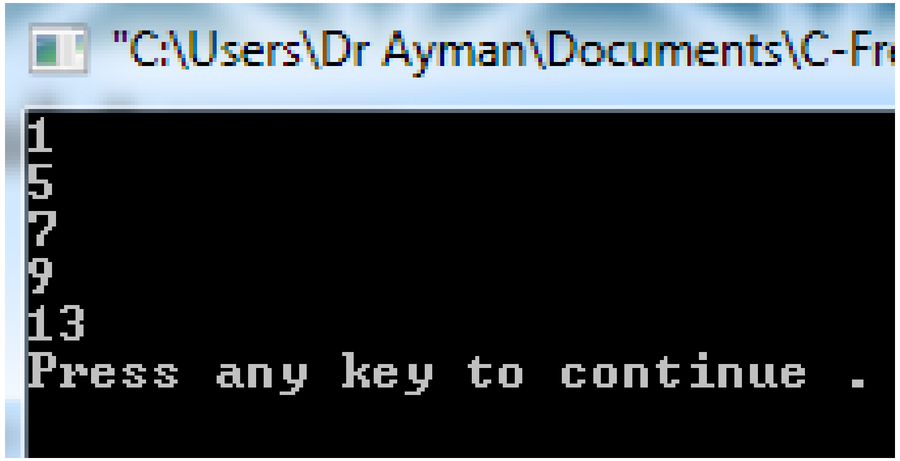
```
array[0][0] = 3;
array[0][1] = 30;
array[2][3] = 7;
```

# ➢ Multidimensional Arrays (cont.)

❑ Example 2

```
#include <iostream.h>
int main()
{ int array[3][5] =
{{ 1, 2, 3, 4, 5 },          // row 0
{ 6, 7, 8, 9, 10 },          // row 1
{ 11, 12, 13, 14, 15 }    // row 2
};
return 0;}
```

```
cout << array[0][0] << '\n';
cout << array[0][4] << '\n';
cout << array[1][1]<< '\n';
cout << array[1][3] << '\n';
cout << array[2][2] << '\n';
```



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```
1
5
7
9
13
Press any key to continue .
```

## ➢ Multidimensional Arrays (cont.)

❑ Initializing two-dimensional arrays

**//Acceptable**

```
int array[3][5] =
{
{ 1, 2, 3, 4, 5 },            // row 0
{ 6, 7, 8, 9, 10 },           // row 1
{ 11, 12, 13, 14, 15 }    // row 2
};
```

**//Acceptable**

```
int array[3][5] =
{
{ 1, 2 },                 // row 0 = 1, 2, 0, 0, 0
{ 6, 7, 8 },              // row 1 = 6, 7, 8, 0, 0
{ 11, 12, 13, 14 } // row 2 = 11, 12, 13, 14, 0
};
```

```
int array[3][5] = { };
```

**//Acceptable**

## ➢ Multidimensional Arrays (cont.)

❑ Initializing two-dimensional arrays

```
int array[ ][5] =
{
{ 1, 2, 3, 4, 5 },        // row 0
{ 6, 7, 8, 9, 10 },       // row 1
{ 11, 12, 13, 14, 15 } // row 2
};
```

**//Acceptable**

**//Compiler Error**

```
int array[ ][ ] =
{
{ 1, 2, 3, 4, 5 },        // row 0
{ 6, 7, 8, 9, 10 },       // row 1
{ 11, 12, 13, 14, 15 } // row 2
};
```

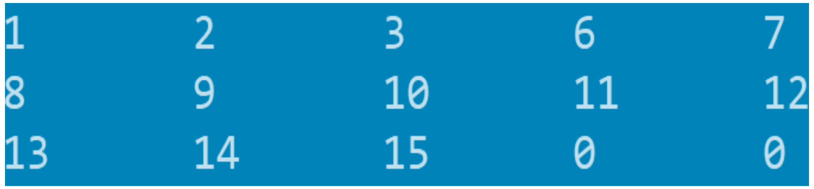
**//Compiler Error**

```
int array[3][ ] = {{ 1, 2, 3, 4, 5 },        // row 0
                   { 6, 7, 8, 9, 10 },       // row 1
                   { 11, 12, 13, 14, 15 } // row 2

};
```

## ➢ Example 3

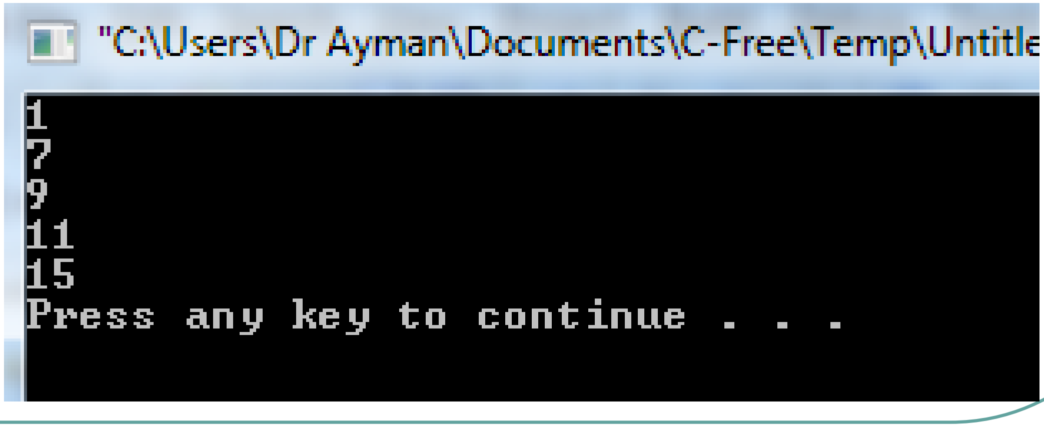
```
#include <iostream.h>
int main()
{
int array[3][5] =
{
1, 2, 3,
6, 7, 8, 9, 10 ,
11, 12, 13, 14, 15
};
```



|  |  |  |  |  |
|---|---|---|---|---|
| 1 | 2 | 3 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 0 | 0 |

## //Acceptable

```
cout << array[0][0] << '\n';
cout << array[0][4] << '\n';
cout << array[1][1]<< '\n';
cout << array[1][3] << '\n';
cout << array[2][2] << '\n';
return 0;}
```



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```
1
7
9
11
15
Press any key to continue . . .
```

- **Declaration and assignment of a 3D array**

```
int array[2][2][3];

array[0][0][0] = 2;

array[0][0][1] = 3; ……etc
```

- **Initialize all elements to 0**

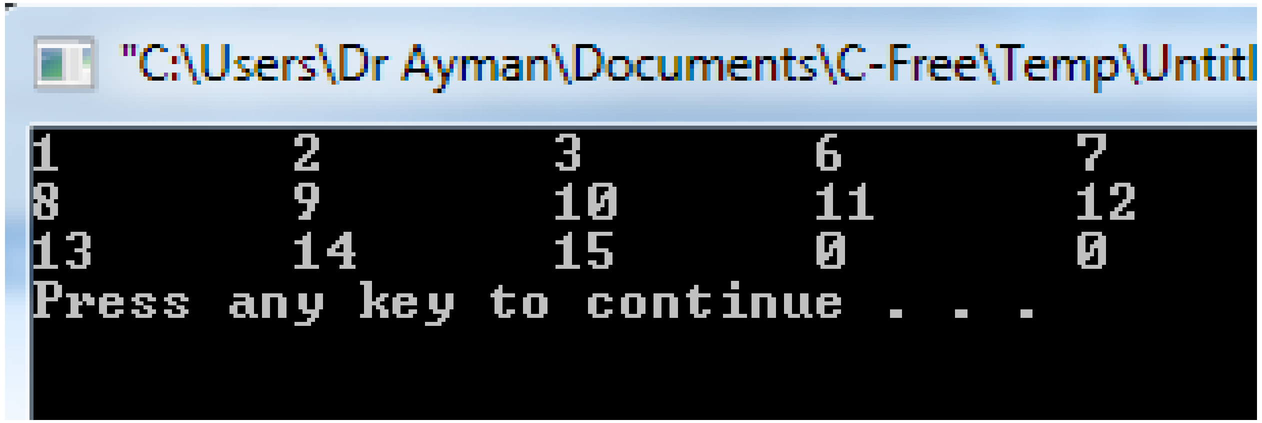
```
int array[2][3][7] ={};
```

- **Declaration and assignment of a 4D array**

```
int array[2][2][3][7];
```

# ➢ Printing all elements of array

```
#include <iostream.h>
int main()
{
int array[3][5] =
{1, 2, 3, 6, 7, 8, 9, 10 , 11, 12, 13, 14, 15};
    for ( int x=0;x<3;x++)
   {for (int y=0; y<5;y++)
    cout<<array[x][y]<<'\t';
    cout<<endl;}
    return 0;}
```



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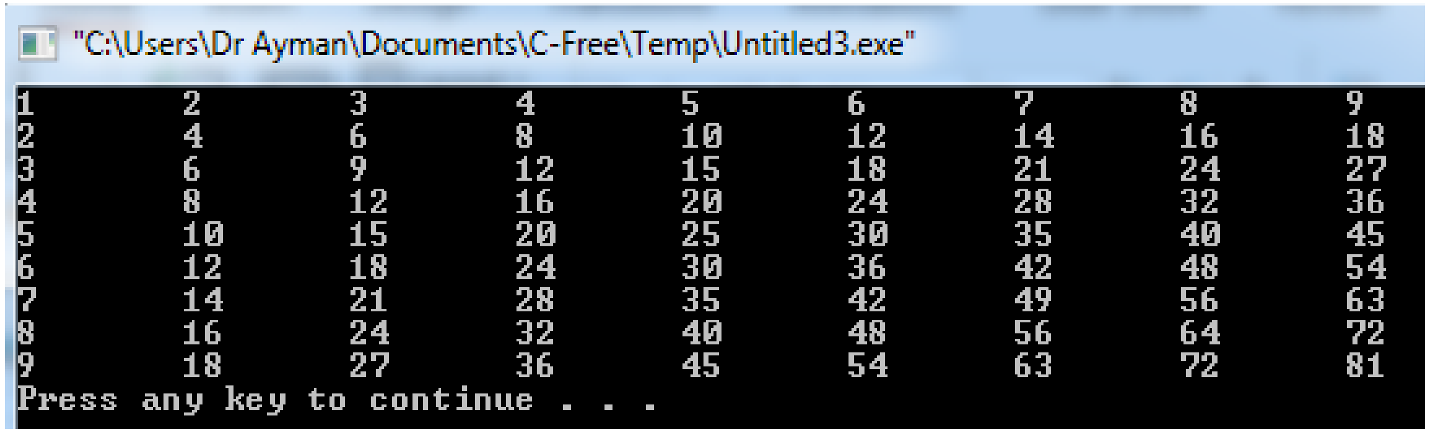
```
1       2       3       6       7
8       9       10      11      12
13      14      15      0       0
Press any key to continue . . .
```

## ➢ Example 4 (multiplication table)

```
#include <iostream.h>
int main()
{  int multiplication[9][9]={};
   for (int x=0;x<9;x++)
   for (int y=0; y<9;y++)
   multiplication[x][y]=(x+1)*(y+1);
   // print the table:-
    for (int x=0;x<9;x++)
   {for (int y=0; y<9;y++)
   cout<<multiplication[x][y]<<'\t';
   cout<<endl;}
   return 0;}
```

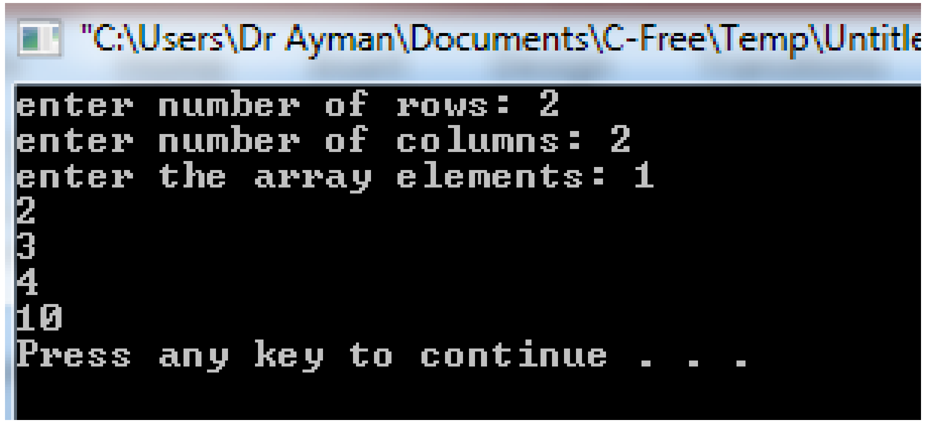


"C:\Users\Dr Ayman\Documents\C-Free\Temp\Untitled3.exe"

```
1       2       3       4       5       6       7       8       9
2       4       6       8       10      12      14      16      18
3       6       9       12      15      18      21      24      27
4       8       12      16      20      24      28      32      36
5       10      15      20      25      30      35      40      45
6       12      18      24      30      36      42      48      54
7       14      21      28      35      42      49      56      63
8       16      24      32      40      48      56      64      72
9       18      27      36      45      54      63      72      81
Press any key to continue . . .
```

# ➢ Example 5 Find the summation of all array elements

```
#include <iostream.h>
int main()
{int i,j,sum=0;
cout<<"enter number of rows: ";
cin>>i;
cout<<"enter number of columns: ";
cin>>j;
cout<<"enter the array elements: ";
int array[i][j];
   for (int x=0;x<i;x++)
   for (int y=0; y<j;y++)
   cin>>array[x][y];
// find the summation of all elements
   for (int x=0;x<i;x++)
   for (int y=0; y<j;y++)
   sum=sum+array[x][y];
   // print the summation
   cout<<sum<<endl;
   return 0;}
```



```
enter number of rows: 2
enter number of columns: 2
enter the array elements: 1
2
3
4
10
Press any key to continue . . .
```

Thank you