



Computer I



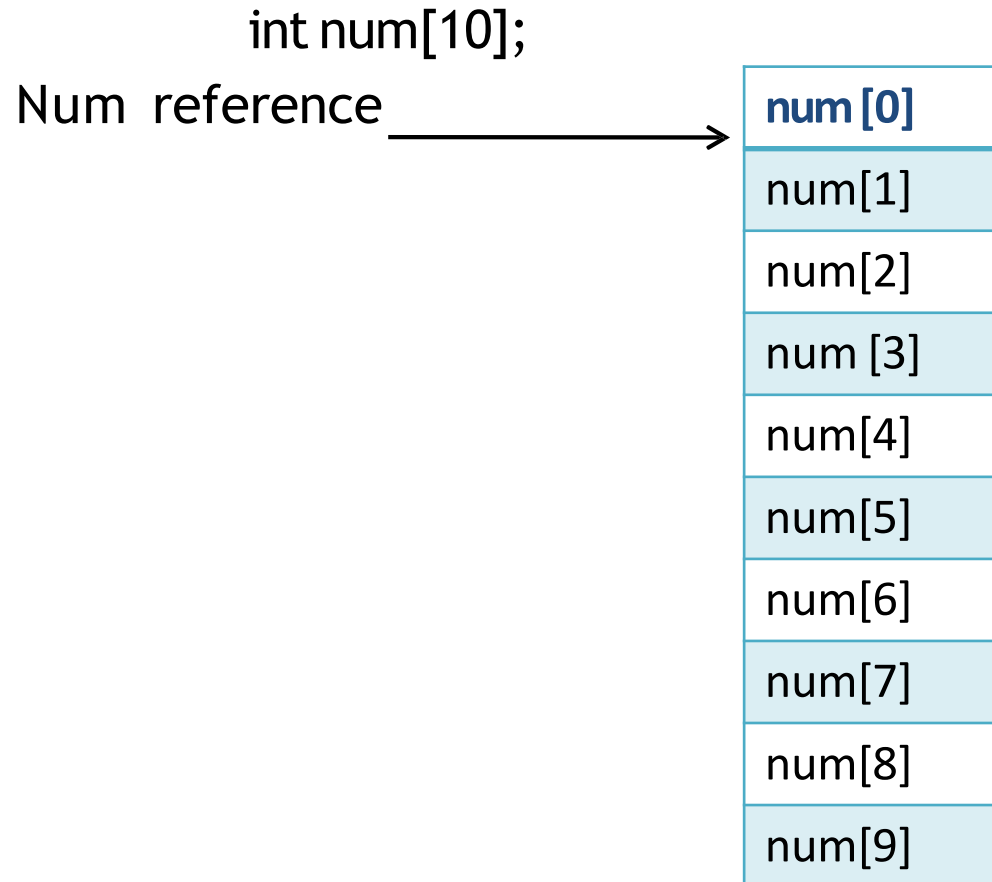
Lecture No. 6

Arrays

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Introducing arrays

- ❑ Array is a data structure that represents a collection of the same types of data.



An Array of 10 Elements of type int

DECLARING ARRAY VARIABLES and CREATING ARRAYS

❑ Data type array name[index];

Example:

```
int list[10];  
char num[15];  
float hat[20];
```

❑ Data type array-name[size];

Example:

```
int num[10];
```

num[0]references the first element in the array.

num[9]references the last element in the array.

The length of arrays and Initializing arrays

- ❑ Once an array is created, its size is fixed. It cannot be changed.

For Example,

```
int arr[10];
```

You can not insert any number to arr[11] location because it is not initialized.

- ❑ Declaring, creating, initializing in one step:

```
int my Array[5] = {1, 2, 3, 4, 5};
```

```
int studentAge[4];
```

```
    studentAge[0] = 14;
```

```
    studentAge[1] = 13;
```

```
    studentAge[2] = 15;
```

```
    studentAge[3] = 16;
```

Example of One Dimension Array

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

int main() {
    // Define an array with 5 integer elements
    int numbers[5] = {10, 20, 30, 40, 50};

    // Print the elements of the array using a for loop
    cout << "The elements of the array are:\n";
    for (int i = 0; i < 5; i++) {
        cout << "Element at index " << i << " = " << numbers[i] << endl;
    }

    return 0;
}
```

Output: The elements of the array are:

Element at index 0 = 10

Element at index 1 = 20

Element at index 2 = 30

Element at index 3 = 40

Element at index 4 = 50

Two dimension Array

- ❑ The simplest form of multidimensional array is the two- dimensional array. A two-dimensional array is, in essence, a list of one-dimensional arrays. To declare a two-dimensional integer array of size [x][y], you would write something as follows
- ❑ `type arrayName [ x ][ y ];`
- ❑ Multidimensional array illustration

	0	1	2	3	4
0					
1					
2					
3					
4					

`int matrix[5] [5];`

	0	1	2	3	4
0					
1					
2		7			
3					
4					

`matrix[2] [1] = 7`

Initializing Two-Dimensional Arrays

```
#include <iostream>
using namespace std;
int main() {
    int a[3][4] = {
        {0, 1, 2, 3},
        {4, 5, 6, 7},
        {8, 9, 10, 11}
    };
    cout << "2D Array elements:\n";
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 4; j++) {
            cout << a[i][j] << "\t";
        }
        cout << endl;
    }
    return 0;
}
```

Row\ Col	0	1	2	3
0	0	1	2	3
1	4	5	6	7
2	8	9	10	11

Example of Two dimension Array

```
#include <stdio.h>

int main () {

    /* an array with 5 rows and 2 columns*/
    int a[5][2] = { {0,0}, {1,2}, {2,4}, {3,6},{4,8}};
    int i, j;

    /* output each array element's value */
    for ( i = 0; i < 5; i++ ) {

        for ( j = 0; j < 2; j++ ) {
            printf("a[%d][%d] = %d\n", i,j, a[i][j] );
        }
    }

    return 0;
}
```

```
a[0][0]: 0
a[0][1]: 0
a[1][0]: 1
a[1][1]: 2
a[2][0]: 2
a[2][1]: 4
a[3][0]: 3
a[3][1]: 6
a[4][0]: 4
a[4][1]: 8
```

String

Definition: A string is a sequence of characters ending with the null character \0. **Explanation:** It's used to store words or sentences in programming.

Example:

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

int main() {
    char name[] = "Ali";
    cout << "Name is: " << name << endl;
    return 0;
}
```

2D Character Array (Array of Strings)

Definition: A 2D char array is used to store multiple strings in one array.

Explanation: Each row holds one word or name.

Example:

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

int main() {
    char names[3][10] = {"Ali", "Sara", "Omar"};

    for(int i = 0; i < 3; i++) {
        cout << "Name " << i + 1 << ": " << names[i] << endl;
    }

    return 0;
}
```

Exercise

Write a C++ program that initializes an array with 5 integers and calculates the sum of the array elements.

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

```
int main() {
    int arr[5] = {1, 2, 3, 4, 5};
    int sum = 0;
    for (int i = 0; i < 5; i++) {
        sum += arr[i];
    }
    cout << "Sum of array elements: " << sum << endl;
    return 0;
}
```

Homework

- ❑ Write a C++ program that initializes an array with 5 integers and calculates the average of the array elements.

- ❑ Write a C++ program that does the following:
 - ❖ Ask the user to enter the names of 3 students (each name is less than 10 characters).
 - ❖ For each student, ask the user to enter 3 grades (integer values).
 - ❖ Calculate and display the average grade for each student.
 - ❖ Finally, display the name of the student who got the highest average.

THANK
YOU