
# Al-Mustaqbal University


College of Engineering & Technology

Biomedical Engineering Department

## Computer

## Lecture 9 - 11

## Arrays

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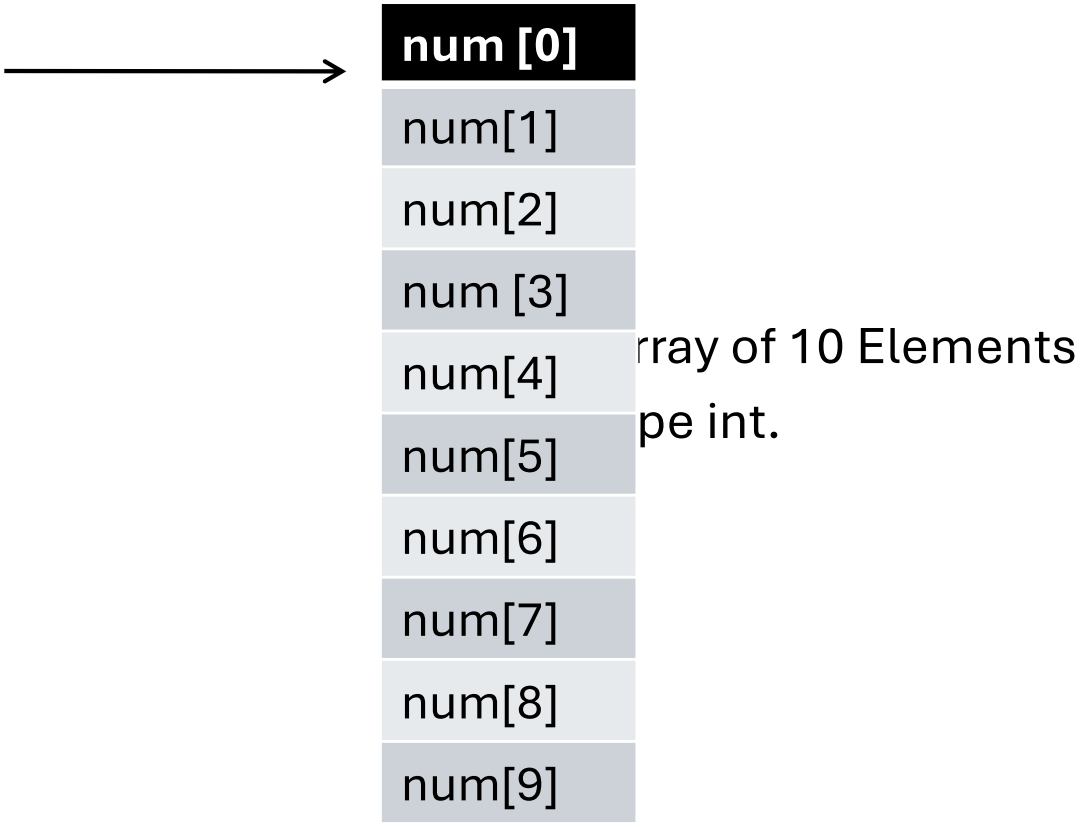
# INTRODUCING ARRAYS

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

int num[10];

Num reference



# DECLARING ARRAY VARIABLES

- Data type  array name[index];

  Example:

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

# CREATING ARRAYS

- 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

- 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.

# Initializing Arrays

- 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

**C program to find the largest element in an array**

```
#include<stdio.h>
int main(){
  int a[50],size,i,big;
  printf("\nEnter the size of the array: ");
  scanf("%d",&size);
  printf("\nEnter %d elements in to the array: ", size);
  for(i=0;i<size;i++)
      scanf("%d",&a[i]);
  big=a[0];
  for(i=1;i<size;i++){
      if(big<a[i])
           big=a[i];
  }
  printf("\nBiggest: %d",big);
  return 0;
}
```

# 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 | | | | | |

| | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| 0 | | | | | |
| 1 | | | | | |
| 2 | | 7 | | | |
| 3 | | | | | |
| 4 | | | | | |

```
int matrix[5] [5];
```

```
matrix[2] [1] = 7
```

# Initializing Two-Dimensional Arrays

```
int a[3][4] = {
    {0, 1, 2, 3} ,
    {4, 5, 6, 7} ,
    {8, 9, 10, 11}
};
```

# Example of Two dimension Array

```c
#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
```

# Exercises

**Exercise 1:** 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;
}
```

# Exercises

**Exercise 2:** Write a C++ program that initializes an array with 5 integers and prints the elements in reverse order.

```
#include <iostream>
using namespace std;
int main() {
   int arr[5] = {1, 2, 3, 4, 5};

   cout << "Array elements in reverse order: ";
   for (int i = 4; i >= 0; i--) {
      cout << arr[i] << " ";
   }
   cout << endl;
```

Write a C++ program that initializes an array with 5 integers and prints the elements in reverse order.

```
}
```

# Exercises

**Exercise 3:** Write a C++ program that initializes an array with 10 integers and counts the number of even and odd numbers in the array.

```
#include <iostream>
using namespace std;
int main() {
   int arr[10] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
   int evenCount = 0, oddCount = 0;
   for (int i = 0; i < 10; i++) {
      if (arr[i] % 2 == 0) {
         evenCount++;
      } else {
         oddCount++;
      }
   }
   cout << "Number of even numbers: " << evenCount << endl;
   cout << "Number of odd numbers: " << oddCount << endl;

}
```

## Homework

**Q:** Write a C++ program that initializes an array with 5 integers and calculates the average of the array elements.

# THANK YOU