C Programming

Lecture five

Arrays in C

Introduction To Array in C

Array is a group of data that holds fixed number of value all of them are the same type

Syntax
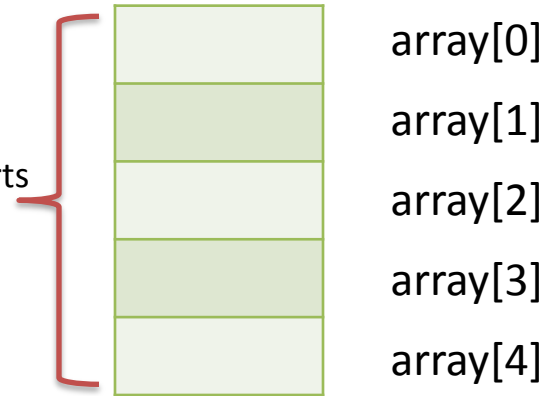*Array_Type Array_Name[Length];*

Example

```
int array[5];
```

This line creates an array of *int* of size **5**.

Array index starts from 0 to 4

array[0]
array[1]
array[2]
array[3]
array[4]

Notes:
1- The array index always starts from 0, it means that this array has elements from element 0 till element 4.

2- Array length must be constant value, can not be variable.

Array can be initialized at the time of definition. To initialize the arry use the following syntax:

Array_Type Array_Name[Length] = { values separated by comma };

Example

```
array[5]= {1,2,3,4,5};
```

1	array[0]
2	array[1]
3	array[2]
4	array[3]
5	array[4]

Special Cases

1- Initializing the array with values less than its length, the remaining elements will be initialized with 0.

```
array[5]= {1,2};
```

1	array[0]
2	array[1]
0	array[2]
0	array[3]
0	array[4]

2- Initializing the array with values more than its length, it would gives a compilation error.

All elements of the array can be accessed at the same statement only at initialization. After initialization the array can be accessed only element by element

Syntax
Array_Name[Element_Index]

Examples

```c
array[3]= 1;
```

```c
printf("Element 0 = %d",array[0]);
```

```c
scanf("%d",&array[1]);
```

Notes
1- Again, array index starts from 0.
2- You can use a variable to indicate for the element index, for ex: *array[i] = 10;* where *i* is variable equals to the desired index number.

Write a C code that ask the user to enter 10 values and save them in an array using a for loop. Then print the values entered by the user in reverse order using another for loop.

Expected Output

```
Please Enter number 0: 5
Please Enter number 1: 6
Please Enter number 2: 7
Please Enter number 3: 8
Please Enter number 4: 9
Please Enter number 5: 10
Please Enter number 6: 11
Please Enter number 7: 12
Please Enter number 8: 13
Please Enter number 9: 14
The values in reversed order
14
13
12
11
10
9
8
7
6
5
```

Time To Code

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Write a C code that ask the user to enter 10 values and save them in an array using a for loop. Then print the summation and the average of the values entered.

Expected Output

```
Please Enter number 0: 10
Please Enter number 1: 20
Please Enter number 2: 30
Please Enter number 3: 40
Please Enter number 4: 50
Please Enter number 5: 60
Please Enter number 6: 70
Please Enter number 7: 80
Please Enter number 8: 90
Please Enter number 9: 100
Sum of array elements = 550
Average of array elements = 55
```
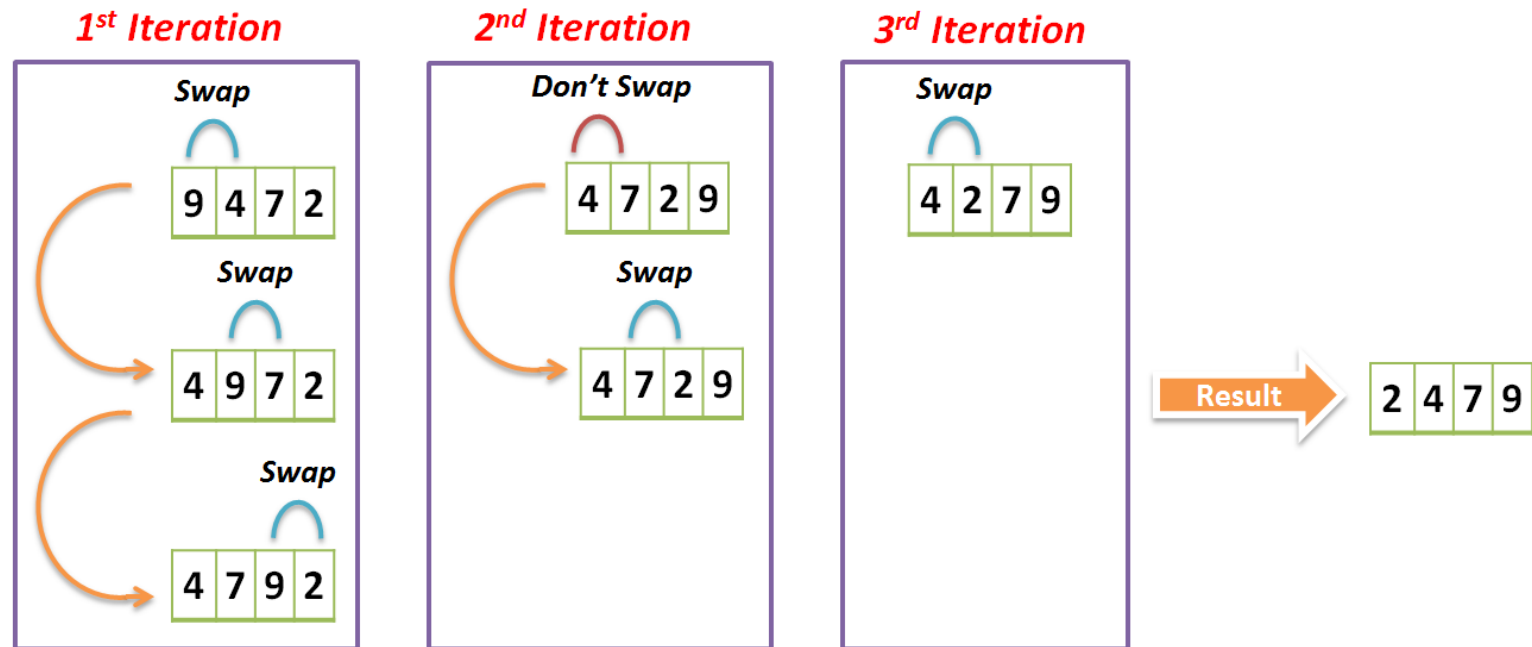
Time To Code

Sorting Algorithms

Sorting is a mean of managing data, There are many algorithms each algorithm has particular strengths and weaknesses. One of the simplest sorting algorithms is the *Bubble Sorting*.

Bubble Sorting Concept

1st Iteration

Swap

| 9 | 4 | 7 | 2 |

Swap

| 4 | 9 | 7 | 2 |

Swap

| 4 | 7 | 9 | 2 |

2nd Iteration

Don't Swap

| 4 | 7 | 2 | 9 |

Swap

| 4 | 7 | 2 | 9 |

3rd Iteration

Swap

| 4 | 2 | 7 | 9 |

Result

| 2 | 4 | 7 | 9 |

Notes:

Number of iterations = Size of array – 1

Write a C code that ask the user to enter 10 values and save them in an array using a for loop. The code then apply the bubble sorting algorithm and then print the values after sorting.

Time To Code

Expected Output

```
Please Enter number 0:   5
Please Enter number 1:   6
Please Enter number 2:   9
Please Enter number 3:   0
Please Enter number 4:   4
Please Enter number 5:   2
Please Enter number 6:   7
Please Enter number 7:   11
Please Enter number 8:   16
Please Enter number 9:   8
Values after sorting are:
0
2
4
5
6
7
8
9
11
16
```

a- Linear Search (Sequential Searching Algorithm)

This is the simplest way to search inside an array. The idea is to start from the beginning of the array till the end and compare each element of the array with the element to search until you find it.

Write a C code that ask the user to enter 10 values and save them in an array using a for loop. Then ask the user to enter a value to search about, if the value existing in the 10 values, the program will print *"Value Exists x times"* where x defines how many times the value exists. If the value is not exist, the program will print *"Value Not Exist"*. Use Linear Searching Algorithm.
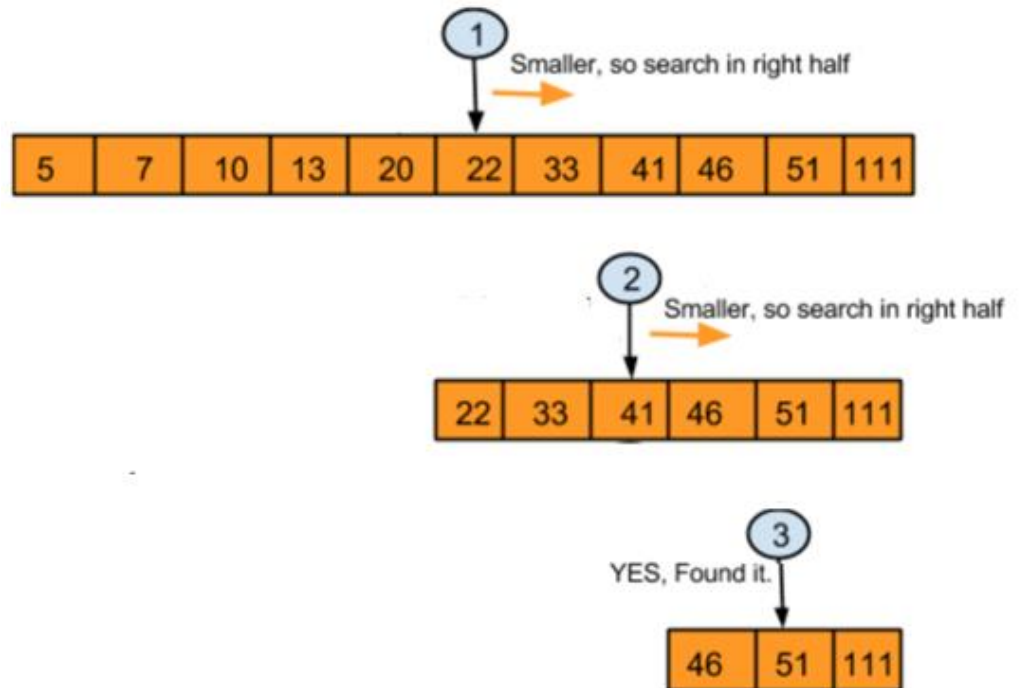
Time To Code

a- Binary Search (Sort then Search)

This type of searching depends on sorting the array first. If the array is already sorted, it would save a lot of time in the searching process

Example

In this arrays, search for number 51

① Smaller, so search in right half

| 5 | 7 | 10 | 13 | 20 | 22 | 33 | 41 | 46 | 51 | 111 |

② Smaller, so search in right half

| 22 | 33 | 41 | 46 | 51 | 111 |

③ YES, Found it.

| 46 | 51 | 111 |

Write a C code that ask the user to enter 10 values and save them in an array using a for loop. Then ask the user to enter a value to search about, if the value existing in the 10 values, the program will print *"Value Found"*. If the value is not exist, the program will print *"Value Not Exist"*. Use Binary Searching Algorithm.

Time To
Code

Any questions … ?

Write a C code that ask the user to enter 10 values and save them in an array using a for loop. Then print the minimum and the maximum of the values.

Write C code that manage a small school. The school has 3 classes each class contains 10 students. Define three arrays for the three classes each one with a length of 10. Save a random numbers in all array elements to indicate the students grade. The program will calculate and display the following statistics:

1- Number of passed students

2- Number of Failed students

3- Highest grade

4- Lowest grade

5- Average grade

Knowing that the total grade is from 100 and the minimum passing grade is 50.

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