Array

What is an Array in?

An array is a collection of similar data-type, means an array can hold value of a particular data type for which it has been declared. Arrays can be created from any data-types int, float, and char. So an integer array can only hold integer values and cannot hold values other than integer. When we declare array, it allocates contiguous memory location for storing values whereas 2 or 3 variables of same data-type can have random locations. So this is the most important difference between a variable and an array.

Types of C arrays:

There are 2 types of C arrays. They are,

1. One dimensional array
2. Multi dimensional array
   • Two dimensional array
   • Three dimensional array, four dimensional array etc…

1. One dimensional array in C:
   Syntax of array:
   data-type arr_name[array_size];

<table>
<thead>
<tr>
<th>Array declaration</th>
<th>Array initialization</th>
<th>Accessing array</th>
</tr>
</thead>
<tbody>
<tr>
<td>data-type arr_name</td>
<td>data_type arr_name</td>
<td>arr_name[index]</td>
</tr>
<tr>
<td>[arr_size]</td>
<td>[arr_size]=</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(value1, value2, value3,…);</td>
<td></td>
</tr>
<tr>
<td>int age [6];</td>
<td>int age[5]={0, 1, 2, 3, 4, 5};</td>
<td>age[0]; /<em>0 is accessed</em>/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>age[1]; /<em>1 is accessed</em>/</td>
</tr>
<tr>
<td>char str[10];</td>
<td>char str[10]={'H','a','i',...};</td>
<td>str[0]; /<em>H is accessed</em>/</td>
</tr>
<tr>
<td></td>
<td>char str[0] = 'H';</td>
<td>str[1]; /<em>a is accessed</em>/</td>
</tr>
<tr>
<td></td>
<td>char str[1] = 'a';</td>
<td>str[2]; /<em>i is accessed</em>/</td>
</tr>
<tr>
<td></td>
<td>char str[2] = 'i';</td>
<td></td>
</tr>
</tbody>
</table>

Example programs for one dimensional array in C:

Source Code to initialize and access one-dimensional array

```c
#include<stdio.h>

int main()
{
    int i;
    int arr[5] = {10,20,30,40,50};
    // declaring and initializing array in C
    //To initialize all array elements to 0, use int arr[5]={0};
    /* Above array can be initialized as below also
    arr[0] = 10;
    arr[1] = 20;
    arr[2] = 30;
```
```c
arr[3] = 40;
arr[4] = 50;
*/
for (i=0;i<5;i++)
{
    // Accessing each variable
    printf("value of arr[%d] is %d \n", i, arr[i]);
}
}
Output
value of arr[0] is 10
value of arr[1] is 20
value of arr[2] is 30
value of arr[3] is 40
value of arr[4] is 50

Source Code to Calculate Average of n numbers Using Arrays

```c
#include <stdio.h>
int main()
{
    int n, i;
    float num[100], sum=0.0, average;
    printf("Enter the total numbers of data: ");
    scanf("%d",&n);
    while (n>100 || n<=0)
    {
        printf("Error! number should in range of (1 to 100).\n");
        printf("Enter the total number of data again: ");
        scanf("%d",&n);
    }
    for(i=0; i<n; ++i)
    {   
        printf("%d. Enter number: ",i+1);
        scanf("%f",&num[i]);
        sum+=num[i];
    }
    average=sum/n;
    printf("Average = %.2f",average);
    return 0;
}
Output
Enter the total numbers of data: 141
Error! number should in range of (1 to 100).
Enter the total numbers of data again: 9
1. Enter number: 12.34
2. Enter number: 45.678
3. Enter number: -3.45
4. Enter number: 0
5. Enter number: 33.48
6. Enter number: -23.45
7. Enter number: 111.11
8. Enter number: 222.432
9. Enter number: 43.45
Average = 25.61
```

This program calculates the average if the number of data are from 1 to 100. If user enters value of n above 100 or below 100 then, while loop is executed which asks user to enter value of n until it is between 1 and 100.
Source code to Find Largest Element of an Array

This program takes n number of elements from the user (where, n is specified by the user) and stores data in an array. Then, this program displays the largest element of that array using loops.

Source Code to Display Largest Element of an Array

```c
#include <stdio.h>
int main()
{
    int i, n;
    float arr[100];
    printf("Enter total number of elements (1 to 100): ");
    scanf("%d", &n);
    printf("n", &n);
    for(i=0;i<n;++i) /* Stores number entered by user. */
    {
        printf("Enter Number %d: ", i+1);
        scanf("%f", &arr[i]);
    }
    for(i=1;i<n;++i) /* Loop to store largest number to arr[0] */
    {
        if(arr[0]<arr[i]) /* Change < to > if you want to find smallest element*/
            arr[0]=arr[i];
    }
    printf("Largest element = %.2f", arr[0]);
    return 0;
}
```

Output

```
Enter total number of elements (1 to 100): 12
Enter Number 1: 2.34
Enter Number 2: 3.45
Enter Number 3: 6.78
Enter Number 4: 2.45
Enter Number 5: 7.64
Enter Number 6: 9.05
Enter Number 7: -3.45
Enter Number 8: -9.99
Enter Number 9: 5.67
Enter Number 10: 34.953
Enter Number 11: 4.5
Enter Number 12: 3.45
Largest element = 34.95
```
3. Source Code to find the sum marks of n students

```c
#include <stdio.h>
int main(){
    int marks[10], i, n, sum = 0;
    printf("Enter number of students: ");
    scanf("%d", &n);
    for(i=0; i<n; ++i){
        printf("Enter marks of student%d: ", i+1);
        scanf("%d", &marks[i]);
        sum = sum + marks[i];
    }
    printf("Sum = %d", sum);
    return 0;
}
```

Output

```
Enter number of students: 3
Enter marks of student1: 12
Enter marks of student2: 31
Enter marks of student3: 2
sum=45
```