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Chapter 7 - Arrays

An Array is a contigous block of homogenous type of elements.

An array is a collection of similar (imp) elements.

One variable ⇒ capable of storing multiple values

similar or same type of

Syntax

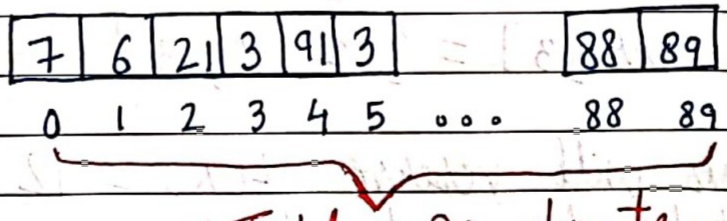
The syntax of declaring an Array looks like this:

```
int marks[90];    ⇒ Integer array
char name[20];    ⇒ Character array or String
float percentile[90]; ⇒ float array
```

The values can now be assigned to marks array like this:

```
marks[0] = 33;
marks[1] = 12;
```

Note: It is very important to note that the array index starts with 0.



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Accessing elements

Elements of an array can be accessed using:

`scanf("%d", &marks[0]);` ⇒ Input first value

`printf("%d", marks[0]);` ⇒ output first value of the array

Quick Quiz → Write a program to accept marks of five students in an array and print them to the screen.

Initialization of an Array

There are many other ways in which an array can be initialized.

```
int cgpa[3] = {9, 8, 8}
float marks[] = {33, 40}
```

⇒ Arrays can be initialized while declaration

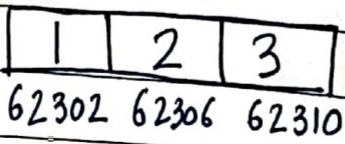
Arrays in memory

Consider this array:

```
int arr[3] = {1, 2, 3}
```

⇒ 1 integer = 4 bytes

This will reserve 4 × 3 = 12 bytes in memory 4 bytes for each integer.



⇒ arr in memory

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Pointer Arithmetic

A pointer can be incremented to point to the next memory location of that type.

Consider this example

```
int i = 32;
int *a = &i;   => a = 87994
a++;           => Now a = 87998
```

i → 32 (address → 87994)

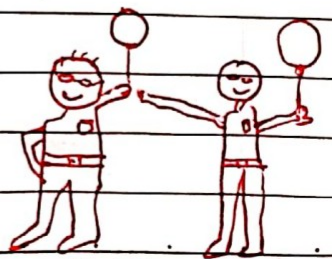
```
char a = 'A';
char *b = &a;  => b = 87994
b++;           => Now b = 87995
```

```
float i = 1.7;
float *a = &i; => Address of i or a = 87994
a++;           => Now a = 87998
```

Following operations can be performed on ~~a~~ pointers:

1. Addition of a number to a pointer
2. Subtraction of a number from a pointer
3. Subtraction of one pointer from another
4. Comparison of two pointer variables

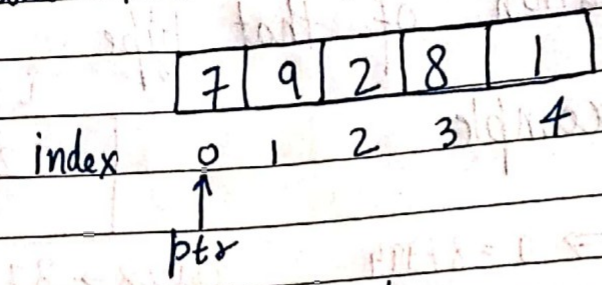
Quick Quiz → Try these operations on another variable by creating pointers in a separate program. Demonstrate all the four operations.



Yay! we understood pointer arithmetic

Accessing Arrays using pointers

Consider this array



If ptr points to index 0, ptr ++ will point to index 1 & so on...

This way we can have an integer pointer pointing to first element of the array like this:

```
int *ptr = &arr[0]; → or simply arr
ptr++;
*ptr => will have 9 as its value
```

Passing arrays to functions

Arrays can be passed to the functions like this

```
printArray(arr,n);      => function call
Void printArray(int *i, int n); => function prototype
                or
Void printArray(int i[], int n);
```

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Multidimensional Arrays

An array can be of 2 dimension / 3 dimension / n dimensions

A 2 dimensional array can be defined as:

```
int arr[3][2] = { { 1, 4 },
                  { 7, 9 },
                  { 11, 22 } };
```

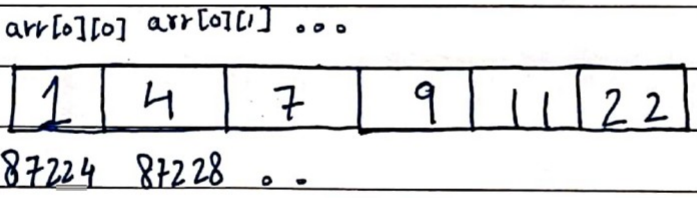
We can access the elements of this array as arr[0][0], arr[0][1] & so on...

arr[0][0] → Value = 1

arr[0][1] → Value = 4

2-D arrays in Memory

A 2d array like a 1-d array is stored in contiguous memory blocks like this:



Quick Quiz: Create a 2-d array by taking input from the user. Write a display function to print the content of this 2-d array on the screen.