URBAN EDGE

Chapter 7 - Arrays

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

One variable ⇒ capable of storing multiple values

Syntax

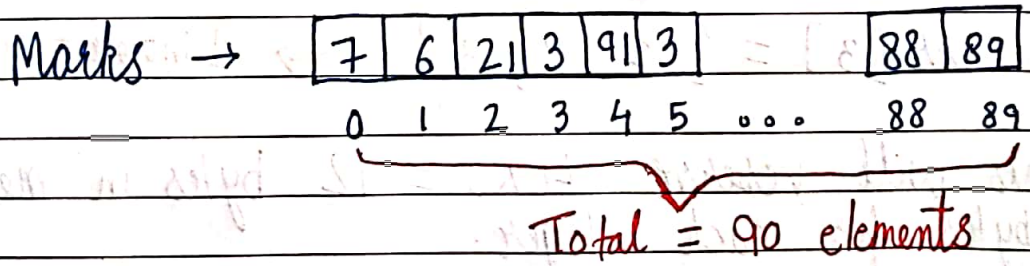
The syntax of declaring an Array looks like this:

```
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.



URBAN EDGE

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.

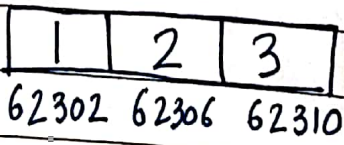
```
int cgpa[3] = {9, 8, 8}      ⇒ Arrays can be
float marks[] = {33, 40}        initialized while declaration
```

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

URBAN EDGE

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)

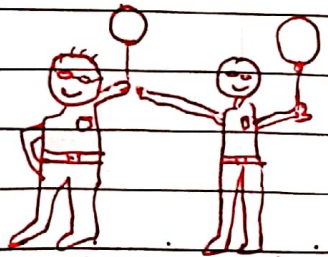
```
char a = 'A';
char *b = &a;  => b = 87994
b++;           => Now b = 87995
```

```
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

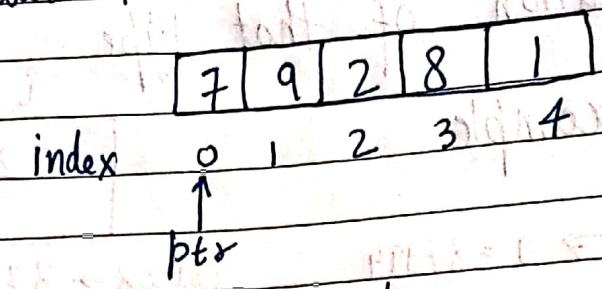
Quick Quiz → Try these operations on another variable by creating pointers in a separate program. Demonstrate all the four operations.



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);
```

URBAN EDGE

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 } };
```

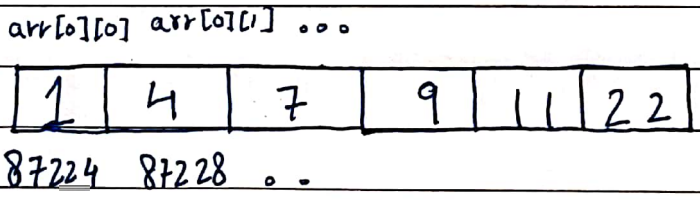
We can access the elements of this array as arr[0][0], arr[0][1] & so on...

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.

URBAN EDGE

Chapter 7 - Practice Set

1. Create an array of 10 numbers. Verify using pointer arithmetic that (ptr+2) points to the third element where ptr is a pointer pointing to the first element of the array.

2. If S[3] is a 1-D array of integers then *(S+3) refers to the third element:
   (i) True
   (ii) False
   (iii) Depends.

3. Write a program to create an array of 10 integers and store multiplication table of 5 in it.

4. Repeat Problem 3 for a general input provided by the user using scanf.

5. Write a program containing a function which reverses the array passed to it.

6. Write a program containing functions which counts the number of positive integers in an array.

7. Create an array of size 3 x 10 containing multiplication tables of the numbers 2, 7 and 9 respectively.

8 Repeat problem 7 for a custom input given by the user.

9 Create a three-dimensional array and print the address of its elements in increasing order.