Pointers

1 What is pointer? How to declare and initialize it?

A pointer is a variable that stores address of another variable as its value. Pointer is a variable whose value is the address of another variable, i.e., direct address of the memory location. Like any variable or constant, you must declare a pointer before using it to store any variable address. The general form of a pointer variable declaration is:

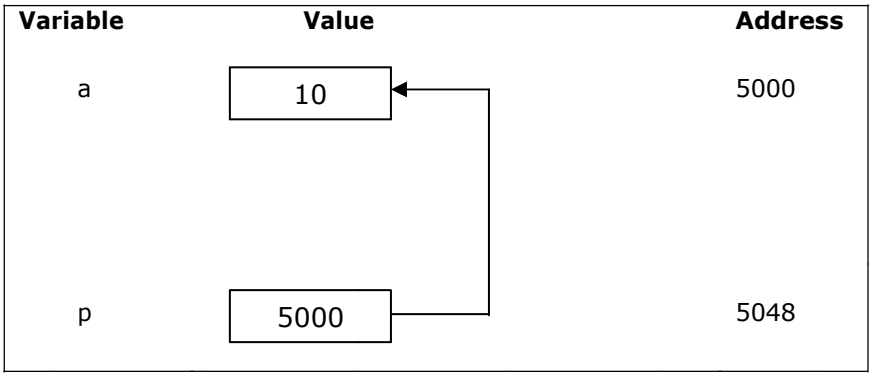
Syntax: data_type *var-name;
Ex: int *p; // here p is pointer variable of type int

- Pointer is a derived data type in C.
- Pointers contain memory address As their values, So they can also be used to access and manipulate data stored in memory.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a=10, *p;
    p = &a; \ \ Assign memory address of a to pointer variable p
    printf("%d %d %d", a, *p, p);
}
```

Output: 10 10 5000

- p is integer pointer variable
- & is address of or referencing operator which returns memory address of variable
- * is indirection or dereferencing operator which returns value stored at that memory address
- & operator is the inverse of * operator (x = a is same as x = *(&a))



Initialization of the pointer,

```
int a=5, x, *p; // Declares pointer variable p and regular variable a and
p= &a // Initializes p with address of a
x = *p;  // p contains address of a and *p gives value stored at that address.
```

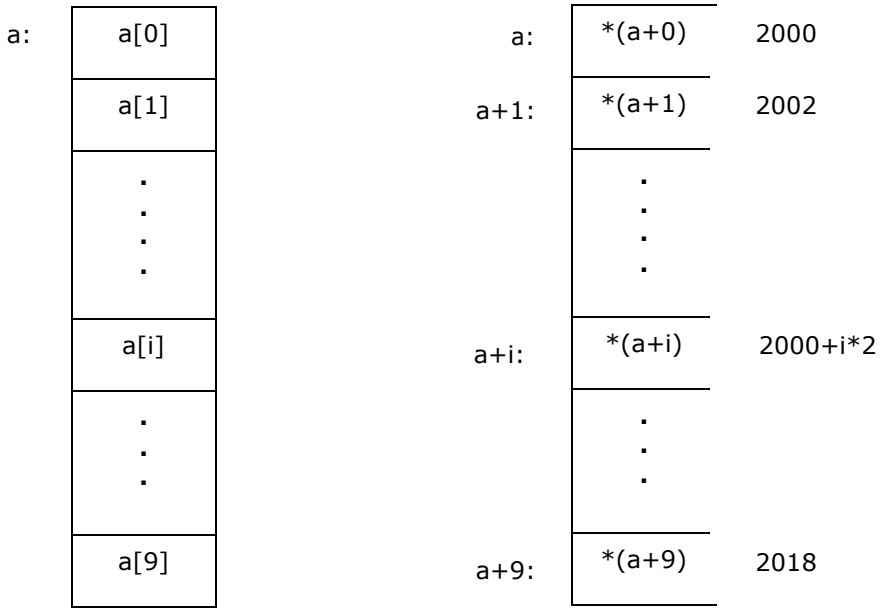
2 How pointer is different from array?

Arra	Pointer
Array is a constant pointer.	Pointer variable can be changed.
It refers directly to the elements.	It refers address of the variable.
Memory allocation is in sequence.	Memory allocation is random.
Allocates the memory space which cannot resize or reassigned.	Allocated memory size can be resized.
It is a group of elements.	It is not a group of elements. It is single

3 Discuss relationship between array and pointer.

int a[10], *p;

- Array name is constant pointer so a is constant pointer and it always points to the first element of an array.
- a[0] is same as *(a+0), a[2] is same as *(a+2), a[i] is same as *(a+i)
- So every program written using array can always be written using pointer.



4 Explain Array of Pointers

As we have an array of char, int, float etc…, same way we can have an array of pointers, individual Elements of an array will store the address values. So, array of pointers is a collection of pointers of same type known by single name.

Syntax :

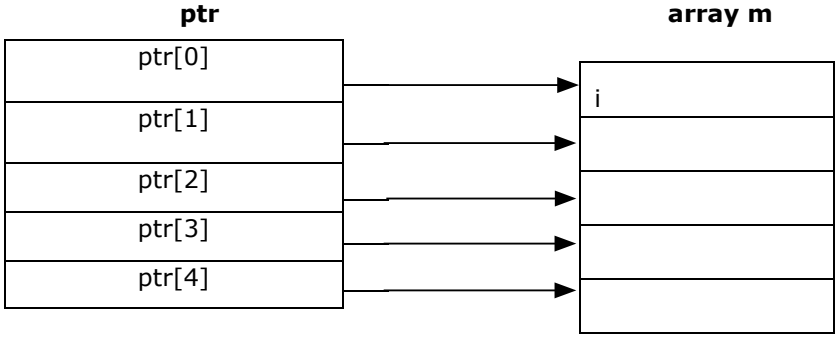
```
data_ty
pe *name[size];
```

Example :

```
int *ptr[5];      \\Declares an array of integer pointer of size 5
int m[5];  \\Declares a one dimensional array of 5
```

Now, the array of pointers ptr can be used to point to different address of m as follow

```
for(i=0;i<5;i++)
{
    ptr[i]=&mat[i];          \\ Can be re-written as ptr[i]=mat[i];
}
```



5 Swap value of two variables using pointer. OR Swap value of two variables using call by reference

```
#include<stdio.h>
#include<conio.h>
void swap(int *,int *);
void
main()
{
    int a,b;
```

```
        printf("Enter two numbers:");
        scanf("%d%d", &a, &b);
        swap(&a, &b);
        printf("a=%d b=%d", a, b);
        getch();
}

void swap(int *a, int *b)
{
        int temp;
        temp=*a;
        *a=*b;
        *b=temp;
}
```

6 Write a C program to calculate sum of 10 elements of an array using pointers

```
#include<stdio.h>
#include<conio.h>
void main()
{
        int *p, a[10], sum=0, i;
        p=a;    // base address of a means a[0] ‘s address will be stored in pointer p.
        printf("Enter elements:");
        for(i=0; i<10; i++)
        {
                scanf("%d", &a[i]);
        }
        for(i=0; i<10; i++)
        {
         sum=sum+*p;
         p++;
        }
        printf("sum=%d", sum);
        getch();
}
```