19CSE102: Computer programming

Pointers

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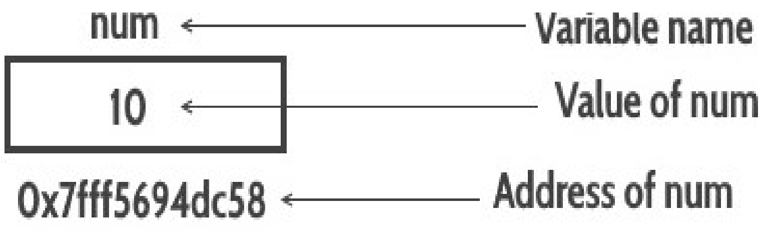
Introduction

- A **pointer** is a variable that stores the address of another variable.



- For example, an integer variable holds (or you can say stores) an integer value, however an integer pointer holds the address of a integer variable.

A Simple Example

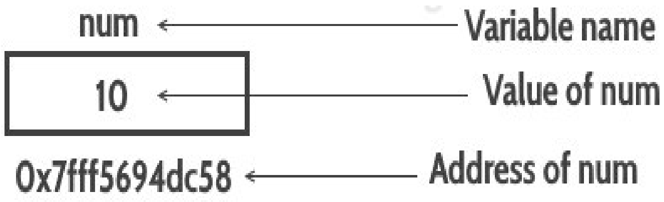
```
#include <stdio.h>

int main() {

  int num = 10;
  int *p;
  p = &num;

  printf("Address of variable num is: %p", p);

  return 0;
}
```



Output:

```
Address of variable num is: 0x7fff5694dc58
```

Operators that are used with Pointers

- “Address of “ (&) Operator
- “Value at Address” (*) Operator

- **How to declare a pointer?**

```
int *p1         /*Pointer to an integer variable*/
double *p2  /*Pointer to a variable of data type double*/
char *p3      /*Pointer to a character variable*/
float *p4      /*pointer to a float variable*/
```

Note: If you need a pointer to store the address of integer variable then the data type of the pointer should be int. Same is the case with the other data types.

Can you guess the output of following C program?

```
#include <stdio.h>
int main()
{
    int var =10;
    int *p;
    p= &var;

    printf ( "Address of var is: %p", &var);
    printf ( "\nAddress of var is: %p", p);
    printf ( "\nValue of var is: %d", var);
    printf ( "\nValue of var is: %d", *p);
    printf ( "\nValue of var is: %d", *( &var) );
    printf( "\nValue of pointer p is: %p", p);
    printf ( "\nAddress of pointer p is: %p", &p);

    return 0;
}
```

Output:

```
Address of var is: 0x7fff5d027c58
Address of var is: 0x7fff5d027c58
Value of var is: 10
Value of var is: 10
Value of var is: 10
Value of pointer p is: 0x7fff5d027c58
Address of pointer p is: 0x7fff5d027c50
```

C Pointer Mistake 1

- Assigning Value to an Uninitialized Pointer

  What does the following code do?

```
void f()
{
    int *ptr,  m = 100;
    *ptr = m;      //  Error
}
```

- Firstly initialize the pointer by assigning the address of integer to pointer variable and then update value.
- You can assign a symbolic constant called NULL (defined in stdio.h) to any pointer variable. (ptr = NULL) The assignment of NULL guarantees that the pointer doesn’t point to any valid memory location.

C Pointer Mistake 2

- Assigning Address of an Un-initialized Variable

```
int *ptr, m;
ptr = &m;
```

- We can assign any valid address to a pointer variable but if you assign the address of un-initialized variable to pointer then it will print garbage value while de-referencing it.

Homework

- Write a C program to multiply two integers using pointers.
- Write a C program to find the maximum of two integers using a pointer.
- Write a C program to print one float value, one character and one double value using pointers.