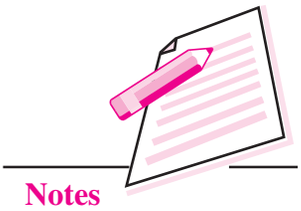


Notes

20

POINTER

In the previous lesson you have learnt about inheritance, types of inheritance. Now you will learn pointers, which is more powerful and is used extensively in C++ programming langauge. It saves the processing time. Pointer is a variable which holds the address of another variable. So, programming is concerned with the address, not with the direct value stored. In this lesson you will learn about pointer, pointer to array, pointer to string constant, pointer to structure, pointer to objects and this pointer.

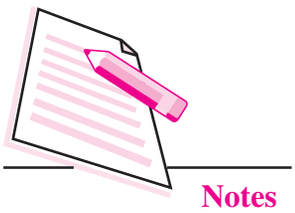
OBJECTIVES

After reading this lesson, you will be able to:

- define pointer;
- use pointers in arrays;
- define pointer variables in a structure;
- access data members of structure through pointer;
- define pointer objects in a class and access members through pointer.

20.1 POINTER

A pointer is a variable that represents the location (rather than the value) of a data item such as a variable or an array element. Pointers are used frequently in C++, as they have a number of useful applications.



Notes

Consider the following example:

```
# include < iostream.h >
void main ( )
{
int A = 5;
cout << &A;
int *ptr;
ptr = &A;
cout << *ptr;
}
```

ptr is a pointer variable which holds the memory address of the integer variable A. ptr = &A

If variable A in the above example has a value 5, then &A holds the address of memory cell A. The variable which holds the address is called pointer variable. int *ptr means that a variable ptr is a pointer to a memory cell which can hold the int data type. *ptr is used for the value stored in a memory cell pointed to by the pointer ptr. It is called de-referencing the pointer. The output of the above program is the address of memory cell A and value 5.

```
void *ptr;
```

Here ptr can point to any data type.

20.1.1 Pointer to Array

Consider the following declaration:

```
int A [ 5 ];
```

The name of the array A itself is a pointer which holds the address of zero location (&A[0]). It is a constant in a program, its value cannot be changed. The following program prints all the values of an array A.

```
# include < iostream.h >
void main ( )
{
int A [5] = { 20, 35, 25, 22, 27 };
for (int i = 0; i < 5; i + + )
cout << "\n" << A [ i ];
}
```

The output of the above program is

The above program can be written using pointer notation also.

```
# include < iostream.h >
void main ( )
{
int A [5] = { 20, 35, 25, 22, 27 }
for (int i = 0; i < 5; i + + )
cout << "\n" << *(A + i);
}
```

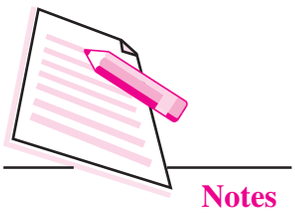
At one stage the value of i is 2. Therefore A + i is two locations away from the zero location. The *(A+i) will print the data stored at that location. In the same way the statement cout <<"\n"<<*(A+i); will print the value of A[0], A[1], A[2], A[3], and A[4].

20.1.2 Pointer to String constant

Consider the following example:

```
# include < iostream.h >
void main ( )
{
char stu1 [ ] = "work as an array";
char *stu2 = "work as a pointer";
cout << stu1;                    //display work as an array
cout << stu2;                    // display work as a pointer
stu1 ++;                         // wrong statement
stu2 ++;
        cout << stu2;
        // it prints "ork as a pointer"
        }
```

Stu2 is a character pointer variable for a string "work as a pointer". stu2++ will increment the value of stu2 by 1. Now stu2 will have only the value of "ork as a pointer".



Notes

stu 1 + + is a wrong statement because stu1 is a pointer which holds the address of zero location (& stu1[0]). It is a constant in a program.

20.1.3 Pointer to Structure

Consider the following program

```
struct student
{
        char name [30];
        int rn;
};
```

The statement

```
student st;
```

declares st as the variable of the structure student.

The statement

```
student *ptr;
```

declares a pointer variable ptr to a student.

That data members using ptr can be referred to as

```
ptr -> name;
ptr -> rn;
```

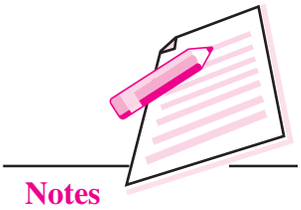
Another way of referring the data member is

```
(*ptr) . name;
(*ptr) . rn;
```

20.1.4 Pointer to Objects

Object pointers are useful in creating objects at run time. Object pointers can be used to access the public members of an object. Consider a class student defined as follows:

```
class student
{
        char name [20];
        int rn;
        public :
                int marks;
                void getdata ( );
                void putdata ( );
};
```




```
void student : : getdata ( )
{
        cin >> name;
        cin >> rn;
        cin >> marks;
}
void student : : putdata (  )
{
        cout << "Name" << name << "\n";
        cout << "Roll no" << rn << "\n";
        cout << "Marks" << marks << "\n";
}
```

Declare an object st and pointer ptr as follows:

```
        student st;
        student *ptr;
```

We can refer to the member functions and data member of student in two ways.

(i) using dot operator

```
            st. marks = 90;
            st. getdata ( );
```

(ii) using arrow operator and object pointer

```
            ptr -> marks = 90;
            ptr -> getdata ( );
```

another way to represent is (*ptr)

```
            (*ptr) . marks = 90;
            (*ptr) . getdata ( );
```

20.2 THIS POINTER

C++ uses a unique keyword called **this** to represent the object that invokes a member function. *This* is a pointer that points to the object for which *this* function was called. For example;

```
        class ABC
        {
        int rn;
```

```
public:
        void getdata ( )
        {
        cin >> this -> rn;
        }
        void putdata ( )
        {
        cout << this -> rn;
        };
void main ( )
        {
        ABC A, B;
        A . getdata (  );
        A . putdata (  );
        B . getdata (  );
        B . putdata (  );
        }
```

When a getdata ( ) or putdata ( ) function is called through object A, *this* has the address of object A. Similarly, when a getdata ( ) or putdata ( ) function is called through object B, *this* has the address of object B.

INTEXT QUESTIONS 20.1

I. Choose the appropriate answer.

1. A pointer is .....

   (i) the address of a variable

   (ii) an indication of the variable to be accessed next

   (iii) a variable for string addresses

   (iv) the data type of address variable

2. The expression *ptr can be said to .....

   (i) be a pointer to ptr

   (ii) refer to the contents of ptr

   (iii) refer to the value of the variable pointed to by ptr

   (iv) dereference ptr

3. The expression int* can be said to .....

   (i) be a pointer pointing to variable int

   (ii) refer to contents of int

   (iii) be a pointer to an int type value.

II. Fill in the blanks:

   (a) A pointer variable stores the ..... of another variable.

   (b) The ..... operator is called address operator.

   (c) To declare t_age pointer to integer, we should write .....

   (d) If A is an integer variable then ..... gives its address.

   (e) If ptr is a pointer to an integer variable, the number stored in it is given by .....

III. State whether the following statements are true or false:

   (a) A pointer is an address of the variable.

   (b) Dereferencing operator (*) is a unary operator. It is different from the multiplication operator (*) which needs two operands.

   (c) This pointer points to the objects that is currently used to invoke a function.

WHAT YOU HAVE LEARNT

- Pointer is a variable that represents the location (rather than the value) of a data item such as a variable or an array element.
- Object pointers are useful in creating objects at run time.
- Object pointers can be used to access the public members of an object.
- C++ uses a unique keyword called **this** to represent the object that invokes a member function.

TERMINAL EXERCISE

1. If arr is an array of integers, why is the expression arr++ not legal?
2. What is the difference between arr [4] and *(arr+4)?
3. If a structure defined has pointer variable, how can it access the members of the structure ? Explain it by taking an example.
4. How can a data member and member function present in public mode in class be accessed through pointer object? Explain it by taking an example.
5. What is this pointer? Explain briefly.

ANSWERS TO INTEXT QUESTIONS

20.1

I.

1. (i) the address of a variable.
2. (iv) dereference ptr.
3. (iii) be a pointer to an int type value.

II. (a) address

(b) &

(c) int *t_age;

(d) &A

(e) *ptr

III. (a) True

(b) True

(c) True