Section 7.1 pointer

What is pointer

- Each variable has
  - type (what kind of data to hold), for example, int, double
  - Name (identify different variables), for example, i, sum
  - Value (current value of a variable), and
  - Address (memory location).
- A pointer denotes the memory location of a variable. That is, a pointer is a variable to hold the address of another variable.

Why Pointer

In C++, pointers are important for several reasons.

- Pointers allow sharing of values stored in variables in a uniform way.
- Pointers can refer to values that are allocated on demand (dynamic memory allocation).
- Pointers are necessary for implementing polymorphism, an important concept in object-oriented programming (later)

Pointer syntax

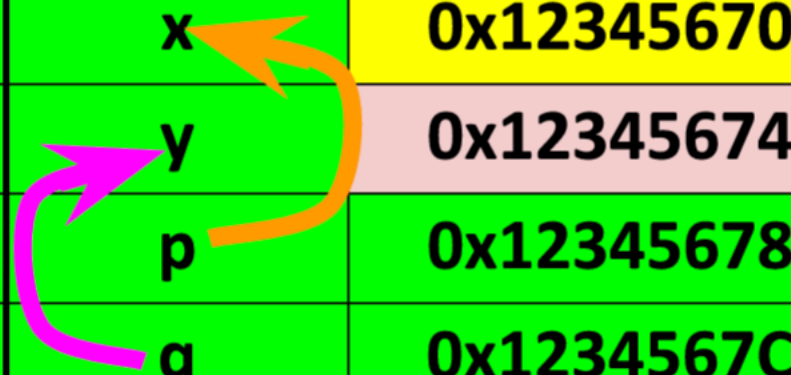
```
char *p;//declares a char pointer
int *q; //declares an int pointer
float *r; //declares a float ptr
string *s;//declares a string ptr
int *p, q; //only p is a pointer variable;
           //q is an int variable
int *p, *q; //to declare two pointers,
     //attach the * to each variable's name
```

Usage of pointer

```
int *p; //p points to an int, code link
int a = 2;
p = &a; //&a is the address of a,
        //p saves the address of a, or p points to a
cout << *p << endl; //*p is like to say "the guy whose address is p".
                    //after p = &a, *p is an alias of a
                    //ie, *p and a are the same
*p = 5;
cout << a << endl;
```

Memory State after int *p = &x; and int *q = &y;

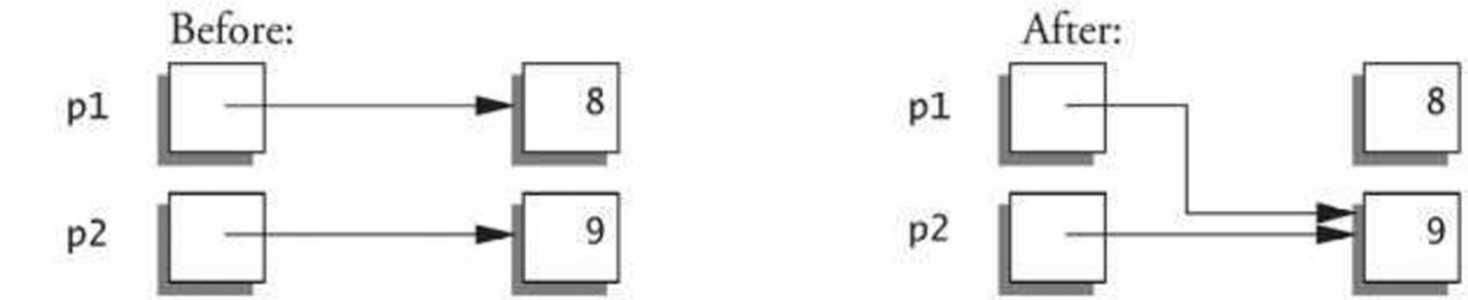
Type	Name	Address	Data
...	...	...	...
int	x	0x12345670	5
int	y	0x12345674	8
int pointer	p	0x12345678	0x12345670
int pointer	q	0x1234567C	0x12345674
...	...	...	...



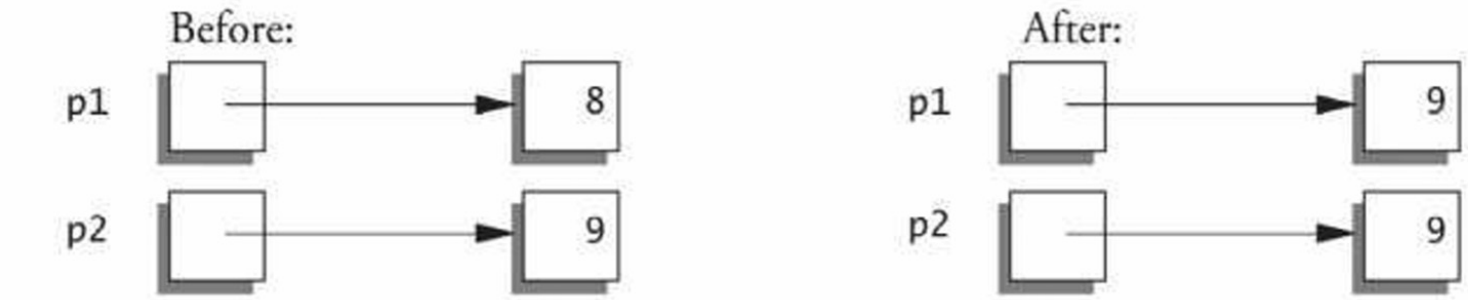
```
int a1 = 8, a2 = 9;
int *p1 = &a1, *p2 = &a2;
```

Display 10.1 Uses of the Assignment Operator with Pointer Variables

```
p1 = p2;
```




```
*p1 = *p2;
```



Summary

- Each variable has a name, address, and value.
- Pointer variable is declared by

type* pointer_variable;

- A pointer variable saves the address of a variable of its type. Or we say the pointer points to the variable.
  - For example, int pointer saves the address of an int, double pointer saves the address of a double variable.
- To access the variable pointed by a pointer, use * operator before a pointer variable.