

Operator Overloading



Today's Agenda

- What is Operator Overloading?
- Syntax
- Can all operator overloaded?
- Types of operator overloading
- Rules for operator overloading
- Different Approaches to operator overloading
- MCQ Question

Let's Get Started-

Operator Overloading

In C++, we can make operators to work for user defined classes. This means C++ has the ability to provide the operators with a special meaning for a data type, this ability is known as operator overloading.

For example, we can overload an operator '+' in a class like String so that we can concatenate two strings by just using +.

Other example classes where arithmetic operators may be overloaded are Complex Number, Fractional Number, Big Integer, etc.

Syntax

```
class class_name
{
    ... ..
    public
        return_type operator symbol (argument(s))
        {
            ... ..
        }
    ... ..
};
```

- The `return_type` is the return type for the function.
- Next, you mention the operator keyword.
- The `symbol` denotes the operator symbol to be overloaded. For example, `+`, `-`, `<`, `++`.
- The `argument(s)` can be passed to the operator function in the same way as functions.

Example

```
#include <iostream>
using namespace std;

class TestClass {
private:
    int count;
public:
    TestClass() : count(5) {}
    void operator --() {
        count = count - 3;
    }
    void Display() {

        cout << "Count: " << count; }
};
```

Example

```
int main() {  
    TestClass tc;  
    --tc;  
    tc.Display();  
    return 0;  
}
```

Can all operator be overloaded?

No. There are C++ operators that can't be overloaded.

They include:

- `::` -Scope resolution operator
- `?:` -ternary operator.
- `.` -member selector
- `sizeof` operator
- `*` -member pointer selector / indirection op / dereference op

Types of operator overloading

- Unary operator overloading
- Binary operator overloading

Unary Operator Overloading Example

The unary operators operate on a single operand and following are the examples of Unary operators –

The increment (++) and decrement (--) operators.

The unary minus (-) operator.

The logical not (!) operator.

The unary operators operate on the object for which they were called and normally, this operator appears on the left side of the object, as in !obj, -obj, and ++obj but sometime they can be used as postfix as well like obj++ or obj--.

Following example explain how minus (-) operator can be overloaded for prefix as well as postfix usage

Unary Operator Overloading Example

```
class Distance {  
    private:  
        int feet;        // 0 to infinite  
        int inches;      // 0 to 12  
  
    public:  
        // required constructors  
        Distance() {  
            feet = 0;  
            inches = 0;  
        }  
        Distance(int f, int i) {  
            feet = f;  
            inches = i;  
        }  
}
```

Unary Operator Overloading Example

```
// method to display distance
void displayDistance() {
    cout << "F: " << feet << " I:" << inches << endl;
}

// overloaded minus (-) operator
Distance operator- () {
    feet = -feet;
    inches = -inches;
    return Distance(feet, inches);
}
};
```

Unary Operator Overloading Example

```
int main() {  
    Distance D1(11, 10), D2(-5, 11);  
  
    -D1;           // apply negation  
    D1.displayDistance(); // display D1  
  
    -D2;           // apply negation  
    D2.displayDistance(); // display D2  
  
    return 0;  
}
```

Output:-

F: -11 l:-10

F: 5 l:-11

Binary Operator Overloading Example

The binary operators take two arguments and following are the examples of Binary operators. You use binary operators very frequently like addition (+) operator, subtraction (-) operator and division (/) operator.

Following example explains how addition (+) operator can be overloaded. Similar way, you can overload subtraction (-) and division (/) operators

Binary Operator Overloading Example

```
class Box {  
    double length;    // Length of a box  
    double breadth;   // Breadth of a box  
    double height;    // Height of a box  
  
public:  
  
    double getVolume(void) {  
        return length * breadth * height;  
    }  
  
    void setLength( double len ) {  
        length = len;  
    }  
}
```

Binary Operator Overloading Example

```
void setBreadth( double bre ) {  
    breadth = bre;  
}
```

```
void setHeight( double hei ) {  
    height = hei;  
}
```

// Overload + operator to add two Box objects.

```
Box operator+(const Box& b) {  
    Box box;  
    box.length = this->length + b.length;  
    box.breadth = this->breadth + b.breadth;  
    box.height = this->height + b.height;  
    return box;  
}
```


Binary Operator Overloading Example

```
// Main function for the program
int main() {
    Box Box1;          // Declare Box1 of type Box
    Box Box2;          // Declare Box2 of type Box
    Box Box3;          // Declare Box3 of type Box
    double volume = 0.0; // Store the volume of a box here

    // box 1 specification
    Box1.setLength(6.0);
    Box1.setBreadth(7.0);
    Box1.setHeight(5.0);

    // box 2 specification
    Box2.setLength(12.0);
    Box2.setBreadth(13.0);
    Box2.setHeight(10.0);
```

Binary Operator Overloading Example

```
// volume of box 1
volume = Box1.getVolume();
cout << "Volume of Box1 : " << volume <<endl;

// volume of box 2
volume = Box2.getVolume();
cout << "Volume of Box2 : " << volume <<endl;

// Add two object as follows:
Box3 = Box1 + Box2;

// volume of box 3
volume = Box3.getVolume();
cout << "Volume of Box3 : " << volume <<endl;

return 0;
}
```

Output:-

Volume of Box1 : 210

Volume of Box2 : 1560

Volume of Box3 : 5400

MCQ 1

Which of the following operators cannot be overloaded

- A . (Member Access or Dot operator)
- B?: (Ternary or Conditional Operator)
- C:: (Scope Resolution Operator)
- D.* (Pointer-to-member Operator)
- E. All the above

MCQ 1

Which of the following operators cannot be overloaded

A . (Member Access or Dot operator)

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C:: (Scope Resolution Operator)

D.* (Pointer-to-member Operator)

E. All the above

MCQ 2

Which is the correct example of a binary operator?

a) ++

b) - -

c) Dereferencing operator(*)

d) +

MCQ 2

Which is the correct example of a binary operator?

a) ++

b) - -

c) Dereferencing operator(*)

d) +

MCQ 3

Which is the correct statement about operator overloading?

- a) Only arithmetic operators can be overloaded
- b) Only non-arithmetic operators can be overloaded
- c) Precedence of operators are changed after overlaoding
- d) Associativity and precedence of operators does not change

MCQ 3

Which is the correct statement about operator overloading?

- a) Only arithmetic operators can be overloaded
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- c) Precedence of operators are changed after overlaoding
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MCQ 4

Which of the following operators should be preferred to overload as a global function rather than a member method?

A Postfix ++

B Comparison Operator

C Insertion Operator <<

D Prefix+

MCQ 4

Which of the following operators should be preferred to overload as a global function rather than a member method?

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C Insertion Operator <<

D Prefix+

Any Questions??

Thank You!

See you guys in next class.