

C/c++ Documentation - Day 7 - Harshnie M

```
1.  
/*  
 * Purpose : Write a program to demonstrate how a static local variable  
 *           inside a function retains its value across multiple  
 *           function calls.  
 *  
 * Author : Harshnie M  
 * Date   : 30-12-2025  
 */  
  
#include <iostream>  
using namespace std;  
  
// Function declaration  
int fun();  
  
int main(){  
    // Calling fun() multiple times  
    cout << "fun() " << fun() << endl;  
    cout << "fun() " << fun() << endl;  
    cout << "fun() " << fun() << endl;  
    cout << "fun() " << fun() << endl;  
  
    return 0;  
}  
  
// Function definition  
int fun(){  
    // Static local variable  
    // Initialized only once and value is retained between function calls  
    static int var = 10;  
  
    // Return current value and then increment  
    return var++;  
}  
Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)  
$ vi staticlocalvariable1.cpp  
Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)  
$ g++ staticlocalvariable1.cpp -o slv  
Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)  
$ ./slv  
fun() 10  
fun() 11  
fun() 12  
fun() 13
```

```

2.
/*
 * Purpose : Write a program to demonstrate how the strtok() function
 *           is used to split a string into tokens using space as
 *           a delimiter.
 *
 * Author : Harshnie M
 * Date   : 30-12-2025
 */

#include <stdio.h>
#include <string.h>

int main(){
    // Input string to be tokenized
    char str[] =
        "One way of using a class is by creating objects and using the member through that
object";

    // First call to strtok(): pass string address and delimiter
    char *ptr = strtok(str, " ");

    // Loop until no more tokens are found
    while(ptr != NULL){
        // Print each token
        printf("%s\n", ptr);

        // Subsequent calls: pass NULL to continue tokenizing same string
        ptr = strtok(NULL, " ");
    }

    return 0;
}

```

```

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$ vi strtokfunction.c

Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ strtokfunction.c -o strtok

Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./strtok
One
way
of
using
a
class
is
by
creating
objects
and
using
the
member
through
that
object

```

```

3.
/*
 * Purpose : Write a program to demonstrate single inheritance in C++,
 *           where a derived class accesses public member functions
 *           of a base class.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

#include <iostream>
using namespace std;

// Base class
class Base{
public:
    // Member function of Base class
    void funOne(){
        cout << "Base::funOne()" << endl;
    }

    // Another member function of Base class
    void funTwo(){
        cout << "Base::funTwo()" << endl;
    }
};

// Derived class inherits from Base
class Derived : public Base{
public:
    // Member function of Derived class
    void funThree(){
        cout << "Derived::funThree()" << endl;
    }

    // Another member function of Derived class
    void funFour(){
        cout << "Derived::funFour()" << endl;
    }
};

int main(){
    // Create object of Derived class
    Derived dObj;

    // Access Base class functions using Derived object
    dObj.funOne();
    dObj.funTwo();
}

```

```

// Access Derived class functions
dObj.funThree();
dObj.funFour();

return 0;
}

```

```

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ vi singleinheritance.cpp

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ singleinheritance.cpp -o sin

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./sin
Base::funOne()
Base::funTwo()
Derived::funThree()
Derived::funFour()

```

4.

```

/*
 * Purpose : Write a program to demonstrate the order of execution of
 *            constructors and destructors in multiple inheritance.
 */

```

```

* Author : Harshinie M
* Date   : 30-12-2025
*/

```

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

```

// Base class A
struct A{
    A(){
        cout << "A()" << endl;
    }
    ~A(){
        cout << "~A()" << endl;
    }
};
```

```

// Base class B
struct B{
    B(){
        cout << "B()" << endl;
    }
    ~B(){
        cout << "~B()" << endl;
    }
};
```

```

        }
};

// Base class C
struct C{
    C(){
        cout << "C()" << endl;
    }
    ~C(){
        cout << "~C()" << endl;
    }
};

// Derived class D inherits from A, B, and C
struct D : A, B, C{
    // Constructor
    D() : B(), C(), A(){
        cout << "D()" << endl;
    }

    // Destructor
    ~D(){
        cout << "~D()" << endl;
    }
};

int main(){
    // Creating object of derived class D
    D dObj;

    // destructors will be called automatically
    return 0;
}

```

```

larshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-c-day7 (master)
$ vi orderofexecutionmultipleinherit.cpp

larshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-c-day7 (master)
$ g++ orderofexecutionmultipleinherit.cpp -o order

larshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-c-day7 (master)
$ ./order
A()
B()
C()
D()
C()
B()
A()

```

```

/*
 * Purpose : Write a program to demonstrate how private, protected,
 *           and public members of a base class are accessed in
 *           a derived class using public inheritance.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

#include <iostream>
using namespace std;

class Test{
    // Private member by default
    void funOne(){
        cout << "Test::funOne() --> Private" << endl;
    }

protected:
    // Protected member
    void funTwo(){
        cout << "Test::funTwo() --> Protected" << endl;
    }

public:
    // Public member
    void funThree(){
        cout << "Test::funThree() --> Public" << endl;
    }
};

// Derived class using public inheritance
class Derived : public Test{
public:
    void funFour(){
        // funOne(); // Not accessible (private member)

        funTwo(); // (protected member)
        funThree(); // (public member)
    }
};

int main(){
    // Create object of Derived class
    Derived dObj;

    // Public member can be accessed using object
    dObj.funThree();
}

```

```

// Function of Derived class accessing inherited members
dObj.funFour();

return 0;
}

```

```

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$ vi privatepublicprotected.cpp

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ privatepublicprotected.cpp -o ppp

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./ppp
Test::funThree() --> Public
Test::funTwo() --> Protected
Test::funThree() --> Public

```

6.

```

/*
 * Purpose : Write a program to demonstrate the accessibility of
 *           private, protected, and public members of a base class
 *           in a derived class using public inheritance.
 */

```

```

* Author : Harshinie M
* Date   : 30-12-2025
*/

```

```

#include <iostream>
using namespace std;

class Test{
    // Private member by default
    void funOne(){
        cout << "Test::funOne() --> Private" << endl;
    }

protected:
    // Protected member
    void funTwo(){
        cout << "Test::funTwo() --> Protected" << endl;
    }

public:
    // Public member
    void funThree(){
        cout << "Test::funThree() --> Public" << endl;
    }
}

```

```

};

// Derived class with public inheritance
class Derived : public Test{
public:
    void funFour(){
        // funOne(); // Not accessible (private member)

        funTwo(); // Accessible (protected member)
        funThree(); // Accessible (public member)
    }
};

int main(){
    Derived dObj;

    // Accessing public member using object
    dObj.funThree();

    // Accessing inherited members inside derived class function
    dObj.funFour();

    return 0;
}

```

```

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$ vi accessbasederived.cpp

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ accessbasederived.cpp -o abd

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./abd
Test::funThree() --> Public
Test::funTwo() --> Protected
Test::funThree() --> Public

```

7.

```

/*
 * Purpose : Write a program to demonstrate runtime polymorphism
 *           using virtual functions and base class pointers.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

```

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

```
// Base class
```

```

class Base{
public:
    // Virtual function
    virtual void funOne(){
        cout << "Base::funOne()" << endl;
    }
};

// Derived class
class Derived : public Base{
public:
    // Overridden function
    void funOne(){
        cout << "Derived::funOne()" << endl;
    }
};

int main(){
    // Base class pointer and objects
    Base *ptr, bObj;
    Derived dObj;

    // Base pointer pointing to Base object
    ptr = &bObj;
    ptr->funOne(); // Calls Base::funOne()

    // Base pointer pointing to Derived object
    ptr = &dObj;
    ptr->funOne(); // Calls Derived::funOne() (runtime binding)

    return 0;
}

```

```

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vi runtimepolymorphism.cpp

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-c-day7 (master)
g++ runtimepolymorphism.cpp -o rtp

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-c-day7 (master)
./rtp
base::funOne()
derived::funOne()

```

8.

```

/*
 * Purpose : Write a program to demonstrate the use of the
 *           this pointer to differentiate between data members
 *           and function parameters having the same name.
 */

```

```

* Author : Harshinie M
* Date   : 30-12-2025
*/
#include <iostream>
using namespace std;

class Test{
    int data; // Data member of the class

public:
    // Function with parameter name same as data member
    void funOne(int data){
        // 'this->data' refers to the data member
        // 'data' refers to the function parameter
        this->data = data;
        cout << "funOne Data: " << data << endl;
    }

    // Function to display the stored data
    void funTwo(){
        cout << "funTwo Data: " << data << endl;
    }
};

int main(){
    // Create object of Test class
    Test obj;

    // Assign value using funOne()
    obj.funOne(10);

    // Display value using funTwo()
    obj.funTwo();

    return 0;
}

```

```

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vi thispointer.cpp

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
g++ thispointer.cpp -o thisp

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
./thisp
unOne Data: 10
unTwo Data: 10

```

9.

```
/*
 * Purpose : Write a program to demonstrate returning the current
 *           object using the this pointer and perform method chaining.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */
```

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

class Test{
public:
    // Function returns reference to current object
    Test& funOne(){
        cout << "in funOne " << this << endl;
        return *this; // return current object
    }

    // Another member function
    void funTwo(){
        cout << "in funTwo" << endl;
    }
};

int main(){
    // Create object of Test class
    Test objOne;

    // Method chaining using returned object
    objOne.funOne().funTwo();

    return 0;
}
```

```
harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ vi methodchaining.cpp

harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ methodchaining.cpp -o mec

harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./mec
in funOne 0x61ff1f
in funTwo
```

10.

```
/*
 * Purpose : Write a program to demonstrate operator overloading
```

```

*      by overloading the prefix increment (++) operator
*      using member function and returning object reference.
*
* Author : Harshinie M
* Date   : 30-12-2025
*/

```

```

#include <iostream>
using namespace std;

class Num{
    int data; // Data member

public:
    // Constructor with default argument
    Num(int x = 0) : data(x) {}

    // Overloading prefix increment operator
    Num& operator++(){
        data++; // Increment data
        return *this; // Return current object
    }

    // Display function
    void disp(ostream &out){
        out << "data: " << data << endl;
    }
};

int main(){
    // Create object and initialize
    Num a = 10;

    // Prefix increment
    ++a;
    a.disp(cout);

    // Prefix increment again
    ++a;
    a.disp(cout);

    return 0;
}

```

```

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vi operatoroverloading++.cpp

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
g++ operatoroverloading++.cpp -o Load

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
./load
ata: 11
ata: 12

```

11.

```

/*
 * Purpose : Write a program to demonstrate operator overloading
 *           by overloading both prefix (++) and postfix (++)
 *           increment operators and show their behavior.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

#include <iostream>
using namespace std;

class Num{
    int data; // Data member

public:
    // Constructor with default value
    Num(int x = 0) : data(x) {}

    // Prefix increment operator overloading
    Num& operator++(){
        cout << "Pre-fix" << endl;
        data++; // Increment first
        return *this; // Return modified object
    }

    // Postfix increment operator overloading
    Num operator++(int){
        cout << "Post-fix" << endl;

        // Store current state before increment
        Num temp(*this);

        data++; // Increment after storing
        return temp; // Return old value
    }
}

```

```

// Display function
void disp(ostream &out){
    out << "data: " << data << endl;
}
};

int main(){
    Num a = 10;

    // Prefix increment
    ++a;
    a.disp(cout);

    // Postfix increment
    a++;
    a.disp(cout);

    return 0;
}

```

```

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$ vi operatorprefixpostfix.cpp

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ operatorprefixpostfix.cpp -o load1

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./load1
Pre-fix
data: 11
Post-fix
data: 12

```

12.

```

/*
 * Purpose : Write a program to demonstrate operator overloading
 *           for arithmetic operators (+ and -) using member functions.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

```

```

#include <iostream>
using namespace std;

class Num{
    int data; // Data member

public:

```

```

// Constructor with default value
Num(int x = 0) : data(x) {}

// Overload '+' operator
Num operator+(const Num& rhs){
    Num temp(data + rhs.data); // Add data members
    return temp;              // Return new object
}

// Overload '-' operator
Num operator-(const Num& rhs){
    Num temp(data - rhs.data); // Subtract data members
    return temp;              // Return new object
}

// Display function
void disp(ostream &out){
    out << "data: " << data << endl;
}
};

int main(){
    // Create objects
    Num a = 100, b = 20;

    // Display initial values
    a.disp(cout);
    b.disp(cout);

    // Use overloaded '+'
    Num c = a + b;

    // Use combination of '+' and '-'
    Num d = c + a - b;

    // Display results
    c.disp(cout);
    d.disp(cout);

    return 0;
}

```

```

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$ vi operatorarithmetic.cpp

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-c-day7 (master)
$ g++ operatorarithmetic.cpp -o arith

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-c-day7 (master)
$ ./arith
data: 100
data: 20
data: 120
data: 200

```

13.

```

/*
 * Purpose : Write a program to demonstrate operator overloading
 *           for arithmetic operators (+ and -) as member functions
 *           and overloading the insertion operator (<<) using
 *           a friend function.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

#include <iostream>
using namespace std;

class Num{
    int data; // Data member

public:
    // Constructor with default value
    Num(int x = 0) : data(x) {}

    // Overload '+' operator as member function
    Num operator+(const Num& rhs){
        Num temp(data + rhs.data); // Add data members
        return temp;
    }

    // Overload '-' operator as member function
    Num operator-(const Num& rhs){
        Num temp(data - rhs.data); // Subtract data members
        return temp;
    }

    // Friend function to overload '<<' operator
    friend ostream& operator<<(ostream &out, const Num &obj);
};


```

```

// Overloading '<<' operator using friend function
ostream& operator<<(ostream &out, const Num &obj){
    out << "data: " << obj.data;
    return out; // Allow chaining
}

int main(){
    // Create objects
    Num a = 100, b = 20;

    // Display using overloaded '<<'
    cout << a << " " << b << endl;

    // Perform arithmetic using overloaded operators
    Num c = a + b;
    Num d = c + a - b;

    // Display results using overloaded '<<'
    cout << c << " " << d << endl;

    return 0;
}

```

```

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vi insertionoperator.cpp

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
g++ insertionoperator.cpp -o insert

arshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
./insert
ata: 100    data: 20
ata: 120    data: 200

```

14.

```

/*
 * Purpose : Write a program to demonstrate operator overloading
 *           entirely using friend functions for arithmetic operators
 *           (+, -) and the insertion operator (<<).
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

#include <iostream>
using namespace std;

class Num{
    int data; // Data member

public:

```

```

// Constructor with default value
Num(int x = 0) : data(x) {}

// Friend functions for operator overloading
friend Num operator+(const Num&, const Num&);
friend Num operator-(const Num&, const Num&);
friend ostream& operator<<(ostream &, const Num &);

};

// Overload '+' operator using friend function
Num operator+(const Num& lhs, const Num& rhs){
    Num temp(lhs.data + rhs.data);
    return temp;
}

// Overload '-' operator using friend function
Num operator-(const Num& lhs, const Num& rhs){
    Num temp(lhs.data - rhs.data);
    return temp;
}

// Overload '<<' operator using friend function
ostream& operator<<(ostream &out, const Num &obj){
    out << "data: " << obj.data;
    return out; // Allows chaining
}

int main(){
    Num a = 100, b = 20;

    // Display initial objects
    cout << a << " " << b << endl;

    // Perform arithmetic using overloaded operators
    Num c = a + b;
    Num d = c + a - b;

    // Display results
    cout << c << " " << d << endl;

    return 0;
}

```

```
harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ vi usingfriendfunction.cpp

harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ usingfriendfunction.cpp -o using

harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./using
data: 100    data: 20
data: 120    data: 200
```

15.

```
/*
 * Purpose : Write a program to demonstrate overloading of global
 *           new and delete operators for dynamic memory allocation
 *           and deallocation.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

#include <iostream>
#include <cstdlib> // For malloc and free
using namespace std;

// Overloading global 'new' operator
void* operator new(size_t size){
    cout << "Global operator new with size: " << size << endl;

    void *ptr = malloc(size); // Allocate memory

    if (ptr == NULL){
        throw bad_alloc(); // Throw exception if allocation fails
    }

    return ptr;           // Return allocated memory
}

// Overloading global 'delete' operator
void operator delete(void *ptr){
    cout << "Global operator delete" << endl;
    free(ptr);           // Free allocated memory
}

// Test structure
struct Test{
    int data;

    // Constructor
}
```

```

Test(int x = 0) : data(x){
    cout << "Test()" << endl;
}

// Destructor
~Test(){
    cout << "~Test()" << endl;
}
};

int main(){
    // Dynamic allocation using overloaded global new
    Test *ptr = new Test();

    // Deallocation using overloaded global delete
    delete ptr;

    return 0;
}

```

```

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$ vi globalnewdelete.cpp

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ globalnewdelete.cpp -o newdel

Harshinie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./newdel
Global operator new with size: 4
Test()
~Test()

```

16.

```

/*
 * Purpose : Write a program to demonstrate class-specific
 *           overloading of new and delete operators for dynamic
 *           memory allocation and deallocation.
 *
 * Author : Harshinie M
 * Date   : 30-12-2025
 */

```

```

#include <iostream>
#include <cstdlib> // For malloc and free
using namespace std;

class Test{
    int data; // Data member

```

```

public:
    // Constructor
    Test(int x = 0) : data(x) {}

    // Overloaded class-specific new operator
    void* operator new(size_t size){
        cout << "Test::operator new size: " << size << endl;

        void *ptr = malloc(size); // Allocate memory
        if (ptr == NULL)
            throw bad_alloc(); // Throw exception if allocation fails
        return ptr;
    }

    // Overloaded class-specific delete operator
    void operator delete(void *ptr){
        cout << "Test::operator delete" << endl;
        free(ptr); // Deallocate memory
    }
};

int main(){
    // Dynamic allocation using class-specific new
    Test *ptr = new Test(100);

    // Deallocation using class-specific delete
    delete ptr;

    return 0;
}

```

```

Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ vi claspecificoverloading.cpp

Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ g++ claspecificoverloading.cpp -o claspec

Harshnie@Asuslaptop-G MINGW64 ~/OneDrive/Desktop/wipro works/30dec2025-C-day7 (master)
$ ./claspec
Test::operator new size: 4
Test::operator delete

```