



# C++ Programming

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1. References
  2. Difference between Pointers and reference
  3. Sum function and Copy Constructor
  4. New and delete
  5. Difference between New and malloc
  6. Shallow Copy and deep copy



# Today's topics

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1. static
2. Friend function
3. Operator Overloading
4. Object Oriented programming structure(oops)
5. Major pillars of oops
6. Minor pillars of oops
7. Association



# Static Variable

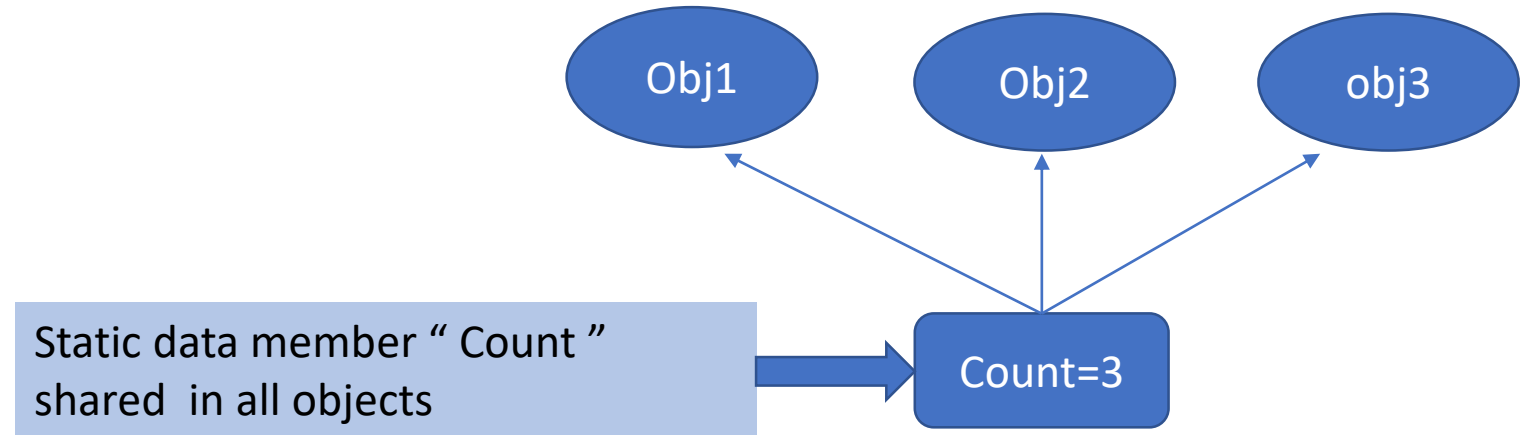
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- All the static and global variables get space only once during program loading / before starting execution of main function
- Static variable is also called as shared variable.
- Initialized static and global variable get space on Data segment.
- Default value of static and global variable is zero.
- Static variables are same as global variables but it is having limited scope.



# Static Data member

- If we want to share value of data member between all objects of same class then we should declare that data member as static data member.
- It is mandatory to provide global definition of static data member otherwise linker generates error.
- Static data member get space during class loading per class so it is called as **class-level variable**



# Static Member Function

- Except main function, we can declare global function as well as member function static.
- static members of the class we should declare member function **static**.
- static member function is also called as **class level method**.
- To access class level method we should use classname and ::(scope resolution) operator.
- This pointer is not available in static member function .



# Friend :-

- A non member function of a class which designed to access **private** data of a class is called friend function.
- To declare a function as a friend of a class, precede the function prototype in the class definition with keyword **friend**

```
class MyData
{
private:
    int pin;
    int pass;

public:
    MyData(int pin,int pass);
    void PrintMyAccDetails();
    friend void anyFunction();
};
```

```
void anyFunction()
{
    MyData d1;
    d1.pass=9898;
    d1.pin=9999;
    d1.PrintMyAccDetails();
}
```



# C++ is not a pure Object Oriented Language Because

- You can write code without creating a class in C++, and main() is a global function.
- Support primitive data types, e.g., int, char, etc. Instances(variable) of these primitive types are NOT objects.
- C++ provides "Friend" which is absolute corruption to the OO-Principle of encapsulation.





# Operator Overloading

- operator is token in C/C++. And it is used to generate expression.
- Types of operator:
  - Unary operator ( ++,--,&!,~,sizeof())
  - Binary Operator (Arithmetic, relational, logical , bitwise, assignment)
  - Ternary operator (conditional)
- In C++, also we can not use operator with objects of user defined type directly.
- If we want to use operator with objects of user defined type then we should **overload operator**.
- To overload operator, we should define **operator function**.
- **We can define operator function using 2 ways:**
  - **Using member function**
  - **Using non member function**



# Operator Overloading

## using member function

- operator function must be member function
- If we want to overload, binary operator using member function then operator function should take only one parameter.
  - Example :  
`c3 = c1 + c2; //will be called as`  
`//c3 = c1.operator+( c2 )`

## using non member function

- Operator function must be global function
- If we want to overload binary operator using non member function then operator function should take two parameters.
  - Example :  
`c3 = c1 - c2; // will be called as`  
`// c3 = operator-(c1,c2);`



# We can not overloading following operator using member as well as non member function:

1. dot/member selection operator( . )
2. Pointer to member selection operator(.\*)
3. Scope resolution operator( :: )
4. Ternary/conditional operator( ? : )
5. sizeof() operator
6. typeid() operator
7. static\_cast operator
8. dynamic\_cast operator
9. const\_cast operator
10. reinterpret\_cast operator



# We can not overload following operators using non member function:

- Assignment operator( = )
- Subscript / Index operator( [] )
- Function Call operator[ ( ) ]
- Arrow / Dereferencing operator( → )



# Object Oriented programming structure(oops) :-

-> It is a programming methodology to organise complex program into simple program in terms of class and objects such methodology is called as "Object Oriented programming structure"

-> It is a programming methodology to organise complex program into simple program by using the concept of Abstraction, Encapsulation and Inheritance, modularity.

->so the language which supports Abstraction, Encapsulation and Inheritance is called as Object Oriented programming language.



# Major pillars of oops

- **Abstraction**

- getting only essential things and hiding unnecessary details is called as abstraction.
- Abstraction always describe outer behavior of object.
- In console application when we give call to function in to the main function , it represents the abstraction.
- By Creating object and calling public member function on it we can achieve abstraction.

- **Encapsulation**

- binding of data and code together is called as encapsulation. By defining class we can achieve encapsulation.
- Implementation of abstraction is called encapsulation.
- Encapsulation always describe inner behavior of object
- Function call is abstraction and Function definition is encapsulation.
- Information hiding
  - Hiding information from user is called information hiding.
  - In c++ we used access Specifier to provide information hiding.

- **Modularity**

- Dividing programs into small modules for the purpose of simplicity is called modularity.

- **Hierarchy**

- Hierarchy is ranking or ordering of abstractions.
- Main purpose of hierarchy is to achieve re-usability.
- Types → 1: **Inheritance [is-a]** , 2: **Association [has-a]**



# Minor pillars of oops

- **Polymorphism (Typing)**

- One interface having multiple forms is called as polymorphism.
- Polymorphism have two types
  1. **Compile time polymorphism** (Static polymorphism / Static binding / Early binding / Weak typing / False Polymorphism )

when the call to the function resolved at compile time it is called as compile time polymorphism. And it is achieved by using function overloading, operator overloading, template
  2. **Runtime polymorphism** (Dynamic polymorphism / Dynamic binding / Late binding / Strong typing / True polymorphism)

when the call to the function resolved at run time it is called as run time polymorphism. And it is achieved by using function overriding.

- **Concurrency**

- Process of executing multiple tasks simultaneously is called Concurrency.
- Can be achieved by multithreading which is Used to utilize hardware resources efficiently.

- **Persistence**

- Used to maintain state of object across time and space on secondary storage .
- Using file handling we can achieve it. To transfer and save the state of object needs serialization and also socket programming for network.



# Association

- If has-a relationship exist between two types then we should use association.
- Example : Car has-a engine (OR engine is part-of car)
- If object is part-of / component of another object then it is called association.
- If we declare object of a class as a data member inside another class then it represents association.

## Example Association:

- Car has-a engine
- Laptop has-a hand disk
- Room has-a wall
- Bank has-a accounts

```
class Engine
{
    int cc, fuel;
};
class Car
{
    private:
        Engine e; //Association
};
Dependant Object : Car Object
Dependency Object : Engine Object
```







# Example of Association



# Composition and aggregation are specialized form of association

## Composition

- If dependency object do not exist without Dependent object then it represents composition.
- Composition represents tight coupling.
- Example: Human has-a heart.

```
class Heart
```

```
{ };
```

```
class Human
```

```
{  
    Heart hrt; //Association->Composition
```

```
};
```

Dependent Object : Human Object

Dependency Object : Heart Object

## Aggregation

- If dependency object exist without Dependent object then it represents Aggregation.
- Aggregation represents loose coupling.
- Example: Department has-a Faculty.

```
class Faculty
```

```
{ };
```

```
class Department
```

```
{  
    Faculty f; //Association->Aggregation
```

```
};
```

Dependent Object : Department Object

Dependency Object : Faculty Object



- Inheritance
  - Protected Data member
  - Types of Inheritance
  - Mode of inheritance
  - Diamond Problem



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# Thank You

