

# C++ Programming

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# We did...

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- ✓ Introduction and History of C++
- ✓ OOPS (Object Oriented Programming Language)
- ✓ Function overloading
- ✓ Default Argument
- ✓ Inline function
- ✓ Bool and wchar\_t
- ✓ Structure in C



# Todays topics

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1. access specifiers
2. this pointer
3. Class and object (data member, member functions)
4. Live examples of class and object
5. Types of Member Functions within class
6. Constructor
7. Types of Constructor



# Time class in CPP

Class is collection of logically related data member and member function.



# **Difference between class and struct in cpp**

- all the members of class is by default private and all the members of structure in cpp is by default public.



# Class

- Building block that binds together data & code.
- Program is divided into different classes
- Class is collection of data member and member function.
- Class represents set/group of such objects which is having common structure and common behaviour.
- Class is logical entity.
- Class has
  - Variables (data members)
  - Functions (member functions or methods)
- By default class members are private( not accessible outside class scope)
- Classes are stand-alone components & can be distributed in form of libraries
- Class is blue-print of an object



# Object

- Object is an instance of class.
- Entity that has physical existence, can store data, send and receive message to communicate with other objects.
- An entity, which get space inside memory is called object.
- Object is used to access data members and member function of the class
- Process of creating object from a class is called instantiation
- **Object has**
  - Data members (**state** of object)
    - Value stored inside object is called state of the object.
    - Value of data member represent state of the object.
  - Member function (**behavior** of object)
    - Set of operation that we perform on object is called behaviour of an object.
    - Member function of class represent behaviour of the object.
    - How object acts & reacts, when its state is changed & operations are done
    - Operations performed are also known as messages
  - Unique address(**identity** of object)
    - Value of any data member, which is used to identify object uniquely is called its identity.
    - If state of object is same then its address can be considered as its identity.



# Few Points to note

- Member function do not get space inside object.
- If we create object of the class then only data members get space inside object. Hence size of object is depends on size of all the data members declared inside class.
- Data members get space once per object according to the order of data member declaration.
- Structure of the object is depends on data members declared inside class.
- Member function do not get space per object rather it gets space on code segment and all the objects of same class share single copy of it.
- Member function's of the class defines behaviour of the object.









## Empty Class :-

A class which do not have any Data member or member function is called as the Empty class.

- We can create an object of a empty class.
- Size of an object of a empty class is 1 byte.



# this pointer

## Structure in C

```
struct time {  
    int hr, min, sec;  
}; //end of struct  
void accept( struct time *p) {  
    scanf("%d:%d:%d", &p→hr,  
        &p→min, &p→sec);  
}  
Main()  
{  
    struct time t;  
    accept(&t);  
}
```

## class in C++

```
class time {  
    int hr, min, sec;  
    void accept(){  
        scanf("%d:%d:%d",&hr, &min,  
            &sec);  
    }  
}; //end of class  
Main()  
{  
    time t;  
    t.accept();  
}
```



# this pointer

- To process state of the object we should call member function on object. Hence we must define member function inside class.
- If we call member function on object then compiler implicitly pass address of that object as a argument to the function implicitly.
- To store address of object compiler implicitly declare one pointer as a parameter inside member function. Such parameter is called this pointer.
- this is a keyword. "this" pointer is a constant pointer.
- this is used to store address of current object or calling object.
- The invoking object is passed as implicit argument to the function.
- *this* pointer points to current object i.e. object invoking the member function.
- Thus every member function receives *this* pointer.
- Following functions do not get this pointer:
  1. Global Function
  2. Static Member function
  3. Friend Function.



# Types of Member Functions within class

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- Constructor : object initialization
- Destructor : used to release the resources
- Mutators / setter : modify state of object
- inspector/getter : read the data member but do not change the state of the object
- Facilitator : Provide extra facility to work with object





# Constructor

- It is a member function of a class which is used to initialize object.
- Constructor has same name as that of class and don't have any return type.
- Constructor get automatically called when object is created i.e. memory is allocated to object.
- If we don't write any constructor, compiler provides a default constructor.
- Due to following reasons, constructor is considered as special function of the class:
  1. Its name is same as class name.
  2. It doesn't have any return type.
  3. It is designed to call implicitly.
  4. In the life time of the object , it gets called only once per object and according to order of its declaration.
- We can not call constructor on object, pointer or reference explicitly. It is designed to call implicitly.
- We can not declare constructor static, constant, volatile or virtual. We can declare constructor only inline.
- Constructor overloading means inside a class more than one constructor is defined.
- We can have constructors with
  - No argument : initialize data member to default values
  - One or more arguments : initialize data member to values passed to it
  - Argument of type of object : initialize object by using the values of the data members of the passed object. It is called as copy constructor.



# Types of Constructor

- Parameterless constructor
  - also called zero argument constructor or user defined default constructor
  - If we create object without passing argument then parameterless constructor gets called
  - Constructor do not take any parameter
- Parameterized constructor
  - If constructor take parameter then it is called parameterized constructor
  - If we create object, by passing argument then parameterized constructor gets called
- Default constructor
  - If we do not define constructor inside class then compiler generates default constructor for the class.
  - Compiler generated default constructor is parameterless.





# Constructor's member initializer list

- If we want to initialize data members according to users requirement then we should use constructor body.

```
class Test
{
private:
    int num1;
    int num2;
    int num3;

public:
    Test( void )
    {
        this->num1 = 10;
        this->num2 = 20;
        this->num3 = num2;
    }
};
```

- If we want to initialize data member according to order of data member declaration then we can use constructors member initializer list.

```
class Test
{
private:
    int num1;
    int num2;
    int num3;

public:
    Test( void ) : num1( 10 ), num2( 20 ), num3( num2 )
    {}

};
```

Except array we can initialize any member inside constructors member initializer list.



# Destructor

- It is a member function of a class which is used to release the resources.
- It is considered as special function of the class
  - Its name is same as class name and always precedes with tilde operator( ~ )
  - It doesn't have return type or doesn't take parameter.
  - It is designed to call implicitly.
- Destructor calling sequence is exactly opposite of constructor calling sequence.
- Destructor is designed to call implicitly.
- If we do not define destructor inside class then compiler generates default destructor for the class.
- Default destructor do not release resources allocated by the programmer. If we want to release it then we should define destructor inside class.



# Other Member functions of class

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- **Mutators / setter : modify state of object**
- **Inspector / getter : do not change the state of the object**
- **facilitator**



Which of the following is not the Characteristics of object?

- a. state
- b. modularity
- c. identity
- d. behavior



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How many access specifiers are there in Cpp?

- a. 2
- b. 3
- c. 4
- d. 5



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What is the size of the object of empty class?

- a. 1 byte
- b. 4 byte
- c. 8 byte
- d. 32 byte





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## **Tomorrow Topic**

- Types of member function
- Use cin and cout
- Dynamic memory allocation

Revise dynamic memory allocation in c.



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# Thank You

