# NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES

## CL 103 - COMPUTER PROGRAMMING LAB

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## **Lab # 05**

## Outline

- this Pointer
- Constant Key word
- Static Key Word
- Examples
- Exercise

## this POINTER

- Bydefault,thecompilerprovideseachmemberfunctionofaclasswithanimplicitparameterthatpointstothe object through which the member function is called. The implicit parameter is this pointer.
- One copy of each member function in a class is stored no matter how many objects exist, and each instance of a class uses the same function code. When you call a member function, it knows which object to use because you use the object's name. The address of the correct object is stored in this pointer and automatically passed to the function.
- Within any member function, you can explicitly use this pointer to access the object's data fields. You can use the C++ pointer-to-member operator, which looks like an arrow(->).

## CONSTANT DATA MEMBERS IN CLASSES

If there is a need to initialize some data members of an object when it is created and cannot be changed afterwards, use const keyword with data members.

## CONSTANT MEMBER FUNCTIONS

- Constant member function is the function that cannot modify the datamembers.
- To declare a constant member function, write the const keyword after the closing parenthesis of the parameter list. If there is separate declaration and definition, then the const keyword is required in both the declaration and the definition.
- Constant member functions are used, so that accidental changes to objects can be avoided. A constant member function can be applied to a non-constobject.
- Keyword, const can't be used for constructors and destructors because the purpose of a constructor is to initialize data members, so it must change the object. Same goes fordestructors.

## CONSTANTOBJECTS

As with normal variables we can also make class objects constant so that their value can't change during program execution. Constant objects can only call constant member functions. The reason is that only constant member function will make sure that it will not change value of the object. They are also called as **read only objects**. To declare constant object just write const keyword before object declaration.

## STATIC VARIABLE IN FUNCTIONS

A variable declared static in a function retains its state between calls to that function.

### STATIC CLASS MEMBERS

- There is an important exception to the rule that each object of a class has its own copy of all the data members of the class. In certain cases, only one copy of a variable should be shared by all objects of a class. A static data member is used for these and otherreasons.
- A static member variable cannot be initialized inside the class declaration. That's because the declaration is a description of how memory is to be allocated, but it doesn't allocatememory.
- Static members exist as members of the class rather than as an instance in each object of the class. So, this keyword is not available in a static memberfunction.
- A non-static member function can be called only after instantiating the class as an object. This is not the case with static member functions. A static member function can be called, even when a class is notinstantiated.
- Static functions may access only static datamembers.

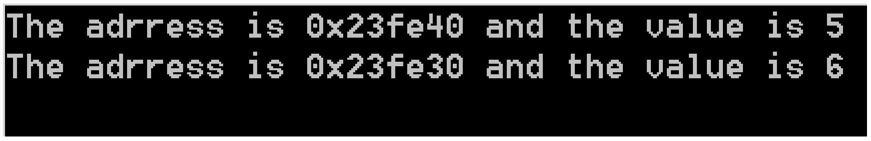
## THIS HOLDS THE ADDRESS OF CURRENT OBJECT

```
#include <iostream>
using namespace std;
class example
{
private:
int x; public:

/* If function argument and data member is same then use this pointer to identify the object's field */
void set(int x)
{
(*this).x = x;
}

int get()
{
return x;
}

void printAddressAndValue()
{
cout<<"The adrress is "<<this<<" and the value is "<<(*this).x<<endl;
}
};
```



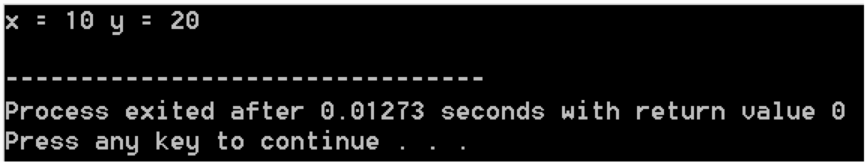
```
The adrress is 0x23fe40 and the value is 5
The adrress is 0x23fe30 and the value is 6
```

## CHAINED FUNCTION CALLS

```
#include<iostream>
using namespace std;
class Test
{
        private: int x; int y;
        public:
        Test(int x = 0, int y = 0)
        {
                this->x = x;
                this->y = y;
        }
        Test& setX(int a)
        {
               x = a;
```

```
                return *this;
        }
        Test& setY(int b)
        {
                 y = b;
                 return *this;
        }
        void print()
        {
                 cout<< "x = " << x << " y = " << y <<endl;
        }
};

int main()
{
   Test obj1(5, 5);
// Chained function calls.  All calls modify the same object
   // as the same object is returned by reference
   obj1.setX(10).setY(20).print();
 }
```



```
x = 10 y = 20

--------------------------------
Process exited after 0.01273 seconds with return value 0
Press any key to continue . . .
```

## CONSTANT DATA MEMBERS IN CLASSES

```
#include <iostream>
using namespace std;
class Students
{
private:
string name;
const int rollno;                        // need to be initialized once member is created
float cgpa;
public:
Students(int rno):rollno(rno){}           // using memberinitializerlist
void set(string sname, float cg)
{
name = sname; cgpa = cg;
}
void print()
{
cout<<"Name: "<<name<<", Roll # "<<rollno<<", CGPA : "<<cgpa<<endl;
}
};
```

```
int main ()
{
Students s(12);
s.set("Ahmad",3.67);
s.print();
}
```

## CONSTANT MEMBERFUNCTIONS

```
#include<iostream>
using namespace std;
class test
{
		private:
		int a;
		public:
				int nonconstFucntion(int a)
				{
						cout<<"Non Constant Function is called"<<endl; a=a+10;
						return a;
				}
				int constFucntion( int a) const
				{
						cout<<"Constant Function is called"<<endl;
				//		this->a=a+10;
						return a;
		}
};
main()
{
		test t;
		cout<<t.nonconstFucntion(10)<<endl;
		cout<<t.constFucntion(20);
		return 0;
}
```

## CONSTANT OBJECTS

```
#include<iostream>
using namespace std;
class test
{
		public:
				int a;
				test()
				{
						a=8;
				}
				int nonconstFucntion()
				{
						cout<<"Non Constant Function is called"<<endl;//a=a+10;
				return a;
				}
```

```
                    int constFucntion(int a) const
                    {
                              cout<<"Constant Function is called"<<endl;
                              // this->a=a+10; error
                              return a;
                    }
};
int main()
{
const test t;
//t.a=10;//        error, can't modify const objects
//cout<<t.nonconstFucntion(); //error, can't call non const objects
cout<<t.constFucntion(10) ;
return 0;
}
```

## STATIC VARIABLES IN FUNCTIONS

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

void showstat( int curr )
{
          static intnStatic;             // Value of nStatic is retained
          // between each function call
          nStatic += curr;
          cout<< "nStatic is " <<nStatic<<endl;
}

int main()
{
          for ( int i = 0; i< 5; i++ )
                    showstat( i );
          return 0;
}
```

## STATIC VARIABLES IN FUNCTIONS

```
#include <iostream>
using namespace std;
class Car
{
          int year;
          int mileage = 34289;
          // Warning: not-static data members initializers only available with c++11 or gnu++11 */

          static int vin = 12345678;
          // error: non-constant data member
          // only static const integral data members
          // can be initialized within a class

          static const  string model = "Sonata";  // error: not-integral type
          // cannot have in-class initializer
```

```
        static const int engine = 6;        // allowed: static const integral type public:
        static void f(int);
};

int Car::year = 2013;      // error: non-static data members
// cannot be defined out-of-class

void Car::f(int z)
{
        mileage=z;
        }
/* error: f(), a static function,
is trying to access non-static member x. */

intmain()
{
return 0;
}
```

## STATIC CLASS VARIABLE

```
#include<stdio.h>
#include<iostream>
using namespace std;
class ATM
{
        public:
        static int balance;

};
intATM::balance = 250;
main()
{
        ATM ob1,ob2,ob3;
        cout<<ob1.balance++<<endl;
        cout<<ob2.balance++<<endl;
        cout<<ob3.balance;

}
```

## EXERCISE

### Question # 1

Create a class ‘Employee’ having two data members ‘EmployeeName’(char*) and ‘EmployeeId’ (int).Keep both data members private. Create three initialized objects ‘Employee1’, ‘Employee2’ and ‘Employee3’ of type ‘Employee’ in such a way that the employee name for each employee can be changed when required but the employee Id for each employee must be initialized only once and should remain same always. Use member initializer list, accessors and mutators for appropriate data members. The result must be displayed by calling the accessors. All of the accessors must not have the ability to modify the data.

### Question # 2

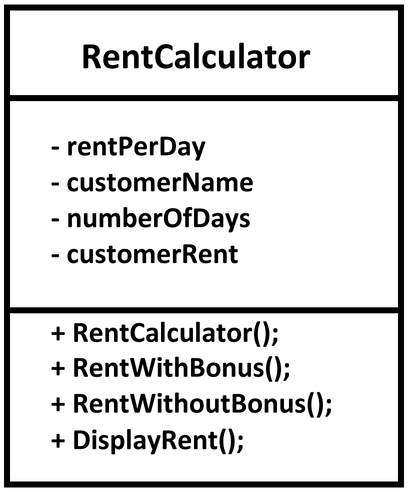
“Hotel Mercato” requires a system module that will help the hotel to calculate the rent of the customers. You are required to develop one module of the system according to the following requirements:

1) The hotel wants such a system that should have the feature to change the implementation independently of the interface. This will help when dealing with changingrequirements.
2) The hotel charges each customer 1000.85/- per day. This amount is being decided by the hotel committee and cannot be changed fulfilling certain complexformalities.
3) The module should take the customer's name and number of days, the customer has stayed in the hotel as arguments in the constructor. The customer name must be initialized only once when the constructor iscalled. Any further attempts to change the customer's name shouldfail.
4) The module then analyses the number of days. If the customer has stayed for more than a week in the hotel , he gets discount on the rent. Otherwise, he is being chargednormally.
5) The discounted rent is being calculated after subtracting one day from the total number ofdays.
6) In the end, the module displays the followingdetails:
   a. Customer Name
   b. Days
   c. Rent

Note that, the function used for displaying purpose must not have the ability to modify any data member.

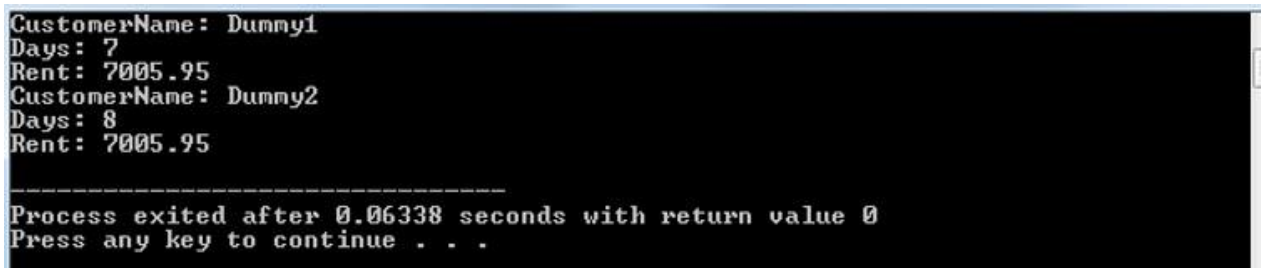
## INSTRUCTIONS

- The following class structure must befollowed:



- Use appropriate data types, return types and functionarguments.
- Display the results for two initializedinstances.

## REQUIRED OUTPUT



```
CustomerName: Dummy1
Days: 7
Rent: 7005.95
CustomerName: Dummy2
Days: 8
Rent: 7005.95

--------------------------------
Process exited after 0.06338 seconds with return value 0
Press any key to continue . . .
```

## QUESTION # 3

Define a class to represent a **Bank account**. Include the following members.

Data members: -

1. Name of thedepositor
2. Accountnumber.
3. Type ofaccount.
4. Balance amount in theaccount.
5. Rate ofinterest

Provide a default constructor, a parameterized constructor to this class.

Also provide Member Functions: -

1. To depositamount.
2. To withdraw amount after checking for minimumbalance.
3. To display all the details of an accountholder.
4. Display rate of interest (a staticfunction)

Illustrate all the constructors as well as all the methods by defining objects.