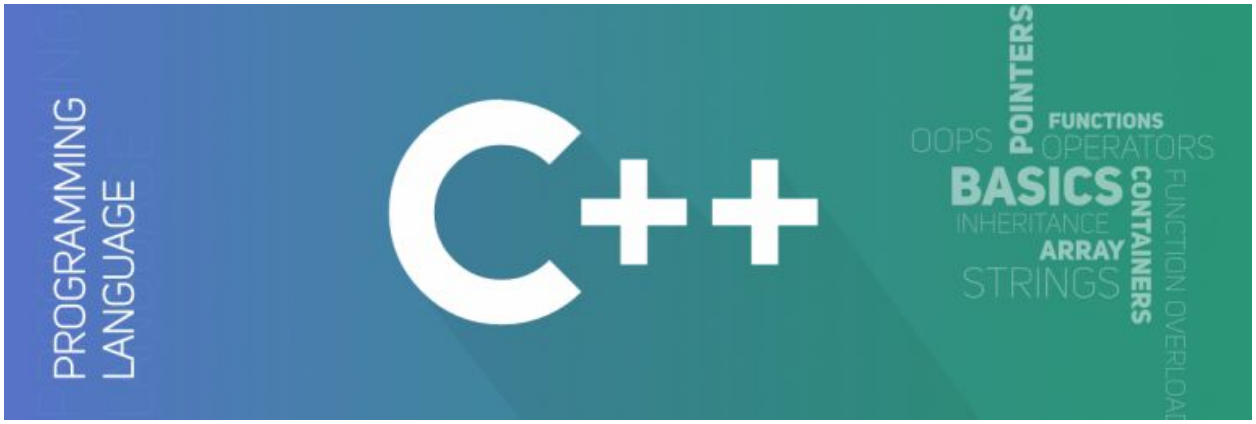

Case study : OOPs C++

“Learn with Examples”

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Overview

This case study is mainly focused on my projects which performs few functionalities of different OOP concepts in C++. This project is in Informative type with examples.

Description

In this case study, we're able to see how different OOP concepts work. There are 7 parts in this program, such as:

- Operator overloading
- Usage of functions and its types:

  -> Inline function

  -> Call by reference

  -> Inline functions

  -> Default arguments

  -> Functions overloading

- Pointers
- Exception handling
- Inheritance
- Constructors
- Objects as member function

Specifications

I'm gonna use some of the main OOP concepts, such as:

- Classes and Objects
- Functions
- Inheritance
- Polymorphism

Explanation

Polymorphism : The word polymorphism means having many forms. In simple words, we can define polymorphism as the ability of a message to be displayed in more than one form. A real-life example of polymorphism, a person at the same time can have different characteristics. Like a man at the same time is a father, a husband, an employee. So the same person possesses different behavior in different situations. This is called polymorphism. Polymorphism is considered as one of the important features of Object Oriented Programming.

Inheritance: The capability of a class to derive properties and characteristics from another class is called Inheritance. Inheritance is one of the most important feature of Object Oriented Programming. Sub Class: The class that inherits properties from another class is called Sub-class or Derived Class. Super Class:The class whose properties are inherited by sub-class is called Base Class or Super class.

Templates: A template is a simple and yet very powerful tool in C++. The simple idea is to pass data type as a parameter so that we don't need to write the same code for different data types. For example, a software company may need sort() for different data types. Rather than writing and maintaining the multiple codes, we can write one sort() and pass data type as a parameter.

Pointers: Pointers are symbolic representations of addresses. They enable programs to simulate call-by-reference as well as to create and manipulate dynamic data structures. It's general declaration in C/C++ has the format: Syntax: datatype *var_name; int *ptr; //ptr can point to an address which holds int data

Objects and Classes: A class is a blueprint for the object. A class is defined in C++ using keyword `class` followed by the name of the class. When a class is defined, only the specification for the object is defined; no memory or storage is allocated. To use the data and access functions defined in the class, we need to create objects.

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.

Source code

```
#include<iostream>

using namespace std;

//Part 1: operator overloading mainly, class, functions are used here
class space
{
      int x;
      int y;
      int z;
   public:
      void getdata(int a, int b ,int c);
      void display(void);
      void operator -(); //operator function for overloaded operator unary minus(-)
```

```
};

void space::getdata(int a, int b,int c)
{   x=a;//x=10
    y=b;//y=-11
    z=c;//z=12
}

void space::display()
{
    cout<<"x= "<<x<<endl;
    cout<<"y= "<<y<<endl;
    cout<<"z= "<<z<<endl;
}
void space::operator -()
{   x=-x; //x=10 , -10
    y=-y; //y=-11, 11
    z=-z; //z=12, -12
}

//Part 2: Functions part: Inline, function overloading, call by reference, default arguments are used here

int swap(int &a1,int &b1) //call by reference
{
    int temp=a1;
    a1=b1;
    b1=temp;
    cout<<"After swapping: value of x =" <<a1 <<"\t value of y = "<<b1<<endl;
    return 0;
```

```
}
inline float cube(int a1) //inline function
{
   cout<< " cube of 3 = " << a1*a1*a1<<endl;
}

float si(int p, int t, float r=0.15) // default argument
{
   cout<<"Simple interest: "<< p*t*r<<endl;
}

int add(int a1, int b1) //function overloadng with example of 5 functions
{
   return a1 + b1;
}

int add(int a1, int b1, int c1)
{
   return a1 + b1 + c1;
}

double add(double a1, double b1)
{
   return a1 + b1;
}

double add(double a1, int b1)
{
   return a1 + b1;
```

```
}

double add(int a1, double b1)
{
   return a1 + b1;
}

//Part 3: Using function pointers, base pointers and etc...

typedef int (*funptr)(int,int);
int add2(int x2, int y2)
{
   int sum2 = x2+y2;
   cout<<sum2<<endl;
}

int sub2(int x2, int y2)
{
   int sub2 = x2-y2;
   cout<<sub2;
}
class A
{
   int a2;
   void read()
   {
      this->a2=10;
      cout<<a2<<endl;
   }
```

```
    public:
    void display()
    {
        cout<<a2<<endl; //this pointer isn't used, hence a value isn't fetched
        read(); //this pointer used through read()
    }
    void display1()
    {
        this->a2=20;
        cout<<a2<<endl;
    }
};

class Base
{
    public:
        void display(){cout<<"in base display"<<endl;};
        virtual void show(){cout<<"in base show"<<endl;}
};
class Derived : public Base
{
    public:
        void display(){cout<<"in derived display"<<endl;};
        void show(){cout<<"in derived show"<<endl;}
};

//Part 4: Exception handling
double division(int a3, int b3)
{
```

```
   if( b3 == 0 )
   {
      throw "Division by zero condition!";
   }
return (a3/b3);
}

// Part 5: Finding rectangular area using Inheritance concepts
class Shape
{
   public:
      void setWidth(int w)
      {
         width = w;
      }
      void setHeight(int h)
      {
         height = h;
      }
   protected:
      int width;
      int height;
};
   // Derived class
class Rectangle: public Shape
{
   public:
      int getArea()
      {
```

```
        return (width * height);
    }
};


//Part 6- Constructors: Multiple constructors

class integer
{
   int m,n;
   public:
      integer()
      {
         m=0; n=0; //constructor 1
         cout<<m<<" "<<n<<endl;;
      }
      integer (int a, int b)
      {
         m=a; n=b;
         cout<<m<<" "<<n<<endl;;
      } //constructor 2
      integer (integer &i)
      {
         m=i.m; n=i.n;
         cout<<m<<" "<<n<<endl;;
      } // constructor 3
};

//Part 7: Objects as member functions
```

```
class ABC;
class XYZ
{
   int x7;
   public:
      void setvalue(int i7)
      {
         x7=i7;
      }

      friend void max(XYZ,ABC);
};

class ABC{
   int a7;
   public:
      void setvalue(int i7)
      {
         a7=i7;
      }
      friend void max(XYZ,ABC);

};

void max(XYZ m7,ABC n7)
{
   if(m7.x7>=n7.a7)
   {
      cout<<"greatest value is "<<m7.x7<<endl;
```

```
    }
    else
    {
        cout<<"greatest value is "<<n7.a7<<endl;
    }

}



int main()
{

cout<<"_____
_____"<<endl;
    cout<<"\t\t\tWelcome to this case study on OOP concepts with C++"<<endl;
    cout<<"\tThe details of this program are mentioned in the decritption part of the case
study!!"<<endl<<endl;

cout<<"_____
_____"<<endl;
    //Part 1
    cout<<"\n\n\tFirst we're gonna see how Operator overloading works!"<<endl;
    cout<<"We've inserted the values for three variables as x, y, and z
respectively"<<endl;
    space s;
    s.getdata(10,-11,12);
    s.display();
    cout<<"\n\tThe overloading part is invoked using the operator we assigned, which
hyphen '-' in this case(as used)."<<endl<<"Thereby, the results are as follows:" <<endl;
    -s;
    cout<<"\n";
```

```
    s.display();


    cout<<"\t Now, we're gonna see how functions part works with different types, such as, call by reference, inline functions, and when default arguments are used..."<<endl;



    //Part 2
    int m,n,x,y=1;       //call by reference
    cout<<"Before swapping: value of x = 2\t value of y = 3"<<endl;
    int swap1 = swap( m=2, n=3); // call by ref
    cout<<"\nDone by inline function"<<endl;
    float b = cube(3); //inline function
    cout<<"\nDefault arguments used in here, i.e., rate of interest is set to 15% "<<endl;
    float s1 = si(1000, 20 ); //default arguments
    cout<<"\nFunction overloading is shown using 5 examples below: "<<endl;
    cout<< add(5,10)<<endl; //function calls for function overloading
    cout<< add(5,10,15)<<endl;
    cout<< add(7.5,2.5)<<endl;
    cout<< add(5,10.5)<<endl;
    cout<< add(5.5,10)<<endl;



    //Part 3
    cout<<"\nUsing function pointers: "<<endl;
    cout<<"We've given the value of two variables as 3 and 2, which on addition gives the value '5', '1' on subtraction"<<endl;
    funptr ptr;
    ptr = &add2;
    ptr(3,2);
    ptr = &sub2;
```

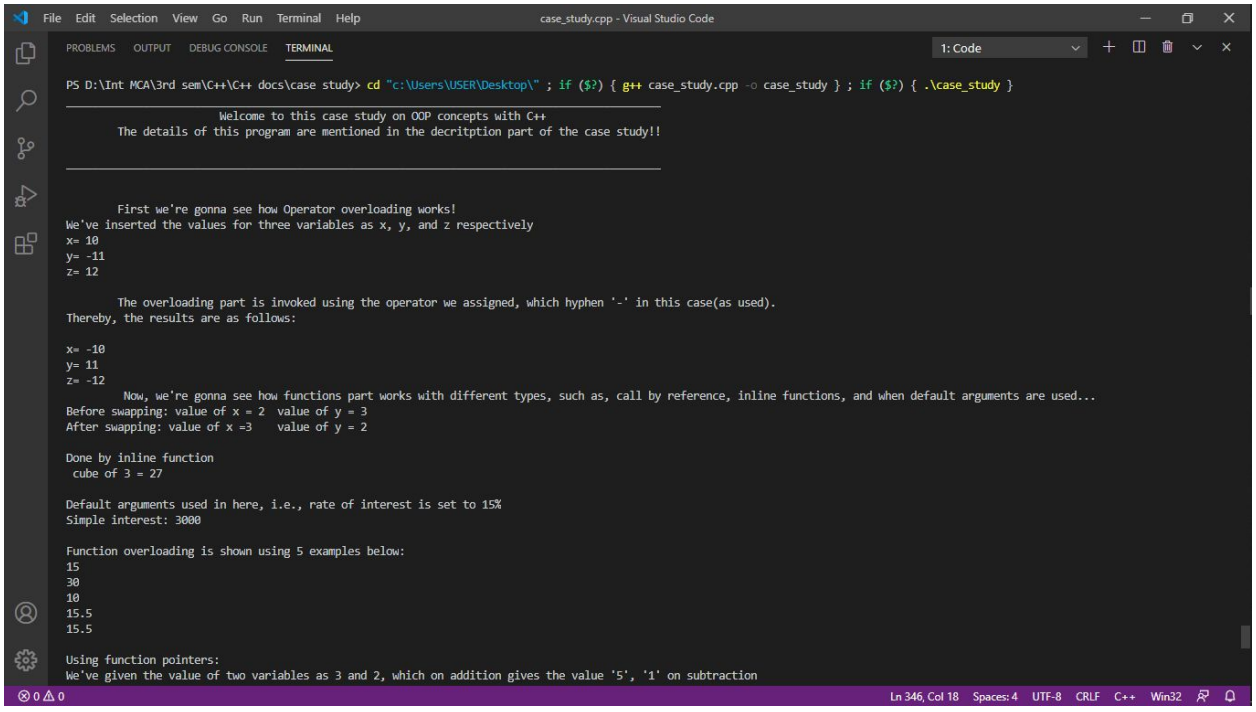
```
    ptr(3,2);
    cout<<endl;
    cout<<"\nHere, I've assigned 10 and 20 for two variables 'a' and 'b' respectively. And these variables are fetched using 'this pointer'! "<<endl;
    A aa;
    aa.display();
    aa.display1();
    cout<<"\n Here, base pointer is used to show differences like the way it works on it's usage!!\n";
    Base B;
    Derived D;
    Base *bptr;
    bptr = &B;
    bptr -> display();
    bptr -> show();
    bptr = &D;
    bptr -> display();
    bptr -> show();


    cout<<"\n\nException handling is used here, therefore message appeared when error is encountered!!"<<endl;


    //Part 4
    int x3 = 50;
    int y3 = 0;
    double z3 = 0;
    try
    {
       z3 = division(x3, y3);
       cout << z3 << endl;
```

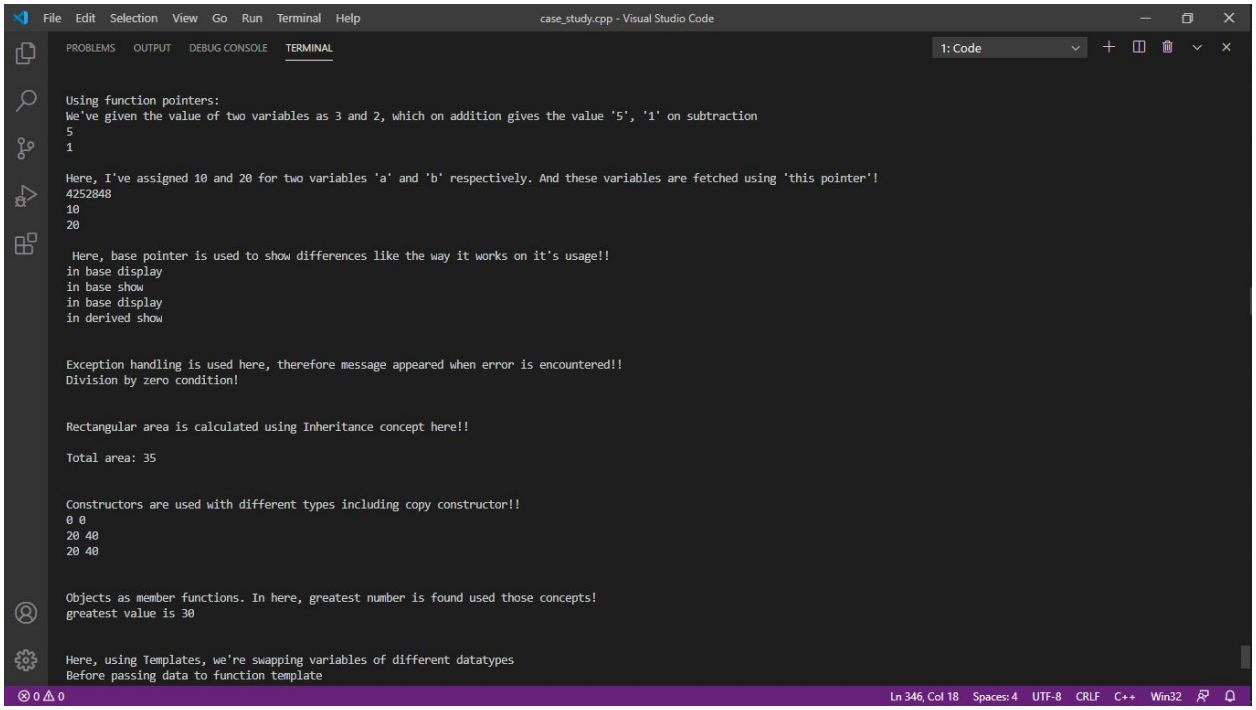
```
    } catch (const char* msg)
    {
        cerr << msg << endl;
    }

    cout<<"\n\nRectangular area is calculated using Inheritance concept here!!\n"<<endl;

    //Part 5
    Rectangle Rect;
    Rect.setWidth(5);//inherited member functions of base class shape
    Rect.setHeight(7);
    cout << "Total area: " << Rect.getArea() << endl;

    cout<<"\n\nConstructors are used with different types including copy
constructor!!"<<endl;
    //Part 6
    integer i1; //calls first constructor
    integer i2(20,40); //calls second constructor
    integer i3(i2); //calls third constructors

    cout<<"\n\nObjects as member functions. In here, greatest number is found used
those concepts!"<<endl;
    //Part 7
    XYZ d7;
    ABC b7;
    d7.setvalue(30);
    b7.setvalue(20);
    max(d7,b7);
```

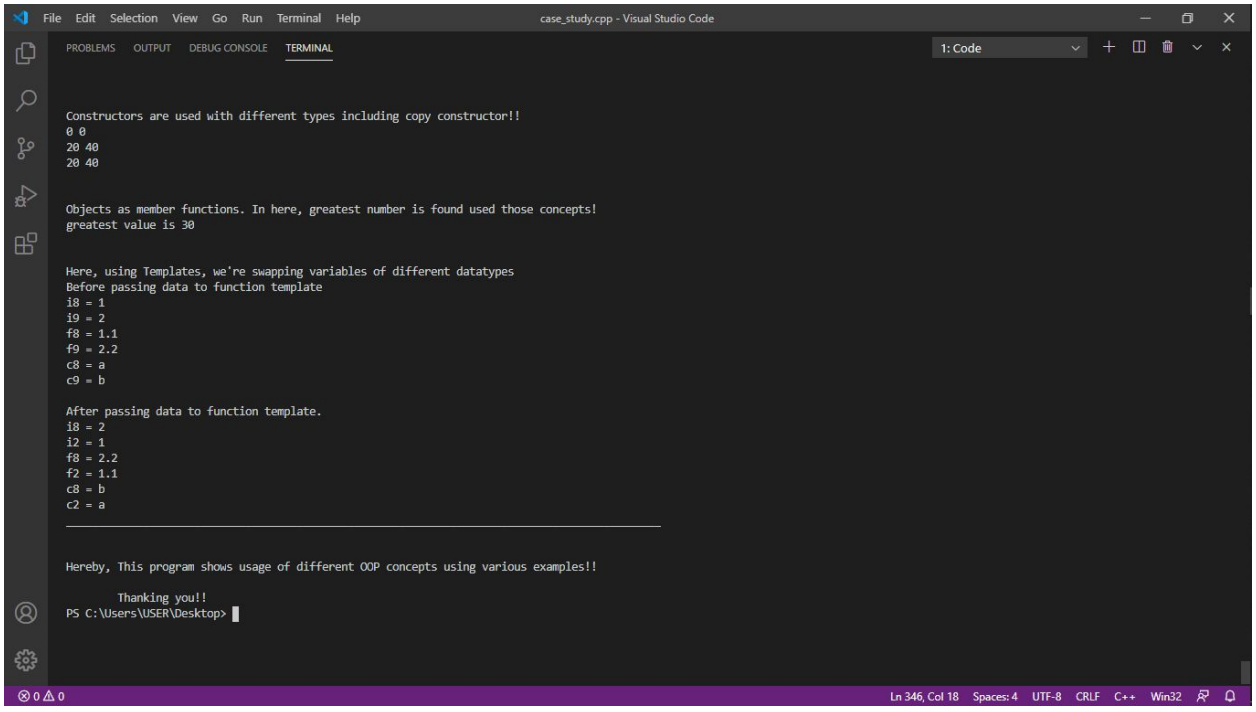
```
cout<<"\n_____
_____"<<endl;
   cout<<"\n\nHereby, This program shows usage of different OOP concepts using various examples!!"<<endl;
   cout<<"\n\tThanking you!!";

   return 0;
}
```

Output:

O







Hereby, I'm attaching my Google drive's link to view the codes too!

https://drive.google.com/file/d/1NCJWoeFwhm-lw-PiBH2lTzbECmjTSJ_G/view?usp=sharing