Program of OOP:

# Write a program to implement Constructor (Default , Parameterized and copy) and Destructor.

In C++, constructors are special member functions of a class that are used to initialize objects of that class when they are created. Similarly, the destructor is also a special member function of a class that is used to release resources held by objects of that class when they are destroyed.

Let's see how to implement Default, Parameterized, and Copy Constructor and Destructor in C++ OOP:

```cpp

#include<iostream>

using namespace std;

class Demo {

private:

int a,b;

public:

// Default Constructor

Demo() {

a = 0;

b = 0;

}

// Parameterized Constructor

Demo(int x, int y) {

a = x;

b = y;

}

// Copy Constructor

Demo(const Demo &d1) {

a = d1.a;

b = d1.b;

}

// Destructor

~Demo() {

cout<<"Object Destroyed"<<endl;

}

void display() {

cout<<"a = "<<a<<endl;

cout<<"b = "<<b<<endl;

}

};

int main() {

Demo d1, d2(10,20), d3(d2);

cout<<"Object d1 : "<<endl;

d1.display();

cout<<"Object d2 : "<<endl;

d2.display();

cout<<"Object d3 : "<<endl;

d3.display();

return 0;

}

```

Here, we have a class `Demo` which has two private member variables `a` and `b`. We have implemented a Default constructor that initializes these variables to 0, a Parameterized constructor that takes two integer arguments and initializes the member variables with the passed values, and a Copy constructor that initializes the member variables with the values of another object of the same class. We have also implemented the Destructor that displays a message when the object is destroyed.

In the main function, we have created three objects of the `Demo` class. `d1` uses the Default constructor to initialize the values to 0, `d2` uses the Parameterized constructor to initialize the values to 10 and 20, and `d3` uses the Copy constructor to initialize the values with the values of `d2`. We have then displayed the values of all three objects using the `display()` function.

Output:

```

Object d1 :

a = 0

b = 0

Object d2 :

a = 10

b = 20

Object d3 :

a = 10

b = 20

Object Destroyed

Object Destroyed

Object Destroyed

```

As we can see from the output, the constructors are called during the creation of objects, and the Destructor is called when the objects are destroyed.

1. Write a program to create class student with data members sno , sname, mark1, mark2, mark3 and give total marks and display details of 5 students.

#include<iostream>

using namespace std;

class student

{

Public:

int sno, mark1, mark2, mark3, total;

char sname[20];

void input()

{

cout<<"Enter the student details: "<<endl;

cout<<"Sno: ";

cin>>sno;

cout<<"Name: ";

cin>>sname;

cout<<"Mark1: ";

cin>>mark1;

cout<<"Mark2: ";

cin>>mark2;

cout<<"Mark3: ";

cin>>mark3;

total = mark1 + mark2 + mark3;

}

void display()

{

cout<<"Sno: "<<sno<<endl;

cout<<"Name: "<<sname<<endl;

cout<<"Mark1: "<<mark1<<endl;

cout<<"Mark2: "<<mark2<<endl;

cout<<"Mark3: "<<mark3<<endl;

cout<<"Total: "<<total<<endl<<endl;

}

};

int main()

{

student s[5];

for(int i=1;i<=5;i++)

{

s[i].input();

}

cout<<"Details of Students"<<endl;

for(int i=0;i<5;i++){

s[i].display();

}

return 0;

}

1. Write a program to create Student class with data members id,name and display details where name start with vowels(a,e,i,o,u).

#include<iostream>

using namespace std;

class Student

{

public:

int id;

string name;

void input()

{

cout<<"Enter student id: ";

cin>>id;

cout<<"Enter student name: ";

cin>>name;

}

void display()

{

if(name[0]=='a' || name[0]=='e' || name[0]=='i' || name[0]=='o' || name[0]=='u' ||

name[0]=='A' || name[0]=='E' || name[0]=='I' || name[0]=='O' || name[0]=='U')

{

cout<<"Id: "<<id;

cout<<" Name: "<<name<<endl;

}

}

};

int main()

{

Student std[10];

for(int i=0;i<10;i++){

std[i].input();

}

cout<<"\n\nDetails of students whose name start with vowels: \n";

for(int i=0;i<10;i++){

std[i].display();

}

return 0;

}

1. Write a menu driven program to create a class “Emp” containing member variables like eno, name and salary and perform following action:
   * + 1. Store details of 3 employees
       2. Search employee details as per ‘eno’.
       3. Give increment of 5000 to employee who has salary > 10000.

#include<iostream>

using namespace std;

class Emp {

int eno;

char name[20];

float salary;

public:

void input();

void display();

int get\_eno();

void increment\_salary();

};

void Emp::input()

{

cout<<"Enter employee details: "<<endl;

cout<<"Employee Number: ";

cin>>eno;

cout<<"Name: ";

cin>>name;

cout<<"Salary: ";

cin>>salary;

}

void Emp::display() {

cout<<"\nEmployee Details: "<<endl;

cout<<"Employee Number: "<<eno<<endl;

cout<<"Name: "<<name<<endl;

cout<<"Salary: "<<salary<<endl;

}

int Emp::get\_eno() {

return eno;

}

void Emp::increment\_salary() {

if(salary > 10000) {

salary += 5000;

}

}

int main() {

int choice;

Emp emp[3];

int emp\_no, idx;

do {

cout<<"\nMenu\n";

cout<<"1. Store details of 3 employees\n";

cout<<"2. Search employee details\n";

cout<<"3. Give increment to employee with salary > 10000\n";

cout<<"4. Exit\n";

cout<<"Enter your choice: ";

cin>>choice;

switch(choice) {

case 1:

for(int i=0; i<3; i++) {

emp[i].input();

}

break;

case 2:

cout<<"\nEnter employee number to search: ";

cin>>emp\_no;

for(int i=0; i<3; i++) {

if(emp\_no == emp[i].get\_eno()) {

emp[i].display();

break;

}

}

break;

case 3:

for(int i=0; i<3; i++) {

emp[i].increment\_salary();

}

cout<<"\nIncrement given successfully!\n";

break;

case 4:

cout<<"\nExiting...\n";

break;

default:

cout<<"\nInvalid choice!\n";

}

} while(choice != 4);

return 0;

}

-----------------------------------------------------------------------------------------------

#include<iostream>

#include<string>

using namespace std;

class Emp {

public:

int eno;

string name;

double salary;

void input();

void display();

};

void Emp::input() {

cout<<"Enter employee ID: ";

cin>>eno;

cout<<"Enter employee name: ";

cin>>name;

cout<<"Enter employee salary: ";

cin>>salary;

}

void Emp::display() {

cout<<"Employee ID: "<<eno<<endl;

cout<<"Employee Name: "<<name<<endl;

cout<<"Employee Salary: "<<salary<<endl;

}

int main() {

Emp e[3];

int eno;

int option;

bool found = false;

for(int i=0;i<3;i++)

{

e[i].input();

cout<<endl;

}

cout<<"Enter employee ID to search: ";

cin>>eno;

for(int i=0;i<3;i++)

{

if(e[i].eno==eno)

{

e[i].display();

found = true;

break;

}

}

if(!found)

cout<<"No employee found with this ID"<<endl;

else

{

for(int i=0;i<3;i++)

{

if(e[i].salary>10000)

e[i].salary+=5000;

}

cout<<"Salary updated successfully"<<endl;

for(int i=0;i<3;i++)

{

e[i].display();

}

}

return 0;

}

1. Write a program to enter string and reverse string and compare both strings which are same or not using string function.
2. #include <iostream>
3. **using** **namespace** std;
5. **int** main ()
6. {
7. // declare string variables
8. string str1;
9. string str2;
11. cout << " Enter the String 1: " << endl;
12. cin >> str1;
13. cout << " Enter the String 2: " << endl;
14. cin >> str2;
16. // use '==' equal to operator to check the equality of the string
17. **if** ( str1 == str2)
18. {
19. cout << " String is equal." << endl;
20. }
21. **else**
22. {
23. cout << " String is not equal." << endl;
24. }
25. **return** 0;
26. }

#include<iostream>

#include<stdio.h>

#include<string.h>

using namespace std;

int main()

{

char str[200], ch;

int i, j, len;

cout<<"Enter the String: ";

gets(str);

len = strlen(str);

j = len-1;

for(i=0; i<j; i++, j--)

{

ch = str[i];

str[i] = str[j];

str[j] = ch;

}

cout<<"\nReverse = "<<str;

cout<<endl;

return 0;

}

```cpp

#include<iostream>

#include<string>

using namespace std;

int main() {

string str1,str2;

cout<<"Enter a string: ";

getline(cin,str1); // Reading string with spaces

str2 = str1;

reverse(str1.begin(),str1.end()); // Reversing the string

cout<<"Reversed String: "<<str1<<endl;

if(str1.compare(str2)==0)

cout<<"Both strings are same"<<endl;

else

cout<<"Both strings are not same"<<endl;

return 0;

}

Output:

```

Enter a string: Hello World

Reversed String: dlroW olleH

Both strings are not same

```

1. Write a program to create Distance class and add distance(km,m) using Friend function.

#include <iostream>

using namespace std;

class Distance

{

private:

float km, m;

public:

Distance()

{

km = 0;

m = 0;

}

Distance(float km, float m)

{

this->km = km;

this->m = m;

}

friend void addDistance(Distance d1, Distance d2);

void display(){

cout << km << "km " << m << "m" << endl;

}

};

void addDistance(Distance d1, Distance d2) {

Distance d3;

d3.km = d1.km + d2.km;

d3.m = d1.m + d2.m;

if(d3.m >= 1000) {

d3.m -= 1000;

d3.km += 1;

}

cout << "The sum is: ";

d3.display();

}

int main() {

Distance d1(5, 780);

Distance d2(2, 120);

addDistance(d1, d2);

return 0;

}

# Write a program ‘<<’ and ‘>>’ Operator Overloading.

Operator overloading is a feature in C++ that allows operators to be redefined for a class. Let's see how to overload the `<<` and `>>` operators for a class.

```cpp

#include<iostream>

using namespace std;

class Point {

private:

int x,y;

public:

Point() {

x=0;

y=0;

}

friend ostream& operator<<(ostream& output, const Point& p)

{ output<<"X: "<<p.x<<" Y: "<<p.y<<endl;

return output;

}

friend istream& operator>>(istream& input, Point& p)

{

cout<<"Enter X coordinate: ";

input>>p.x;

cout<<"Enter Y coordinate: ";

input>>p.y;

return input;

}

};

int main() {

Point p1,p2;

// Using the overloaded >> operator to input coordinates

cin>>p1;

cin>>p2;

// Using the overloaded << operator to output coordinates

cout<<"Point 1: "<<p1;

cout<<"Point 2: "<<p2;

return 0;

}

In the `Point` class, we have overloaded the `<<` and `>>` operators using the `friend` keyword inside the class. We have also made the overloaded functions as friends, so that they can access the private members of the class.

In the main function, we have created two objects of the `Point` class `p1` and `p2`. We have then used the overloaded `>>` operator to input the coordinates of the points. After this, we have used the overloaded `<<` operator to output the coordinates of the points.

Output:

```

Enter X coordinate: 2

Enter Y coordinate: 3

Enter X coordinate: 4

Enter Y coordinate: 5

Point 1: X: 2 Y: 3

Point 2: X: 4 Y: 5

```

As an AI language model, I don't have the capability to write programs. However, let me provide you a sample code for operator overloading using the '>>' operator.

Suppose we have a class 'Person' that has two attributes, 'name' and 'age'. We want to overload the '>>' operator to allow the user to input values for these attributes using cin.

## Write a program ‘>>’ Operator Overloading.

#include <iostream>

using namespace std;

class Person {

private:

string name;

int age;

public:

Person(string name = "", int age = 0) {

this->name = name;

this->age = age;

}

friend istream& operator>>(istream& in, Person& p) {

cout << "Enter name: ";

in >> p.name;

cout << "Enter age: ";

in >> p.age;

return in;

}

void display() {

cout << "Name: " << name << endl;

cout << "Age: " << age << endl;

}

};

int main() {

Person p;

cin >> p;

p.display();

return 0;

}

```

In the above code, we define a friend function 'operator>>' that takes an istream object 'in' and a Person object 'p' as its arguments. Inside the function, we prompt the user to enter the name and age of the person using cout. We then read the input values using 'in' and store them in 'p.name' and 'p.age'. Finally, we return 'in' to allow cascading of the extraction operator '>>'.

In the main function, we create a Person object 'p' and use the overloaded '>>' operator to input values for its attributes using cin. We then display the attributes using the 'display' method.

Note: We have used 'friend' keyword in the 'operator>>' function to allow it access to private attributes of the 'Person' class.

## Write a program <<’ Operator Overloading.

As an AI language model, I do not have the capability to write a program in any programming language. However, as a concept, operator overloading is a way to define new behaviors for existing operators in a programming language. In the case of the "<<" operator, which is commonly used for outputting data in many programming languages, we can overload this operator to output data in a customized manner.

Here is an example of how operator overloading for "<<" operator can be done in C++:

```c++

#include <iostream>

using namespace std;

class MyClass {

public:

int x, y;

};

ostream& operator<<(ostream& stream, const MyClass& obj) {

stream << "MyClass(" << obj.x << ", " << obj.y << ")";

return stream;

}

int main() {

MyClass obj = {5, 10};

cout << obj << endl;

return 0;

}

```

In this example, we define a class called "MyClass" with two integer properties "x" and "y". We then overload the "<<" operator by defining a function that takes in an "ostream" object and a "const" reference to a "MyClass" object. Inside the function, we customize the output to display the values of "x" and "y" in a specific format.

In the main function, we create an instance of "MyClass" and output it using cout and the "<<" operator. The output will be "MyClass(5, 10)".

This is just one example of how operator overloading can be used to customize the behavior of an existing operator. The possibilities are endless and depend on the specific needs of your program.

# Write a program ‘++’ and ‘--‘ Operator Overloading.

Operator overloading is a feature in C++ that allows operators, such as ‘++’ and ‘--‘, to be redefined for a class. Let’s see how to implement the same:

```cpp

#include<iostream>

using namespace std;

class Counter {

private:

int count;

public:

Counter() {

count = 0;

}

void operator++()

{

count++;

}

void operator--() { // Operator overloading for --

count--;

}

void display() {

cout<<"Count: "<<count<<endl;

}

};

int main() {

Counter c1,c2;

cout<<"Inital Values: "<<endl;

c1.display();

c2.display();

++c1;

--c2;

cout<<"After increment and decrement: "<<endl;

c1.display();

c2.display();

return 0;

}

```

Here, we have a class `Counter` which has an integer member variable `count`. We have overloaded the `++` and `--` operator using the `operator` keyword.

In the main function, we have created two objects of the `Counter` class `c1` and `c2` and initialized their values to 0. We have then displayed the initial values of both objects.

We have then used the overloaded `++` and `--` operators to increment and decrement the values of `c1` and `c2` respectively. After this, we have again displayed the values to see the updated count.

Output:

```

Inital Values:

Count: 0

Count: 0

After increment and decrement:

Count: 1

Count: -1

```

1. Create a class shape with proper members. Apply function overloading find volume of cube and cylinder. (Hint volume of cube=a3, cylinder=πr2h).

#include <iostream>

using namespace std;

class Shape {

public:

void input() {}

void display() {}

};

class Square : public Shape {

private:

double length;

public:

void input() {

cout << "Enter the side length of the square: ";

cin >> length;

}

void display() {

cout << "Area of square with side " << length << " units is " << length\*length << " square units.\n";

}

};

class Circle : public Shape {

private:

double radius;

public:

void input() {

cout << "Enter the radius of the circle: ";

cin >> radius;

}

void display() {

cout << "Area of circle with radius " << radius << " units is " << 3.14\*radius\*radius << " square units.\n";

}

};

int main() {

Square s;

Circle c;

s.input();

s.display();

c.input();

c.display();

return 0;

}

```

1. Write a program to find area of square and circle using class.

#include <iostream>

using namespace std;

class Shape {

public:

void input() {}

void display() {}

};

class Square : public Shape {

private:

double length;

public:

void input() {

cout << "Enter the side length of the square: ";

cin >> length;

}

void display() {

cout << "Area of square with side " << length << " units is " << length\*length << " square units.\n";

}

};

class Circle : public Shape {

private:

double radius;

public:

void input() {

cout << "Enter the radius of the circle: ";

cin >> radius;

}

void display() {

cout << "Area of circle with radius " << radius << " units is " << 3.14\*radius\*radius << " square units.\n";

}

};

int main() {

Square s;

Circle c;

s.input();

s.display();

c.input();

c.display();

return 0;

}

Or

Create an abstract class “shape” which stores data members like length, breadth and radius. Create two classes “Circle” and “Rectangle” which stores data members like area respectively. Write a function to calculate area and display it.

Here is a program that finds the area of a square and circle using class in C++:

#include <iostream>

using namespace std;

class Shape {

public:

void input() {}

void display() {}

};

class Square : public Shape {

private:

double length;

public:

void input() {

cout << "Enter the side length of the square: ";

cin >> length;

}

void display() {

cout << "Area of square with side " << length << " units is " << length\*length << " square units.\n";

}

};

class Circle : public Shape {

private:

double radius;

public:

void input() {

cout << "Enter the radius of the circle: ";

cin >> radius;

}

void display() {

cout << "Area of circle with radius " << radius << " units is " << 3.14\*radius\*radius << " square units.\n";

}

};

int main() {

Square s;

Circle c;

s.input();

s.display();

c.input();

c.display();

return 0;

}

1. Write a program which will display information of a particular product. Product class have following properties:

Data Members: Pr\_no Pr\_name Quanity Price per unit

Methods:

constructor () - for insertion of a product information.

search ()- which will search information of product, search will be done by product name given by user.

display ()- which will display information of a product

#include<iostream>

#include<string>

using namespace std;

class Product{

private:

int pr\_no;

string pr\_name;

int quantity;

float price\_per\_unit;

public:

//Constructor

Product(){

cout<<"Enter product number: ";

cin>>pr\_no;

cout<<"Enter product name: ";

cin>>pr\_name;

cout<<"Enter quantity: ";

cin>>quantity;

cout<<"Enter price per unit: ";

cin>>price\_per\_unit;

cout<<endl;

}

//Search Method

bool search(string name){

if(pr\_name == name){

return true;

}

return false;

}

//Display Method

void display(){

cout<<"Product Number: "<<pr\_no<<endl;

cout<<"Product Name: "<<pr\_name<<endl;

cout<<"Quantity: "<<quantity<<endl;

cout<<"Price Per Unit: "<<price\_per\_unit<<endl;

cout<<endl;

}

};

int main(){

Product products[3];

string search\_name;

bool found = false;

//Search for a product

cout<<"Enter a product name to search: ";

cin>>search\_name;

for(int i=0; i<3; i++){

if(products[i].search(search\_name)){

products[i].display();

found = true;

}

}

if(!found){

cout<<"No product found with the name "<<search\_name<<endl;

}

return 0;

}

1. Write a program to create student class with data members rno and name.Sports class for sports details , marks class for marks of 3 subjects and result class to display total and percentage using Hybrid Inheritance.

```

#include<iostream>

using namespace std;

class Student{

protected:

int rno;

string name;

public:

void input(){

cout<<"Enter roll number: ";

cin>>rno;

cout<<"Enter name: ";

cin>>name;

}

void display(){

cout<<"Roll number: "<<rno<<endl;

cout<<"Name: "<<name<<endl;

}

};

class Sports{

protected:

string game;

int score;

public:

void input(){

cout<<"Enter the name of game: ";

cin>>game;

cout<<"Enter the score in "<<game<<": ";

cin>>score;

}

void display(){

cout<<"Game: "<<game<<endl;

cout<<"Score in "<<game<<": "<<score<<endl;

}

};

class Marks{

protected:

int m1, m2, m3;

public:

void input(){

cout<<"Enter marks in Subject 1: ";

cin>>m1;

cout<<"Enter marks in Subject 2: ";

cin>>m2;

cout<<"Enter marks in Subject 3: ";

cin>>m3;

}

void display(){

cout<<"Marks in Subject 1: "<<m1<<endl;

cout<<"Marks in Subject 2: "<<m2<<endl;

cout<<"Marks in Subject 3: "<<m3<<endl;

}

};

class Result: public Student, public Sports, public Marks{

private:

int total;

float percentage;

public:

void calculate(){

total = m1 + m2 + m3 + score;

percentage = (float)total / 4;

}

void display(){

Student::display();

cout<<"------------------"<<endl;

Sports::display();

cout<<"------------------"<<endl;

Marks::display();

cout<<"------------------"<<endl;

cout<<"Total marks: "<<total<<endl;

cout<<"Percentage: "<<percentage<<"%"<<endl;

}

};

int main(){

Result r;

r.input(); // Input details for student, sports and marks

r.calculate(); // Calculate total and percentage

r.display(); // Display all details

return 0;

}

1. Write a program to create a class Account with functions SetBalance and GetBalance to find Balance of and display the name of the Account and other essential component of the class. Create derived classes CheckingAccount and SavingsAccount each having overridden function GetBalance. Write a suitable program to illustrate virtual function.

#include <iostream>

using namespace std;

class Account {

protected:

string name;

double balance;

public:

Account(string name, double balance) {

this->name = name;

this->balance = balance;

}

void SetBalance(double balance) {

this->balance = balance;

}

double GetBalance() {

return balance;

}

};

class CheckingAccount : public Account {

public:

CheckingAccount(string name, double balance) : Account(name, balance) {}

double GetBalance() {

return balance \* 0.995;

}

};

class SavingsAccount : public Account {

public:

SavingsAccount(string name, double balance) : Account(name, balance) {}

double GetBalance() {

return balance \* 1.01;

}

};

void input(Account& account) {

double balance;

cout << "Enter balance: ";

cin >> balance;

account.SetBalance(balance);

}

void display(Account& account) {

cout << "Name: " << account.name << ", Balance: " << account.GetBalance() << endl;

}

int main() {

Account account("John", 1000);

CheckingAccount checkingAccount("Alice", 2000);

SavingsAccount savingsAccount("Bob", 3000);

input(account);

display(account);

display(checkingAccount);

display(savingsAccount);

return 0;

}

1. Create a base class media, declare two data members title and price. Derive two class tape and book from media. Declare display as virtual function in base class media and display details of both books (title, price, page) and tape (title, price, play time) details.

#include<iostream>

#include<string>

using namespace std;

class media {

public:

string title;

float price;

virtual void input() = 0;

virtual void display() = 0;

};

class book : public media {

public:

int pages;

void input() {

cout << "Enter the title of the book: ";

cin >> title;

cout << "Enter the price of the book: ";

cin >> price;

cout << "Enter the number of pages in the book: ";

cin >> pages;

}

void display() {

cout << "Title: " << title << endl;

cout << "Price: " << price << endl;

cout << "Pages: " << pages << endl;

}

};

class tape : public media {

public:

float play\_time;

void input() {

cout << "Enter the title of the tape: ";

cin >> title;

cout << "Enter the price of the tape: ";

cin >> price;

cout << "Enter the play time of the tape: ";

cin >> play\_time;

}

void display() {

cout << "Title: " << title << endl;

cout << "Price: " << price << endl;

cout << "Play Time: " << play\_time << endl;

}

};

int main() {

book b;

tape t;

// input and display book details

b.input();

b.display();

// input and display tape details

t.input();

t.display();

return 0;

}

```

Program of DS

1. Write a program to implement stack using array.
2. Write a program to implement infix to postfix conversion using stack.
3. Write a program to implement infix to prefix conversion using stack.
4. Write a program to implement simple Queue using array.
5. Write a program to implement IRDQ.
6. Write a program to implement ORDQ.
7. Write a program to implement Circular Queue.