Classes and objects

Q. what is the class?

Class is combination of state and behavior Here State means variable declared within class and behavior is function define under the class.

Or

Class is combination of data member and member function in C++. Data member means variable declared within class and member function means function define under the class.

Or

Class is combination of instance variable, class variable, method, constructor, instance initialize, static initialize and nested classes

How to declare the class in C++

```
        class classname
        {
            private:
            datatype variablename;

            protected :
             datattype variablename;
            public:
returntype  functionanme()
            {
            }
        };
```

Example

```
class ABC
{
   private :
    int no; //state or data member or instance variable.
    static int x; //class variable or static variable
   public:
   void setValue(int x) //method or member function or behaviour
   {
          no = x;
   }
   ABC() //constructor
   {
   }

};
```

In the class declaration we have the three new keywords private, public, protected

Q. What is the private, public and protected ?

---

private public and protected are the access specifier or visibility mode

.Q. what is the access specifier?

Access specifier are the some keywords in CPP or in OOP which is used for apply the restriction level or accessibility level for class and its member.

private: private access specifier not allow use the member outside of his class definition we must be access member inside of class definition.

public: public access specifier means member can access outside of class anywhere in program using its object.

protected: protected member can access only within child class

Note: protected concept we will discuss in inheritance.

Q. why use the class or what is the benefit of class?

There are three benefit of class

1) Ability to store different type of data

```
class Student
{
   private:
   char name[90],contact[90];
   int id;
   float per;
   public:
   void setData()
   {
      cout<<"Enter the name id per and contact of student\n";
      cin>>name>>id>>per>>contact;
   }
   void showData()
   {
    cout<<name<<"\t"<<id<<"\t"<<per<<"\t"<<contact<<"\n";
   }
};
```

If we think about above code it contain string,integer and float data type so we can say class is complex data structure.

Note:

Why use the variable class

Variable is used for store data in object or data holding

Why use the function in class

To write logics if we want to write any logical statement we must be writing within function we cannot write directly within class.

2) Provide the reusability

Means we can declare the class only once and we can reuse it more than one time.

Q. How we can reuse the class?

If we want to reuse the class then we have to create the object of class.

Q. what is the Object

Object is block of memory where class data store means when we create the object of class then CPP allocate block of class in memory and store the all variables or data in object.

Or

Object is run time entity Here entity means a class. This statement indicates object is run time class.

Or

Object is instance of class Here instance indicate example the meaning of this statement is object is an example of class

Or

Object is blueprint or Xerox of class means class and object contain same data but object reflect from or object represent as class so we can say it is blue print of class.

How to Create Object of class in CPP

If we want to create the object of class in CPP we have the following syntax

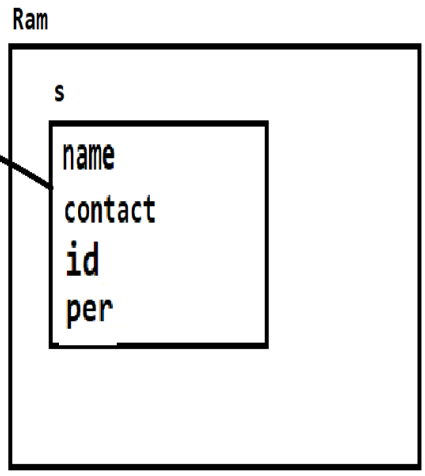
```
classname  objectname;

e.g Student s;
```

Here s is object of Student class and it contain the all data of student class means all variables of Student class

Following Diagram shows how s will store in memory

```
class Student
{
   private:
   char name[90],contact[90];
   int id;
   float per;
   public:
   void setData()
   {
      cout<<"Enter the name id per and contact of student\n";
      cin>>name>>id>>per>>contact;
   }
   void showData()
   {
    cout<<name<<"\t"<<id<<"\t"<<per<<"\t"<<contact<<"\n";
   }
};
```



If w wants to work with any class in CPP we have the some important steps.

a) Declare the class

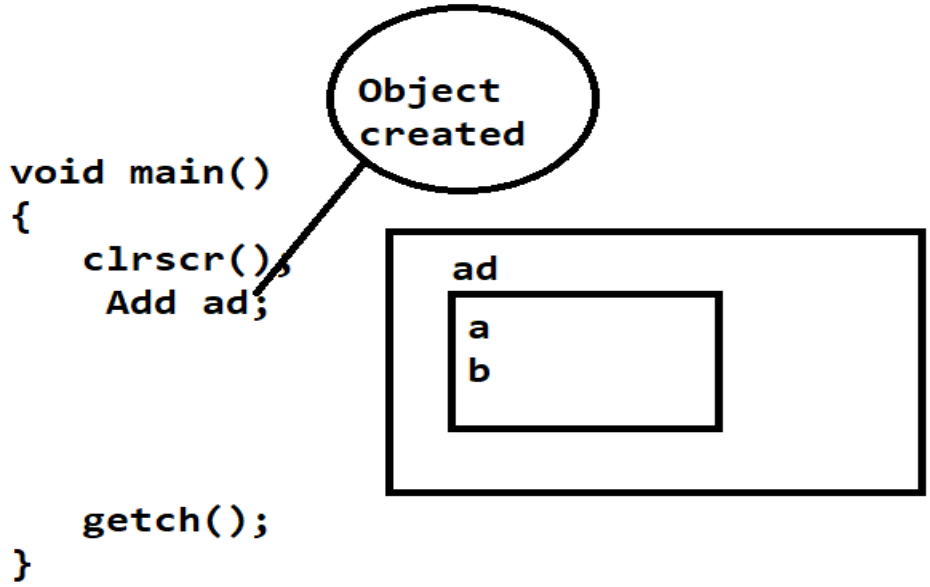
```
class Add
{
};
```

b) Define the function under the class and declare the variables.

```
class Add
{
    private:
    int a,b;
    public:
    void setData()
    {
         cout<<"Enter the two values"<<"\n";
         cin>>a>>b;
    }
    void showAdd()
    {
      cout<<"Addition is  "<<a+b;
    }
};
```

c) Create the object of class

```
#include<iostream.h>
#include<conio.h>
class Add
{
    private:
    int a,b;
    public:
    void setData()
    {
         cout<<"Enter the two values"<<"\n";
         cin>>a>>b;
    }
    void showAdd()
    {
      cout<<"Addition is  "<<a+b;
    }
};
```



d) Call Class member using object.membername

if we want to use the member of class we have syntax

Object. Public membername;

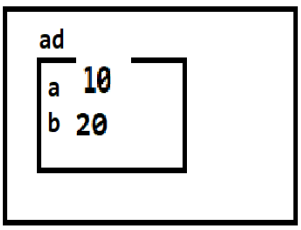
Example

```
#include<iostream.h>
#include<conio.h>
class Add
{
    private:
    int a,b;
    public:
    void setData()
    {
         cout<<"Enter the two values"<<"\n";
         cin>>a>>b;
    }
    void showAdd()
    {
      cout<<"Addition is  "<<a+b;
    }
};
```

```
void main()
{
   clrscr();
    Add ad;

ad.setData();
ad.showAdd();

   getch();
}
```




```
output
_________
Enter the two values
10
20
Addition is  30
```

Example

```
class Add
{ private:
  int a,b;
  public:
  void setData()
  {
    cout<<"\n\n\nenter the two values\n";
    cin>>a>>b;
  }
  void showAdd()
  {  cout<<"Addition is  "<<a+b;
  }
};
void main()
{  clrscr();
  Add ad;
  ad.setData();
  ad.showAdd();
  getch();
}
```

```
enter the two values
10
20
Addition is  30
```

3) Provide the encapsulation: encapsulation means to hide the implementation detail from end user at implementation level called as encapsulation or if we declare the class variable as private and access via public function called as encapsulation.

Following Code Demonstrate the Encapsulation process

```
class Student
{
   private :
    int id;
    char name[90];
    char contact;
    float per;
   public:
    void setDetail()
    { cout<<"Enter the name id contact and per"<<"\n";
      cin>>name>>id>>contact>>per;
    }
    void showDetail()
    { cout<<name<<"\t"<<id<<"\t"<<contact<<"\t"<<per<<"\n";
    }
};
```

In above code we declare the class variable as private and access via public function

Q. what is the benefit of encapsulation?

The Major benefit of encapsulation is data security is major benefit of encapsulation.

What is the data?

Data means variable declared within class. If we declare the variable as private then we cannot access variable or data directly outside of the class we can access the variable or data via public function and public function contain logic which decide data is accessible or not called as encapsulation.

Example

```
class Student
{
   private :
    int id;
    char name[90];
    char contact;
    float per;
   public:
    void setDetail()
    { cout<<"Enter the name id contact and per"<<"\n";
      cin>>name>>id>>contact>>per;
    }
                          messwala
   void showDetail(char type[])
   {     if(strcmp(type,"itcompany"))
         {  cout<<name<<"\t"<<id<<"\t"<<contact<<"\t"<<per<<"\n";
         }
         else{
            cout<<"Not access my student data";
        }
   }

};


 void main()
 {
     Student  s;

    s.setDetail();
    s.showDetail("itcompany");
 }
```

Example of Encapsulation

WAP to create the class name as Employee with variables name, id, salary of employee with two functions void setEmployeeDetail() and showEmployeeDetail(char type[]) in showEmployeeDetail function

we have small logics we want to show only id name of employee to security guard and id name and salary to manager and no access other than these two persons

```
#include<iostream.h>
#include<conio.h>

class Employee
{
    int id;
    char name[90];
    int sal;
    public:
    void setDetail()
    {
      cout<<"enter the name id and salary of employee\n";
      cin>>name>>id>>sal;
    }
    void showDetail(char type[])
    {
            if(strcmp(type,"security")==0)
            { cout<<name<<"\t"<<id<<"\n";
            }
            else if(strcmp(type,"manager")==0)
            { cout<<name<<"\t"<<id<<"\t"<<sal<<"\n";
            }
            else{
               cout<<"Not Access Data";
            }
    }
};

void main()
{
   clrscr();
   int choice
   cout<<"Enter your choice");
   cin>>choice;
   Employee emp;
   emp.setDetail();
   switch(choice)
   {
      case 1:
        emp.showDetail("security");
      break;
      case 2:
        emp.showDetail("manager");
      break;
      default:
         emp.showDetail("other");

   }


   getch();
}
```

2 1 2 manager

emp
id = 1
name = ram
sal = 10000

```
Enter the name id and salary of emplo
ram
1
10000
```

How to Define the class Function outside of class

If we define class function within class then function by default work as inline. In this case if we have large logical code in function definition we have the define the function outside of class.

How to Define the Function outside of class

If we define the function outside of class we have the use the scope resolution operator

Operator	meaning
::	scope resolution operator

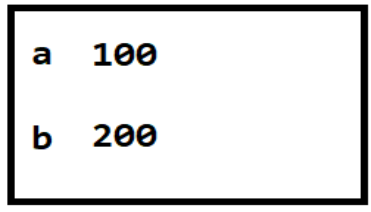
This operator indicates which member belongs from which class.

If we want to define the function outside of class definition we have the following syntax

Syntax: returntype classname::functionanme(arguments)
{
}

Example

```
#include<iostream.h>
#include<conio.h>
class Add
{  int a,b;
   public:
   void setValue(int x,int y);
   void showAdd();
};
void Add::setValue(int x,int y)
{                          100  200
   a=x;
   b=y;
}
void Add::showAdd()
{
   cout<<"Addition is  "<<a+b;
}
void main()
{
   clrscr();
     Add ad;
    ad.setValue(100,200);
     ad.showAdd();
   getch();
}
```



Addition is 300