Example

Create a class called "`MyClass`":

```
class MyClass {       // The class
  public:             // Access specifier
    int myNum;        // Attribute (int variable)
    string myString;  // Attribute (string variable)
};
```

Example explained

- The `class` keyword is used to create a class called `MyClass`.
- The `public` keyword is an **access specifier**, which specifies that members (attributes and methods) of the class are accessible from outside the class. You will learn more about access specifiers later.
- Inside the class, there is an integer variable `myNum` and a string variable `myString`. When variables are declared within a class, they are called **attributes**.
- At last, end the class definition with a semicolon `;`.

To create an object of `MyClass`, specify the class name, followed by the object name.

To access the class attributes (`myNum` and `myString`), use the dot syntax (`.`) on the object:

Example

Create an object called "`myObj`" and access the attributes:

```
class MyClass {       // The class
  public:             // Access specifier
    int myNum;        // Attribute (int variable)
    string myString;  // Attribute (string variable)
};

int main() {
  MyClass myObj;  // Create an object of MyClass

  // Access attributes and set values
  myObj.myNum = 15;
  myObj.myString = "Some text";

  // Print attribute values
  cout << myObj.myNum << "\n";
  cout << myObj.myString;
  return 0;
}
```

Multiple Objects

You can create multiple objects of one class:

Example

```
// Create a Car class with some attributes
class Car {
  public:
    string brand;
    string model;
    int year;
};

int main() {
  // Create an object of Car
  Car carObj1;
  carObj1.brand = "BMW";
  carObj1.model = "X5";
  carObj1.year = 1999;

  // Create another object of Car
  Car carObj2;
  carObj2.brand = "Ford";
  carObj2.model = "Mustang";
  carObj2.year = 1969;

  // Print attribute values
  cout << carObj1.brand << " " << carObj1.model << " " << carObj1.year << "\n";
  cout << carObj2.brand << " " << carObj2.model << " " << carObj2.year << "\n";
  return 0;
}
```

- Access Modifiers or Access Specifiers in a class are used to set the accessibility of the class members. That is, it sets some restrictions on the class members not to get directly accessed by the outside functions.
- There are 3 types of access modifiers available in C++:
- **Public**
- **Private**
- **Protected**
- **Note**: If we do not specify any access modifiers for the members inside the class then by default the access modifier for the members will be **Private**.

Public

All the class members declared under public will be available to everyone. The data members and member functions declared public can be accessed by other classes too. The public members of a class can be accessed from anywhere in the program using the direct member access operator (.) with the object of that class.

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

// class definition
class Circle
{
    public:
        double radius;

        double  compute_area()
        {
            return 3.14*radius*radius;
        }

};

// main function
int main()
{
    Circle obj;

    // accessing public datamember outside class
    obj.radius = 5.5;

    cout << "Radius is: " << obj.radius << "\n";
    cout << "Area is: " << obj.compute_area();
    return 0;
}
```

ut:

```
ius is: 5.5
a is: 94.985
```

Private

- The class members declared as *private* can be accessed only by the functions inside the class. They are not allowed to be accessed directly by any object or function outside the class. Only the member functions or the friend functions are allowed to access the private data members of a class.

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

class Circle
{
    // private data member
    private:
        double radius;

    // public member function
    public:
        double  compute_area()
        {   // member function can access private
            // data member radius
            return 3.14*radius*radius;
        }

};

// main function
int main()
{
    // creating object of the class
    Circle obj;

    // trying to access private data member
    // directly outside the class
    obj.radius = 1.5;

    cout << "Area is:" << obj.compute_area();
    return 0;
}
```

The output of above program will be a compile time error because we are not allowed to access the private data members of a class directly outside the class.

Output:

```
 In function 'int main()':
11:16: error: 'double Circle::radius' is private
         double radius;
                ^
31:9: error: within this context
     obj.radius = 1.5;
         ^
```

However, we can access the private data members of a class indirectly using the public member functions of the class. Below program explains how to do this:

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

class Circle
{
    // private data member
    private:
        double radius;

    // public member function
    public:
        void compute_area(double r)
        {   // member function can access private
            // data member radius
            radius = r;

            double area = 3.14*radius*radius;

            cout << "Radius is: " << radius << endl;
            cout << "Area is: " << area;
        }

};

// main function
int main()
{
    // creating object of the class
    Circle obj;

    // trying to access private data member
    // directly outside the class
    obj.compute_area(1.5);


    return 0;
}
```

In the following example, we demonstrate the differences between `public` and `private` members:

Example

```
class MyClass {
  public:    // Public access specifier
    int x;   // Public attribute
  private:   // Private access specifier
    int y;   // Private attribute
};

int main() {
  MyClass myObj;
  myObj.x = 25;  // Allowed (public)
  myObj.y = 50;  // Not allowed (private)
  return 0;
}
```

If you try to access a private member, an error occurs:

```
error: y is private
```

- It is possible to access private members of a class using a public method inside the same class. (Encapsulation)
- **Tip:** It is considered good practice to declare your class attributes as private (as often as you can). This will reduce the possibility of yourself (or others) to mess up the code. This is also the main ingredient of the Encapsulation concept,
- **Note:** By default, all members of a class are private if you don't specify an access specifier:
- Example
- class MyClass {
  int x; // Private attribute
  int y; // Private attribute
  };

- Example explained
- The salary attribute is private, which have restricted access.
- The public setSalary() method takes a parameter (s) and assigns it to the salary attribute (salary = s).
- The public getSalary() method returns the value of the private salary attribute.
- Inside main(), we create an object of the Employee class. Now we can use the setSalary() method to set the value of the private attribute to 50000. Then we call the getSalary() method on the object to return the value.

- The meaning of **Encapsulation**, is to make sure that "sensitive" data is hidden from users. To achieve this, you must declare class variables/attributes as private (cannot be accessed from outside the class). If you want others to read or modify the value of a private member, you can provide public **get** and **set** methods.
-

Access Private Members

- To access a private attribute, use public "get" and "set" methods:

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

class Employee {
  private:
    // Private attribute
    int salary;

  public:
    // Setter
    void setSalary(int s) {
      salary = s;
    }
    // Getter
    int getSalary() {
      return salary;
    }
};

int main() {
  Employee myObj;
  myObj.setSalary(50000);
  cout << myObj.getSalary();
  return 0;
}
```

Why Encapsulation?

- It is considered good practice to declare your class attributes as private (as often as you can). Encapsulation ensures better control of your data, because you (or others) can change one part of the code without affecting other parts
- Increased security of data

Protected

- Protected access modifier is similar to that of private access modifiers, the difference is that the class member declared as Protected are inaccessible outside the class but they can be accessed by any subclass(derived class) of that class.

```cpp
using namespace std;

// base class
class Parent
{
    // protected data members
    protected:
    int id_protected;

};

// sub class or derived class
class Child : public Parent
{


    public:
    void setId(int id)
    {

        // Child class is able to access the inherited
        // protected data members of base class

        id_protected = id;

    }

    void displayId()
    {
        cout << "id_protected is: " << id_protected << endl;
    }
};

// main function
int main() {

    Child obj1;

    // member function of the derived class can
    // access the protected data members of the base class

    obj1.setId(81);
    obj1.displayId();
    return 0;
}
```