LAB NO. 05

CLASSES IN C++

Lab Objectives

Following are the lab objectives:

1. C++ Class
2. C++ Objects
3. Class Member Functions
   - Inside the class definition
   - Outside the class definition

Instructions

- This is individual Lab work/task.
- Complete this lab work within lab timing.
- Discussion with peers is not allowed.
- Copy paste from Internet will give you **negative marks**.
- Lab work is divided into small tasks, complete all tasks sequentially.

Object Oriented Programming

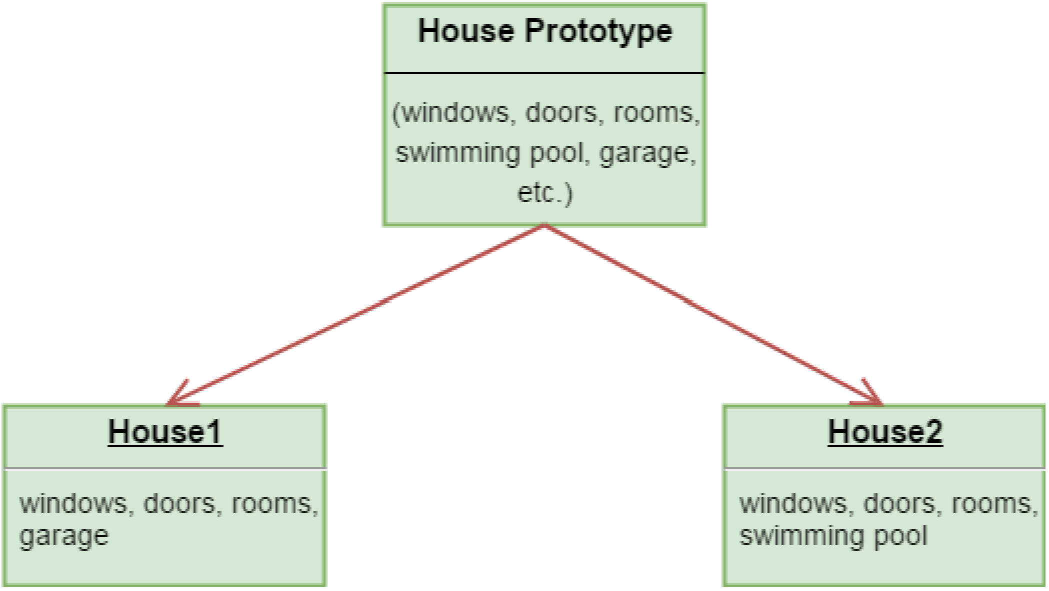
Suppose, we need to store the length, breadth, and height of a rectangular room and calculate its area and volume. To handle this task, we can create three variables, say, length, breadth, and height along with the functions calculateArea() and calculateVolume().

However, in C++, rather than creating separate variables and functions, we can also wrap these related data and functions in a single place (by creating objects). This programming paradigm is known as object-oriented programming.

C++ Class

A C++ class combines data and methods for manipulating the data into one. Classes also determine the forms of objects. The data and methods contained in a class are known as class members. A class is a user-defined data type. To access the class members, we use an instance of the class. You can see a class as a blueprint for an object.

A class be a prototype for a house. It shows the location and sizes of doors, windows, floors, etc. From these descriptions, we can construct a house. The house becomes the object. It's possible to create many houses from the prototype. Also, it's possible to create many objects from a class.


House Prototype
(windows, doors, rooms, swimming pool, garage, etc.)
House1
windows, doors, rooms, garage
House2
windows, doors, rooms, swimming pool

In the above figure, we have a single house prototype. From this prototype, we have created two houses with different features.

Class Declaration

In C+, a class is defined using the class keyword. This should be followed by the class name. The class body is then added between curly braces { }.

Syntax:

Class class-name

```
  {
  // data
  // functions
  };
```

- The class-name is the name to assign to the class.
- The data is the data for the class, normally declared as variables.
- The functions are the class functions.

Private and Public Keywords

You must have come across these two keywords. They are access modifiers.

Private:

When the private keyword is used to define a function or class, it becomes private. Such are only accessible from within the class.

Public:

The public keyword, on the other hand, makes data/functions public. These are accessible from outside the class.

Object Definition

Objects are created from classes. Class objects are declared in a similar way as variables are declared. The class name must start, followed by the object name. The object of the class type.

Syntax:

```
class-name object-name;
```

- The class-name is the name of the class from which an object is to be created.
- The object-name is the name to be assigned to the new object.

This process of creating an object from a class is known as instantiation.

Accessing Data Members

To access public members of a class, we use the (.)dot operator. These are members marked with public access modifier.

Example 1:

```
#include <iostream>
using namespace std;
class Phone {
```

```
public:
        double cost;
        int slots;
};
int main() {
        Phone Y6;
        Phone Y7;
        Y6.cost = 100.0;
        Y6.slots = 2;
        Y7.cost = 200.0;
        Y7.slots = 2;
        cout << "Cost of Huawei Y6 : " << Y6.cost << endl;
        cout << "Cost of Huawei Y7 : " << Y7.cost << endl;
        cout << "Number of card slots for Huawei Y6 : " << Y6.slots << endl;
        cout << "Number of card slots for Huawei Y7 : " << Y7.slots << endl;
        return 0;
}
```

Class Member Functions

Functions help us manipulate data. Class member functions can be defined in two ways:

- Inside the class definition
- Outside the class definition

If a function is to be defined outside a class definition, we must use the scope resolution operator (::). This should be accompanied by the class and function names.

Example 2:

```
#include <iostream>
#include <string>
using namespace std;
class Name
{
public:
    string tutorial_name;
    int id;
    void printname();
    void printid()
    {
        cout << "class id is: "<< id;
    }
};
void Name::printname()
{
    cout << "class name is: " << class_name;
}
int main() {
    Name n1;
    n1.class_name = "C++";
    n1.id = 1001;
    n1.printname();
    cout << endl;
    n1.printid();
    return 0;
}
```

Example 3: Using public and private in C++ Class

```
#include <iostream>
using namespace std;
class Room {
   private:
    double length;
    double breadth;
    double height;
```

```
  public:
    // function to initialize private variables
    void getData(double len, double brth, double hgt) {
        length = len;
        breadth = brth;
        height = hgt;
    }
    double calculateArea() {
        return length * breadth;
    }
    double calculateVolume() {
        return length * breadth * height;
    }
};
int main() {
    // create object of Room class
    Room room1;
    // pass the values of private variables as arguments
    room1.getData(42.5, 30.8, 19.2);
    cout << "Area of Room =  " << room1.calculateArea() << endl;
    cout << "Volume of Room =  " << room1.calculateVolume() << endl;
    return 0;
}
```

Lab Tasks

Q1). Write a C++ program to create student class that contains attributes of the student name, roll no, and total-marks. Write two functions to get and display these attributes.

Write a C++ program to create a class name as arithmetic_operations with two attributes (number 1 and number 2). Write four functions addition, subtraction, multiplication and division. Program menu should be user friendly.

Home Activity

Q.3. Create a class named “Student” with a string variable “name” and an integer variable “roll_no”. Assign the value of roll_no as “101” and that of name as "Ali" by creating an object of the class Student.

Q4. Write a C++ program to print the area of a rectangle by creating a class named 'Area' having two functions. First function named as “Set_Dim” takes the length and breadth of the rectangle as parameters and the second function named as 'Get_Area' returns the area of the rectangle. Length and breadth of the rectangle are entered through user.