SVKM'S NMIMS Deemed-to-be UNIVERSITY	SVKM's NMIMS Mukesh Patel School of Technology Management & Engineering / School of Technology Management & Engineering	
B. Tech/MBA Tech	**Workbook**	**Academic Year- 2024-25**
Year:-First	**Subject:-** Programming for Problem Solving	**Semester: - First**

Experiment: 9

PART A

(PART A: TO BE REFERRED BY STUDENTS)

Aim: Programming using object-oriented programming concepts (using data members and member functions)

Learning Outcomes: The learner would be able to

1. Understand the concept of object-oriented programming
2. Solve problems using class and objects
3. Implement programming using overloading of functions

Theory:

Note: - Theory part is continued from page number two.

Tasks:

1. Create a class named 'Employee' with a string (char array) variable 'name' and float variable 'salary'. Assign the value of salary as 20000.67 and that of name as "Scott" in main( ) function by creating an object of the class Employee and display the same.
2. Create a class Employee having data members name, salary & department and define two member function getData( ) & showData( ) for taking input & display the same. Write a complete C++ code for displaying the information of a Employee.
3. Create a student record (name, rollno, marks of 3 subjects and score), calculate the average, store average in a score data member. If score<40, declare FAIL else PASS along with student details, maintain 10 students records. (make use of member function to read and display records)
4. Write a program to overload sum function to perform addition of two integers, three integers and two floating-point numbers.
5. Create a class named "Shapes" with data member area. Write a member function "calArea" with two float parameters to calculate the area of rectangle and overload the same function having one float parameter to calculate the area of square.

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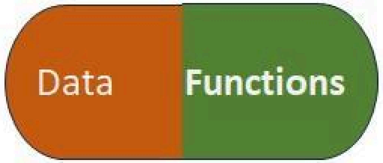
What is Object Oriented Programming (OOP)

If any programming language supports **Encapsulation**, **Polymorphism**, **Inheritance** and **Abstraction** etc. is called as **OOP**

Encapsulation:-

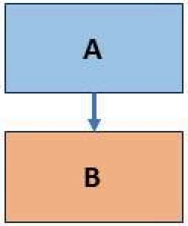
- Binding/Wrapping of data to its related functions into a single unit
- In OOP we can achieve encapsulation by creating Class & Objects.



```
class Test {
      int a ; //Data
      void show(){ //Function
      }
};
```

Inheritance:-

- Inherence is reusability (of encapsulation).
- Child/Derived/ Sub Class inherits the properties of Parent/Base/ Super Class.



```
class Base{
}

class Derived : Base{
}
```

Polymorphism (many forms):-

- Defining multiple functions with same name
- These functions with same name, will show different behaviours
- There are two types of polymorphism → Static(Overloading) & Dynamic(Overriding)

```
void area(float radius){
      cout<<3.147*radius;
}
```

```
void area(int base, int ht ){
      cout<<(0.5*base*ht);
}
```

Here, area() function is showing two behaviors,
1. Finding Area of Circle
2. Finding Area of right angle triangle
This is function overloading

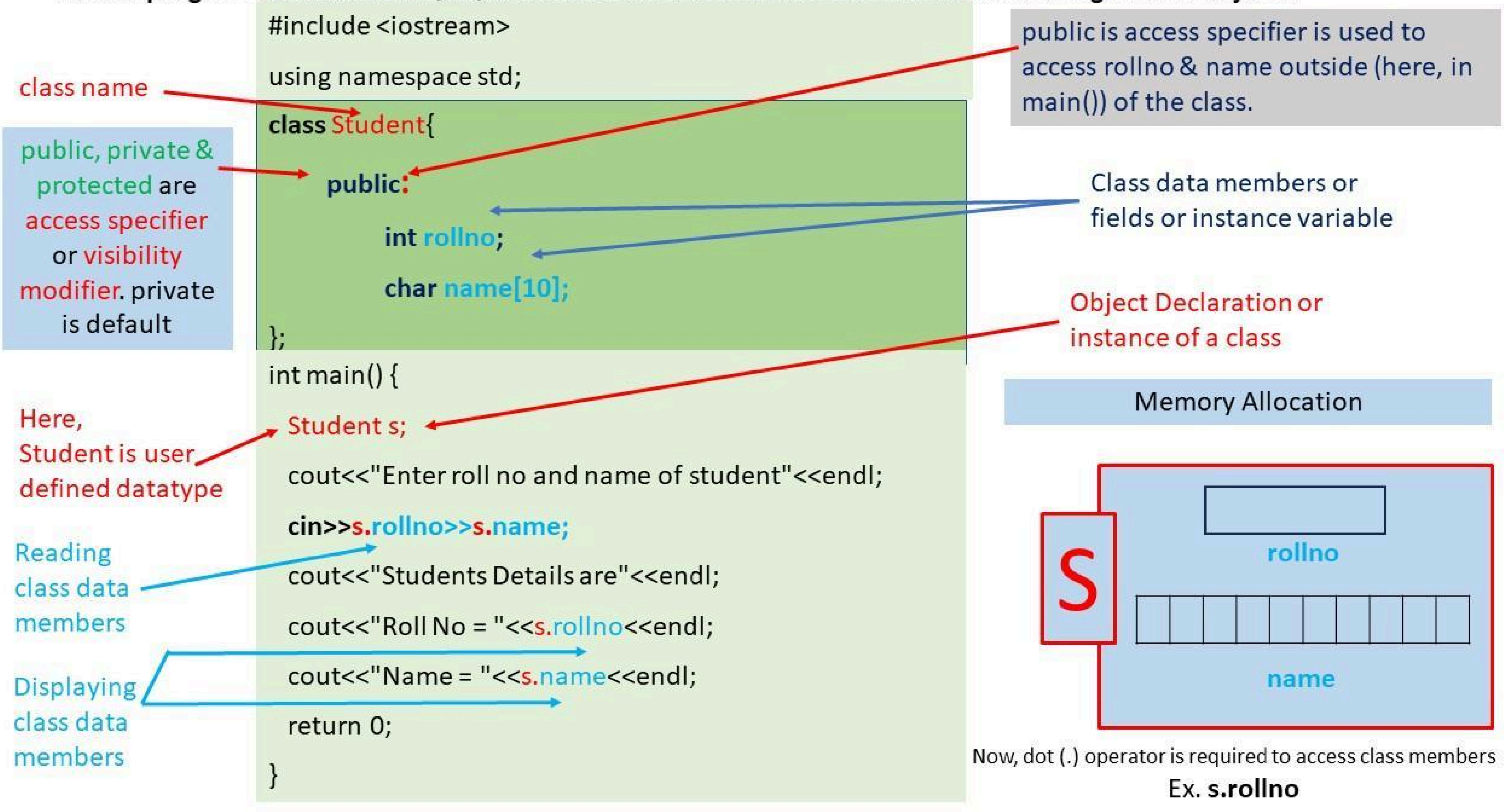
Abstraction:-

- It hides the implementation details.
- A Class can decide which member will be visible to the outside of class
- cin>> & cout<< implementation details are in iostream, which is hidden

```
#include<iostream>
#include<math.h>
using namespace std;
int main(){
      cout<< sqrt(25);
      return 0;
}
```

Here, implementation details of sqrt() is hidden as it is in math.h and details of cout<< is also hidden as it is in iostream... this way abstraction is achieved

Write a program to read and display Student information like roll number & name using class & Object...



```
#include <iostream>

using namespace std;

class Student{

      public:

            int rollno;

            char name[10];

};
int main() {

  Student s;

  cout<<"Enter roll no and name of student"<<endl;

  cin>>s.rollno>>s.name;

  cout<<"Students Details are"<<endl;

  cout<<"Roll No = "<<s.rollno<<endl;

  cout<<"Name = "<<s.name<<endl;

  return 0;

}
```

class name

public, private & protected are access specifier or visibility modifier. private is default

public is access specifier is used to access rollno & name outside (here, in main()) of the class.

Class data members or fields or instance variable

Object Declaration or instance of a class

Here, Student is user defined datatype

Reading class data members

Displaying class data members

Memory Allocation

Now, dot (.) operator is required to access class members

Ex. **s.rollno**

Classes and Objects

Class:

- A class is user defined data type
- A class is blueprint of an object
- One class can have many objects

Syntax of class definition

```
class classname{
            access_specifier:
                        datatype datamember$_1$;
                        :
                        datatype datamember$_n$;
            access_specifier:
                        type memberfunction$_1$( ){
                                    //body
                        }
                        :
                        type memberfunction$_n$( ){
                                    //body
                        }
};
```

Objects:

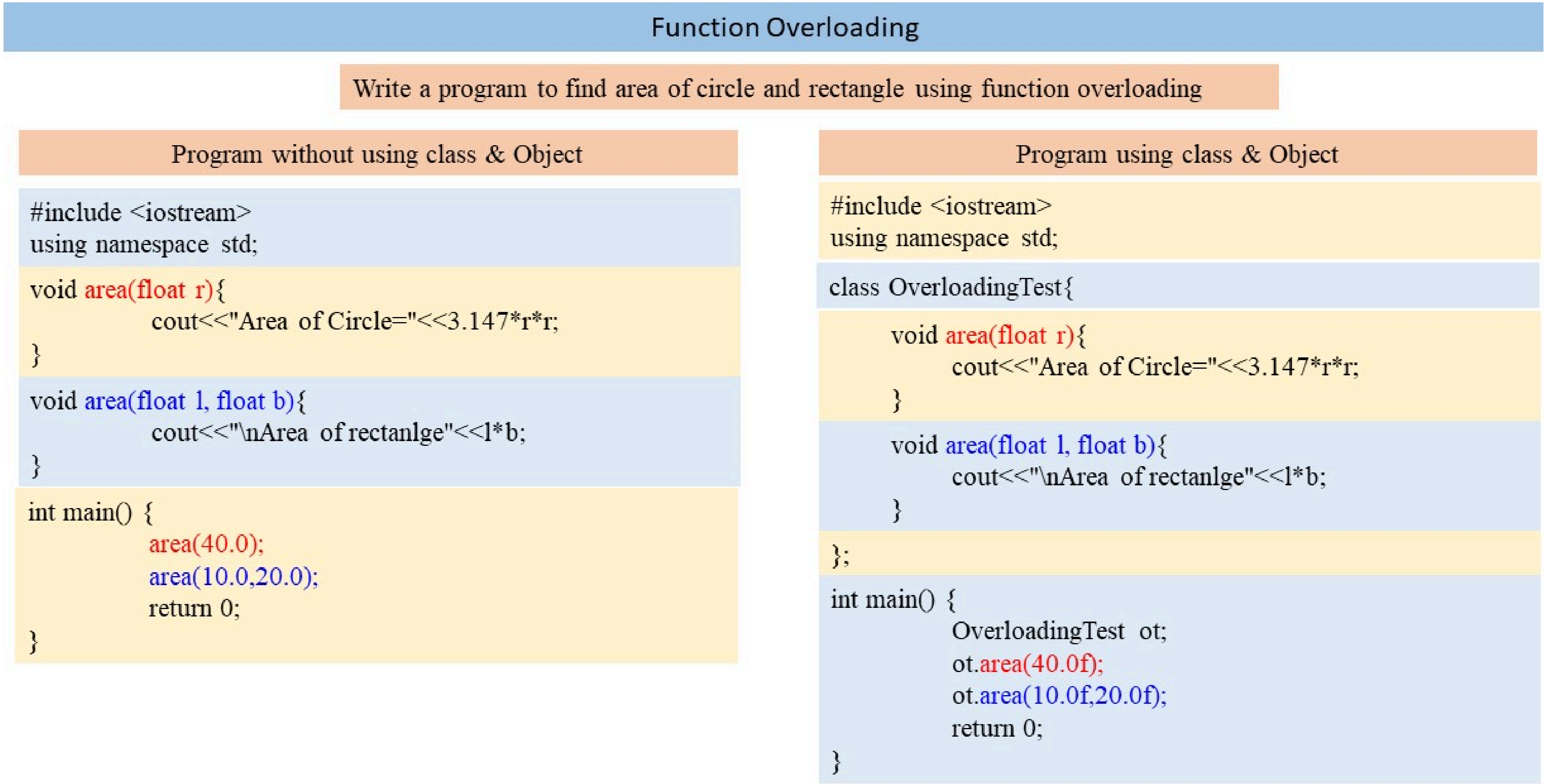
- object is an instance of a class
- due to objects class comes to the existence
- Object have access to members of a class.

Syntax of object declaration

```
classname  objectname;
```

Define a class Cricket with data members player_name, team_name & batting_average and Member Function as read( ) and display( ). Write C++ program to read and display information of a players of a team.

```
class Cricket{
      private:
            char player_name10];
            char team_name[10];
            float batting_average;
      public:
            void read( ){
                  cout<< “Enter Player name,Team  name & bat avg of player\n”;
                  cin>>player_name>>team_name>>batting_average;
            }
            void display( ){
                  cout<< “Player Name=”<<player_name;
                  cout<< “Team Name”<<team_name;
                  cout<< “Batting Avg=”<<batting_average;
            }
};
int main( ){
      Cricket p;
      p.read( );
      p.display( );
      return 0;
}
```



Function Overloading

Write a program to find area of circle and rectangle using function overloading

Program without using class & Object

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

void area(float r){
        cout<<"Area of Circle="<<3.147*r*r;
}

void area(float l, float b){
        cout<<"\nArea of rectanlge"<<l*b;
}

int main() {
        area(40.0);
        area(10.0,20.0);
        return 0;
}
```

Program using class & Object

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

class OverloadingTest{

    void area(float r){
        cout<<"Area of Circle="<<3.147*r*r;
    }

    void area(float l, float b){
        cout<<"\nArea of rectanlge"<<l*b;
    }

};

int main() {
        OverloadingTest ot;
        ot.area(40.0f);
        ot.area(10.0f,20.0f);
        return 0;
}
```