Unit 1: Introduction to Object Oriented Programming

3 hours

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Introduction to Object Oriented Programming (3 hrs)

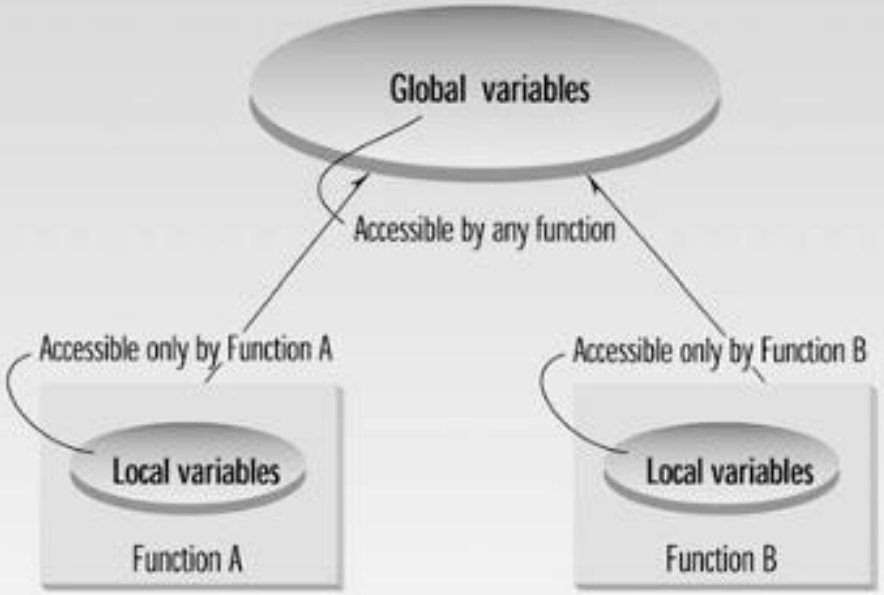
- Overview of structured programming approach,
- Object oriented programming approach,
- Characteristics of object oriented languages

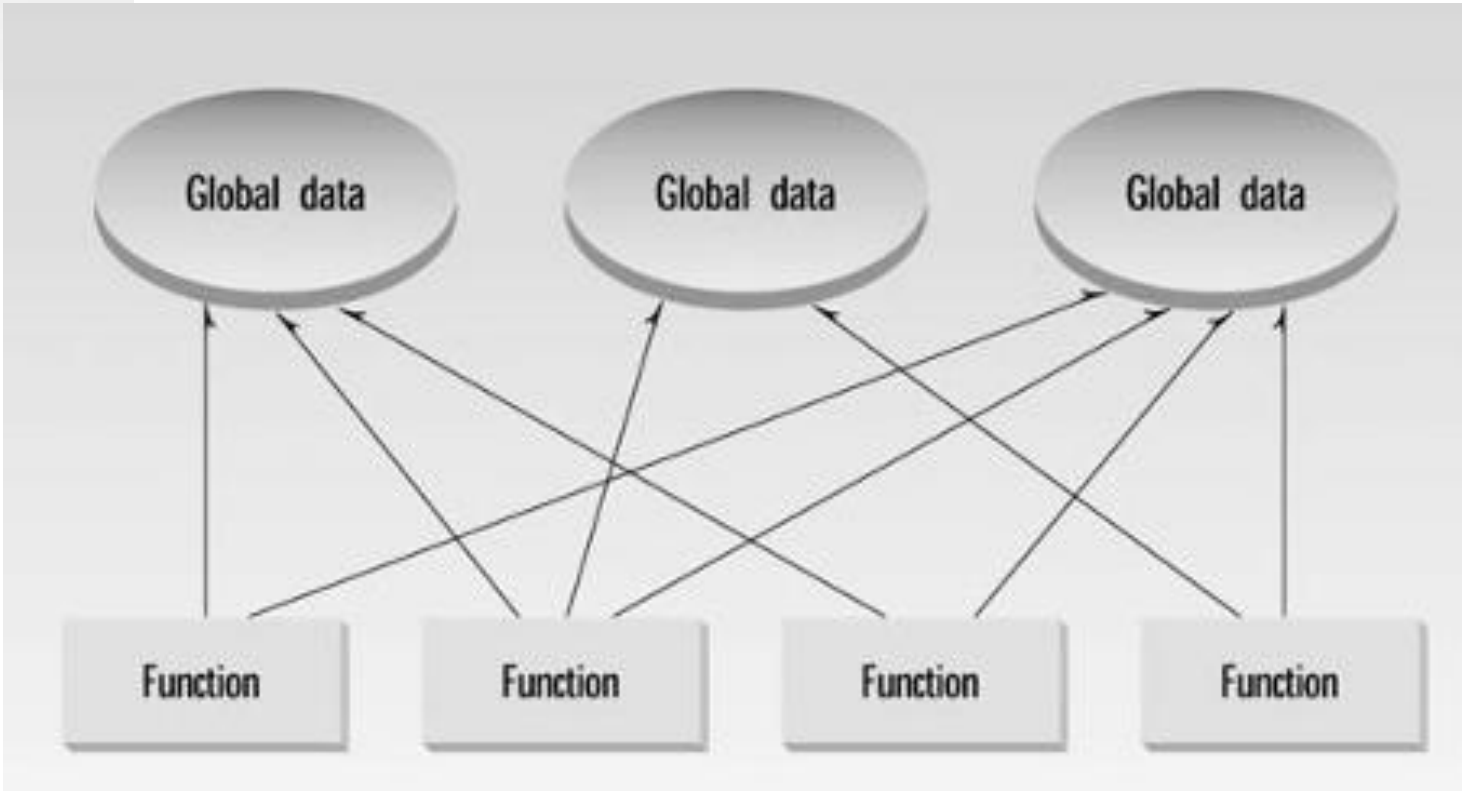
Structured Programming Approach

- Structured programming become very popular in the 1980s and was the main technique.
- Structured programming is a very powerful tool that enables programmers to write moderately complex programs fairly easily.
- As the program grew larger, even the structured approach failed to show the desired results in terms of bug-free, easy to maintain, and reusable programs
- Each statement in language tells the computer to do something

Characteristics

- Follow top-down approach to program design.
- Data and Functions don’t tide with each other.
- Large programs are divided into smaller self contained program segment known as functions.
- Data moves openly around the system from function to function.
- Functions are dependent so reusability is not possible
- large programs become excessively complex even though it is well implemented


Global variables
Accessible by any function
Accessible only by Function A
Accessible only by Function B
Local variables
Function A
Local variables
Function B


Global data
Global data
Global data
Function
Function
Function
Function

Limitations

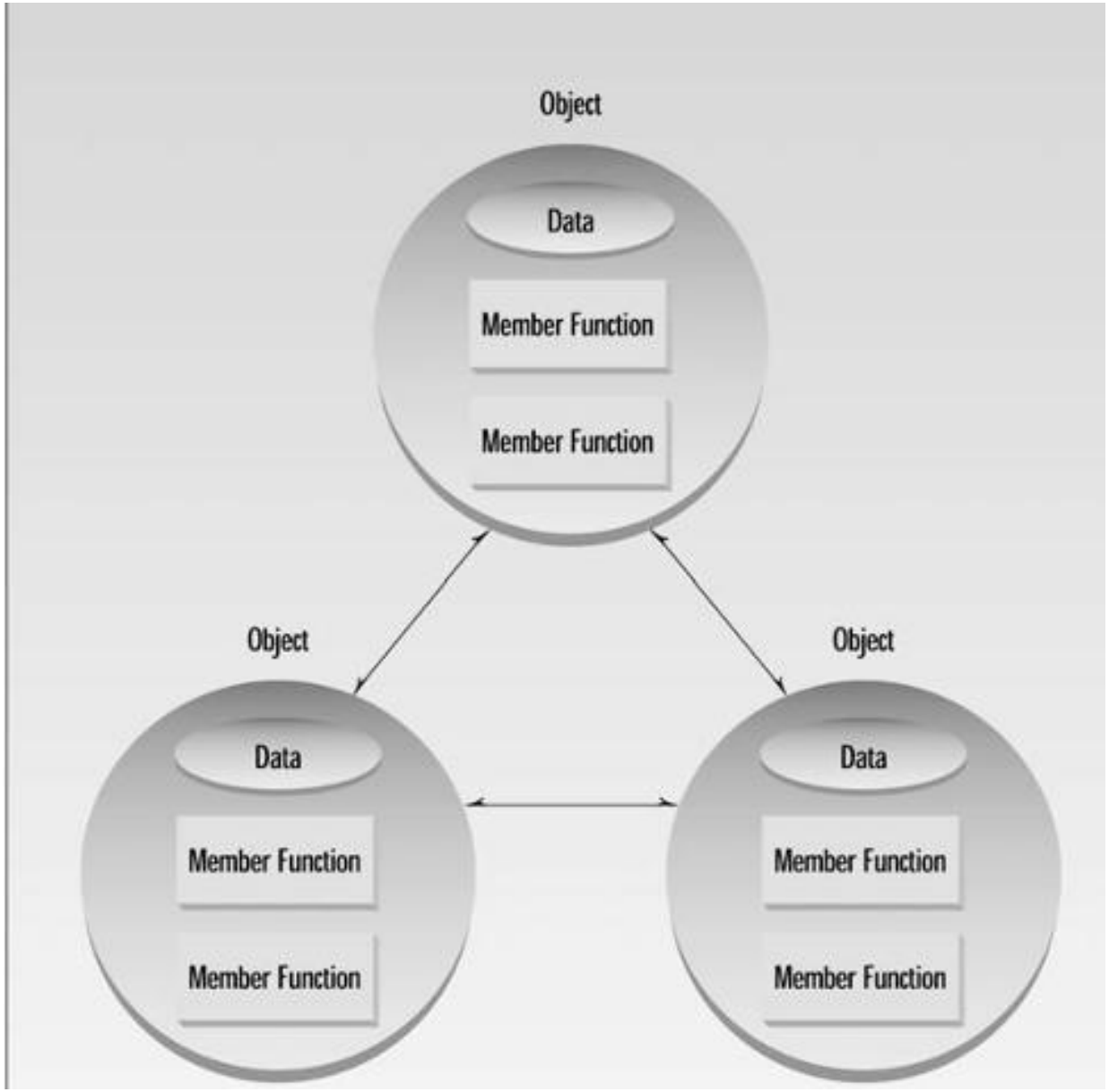
- Even though procedure oriented programming approach is still used in software industry it has following limitations:
  - Focus on functions rather than data.
  - In large program, it is difficult to identify belonging of global data.
  - The use of global data is error prone and it could be an obstacle in code maintenance and enhancements.
  - The modification of global data requires the modification of those functions using it.
  - Maintaining and enhancing program code is still difficult because of global data.
  - It does not model real world problem very well. Since functions are action oriented and do not really correspond to the elements of problem.

Object Oriented Programming

- Programming model which is based upon the concept of objects
- Programs are organized as cooperative collections of objects, each of which represents an instance of some class
- Importance is given to data rather than the algorithm
- If you want to modify the data in an object, you should know what function to interact with it, the member function in object.
- Data and functions are tied together and encapsulated
- Data protection or security of data is achieved by data hiding using access specifiers
- Uses bottom up approach in program design

Object Oriented Programming is more powerful than Structured Programming.

Object Oriented



Characteristics of Object Oriented Programming

1. Classes
2. Object
3. Encapsulation
4. Inheritance
5. Polymorphism
6. Data Abstraction
7. Message Passing

Characteristics of Object Oriented Programming

1. Object :

- Real world entities
- Object is entity that has characteristics and behavior
- Object is instance of a class

-If Ram is a Student than

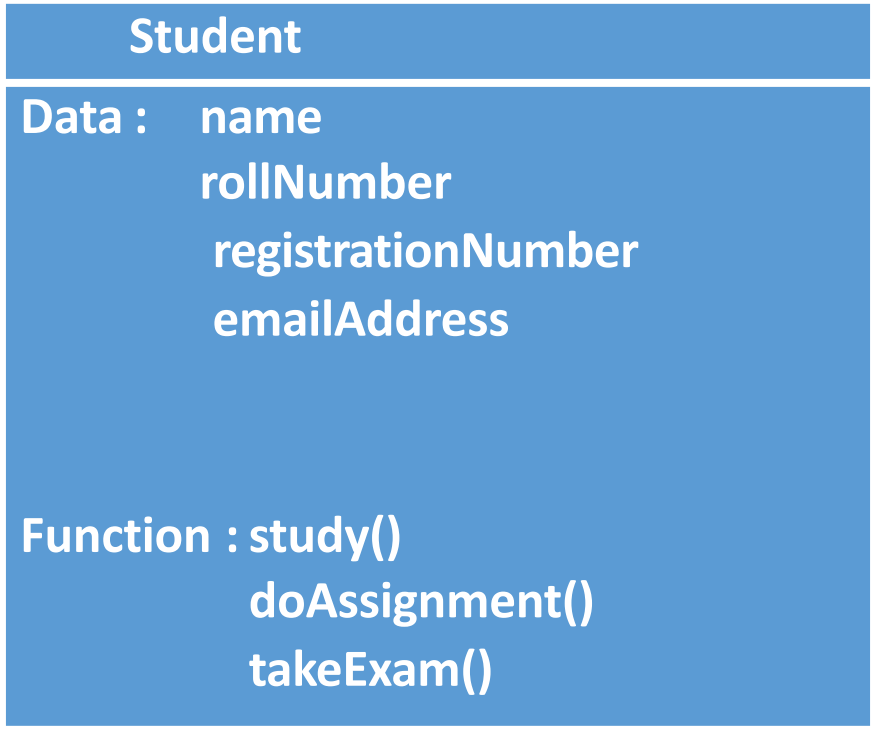
- He has characteristics like name, address, registrationNumber, marks
- He has behavior like studying, taking exam, doing assignment

Characteristics of Object Oriented Programming

2. Classes :

- A group of objects that share common characteristics and behavior

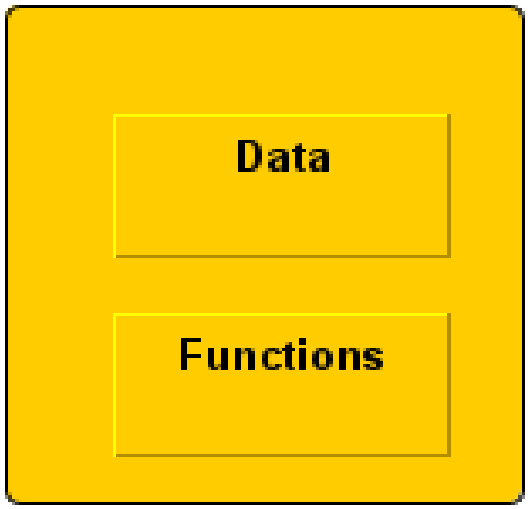
Example: Student



Characteristics of Object Oriented Programming

3. Encapsulation :

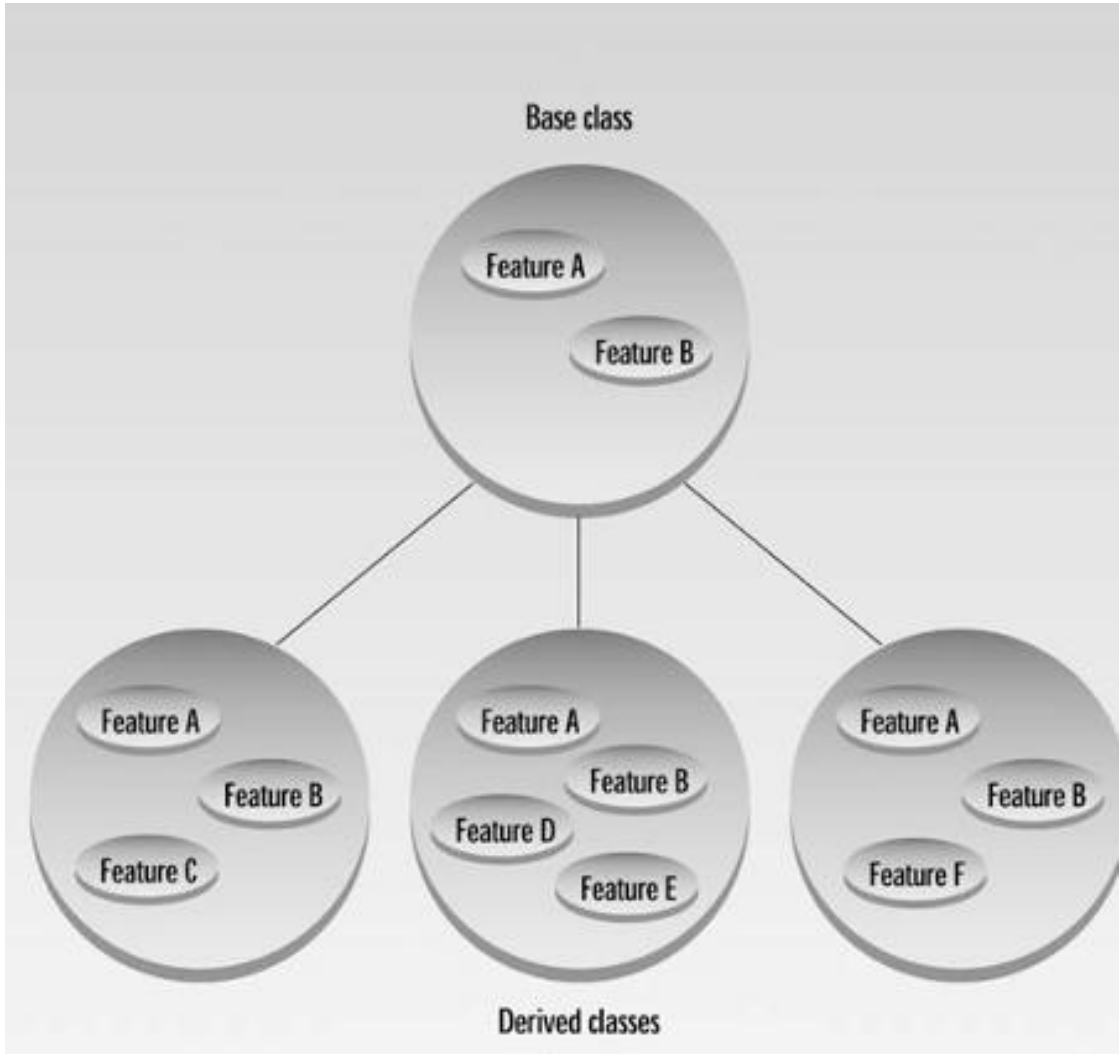
- Binding together the data and functions
- Prevents the data from unauthorized access



Characteristics of Object Oriented Programming

4. Inheritance :

- Ability to create new classes from the already existing class
- The existing class is called **baseclass** and the new class is called **derived class**
- Property of base class is inherited by derived class
- Derived class has data and functions of its parent class as well as its own data and functions
- Inheritance supports reusability



Characteristics of Object Oriented Programming

5. Data Abstraction:

- Abstraction refers representing only essential features or information and hiding background details

6. Polymorphism:

- Polymorphism means having many form
- Polymorphism can be achieved through function overloading and operator overloading

Characteristics of Object Oriented Programming

7. Message Passing :

- Objects communicate with each other by sending and receiving information to each other to perform certain task
- Message for an object is a request for execution of a procedure
- Invoke the function in receiving object that generates the desired result

Object.functionName(information)

Advantages

- Redundant code is eliminated by various techniques like inheritance templates.
- Through data hiding, programmer can build secure programs that cannot be invaded by code in other parts of the program.
- Existing classes can serve as library class for further enhancements. Classes are also available as library class in the standard library of the language.
- Because of division of program into objects makes software development easy.
- Software complexity is less severe than conventional programming techniques.
- Because of dynamic binding, addition of new classes of objects at run time is possible without modifying the existing code.
- The limitation realized in base class can be fulfilled in derived class without writing even a single piece of code in the base class.
- Upgrading and maintenance of software is easily manageable.
- System can be easily upgraded from small to large systems.
- Message passing technique makes the interface simpler with external systems.
- Models real world system perfectly.
- Code reusability is much easier than conventional programming languages.

Summary

- OOP programs are organized around objects, which contain both data and functions that act on that data.
- A class is a template for a number of objects.
- OOP focuses on the way programs are designed, not on coding details.
- Inheritance allows a class to be derived from an existing class without modifying it. The derived class has all the data and functions of the parent class, but adds new ones of its own.
- C++ is a superset of C. It adds to the C language the capability to implement OOP. It also adds a variety of other features.

Classwork

- Differentiate between C and C++.
- Differentiate between OOP and POP.