Procedural v Object-Oriented Programming

- There exist two main approaches to write a program – 1) Procedure oriented programming (POP) and 2) Object oriented programming (OOP).
- You can write a program in either way, but there are notable differences between both approaches. These two approaches are the result of software development evolution over many decades.
- Generally POP methodology can handle the task of developing a moderately complex program fairly well enough, but once the program gets highly complex OOP style programing makes the task more manageable by breaking the task down to smaller modular, often reusable units.
- OOP method also facilitates more collaborative working due to code reusability.
- As yet, we have only looked at the POP approach.

Procedure Oriented Programming (POP) [C]

- The word “procedure” is the key element here to notice. It means “a set of procedures” which is a “set of subroutines” or a “set of functions“.
- We all know about “functions in C language”. ‘C’ is a procedure oriented language. In a POP method, emphasis is given to functions or subroutines. Functions are a set of instructions which performs a particular task. Functions are called repeatedly in a program to execute tasks performed by them.
- For example, a program may involve collecting data from user (reading), performing some kind of calculations on the collected data (calculation), and finally displaying the result to the user when requested (printing).
- The problem with POP approach is its handling of data. POP approach gives no importance to data. By ‘data’ I mean the information collected from user, the new results obtained after calculations etc.
- In C, a data member must be declared *global* in order to make it accessible by two or more functions in the program. What happens when two or more functions work on the same data member? If there are 10 functions in a program, all these 10 functions can access a global data member. It is possible one function may accidentally change values of this global data member. If this data member is a key element of the program, any such accidental manipulation will affect the whole program. It becomes too difficult to debug and identify which function is causing the problem if the program is really big.
- One of the most important feature of C language is structures (`struct`).
- `struct` provides a way to pack together different data types into a single entity. The programmer can pack together integer data, decimal point data (`float`), array data types, etc into a single entity using `struct`. Programming using “structure” was first introduced by C language and this is the single best reason for its wide popularity and acceptance.
- The problem with structures was that it handled only data. Structure do not allows to pack together associated functions inside it along with data.
- In POP, the program is divided into small parts called functions.
- POP does not have any proper way for hiding data so is less secure.
- Example of POP languages are C, Go, Fortran, Pascal, BASIC.

Object Oriented Programming (OOP) [C++]

- An OOP method differs from POP in its basic approach itself.
- The basic concept of OOP revolves around a feature similar to `struct` in POP, named as `class` in OOP. A `class` differs from a `struct` in that it allows the programmer to pack data together with with its associated functions.
- The first feature that any programmer would talk about OOP is “data hiding.” OOP gives lots of importance to data. The programmer can hide core data from external world using OOP method. By hiding the data they ensure that the data is safe from being accidentally manipulated.
- A class is a feature in OOP which facilitates to pack together different data types along with different functions that manipulate these data members of class. Data members and functions can be declared as **private** or **public** inside a class. To hide the data from external world, a programmer does it by declaring the data as **private**.
- This feature of protecting data and functions is called “Encapsulation.“ Thus one of the major flaws of POP is solved in OOP. OOP ties the data closely to a particular class and its objects. There is no need of “global data types” as in POP and hence data will not flow freely around the program. This makes sure there will be no ‘accidental modification’ of critical data.
- Another important feature brought in by OOP is an emphasis on code reusability. This simply means a piece of code written earlier in a program can be used later. This is made possible by a feature of classes named “inheritance”. By using inheritance, one class can acquire the properties of another class.
- In OOP, the program is divided into parts called objects.
- OOP provides Data Hiding so is more secure.
- Examples of OOP languages are C++, C#, Java, Python, Visual Basic, COBOL.