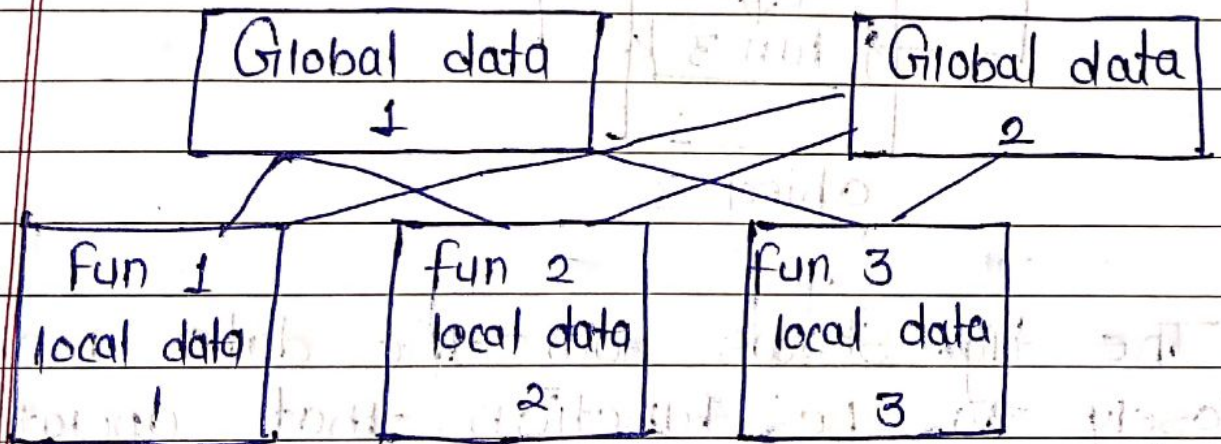
Object Oriented Programming and C++

- **Procedure oriented programming**

:- It consists of writing a list of instructions for the computer to follow and organising these instructions into groups known as functions.

In these concept more concentration on the developement of function and little attention is given to the data that are being used by functions. In such case it is very difficult to identify what data is used by which function.

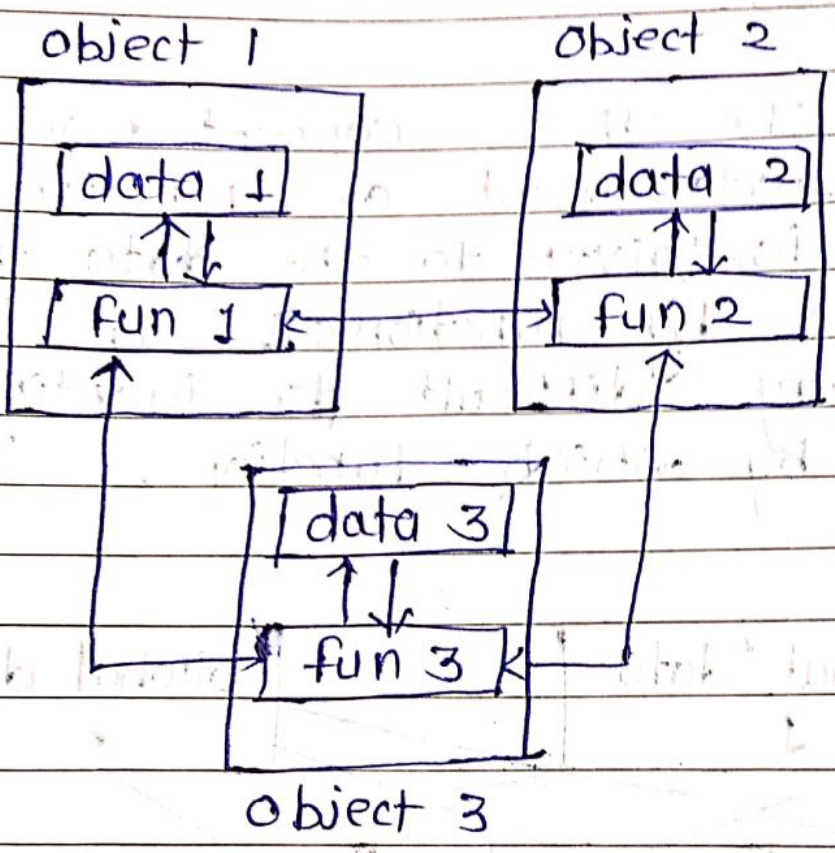


Relationship betⁿ data & funⁿ in procedure oriented data

Hence procedure oriented programming has the drawback that data is not secure and it doesn't model or support real world problem very well.

* Object Oriented Programming

To overcome the drawbacks of POP, Object oriented approch is invented. OOP treats data as critical element in the program development and does not allow it to flow freely around the system.



The fig. shows how the data more closely to the function that operate on it and protect it from accidental modification from outside function.

OOPS allows to decompose the problems into number of entities called objects and then will data and fun^{n} around these entities.

* Basic concept of OOP

There are some concept use expensively in Object oriented Programming.

Following are general concept

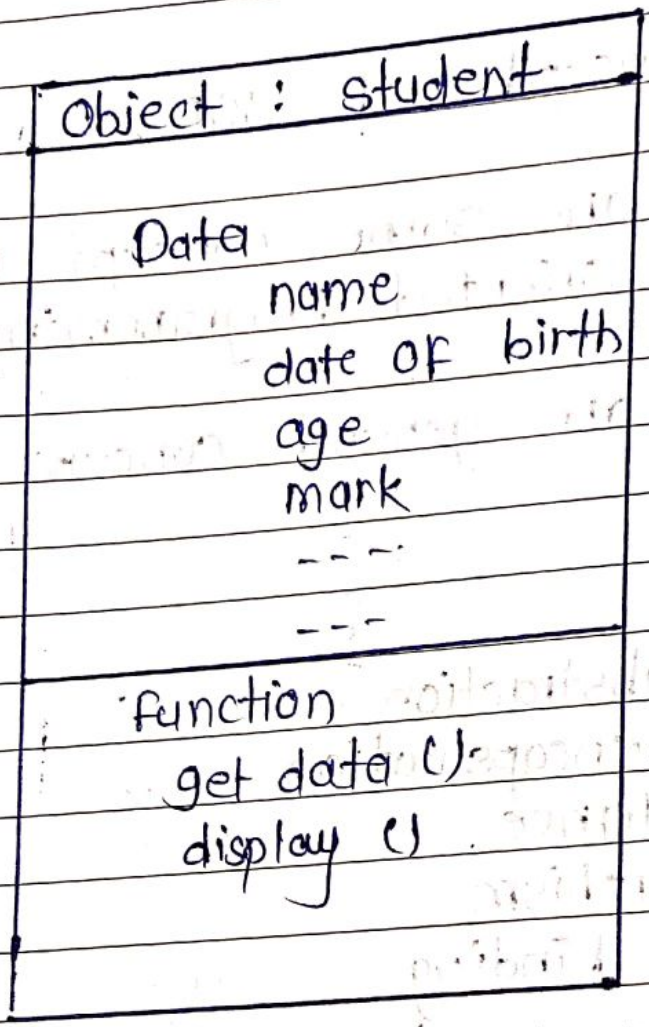
1) Object
2) Classes
3) data abstraction
4) data encapsulation
5) Inheritance
6) Polymorphism
7) Dynalic binding
8) Message passing

① Object

:- Objects are run time entities in Object Oriented System. They may represent a person, a bank account or a table of data or any item that the program must handle. When a program is exicuted the object inter-react by sending message to one another.

Each Object contain data and code to manipulate the data.

For. eg.



(1) Student.

(2) Classes :-

The entire set of data and code of Object can be made user define data type with the help of class. Inshort objects are variable of type class.

Once a class has been define we can create any number of objects to that class.

A class is thus, a collection of objects of similar type.

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* Data abstraction and Encapsulation

The wrapping up data and function into a single unit (called class) is known as encapsulation.

Data encapsulation is the most striking feature of class. The data is not accesable to the outside world and only allow to those fun^{n}s which are wraped in the class can access it.

These ~~enco~~ insulation of the data from direct access by the program is called data hiding.

Abstraction refers to the act of representing essential features without including the background details, or explanation. Classes use the concept of abstraction and are defined as list of abstract attributes they encapsulate all the essential properties of objects that are to be created.

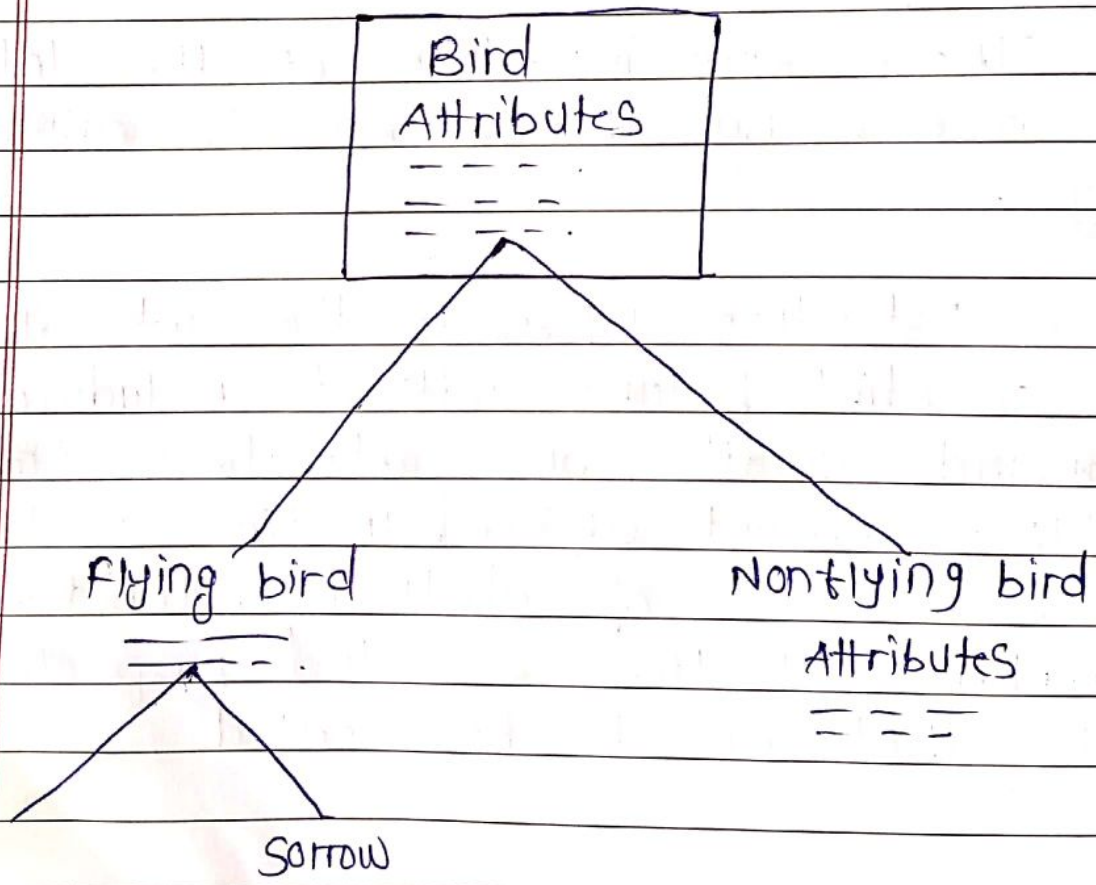
The classes use the this concept of data abstractions are called abstract data type

* Inheritance

Inheritance is the process by which objects of one class acquire the properties of subjects of another class. It support the concept of hierarchical classification.

for example :-

The bird Robin is a part of flying bird which is again the part of class bird.



The principle behind this sort of division is that each derived class shares common characteristics with the class from which it is derived.

In OOP, the concept of inheritance provides the idea of reuseability.

i.e. It allows the programmer to reuse a class that is almost, but not exactly from the previous class.

* Polymorphism

:- This is another important oop concep Polymorphism means the ability to take mor than one form.

For ex :- An operation many exhibit different behaviour in different instances.

The behaviour depends upon the types of data use in the operations.

Consider, the example of addition for two numbers, the addition generates sum while for two string the operation produce string the Operation produce a third string by concatination.

* Dynamic binding

Binding refers to the linking of procedure called to the code to be executed in response to the call.

Dynamic binding means the code associated with a given procedure call is not known until the time of the call at run time.

It is associated with ~~program~~ polymorphism and inheritance

* Message Communication

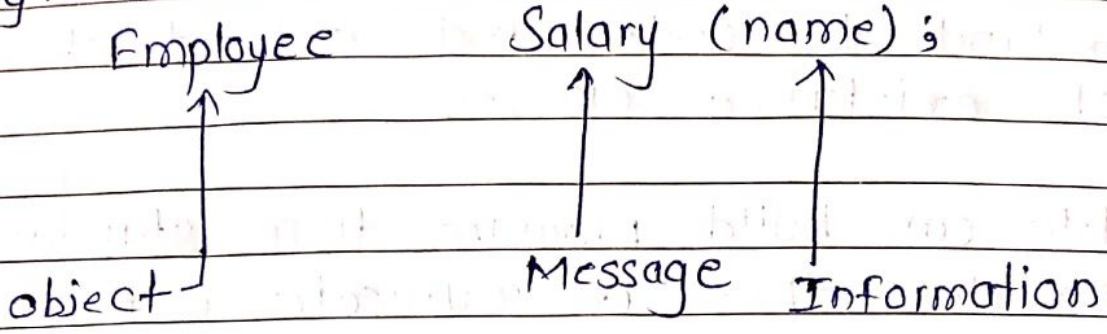
Object oriented program consists of set of objects that communicate with each other with the following basic steps.

1) Create classes that define objects and its behaviour

2) Creating objects from class defination

3) Estabilishing communication along with object.

e.g.



Message for an object is request for exeication of procedure.

In above example, employee object get the information of employee by a sending message salary.

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* Benefits of OOPS :-

OOP offers server benefits to both the program designner and user. The new technology promices greater programer productivity, better ~~quanti~~ quality of software and lesser maintainance.

Following are some principle advantages of OOPS

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1) Because of inheritance, we can eliminate redundent code and extend the use of existance classes.

2) We can build program from standard working modules that communicate with one another, rather than having to start writing the code from scrach.

3) The data hiding concept help programmer to build secure program.

4) It is possible to have multiple instances of an object to co-exist without any interferance.

5) It is possible to map objects in the problem domain to those objects in the program.

6) It is easy to partetian the work.

7) Object oriented system can be easily upgrade from small to large system

8) Message passing techniques for communication betn objects make the interface simple

9) Software compleexity can be easily manage

* Applications of OOP.

The promising area for application of OOP includes:

i) Real time system

ii) Simulation and modeling

iii) Hypertext, hypermedia and expert text

iv) AI (Artificial Intelligency) and expert system

v) Neural networks and parallel programming.

vi) Decision support and office automation system.

vii) CAD / CAM System

CAD ⇒ Computer Aded Design)
CAM ⇒ Computer Aded machine)

C++ is Object Oriented language developed by Bjarne Stroustrup at AT and T Bell Jabroteries in USA.

c++ is an extention of C with major addition of the class construct feature.

The three most important facilities that c++ has are classes, function overloading and operator overloading.

This features enable us to create abstract data type, inherite properties from existing data type, support polymorphism etc.

* Simple C++ Program

```
# include <iostream.h>
// simple String print program
  void main ()
    {
object → cout << "This is c++ program";
name.   }
          ↳ Redirection symbol
```

Simple c program :-

```
# include <stdio.h>
# include <conio.h>
/* simple string print program */
 void main ()
   {
    printf ("This is c program");
   }
```

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* More statement in c++

```
// Program with more statement
# include <iostream.h>
 void main ()
 {
  float num1, num2, sum, avg;  → cout << "Enter two numbers"
  cin >> num1; // enter first number
  cin >> num2; // enter second number
  sum = num1 + num2;
  avg = sum/2;
  cout << " Average = " << avg;
 }
```

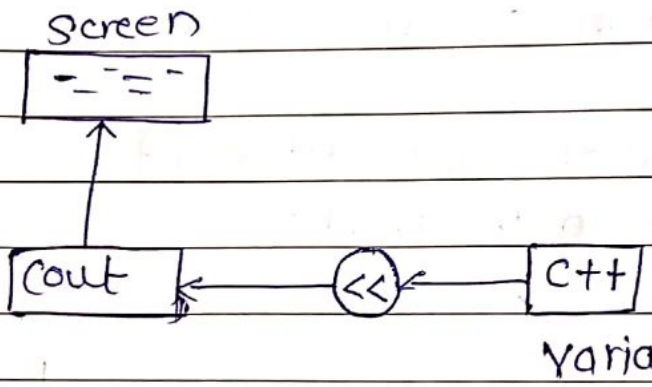
O/p.

```
Enter two numbers
-4.5
-5.5
-5.0
Average = 5.0
```

Output Operator :-

The statement cout<<"average = " introdu two new c++ features 'cout' and '<<'.

cout is predefined object that represent the Standard output steing in c++.
The Operator "<<" is called insertional Operator, it inserts the containt of varible on the right to the object on its left as shown in the fig.

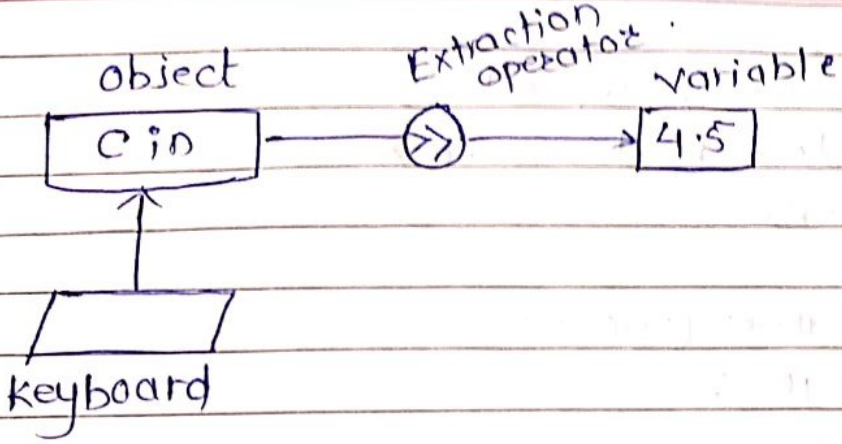


output using insertion Operation.

* Input Operator

The Statement cin >> num1; is an input statement and causes the program to wait for the user to type in a number. The identifier cin is predefind object in c++.

The ">>" operator is called extraction operator, and it extract the values from keyboard



* Cascading of I/O operator :

The insertion operator and extraction operator can be use repeately in the input and output statement as follows.

```
cin >> num1 >> num2;
```

OR

```
cout << "Sum = " << sum << "average = " << avg
```

these operator

The multiple of << , >> in one statement is called cascading.

* C++ program with Class

The following program uses the class as a user define data type

```
// Program using class
# include <iostream.h>
class person
{
 char name [20];
 int age;
 Public:
 void getdata();
 void putdata();
};
 void person::get data()
 {
  cout <<" Enter name ";
  cin >> name;
  cout<<" Enter age ";
  cin >> age;
 }
```

scope operator

```
 void person :: put data()
 {
  cout <<"\n name : " << name;
  cout <<"\n Age : " << age;
 }
 main()
 {
  Person P; //object at type peason
  P. getdata();
  P. Putdata();
 }
```

The program defines person as new data of type class.

The class person includes two basic data types and two functions to operate on that data, the functions are called member functions and data are called member variables.

The main program uses "person" to declare variable of its type. Here 'p' is a variable of type "Person". P is also called as object.

* Structure of C++ program.

include files
class declaration
class fun^n defination
main: fun^n program.

overall structure of c++ program.

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* Object oriented Languages

Object oriented programming is not the right of any particular languages. A language that is specially design to support the OOP concept make it easier to implement them are called Object oriented languages.

They are again classified into the following two categeries

i) Object base programming languages
ii) Object oriented programming languages.

Object based programming ~~are~~ have features like data encopsulation, data hiding, Operator overloading and automatic initialization and clear up of object. Whereas, Object oriented programing can be characterised by object base feature + interitance + dynamic binding.

Languages that support these features include c++, Small talk, Object pascal, Ada is the language supports object base features.