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Ch-1 (Introduction to C++)

- It is an Object-Oriented programming language.
- It is an extension of C programming with a major addition of the class.
- The idea of C++ comes from the C increment operator (++).
- It is super-set of C programming.
- Most of what we already know about C programming apply to C++ also.
- The most important facilities that C++ provides on C programming are -
  (i) Classes
  (ii) Inheritence
  (iii) Object
  (iv) Abstraction
  (v) Polymorphism
  (vi) Encapsulation
  (vii) Data Hiding
- Like C programming, C++ program is a collection of functions.

Ex:
```
#include <iostream.h>
#include <conio.h>
void main()
{
  int a;
  cout << " C++ is better than C ";
  cin >> a;
  cout << a;
  getch();
}
```

- The Header file iostream should be included at the begining of all the programs that use input/output statements.
- Input/Extraction Operator (>>) is used to extract the value from the keyboard & assign it to the variable.
- Output/Insertion Operator (<<) is used to insert the value from the keyboard & assign it to the variable.

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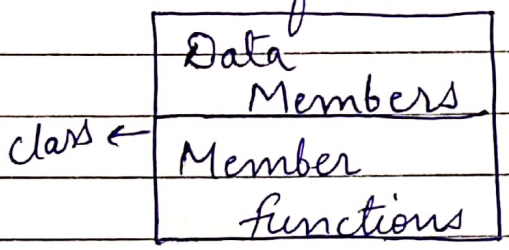
Ch-2 (Object-Oriented Programming)

- The language that support programming with object are said to be Object-Oriented Programming.
- Object-Oriented Programming provides some features other than C programming which are as data hiding, encapsulation, abstraction, object, inheritence, classes, polymorphism.

Class	Object
(i) It is a collection of data members and member functions.	(i) Object is the instance of class.
	(ii) Object are the basic runtime entities in the OOP.
(ii) Class is also a group of objects.	(iii) They may represent a person, a place, etc.

★ Class and Object:

(i) Class is a structure (body) where we can define data members & member functions to utilise by object.

(ii) Without class, object does not exist.

(iii) Without object, class may exist.

Ex
```
class student
{
  private:
    int roll_no;
    char name[20];
  public:
    void read();
    void write();
};

void main()
{
  student S1;
  S1.read();
  S1.write();
  getch();
}
```

Data Members

Member functions

Note: Access Specifiers are: private, public, and protected.

* Data Abstraction / Data Hiding:

It refers to the act of represeiting essential features without including the background details or explanation (basically it hides all implementation details).

When a class is given to the user he is familiar only with the public

interface of the class. Internal details & implementation are hidden from the user.

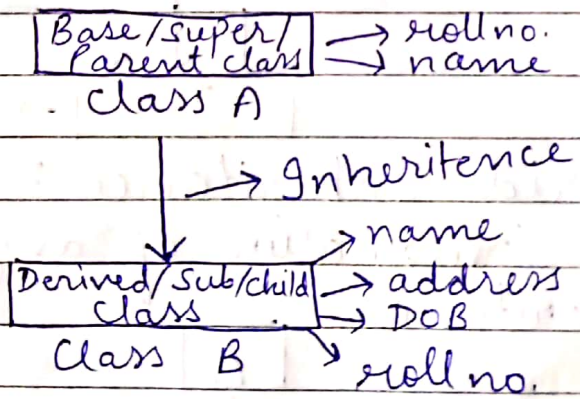
* Encapsulation:

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

Data Encapsulation is the most important feature of a class. The data is not accessible to the outside world, and only those functions which are wrapped in a class can access it.

* Inheritence:

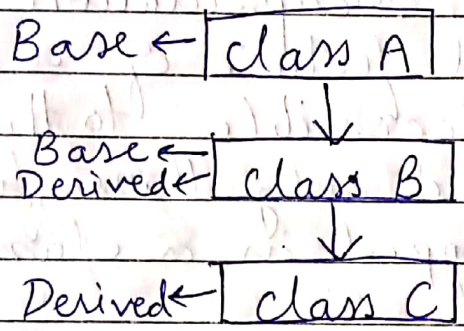
It is the process by which object of one class acquire the properties of another class object. When class is derived from another class, it is known as inheritence.



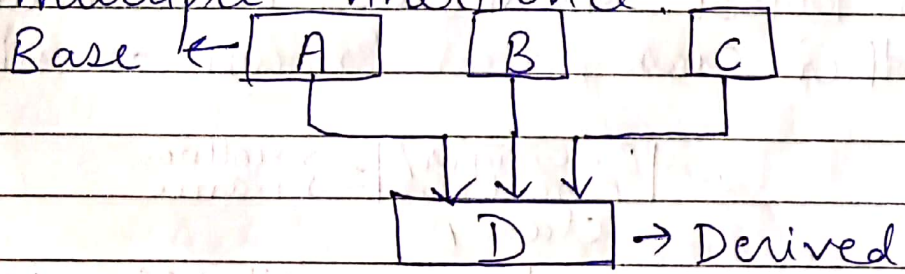
* Types of Inheritence:

(i) Single-level Inheritence:
When one class is derived from another one class is called single-level inheritence.

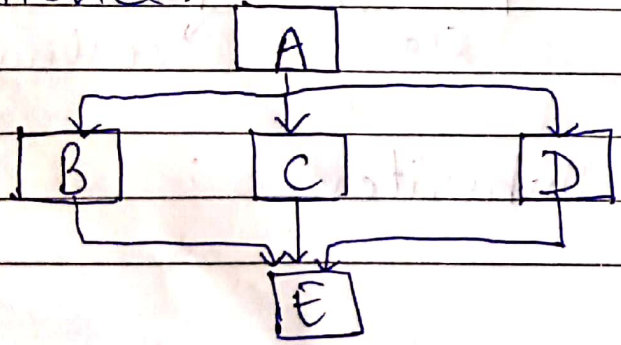
(ii) Multi-level Inheritence:
If a class is derived from a class and further class derived from this derived class.



(iii) Multiple Inheritence:
When a class is derived from two or more classes, it is known as multiple Inheritence.

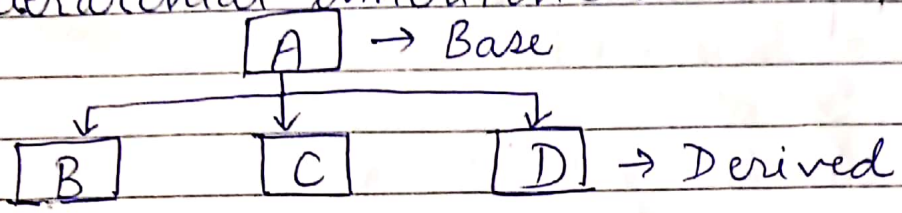


(iv) Hybrid Inheritence:
Combination of any two types of inheritence.



(v) Hierarchial Inheritence:

- If two or more classes are derived from the single base is known as hierarchial inheritence.



★ Polymorphism (one name many form):

It is a feature of OOP which create function with the same name but with different arguments, which will perform different - different tasks.

Types of polymorphism -

(i) Compile Time (Static)

(ii) Run Time (Dynamic)

- → Function Overloading
- → Operator Overloading

Ex: int sum (float x, float y)
int sum (int a, int b)
→ sum (2,3);
→ sum (2.5, 7.5);

★ Dynamic Binding:

Binding refers to the linking of a procedure call (function call) to the code to be executed (function definition) in response to the call.

Dynamic Binding (late binding) means the code associated with the a given procedure call is not known until the time of call at runtime.

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* Message Passing:

A Message Passing object communicate with each other by sending or receiving information at the runtime.

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Ch-3 (Tokens in C++)

* **Keywords:**
  These are the reserved identifiers and cannot be used as a name or a program variable or any other user defined grand elements.

* **Identifiers:**
  These refers to the name of function, class, variables, array, pointers.

* **Datatypes:**
  (i) User-Defined
    (a) Structure
    (b) Union
    (c) Enumeration
    (d) Class
  (ii) Pre-Defined (built-in type)
    (a) Primitive
      (1.) int
      (2.) long
      (3.) char
    (b) Void
    (c) Floating Point
      (1.) Float
      (2.) Double
  (iii) Derived
    (a) Array
    (b) Pointer
    (c) Function

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* Constant :

It refers to the fixed value that do not change during the execution of the program.

Syntax ⇨ int const a = 20;

If you'll add const keyword after int, the value of the variable will remain same throughout program.

* Operators :

(i) :: → scope resolution operator
(ii) ::* → pointer to member declaration
(iii) →* → pointer to member operator
(iv) .* → pointer to member operator
(v) delete → memory release operator
(vi) new → memory allocation operator
(vii) endl → line feed operator

Note: Malloc ( ) → memory provide
Calloc ( ) → memory allocate

* Scope Resolution Operator (::)

Ex:
```
#include <iostream.h>
#include <conio.h>
int m = 10;
int main ( )
{
  int m = 20;
```

```
{
    int k = m;
    int m = 30;
    cout << " inner block ";
    cout << " k = " << k;      → 20
    cout << " M = " << m;      → 30
    cout << " :: M = " << ::m; → 10 (global variable)
}
    cout << " outer block ";
    cout << " M = " << M;      → 20
    cout << " :: M = " << ::m; → 10 (global variable)
    return 0;
}
```

Syntax :→ :: variable_name

- In C programming, the global version of a variable can't be accessed within the inner block.
- In C++ resolving, this problem is done by introducing the operator ::.
- This operator allow us to access to the global version of a variable.
- This operator prints the value which is globally declared.

- This operator also defines that a method (function) belongs to a particular class.

Syntax :→

```
return_type class_name :: function_name
{
   ======
   ======
   ======
}
```

Ex: Using Member function :

```
class student                                   ← user-defined datatype
{
  int roll_no;
  char name[10];
public: void read();      } Member functions    } Class (Student)
        void show();      }
};
void student :: read()
{
 cout << " Enter the details : ";               } definition of read function
  cin >> roll_no >> name;
}
void student :: show()
{
 cout << " Result is " ;                        } definition of show function
 cout << roll_no << name;
}
void main()
```

```
{ student s1;
  s1.read();
  s1.show();
}
```
Definition of main function

Ques: Design a class student without using scope resolution operator.

Ans
```
class student
{
  int roll_no;
  char name[10];
  public: void read()
          { - - - };

          void show()
          { - - - - };
};
```

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Ch-4 (Constructor & Destructor)

- Constructors are special methods (functions) that are automatically executed when an object of a class is created.
- It is special because its name is same as the class-name.
- They do not have any return type, not even void.
- Like other C++ functions, they can have default arguments.
- There are three types of constructors:
  (i) Default
  (ii) Parameterized
  (iii) Copy

* Default constructor:
  A constructor that accepts no parameter is called default constructor. This constructor is executed when an object of the class is created. If we don't define any of the constructor, then the default is provided by the C++.

* Parameterized constructor:
  It is executed when an object of

the class is created and is initialised with some values at the time of creation.

* Copy Constructor:
  This constructor is executed when an object of the class is created and it it initialized with some other objects of the same class at the time of creation.

- Destructor releases the memory of the constructors defined.

- Destructor do not have to be called, it can only be defined and declared and definition of destructor is not compulsory.

Ex:
```
class money
{
    int rs;
    int paise;          } Data Members
  public:
    money ( );          → Default constructor
    money (int r, int p); → parameterized
    money (money & m);  → copy
    ~ money ( );        → destructor
    void read ( );      } Member
    void show ( );      } functions
};
```

class-name → money :: money ( ) ← function
(SRO)

```
{
    rs = paisa = 0;
}
money :: money (int r, int p)
{
    rs = r;
    paisa = p;
}
money :: money (money &m)
{
    rs = m.rs;
    paisa = m.paisa;
}
void money :: read ()
{
  cin >> rs >> paisa;
}
void money :: show ()
{
  cout << rs << paisa;
}
money :: ~ money ( );
{

}
void main ( )
{
  money m1, m4;
```

```
cout << " first amount is ";
m1. show ();  → 0, 0
money m2 (100, 20);
cout << " Second amount is ";
m2. show ();  → 100, 20
money m3 (m2);
cout << " Third amount is ";
m3. show ();  → 100, 20
cout << " Enter an amount";
m4. read ();
m4. show ();  → any value given by the user
                Eg: 20, 40
}
```

* Constructor Overloading :

- We can have more than one constructor in the class with the same name, as long as each has a different list of arguments. Its example is same as the above example.

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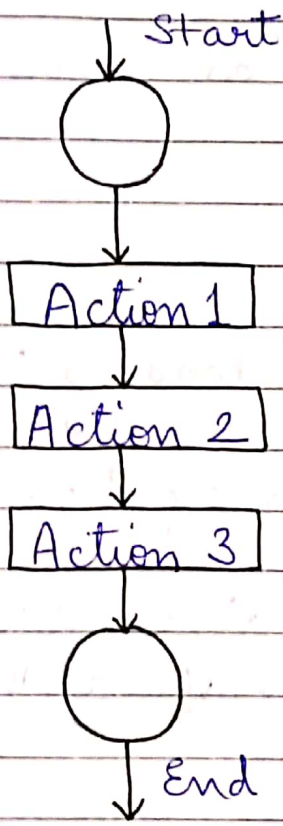
Ch-5 (Control Statements)

- There are three types of control statements:
  (i) Sequence
  (ii) Selection
  (iii) Looping

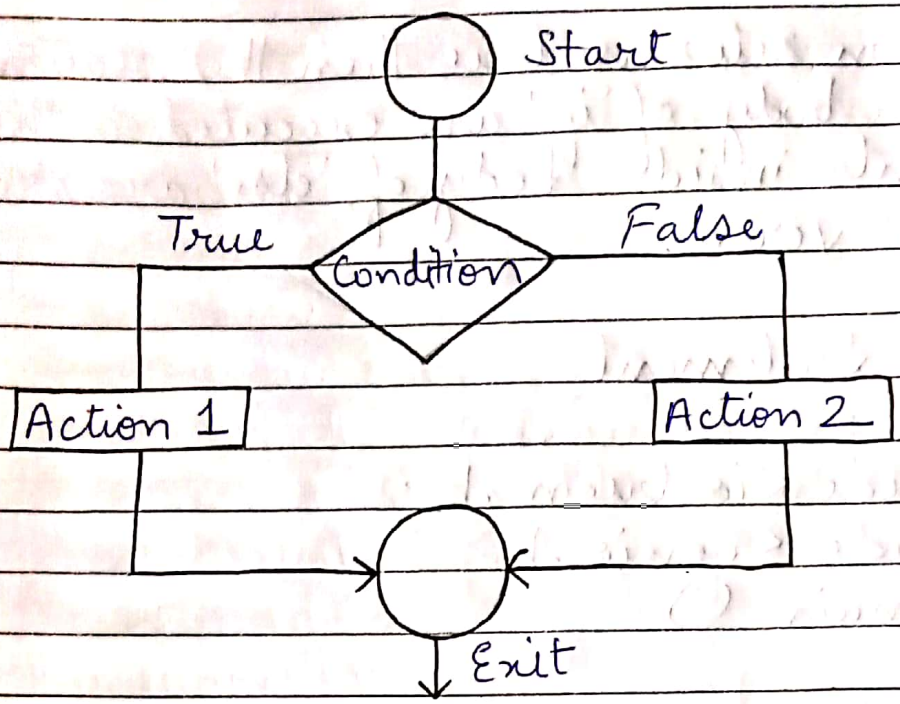
* Sequence Statements:



- It includes break, continue & return.

* Selection Statements:

- It includes if-else & switch.



Ex: If-else statement

```
#include <iostream.h>
#include <conio.h>
int main()
{
  int age;
  cout << "Enter your age:";
  cin >> age;
  if (age >= 18)
    {
      cout << "You are eligible for voting";
    }
  else
    {
      cout << "You are not eligible for voting";
    }
  getch();
}
```

- If condition returns true then the statements inside the body of 'if' are executed & the statements inside body of 'else' are skipped and vice-versa.

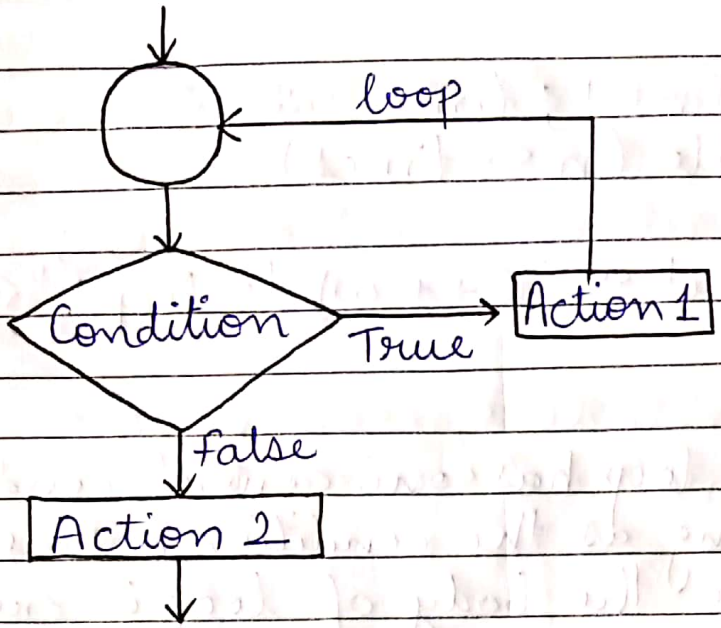
Ex: Switch Statements

```
#include <iostream.h>
#include <conio.h>
int main ()
{
  int num = 2;
  switch (num + 2)
  {
    case 1: cout << "Value is: "<<num<<endl;
    case 2: cout << "Value is: " <<num<<endl;
    case 3: cout <<"Value is: "<<num<<endl;
    default: cout <<"Value is:"<<num<<endl;
  }
  getch();
}
```

- Switch case is used when we have multiple conditions and we need to execute a block of statements when a particular condition is satisfied.

★ Looping Statements:

- It includes for, while and do-while loop.



for loop

Ex:
```
#include <iostream.h>
#include <conio.h>
int main()
{
  for (int i=1; i<=6; i++)
    {
      cout << " Value of variable i is : " << i ;
    }
}
```

- It is used to check certain conditions and then repeatedly execute a block of code as long as those conditions are true.

Ex: While loop

```
#include <iostream.h>
#include <conio.h>
int main()
{
```

```
int n=1, times=5;
while (n<=times)
{
 cout<<" C++ while loop : "<<n<<endl; n++;
}
}
```

- while loop has one control condition & executes as long as the condition is true and it is tested before the body of loop is executed.

Ex: do-while loop

```
#include <iostream.h>
#include <conio.h>
int main()
{ int num=1;
   do{
      { cout<<" Value of num : "<<num<<endl;
      n++;
      } while (num<=6);
}
```

- In do-while loop, first the statements inside loop execute and then the condition gets evaluated, if the condition returns true then the control jumps to the 'do' for further repeated execution of it, this happens repeatedly until the condition returns false.

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Ch-6 (Inline Function)

- To eliminate the cost of functions, C++ propose a new feature called inline function.
- In this, The compiler replace the function calling the corresponding function code (function definition).
- All inline function must be defined before they are called and just after header files.
- Advantage of inline function is that it minimizes the code and function definition is completed in one line.

C Inline function	C++ Inline function
(i) Here, code is transformed.	(i) Here, because of inline keyword code is replaced.
(ii) Ex:	(ii) Ex:

```
sum (3,4);
int sum (int a, int b)
{
  int c = a+b;
  return c;
}
```

```
inline int sum
 (int a, int b)
{
  return a+b;
}
sum (3,4);
```

Ex 1.

```
inline double cube (double a)
{
   return (a * a * a);
}
```

Ex 2.

```
#include <iostream.h>
#include <conio.h>
inline float mul (float x, float y)
{
   return x * y;
}
inline double div(double p, double q)
{
   return (p/q);
}
void main()
{
   float a = 12.34;
   float b = 9.82;

   cout << mul (a, b);
   cout << div (a, b);
}
```

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Ch-7 (Array of Object)

- We can also have array of variables that are of the type class.

Ex:
```
class employee
{
    char name[10];
    int age;
    public:
        void input();
        void output();
};
void employee::input()
{
    cin >> name;
    cin >> age
}
void employee::output()
{
    cout << name;
    cout << age;
}
void main()
{
    employee manager[4];
    for(int i=0; i<4; i++)
    {
        cout << "\n\nDetail of manager";
        manager[i].input();
    }
```

```
for ( int i=0; i<4; i++)
{
    cout <<" Detail is ";
    manager[i].output();
}
getch();
}
```

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Ch-8 (Friend Function)

- A Friend function is declare using the keyword "friend".
- A Friend function is a function i.e. not a member of our class but it his granted all the rights to access private part of the class.
- A member function can also be declare friend of another class.

Ex
```
class person ;
class money
{
  int rs;
  int paise;
  public:
      void read ()
      {
        cin >> rs >> paise ;
      }
      void show ()
      {
        cout << rs << paise ;
  Friend void display (person p, money m);
};
```

Class Person

```
{
  char name[10];
  public:
        void input()
        {
          cin >> name;
        }
        void output()
        {
          cout << name;
        }
  friend void display(person p, money m);
};

void display(person p, money m)
{
  cout << p.name << "Contains" << m.rs << m.paise;
}
void main()
{
  money m1;
  m1.read();
  person p1;
  p1.input();
  display(p1, m1);
}
```