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Programming in C++ (Part-III)

ABOUT ME : NAVNEET GUPTA

- 8 years teaching experience.
- AIR 92 in GATE 2008
- Qualified UGC-NET 2012, Raj.-SET 2012, CSIR-Recruitment-Exam in 2011
- Achieved 3rd Rank in NPTEL-DBMS Course
- Achieved Silver Medal in CSIR on ERP Project in 2013
- Area of Expertise : DBMS, Programming, Algorithms, Discrete Math, Computer Networks, Operating system

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C++ Single Level Inheritance Example: Inheriting Methods

```
class animal //base class
{
public:
    void eat(){
        cout<< "Eating..";
    }
};
```

```
class Dog: public animal //derived class
{
public:
    void bark()
    {
        cout<< "barking..";
    }
};
main()
{
    Dog d1;
    d1.eat();
    d1.bark();
}
```

O/P:

Eating...barking..

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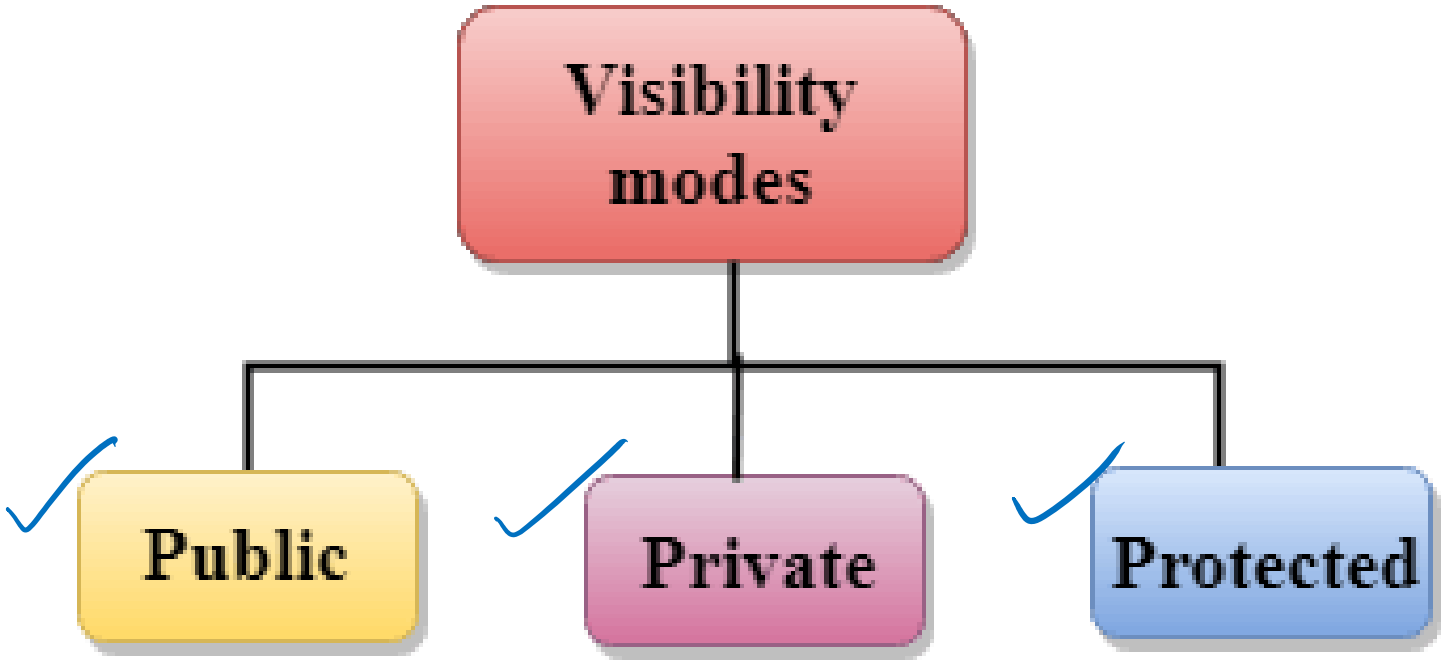
Visibility modes can be classified into three categories:



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Visibility modes can be classified into three categories:

1) Public: When the members are declared as public, it is accessible to all the functions of the program.

2) Private: When the members are declared as private it is accessible within the class only.

3) Protected: When the members are declared as protected, it is accessible within its own class as well as the class immediately derived from it.

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C++ Multilevel Inheritance

(*) Multilevel inheritance is a process of deriving a class from another derived class.

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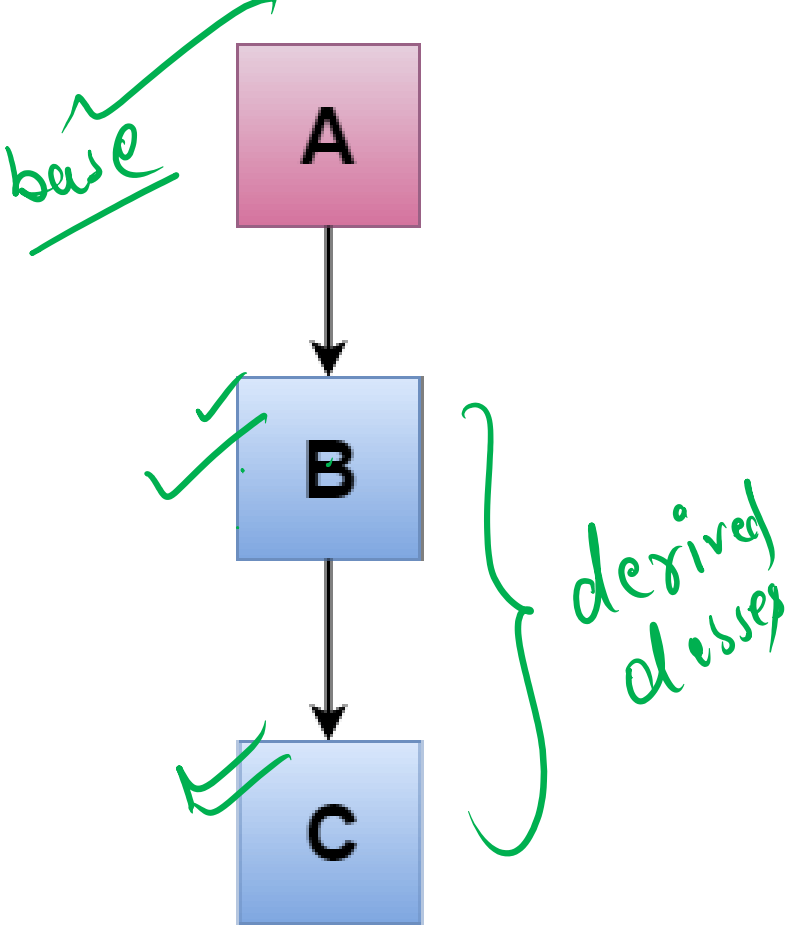
C++ Multilevel Inheritance



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C++ Multi Level Inheritance Example:-

```
class Animal
{public:
    void eat (){
    cout << "eating" << endl
};
class Dog : public Animal
    { public:
    void bark(){
        cout << "barking";
    }
};
class cuteDog : public dog
{public:
    void MNG () {
        cout << "Cute";
}};
```

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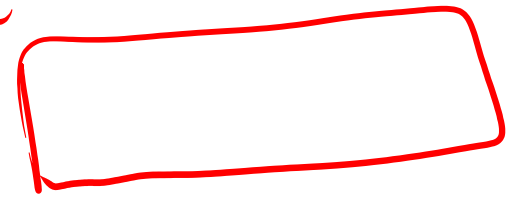
C++ Multi Level Inheritance Example :- (Contd.)

```
main()
{
    CuteDog cd;
    cd.eat();
    cd.bark();
    cd.MNG();
}
```

o/p :-

cd



eating... barking... cute

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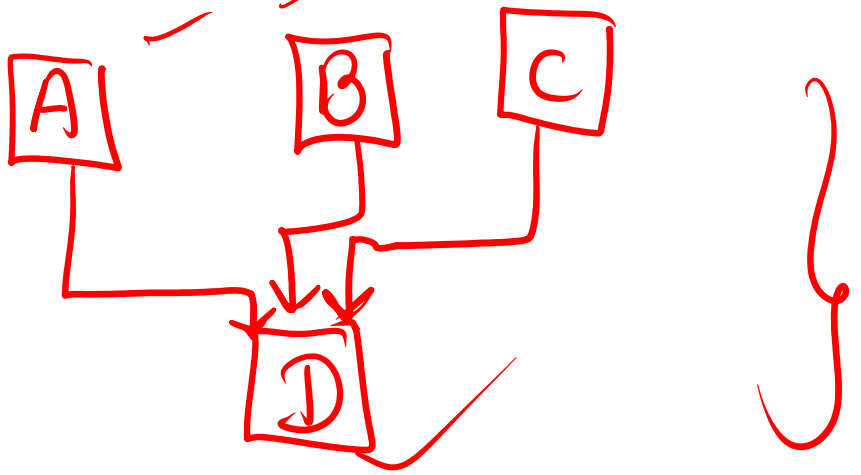
C++ Multiple Inheritance

(*) Multiple inheritance is the process of deriving a new class that inherits the attributes from 2 or more classes.



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C++ Multiple Inheritance Example:-

```
class std
{
public:
    string name;
void II (string n)
    {
    name = n;
    }
};
```

```
class grde
{
public:
    string gd;
void PR (string g)
    {
    gd = g;
    }
};
```

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Example:-Contd.:

```
class show : public std, public grade
{
  public:
      void display ()
        {
          cout << "student name is" << name;
          cout << endl << "grade is :" << gd;
        }
};
```

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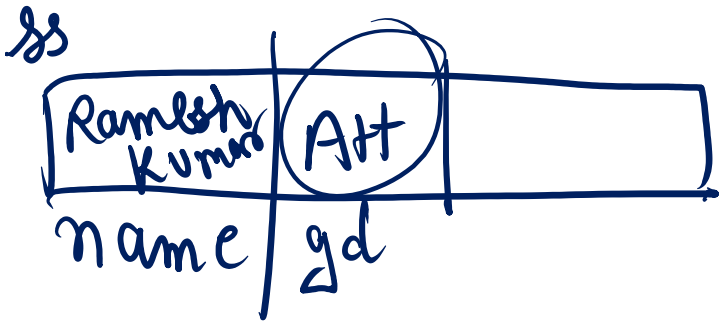
Example:-Contd.:

```
main ()
{
    show ss;
    ss.JJ ("Ramesh Kumar");
    ss.PP ("A++ ");
    ss.display ();
}
```



o/p

student name is Ramesh Kumar

Grade is : A++

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Ambiquity Resolution in Inheritance

```
class A
{
public:
    void display()
    {
        cout<< "I am in \"A\" class";
    }
};
```

```
class B
{
public:
    void display()
    {
        cout<< "I m in 'B' class";
    }
};
```

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Example Contd:

```
class C : public A, public B
{ public :
    void show()
        { display (); }
}
```

```
main ()
{
    C c1;
    c1. display ();
}
```

o/p

Error: reference to 'display' is ambiguous

```
display ();
```

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The above issue can be resolved by using the class resolution operator with the function. In the above example, the derived class code can be rewritten as:

```
class C : public A, public B
{
    void show()
    {
        A :: display ();
        B :: display ();
    }
};
```

```
main()
{
    C c1;
    c1.show();
}
```

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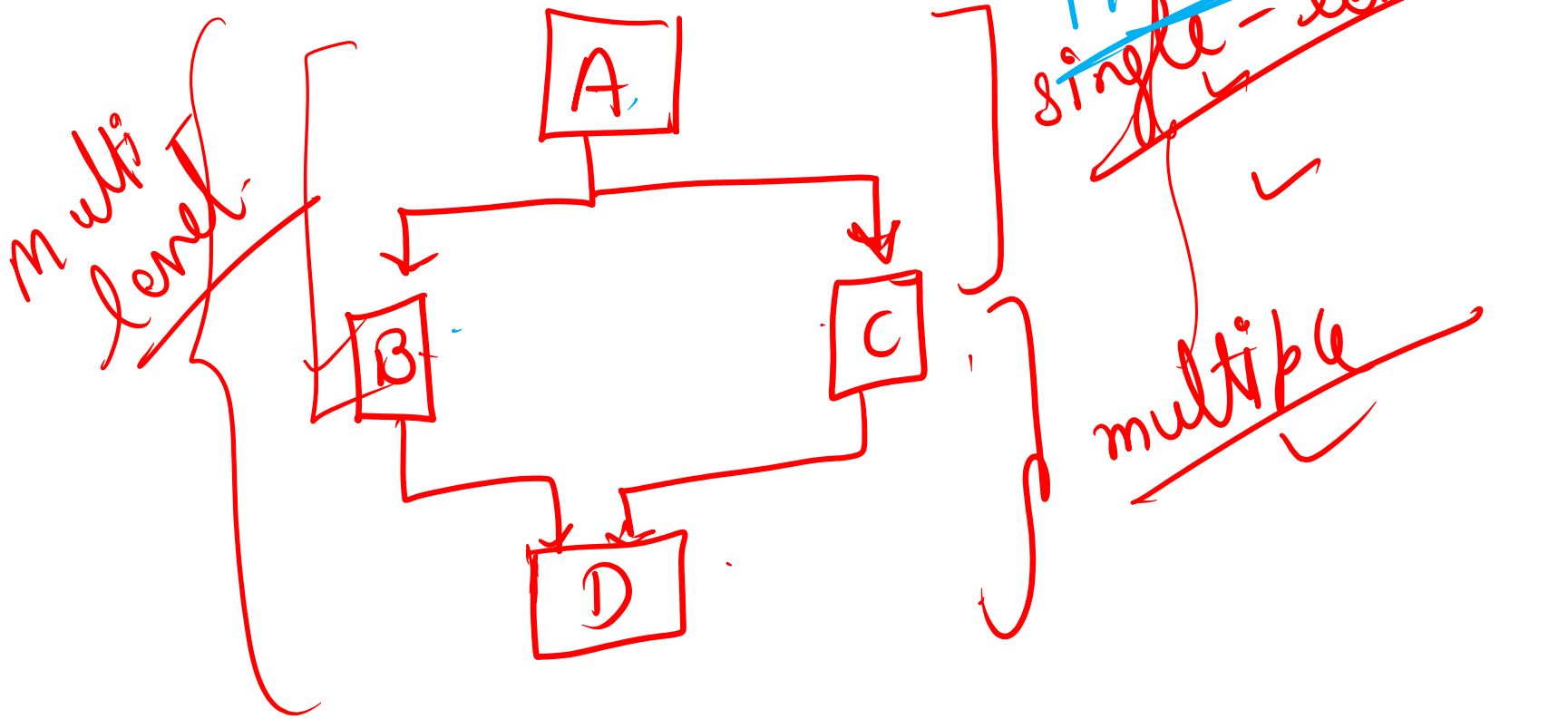
C++ Hybrid Inheritance

Hybrid inheritance is a combination of more than one type of inheritance.



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Example:

```
class A
{
protected:
    int x;
public: void get()
    {
        cout << "Enter value:";
        cin >> x;
    }
};
```

```
class B: public A
{
protected:
    int y;
public:
    void get_y()
    {
        cout << "Enter value:";
        cin >> y;
    }
};
```

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Example:Contd.

```
class C
{
protected:
    int z;
public:
    void get_z()
    {
        cout << "Enter Z: ";
        cin >> z;
    }
};
```

```
cout << "Sum of
    x+y+z = " << x+y+z;
```

```
class D : public B,
          public C
{
protected:
    int p;
public:
    void callme()
    {
        get();
        get_y();
        get_z();
    }
};
```

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Example:Contd.

```
main()
{
    D d1;
    d1.callme();
}
```

o/p-

```
Enter value : 15
Enter value: 25
Enter z: 30
Sum of x+y+z=70
```

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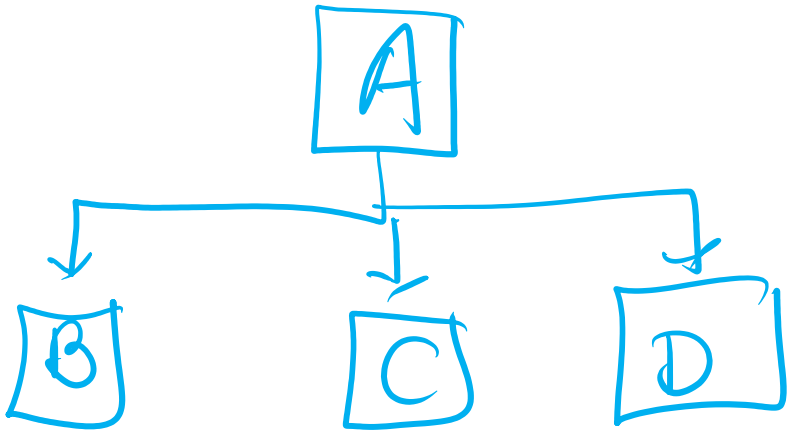
C++ Hierarchical Inheritance



It is a process of deriving more than one class from a base class

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Example:

```
class shape
{
public:
    int a,b;
    void get_data(int n, int m)
    {
        a=n;
        b=m;
    }
};
```

```
class rectangle: public shape
{
public:
    int rect_area()
    {
        int c=a*b;
        return c;
    }
};
```

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Example: Contd.:

```
class triangle : public shape
{
  public :
  float tri_area ()
  {
    float c = 0.5 * a * b ;
    return c ;
  }
};
```

$\frac{1}{2} * base * height$ $\quad \frac{a * b}{2}$

Area of triangle

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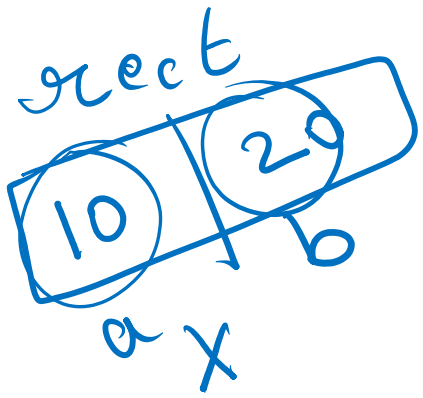
Example: Contd.:




```
main()
{
    rectangle rect;
    triangle tri;
    int l, b, base, h;
    cout << "Enter length and breadth of rectangle";
    cin >> l >> b;
    rect.get_data(l,b);
    int area;
    area = rect.rect_area();
    cout << "Area of rectangle =" << area;
    cout << endl << "Enter value of base and height";
    cin >> base >> h;
    tri.get_data(base, h);
    float n = tri.tri_area();
    cout << "Area of triangle =" << n;
}
```

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C++ Polymorphism

poly + morphs

↓ many

↓ to change

one thing has to changed into multiple form.

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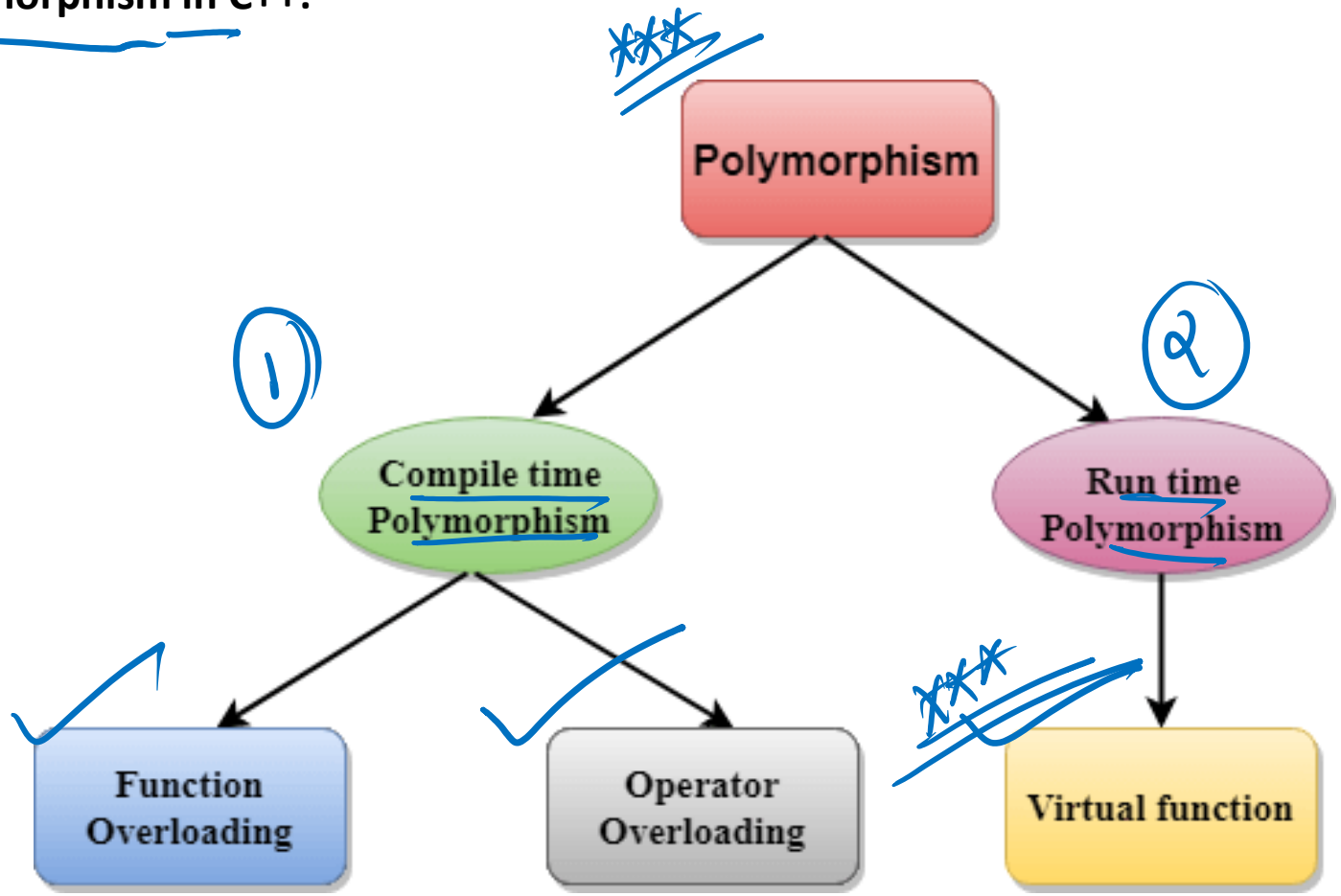
There are two types of polymorphism in C++:



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Compile time polymorphism:

*) The overloaded functions are invoked by matching the type & no. of arguments. This information is available at compile-time and therefore compiler selects the appropriate function at compile time.

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Run time polymorphism:

*) Run-time polymorphism is achieved when object's method is invoked at the run time instead of compile-time. It is achieved by "method overriding" which is also known as dynamic binding or late binding.

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1 Function Overloading :

*) function overloading is defined as the process of having two or more function with the same name but different in parameters is know as function overloading.

(*) In this, the function is redefined by using either different types of arguments or a diffent no. of arguments.

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Function Overloading Example :

```
int   mul(int, int);
float mul(float, int);
int   mul(int a, int b)
{
    return a*b;
}
float mul(float x, int y)
{
    return x*y;
}
```

```
main()
{
    int   r1 = mul(6,7);
    float f1 = mul(2.3, 5);
    cout << r1;
    cout << endl << r2;
}
```

o/p

42
11.5

C++ Operators Overloading

operators that cannot be overloaded :

*) Scope resolution operator (::)

*) sizeof

*) member selector (.)

*) member pointer selector (*)

*) ternary operator (?:)