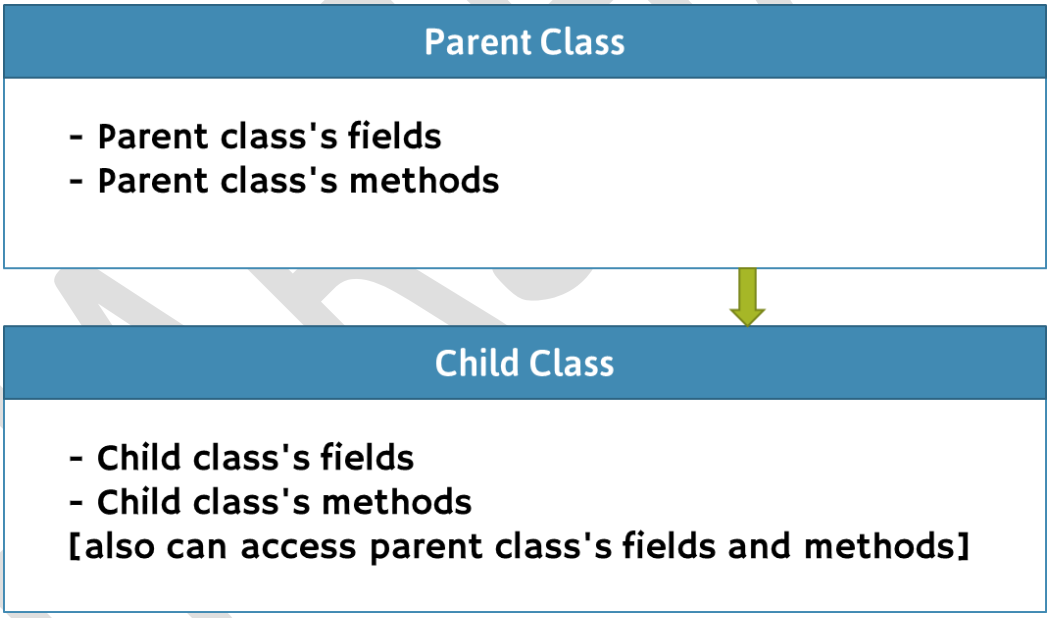
15

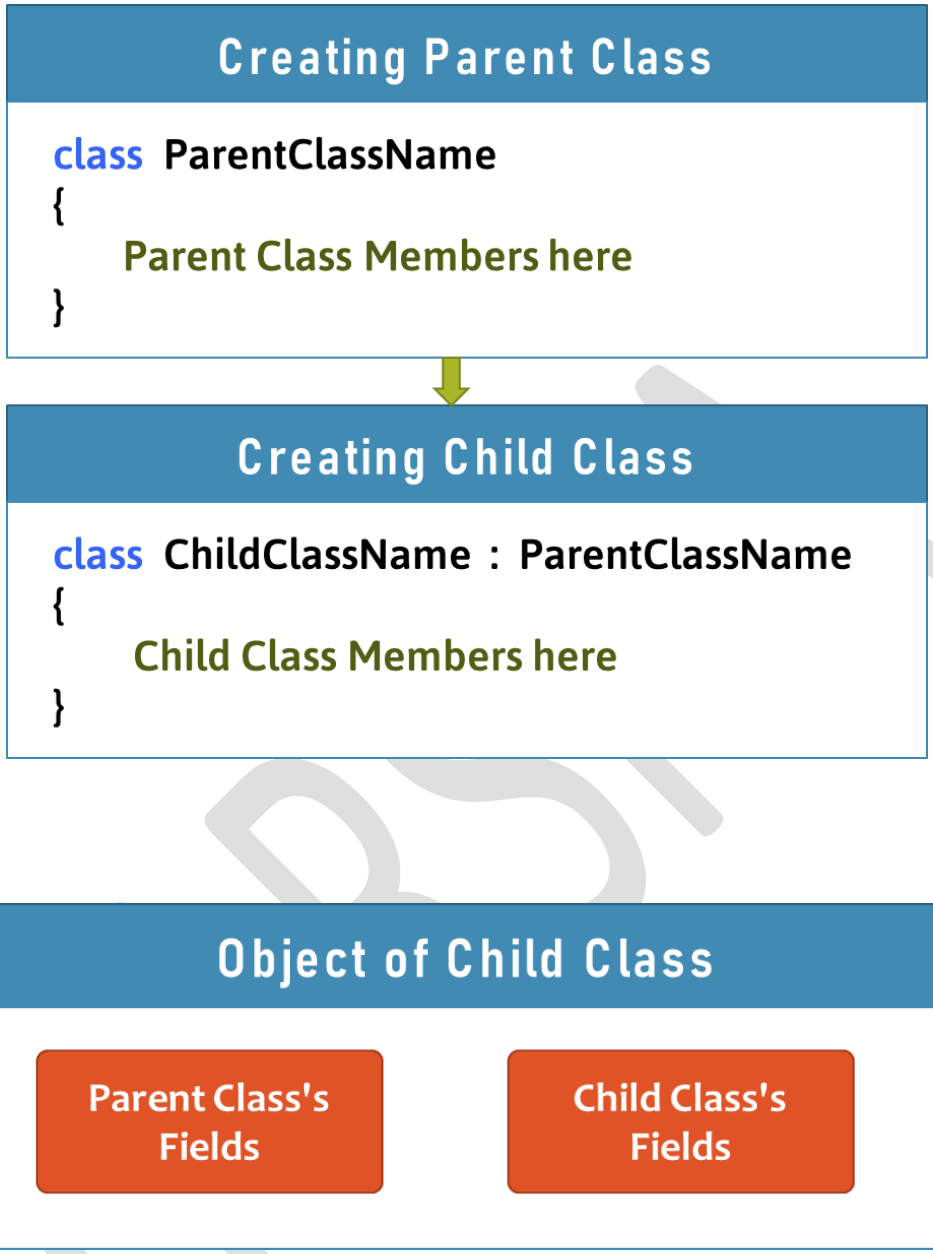
Inheritance

Introducing Inheritance

- This allows classes to be arranged in a hierarchy that represents "is-a-type-of" relationships.
- The "parent class" acts as a "base type" of "one or more child classes".
- Child classes are derived from parent class.



- Concept of extending the parent class, by creating child class.
- "Child class" extends "parent class".
- The child class's object stores members of both child class and parent class.


Creating Parent Class
class ParentClassName
{
Parent Class Members here
}
Creating Child Class
class ChildClassName : ParentClassName
{
Child Class Members here
}

Object of Child Class
Parent Class's Fields
Child Class's Fields

Types of Inheritance – Single Inheritance

I. Single Inheritance

```
class  ParentClassName
{
}

class  ChildClassName : ParentClassName
{
}
```

One Parent Class, One Child Class.

Types of Inheritance – Multi-Level Inheritance

2. Multi-Level Inheritance

```
class  ParentClassName
{
}

class  ChildClass1 : ParentClassName
{
}

class  ChildClass2 : ChildClass1
{
}
```

One Parent Class, One Child Class;

and the Child class has another Child class.

Types of Inheritance – Hierarchical Inheritance

3. Hierarchical Inheritance

```
class  ParentClassName
{
}

class  ChildClassI : ParentClassName
{
}

class  ChildClass2 : ParentClassName
{
}
```

One Parent Class, Multiple Child Classes.

Types of Inheritance – Multiple Inheritance

4. Multiple Inheritance

```
class  ParentClassI
{
}

class  ParentClass2
{
}

class  ChildClass : ParentClassI, ParentClass2
{
}
```

Multiple Parent Classes, One Child class.

Types of Inheritance – Hybrid Inheritance

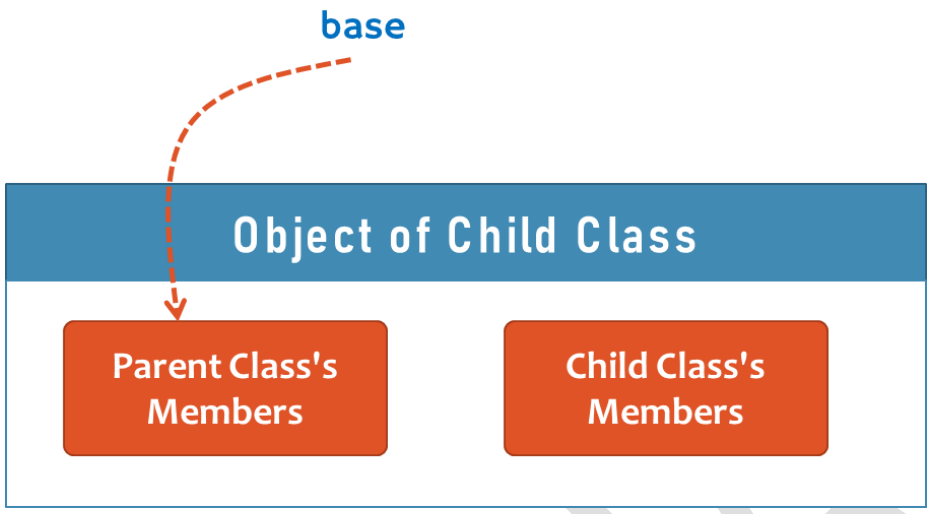
5. Hybrid Inheritance

```
class  ParentClassName
{
}

class  ChildClassI : ParentClassName
{
}

class  ChildClass2 : ChildClassI
{
}

class  ChildClass3 : ChildClassI
{
}
```

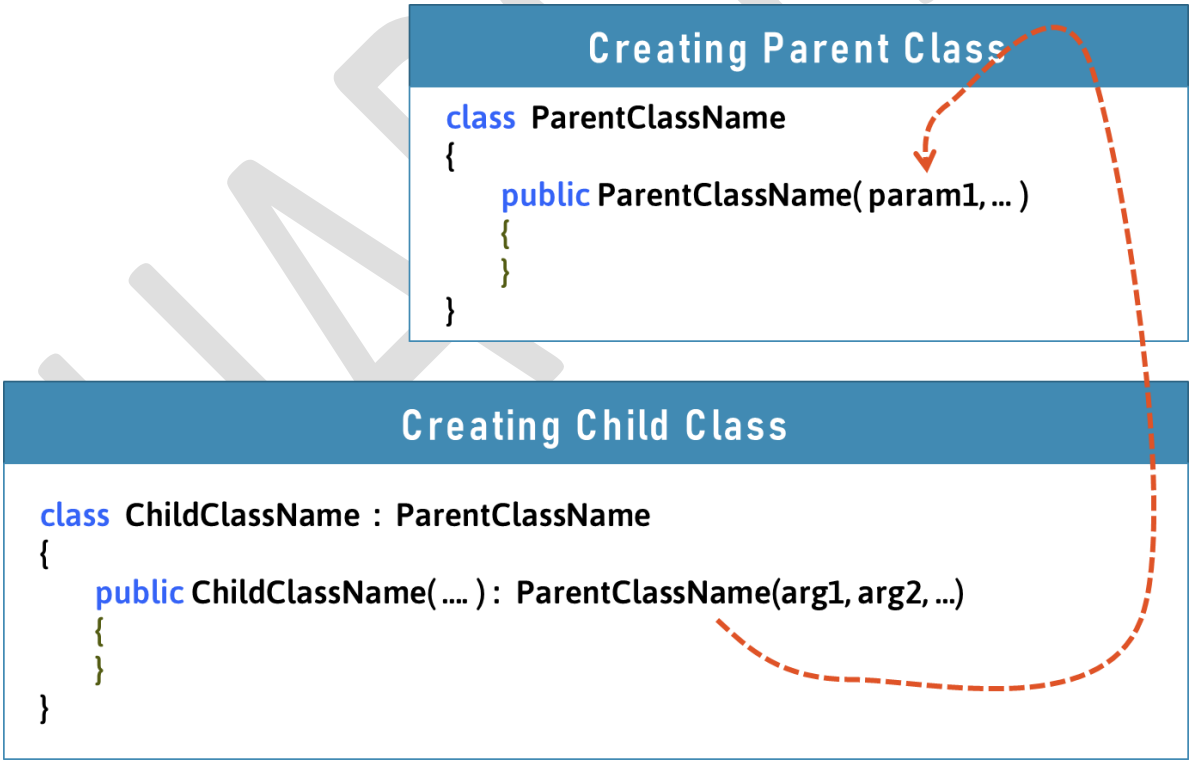
Hierarchical Inheritance + Multi Level Inheritance

'base' keyword

- The "base" keyword represents parent class's members in the child class.
- It is optional to use, by default.
- It is must to use, when there is "name ambiguity" between parent class's member and child class's member.



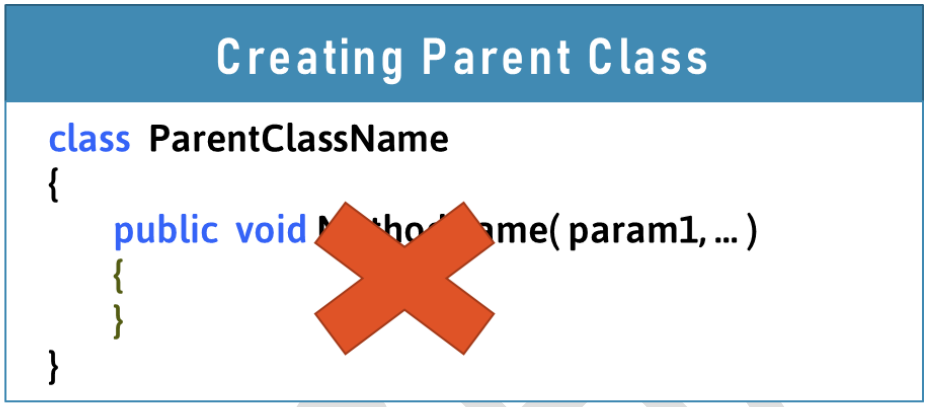
Parent Class's Constructor

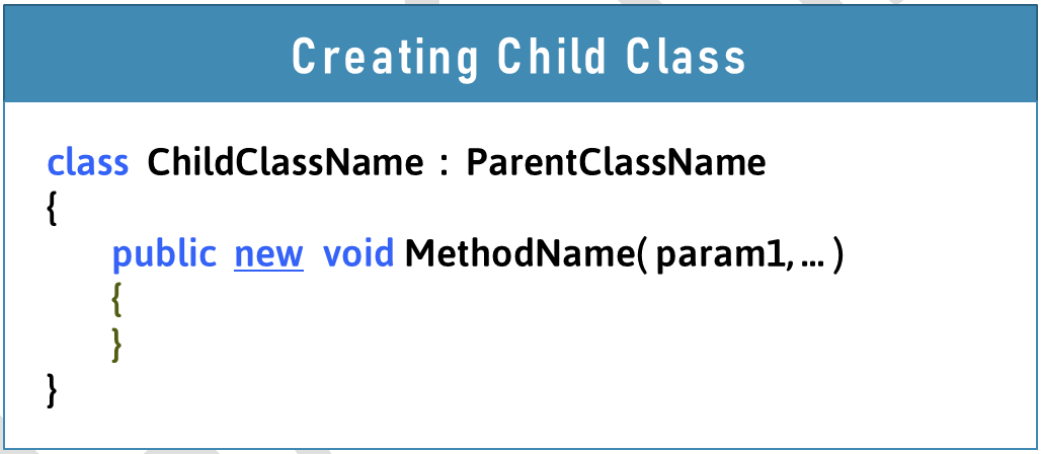


- It is OPTIONAL to call "Parent Class's Parameter-less Constructor" from "Child Class".
- It is MUST to call "Parent Class's Parameterized Constructor" from "Child Class" and pass necessary arguments.

Method Hiding

- It is a concept, which is used to hide (overwrite) the parent class's method, by creating another method in the child class with same name and same parameters.





- When method hiding is done, if the method is called using child class's object; the child class's method only executes; parent class's method will not be executed.
- Method hiding is done automatically; but is recommended to use "new" keyword (but not must).

Method Overriding

- It is a concept, which is used to extend the parent class's method, by creating another method in the child class with same name and same parameters.

Creating Parent Class

```
class ParentClassName
{
    public virtual void MethodName( param1, ... )
    {
    }
}
```

1

Creating Child Class

```
class ChildClassName : ParentClassName
{
    public override void MethodName( param1, ... )
    {
        base.MethodName();
    }
}
```

2

- When method overriding is done, if the method is called using child class's object; the parent class's method first and child's method executed next.
- Method Overriding is done with "virtual" keyword at parent class; and "override" keyword at child class's method.
- The parent class's method invoked using "base" keyword.
- Without 'virtual' keyword are parent class's method; the child class's method can't be 'override'.

Points to Remember

- The "parent class" acts as a "base type" of "one or more child classes".
- The 'base' keyword inside the child class, can access the members of parent class.

- The child class's object stores parent class's fields also, automatically; however they are accessible in child class if they are not 'private'.
- Method hiding is a concept of 'overwriting' the parent class's method, by creating another method in child class, with same signature.
- Method overriding is a concept of 'extending' the parent class's method, by creating another method in child class, with same signature.
- C# doesn't support multiple inheritance (with multiple parent classes). That means, a child class can have ONLY ONE parent class; however, a child class can have MULTIPLE parent interfaces; so in this way, C# supports multiple inheritance.