MUST

Wisdom & Virtue

MIRPUR UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SOFTWARE ENGINEERING

Object Oriented Programming

Lecture 9 : Types of Inheritance

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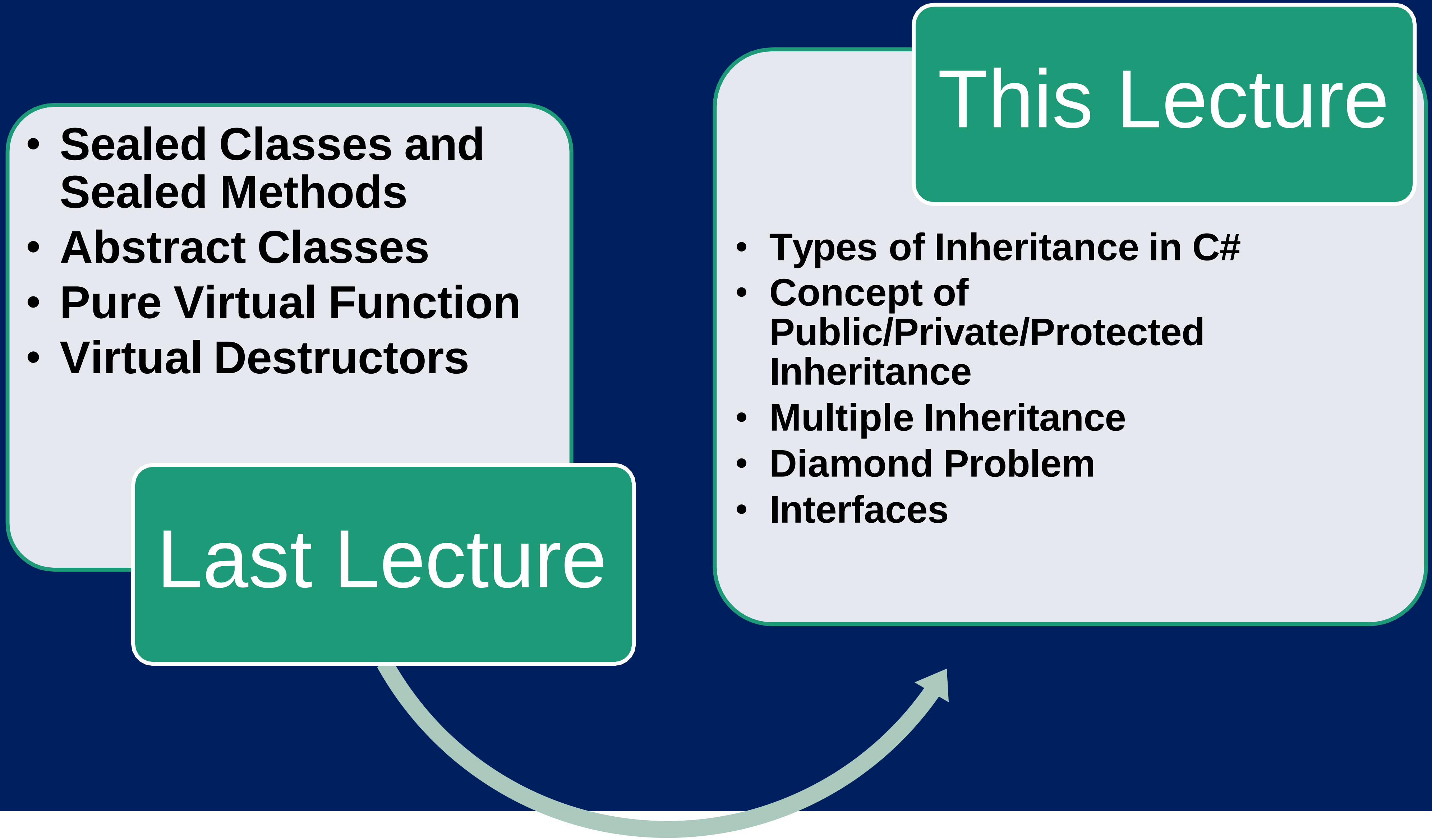
Lecturer



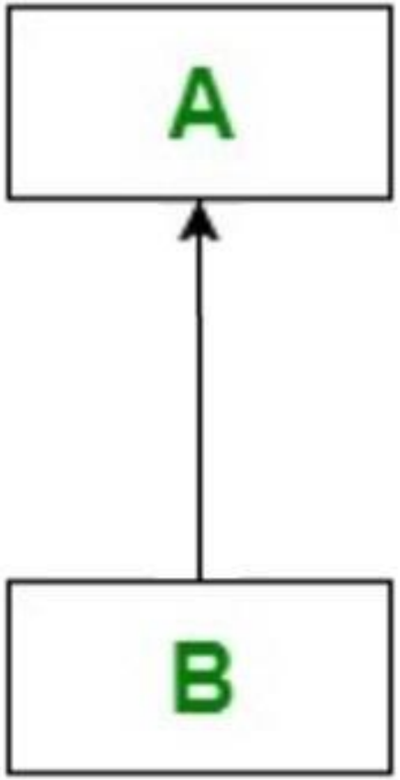
Last Lecture

- Sealed Classes and Sealed Methods
- Abstract Classes
- Pure Virtual Function
- Virtual Destructors

This Lecture

- Types of Inheritance in C#
- Concept of Public/Private/Protected Inheritance
- Multiple Inheritance
- Diamond Problem
- Interfaces

Types of Inheritance in C#

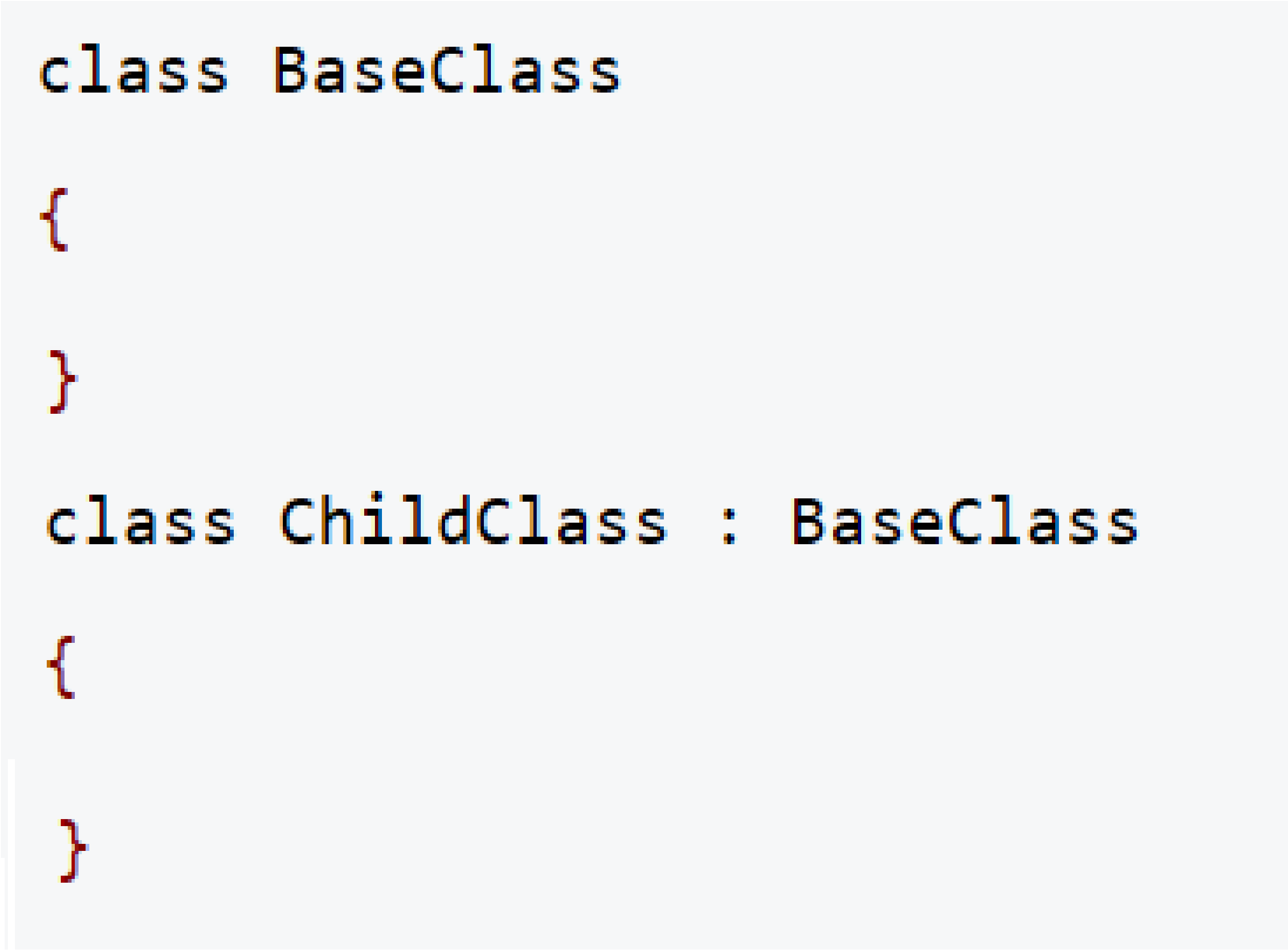


Single Inheritance

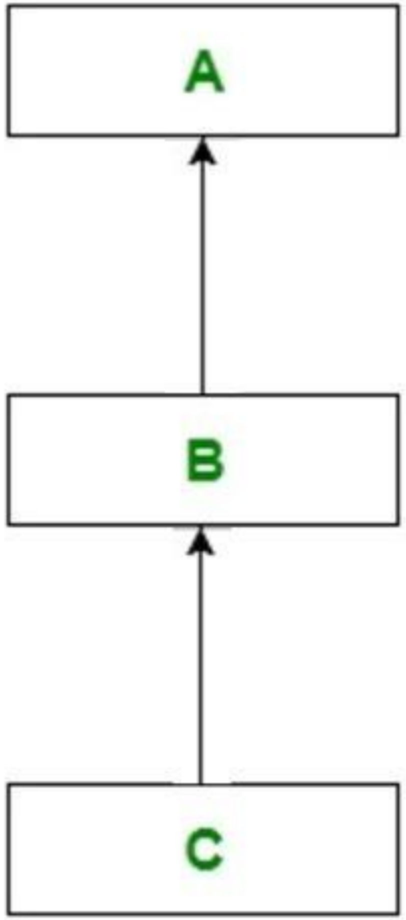
Single Inheritance:

- In single inheritance, subclasses inherit the features of one superclass.
- The class A serves as a base class for the derived class B.

Single Inheritance(C#)



```
class BaseClass
{
}
class ChildClass : BaseClass
{
}
```

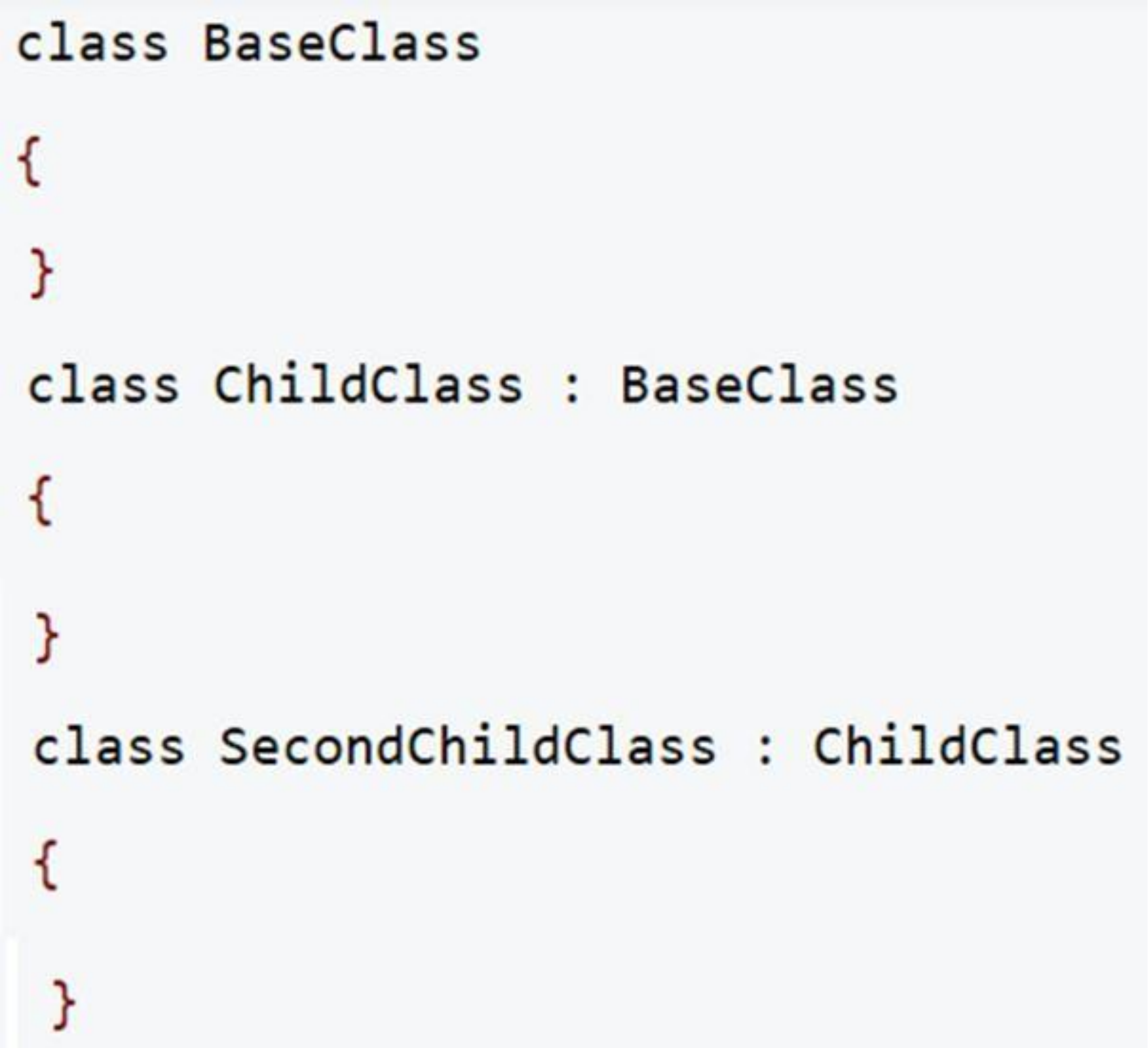


Multilevel Inheritance

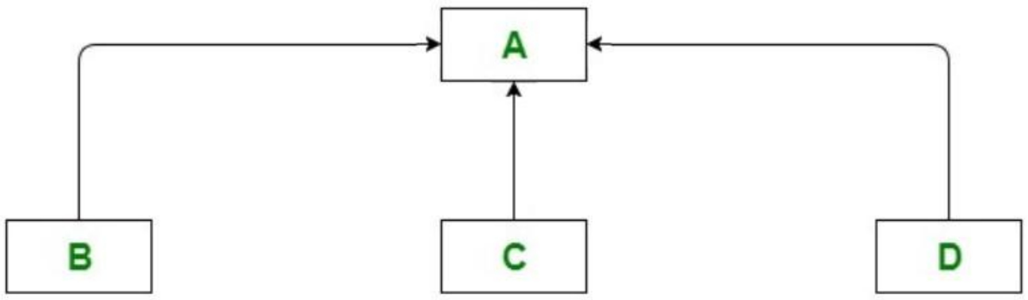
Multilevel Inheritance:

- In Multilevel Inheritance, a derived class will be inheriting a base class and as well as the derived class also act as the base class to other class.
- The class A serves as a base class for the derived class B, which in turn serves as a base class for the derived class C.

Multilevel Inheritance(C#)



```
class BaseClass

{

}

class ChildClass : BaseClass

{

}

class SecondChildClass : ChildClass

{

}
```

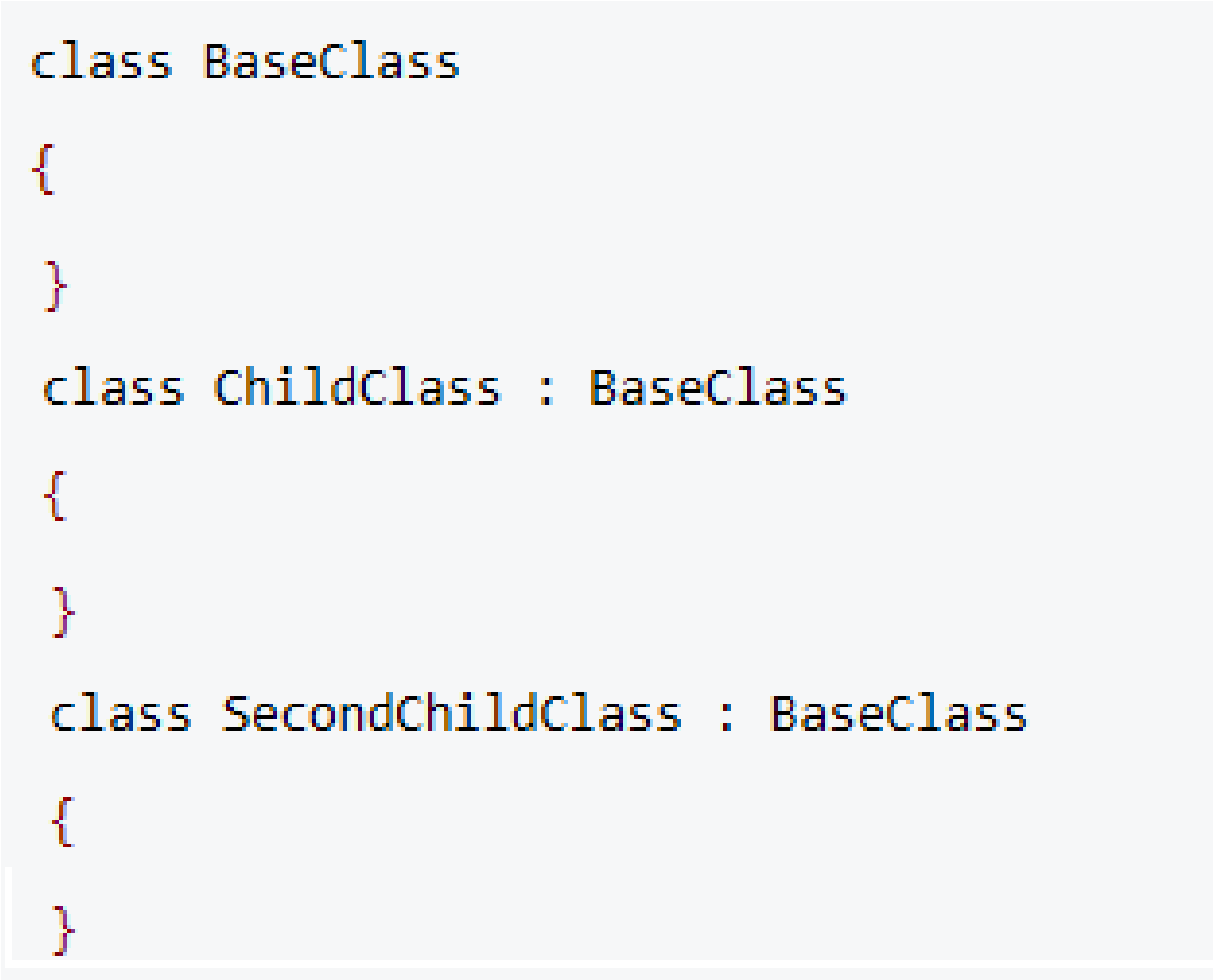


Hierarchical Inheritance

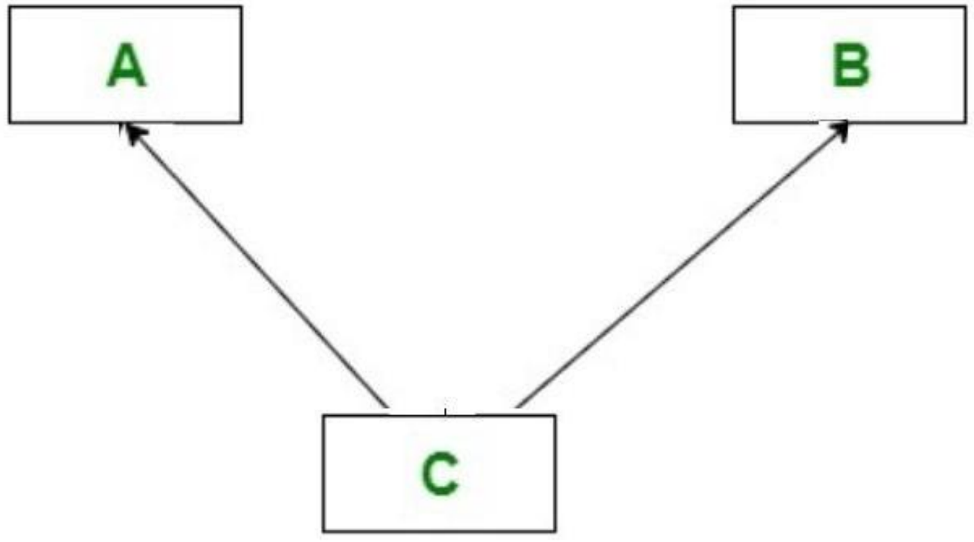
Hierarchical Inheritance:

- In Hierarchical Inheritance, one class serves as a superclass (base class) for more than one subclass.
- In image, class A serves as a base class for the derived class B, C, and D.

Hierarchical Inheritance(C#)



```
class BaseClass
{
}
class ChildClass : BaseClass
{
}
class SecondChildClass : BaseClass
{
}
```



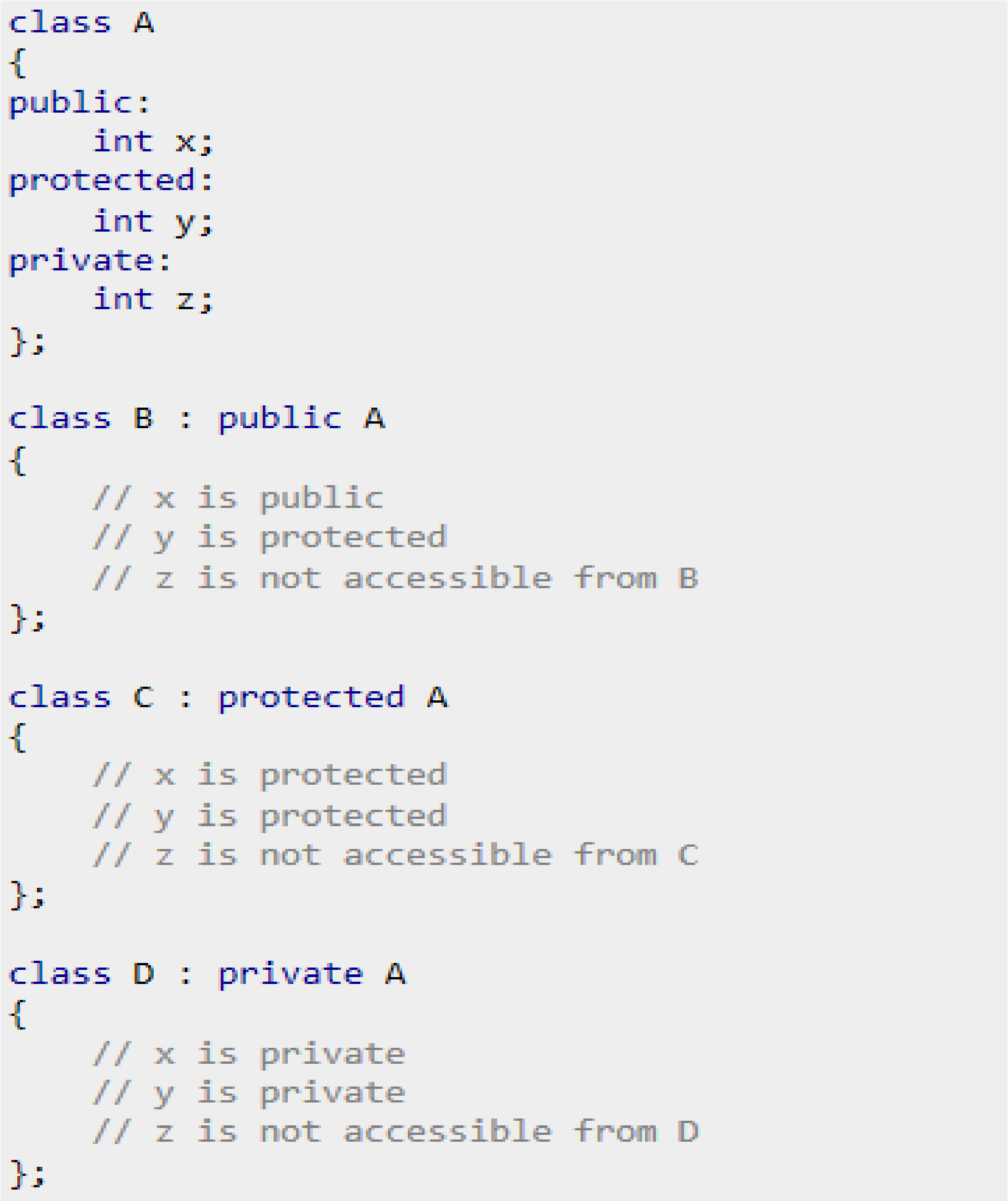
Multiple Inheritance

Multiple Inheritance(Through Interfaces):

- In Multiple inheritance, one class can have more than one superclass and inherit features from all parent classes.
- Please note that **C# does not support multiple inheritance** with classes. We use interfaces to achieve multiple inheritance.

Concept of Public/Private/Protected Inheritance

Concept of Public/Private/Protected Inheritance



```
class A
{
public:
    int x;
protected:
    int y;
private:
    int z;
};

class B : public A
{
    // x is public
    // y is protected
    // z is not accessible from B
};

class C : protected A
{
    // x is protected
    // y is protected
    // z is not accessible from C
};

class D : private A
{
    // x is private
    // y is private
    // z is not accessible from D
};
```

Public/Private/Protected Inheritance

Public Inheritance

- Inherit the protected members as protected in derived class and public members will be public in derived class

Protected Inheritance

- Pubic and protected members of the base class will become protected in derived class

Private Inheritance

- Public and protected members will become private in derived class

Inheritance in C#

Public inheritance is the only kind supported in C#.

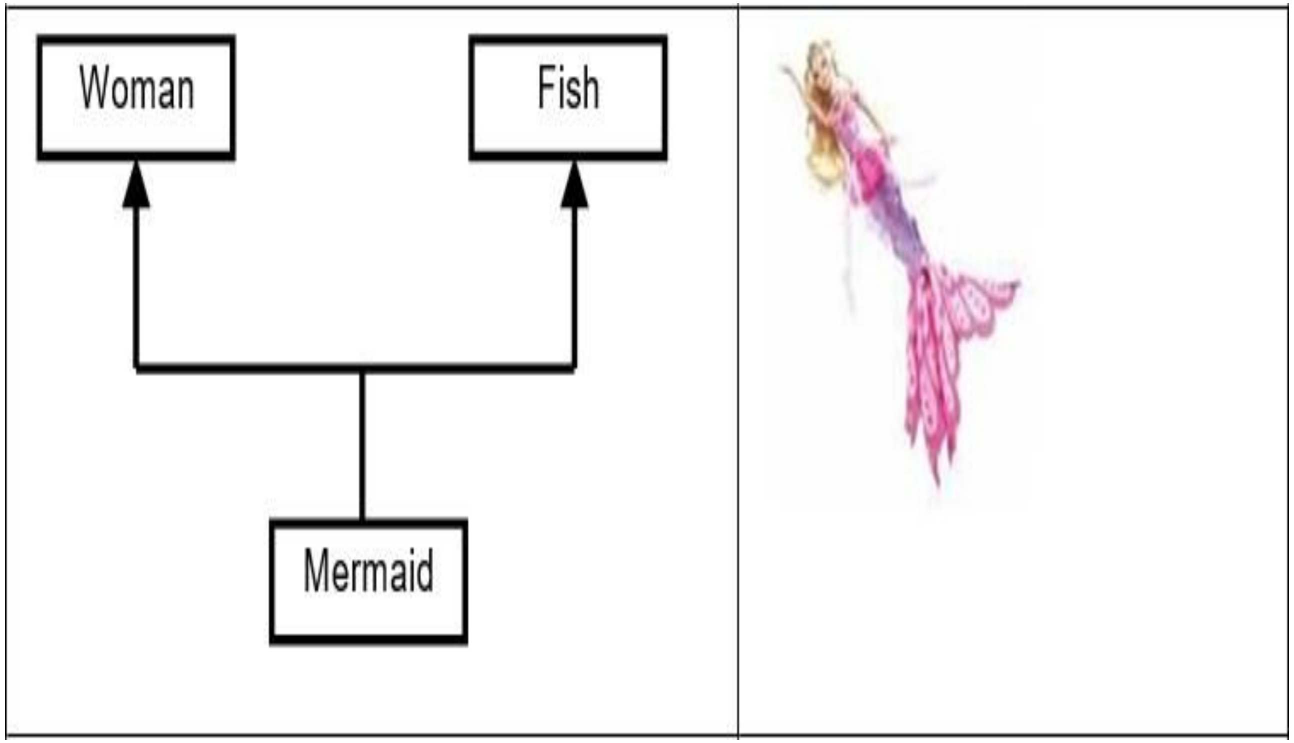
Multiple Inheritance

Multiple Inheritance

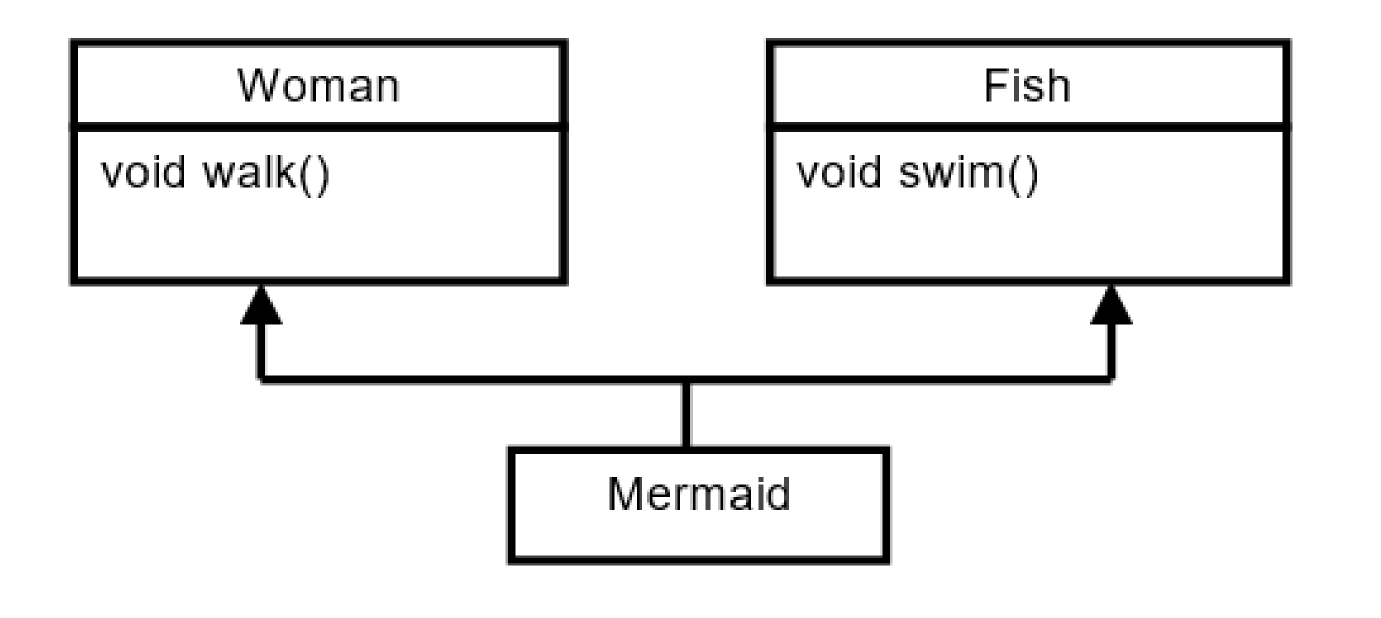
- Sometimes we want to reuse characteristics of more than one parent class, in that case we need to inherit a class from more than one classes.

Example 1– Multiple Inheritance

- Consider the example of an imaginary species Mermaid used in fairy tales that lives in water having features both of a women as well as of a fish
- In Object Oriented programming perspective Mermaid can be derived from two classes Women and Fish.



Example 1– Multiple Inheritance



- Our Mermaid class inherits features of both woman and fish
- Suppose our woman class has method **walk()** and fish class has method **swim()**
- Then our mermaid class can use both methods
  - i.e **can walk as well as can swim**.

Example 2– Multiple Inheritance

Suppose we have a **changeGear** method in **Vehicle class** that is applicable to both water and land vehicle

We also have **Float** and **Move** methods in water and land vehicles respectively then our amphibious vehicle will have all these methods,

References

- Object Oriented Programing , Virtual University , Lecture 27, Online Available at: https://ocw.vu.edu.pk/CourseDetails.aspx?cat=Computer+Science%2FInformation+Technology+&course=CS304
- Object Oriented Programing , Virtual University , Lecture 24, Online Available at: https://ocw.vu.edu.pk/CourseDetails.aspx?cat=Computer+Science%2FInformation+Technology+&course=CS304
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- Object Oriented Programing , Virtual University , Lecture 13, Online Available at: https://ocw.vu.edu.pk/CourseDetails.aspx?cat=Computer+Science%2FInformation+Technology+&course=CS304

THANKS