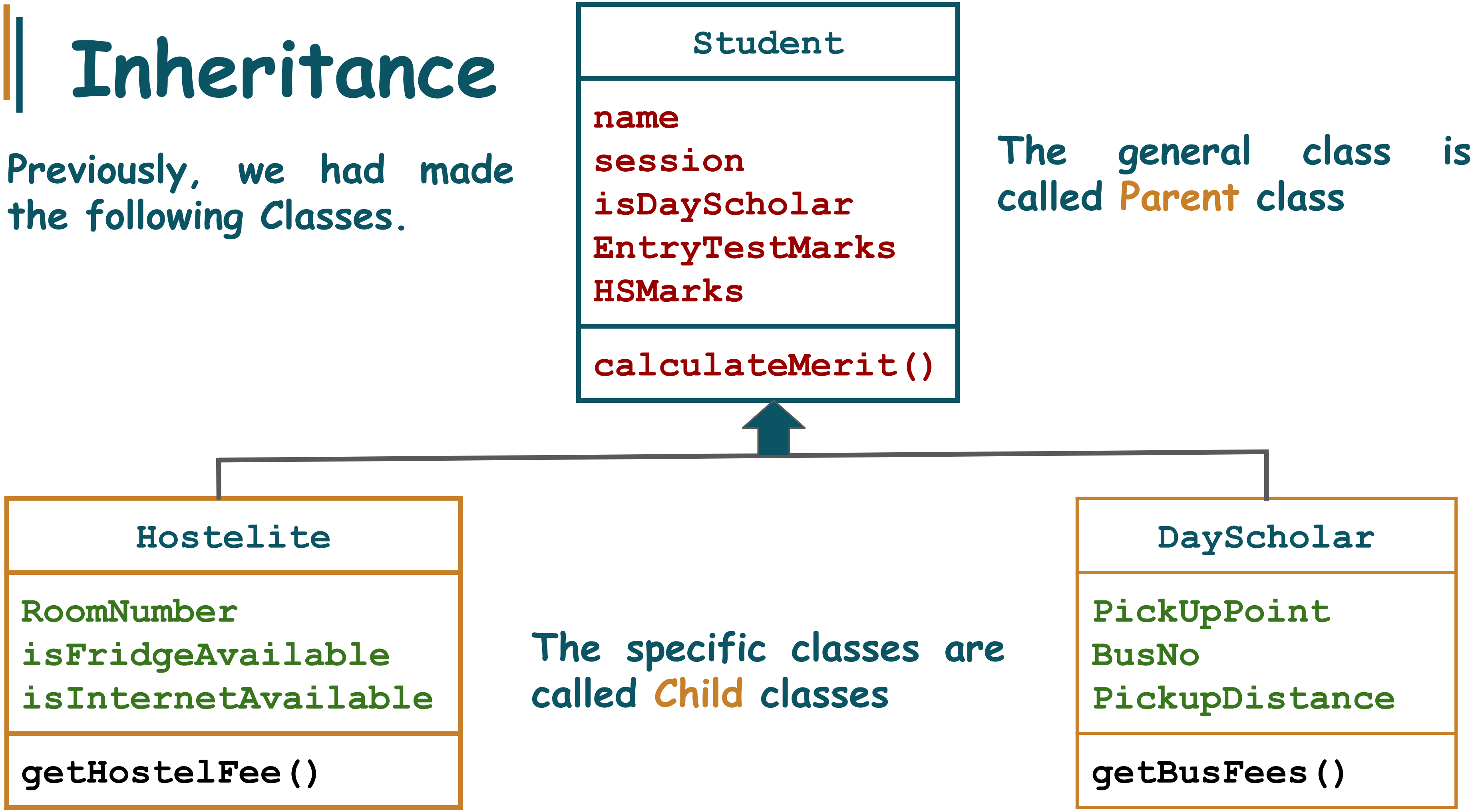
Relationship between the Constructors of Parent and Child And Extending the Functionality

Inheritance

Previously, we had made the following Classes.

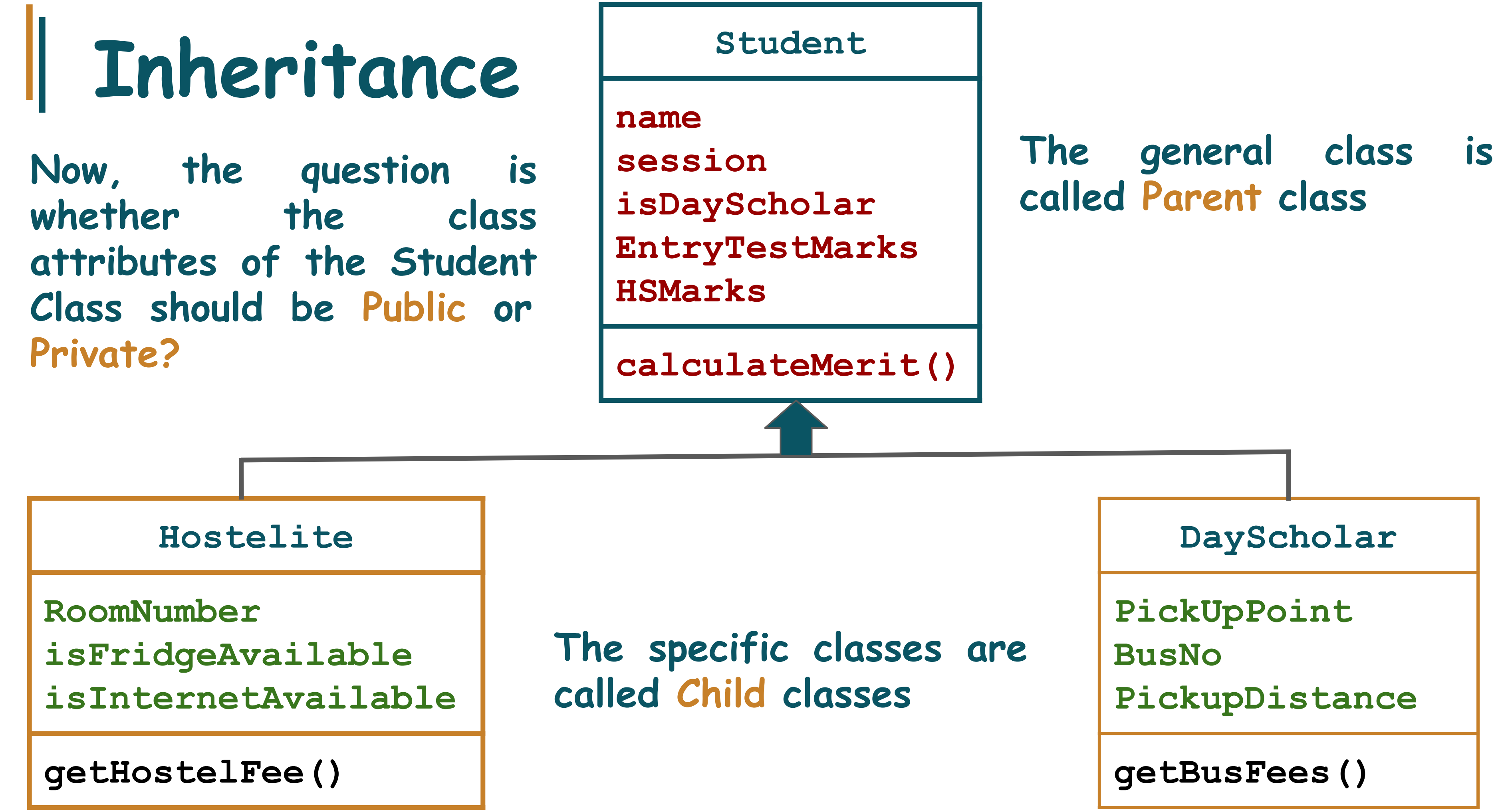


The general class is called Parent class

The specific classes are called Child classes

Inheritance

Now, the question is whether the class attributes of the Student Class should be Public or Private?



The general class is called Parent class

The specific classes are called Child classes

Inheritance

Let's see if we make them Public.

```
class Student
{
    public string name;
    public string session;
    public bool isDayScholar;
    public int EntryTestMarks;
    public int HSMarks;
}
```

Inheritance: Any Problem in This?

Let's see if we make them Public.

```
class Student
{
     public string name;
     public string session;
     public bool isDayScholar;
     public int EntryTestMarks;
     public int HSMarks;
}
```

Inheritance: Any Problem in This?

Let's see if we make them Public. They will be accessed in the Child class. But any class will access them as well by creating the object of Student Class.

```
class Student
{
    public string name;
    public string session;
    public bool isDayScholar;
    public int EntryTestMarks;
    public int HSMarks;
}
```

Inheritance:

Let's see if we make them Private.

```
class Student
{
    private string name;
    private string session;
    private bool isDayScholar;
    private int EntryTestMarks;
    private int HSMarks;
}
```

Inheritance: Any Problem in This?

Let's see if we make them Private.

```
class Student
{
    private string name;
    private string session;
    private bool isDayScholar;
    private int EntryTestMarks;
    private int HSMarks;
}
```

Inheritance: Any Problem in This?

Let's see if we make them Private. Outside classes will not be able to access them. But the Child class will not be able to access the attributes also.

```
class Student
{
    private string name;
    private string session;
    private bool isDayScholar;
    private int EntryTestMarks;
    private int HSMarks;
}
```

Solution

Object Oriented Programming also have another Access modifier.

1. Public
2. Private
3. Protected

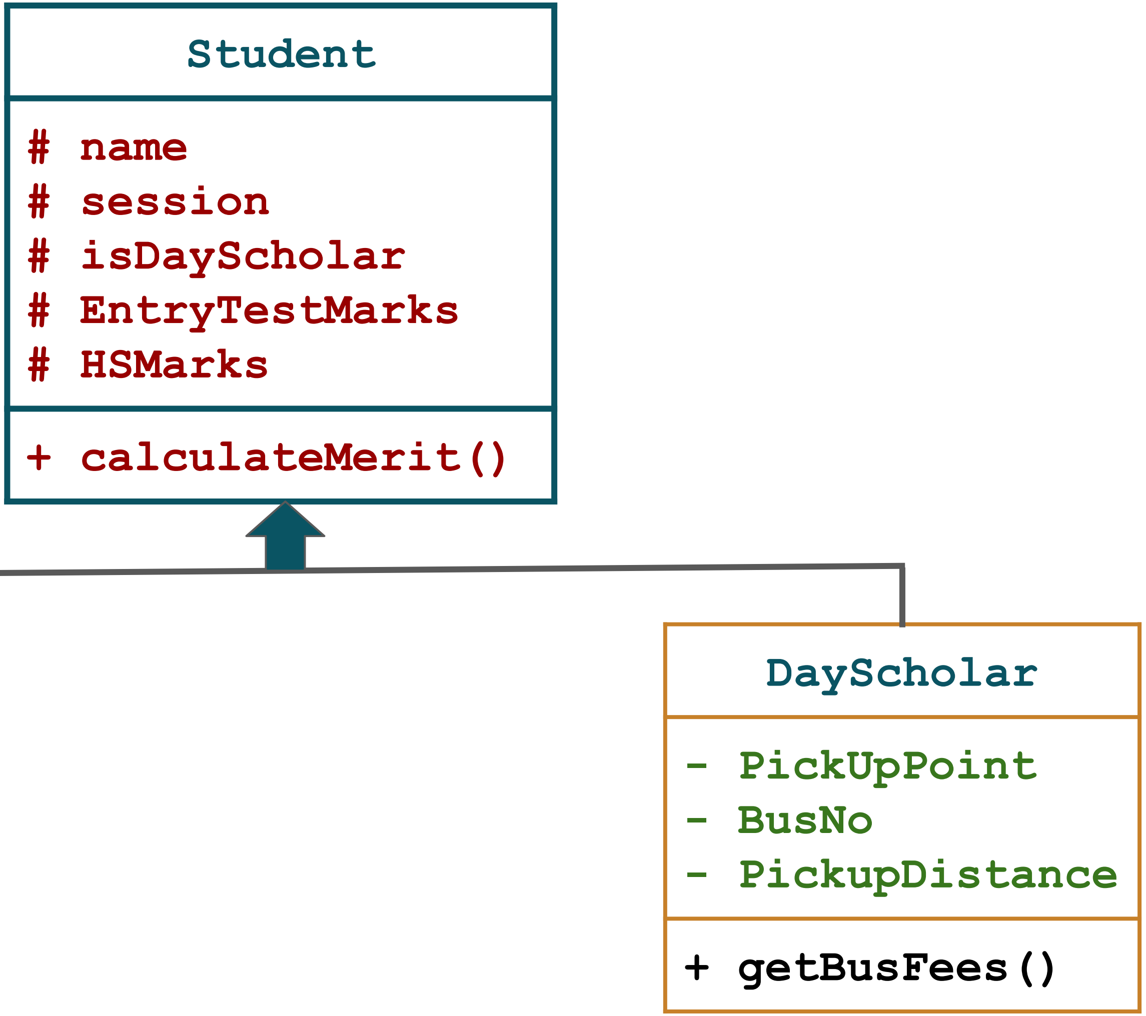
Encapsulation

Access modifiers are an integral part of object oriented programming. Access modifiers are used to implement Encapsulation of OOP. Access modifiers allow you to define who does or who doesn't have access to certain features.

Modifier	Description
public	There are no restrictions on accessing public members.
private	Access is limited to within the class definition. This is the default access modifier type if none is formally specified
protected	Access is limited to within the class definition and any class that inherits from the class

Inheritance

When child class inherits parent class, it receive all the protected and public attributes and functions of the parent class.



Working Example

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;

    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

Working Example

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;

    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool 
isFridgeAvailable)...
    public void setIsInternetAvailable(bool 
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

Working Example

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;

    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

Working Example

Object of Hostelite class have all the protected and public attributes and functions of Student class that it has inherited

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool 
isFridgeAvailable)...
    public void setIsInternetAvailable(bool 
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

Driver Program

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;

    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

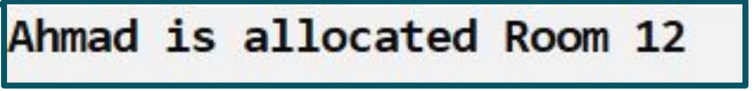
```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setName("Ahmad");
    std.setRoomNumber(12);
    Console.WriteLine(std.getName() + " is
allocated Room " + std.getRoomNumber());
    Console.ReadKey();
}
```

Driver Program

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;

    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setName("Ahmad");
    std.setRoomNumber(12);
    Console.WriteLine(std.getName() + " is
allocated Room " + std.getRoomNumber());
    Console.ReadKey();
}
```



```
Ahmad is allocated Room 12
```

Child Inherits Parent's Legacy

It means Child Class gets the access of all the public and protected attributes and functions of its Parent Class.

Child Class uses all the public and protected attributes and functions of its Parent Class as its own.

Child Inherits Parent's Legacy

Now, let's see what is the relationship of Parent and Child Constructors because the constructors are automatically called.

Activity

What will be the output after the execution of the main?

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student()
    {
        Console.WriteLine("Parent Constructor");
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Activity

What will be the output after the execution of the main?

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student()
    {
        Console.WriteLine("Parent Constructor");
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Activity

It will print "Parent Constructor" on the screen

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student()
    {
        Console.WriteLine("Parent Constructor");
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
Parent Constructor
```

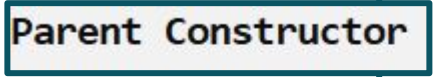
```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Activity

It will print "Parent Constructor" on the screen.
But Why?

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student()
    {
        Console.WriteLine("Parent Constructor");
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```



```
Parent Constructor
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Child Inherits Parent's Legacy

Whenever we create the object of child class it automatically calls the default constructor of parent class.

Activity

Let's add the Default Constructor inside the child class as well.

Activity

Now, What will be the output after the execution of the main?

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student()
    {
        Console.WriteLine("Parent Constructor");
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;
    public Hostelite()
    {
        Console.WriteLine("Child Constructor");
    }
    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Activity

Now, What will be the output after the execution of the main?

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student()
    {
        Console.WriteLine("Parent Constructor");
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

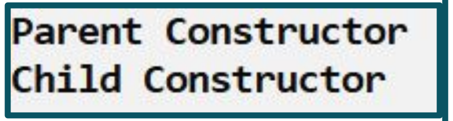
```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;
    public Hostelite()
    {
        Console.WriteLine("Child Constructor");
    }
    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Activity

It will call the Parent Constructor and then the Child Constructor.

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student()
    {
        Console.WriteLine("Parent Constructor");
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```



```
Parent Constructor
Child Constructor
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;
    public Hostelite()
    {
        Console.WriteLine("Child Constructor");
    }
    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Child Inherits Parent's Legacy

Whenever we create the object of child class it automatically first calls the default constructor of parent class and then its own constructor.

Activity

Now Let's add a Parameterized Constructor inside the Parent class.

Activity

What will be the Output?

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student(string name)
    {
        this.name = name;
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool 
isFridgeAvailable)...
    public void setIsInternetAvailable(bool 
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Activity

What will be the Output?

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student(string name)
    {
        this.name = name;
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Activity

This will give us Compile time error as we are not passing the name.

There is no argument given that corresponds to the required formal parameter 'name' of 'Student.Student(string)'

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student(string name)
    {
        this.name = name;
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()
    {
        double merit = 0.0;
        // Code to calculate merit
        return merit;
    }
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool 
isFridgeAvailable)...
    public void setIsInternetAvailable(bool 
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()
    {
        int fee = 0;
        // Code to calculate fee
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    Console.ReadKey();
}
```

Solution?

So, how can we explicitly pass the parameters in the parameterized constructor of the parent class through child class?

Activity

We use the base keyword to call the parameterized constructor of parent Class

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student(string name)
    {
        this.name = name;
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()...
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public Hostelite(string name): base (name)
    {
    }

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()...
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite("Ahmad");
    Console.WriteLine(std.getName());
    Console.ReadKey();
}
```

Activity

We use the base keyword to call the parameterized constructor of parent Class

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student(string name)
    {
        this.name = name;
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()...
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public Hostelite(string name): base (name)
    {
    }

    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()...
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite("Ahmad");
    Console.WriteLine(std.getName());
    Console.ReadKey();
}
```

More than one Parameter

Similarly, we can explicitly pass more than one parameters in the parameterized constructor of the parent class through child class using the base keyword.

Activity

We use the **base** keyword to call the parameterized constructor of parent Class

```
class Student
{
    protected string name;
    protected string session;
    protected bool isDayScholar;
    protected int EntryTestMarks;
    protected int HSMarks;
    public Student(string name, string session)
    {
        this.name = name;
        this.session = session;
    }
    public void setName(string name)...
    public void setSession(string session)...
    public void setIsDayScholar(bool isDayScholar)...
    public void setEntryTestMarks(int EntryTestMarks)...
    public void setHSMarks(int HSMarks)...
    public string getName()...
    public double calculateMerit()...
}
```

```
class Hostelite : Student
{
    private int RoomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvailable;

    public Hostelite(string name, string
session): base (name, session)
    {
    }
    public void setRoomNumber(int RoomNumber)...
    public void setIsFridgeAvailable(bool
isFridgeAvailable)...
    public void setIsInternetAvailable(bool
isInternetAvailable)...
    public int getRoomNumber()...
    public int getHostelFee()...
}
```

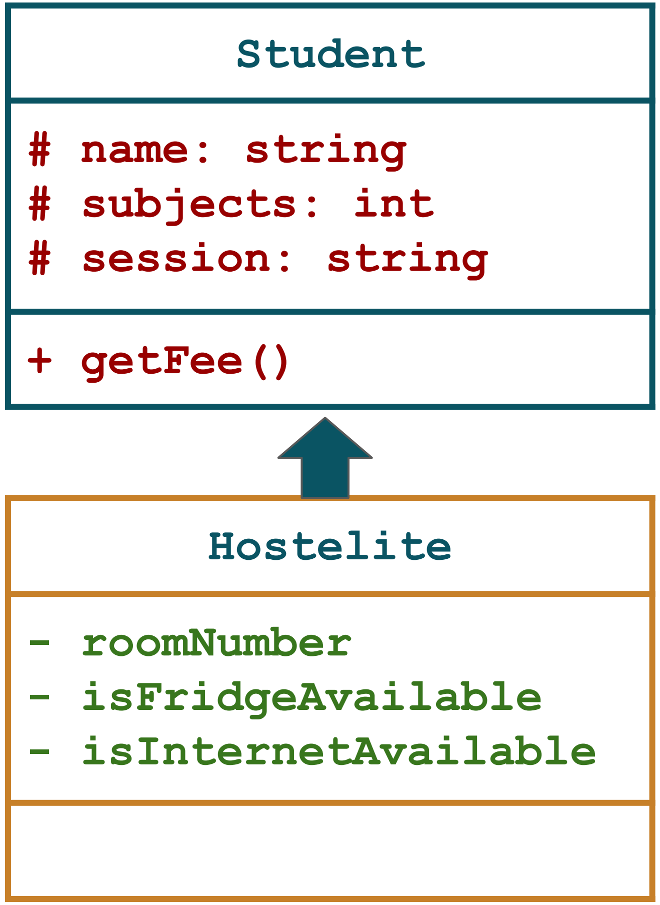
```
static void Main(string[] args)
{
    Hostelite std = new Hostelite("Ahmad",
"2021");
    Console.ReadKey();
}
```

Problem Scenario

When a class inherits another class, all the functionality (attributes and functions) become part of this class.

Problem Scenario

For example, in this case Hostelite class inherits Student. Now the object of Hostelite class have all Functionality that exists in the student class.



Problem Scenario

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Hostelite: Student
{
  private int roomNumber;
  private bool isFridgeAvailable;
  private bool isInternetAvalable;
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

Problem Scenario: Modify the Functionality

Let’s say, the child class (Hostelite) needs to modify/extend the capability of the parent class (Student).

Problem Scenario: Modify the Functionality

Let's say, the child class (Hostelite) needs to modify/extend the capability of the parent class (Student).

What to Do ?

Problem Scenario: Modify the Functionality

Suppose, the fee for Hostelite is bit different than the general Student.
It has extra fee of hostel room, internet and Fridge that is required to be added in the Registered Subject fees.

Problem Scenario: Modify the Functionality

So the problem is the child class (Hostelite) needs to modify/extend the capability of the parent class (Student)

What to Do ?

Function Overriding

Object Oriented Programming offers us a way to modify/extend the functionality of the parent class through function overriding.

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

Whenever extend the functionality in the child class with the same name, use **new** keyword

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

It means we are changing what the Parent class does for the Child class.

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

Anything Wrong with this?

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

Repetition of Code.

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

Here it is just one line why it could be the problem ?

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

Function Overriding: One Line why bother ?

Whenever same business logic repeats itself across the code, it will get difficult to track all the places and update the change every where.

Modify the Functionality

Object Oriented Programming has better solution, when you need to extend the functionality of Base Class (Parent Class) you can call the parent function from child function.

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee = base.getFee();

        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;

    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }

    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

base is reserved word to call the parent method

```
class Hostelite: Student
{
    private int roomNumber;
    private bool isFridgeAvailable;
    private bool isInternetAvalable;
    public new int getFee()
    {
        //Fee 4000 per subject
        int fee = base.getFee();

        if (isFridgeAvailable)
        {
            fee = fee + 1000;
        }
        return fee;
    }
}
```

```
static void Main(string[] args)
{
    Hostelite std = new Hostelite();
    std.setSubjects(4);
    int fee = std.getFee();
    Console.WriteLine("Fee " + fee);
    Console.ReadKey();
}
```

```
class Student
{
    protected string name;
    protected string session;
    protected int subjects;
    public void setName(string name)
    {
        this.name = name;
    }
    public void setSession(string session)
    {
        this.session = session;
    }
    public void setSubjects(int subjects)
    {
        this.subjects = subjects;
    }
    public int getFee()
    {
        //Fee 4000 per subject
        int fee;
        fee = subjects * 4000;
        return fee;
    }
}
```

Function Overriding: Advantage

Some one may argue, we even we need overriding?
We can declare another function with some different name into the child class.

Function Overriding: Advantage

Some one may argue, we even we need overriding?
We can declare another function with some different name into the child class.

Any Answer?

Function Overriding: Advantage

It helps to create consistency in the classes.
Now developer is aware who ever the student whether hostelite, general student or day scholar, all will have same method (getFee()) that he/she can use to calculate the fee.

Conclusion

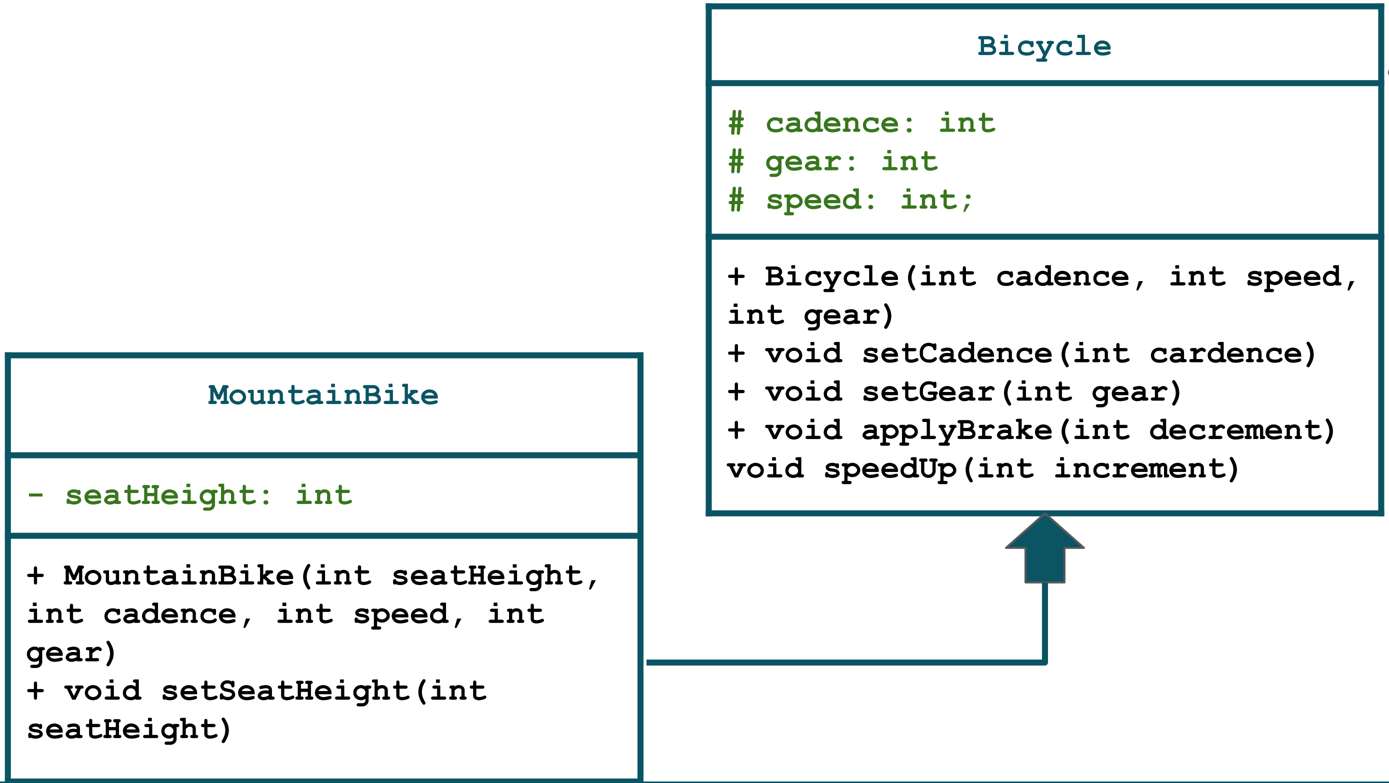
- While extending a class, the subclass inherits all of the public and protected attributes and behaviours from the parent class.
- Function overriding is a feature that allows us to have a same function in child class which is already present in the parent class.
- Base keyword is used, if we want to extend the functionality of a function in child class.

Learning Objective

Child Overrides Behaviour of its Parent Class

Self Assessment: Inheritance

Implement the Following Classes



Bicycle
# cadence: int
# gear: int
# speed: int;
+ Bicycle(int cadence, int speed, int gear)
+ void setCadence(int cardence)
+ void setGear(int gear)
+ void applyBrake(int decrement)
void speedUp(int increment)
MountainBike
- seatHeight: int
+ MountainBike(int seatHeight, int cadence, int speed, int gear)
+ void setSeatHeight(int seatHeight)

Self Assessment: Write Output

```
class Animals
{
    public void sound()
        {
            Console.WriteLine("This is parent class");
        }
}

class Dogs: Animals
{
    public new void sound()
        {
            Console.WriteLine("Dogs bark");
        }
}

class Cats: Animals
{
    public new void sound()
        {
            base.sound();
            Console.WriteLine("Cats meow");
        }
}
```

```
Dogs d = new Dogs();
Cats c = new Cats();
d.sound();
c.sound();
```