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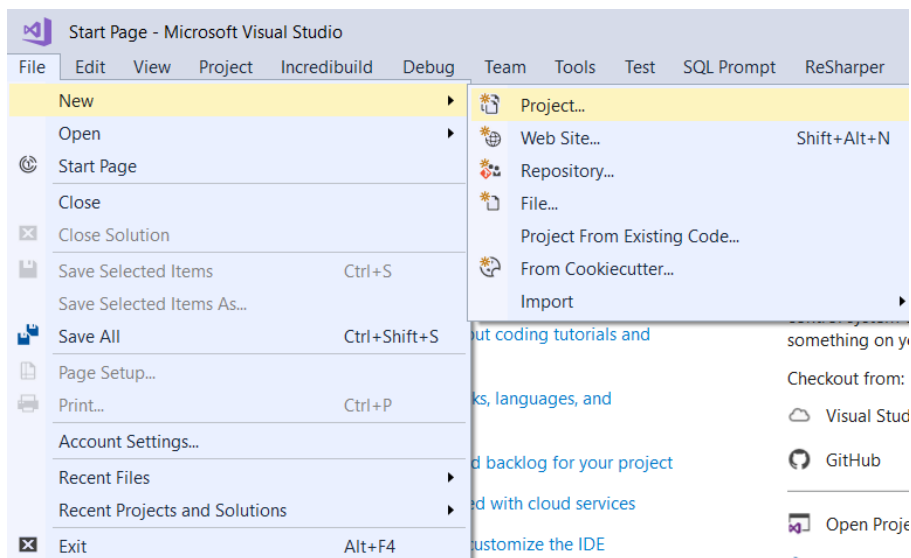
2. Main

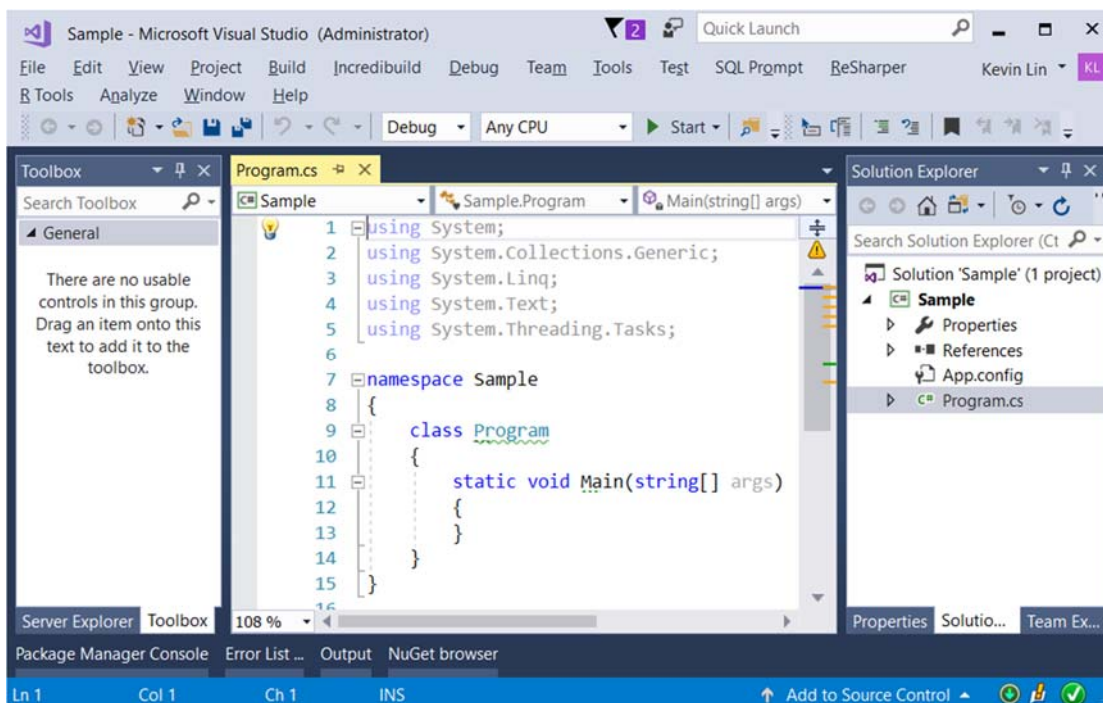
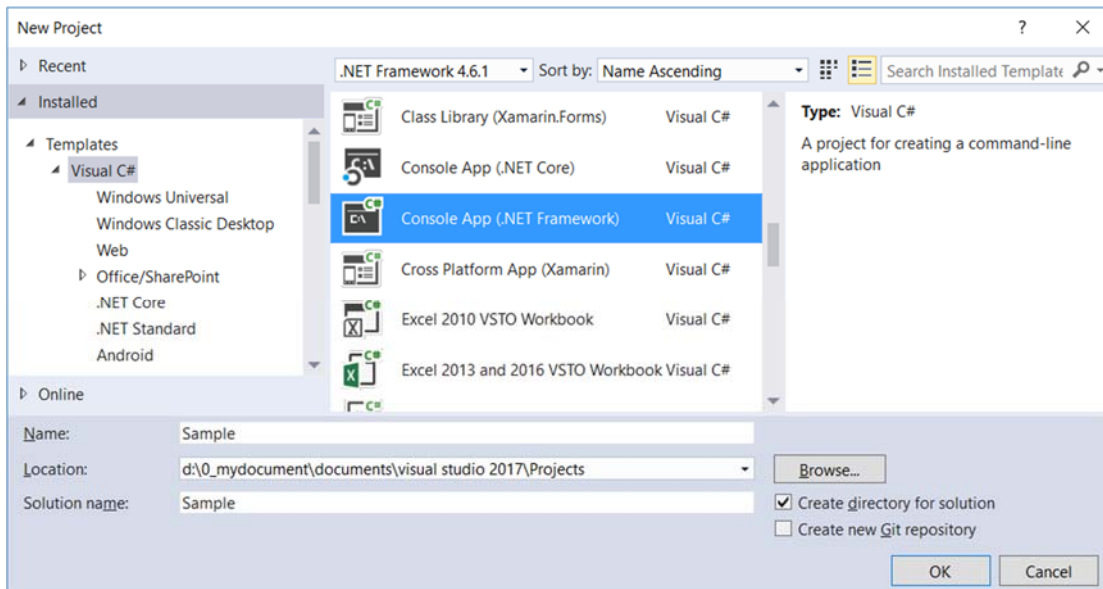
1. Create New Project

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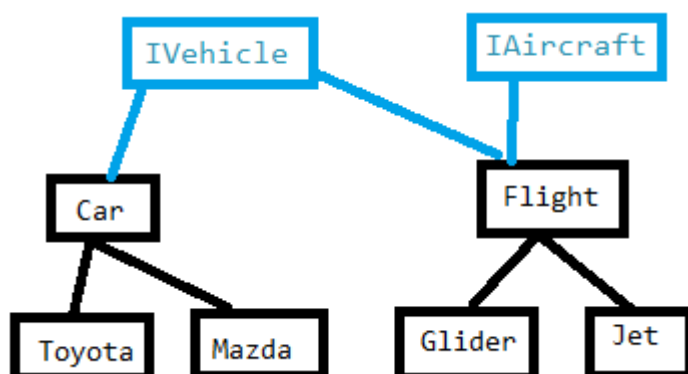
Visual C# --> **Console App (.Net Framework)** -->

Name: **Sample**

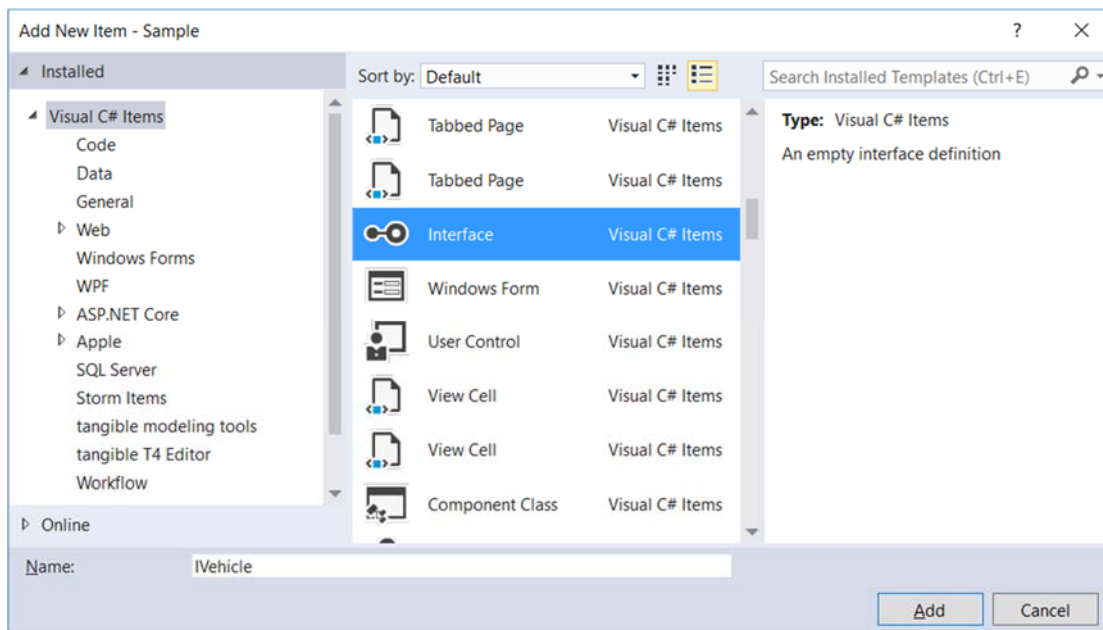




2. Object Oriented



2.1. Interface : IVehicle.cs



// Namespace is like a folder which contains some classes.

```
namespace Sample
```

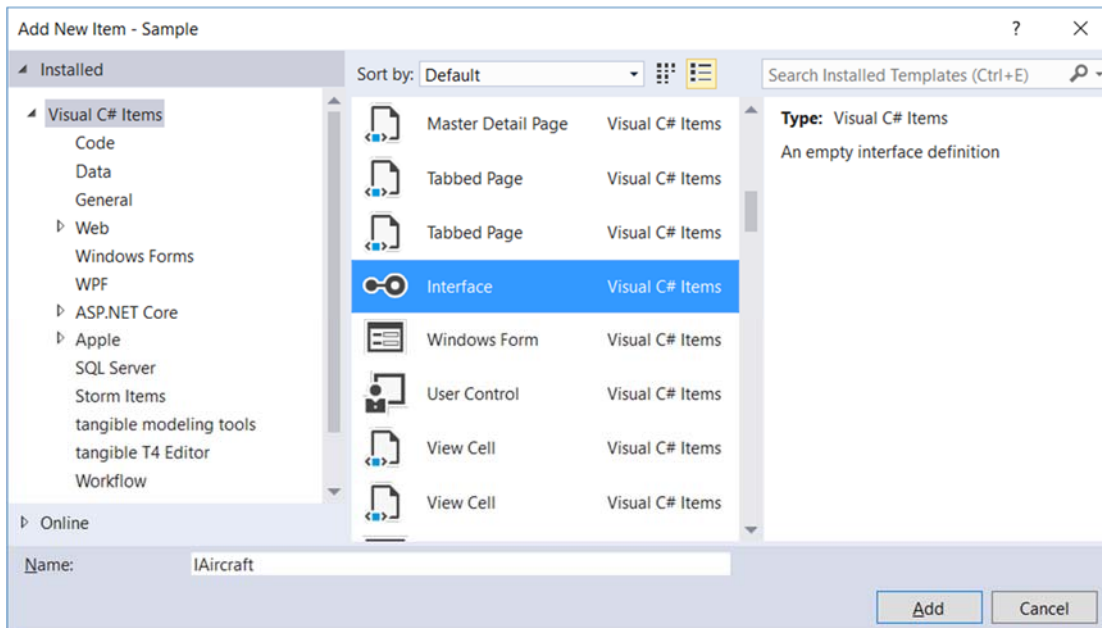
```
{  
    // 1.  
    // Interface is like an product booklet which contains  
    // the standard actions that this product must be able to do.  
    // Interface only contains the method signature without its body.  
    // E.g.  
    // IAircraft must be able to take off and land.  
    // 2.  
    // Interface can not contain fields.  
    // 3.  
    // The prefix of interface is "I"  
    // 4.  
    // a class can exten only one class and implement many Interface.  
    // E.g.  
    // public class ClassA : ClassB, InterfaceA, InterfaceB  
    /// <summary>  
    /// IVehicle must be able to move and stop  
    /// </summary>  
    public interface IVehicle  
    {  
        //string _interfaceName = "IVehicle"; // Interface can not contain fields.  
        /// <summary>  
        /// IVehicle is moving  
        /// </summary>  
        /// <returns></returns>  
        string Moving();  
        /// <summary>  
        /// IVehicle has stopped.  
        /// </summary>  
        /// <returns></returns>  
    }  
}
```

```

        string Stop();
    }
}

```

2.2. Interface : IAircraft.cs



```

namespace Sample
{
    // 1.
    // Interface is like an product booklet which contains
    // the standard actions that this product must be able to do.
    // Interface only contains the method signature without its body.
    // E.g.
    // IAircraft must be able to take off and land.
    // 2.
    // Interface can not contain fields.
    // 3.
    // The prefix of interface is "I"
    // 4.
    // a class can exten only one class and implement many Interface.
    // E.g.
    // public class ClassA : ClassB, InterfaceA, InterfaceB
    /// <summary>
    /// IAircraft must be able to take off and land.
    /// </summary>
    public interface IAircraft
    {
        ///string _interfaceName = "IAircraft"; // Interface can not contain fields.
        /// <summary>
        /// IAircraft is taking off.
        /// </summary>
        /// <returns></returns>
        string TakingOff();
        /// <summary>
        /// IAircraft is landing.
    }
}

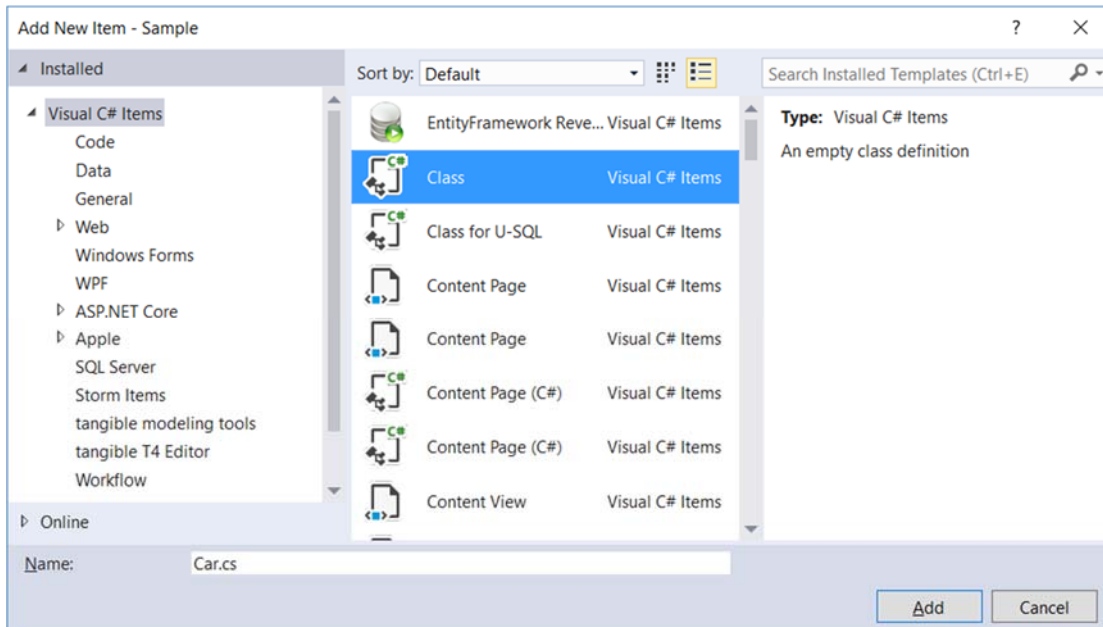
```

```

    /// </summary>
    /// <returns></returns>
    string Landing();
}
}

```

2.3. Car.cs, Car : IVehicle



```

// Namespace is like a folder which contains some classes.
namespace Sample
{
    // 1.
    // public / protected / private
    // Reference:
    // https://docs.microsoft.com/en-us/dotnet/csharp/language-reference/keywords/accessibility-levels
    // Accessibility Levels includes several levels.
    // Here, we only discuss, public, protected, and private.
    // public means access is not restricted.
    // protected means access is limited to the containing class or types derived from the containing
class.
    // private means access is limited to the containing type.
    // 2.
    // class is like a blueprint or template.
    // object is a single instance of the class.
    public class Car : IVehicle
    {
        //-----
        // This can be called as Class Member, Field, global variable.
        // Most people called this as "Field".
        // Field is like a Database Table Column to store the data of the object.
        private string _make;
        private string _type;
        private string _registration;
        private string _year;
        //-----
    }
}

```

```

//The constructor is a special method.
//Whenever a class or struct is created, its constructor is called
/// <summary>
/// The constructor of car.
/// </summary>
/// <param name="make"></param>
/// <param name="type"></param>
/// <param name="registration"></param>
/// <param name="year"></param>
/// <param name="currentValue"></param>
public Car(string make, string type, string registration, string year, double currentValue)
{
    _make = make;
    _type = type;
    _registration = registration; // set value directly to the field.
    _year = year; // set value directly to the field.
    CurrentValue = currentValue; // set the field value by its property.
}
//-----
// Properties is special method to replace get and set.
// Year Property can replace GetYear() and SetYear()
public string Year
{
    get { return _year; }
    // this is the keyword, means current object
    set { this._year = value; }
}
// CurrentValue Property can replace GetValue() and SetValue()
public double CurrentValue { get; set; }
// Make Property can replace GetMake()
public string Make { get { return _make; } }
// Type Property can replace GetType()
public string Type { get { return _type; } }
//-----
// 1.
//Method is a set of logic processes.
//Method is like an action which this object can do.
//E.g. Car can move and stop.
//2.
//Only virtual method can be overriden in the sub-class.
/// <summary>
/// Get the _registration
/// </summary>
/// <returns>_registration</returns>
public string GetRegistration()
{
    return _registration;
}
/// <summary>
/// Set the _registration
/// </summary>
/// <param name="registration">registration string</param>
public void SetRegistration(string registration)
{
    _registration = registration;
}

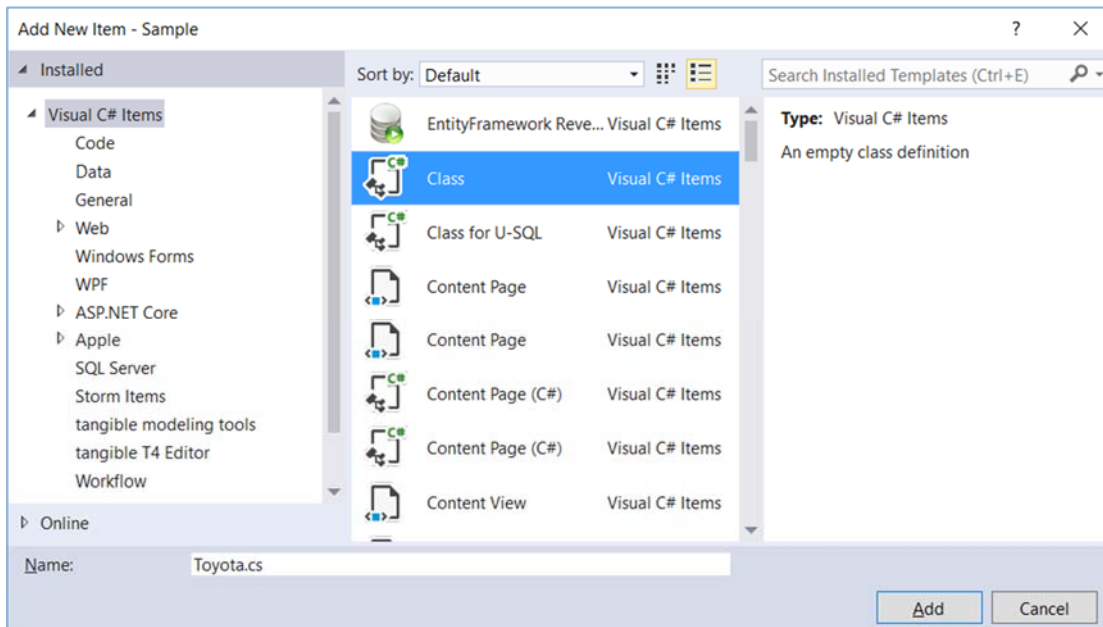
```

```

    }
    /// <summary>
    /// Return full car information
    /// </summary>
    /// <returns>full car information</returns>
    public override string ToString()
    {
        //return String.Format("Car Make: {0}\n" +
        //                      "Car Type: {1}\n" +
        //                      "Car Registration: {2}\n" +
        //                      "Car Year: {3}\n" +
        //                      "Current Value: {4}", _make, _type, _registration, _year,
CurrentValue);
        return $"Car Make: {_make}\n" +
            $"Car Type: {_type}\n" +
            $"Car Registration: {_registration}\n" +
            $"Car Year: {_year}\n" +
            $"Current Value: {CurrentValue}";
    }
    /// <summary>
    /// IVehicle is moving
    /// </summary>
    /// <returns></returns>
    public virtual string Moving()
    {
        return "Car is moving.";
    }
    /// <summary>
    /// IVehicle has stopped.
    /// </summary>
    /// <returns></returns>
    public string Stop()
    {
        return "Car has stopped.";
    }
}
}

```

2.4. Toyota.cs, Toyota : Car



// Namespace is like a folder which contains some classes.

namespace Sample

{

// 1.

// class is like a blueprint or template.

// object is a single instance of the class.

// 2.

// Toyota : Car

// means Toyota extend or implement Car.

// We can say Car is the parent class of Toyota.

// Toyota is a sub-Class of Car.

// Toyota succeed all members, properties, methods

// from its parent class, Car.

public class Toyota : Car

{

//-----

//The constructor is a special method.

//Whenever a class or struct is created, its constructor is called

public Toyota(string type, string registration, string year, double currentValue) : base("Toyota", type, registration, year, currentValue)

{
}

//-----

// 1.

//Method is a set of logic processes.

//Method is like an action which this object can do.

//E.g. Car can move and stop.

//2.

//Only virtual method can be overridden in the sub-class.

/// <summary>

/// An action or method which ONLY Toyota can do.

/// </summary>

/// <returns></returns>

public string OnlyToyotaCanDo()

{

return "This is an action or method which ONLY " + this.Make + " can do.";

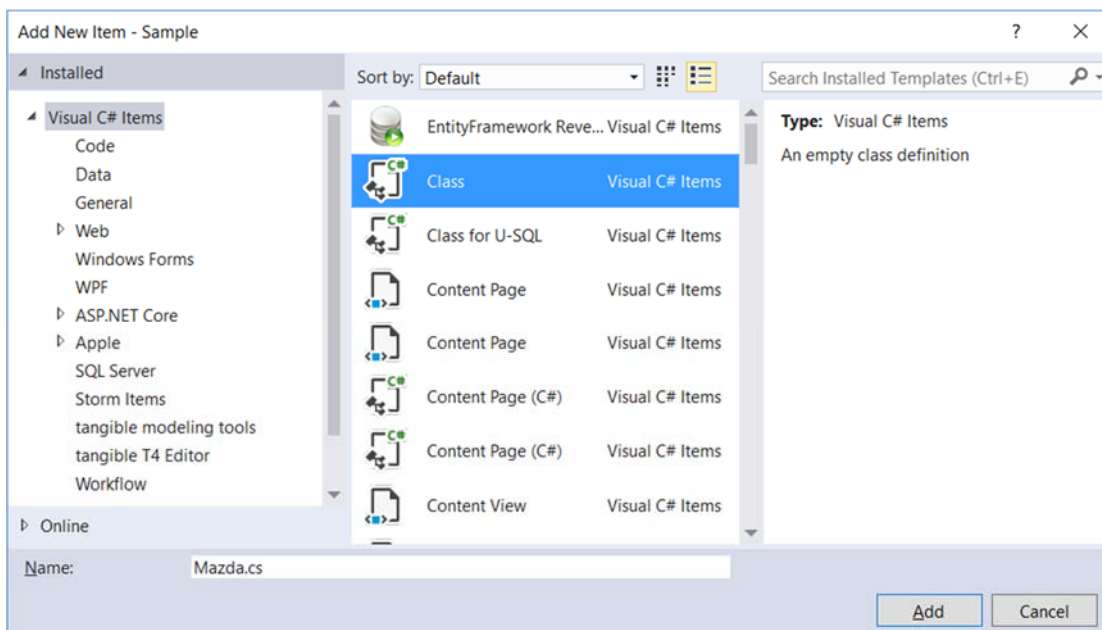
}


```

    /// <summary>
    /// IVehicle is moving
    /// </summary>
    /// <returns></returns>
    public override string Moving()
    {
        return this.Make + " Car is moving.";
    }
}
}

```

2.5. Mazda.cs, Mazda : Car



// Namespace is like a folder which contains some classes.

```
namespace Sample
```

```

{
    // 1.
    // class is like a blueprint or template.
    // object is a single instance of the class.
    // 2.
    // Mazda : Car
    // means Mazda extend or implement Car.
    // We can say Car is the parent class of Mazda.
    // Mazda is a sub-Class of Car.
    // Mazda succeed all members, properties, methods
    // from its parent class, Car.
    public class Mazda : Car
    {
        //-----
        //The constructor is a special method.
        //Whenever a class or struct is created, its constructor is called
        public Mazda(string type, string registration, string year, double currentValue) : base("Mazda", type,
registration, year, currentValue)
        {
        }
    }
    //-----
}

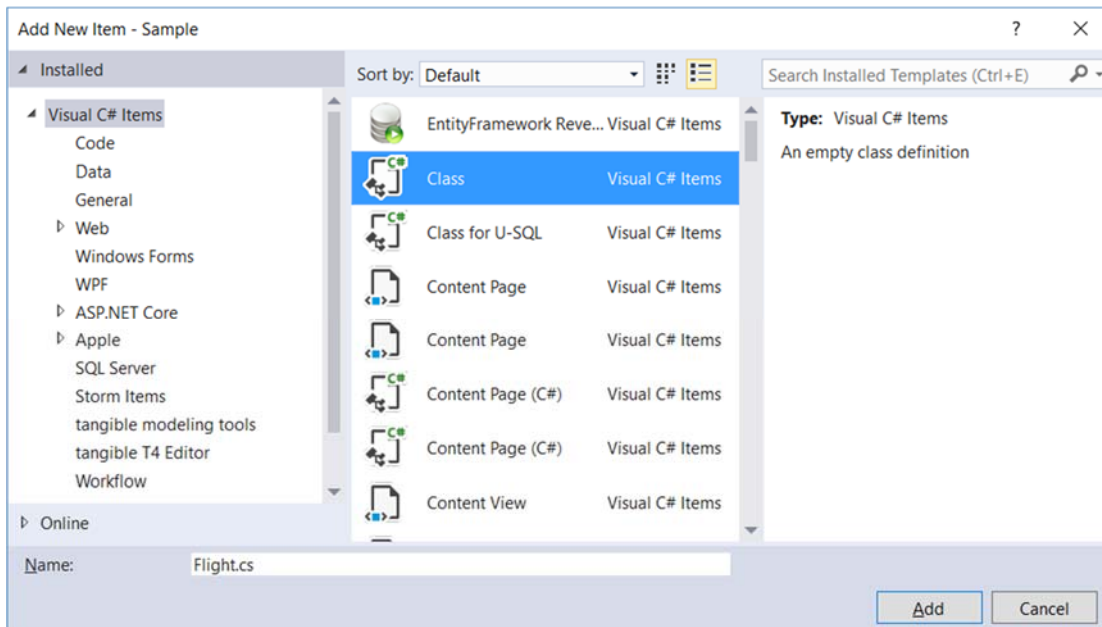
```

```

// 1.
//Method is a set of logic processes.
//Method is like an action which this object can do.
//E.g. Car can move and stop.
//2.
//Only virtual method can be overriden in the sub-class.
/// <summary>
/// An action or method which ONLY Mazda can do.
/// </summary>
/// <returns></returns>
public string OnlyMazdaCanDo()
{
    return "This is an action or method which ONLY " + this.Make + " can do.";
}
}
}

```

2.6. Flight.cs, Flight : IAircraft, IVehicle



```

// Namespace is like a folder which contains some classes.
namespace Sample
{
    // a class can extend only one class and implement many Interface.
    // E.g.
    // public class ClassA : ClassB, InterfaceA, InterfaceB
    public class Flight : IAircraft, IVehicle
    {
        //-----
        // This can be called as Class Member, Field, global variable.
        // Most people called this as "Field".
        // Field is like a Database Table Column to store the data of the object.
        private string _type;
        private string _year;
        //-----
        //The constructor is a special method.
    }
}

```

```

//Whenever a class or struct is created, its constructor is called
/// <summary>
/// The constructor of Flight.
/// </summary>
/// <param name="type"></param>
/// <param name="year"></param>
/// <param name="currentValue"></param>
public Flight(string type, string year, double currentValue)
{
    _type = type;
    _year = year;    // set value directly to the field
    CurrentValue = currentValue;    // set the field value by its property.
}
//-----
// Properties is special method to replace get and set.
// Year Property can replace GetYear() and SetYear()
public string Year
{
    get { return _year; }
    // this is the keyword, means current object
    set { this._year = value; }
}
// CurrentValue Property can replace GetValue() and SetValue()
public double CurrentValue { get; set; }
// Make Property can replace GetMake()
public string Type { get { return _type; } }
//-----
//1.
//Method is a set of logic processes.
//Method is like an action which this object can do.
//E.g. Flight can take off and land.
//2.
//Only virtual method can be overridden in the sub-class.
/// <summary>
/// IAircraft is taking off.
/// </summary>
/// <returns></returns>
public virtual string TakingOff()
{
    return "Flight is taking off.";
}
/// <summary>
/// IAircraft is landing.
/// </summary>
/// <returns></returns>
public virtual string Landing()
{
    return "Flight is landing.";
}
/// <summary>
/// IVehicle is moving
/// </summary>
/// <returns></returns>
public string Moving()
{

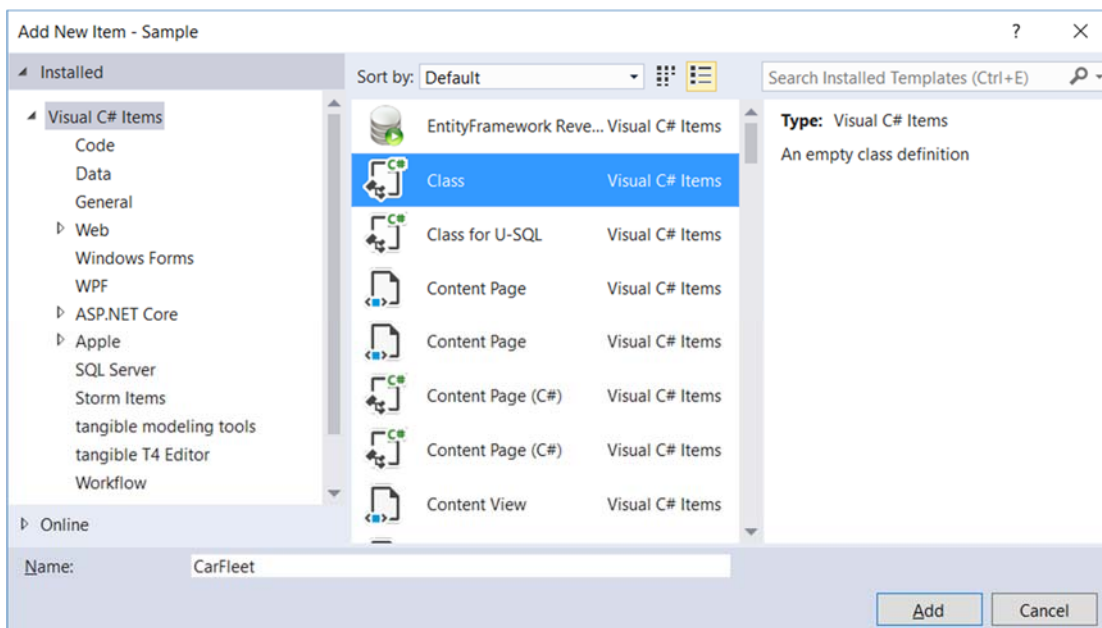
```

```

        return "Flight is moving.";
    }
    /// <summary>
    /// IVehicle has stopped.
    /// </summary>
    /// <returns></returns>
    public string Stop()
    {
        return "Flight has stopped.";
    }
}
}

```

2.7. CarFleet.cs



```

namespace Sample
{
    public class CarFleet
    {
        //-----
        // This can be called as Class Member, Field, global variable.
        // Most people called this as "Field".
        // Field is like a Database Table Column to store the data of the object.
        // an array of _cars which can contain 100 car objects.
        //Max number of car quantity is 100.
        private Car[] _cars;
        // The current index of car array represents the current car quantity in array.
        // In the beginning, it should be 0.
        private int _qtyOfCarInArray;
        //-----
        //The constructor is a special method.
        //Whenever a class or struct is created, its constructor is called
        /// <summary>
        /// The constructor.
        /// </summary>
    }
}

```

```

public CarFleet()
{
    // an array of _cars which can contain 100 car objects.
    //Max number of car quantity is 100.
    _cars = new Car[100];
    // The current index of car array represents the current car quantity in array.
    // In the beginning, it should be 0.
    _qtyOfCarInArray = 0;
}
//-----
// 1.
//Method is a set of logic processes.
//Method is like an action which this object can do.
//E.g. Car can move and stop.
//2.
//Only virtual method can be overridden in the sub-class.
/// <summary>
/// Add the car into the next free slot in the car array.
/// </summary>
/// <param name="car">The car to add</param>
public void Add(Car car)
{
    // _qtyOfCarInArray field tracks where
    // the next free slot in the array is and
    // increments it after a car has been added.
    _cars[_qtyOfCarInArray] = car;
    _qtyOfCarInArray++;
}
/// <summary>
/// Summing up the value of each car in the car array.
/// </summary>
/// <returns>Return the Sum value of each car in the car array.</returns>
public double SumFleetValue()
{
    double total = 0;
    for (int i = 0; i < _qtyOfCarInArray; i++)
    {
        total += _cars[i].CurrentValue; // total = total + _cars[i].CurrentValue;
    }
    return total;
}
/// <summary>
/// Output parameter for the car Min Value and
/// car Max Value from the car array.
/// </summary>
/// <param name="leastValue">Car least Value from the car array</param>
/// <param name="highestValue">Car highest Value from the car array</param>
public void Statistics(out double leastValue, out double highestValue)
{
    leastValue = _cars[0].CurrentValue;
    highestValue = _cars[0].CurrentValue;
    for (int i = 0; i < _qtyOfCarInArray; i++)
    {
        if (_cars[i].CurrentValue < leastValue)
            leastValue = _cars[i].CurrentValue;
        else if (_cars[i].CurrentValue > highestValue)

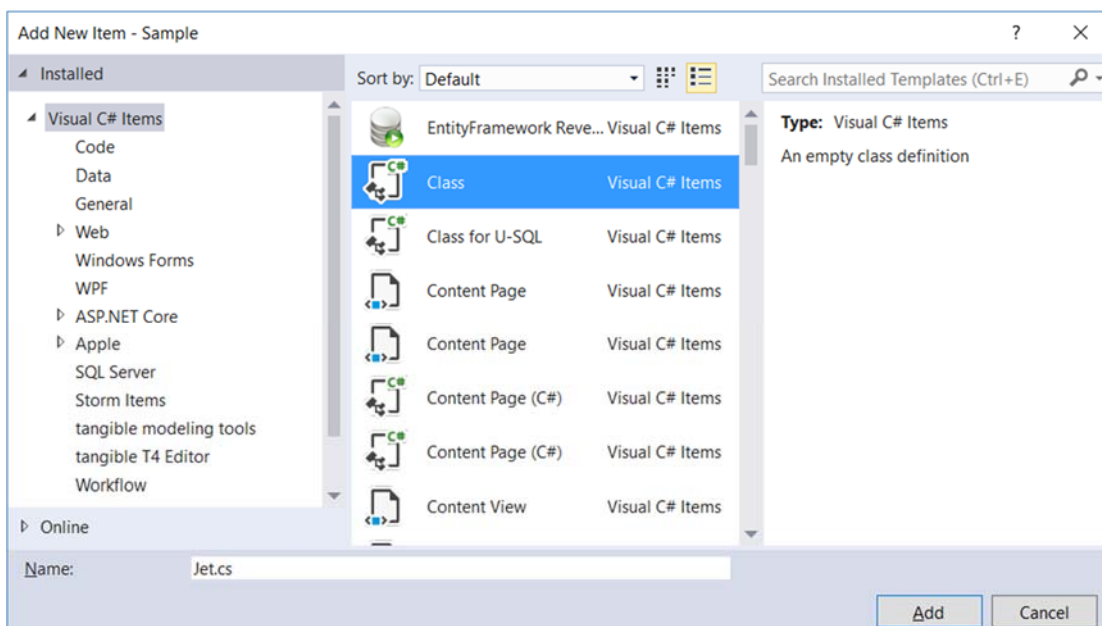
```

```

        highestValue = _cars[i].CurrentValue;
    }
}
/// <summary>
/// Get the cars by its year.
/// </summary>
/// <param name="year">The specific car year.</param>
/// <returns>The cars by its year.</returns>
public Car[] GetCars(string year)
{
    //Count how many cars in the car array are for the specified year.
    int count = 0;
    for (int i = 0; i < _qtyOfCarInArray; i++)
    {
        if (_cars[i].Year == year)
            count++;
    }
    // Create a new array, carsYears, with this size, count.
    Car[] carsYears = new Car[count];
    // copy in the cars for the specified year into new array, carsYears.
    int index = 0;
    for (int i = 0; i < _qtyOfCarInArray; i++)
    {
        if (_cars[i].Year == year)
        {
            carsYears[index] = _cars[i];
            index++;
        }
    }
    // return the array.
    return carsYears;
}
}
}

```

2.8. Jet.cs, Jet : Flight

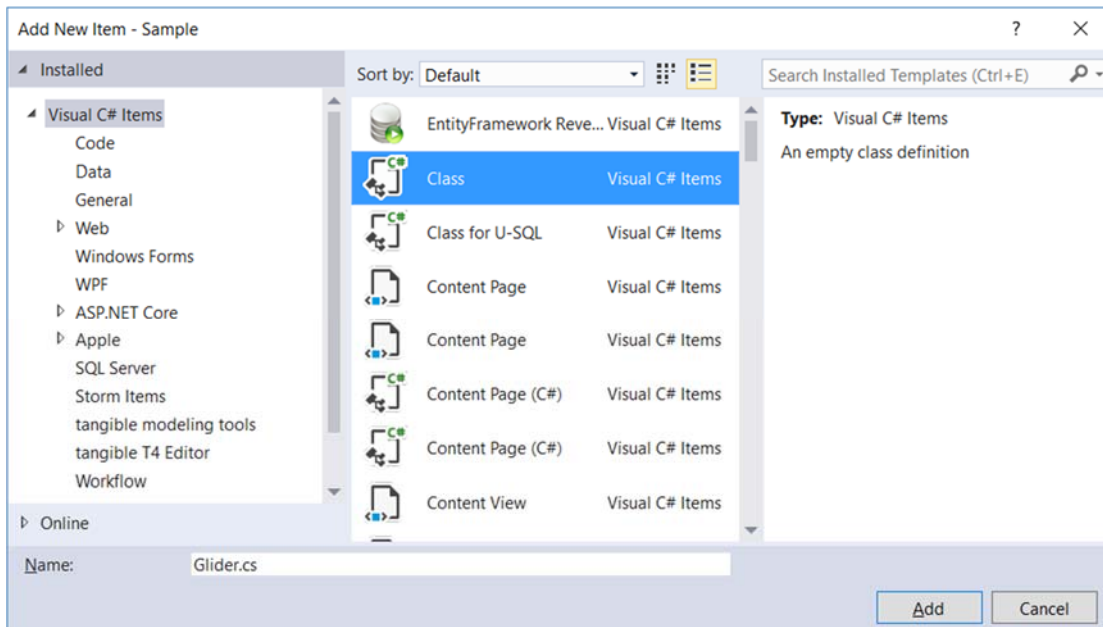


```

// Namespace is like a folder which contains some classes.
namespace Sample
{
    public class Jet : Flight
    {
        //-----
        //The constructor is a special method.
        //Whenever a class or struct is created, its constructor is called
        public Jet(string year, double currentValue) : base("Jet", year, currentValue)
        {
        }
        //-----
        // 1.
        //Method is a set of logic processes.
        //Method is like an action which this object can do.
        //E.g. Car can move and stop.
        //2.
        //Only virtual method can be overridden in the sub-class.
        /// <summary>
        /// An action or method which ONLY Jet can do.
        /// </summary>
        /// <returns></returns>
        public string OnlyJetCanDo()
        {
            return "This is an action or method which ONLY " + this.Type + " can do.";
        }
        /// <summary>
        /// IAircraft is taking off.
        /// </summary>
        /// <returns></returns>
        public override string TakingOff()
        {
            return "Flight is taking off.";
        }
        /// <summary>
        /// IAircraft is landing.
        /// </summary>
        /// <returns></returns>
        public override string Landing()
        {
            return "Flight is landing.";
        }
    }
}

```

2.9. Glider.cs, Glider : Flight



// Namespace is like a folder which contains some classes.

```
namespace Sample
```

```
{
    public class Glider : Flight
    {
        //-----
        //The constructor is a special method.
        //Whenever a class or struct is created, its constructor is called
        public Glider(string year, double currentValue) : base("Glider", year, currentValue)
        {
        }
        //-----
        // 1.
        //Method is a set of logic processes.
        //Method is like an action which this object can do.
        //E.g. Car can move and stop.
        //2.
        //Only virtual method can be overriden in the sub-class.
        /// <summary>
        /// An action or method which ONLY Glider can do.
        /// </summary>
        /// <returns></returns>
        public string OnlyGliderCanDo()
        {
            return "This is an action or method which ONLY " + this.Type + " can do.";
        }
    }
}
```

2. Main

```
using System;
// Namespace is like a folder which contains some classes.
namespace Sample
{
    class Program
```



```

{
    static void Main(string[] args)
    {
        //1.
        //Create a detail for Honda CRV and print its detail.
        Console.WriteLine("CarA -----");
        Car carA = new Car("Honda", "Crv", "RegistrationA", "2014", 21000);
        Console.WriteLine(carA);
        Console.WriteLine(carA.Moving());
        Console.WriteLine(carA.Stop());
        //2.
        //Create a detail for Toyota Corolla and print its detail.
        Console.WriteLine("CarB -----");
        // Class ObjectName = new Class
        // E.g.
        // Use Toyota class as the blueprint and create an instance object of Toyota.
        // The instance object name is carB.
        Toyota carB = new Toyota("Prius", "RegistrationB", "2014", 23000);
        Console.WriteLine(carB);
        Console.WriteLine(carB.Moving());
        Console.WriteLine(carB.Stop());
        Console.WriteLine(carB.OnlyToyotaCanDo());
        //3.
        //Create a detail for Toyota Corolla and print its detail.
        Console.WriteLine("CarC -----");
        // We can also use Toyota's parents class, Car, to create Toyota instance object.
        Car carC = new Toyota("Corolla", "RegistrationC", "2017", 25000);
        Console.WriteLine(carC);
        Console.WriteLine(carC.Moving());
        Console.WriteLine(carC.Stop());
        //// Error! Because we already cast Toyota to Car type variable, carC.
        //// Thus, carC has no "OnlyToyotaCanDo()" method.
        //Console.WriteLine(carC.OnlyToyotaCanDo());
        Console.WriteLine(((Toyota)carC).OnlyToyotaCanDo());
        //4.
        Console.WriteLine("CarD -----");
        // We can also use Toyota's parents Interface, IVehicle, to create Toyota instance object.
        IVehicle carD = new Toyota("Camry", "RegistrationD", "2017", 28000);
        Console.WriteLine(carD);
        Console.WriteLine(carD.Moving());
        Console.WriteLine(carD.Stop());
        //// Error! Because we already cast Toyota to Car type variable, carD.
        //// Thus, carD has no "OnlyToyotaCanDo()" method.
        //Console.WriteLine(carD.OnlyToyotaCanDo());
        Console.WriteLine(((Toyota)carD).OnlyToyotaCanDo());
        //5.
        Console.WriteLine("CarE -----");
        // We can also use "var" to create Toyota instance object.
        var carE = new Toyota("Prius C", "RegistrationE", "2016", 20000);
        Console.WriteLine(carE);
        Console.WriteLine(carE.Moving());
        Console.WriteLine(carE.Stop());
        Console.WriteLine(carE.OnlyToyotaCanDo());
    }
}

```

```

//6.
Console.WriteLine("CarF -----");
// We can also use "var" to create Toyota instance object.
var carF = new Mazda("Three", "RegistrationF", "2016", 25000);
Console.WriteLine(carF);
Console.WriteLine(carF.Moving());
Console.WriteLine(carF.Stop());
Console.WriteLine(carF.OnlyMazdaCanDo());
//7.
Console.WriteLine("CarG -----");
// We can also use "var" to create Toyota instance object.
Mazda carG = new Mazda("Six", "RegistrationG", "2016", 29000);
Console.WriteLine(carG);
Console.WriteLine(carG.Moving());
Console.WriteLine(carG.Stop());
Console.WriteLine(carG.OnlyMazdaCanDo());
//8.
Console.WriteLine("CarFleet =====");
// Add cars to CarFleet object.
CarFleet carFleet = new CarFleet();
carFleet.Add(carA);
carFleet.Add(carB);
carFleet.Add(carC);
carFleet.Add((Car)carD);
carFleet.Add(carE);
carFleet.Add(carF);
carFleet.Add(carG);
// Print the sum value.
Console.WriteLine("Total sum value : {0}", carFleet.SumFleetValue());
// print the max and min value.
double max, min;
carFleet.Statistics(out min, out max);
Console.WriteLine("The most expensive car value : {0}", max);
Console.WriteLine("The cheapest car value : {0}", min);
// print the cars by its year.
Car[] carYears = carFleet.GetCars("2016");
foreach (Car car in carYears)
{
    Console.WriteLine("CarFleet {0}, {1} -----", car.Make, car.Type);
    Console.WriteLine(car);
}
Console.ReadLine();
}
}
}

```

```
CarA -----
Car Make: Honda
Car Type: Crv
Car Registration: RegistrationA
Car Year: 2014
Current Value: 21000
Car is moving.
Car has stopped.
CarB -----
Car Make: Toyota
Car Type: Prius
Car Registration: RegistrationB
Car Year: 2014
Current Value: 23000
Toyota Car is moving.
Car has stopped.
This is an action or method which ONLY Toyota can do.
CarC -----
Car Make: Toyota
Car Type: Corolla
Car Registration: RegistrationC
Car Year: 2017
Current Value: 25000
Toyota Car is moving.
Car has stopped.
This is an action or method which ONLY Toyota can do.
CarD -----
Car Make: Toyota
Car Type: Camry
Car Registration: RegistrationD
Car Year: 2017
Current Value: 28000
Toyota Car is moving.
Car has stopped.
This is an action or method which ONLY Toyota can do.
CarE -----
Car Make: Toyota
Car Type: Prius C
Car Registration: RegistrationE
Car Year: 2016
Current Value: 20000
Toyota Car is moving.
Car has stopped.
This is an action or method which ONLY Toyota can do.
CarF -----
Car Make: Mazda
Car Type: Three
```

```
CarF -----
Car Make: Mazda
Car Type: Three
Car Registration: RegistrationF
Car Year: 2016
Current Value: 25000
Car is moving.
Car has stopped.
This is an action or method which ONLY Mazda can do.
CarG -----
Car Make: Mazda
Car Type: Six
Car Registration: RegistrationG
Car Year: 2016
Current Value: 29000
Car is moving.
Car has stopped.
This is an action or method which ONLY Mazda can do.
CarFleet =====
Total sum value : 171000
The most expensive car value : 29000
The cheapest car value : 20000
CarFleet Toyota, Prius C -----
Car Make: Toyota
Car Type: Prius C
Car Registration: RegistrationE
Car Year: 2016
Current Value: 20000
CarFleet Mazda, Three -----
Car Make: Mazda
Car Type: Three
Car Registration: RegistrationF
Car Year: 2016
Current Value: 25000
CarFleet Mazda, Six -----
Car Make: Mazda
Car Type: Six
Car Registration: RegistrationG
Car Year: 2016
Current Value: 29000
```