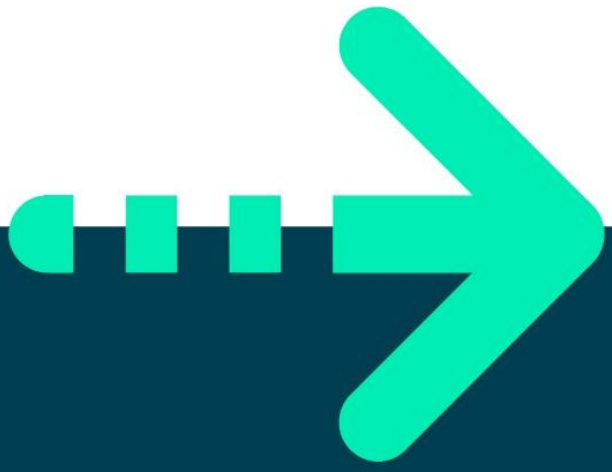
EXERCISE 5, INHERITANCE – TOWARDS POLYMORPHISM



Exercise 5, Inheritance – towards polymorphism

Objective

The primary objective for this lab is to enable you to derive new types and to override functionality.

Overview

Read the instructions below and critically evaluate each code sample. Trust nothing and make comments that will be reviewed as a class.

Part 1 – Testing Racing Cars

Scenario

You are going to work with a project which consists of a `Car` class, a `RacingCar` class and a `Program (test)` class that fills a `Car[]` array with Cars and RacingCars objects.

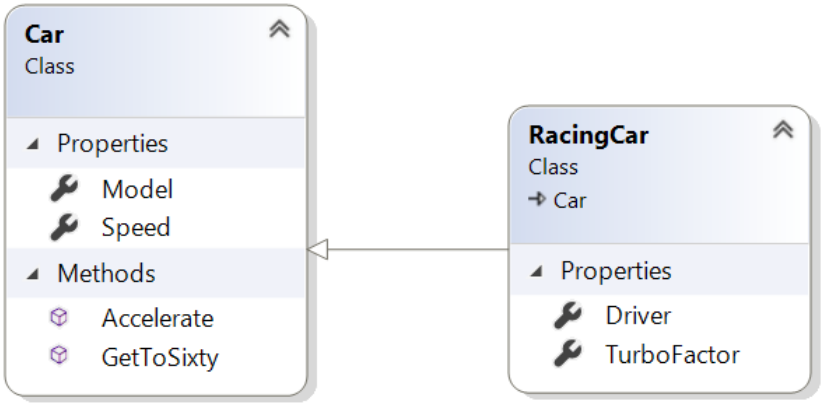
The `Program` class will then process each `Car,` setting their initial speeds to 60MPH (this is done using a blatant cheat that normal cars don't usually possess – a `GetToSixty()` method). The test will then continue by making each '`Car`' `Accelerate` for 2 seconds before writing their `model` and `speed` to the `Console`.

If the car is a `RacingCar` we will need to add some additional code to the `Program` class so that a little extra information is written out.

Step by step

1. Open the Labs project
2. Create a new package called lab05
3. Add a class called Program with a Main() method to the lab05 package.
4. Add a class called Car to the new package.
5. Add another class called RacingCar. This class extends Car
6. The Car and RacingCar classes will have the fields and methods as displayed in the class diagram below.
7. You will also need to add constructors for the two class.

Please study the diagram below before writing code.



8. Add code to the `Car` class.

   Create property methods for the model and speed fields.
   The GetToSixty() method just sets the **speed** field to 60.

   The accelerate method should look like void Accelerate(int *seconds*) and increase the speed by *5 * seconds*.

   Create a suitable constructor for the Car class.

9. Add extra code to the RacingCar class.

   Add a string Driver property method.

   Add an int TurboFactor property method.

10. You'll have to create a suitable constructor for the RacingCar class.

11. The Accelerate() method of the RacingCar will invoke the base class (Car) Accelerate method and then multiply the **speed** by the **TurboFactor**.

    Tip: use the base.Accelerate() method.

12. The Main() method should create an array of Cars comprising of a few cars and racing cars.

13. The Main() method should then pass the **cars** array to a method called **`ProcessCars`**.

    The `ProcessCars` method currently:

    a. Gets each '`Car`' up to 60MPH as a start point
    b. Then accelerates each `Car` for 2 seconds
    c. And displays details of each car.
    d. You'll also display the driver's name but only if a `Car` in the array is a `RacingCar`.

       - You'll need to examine the type of car in the array and if it is a RacigCar, cast it to a RacingCar in order to get the driver's name.

         Tip: use the is keyword: if (c is *RacingCar*) {....}
         where '**c**' is a car element in the array.

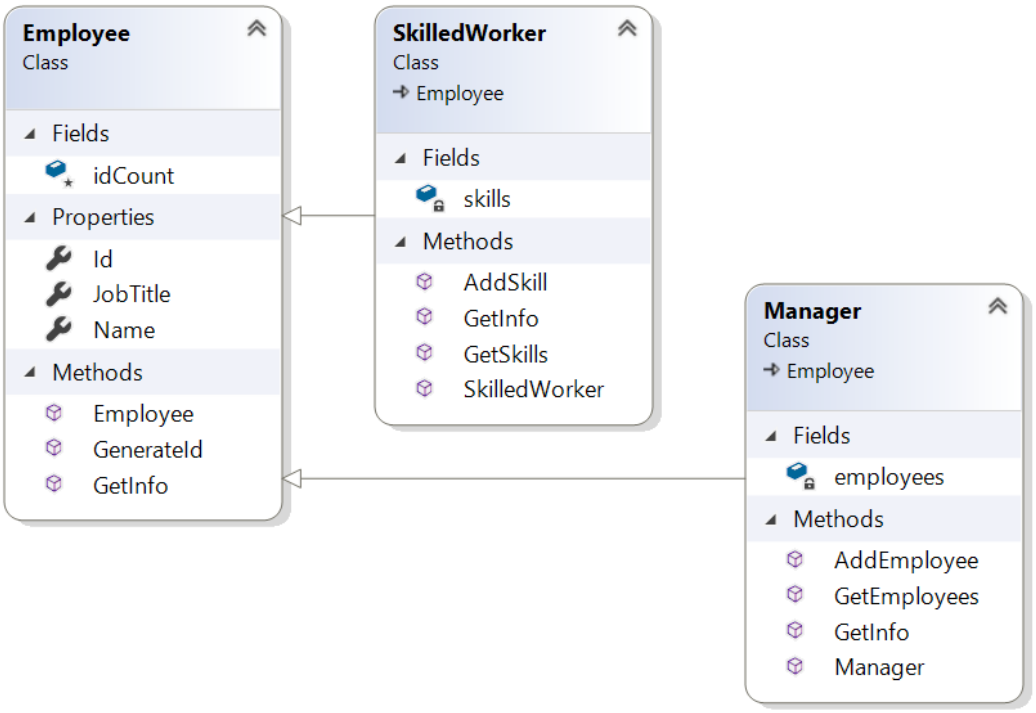
Part 2 – Employee Hierarchy

Scenario

In these labs, you will design and create a class hierarchy for an employee tracking system.

Designing the hierarchy

14. Create the following classes. The employee class is provided below. Just copy and paste. We'll need you to concentrate on the other two classes. **Please note** that any method shown below with the same name as the class is the **constructor** for that class.



15. The **Manager** class holds a List<**Employee**> called **employees**.
A Manager is also an Employee.
16. The **AddEmployee(Employee emp)** method adds the **emp** object to the **employees** List.
17. The **GetInfo()** method of the Manager should first gather the manager's details (using base.GetInfo()) and then use a for-loop to go through the **employees** List in order to call their GetInfo() method. It should then return the resulting string.
18. The **SkilledWorker** has a List <String> called **skills** which holds the names of skills possessed by a SkilledWorker instance.
19. The **AddSkill(String skill)** method adds the **skill** String to the **skills** ArrayList.
20. In the main() method

a. Create a Manager instance

b. Create a few regular Employee instances and add them to the manager's employees ArrayList

c. Create a SkilledWorker object with a few skills and then add the instance to the Manager's employee ArrayList.

d. Call the manager's GetInfo() method and display the resulting String.

Question: Can we add a manager instance to a manager's employees?

*** END ***

To get you started here is the code for the Employee class:

```
public class Employee {
	protected static int idCount;

	public string Name { get; set; }
	public string JobTitle { get; set; }
	public int ID { get; private set; }

	public Employee(string name, string jobTitle ) {
		ID = ++idCount * 10;
		Name = name;
		JobTitle = jobTitle;
	}

	public virtual String getInfo() {
		string info = "\n**** *****\n";
		info += "Name: " + Name + "\n";
		info += "Job Title: "+ JobTitle + "\n";
		info += "Employee ID: "+ ID + "\n";
		return info;
	}
}
```