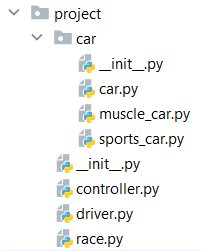
# Python OOP Retake Exam - Christmas Races

*Christmas is around the corner, and the annual Christmas races are about to begin. You are their biggest fan, so the Christmas races federation hired you to create a platform for storing information about drivers, cars, and races.*

You will be provided with a **skeleton** that includes all the folders and files that you will need.

***Note: You are not allowed to change the folder and file structure and change their names!***



# Judge Upload

For the **first 2 problems**, create a **zip** file with the **project** **folder** and **upload it** to the judge system

For the **last problem**, create a **zip** file with the **tests** **folder** and **upload it** to the judge system

# Structure (Problem 1) and Functionality (Problem 2)

Our first task is to implement the **structure and functionality** of all the classes (properties, methods, inheritance, etc.)

You are **free to add additional attributes** (instance attributes, class attributes, methods, dunder methods, etc.) to simplify your code and increase readability as long as it does not change the project's final result according to the requirements and the program works properly.

### Class Car

In the file **car.py,** the class **Car** should be implemented. It is a **base class** for any **type of car,** and it **should not be able to be instantiated**.

### Structure

The class should have the following attributes:

* **model:** str
  + If the model **is less than 4 symbols,** raise a **ValueError** with the message **"Model {model} is less than 4 symbols!"**
* **speed\_limit:** int
  + **Every type** of car has a different **range of speed limit**. If it is **not** in the valid range, raise a **ValueError** with the message **"Invalid speed limit! Must be between {min\_speed\_limit} and {max\_speed\_limit}!"**
  + All **speed limit** **values** will be **unique**. You do **NOT** need to check it explicitly.
* **is\_taken:** **bool**
  + The default value is **False**.
  + One car can be driven by **ONLY** one driver.

### Methods

#### \_\_init\_\_(model: str, speed\_limit: int)

In the **\_\_init\_\_** method all the needed attributes must be set.

### Class MuscleCar

In the **muscle\_car.py** file, the class **MuscleCar** should be implemented. It is a **type of car**. Each muscle car's minimum **speed** **limit** is 250, and its maximum **speed limit** is 450 (inclusive).

### Class SportsCar

In the **sports\_car.py** file, the class **SportsCar** should be implemented. It is a **type of car**. Each sports car's minimum **speed** **limit** is 400, and its maximum **speed** **limit** is 600 (inclusive).

### Class Driver

In the **driver.py** file, the class **Driver** should be implemented. It will store the info of each driver.

### Structure

The class should have the following attributes:

* **name:** str
  + If the name is **an empty string or contains only white spaces (one or many)**, raise a ValueError with the message **"Name should contain at least one character!"**
* **car:** Car
  + The default value is **None**.
  + One driver drives **ONLY** one car.
* **number\_of\_wins:** int
  + The default value is **0**.
  + When the driver **wins a race**, the number of wins should be **increased**!

### Methods

#### \_\_init\_\_(name: str)

In the **\_\_init\_\_** method all the needed attributes must be set.

### Class Race

In the **race.py** file, the class **Race** should be implemented. It will store the info of each race.

### Structure

The class should have the following attributes:

* name**:** str
  + If the name **is an empty string,** raise a ValueError with the message **"Name cannot be an empty string!"**
* drivers**: list**
  + An **empty** list that will contain **all the drivers** (objects) **participating in the race**

### Methods

#### \_\_init\_\_(name: str)

In the **\_\_init\_\_** method all the needed attributes must be set.

### Class Controller

In the **controller.py** file, the class **Controller** should be implemented. It will contain **all the functionality** of the project.

### Structure

The class should have the following attributes:

* **cars: list**
  + An **empty** list that will contain **all cars** (objects)
* **drivers: list**
  + An **empty** list that will contain **all drivers** (objects)
* **races: list**
  + An **empty** list that will contain **all races** (objects)

### Methods

#### \_\_init\_\_()

In the **\_\_init\_\_** method all the needed attributes must be set.

#### create\_car(car\_type: str, model: str, speed\_limit: int)

* **Create a car** with the provided model and speed limit and **add it to the cars' list**.
* If the car **is successfully created**, the method should **return** the message "{car\_type} {model} is created."
* If the **car** of the **same model** **already exists**, raise an Exception with the message "Car {model} is already created!"
* The valid car types are **"MuscleCar"** and **"SportsCar"**. In any other case, **ignore** the command.

#### create\_driver(driver\_name: str)

* **Creates a driver** with the given name and **adds it to the drivers' list**.
* If the driver **is successfully created**, the method should **return** the message **"****Driver {name} is created."**
* **If a driver with the given name already exists, raise** an Exception **with the message** "Driver {name} is already created!"

#### create\_race(race\_name: str)

* **Creates a race** with the given name and **adds it to the races' list**.
* If the race **is successfully created**, the method should **return** the message **"****Race {name} is created."**
* If the **race** with the given name **already** **exists**, throw an **Exception** with the message **"****Race {name} is already created!"**

#### add\_car\_to\_driver(driver\_name: str, car\_type: str)

* Set the **last car added** from the **given type** to the **driver with the given name** (if they both exist).
* If the **driver** **does not exist** in the drivers' list, raise an **Exception** with the message "Driver {name} could not be found!**"**
* If there is **no available car** (all cars from that type are taken or does not exist) from the given type in the cars' list, raise an **Exception** with the message "Car {car\_type} could not be found!". The car types are **"MuscleCar"** and **"SportsCar"**.
* First, check if the driver exists!
* If there is an available car (the car is not taken), but the driver **already has a car**, **change it with the new one**, **change it** to taken and **return** the message **"Driver {name} changed his car from {old\_model} to {new\_model}."**
* If **they both exist, the driver doesn't own a car**, and the **car is not taken**, you should **set the car** (object) **to the driver** and **return** the message "Driver {driver\_name} chose the car {car\_model}."

#### add\_driver\_to\_race(race\_name: str, driver\_name: str)

* Adds a **driver (object)** **with the given name** to the **race with the given** **name** (if they both exist).
* If the **race** **does not exist** in the races' list, raise an **Exception** with the message **"Race {name} could not be found!"**
* If the **driver** **does not exist** in the drivers' list, raise an **Exception** with the message "Driver {name} could not be found!"
* First, check if the race exists!
* A driver can participate in a race, **ONLY** if he has a car. If the driver **doesn't own a car**, raise an **Exception** with the message **"****Driver {driver\_name} could not participate in the race!"**
* If **they both exist and the driver owns a car**, you should **add the driver** (object) **to the race** and **return** the message "Driver {driver\_name} added in {race\_name} race."
* If the driver has already **participated** in the race, **return** the message **"****Driver {driver\_name} is already added in {race\_name} race."**

#### start\_race(race\_name: str)

* If the race **does not exist** in the races' list, raise an **Exception** with the message **"****Race {name} could not be found!"**
* If the participants in the race are less than **3**, raise an **Exception** with the message **"****Race {race\_name} cannot start with less than 3 participants!"**
* If the race exists and participants in the race are at least 3, **the** **race starts**. The **fastest 3 cars** **win** the race and **increase their number of wins by 1**. You should **return a message for each of them** in **descending order** in the format:

"Driver {fastest\_driver\_name} wins the {race\_name} race with a speed of {speed\_limit}."

## Examples

|  |
| --- |
| **Test Code** |
| from project.controller import Controller  controller = Controller()  print(controller.create\_driver("Peter"))  print(controller.create\_car("SportsCar", "Porsche 718 Boxster", 470))  print(controller.add\_car\_to\_driver("Peter", "SportsCar"))  print(controller.create\_car("SportsCar", "Porsche 911", 580))  print(controller.add\_car\_to\_driver("Peter", "SportsCar"))  print(controller.create\_car("MuscleCar", "BMW ALPINA B7", 290))  print(controller.create\_car("MuscleCar", "Mercedes-Benz AMG GLA 45", 420))  print(controller.create\_driver("John"))  print(controller.create\_driver("Jack"))  print(controller.create\_driver("Kelly"))  print(controller.add\_car\_to\_driver("Kelly", "MuscleCar"))  print(controller.add\_car\_to\_driver("Jack", "MuscleCar"))  print(controller.add\_car\_to\_driver("John", "SportsCar"))  print(controller.create\_race("Christmas Top Racers"))  print(controller.add\_driver\_to\_race("Christmas Top Racers", "John"))  print(controller.add\_driver\_to\_race("Christmas Top Racers", "Jack"))  print(controller.add\_driver\_to\_race("Christmas Top Racers", "Kelly"))  print(controller.add\_driver\_to\_race("Christmas Top Racers", "Peter"))  print(controller.start\_race("Christmas Top Racers"))  [print(d.name, d.number\_of\_wins) for d in controller.drivers] |
| **Output** |
| Driver Peter is created.  SportsCar Porsche 718 Boxster is created.  Driver Peter chose the car Porsche 718 Boxster.  SportsCar Porsche 911 is created.  Driver Peter changed his car from Porsche 718 Boxster to Porsche 911.  MuscleCar BMW ALPINA B7 is created.  MuscleCar Mercedes-Benz AMG GLA 45 is created.  Driver John is created.  Driver Jack is created.  Driver Kelly is created.  Driver Kelly chose the car Mercedes-Benz AMG GLA 45.  Driver Jack chose the car BMW ALPINA B7.  Driver John chose the car Porsche 718 Boxster.  Race Christmas Top Racers is created.  Driver John added in Christmas Top Racers race.  Driver Jack added in Christmas Top Racers race.  Driver Kelly added in Christmas Top Racers race.  Driver Peter added in Christmas Top Racers race.  Driver Peter wins the Christmas Top Racers race with a speed of 580.  Driver John wins the Christmas Top Racers race with a speed of 470.  Driver Kelly wins the Christmas Top Racers race with a speed of 420.  Peter 1  John 1  Jack 0  Kelly 1 |

## Task 3: Unit Tests

You will **be provided with another skeleton** for this problem. **Open** the **new skeleton** as a **new project** and write tests for the **Team** class. The class will have some methods, fields, and one constructor, who are working properly. You are **NOT ALLOWED** to change any class. Cover the whole class with unit tests to make sure that the class is working as intended. Submit **only the test** folder.