# Lab: Interfaces and Abstraction

This document defines the lab for the ["Java Advanced" course @ Software University](https://softuni.bg/trainings/4375/java-oop-february-2024). Please submit your solutions (source code) to all below-described problems in [Judge](https://judge.softuni.bg/Contests/1581/Interfaces-and-Abstraction-Lab).

## Car Shop

Build hierarchy from **classes** and **interfaces** for this UML diagram:

|  |
| --- |
| <<inteface>>  <<Car>> |
| **+TIRES: Integer** |
| **+getModel(): String**  **+getColor(): String**  **+getHorsePower(): Integer**  **+countryProduced(): String** |

|  |
| --- |
| **<<Serializable>>** |

|  |
| --- |
| Seat |
| **+toString(): String** |

Your hierarchy has to be used with this code.

|  |
| --- |
| Main.java |
| **public static void** main(String[] args) {  Car seat = **new** Seat(**"Leon"**, **"gray"**, 110, **"Spain"**);   System.***out***.println(String.*format*(  **"%s is %s color and have %s horse power"**,  seat.getModel(),  seat.getColor(),  seat.getHorsePower()));  System.***out***.println(seat.toString()); } |

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
|  | Leon is gray color and have 110 horse power  This is Leon produced in Spain and have 4 tires |

### Solution



**Note:** consider using the wrapper classes in the **Seat** constructor**.**

## Car Shop Extend

|  |
| --- |
| **<<Car>>** |

Extend the previous problem:

|  |
| --- |
| CarImpl |
| **+CarImpl(model, color, horsePower, countryProduced)**  **+toString(): String** |

|  |
| --- |
| <<Rentable>> |
| **+getMinRentDay(): Integer**  **+getPricePerDay(): Double** |

|  |
| --- |
| <<Sellable>> |
| **+getPrice(): Double** |

|  |
| --- |
| Seat |
| **-price: Double** |
| **+toString(): String** |

|  |
| --- |
| Audi |
| **-minRentDay: Integer**  **-pricePerDay: Double** |
| **+toString(): String** |

Your hierarchy has to be used with this code:

|  |
| --- |
| Main.java |
| **public static void** main(String[] args) {  Sellable seat = **new** Seat(**"Leon"**, **"Gray"**, 110, **"Spain"**, 11111.1);  Rentable audi = **new** Audi(**"**A4**"**, **"Gray"**, 110, **"Germany"**, 3, 99.9);   *printCarInfo*(seat);  *printCarInfo*(audi); }  **private static void** printCarInfo(Car car) {  System.***out***.println(String.*format*(  **"%s is %s color and have %s horse power"**,  car.getModel(),  car.getColor(),  car.getHorsePower()));  System.***out***.println(car.toString()); } |

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
|  | Leon is Gray color and have 110 horse power  This is Leon produced in Spain and have 4 tires  Leon sells for 11111,100000  A4 is Gray color and have 110 horse power  This is A4 produced in Germany and have 4 tires  Minimum rental period of 3 days. Price per day 99,900000 |

## Say Hello

Build hierarchy from classes and interfaces for this **UML** diagram:

|  |
| --- |
| <<Person>> |
| **+getName(): String**  **+sayHello(): String** |

|  |
| --- |
| Chinese |
| **-name: String** |
| **+sayHello(): String** |

|  |
| --- |
| Bulgarian |
| **-name: String** |
| **+sayHello(): String** |

|  |
| --- |
| European |
| **-name: String** |
|  |

Your hierarchy has to be used with this code:

|  |
| --- |
| Main.java |
| **public static void** main(String[] args) {  List<Person> persons = **new** ArrayList<>();  persons.add(**new** Bulgarian(**"Peter"**));  persons.add(**new** European(**"Peter"**));  persons.add(**new** Chinese(**"Peter"**));   **for** (Person person : persons) {  *print*(person);  } }  **private static void** print(Person person) {  System.***out***.println(person.sayHello()); } |

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
|  | Здравей  Hello  Djydjybydjy |

## Say Hello Extend

Build hierarchy from classes and interfaces for this **UML** diagram

|  |
| --- |
| Bulgarian |
| **+Bulgarian(name)**  **+sayHello(): String** |

|  |
| --- |
| <<Person>> |
| **+getName(): String**  **+sayHello(): String** |

|  |
| --- |
| *(Abstract)*  *BasePerson* |
| **-name: String** |
| **#BasePerson(name)**  **+getName(): String**  **-setName(): void** |

|  |
| --- |
| European |
| **+European(name)**  +sayHello(): String |

|  |
| --- |
| Chinese |
| **+Chinese(name)**  **+sayHello(): String** |

Your hierarchy has to be used with this code:

|  |
| --- |
| Main.java |
| **public static void** main(String[] args) {  List<Person> persons = **new** ArrayList<>();  persons.add(**new** Bulgarian(**"Peter"**));  persons.add(**new** European(**"Peter"**));  persons.add(**new** Chinese(**"Peter"**));   **for** (Person person : persons) {  *print*(person);  } }  **private static void** print(Person person) {  System.***out***.println(person.sayHello()); } |

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
|  | Здравей  Hello  Djydjybydjy |

## Border Control

It’s the future, you’re the ruler of a totalitarian dystopian society inhabited by **citizens** and **robots**, since you’re afraid of rebellions you decide to implement strict control of who enters your city. Your soldiers check the **Id**s of everyone who enters and leaves.

You will receive from the console an **unknown** amount of lines until the command "**End**" is received, on each line, there will be the information for either **a citizen** or **a robot** who tries to enter your city in the format   
"**{name} {age} {id}**" for citizens and "**{model} {id}**" for robots.

After the end command on the next line, you will receive a single number representing **the last digits of fake ids**, all citizens or robots whose **Id** ends with the specified digits must be detained.

The output of your program should consist of all detained **Id**s each on a separate line (the order of printing doesn’t matter).

|  |  |
| --- | --- |
| **Robot** | |
| **-** | **id: String** |
| **-** | **model: String** |
| **+** | **Robot(String, String)** |
| **+** | **getId(): String** |
| **+** | **getModel(): String** |

|  |  |
| --- | --- |
| **Citizen** | |
| **-** | **name: String** |
| **-** | **age: int** |
| **-** | **id: String** |
| **+** | **Citizen(String, int, String)** |
| **+** | **getName(): String** |
| **+** | **getAge(): int** |
| **+** | **getId(): String** |

|  |  |
| --- | --- |
| **<<Interface>>**  **Identifiable** | |
| **+** | **getId(): String** |

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Peter 22 9010101122  MK-13 558833251  MK-12 33283122  End  122 | 9010101122  33283122 |
| Teo 31 7801211340  Anna 29 8007181534  IV-228 999999  Simon 54 3401018380  KKK-666 80808080  End  340 | 7801211340 |

## Ferrari

Model an application that contains a **class Ferrari** and an **interface**. Your task is simple, you have a **car - Ferrari**, its model is "**488-Spider**" and it has a **driver**. Your Ferrari should have the functionality to **use brakes** and **push the gas pedal**. When the **brakes** are pushed down print"**Brakes!**", and when the **gas pedal** is pushed down - "**brum-brum-brum-brrrrr**". As you may have guessed this functionality is typical for all cars, so you should **implement an interface** to describe it.

|  |  |
| --- | --- |
| **<<Interface>>**  **Car** | |
| **+** | **brakes() : String** |
| **+** | **gas() : String** |

Your task is to **create a Ferrari** and **set the driver's name** to the passed one in the input. After that, print the info. Take a look at the Examples to understand the task better.

|  |  |
| --- | --- |
| **Ferrari** | |
| **-** | **driverName: String** |
| **-** | **model: String** |
| **+** | **Ferrari (String)** |
| **+** | **brakes() : String** |
| **+** | **gas() : String** |
| **+** | **toString(): String** |

### Input

On the **single input line**, you will be given the **driver's name**.

### Output

On the **single output line**, print the model, the messages from the brakes and gas pedal methods, and the driver's name. In the following format:

"**{model}/{brakes}/{gas}/{driver's name}**"

### Constraints

**The input will always be valid, no need to check it explicitly!** The Driver's name may contain any ASCII characters.

### Example

|  |  |
| --- | --- |
| **Input** | **Output** |
| Dominic Toretto | 488-Spider/Brakes!/brum-brum-brum-brrrrr/Dominic Toretto |
| Brian O'Conner | 488-Spider/Brakes!/brum-brum-brum-brrrrr/Brian O'Conner |