# Exercise: Defining Classes

Problems for the ["C# Advanced" course @ Software University](https://softuni.bg/trainings/4376/csharp-advanced-january-2024)  
You can check your solutions in [Judge](https://judge.softuni.org/Contests/1479/Defining-Classes-Exercise)

## Define a Class Person

**NOTE**: You need a StartUp class with the namespace DefiningClasses.

Define a class **Person** with **private** fields for **name** and **age** and **public** properties **Name** and **Age**.

### Bonus\*

Try to create a few objects of type Person:

|  |  |
| --- | --- |
| **Name** | **Age** |
| Peter | 20 |
| George | 18 |
| Jose | 43 |

**NOTE:** Use both **the inline initialization** and **the default constructor**.

## Creating Constructors

**NOTE**: You need a StartUp class with the namespace DefiningClasses.

Add **3** constructors to the **Person** class from the last task. Use constructor chaining to reuse code:

* The **first** should take **no arguments** and produce a person with the name "**No name**" and **age** **= 1**.
* The **second** should accept only an integer **number** for the **age** and produce a person with the name "**No name**" and **age** equal to the passed **parameter**.
* The **third** one should accept a **string** for the **name** and an integer for the **age** and should produce a person with the given **name** and **age**.

## Oldest Family Member

Use your **Person** **class** from the previous tasks. Create a class **Family**. The class should have a **list of people**, a method for adding members - **void AddMember(Person member)** and a method returning the oldest family member– **Person GetOldestMember()**. Write a program that reads the names and ages of **N** people and **adds them to the family**. Then **print** the **name** and **age** of the oldest member.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  Peter 3  George 4  Annie 5 | Annie 5 |
| 5  Steve 10  Christopher 15  Annie 4  Ivan 35  Maria 34 | Ivan 35 |

## Opinion Poll

Using the **Person** class, write a program that reads from the console **N** lines of personal information and then prints all people, whose **age** is **more than 30** years, **sorted in alphabetical order**.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  Peter 12  Sam 31  Ivan 48 | Ivan - 48  Sam - 31 |
| 5  Niki 33  Yord 88  Teo 22  Lily 44  Stan 11 | Lily - 44  Niki - 33  Yord - 88 |

## \*Date Modifier

Create a class **DateModifier**, which stores the difference of the days between two dates. It should have a method that takes **two string parameters,** **representing dates** as strings and **calculates** thedifference in the days between them.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1992 05 31  2016 06 17 | 8783 |
| 2016 05 31  2016 04 19 | 42 |

## Speed Racing

Create a program that keeps track of **cars** and their **fuel** and supports methods for **moving** the cars. Define a class **Car**. Each Car has the following properties:

* **string Model**
* **double FuelAmount**
* **double FuelConsumptionPer**K**ilometer**
* **double Travelled distance**

A car's model is **unique** - there will never be 2 cars with the same model. On the first line of the input, you will receive a number **N** – the **number** of **cars** you need to track. On each of the next **N** lines, you will receive information about a car in the following format:

"**{model} {fuelAmount} {fuelConsumptionFor1km}**"

All **cars start at 0 kilometers traveled**. After the **N** lines, until the command "**End**" is received, you will receive commands in the following format:

"**Drive {carModel} {amountOfKm}**"

Implement a method in the **Car** class to calculate whether or not a car can **move** that **distance**. If it can, the car's **fuel amount** should be **reduced** by the amount of **used** **fuel** and its **traveled** **distance** should be increased by the number of the **traveled kilometers**. Otherwise, the car should not move (its fuel amount and the traveled distance should stay the same) and you should print on the console:

"**Insufficient fuel for the drive**"

After the "**End**" command is received, print **each car** and its **current fuel amount** and the **traveled** **distance** in the format:

**"{model} {fuelAmount} {distanceTraveled}**"

Print the fuel amount formatted **two digits** after the decimal separator.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2  AudiA4 23 0.3  BMW-M2 45 0.42  Drive BMW-M2 56  Drive AudiA4 5  Drive AudiA4 13  End | AudiA4 17.60 18  BMW-M2 21.48 56 |
| 3  AudiA4 18 0.34  BMW-M2 33 0.41  Ferrari-488Spider 50 0.47  Drive Ferrari-488Spider 97  Drive Ferrari-488Spider 35  Drive AudiA4 85  Drive AudiA4 50  End | Insufficient fuel for the drive  Insufficient fuel for the drive  AudiA4 1.00 50  BMW-M2 33.00 0  Ferrari-488Spider 4.41 97 |

## Raw Data

Create a program that tracks **cars** and their **cargo**.

Start by defining a class **Car** that holds information about:

* **Model: a string property**
* **Engine: a class** with **two properties – speed** and **power,**
* **Cargo: a class** with **two properties – type** and **weight**
* **Tires:** a **collection of exactly 4 tires**. Each tire should have **two properties**: **age** and **pressure**.

Create a **constructor** that receives all of the information about the **Car** and creates and **initializes the model and** its inner **components** (**engine**, **cargo** and **tires**).

### Input

On the first line of input, you will receive a number **N** representing the number of cars you have.

1. On the next **N** lines, you will receive information about each car in the format:

"**{model} {engineSpeed} {enginePower} {cargoWeight} {cargoType} {tire1Pressure} {tire1Age} {tire2Pressure} {tire2Age} {tire3Pressure} {tire3Age} {tire4Pressure} {tire4Age}"**

* The **speed**, **power**, **weight** and **tire age** are **integers.**
* The **tire** **pressure** is a **floating point number.**

1. Next, you will receive a single line with one of the following commands: "**fragile**" or "**flammable**".

### Output

As an output, if the command is:

* "**fragile**" - print **all cars,** whose **cargo** is **"fragile"** and **have a** **pressure of a single tire < 1.**
* "**flammable**" - print **all cars**, whose **cargo** is **"flammable"** and have **engine power > 250.**

**The cars should be printed in order of appearing in the input.**

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2  ChevroletAstro 200 180 1000 fragile 1.3 1 1.5 2 1.4 2 1.7 4  Citroen2CV 190 165 1200 fragile 0.9 3 0.85 2 0.95 2 1.1 1  fragile | Citroen2CV |
| 4  ChevroletExpress 215 255 1200 flammable 2.5 1 2.4 2 2.7 1 2.8 1  ChevroletAstro 210 230 1000 flammable 2 1 1.9 2 1.7 3 2.1 1  DaciaDokker 230 275 1400 flammable 2.2 1 2.3 1 2.4 1 2 1  Citroen2CV 190 165 1200 fragile 0.8 3 0.85 2 0.7 5 0.95 2  flammable | ChevroletExpress  DaciaDokker |

## Car Salesman

Define two classes **Car** and **Engine.**

Start by defining a class **Car** that holds information about:

* **Model:** a **string property**
* **Engine:** a **property holding the engine object**
* **Weight**: an **int property, it is optional**
* **Color:** a **string property, it is optional**

Next, the **Engine class** has the following properties:

* **Model:** a **string property**
* **Power:** an **int property**
* **Displacement:** an **int property, it is optional**
* **Efficiency:** a **string property, it is optional**

### Input

1. On the first line, you will read a number **N,** which will specify how many lines of **engines** you will receive.

* On each of the next **N** lines, you will receive information about an **Engine** in the following format: "**{model} {power} {displacement} {efficiency}**"
* Keep in mind that **"displacement" and "efficiency"** are optional**,** they **could be missing** from the command.

1. Next, you will receive a number **M,** which will specify how many lines of **car** you will receive.

* On each of the next **M** lines, you will receive information about a **Car** in the following format: "**{model} {engine} {weight} {color}**".
* Keep in mind that "**weight" and "color" are optional,** they could **be missing** from the command.
* The **"engine"** will always be the model of an existing **Engine**.
* When creating the object for a **Car**, you should keep a **reference to the real engine** in it, instead of just the engine's model.

Note: The optional properties **might be missing** from the formats.

### Output

Your task is to **print** all the **cars** in the order they were received and their information in the format defined below. If any of the optional fields are missing, print "**n/a**" in its place:

"{CarModel}:  
 {EngineModel}:  
 Power: {EnginePower}  
 Displacement: {EngineDisplacement}  
 Efficiency: {EngineEfficiency}  
 Weight: {CarWeight}  
 Color: {CarColor}"

### Bonus\*

Override the classes' "**ToString()"** methods to have a reusable way of displaying the objects.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 2  V8-101 220 50  V4-33 140 28 B  3  FordFocus V4-33 1300 Silver  FordMustang V8-101  VolkswagenGolf V4-33 Orange | FordFocus:  V4-33:  Power: 140  Displacement: 28  Efficiency: B  Weight: 1300  Color: Silver  FordMustang:  V8-101:  Power: 220  Displacement: 50  Efficiency: n/a  Weight: n/a  Color: n/a  VolkswagenGolf:  V4-33:  Power: 140  Displacement: 28  Efficiency: B  Weight: n/a  Color: Orange |
| 4  DSL-10 280 B  V7-55 200 35  DSL-13 305 55 A+  V7-54 190 30 D  4  FordMondeo DSL-13 Purple  VolkswagenPolo V7-54 1200 Yellow  VolkswagenPassat DSL-10 1375 Blue  FordFusion DSL-13 | FordMondeo:  DSL-13:  Power: 305  Displacement: 55  Efficiency: A+  Weight: n/a  Color: Purple  VolkswagenPolo:  V7-54:  Power: 190  Displacement: 30  Efficiency: D  Weight: 1200  Color: Yellow  VolkswagenPassat:  DSL-10:  Power: 280  Displacement: n/a  Efficiency: B  Weight: 1375  Color: Blue  FordFusion:  DSL-13:  Power: 305  Displacement: 55  Efficiency: A+  Weight: n/a  Color: n/a |

## Pokemon Trainer

Define a class **Trainer** and a class **Pokemon**.

**Trainers** have:

* **Name**
* **Number of badges**
* **A collection of pokemon**

**Pokemon** have:

* **Name**
* **Element**
* **Health**

All values are **mandatory**. Every Trainer **starts with 0 badges**.

You will be receiving lines until you receive the command "**Tournament**". Each line will carry information about a pokemon and the trainer who caught it in the format:

**"{trainerName} {pokemonName} {pokemonElement} {pokemonHealth}"**

**TrainerName** is the name of the Trainer who caught the pokemon. Trainers' names are **unique**.  
After receiving the command "**Tournament**", you will start receiving commands until the "**End**" command is received. They can contain one of the following:

* **"Fire"**
* **"Water"**
* **"Electricity"**

For every command, you must check if a trainer has at least 1 pokemon with the given element. If he does, he receives 1 badge. Otherwise, all of his pokemon **lose 10 health**. If a pokemon falls **to 0 or less health**, **he dies** and must be deleted from the trainer's collection. In the end, you should print all of the trainers, **sorted by the number of badges they have in descending order** (if two trainers have the same amount of badges, they should be sorted by order of appearance in the input)in the format:

**"{trainerName} {badges} {numberOfPokemon}"**

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Peter Charizard Fire 100  George Squirtle Water 38  Peter Pikachu Electricity 10  Tournament  Fire  Electricity  End | Peter 2 2  George 0 1 |
| Sam Blastoise Water 18  Narry Pikachu Electricity 22  John Kadabra Psychic 90  Tournament  Fire  Electricity  Fire  End | Narry 1 1  Sam 0 0  John 0 1 |

## SoftUni Parking

### Preparation

Download the skeleton provided in [Judge](https://judge.softuni.org/Contests/Practice/Index/1479#9). **Do not** change the **StartUp** class or its **namespace**.

### Problem Description

Your task is to create a repository, which stores cars by creating the classes described below.

First, write a C# class **Car** with the following properties:

* **Make: string**
* **Model: string**
* **HorsePower: int**
* **RegistrationNumber: string**

|  |
| --- |
| **public class** Car  {   ***// TODO: implement this class*** } |

The class' **constructor** should receive **make, model, horsePower** and **registrationNumber** and override the **ToString()** method in the following format:

**"Make: {make}"**

**"Model: {model}"**

**"HorsePower: {horse power}"**

**"RegistrationNumber: {registration number}"**

Create a C# class **Parking** that has **Cars** (a collection that stores the entity **Car**). All entities inside the class have the **same properties**.

|  |
| --- |
| **public class** Parking  {   ***// TODO: implement this class*** } |

The class' **constructor** should initialize the **Cars** with a new instance of the collection and accept **capacity** as a parameter**.**

Implement the following fields:

* Field **cars** – a **collection** that holds added cars.
* Field **capacity** – accessed only by the base class (responsible for the parking capacity).

Implement the following **methods**:

AddCar(Car Car)

The method first checks if there is already a car with the provided car registration number and if there is, the method returns the following message:

"Car with that registration number, already exists!"

Next check if the count of the cars in the parking is more than the capacity and if it returns the following message:

"Parking is full!"

Finally, if nothing from the previous conditions is true, it just adds the current car to the cars in the parking and returns the message:

"Successfully added new car {Make} {RegistrationNumber}"

RemoveCar(string RegistrationNumber)

Removes a car with the given registration number. If the provided registration number does not exist returns the message:

"Car with that registration number, doesn't exist!"

Otherwise, removes the car and returns the message:

"Successfully removed {registrationNumber}"

GetCar(string RegistrationNumber)

Returns the **Car** with the provided registration number.

RemoveSetOfRegistrationNumber(List<string> RegistrationNumbers)

A void method, which removes all cars that have the provided registration numbers. Each car is removed only if the registration number exists.

And the following **property**:

* Count - Returns the number of stored cars.

### Examples

This is an example of how the **Parking** class is **intended to be used**.

|  |
| --- |
| Sample code usage |
| var car = new Car("Skoda", "Fabia", 65, "CC1856BG");  var car2 = new Car("Audi", "A3", 110, "EB8787MN");  Console.WriteLine(car.ToString());  // Make: Skoda  // Model: Fabia  // HorsePower: 65  // RegistrationNumber: CC1856BG  var parking = new Parking(5);  Console.WriteLine(parking.AddCar(car));  // Successfully added new car Skoda CC1856BG  Console.WriteLine(parking.AddCar(car));  // Car with that registration number, already exists!  Console.WriteLine(parking.AddCar(car2));  // Successfully added new car Audi EB8787MN  Console.WriteLine(parking.GetCar("EB8787MN").ToString());  // Make: Audi  // Model: A3  // HorsePower: 110  // RegistrationNumber: EB8787MN    Console.WriteLine(parking.RemoveCar("EB8787MN"));  // Successfullyremoved EB8787MN  Console.WriteLine(parking.Count);  // 1 |

### Submission

Zip all the files in the project folder except **bin** and **obj** folders.