# Lab: Objects and Classes

Problems for in-class lab for the ["C# Fundamentals" course @ SoftUni](https://softuni.bg/trainings/3836/programming-fundamentals-with-csharp-september-2022)  
You can check your solutions in [Judge](https://judge.softuni.org/Contests/1214/Objects-and-Classes-Lab)

# Using the Built-in .NET Classes

## Randomize Words

You will be given a **string** that will contain words separated by a single space. **Randomize their order** and print **each word on a new line**.

using System;

using System.Linq;

namespace \_01.\_Randomize\_Words

{

class Program

{

static void Main(string[] args)

{

string[] arr = Console.ReadLine()

.Split();

Random random = new Random();

for (int i = 0; i < arr.Length; i++)

{

int Ind = random.Next(0, arr.Length);

string swap = " ";

swap = arr[Ind];

arr[Ind] = arr[i];

arr[i] = swap;

}

Console.WriteLine(string.Join(Environment.NewLine,arr));

}

}

}

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| Welcome to SoftUni and have fun learning programming | learning  Welcome  SoftUni  and  fun  programming  have  to | The order of the words in the output will be different after each program execution. |

### Hints

* **Split** the input string by (space) and create an **array of words**.
* Create a random number generator – an object rnd of type **Random**.
* In a **for loop exchange each number** at positions 0, 1,…,words.Length-1 by a number at **random position**. To generate a random number in rangeuse **rnd.**[**Next(minValue, maxValue)**](https://msdn.microsoft.com/en-us/library/2dx6wyd4(v=vs.110).aspx). Note that by definition minValue is **inclusive**, but maxValue is **exclusive**.
* Print each word in the array on new line.

## Big Factorial

You will receive a number **N** in the range [0…1000]. Calculate the **Factorial of N** and print out the result.

using System;

using System.Numerics;

namespace \_02.\_Big\_Factorial

{

class Program

{

static void Main(string[] args)

{

BigInteger factoriel = 1;

int n = int.Parse(Console.ReadLine());

for (int i = 1; i <= n; i++)

{

factoriel \*= i;

}

Console.WriteLine(factoriel);

}

}

}

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 50 | 30414093201713378043612608166064768844377641568960512000000000000 |
| 125 | 188267717688892609974376770249160085759540364871492425887598231508353156331613598866882932889495923133646405445930057740630161919341380597818883457558547055524326375565007131770880000000000000000000000000000000 |

### Hints

Use the class BigIntegerfrom the built-in .NET library System.Numerics.dll.

1. Import the namespace "System.Numerics".



1. Use the type BigInteger to calculate the number **factorial.**



1. **Loop from 2 to N and multiply every number with factorial.**

# Defining Simple Classes

## Songs

Define a class called **Song** that will hold the following information about some songs:

* **Type List**
* **Name**
* **Time**

### Input / Constraints

* On the first line, you will receive the **number of songs - N**.
* On the next **N** lines, you will be receiving data in the following format: **"{typeList}\_{name}\_{time}".**
* On the last line, you will receive **Type List** or "**all**".

### Output

If you receive **Type List** as an input on the last line, print out **only the names of the songs**, which are from that **Type List**. If you receive the "**all**" command, print out the names of **all the songs**.

using System;

using System.Collections.Generic;

using System.Linq;

using System.Numerics;

namespace \_03.\_Songs

{

class Program

{

static void Main(string[] args)

{

List<Song> songs = new List<Song>();

int n = int.Parse(Console.ReadLine());

for (int i = 0; i < n; i++)

{

string[] input = Console.ReadLine().Split("\_").ToArray();

Song song = new Song();

song.TypeSong = input[0];

song.Name = input[1];

song.Time = input[2];

songs.Add(song);

}

string command = Console.ReadLine();

for (int i = 0; i < songs.Count; i++)

{

if(command==songs[i].TypeSong)

{

Console.WriteLine($"{songs[i].Name}");

}

else if(command == "all")

{ Console.WriteLine($"{songs[i].Name}"); }

}

}

}

public class Song

{

//public Song(string typeList,string name,string time)

//{

// TypeSong = typeList;

// Name = name;

// time = Time;

//}

public string TypeSong { get; set; }

public string Name { get; set; }

public string Time { get; set; }

}

}

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3  favourite\_DownTown\_3:14  favourite\_Kiss\_4:16  favourite\_Smooth Criminal\_4:01  favourite | DownTown  Kiss  Smooth Criminal |
| 4  favourite\_DownTown\_3:14  listenLater\_Andalouse\_3:24  favourite\_In To The Night\_3:58  favourite\_Live It Up\_3:48  listenLater | Andalouse |
| 2  like\_Replay\_3:15  ban\_Photoshop\_3:48  all | Replay  Photoshop |

### Solution

Define a class Song with properties: **TypeList**, **Name** and **Time**.



Read the input lines, make a collection and store the data.

  
Finally, read your last line – **Type List** and **print** the result.



You can use LINQ to filter the collection.



## Students

Define a class called **Student**, which will hold the following information about some students:

* **first name**
* **last name**
* **age**
* **home town**

**Input / Constraints**

Read information about some students, until you receive the "**end**" command. After that, you will receive a **city name**.

**Output**

Print the students who are from the given city in the following format: "**{firstName} {lastName} is {age} years old.**"

using System;

using System.Collections.Generic;

using System.Linq;

namespace \_04.\_Students

{

class Program

{

static void Main(string[] args)

{

string input = Console.ReadLine();

List<Student> students = new List<Student>();

while (input!="end")

{

string[] personInfo = input.Split();

Student student = new Student();

student.FirstName = personInfo[0];

student.LastName = personInfo[1];

student.Age = int.Parse(personInfo[2]);

student.Hometown = personInfo[3];

students.Add(student);

input = Console.ReadLine();

}

string deservedHometown = Console.ReadLine();

for (int i = 0; i < students.Count; i++)

{

if (students[i].Hometown==deservedHometown)

{

Console.WriteLine($"{ students[i].FirstName} {students[i].LastName} is { students[i].Age } years old.");

}

}

}

}

public class Student

{

//public Student(string name,string lname,int age,string hometown)

//{

// FirstName=name;

// LastName= lname ;

// Age=age;

// Hometown=hometown;

//}

public string FirstName { get; set; }

public string LastName { get; set; }

public int Age { get; set; }

public string Hometown{ get; set; }

}

}

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| John Smith 15 Sofia  Peter Ivanov 14 Plovdiv  Linda Bridge 16 Sofia  Simon Stone 12 Varna  end  Sofia | John Smith is 15 years old.  Linda Bridge is 16 years old. |
| Anthony Taylor 15 Chicago  David Anderson 16 Washington  Jack Lewis 14 Chicago  David Lee 14 Chicago  end  Chicago | Anthony Taylor is 15 years old.  Jack Lewis is 14 years old.  David Lee is 14 years old. |

### Solution

Define a class Student with the following properties: **FirstName**, **LastName**, **Age** and **City**.



Read a list of students.



Read a city name and print only students which are from the given city.



You can filter the students with LINQ.



## Students 2.0

Use the class from the previous problem. If you receive a student, which already exists (**first name** and **last name** should be **unique**) overwrite the information.

|  |  |
| --- | --- |
| **Input** | **Output** |
| John Smith 15 Sofia  Peter Johnson 14 Plovdiv  Peter Johnson 25 Plovdiv  Linda Bridge 16 Sofia  Linda Bridge 27 Sofia  Simon Stone 12 Varna  end  Sofia | John Smith is 15 years old.  Linda Bridge is 27 years old. |
| Anthony Taylor 15 Chicago  David Anderson 16 Washington  Jack Lewis 14 Chicago  David Lee 14 Chicago  Jack Lewis 26 Chicago  David Lee 18 Chicago  end  Chicago | Anthony Taylor is 15 years old.  Jack Lewis is 26 years old.  David Lee is 18 years old. |

### Hints

Check if the given student already exists.





Overwrite the student information.

First, we have to find the existing student.





Finally, we have to overwrite the information.



We can use LINQ as well.



**FirstOrDefault** returns the first occurrence or the default value (null in this case).

using System;

using System.Collections.Generic;

using System.Linq;

namespace \_05.\_Students\_2.\_0

{

class Program

{

static void Main(string[] args)

{

string input = Console.ReadLine();

List<Student> students = new List<Student>();

while (input != "end")

{

string[] personInfo = input.Split();

Student student = new Student();

student.FirstName = personInfo[0];

student.LastName = personInfo[1];

student.Age = int.Parse(personInfo[2]);

student.Hometown = personInfo[3];

bool exist = false;

for (int i = 0; i < students.Count; i++)

{

if(student.FirstName==students[i].FirstName&& student.LastName == students[i].LastName)

{

students[i] = student;

exist = true;

}

}

if (!exist)

{ students.Add(student); }

input = Console.ReadLine();

}

string deservedHometown = Console.ReadLine();

for (int i = 0; i < students.Count; i++)

{

if (students[i].Hometown == deservedHometown)

{

Console.WriteLine($"{ students[i].FirstName} {students[i].LastName} is { students[i].Age } years old.");

}

}

}

}

public class Student

{

//public Student(string name,string lname,int age,string hometown)

//{

// FirstName=name;

// LastName= lname ;

// Age=age;

// Hometown=hometown;

//}

public string FirstName { get; set; }

public string LastName { get; set; }

public int Age { get; set; }

public string Hometown { get; set; }

}

}

## Store Boxes

Define a class **Item,** which contains these properties: **Name** and **Price.**

Define a class **Box,** which contains these properties: **Serial Number, Item, Item Quantity** and **Price for a Box.**

Until you receive **"end",** you will be receiving data in the following format: "**{Serial Number} {Item Name} {Item Quantity} {itemPrice}**"

The **Price of one box** has to be calculated: **itemQuantity \* itemPrice.**

Print all the boxes ordered descending by price for a box, in the following format:

**{boxSerialNumber}**

**-- {boxItemName} – ${boxItemPrice}: {boxItemQuantity}**

**-- ${boxPrice}**

The price should be **formatted to the 2nd digit after the decimal separator**.

using System;

using System.Collections.Generic;

using System.Linq;

namespace \_06.\_Store\_Boxes

{

class Program

{

static void Main(string[] args)

{

string input = Console.ReadLine();

List<Box> boxes = new List<Box>();

while(input!="end")

{

string[] boxInfo = input.Split();

string serialNumber = boxInfo[0];

string itemName = boxInfo[1];

int itemQuantity = int.Parse(boxInfo[2]);

decimal itemPrice = decimal.Parse(boxInfo[3]);

Box box = new Box();

Item item = new Item();

item.Name = itemName;

item.Price = itemPrice;

box.SerialNumber = serialNumber;

box.Item = item;

box.ItemQuantity = itemQuantity;

boxes.Add(box);

input = Console.ReadLine();

}

foreach (var box in boxes.OrderByDescending(x => x.PricePerBox))

{

Console.WriteLine(box.SerialNumber);

Console.WriteLine($"-- {box.Item.Name} - ${box.Item.Price:F2}: {box.ItemQuantity}");

Console.WriteLine($"-- ${box.PricePerBox:F2}");

}

}

}

public class Box

{

public string SerialNumber { get; set; }

public Item Item { get; set; }

public int ItemQuantity { get; set; }

public decimal PricePerBox

{

get { return ItemQuantity \* Item.Price; }

}

}

public class Item

{

public string Name { get; set; }

public decimal Price { get; set; }

}

}

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 19861519 Dove 15 2,50  86757035 Butter 7 3,20  39393891 Orbit 16 1,60  37741865 Samsung 10 1000  end | 37741865  -- Samsung - $1000.00: 10  -- $10000.00  19861519  -- Dove - $2.50: 15  -- $37.50  39393891  -- Orbit - $1.60: 16  -- $25.60  86757035  -- Butter - $3.20: 7  -- $22.40 |
| 48760766 Alcatel 8 100  97617240 Intel 2 500  83840873 Milka 20 2.75  35056501 SneakersXL 15 1.50  end | 97617240  -- Intel - $500.00: 2  -- $1000.00  48760766  -- Alcatel - $100.00: 8  -- $800.00  83840873  -- Milka - $2.75: 20  -- $55.00  35056501  -- SneakersXL - $1.50: 15  -- $22.50 |

### Hints

This is how your class Box should look like:



Create an **instance** of **an Item** in such a way, that when you try to set a value to some of the properties, it will not throw you an exception.

There are two ways to do that:

First, you can create a new instance of the **Item** in the **Box constructor**.



Or, every time you create a new Box, on the next line just access the Item property and create a new instance.



## Vehicle Catalogue

Your task is to **create a Vehicle catalog,** which contains only **Trucks** **and** **Cars**.

Define a class **Truck** with the following properties: **Brand, Model, and Weight**.

Define a class **Car** with the following properties: **Brand, Model, and Horse Power**.

Define a class **Catalog** with the following properties: **Collections of** **Trucks and Cars**.

You must read the input, until you receive the "**end**" command. It will be in following format: "**{type}/{brand}/{model}/{horse power / weight}**"

In the end, you have **to print all of the vehicles ordered alphabetical by brand,** in the following format:

"**Cars:**

**{Brand}: {Model} - {Horse Power}hp**

**Trucks:**

**{Brand}: {Model} - {Weight}kg**"

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Car/Audi/A3/110  Car/Maserati/Levante/350  Truck/Mercedes/Actros/9019  Car/Porsche/Panamera/375  end | Cars:  Audi: A3 - 110hp  Maserati: Levante - 350hp  Porsche: Panamera - 375hp  Trucks:  Mercedes: Actros - 9019kg |
| Car/Subaru/Impreza/152  Car/Peugeot/307/109  end | Cars:  Peugeot: 307 - 109hp  Subaru: Impreza - 152hp |

### Hints

This is how your class **Catalog** should look like.



Don't forget to **create instances** **for the two** l**ists**.

You can do it in the **constructor of CatalogueVehicle.**

using System;

using System.Collections.Generic;

using System.Linq;

namespace \_07.\_Vehicle\_Catalogue

{

internal class Program

{

static void Main(string[] args)

{

string input = Console.ReadLine();

Catalog catalog = new Catalog();

while (input != "end")

{

string[] vehicleInfo = input.Split('/');

if (vehicleInfo[0] == "Truck")

{

Truck truck = new Truck(vehicleInfo[1],vehicleInfo[2], int.Parse(vehicleInfo[3]));

catalog.Trucks.Add(truck);

}

else

{

Car car = new Car(vehicleInfo[1], vehicleInfo[2], int.Parse(vehicleInfo[3]));

catalog.Cars.Add(car);

}

input = Console.ReadLine();

}

if (catalog.Cars.Count > 0)

{

Console.WriteLine("Cars:");

}

foreach (var car in catalog.Cars.OrderBy(x => x.Brand))

{

Console.WriteLine($"{car.Brand}: {car.Model} - {car.HorsePower}hp");

}

if (catalog.Trucks.Count > 0)

{

Console.WriteLine("Trucks:");

}

foreach (var truck in catalog.Trucks.OrderBy(x => x.Brand))

{

Console.WriteLine($"{truck.Brand}: {truck.Model} - {truck.Weight}kg");

}

}

}

public class Catalog

{

public Catalog()

{

Cars = new List<Car>();

Trucks = new List<Truck>();

}

public List<Car> Cars { get; set; } //Do i need ctor?

public List<Truck> Trucks { get; set; }

}

public class Car

{

public Car(string brand, string model, int horsePower)

{

this.Brand = brand;

this.Model = model;

this.HorsePower = horsePower;

}

public string Brand { get; set; }

public string Model { get; set; }

public int HorsePower { get; set; }

}

public class Truck

{

public Truck(string brand, string model, int weight)

{

this.Brand = brand;

this.Model = model;

this.Weight = weight;

}

public string Brand { get; set; }

public string Model { get; set; }

public int Weight { get; set; }

}

}