**Lab: Encapsulation**

Problems for exercises and homework for the ["C# OOP" course @ SoftUni"](https://softuni.bg/trainings/2244/csharp-oop-february-2019).

You can check your solutions here: <https://judge.softuni.bg/Contests/1497/Encapsulation-Lab>

* **Sort Persons by Name and Age**

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

Create a class **Person**, which should have **public** properties with **private** setters for:

* **FirstName**: **string**
* **LastName**: **string**
* **Age**: **int**
* **ToString()**: **string** - **override**

You should be able to use the class like this:

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| --- |
| **StartUp.cs** |
| public static void Main()  {  var lines = int.Parse(Console.ReadLine());  var persons = new List<Person>();  for (int i = 0; i < lines; i++)  {  var cmdArgs = Console.ReadLine().Split();  var person = new Person(cmdArgs[0], cmdArgs[1], int.Parse(cmdArgs[2]));  persons.Add(person);  }  persons.OrderBy(p => p.FirstName)  .ThenBy(p => p.Age)  .ToList()  .ForEach(p => Console.WriteLine(p.ToString()));  } |

**Examples**

|  |  |
| --- | --- |
| **Input** | **Output** |
| 5  Asen Ivanov 65  Boiko Borisov 57  Ventsislav Ivanov 27  Asen Harizanoov 44  Boiko Angelov 35 | Asen Harizanoov is 44 years old.  Asen Ivanov is 65 years old.  Boiko Angelov is 35 years old.  Boiko Borisov is 57 years old.  Ventsislav Ivanov is 27 years old. |

**Solution**

Create a **new class** and ensure **proper naming**. Define the **public** properties:

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| **Person.cs** |
| public class Person  {  public string FirstName { get; private set; }  public string LastName { get; private set; }  public int Age { get; private set; }  } |

Create a constructor for Person, which takes 3 parameters firstName, lastName, age:

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| --- |
| **Person.cs** |
| public Person(string firstName, string lastName, int age)  {  this.FirstName = firstName;  this.LastName = lastName;  this.Age = age;  } |

Override **ToString()** method:

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| --- |
| **Person.cs** |
| public override string ToString()  {  return $"{this.FirstName} {this.LastName} is {this.Age} years old.";  } |

* **Salary Increase**

**NOTE**: You need a public **StartUp** class with the namespace **PersonsInfo**. **Refactor the project from the last task.**

Read a **Person** with their **names**, **age** and **salary**. Read the percentage of the bonus to every **Person** **salary**. People younger than 30 **get half the increase**. Expand **Person** from the previous task.

New **properties** and **methods:**

* **Salary**: **decimal**
* **IncreaseSalary**(**decimal** **percentage**)

You should be able to use the class like this:

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| --- |
| **StartUp.cs** |
| var lines = int.Parse(Console.ReadLine());  var persons = new List<Person>();  for (int i = 0; i < lines; i++)  {  var cmdArgs = Console.ReadLine().Split();  var person = new Person(cmdArgs[0],  cmdArgs[1],  int.Parse(cmdArgs[2]),  decimal.Parse(cmdArgs[3]));  persons.Add(person);  }  var parcentage = decimal.Parse(Console.ReadLine());  persons.ForEach(p => p.IncreaseSalary(parcentage));  persons.ForEach(p => Console.WriteLine(p.ToString())); |

**Examples**

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| --- | --- |
| **Input** | **Output** |
| 5  Asen Ivanov 65 2200  Boiko Borisov 57 3333  Ventsislav Ivanov 27 600  Asen Harizanoov 44 666.66  Boiko Angelov 35 559.4  20 | Asen Ivanov receives 2640.00 leva.  Boiko Borisov receives 3999.60 leva.  Ventsislav Ivanov receives 660.00 leva.  Asen Harizanoov receives 799.99 leva.  Boiko Angelov receives 671.28 leva. |

**Solution**

Add a new **public** property for **salary** and **refactor constructor**. Add a new **method**, which will **update** **salary** with a bonus:

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| --- |
| **Person.cs** |
| public void IncreaseSalary(decimal percentage)  {  if(this.Age > 30)  {  this.Salary += this.Salary \* percentage / 100;  }  else  {  this.Salary += this.Salary \* percentage / 200;  }  } |

Refactor the **ToString()** method for this task.

* **Validation of Data**

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

Expand **Person** with proper validation for every field:

* Names must be at least 3 symbols
* Age must not be zero or negative
* Salary can't be less than 460.0

Print proper messages to the user:

* **"Age cannot be zero or a negative integer!"**
* **"First name cannot contain fewer than 3 symbols!"**
* **"Last name cannot contain fewer than 3 symbols!"**
* **"Salary cannot be less than 460 leva!"**

Use **ArgumentExeption** with the listed message.

**Examples**

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| --- | --- |
| **Input** | **Output** |
| 5  Asen Ivanov -6 2200  B Borisov 57 3333  Ventsislav Ivanov 27 600  Asen H 44 666.66  Boiko Angelov 35 300  20 | Age cannot be zero or a negative integer!  First name cannot contain fewer than 3 symbols!  Last name cannot contain fewer than 3 symbols!  Salary cannot be less than 460 leva!  Ventsislav Ivanov gets 660.00 leva. |

**Solution**

Add validation to all of the setters in **Person**. Validation may look like this or something similar:

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| --- |
| **Person.cs** |
| public decimal Salary  {  get  {  return this.salary;  }  private set  {  if (value < 460)  {  throw new ArgumentException("Salary cannot be less than 460 leva!");  }  }  } |

* **First and Reserve Team**

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

Create a **Team** class. Add to this team all of the people you have received. Those who are younger than 40 go to the first team, others go to the reverse team. At the end print the sizes of the first and the reserved team.

The class should have **private fields** for:

* **name**: **string**
* **firstTeam**: **List<Person>**
* **reserveTeam**: **List<Person>**

The class should have **constructors**:

* **Team(string name)**

The class should also have **public properties** for:

* **FirstTeam: List<Person> (read only!)**
* **ReserveTeam: List<Person> (read only!)**

And a method for adding players:

* **AddPlayer**(**Person** **person**): **void**

You should be able to use the class like this:

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| --- |
| **StartUp.cs** |
| Team team = new Team("SoftUni");  foreach (Person person in persons)  {  team.AddPlayer(person);  } |

You should **NOT** be able to use the class like this:

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| --- |
| **StartUp.cs** |
| Team team = new Team("SoftUni");  foreach (Person person in persons)  {  if(person.Age < 40)  {  team.FirstTeam.Add(person);  }  else  {  team.ReserveTeam(person);  }  } |

**Examples**

|  |  |
| --- | --- |
| **Input** | **Output** |
| 5  Asen Ivanov 20 2200  Boiko Borisov 57 3333  Ventsislav Ivanov 27 600  Grigor Dimitrov 25 666.66  Boiko Angelov 35 555 | First team has 4 players.  Reserve team has 1 players. |

**Solution**

Add a new class Team. Its fields and **constructor** should look like

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| --- |
| **Team.cs** |
| private string name;  private List<Person> firstTeam;  private List<Person> reserveTeam;  public Team(string name)  {  this.name = name;  this.firstTeam = new List<Person>();  this.reserveTeam = new List<Person>();  } |

Properties for **FirstTeam** and **ReserveTeam** have only getters:

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| --- |
| **Team.cs** |
| public IReadOnlyCollection<Person> FirstTeam  {  get { return this.firstTeam.AsReadOnly(); }  }  public IReadOnlyCollection<Person> ReserveTeam  {  get { return this.reserveTeam.AsReadOnly(); }  } |

There will be only one method, which adds players to teams:

|  |
| --- |
| **Team.cs** |
| public void AddPlayer(Person person)  {  if (person.Age < 40)  {  firstTeam.Add(person);  }  else  {  reserveTeam.Add(person);  }  } |