# Java OOP Exam - 12 April 2020



## Overview

In this exam, your task will be to create a basic Shooter game. In the game, there are **Field**, **Players** of different teams, and **Guns**.

## Setup

* Upload **only the** CounterStrikerpackage in every task **except** **Unit Tests.**
* **Do not modify the interfaces or their packages.**
* Use **strong cohesion** and **loose coupling.**
* **Use inheritance and the provided interfaces wherever possible**.
  + This includes **constructors**, **method parameters,** and **return types.**
* **Do not** violate your **interface** **implementations** by adding **more public methods** in the concrete class than the interface has defined.
* Make sure you have **no public fields** anywhere.

# Task 1: Structure (50 points)

You are given interfaces, and you have to implement their functionality in the **correct classes**.

There are **3** types of entities in the application: **Gun**, **Player**, **and Field**. There should also be **GunRepository** and **PlayerRepository**.

### GunImpl

GunImpl is a **base class** of any **type of gun** and it **should not be able to be instantiated**.

#### Data

* **name** – String
  + If the name **is null or whitespace,** throw a **NullPointerException** with a message: **"Gun cannot be null or empty."**
  + All names are unique.
* **bulletsCount** – int
  + If the bullets count is below zero**,** throw an **IllegalArgumentException** with a message: **"Bullets cannot be below 0."**

#### Behavior

##### int fire()

The **fire()** method returns the number of bullets fired. **Pistol** can fire only 1 bullet and the **Rifle** only 10 at once, **not more, not less**. If there are **not enough** bullets, the method should return 0.

#### Constructor

A **Gun** should take the following values upon initialization:

**(String name, int bulletsCount)**

#### Child Classes

There are two types of **Gun**:

##### Pistol

The constructorshould take the following values upon initialization:

(**String name, int bulletsCount**)

**Pistol can fire() 1 bullet at a time.**

##### Rifle

The constructorshould take the following values upon initialization:

(**String name, int bulletsCount**)

**Rifle can fire() 10 bullets at a time.**

### PlayerImpl

PlayerImpl is a **base class** for any **type of player,** and it **should not be able to be instantiated**.

#### Data

* **username** - **String**
  + If the username **is null or whitespace,** throw a **NullPointerException** with a message: **"Username cannot be null or empty."**
  + All names are unique.
* **health** - **int**
  + If the health is below 0**,** throw an **IllegalArgumentException** with a message: **"Player health cannot be below 0."**
* **armor** - **int**
  + If the armor is below 0**,** throw an **IllegalArgumentException** with a message: **"Player armor cannot be below 0."**
* **isAlive** - **boolean**
  + If the health is above zero.
* **gun** - **Gun**
  + If the gun is null**,** throw a **NullPointerException** with a message:

**"Gun cannot be null."**

#### Behavior

##### void takeDamage(int points)

The **takeDamage()** method decreases the **Player**'s armor and health. First, you need to reduce the armor. If the armor reaches 0, transfer the damage to health points. If the health points are less than or equal to zero, the player is dead.

#### Constructor

A **Player** should take the following values upon initialization:

**(String username, int health, int armor, Gun gun)**

#### Child Classes

There are two types of **Player**:

##### Terrorist

The constructorshould take the following values upon initialization:

**(String username, int health, int armor, Gun gun)**

##### CounterTerrorist

The constructorshould take the following values upon initialization:

**(String username, int health, int armor, Gun gun)**

### FieldImpl

#### Behavior

##### String start(Collection<Player> players)

Separates the players into two types - Terrorist and Counter Terrorist. The game continues until one of the teams is completely dead (all players have 0 health). The terrorists attack first and after that the counter terrorists. The attack happens like that: Each **live** terrorist shoots on each **live** counter terrorist once and inflicts damage equal to the bullets fired and after that each **live** counter terrorist shoots on each **live** terrorist.

If Terrorists win **return** "**Terrorist wins!"** otherwise **return** "**Counter Terrorist wins!**"

### GunRepository

The **gun repository** is a **repository** for all **guns** in the game.

#### Data

* models - **a** **collection of guns**

#### Behavior

##### void add(Gun gun)

* If the gun is null**,** throw a **NullPointerException** with a message: **"Cannot add null in Gun Repository"**.
* **Adds** a **gun** to the **collection**.

##### boolean remove(Gun gun)

* **Removes** a **gun** from the **collection**. **Returns true** if the removal was **successful**, **otherwise** - **false**.

**Gun findByName(String name)**

* **Returns** the **first** **gun** with the **given name**, if there is such a gun. **Otherwise**, returns **null**.

### PlayerRepository

The **player repository** is a **repository** for all **players** in the game.

#### Data

* models - **a** **collection of players**

#### Behavior

##### void add(Player player)

* If the player is null**,** throw a **NullPointerException** with a message: "**Cannot add null in Player Repository"**.
* **Adds** a **player** to the **collection**.

##### boolean remove(Player player)

* **Removes** a **player** from the **collection**. **Returns true** if the removal was **successful**, **otherwise** - **false**.

**Player findByName(String name)**

* **Returns** the **first** **player** with the **given username**, if there is such a player. **Otherwise**, returns **null**.

# Task 2: Business Logic (150 points)

### The Controller Class

The business logic of the program should be concentrated around several **commands**. You are given interfaces, which you have to implement in the correct classes.

**Note: The** Controller **class SHOULD NOT handle exceptions! The tests are designed to expect exceptions, not messages!**

The first interface is Controller. You must create a ControllerImplclass, which implements the interface and all of its methods. The constructor of Controllerdoes **not take any arguments**. The given methods should have the logic described for each in the Commands section.

### Data

You need to keep track of some things; this is why you need some private fields in your controller class:

* **guns** - **GunRepository**
* **players** – **PlayerRepository**
* **field - Field**

### Commands

There are several **commands**, which control the **business** **logic** of the **application**. They are **stated** **below**.

#### AddGun Command

##### Parameters

* type - String
* name - String
* bulletsCount - int

##### Functionality

**Adds** a **Gun** and **adds** it to the **GunRepository**. **Valid** types are "**Pistol**" and "**Rifle**".

If the **Gun** **type** is **invalid**, you have to **throw an IllegalArgumentException** with **the following message:**

* **"Invalid gun type."**

If the **Gun** is **added successfully**, the method should **return** the following **String**:

* **"Successfully added gun {gunName}."**

#### AddPlayer Command

##### Parameters

* type - String
* username – String
* health – int
* armor – int
* gunName - String

##### Functionality

**Creates** a **Player** of the **given type** and **adds** it to the **PlayerRepository**. **Valid** types are: "**Terrorist**" and "**CounterTerrorist**".

If the **gun** is **not found** throw **NullPointerException** with a message:

* **"Gun cannot be found!"**

If the player **type** is **invalid**, throw an **IllegalArgumentException** with a message:

* **"Invalid player type!"**

The **method** should **return** the following **String** if the **operation** is **successful**:

* **"Successfully added player {playerUsername}."**

#### StartGame Command

##### Functionality

The game starts with all players that are **alive**! Returns the result from the **start()** method.

#### Report Command

##### Functionality

Returns information about each player separated with a new line. Order them by type alphabetically, then by health descending, then by username alphabetically. You can use the overridden **.toString() Player** method.

**"{player type}: {player username}**

**--Health: {player health}**

**--Armor: {player armor}**

**--Gun: {player gun name}"**

**Note: Use System.lineSeparator() for a new line and don't forget to trim if you use StringBuilder.**

### Input / Output

You are provided with one interface, which will help you with the correct execution process of your program. The interface is Engine and the class implementing this interface should read the input and when the program finishes, this class should print the output.

You are given the **EngineImpl** class with written logic in it. For the code to be **compiled**, some parts are **commented**, **don't forget to uncomment them**.

#### Input

Below, you can see the **format** in which **each command** will be given in the input:

* **AddGun** **{type} {name} {bulletsCount}**
* **AddPlayer {type} {username} {health} {armor} {gunName}**
* **StartGame**
* **Report**
* **Exit**

#### Output

Print the output from each command when issued. If an exception is thrown during any of the commands' execution, print the exception message.

#### Examples

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| **Input** |
| **AddGun Rifle Express 100**  **AddGun Rifle Buffalo 100**  **AddGun Rifle Assault 100**  **AddGun Granate Invalid 100**  **AddGun Pistol Kolibri** **5**  **AddGun Pistol Makarov 15**  **AddGun Pistol Magnum 3**  **AddGun Pistol 3**  **AddPlayer Terrorist Shopoff 50 50 Express**  **AddPlayer Terrorist Kris 50 50 Buffalo**  **AddPlayer Terrorist 50 50 Express**  **AddPlayer Terrorist Atanas 50 50 Invalid**  **AddPlayer Terrorist Atanas -10 50 Express**  **AddPlayer Terrorist Atanas 20 -50 Express**  **AddPlayer CounterTerrorist John 50 50 Kolibri**  **AddPlayer CounterTerrorist Peter 30 30 Makarov**  **AddPlayer Player Invalid 30 30 Makarov**  **StartGame**  **Report**  **Exit** |
| **Output** |
| **Successfully added gun Express.**  **Successfully added gun Buffalo.**  **Successfully added gun Assault.**  **Invalid gun type!**  **Successfully added gun Kolibri.**  **Successfully added gun Makarov.**  **Successfully added gun Magnum.**  **Gun cannot be null or empty.**  **Successfully added player Shopoff.**  **Successfully added player Kris.**  **Username cannot be null or empty.**  **Gun cannot be found!**  **Player health cannot be below 0.**  **Player armor cannot be below 0.**  **Successfully added player John.**  **Successfully added player Peter.**  **Invalid player type!**  **Terrorist wins!**  **CounterTerrorist: John**  **--Health: 0**  **--Armor: 0**  **--Gun: Kolibri**  **CounterTerrorist: Peter**  **--Health: 0**  **--Armor: 0**  **--Gun: Makarov**  **Terrorist: Kris**  **--Health: 50**  **--Armor: 46**  **--Gun: Buffalo**  **Terrorist: Shopoff**  **--Health: 50**  **--Armor: 45**  **--Gun: Express** |

|  |
| --- |
| **Input** |
| **AddGun Rifle Express 1000**  **AddGun Rifle Buffalo 1000**  **AddGun Rifle Assault 1000**  **AddGun Pistol Kolibri** **20**  **AddGun Pistol Makarov 20**  **AddGun Pistol Magnum 20**  **AddPlayer Terrorist Shopoff 50 44 Makarov**  **AddPlayer Terrorist Kris 50 0 Magnum**  **AddPlayer Terrorist Atanas 50 10 Kolibri**  **AddPlayer CounterTerrorist John 100 100 Express**  **AddPlayer CounterTerrorist Peter 100 100 Buffalo**  **StartGame**  **Report**  **Exit** |
| **Output** |
| **Successfully added gun Express.**  **Successfully added gun Buffalo.**  **Successfully added gun Assault.**  **Successfully added gun Kolibri.**  **Successfully added gun Makarov.**  **Successfully added gun Magnum.**  **Successfully added player Shopoff.**  **Successfully added player Kris.**  **Successfully added player Atanas.**  **Successfully added player John.**  **Successfully added player Peter.**  **Counter Terrorist wins!**  **CounterTerrorist: John**  **--Health: 100**  **--Armor: 89**  **--Gun: Express**  **CounterTerrorist: Peter**  **--Health: 100**  **--Armor: 89**  **--Gun: Buffalo**  **Terrorist: Atanas**  **--Health: 0**  **--Armor: 0**  **--Gun: Kolibri**  **Terrorist: Kris**  **--Health: 0**  **--Armor: 0**  **--Gun: Magnum**  **Terrorist: Shopoff**  **--Health: 0**  **--Armor: 0**  **--Gun: Makarov** |

# Task 3: Unit Tests (100 points)

You will receive a skeleton with **Gun** and **Player** classes inside. The class will have some methods, fields, and one constructor, which are working properly. You are **NOT ALLOWED** to change any classes. Cover the whole class with unit tests to make sure that the class is working as intended.

You are provided with a **unit test project** in the **project skeleton**.

Do **NOT** use **Mocking** in your unit tests!