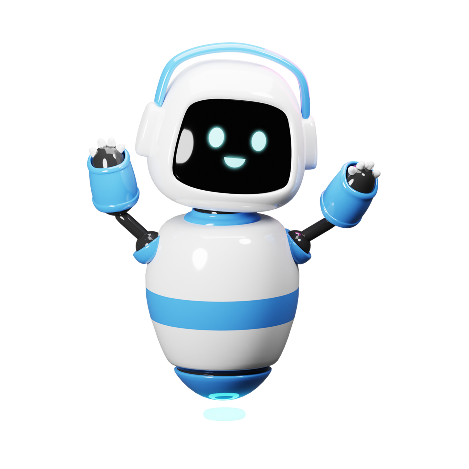
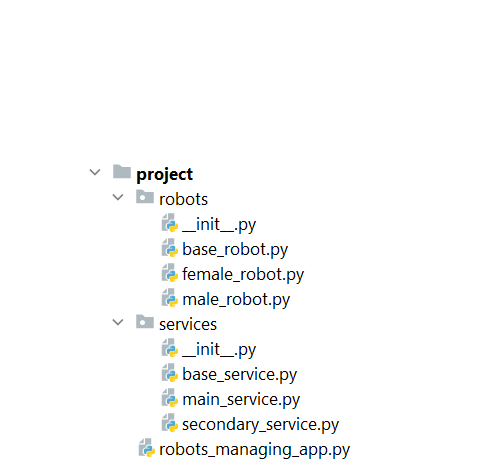
# Python OOP Exam - 8 April 2023



*We are in the year 2100. Technology is so advanced that robots are all around us. They talk, eat, and do whatever you tell them to do. You are working on a robot service and you need to create a project to monitor the robot's actions. Each service has a robot that requires different care. Your job is to add, feed and take care of the robot, as well as upgrade it with various supplements.*

You will be provided with a **skeleton** that includes all the folders and files that you will need.

***Note: You are not allowed to change the folder and file structure and change their names!***



**Judge Upload**

For the **first two problems**, create a **zip** file with the **project** **folder** and **upload it** to the judge system.

For the **last problem**, create a **zip** file with the **test folder** and **upload it** to the judge system.

You do not need to include **in the zip file** your **venv**, **.idea**, **pycache**, and **\_\_MACOSX** (for Mac users), so you do not exceed **the maximum allowed size** of **16.00 KB**.

# Structure (Problem 1) and Functionality (Problem 2)

Our task is to implement the **structure and functionality** of all the classes (properties, methods, inheritance, abstraction, etc.)

You are **free to add additional attributes** (instance attributes, class attributes, methods, dunder methods, etc.) to simplify your code and increase readability as long as it does not change the project's final result in accordance with its requirements so that the program works properly.

## Class BaseRobot

In the **base\_robot.py** file, the class **BaseRobot** should be implemented. It is a **base class** for any **type of robot,** and it **should not be able to be instantiated**.

### Structure

The class should have the following attributes:

* **name:** str
  + The value represents the **name of the robot**.
  + If the name is **an empty string or contains only white spaces**, raise a ValueError with the message: **"Robot name cannot be empty!"**
* **kind:** str
  + The value represents the **kind of the robot**.
  + If the kind is **an empty string or contains only white spaces**, raise a ValueError with the message: **"Robot kind cannot be empty!"**
* **price:** float
  + The value represents the **price of the robot**.
  + If the price **is less than or equal to 0.0**, raise a **ValueError** with the message: **"Robot** price cannot be less than or equal to 0.0!**"**
* **weight:** int
  + The value represents the **weight in kilograms of the robot**.

### Methods

#### \_\_init\_\_(name: str, kind: str, price: float, weight: int)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### eating()

* The method **increases the robot's kilograms**. Keep in mind that each kind of robot implements the method differently.

## Class FemaleRobot

In the **female\_robot.py** file, the class **FemaleRobot** should be implemented. The female robot is a **type of BaseRobot**. Each female robot has **7 kilograms of weight initially**.

### Methods

#### \_\_init\_\_(name: str, kind: str, price: float)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### eating()

* The method **increases** the **robot's weight** by **1 kilogram**.

## Class MaleRobot

In the **male\_robot.py** file, the class **MaleRobot** should be implemented. The male robot is a **type of BaseRobot**. Each male robot has **9 kilograms of weight initially**.

### Methods

#### \_\_init\_\_(name: str, kind: str, price: float)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### eating()

* The method **increases** the **robot's weight** by **3 kilograms**.

## Class BaseService

In the **base\_service.py** file, the class **BaseService** should be implemented. It is a **base class** for any **type of service,** and it **should not be able to be instantiated**.

### Structure

The class should have the following attributes:

* **name:** str
  + The value represents the **name of the service**.
  + If the name is **an empty string or contains only white spaces**, raise a ValueError with the message: **"Service name cannot be empty!"**
* **capacity:** int
  + The value represents the **number** of robots а service **can have**.
  + If the capacity **is less than or equal to 0**, raise a ValueError with the message: **"Service capacity cannot be** less than or equal to 0**!"**
* **robots:** list
  + Empty list that **will contain robots (objects)** added to the service.

### Methods

#### \_\_init\_\_(name: str, capacity: int)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### details()

* **Returns** a string with **information** about the service depending on its type.

## Class MainService

In the **main\_service.py** file, the class **MainService** should be implemented. Main service is a **type of BaseService**. Each main service has a **capacity of 30**.

### Methods

#### \_\_init\_\_(name: str)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### details()

* Returns a string in the following format:

"{service\_name} Main Service:

Robots: {robot\_name1} {robot\_name2} … {robot\_nameN}"

* If the service **doesn't have any robots**, add **"none"** instead of the robots' names:

"{service\_name} Main Service:

**Robots: none"**

## Class SecondaryService

In the **secondary\_service.py** file, the class **SecondaryService** should be implemented. Secondary service is a **type of BaseService**. Each secondary service has a **capacity of 15**.

### Methods

#### \_\_init\_\_(name: str)

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### details()

* Returns a string in the following format:

"{service\_name} Secondary Service:

Robots: {robot\_name1} {robot\_name2} … {robot\_nameN}"

* If the service **doesn't have any robots**, add **"none"** instead of the robots' names:

"{service\_name} Secondary Service:

**Robots: none"**

## Class RobotsManagingApp

In the **robots\_managing\_app.py** file, the class **RobotsManagingApp** should be implemented. It will contain the functionality of the project.

### Structure

The class should have the following attributes:

* **robots: list**
  + Empty list that **will contain all robots** (objects) that are created.
* **services: list**
  + Empty list that **will contain all services** (objects) that are created.

### Methods

#### \_\_init\_\_()

* In the **\_\_init\_\_** method, all the needed attributes must be set.

#### add\_service(service\_type: str, name: str)

The method **creates** a service of the given type and **adds** it to the services collection.   
All service **names** will be **unique**.

* If the service type is not valid, raise an **Exception** with the following message:

**"Invalid service type!"**

* Otherwise, **create** the service, **add** it to the services list, and **return** the following message:

**"{service\_type} is successfully added."**

* **Valid types** of services are: **"MainService"** and **"SecondaryService"**

#### add\_robot(robot\_type: str, name: str, kind: str, price: float)

The method **creates** a robot of the given type and **adds** it to the robots' collection.   
All robots' **names** will be **unique**.

* If the robot type is not valid, raise an **Exception** with the following message:

**"Invalid robot type!"**

* Otherwise, **create** the robot, **add** it to the robots' list, and **return** the following message:

**"{robot\_type} is successfully added."**

* **Valid types** of robots are: **"MaleRobot"** and **"FemaleRobot"**

#### add\_robot\_to\_service(robot\_name: str, service\_name: str)

The method **adds the robot** with the given name to the service if there is a **capacity** for that. Both robot and service with the given names will **always exist**.

* First, check if the robot **can be added** to the service. The **Female robot** can be **ONLY** added to the **Secondary Service** and the **Male robot** can be **ONLY** added to the **Main Service**. In case of a mismatch, **return** the message: **"Unsuitable service."**
* Next, if there is **NOT enough capacity** to **add** the robot to the service, **raise an Exception** with thefollowing message: **"Not enough capacity for this robot!"**
* If the robot can be **added successfully** to the service, **remove** it from the **robots' collection**, and **add it** to the **service**. **Return** the following message: **"Successfully added {robot\_name} to {service\_name}."**

#### remove\_robot\_from\_service(robot\_name: str, service\_name: str)

The method **removes the robot** with the given name from the service. The service with the given name will **always exist**.

* Check if there is a robot with the given name in the service. If not, **raise an Exception** with thefollowing message: **"No such robot in this service!"**
* If the robot can be **removed successfully** from the service, **remove** it from the service, and **add it** back to the **robots' collection**. **Return** the following message: **"Successfully removed {robot\_name} from {service\_name}."**

#### feed\_all\_robots\_from\_service(service\_name: str)

The method **feeds all robots** from the service. The service with the given name will **always exist**. When all robots from the service are successfully fed (hint: use eating() method), **return** the following message:

**"Robots fed: {number\_of\_robots\_fed}."**

#### service\_price(service\_name: str)

The method **calculates the price of all robots that are in the service**. The service with the given name will **always exist**.

**Return** the calculated price, formatted to the **second decimal place** with the following message:

**"The value of service {service\_name} is {total\_price}."**

#### \_\_str\_\_()

Returns information about each service (hint: you can use the service details() method)

"{service\_name1} {service\_type}:

Robots: {robot\_name1} {robot\_name2} … {robot\_nameN}

{service\_name2} {service\_type}:

Robots: {robot\_name1} {robot\_name2} … {robot\_nameN}

…

{service\_nameN} {service\_type}:

Robots: {robot\_name1} {robot\_name2} … {robot\_nameN}"

#### Examples

|  |
| --- |
| **Input** |
| **main\_app = RobotsManagingApp()**  **print(main\_app.add\_service('SecondaryService', 'ServiceRobotsWorld'))**  **print(main\_app.add\_service('MainService', 'ServiceTechnicalsWorld'))**  **print(main\_app.add\_robot('FemaleRobot', 'Scrap', 'HouseholdRobots', 321.26))**  **print(main\_app.add\_robot('FemaleRobot', 'Sparkle', 'FunnyRobots', 211.11))**  **print(main\_app.add\_robot\_to\_service('Scrap', 'ServiceRobotsWorld'))**  **print(main\_app.add\_robot\_to\_service('Sparkle', 'ServiceRobotsWorld'))**  **print(main\_app.feed\_all\_robots\_from\_service('ServiceRobotsWorld'))**  **print(main\_app.feed\_all\_robots\_from\_service('ServiceTechnicalsWorld'))**  **print(main\_app.service\_price('ServiceRobotsWorld'))**  **print(main\_app.service\_price('ServiceTechnicalsWorld'))**  **print(str(main\_app))**  **print(main\_app.remove\_robot\_from\_service('Scrap', 'ServiceRobotsWorld'))**  **print(main\_app.service\_price('ServiceRobotsWorld'))**  **print(main\_app.service\_price('ServiceTechnicalsWorld'))**  **print(str(main\_app))** |
| **Output** |
| **SecondaryService is successfully added.**  **MainService is successfully added.**  **FemaleRobot is successfully added.**  **FemaleRobot is successfully added.**  **Successfully added Scrap to ServiceRobotsWorld.**  **Successfully added Sparkle to ServiceRobotsWorld.**  **Robots fed: 2.**  **Robots fed: 0.**  **The value of service ServiceRobotsWorld is 532.37.**  **The value of service ServiceTechnicalsWorld is 0.00.**  **ServiceRobotsWorld Secondary Service:**  **Robots: Scrap Sparkle**  **ServiceTechnicalsWorld Main Service:**  **Robots: none**  **Successfully removed Scrap from ServiceRobotsWorld.**  **The value of service ServiceRobotsWorld is 211.11.**  **The value of service ServiceTechnicalsWorld is 0.00.**  **ServiceRobotsWorld Secondary Service:**  **Robots: Sparkle**  **ServiceTechnicalsWorld Main Service:**  **Robots: none** |

# Task 3: Unit Tests (100 points)

You will **be provided with another skeleton** for this problem. **Open** the **new skeleton** as a **new project** and write tests for the **TennisPlayer** class. The class will have some methods, fields and one constructor, all of them working properly. You are **NOT ALLOWED** to change anything in the class. Cover the whole class with unit tests to make sure that the class is working as intended. Submit **only the test** folder as zip archive.