# Python OOP Exam - 10 April 2021

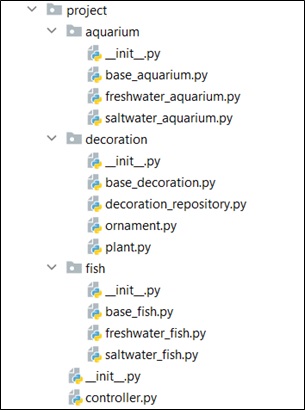
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Description automatically generated**Submit your solutions in the SoftUni judge system at** [**https://judge.softuni.org/Contests/Practice/Index/2934#0**](https://judge.softuni.org/Contests/Practice/Index/2934#0)

*Aquariums are nice and interesting species can live in there. You have to create* ***an aqua shop******project****, which keeps track of the fish in the aquariums. The* ***Aquariums*** *have* ***Fish*** *with different environment requirements. Your task is to add, feed and take care of the fish.*

You will be provided with a **skeleton** which 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 2 problems**, create a **zip** file with the name **project** and upload it to the judge system

For the **last problem**, create a **zip** file with the name **tests** and upload it to the judge system

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

Our first task is to implement the **structure and functionality** of all the classes (properties, methods, inheritance, 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 according to the requirements and the program works properly.

### BaseDecoration

In the **base\_decoration.py** file the class BaseDecoration should be implemented. It is a **base class** of any **type of decoration,** and it **should not be able to be instantiated**.

### Structure

The class should have the following attributes:

* **comfort**: **int** - passed upon **initialization.**
* **price:** **float** - passed upon **initialization.**

### Methods

#### \_\_init\_\_(comfort: int, price: float)

The **\_\_init\_\_** method should have a **comfort** and **price.**

### Ornament

In the file **ornament.py** the class **Ornament** should be implemented.

**Structure**

The class should **inherit** from the **BaseDecoration** class.

**Methods**

**\_\_init\_\_()**

An instance of the **Ornament** class will have **1 comfort** and its **price** is **5**.

### Plant

In the file **plant.py** the class **Plant** should be implemented.

**Structure**

The class should **inherit** from the **BaseDecoration** class.

**Methods**

**\_\_init\_\_()**

An instance of the **Plant** class will have **5 comfort** and its **price** is **10**.

### DecorationRepository

In the file **decoration\_repository.py** the class **DecorationRepository** should be implemented. It is a **repository** for the **decorations** that are in the aqua shop.

### Structure

The class should have the following attributes:

* decorations: **list** – **empty** list that will contain all **decorations** (objects).

#### Methods

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

The **\_\_init\_\_** method should have an empty list of **decorations.**

**add(decoration)**

* **Adds** a **decoration object** in the **list**.

**remove(decoration)**

* **Removes** the **decoration object** fromthe **list if it exists** andreturns **True,** otherwise returns **False**.

**find\_by\_type(decoration\_type: str)**

* **Returns** the **first** **decoration** of the **given type** if there is. Otherwise, **returns** a **message "None"**.

### BaseFish

In the **base\_fish.py** file the class BaseFish should be implemented. It is a **base class** of any **type of fish,** and it **should not be able to be instantiated**.

### Structure

The class should have the following attributes:

* **name**: **string** - passed upon **initialization.** If the name is **empty string,** raise a **ValueError** with message **"Fish name cannot be an empty string."**
  + All passed **names** would be **unique** and **it will not be necessary** to check if a given name already exists.
* **species:** **string** - passed upon **initialization.** If the species is **empty string,** raise a **ValueError** with message **"Fish species cannot be an empty string."**
* **size**: **int** - passed upon **initialization.**
* **price:** **float** - passed upon **initialization.** It represents the price of the fish.If the price is equal to or below **0,** raise a **ValueError** with message "**Price cannot be equal to or below zero.**"

### Methods

#### \_\_init\_\_(name: str, species: str, size: int, price: float)

The **\_\_init\_\_** method should have a **name**, a **species**,a **size** and a **price.**

##### eat()

The **eat()** method increases the **Fish**'s size. Keep in mind that some types of **Fish** can implement the method in a different way.

* The method **increases** the fish’s size by **5**.

### FreshwaterFish

In the file **freshwater\_fish.py** the class **FreshwaterFish** should be implemented. **The FreshwaterFish could only live in FreshwaterAquarium!**

**Structure**

The class should **inherit** from the **BaseFish** class.

**Methods**

**\_\_init\_\_(name: str, species: str, price: float)**

An instance of the **FreshwaterFish** class should have a **name**, a **species**, a **price** upon initialization and will have **3 initial size**.

**еat()**

The method **increases** the fish’s size by **3**.

##### SaltwaterFish

In the file **saltwater\_fish.py** the class **SaltwaterFish** should be implemented. **The SaltwaterFish could only live in SaltwaterAquarium!**

**Structure**

The class should **inherit** from the **BaseFish** class.

**Methods**

**\_\_init\_\_(name: str, species: str, price: float)**

An instance of the **SaltwaterFish** class should have a **name**, a **species**, a **price** upon initialization and will have **5 initial size**.

**eat()**

The method **increases** the fish’s size by **2**.

### BaseAquarium

In the **base\_aquarium.py** file the class BaseAquarium should be implemented. It is a **base class** of any **type of aquarium,** and it **should not be able to be instantiated**.

### Structure

The class should have the following attributes:

* **name**: **string** - passed upon **initialization.** If the name is **empty string,** raise a **ValueError** with message: **"Aquarium name cannot be an empty string."**
  + All passed **names** would be **unique** and **it will not be necessary** to check if a given name already exists.
* **capacity:**  **int** - passed upon **initialization.** It represents the number of **fish** an aquarium can have.
* **decorations: list** - **empty** list upon initialization that will contain **all the decorations** (objects).
* **fish: list** - **empty** list upon initialization that will contain **all the fish** (objects).

### Methods

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

The **\_\_init\_\_** method should have a **name**, a **capacity**, **decorations** and **fish**.

##### calculate\_comfort()

**Returns the sum** of **each decoration’s comfort** in the **Aquarium**.

##### add\_fish(fish)

**Adds** a **fish (object)** in the **Aquarium** and **return** one of the following strings:

* **"Not enough capacity."** - if there is **not enough capacity** to **add** the **Fish** in the **Aquarium**
* **"Successfully added {fish\_type} to {aquarium\_name}."** - if the **Fish** is **added successfully** in the **Aquarium**
  + Possiblefish\_type**s** are: "**FreshwaterFish**" and "**SaltwaterFish**".

##### remove\_fish(fish)

Removes a **fish object** from the **Aquarium**.

##### add\_decoration(decoration)

Adds a **decoration object** in the **Aquarium**.

##### feed()

The **feed()** method **feeds** **all fish** in the aquarium.

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

**Returns** a **String** with **information** about the **Aquarium** in the format below. If the **Aquarium does not have fish**, you should **replace the fish names** with the word **"none"** instead.

**"{aquarium name}:  
Fish: {fish\_name1} {fish\_name2} {fish\_name3} (…) / none  
Decorations: {decorations\_count}  
Comfort: {aquarium\_comfort}"**

##### FreshwaterAquarium

In the file **freshwater\_aquarium.py** the class **FreshwaterAquarium** should be implemented.

**Structure**

The class should **inherit** from the **BaseAquarium** class.

**Methods**

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

An instance of the **FreshwaterAquarium** class should have a **name** upon initialization and **50 initial capacity**.

##### SaltwaterAquarium

In the file **saltwater\_aquarium.py** the class **SaltwaterAquarium** should be implemented.

**Structure**

The class should **inherit** from the **BaseAquarium** class.

**Methods**

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

An instance of the **SaltwaterAquarium** class should have a **name** upon initialization and **25 initial capacity**.

### Controller

In the file **controller.py** the class Controller should be implemented.

**Structure**

The class should have the following attributes:

* **decorations\_repository**: **DecorationRepository** **– new decoration repository** upon initialization.
* **aquariums**: **list** – **empty** list upon initialization that will contain **all aquariums** (objects).

**Methods**

**\_\_init\_\_()**

An instance of the **Controller** class will have **decorations\_repository** and **aquariums.**

#### add\_aquarium(aquarium\_type: str, aquarium\_name: str)

**Creates an aquarium of the given type and then adds** it to the list of aquariums. **Valid** types are: "**FreshwaterAquarium**" and "**SaltwaterAquarium**".

If the **aquarium** **type** is **invalid**, you should **return the following message:**

* **"Invalid aquarium type."**

If the **Aquarium** is **added successfully**, the method should **return** the following **message**:

* **"Successfully added {aquarium\_type}."**

#### add\_decoration(decoration\_type: str)

**Creates** a **decoration** of the **given type** and **adds** it to the **DecorationRepository**. **Valid** types are: "**Ornament**" and "**Plant**".

If the **decoration** **type** is **invalid**, **return the following message**:

* **"Invalid decoration type."**

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

* **"Successfully added {decoration\_type}."**

#### insert\_decoration(aquarium\_name: str, decoration\_type: str)

If there is such decoration and such aquarium, **you should add** the first occurrence of the desired decoration to the aquarium with the **given name**. You should remove the decoration from the DecorationRepository and **return** the following message:

* **"Successfully added {decoration\_type} to {aquarium\_name}."**

If there is **no such decoration**, you should **return** the following message:

* **"There isn't a decoration of type {decoration\_type}."**

#### add\_fish(aquarium\_name: str, fish\_type: str, fish\_name: str, fish\_species: str, price: float)

**Creates** a **fish** of the **given type** and **adds** it to the **aquarium** with the **given name**. **Valid** **f**ish types are: "**FreshwaterFish**" and "**SaltwaterFish**". If the **fish** **type** is **invalid, you should return a massage:**

* **"There isn't a fish of type {fish\_type}."**

**If the fish type is valid, return** one of the following strings:

* **"Not enough capacity."** - if there is **not enough capacity** to **add** the **fish** in the **aquarium**.
* **"Water not suitable."** - if the **fish** **cannot live** in the **aquarium**.
* **"Successfully added {fish\_type} to {aquarium\_name}."** - if the **fish** is **added successfully** in the **aquarium**.

You can use the overridden **add\_fish Aquarium** method.

#### feed\_fish(aquarium\_name: str)

Feeds all **fish** in the **aquarium** with the given **name**.

**Returns** a **string** with information about **how many fish** were **successfully fed**, in the following **format**:

* **"Fish fed: {fed\_count}"**

#### calculate\_value(aquarium\_name: str)

Calculates the value of the **aquarium** with the given **name**. It is calculated by the sum of all **fish’s** and **decorations**’ **prices** in the **aquarium**.

**Return** a **string** in the following **format**:

* **"The value of Aquarium {aquarium\_name} is {value}."**
  + The **value** should be **formatted** to the **2nd decimal place**!

#### report()

**Returns** information about each aquarium. You can use the overridden **\_\_str\_\_ Aquarium** method.

**"{aquarium name1}:  
Fish: {fish\_name1} {fish\_name2} {fish\_name3} (…) / none  
Decorations: {decorations\_count}  
Comfort: {aquarium\_comfort}**

**{aquarium name2}:  
Fish: {fish\_name1} {fish\_name2} {fish\_name3} (…) / none  
Decorations: {decorations\_count}  
Comfort: {aquarium\_comfort}**

**…**

**{aquarium nameN}:  
Fish: {fish\_name1} {fish\_name2} {fish\_name3} (…) / none  
Decorations: {decorations\_count}  
Comfort: {aquarium\_comfort}"**

# Problem 3. Unit Tests

You will **be provided with another skeleton** for this problem. **Import** the **new skeleton** and **write tests** for the **Train** class. The class will have some methods, fields and one constructor, which are working properly. You are **NOT ALLOWED** to change any class. Cover the whole class with unit tests to make sure that the class is working as intended. Submit **only the test** folder.