Exercise: Class and Static Methods

Problems for exercise and homework for the Python OOP Course @SoftUni.
Submit your solutions in the SoftUni judge system at https://judge.softuni.bg/Contests/2431.

1. Photo Album

Create a class called **PhotoAlbum**. Upon initialization, it should receive **pages** (**int**). It should also have **one more attribute**: **photos** (empty matrix) representing the album with its pages where you should put the photos. Each page can contain only **4 photos**. The class should also have **3 more methods**:

- **from_photos_count(photos_count: int)** - creates a **new instance** of **PhotoAlbum**. Note: Each page can contain **4 photos**.
- **add_photo(label:str)** - adds the photo in the **first possible page** and **slot** and return **"{label} photo added successfully on page {page_number(starting from 1)} slot {slot_number(starting from 1)}"**. If there are **no free slots** left, return **"No more free slots"**
- **display()** - returns a **string representation** of **each page** and the **photos** in it. Each photo is marked with **"[]"**, and the **page separation** is made using **11 dashes (-)**. For example, if we have **1 page** and **2 photos**:

  ```
  -----------
  [] []
  -----------
  ```

  and if we have **2 empty pages**:

  ```
  -----------

  -----------

  -----------
  ```

Examples

Test Code

`album = PhotoAlbum(2)`
 	
`print(album.add_photo("baby"))`
`print(album.add_photo("first grade"))`
`print(album.add_photo("eight grade"))`
`print(album.add_photo("party with friends"))`
`print(album.photos)`
`print(album.add_photo("prom"))`
`print(album.add_photo("wedding"))`
 	
`print(album.display())`

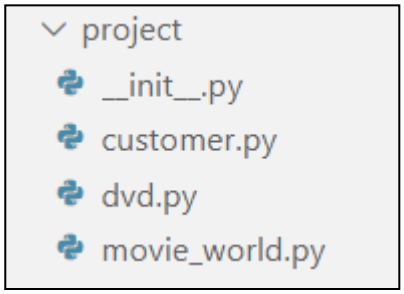
Output

`baby photo added successfully on page 1 slot 1`
`first grade photo added successfully on page 1 slot 2`
`eight grade photo added successfully on page 1 slot 3`
`party with friends photo added successfully on page 1 slot 4`
`[['baby', 'first grade', 'eight grade', 'party with friends'], []]`
`prom photo added successfully on page 2 slot 1`
`wedding photo added successfully on page 2 slot 2`

```
-----------
[] [] [] []
-----------
[] []
-----------
```

2. Movie World

Create the following project structure



Class Customer

Upon initialization, the **`Customer`** class should receive the following parameters: **`name: str`**, **`age: int`**, **`id: int`**. Each customer should also have an instance **attribute** called **`rented_dvds`** (empty list with **DVD instances**).

Implement the **`__repr__`** method, so it **returns** the following string: **`"{id}: {name} of age {age} has {count_rented_dvds} rented DVD's ({dvd_names joined by comma and space})"`**

Class DVD

Upon initialization, the **DVD class** should receive the following parameters: **`name: str`**, **`id: int`**, **`creation_year: int`**, **`creation_month: str`**, **`age_restriction: int`**. Each DVD should also have an **attribute** called **`is_rented`** (**`False`** by default)

Create a method called **`from_date(id: int, name: str, date: str, age_restriction: int)`** - it should create a **new instance** using the provided data. The **date** will be in the format **`"day.month.year"`** - **all of them should be numbers.**

Implement the **`__repr__`** method so it returns the following string: **`"{id}: {name} ({creation_month} {creation_year}) has age restriction {age_restriction}. Status: {rented/not rented}"`**

Class MovieWorld

The **`MovieWorld`** class should receive **one parameter** upon initialization: **`name: str`**. Each **`MovieWorld`** instance should also have **2 more attributes**: **`customers`** (**empty list** of Customer **objects**), **`dvds`** (**empty list** of DVD **objects**). The class should also have the following **methods**:

- **`dvd_capacity()`** - returns **15** - the **DVD capacity** of a movie world
- **`customer_capacity()`** - returns **10** - the **customer capacity** of a movie world
- **`add_customer(customer: Customer)`** - add the customer if capacity not exceeded
- **`add_dvd(dvd: DVD)`** - add the DVD if capacity not exceeded
- **`rent_dvd(customer_id: int, dvd_id: int)`**
    - If the customer has **already rented** that DVD return **`"{customer_name} has already rented {dvd_name}"`**

- If the DVD **is rented by someone else**, return **"DVD is already rented"**
- If the customer is **not allowed** to rent the DVD, return **"{customer_name} should be at least {dvd_age_restriction} to rent this movie"**
- Otherwise, the rent is **successful** (the DVD is rented and added to the customer's DVDs). Return **"{customer_name} has successfully rented {dvd_name}"**

- **return_dvd(customer_id, dvd_id)** - if the DVD is in **the customer**, he/she should **return it** and the method should return the message **"{customer_name} has successfully returned {dvd_name}"**. Otherwise, return **"{customer_name} does not have that DVD"**
- **__repr__()** - return the **string representation** of **each customer** and **each DVD** on separate lines

Examples

Test Code

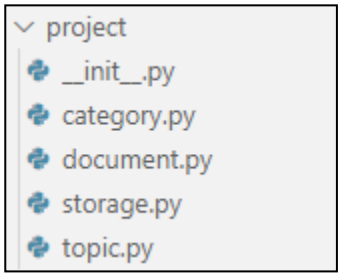
```
from project.customer import Customer
from project.dvd import DVD
from project.movie_world import MovieWorld

c1 = Customer("John", 16, 1)
c2 = Customer("Anna", 55, 2)

d1 = DVD("Black Widow", 1, 2020, "April", 18)
d2 = DVD.from_date(2, "The Croods 2", "23.12.2020", 3)

movie_world = MovieWorld("The Best Movie Shop")

movie_world.add_customer(c1)
movie_world.add_customer(c2)

movie_world.add_dvd(d1)
movie_world.add_dvd(d2)

print(movie_world.rent_dvd(1, 1))
print(movie_world.rent_dvd(2, 1))
print(movie_world.rent_dvd(1, 2))

print(movie_world)
```

Output

```
John should be at least 18 to rent this movie
Anna has successfully rented Black Widow
John has successfully rented The Croods 2
1: John of age 16 has 1 rented DVD's (The Croods 2)
2: Anna of age 55 has 1 rented DVD's (Black Widow)
1: Black Widow (April 2020) has age restriction 18. Status: rented
2: The Croods 2 (December 2020) has age restriction 3. Status: rented
```

3. Document Management

Create the following project structure



Class Topic

The **Topic** class should receive the following **parameters** upon initialization: **`id: int`**, **`topic: str`**, **`storage_folder: str`**. It should have **two methods**:

- **`edit(new_topic: str, new_storage_folder: str)`** - change the **topic** and the **storage folder**
- **`__repr__()`** - returns a **string representation** of the topic in the format: **`"Topic {id}: {topic} in {storage_folder}"`**

Class Category

The **Category** class should receive the following **parameters** upon initialization: **`id: int`**, **`name: str`**. The class should have **two methods**:

- **`edit(new_name: str)`** - edit the **name** of the category
- **`__repr__()`** - returns a **string representation** of the category in the following format: **`"Category {id}: {name}"`**

Class Document

The **Document** class should receive the following **parameters** upon initialization: **`id: int`**, **`category_id: int`**, **`topic_id: int`**, **`file_name: str`**. The class should also have **one more attribute** called **`tags`** (**empty list**). The class should also have **4 methods**:

- **`from_instances(id: int, category: Category, topic: Topic, file_name: str)`** - create a **new instance** using the provided **category** and **topic** instances
- **`add_tag(tag_content: str)`** - if the **tag** is **not** already in the tags **list**, **add** it to the tags list
- **`remove_tag(tag_content:str)`** - if the tag is **in** the tags **list**, **delete it**
- **`edit(file_name: str)`** - **change** the **file name** with the given one
- **`__repr__()`** - returns a string representation of a document in the format: **`"Document {id}: {file_name}; category {category_id}, topic {topic_id}, tags: {tags joined by comma and space)}"`**

Class Storage

Upon initialization the class **Storage** will **not receive any parameters**. It should have **3 instance attributes**: **`categories`** (empty list), **`topics`** (empty list), **`documents`** (empty list). The class should have the following **methods**:

- **`add_category(category:Category)`** - add the category if it **is not in the list**
- **`add_topic(topic:Topic)`** - add the topic if it **does not exist**
- **`add_document(document:Document)`** - add the document if it **does not exist**

- **`edit_category(category_id: int, new_name:str)`** - edit the **name** of the category with the provided **id**
- **`edit_topic(topic_id: int, new_topic: str, new_storage_folder: str)`** - edit the **topic** with the given **id**
- **`edit_document(document_id: int, new_file_name: str)`** - edit the **document** with the given **id**
- **`delete_category(category_id)`** - delete the **category** with the provided **id**
- **`delete_topic(topic_id)`** - delete the **topic** with the provided **id**
- **`delete_document(document_id)`** - delete the **document** with the provided **id**
- **`get_document(document_id)`** - return the **document** with the provided **id**
- **`__repr__()`** - returns a **string representation** of each document on **separate lines**

Examples

Test Code

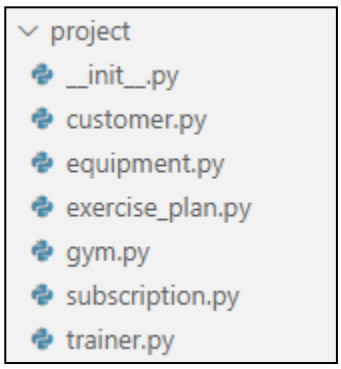
`from project.category import Category`
`from project.document import Document`
`from project.storage import Storage`
`from project.topic import Topic`
 	
`c1 = Category(1, "work")`
`t1 = Topic(1, "daily tasks", "C:\\work_documents")`
`d1 = Document(1, 1, 1, "finilize project")`
 	
`d1.add_tag("urgent")`
`d1.add_tag("work")`
 	
`storage = Storage()`
`storage.add_category(c1)`
`storage.add_topic(t1)`
`storage.add_document(d1)`
 	
`print(c1)`
`print(t1)`
`print(storage.get_document(1))`
`print(storage)`

Output

`Category 1: work`
`Topic 1: daily tasks in C:\work_documents`
`Document 1: finilize project; category 1, topic 1, tags: urgent, work`
`Document 1: finilize project; category 1, topic 1, tags: urgent, work`

4. Gym

Create the following project structure:



Class Customer

Upon initialization, each customer will receive the following **parameters**: **`name: str`**, **`address: str`**, **`email: str`**. Each customer should also have a personal **`id`** (**autoincremented**, starting from 1). To do the incrementation, you should create a **class attribute `id`** equal to **1**, which will keep the value of the **id for the upcoming customer**. For example, if there are **no customers**, the class **id** should be equal to **1**. When there **is one customer** - the class **id** should be equal to **2**.

Create a method called **`get_next_id`**, which returns the **id** that will be given to the **next customer.**

Implement the **`__repr__`** method so it returns the **info** about the customer in the following format: **`"Customer <{id}> {name}; Address: {address}; Email: {email}"`**

Class Equipment

Upon initialization, the class will receive the following **parameters**: **`name: str`**. Each equipment should also have an **id** (**autoincremented**, starting from **1**). To do the incrementation, you should create a **class attribute `id`** equal to **1**, which will keep the value of the **id for the following equipment's id**.

Create a **method** called **`get_next_id`**, which returns the **`id`** that will be given to the **following equipment.**

Implement the **`__repr__`** method so it returns the **info** about the equipment in the following format: **`"Equipment <{id}> {name}"`**

Create a **static method** called **`get_next_id`**, which returns the **`id`** that will be given to the **following equipment.**

Class ExercisePlan

Upon initialization, the class will receive the following **parameters**: **`trainer_id: int`**, **`equipment_id: int`**, **`duration: int`** (in **minutes**). Each plan should also have an **`id`** (**autoincremented**, starting from **1**). To do the incrementation, you should create a **class attribute `id`** equal to **1**, which will keep the value of the **id for the next plan's id**. Create the following **methods**:

- **`from_hours(trainer_id:int, equipment_id:int, hours:int)`** - creates **new instance** using the provided information
- **`get_next_id()`** - **static method** that returns the **id** that will be given to the **next plan**
- **`__repr__()`** - returns the **information** about the plan in the following format: **`"Plan <{id}> with duration {duration} minutes"`**

Class Subscription

Upon initialization, the class will receive the following **parameters**: **`date: str`**, **`customer_id: int`**, **`trainer_id: int`**, **`exercise_id: int`**. The class should also have an **id** (**autoincremented** starting from **1**). To do the incrementation, you should create a **class attribute `id`** equal to **1**, which will keep the value of the **id for the next subscription's id**.

Implement the **`__repr__`** method so it returns the **info** about the subscription in the following format: **`"Subscription <{id}> on {date}"`**

Create a **static method** called **`get_next_id`** which returns the **id** that will be given to the **next subscription**

Class Trainer

Upon initialization, the class will receive the following **parameters**: **`name: str`**. The class should also have an **id** (**autoincremented** starting from **1**). To do the incrementation, you should create a **class attribute `id`** equal to **1**, which will keep the value of the **id for the next trainer's id**.

Implement the **`__repr__`** method so it returns the **info** about the trainer in the following format: **`"Trainer <{id}> {name}"`**

Create a **static method** called **`get_next_id`**, which returns the **id** that will be given to the **next trainer.**

Class Gym

Upon initialization, the class will **not receive** any **parameters**. However, it should have the following **attributes**: **`customers`** (**empty list of customer** objects), **`trainers`** (**empty list of trainer** objects), **`equipment`** (**empty list of equipment** objects), **`plans`** (**empty list of plan** objects), **`subscriptions`** (**empty list of subscription** objects)

Create the following **methods**:

- **`add_customer(customer: Customer)`** - **add the customer** in the customer list if the customer **is not** already **in it**
- **`add_trainer(trainer: Trainer)`** - **add the trainer** to the trainers' list, if the trainer **is not** already in it
- **`add_equipment(equipment: Equipment)`** - **add the equipment** to the equipment list, if the equipment **is not** already in it
- **`add_plan(plan: ExercisePlan)`** - **add the plan** to the plans' list, if the plan **is not** already in it
- **`add_subscription(subscription: Subscription)`** - **add the subscription** in the subscriptions list if the subscription **is not** already in it
- **`subscription_info(subscription_id: int)`** - get the **subscription**, the **customer,** the **trainer**, the **equipment,** and the **plan**. Then **return** their **string representations** each on a **new line.**

Examples

Test Code

`from project.customer import Customer`
`from project.equipment import Equipment`
`from project.exercise_plan import ExercisePlan`
`from project.gym import Gym`
`from project.subscription import Subscription`
`from project.trainer import Trainer`
 	
`customer = Customer("John", "Maple Street", "john.smith@gmail.com")`
`equipment = Equipment("Treadmill")`
`trainer = Trainer("Peter")`

```
subscription = Subscription("14.05.2020", 1, 1, 1)
plan = ExercisePlan(1, 1, 20)

gym = Gym()

gym.add_customer(customer)
gym.add_equipment(equipment)
gym.add_trainer(trainer)
gym.add_plan(plan)
gym.add_subscription(subscription)

print(Customer.get_next_id())

print(gym.subscription_info(1))
```

Output

```
2
Subscription <1> on 14.05.2020
Customer <1> John; Address: Maple Street; Email: john.smith@gmail.com
Trainer <1> Peter
Equipment <1> Treadmill
Plan <1> with duration 20 minutes
```