Practical Object oriented design (Strategy & Observer)

Solve the following problems.

Problem1: Computing Average Score

We want to implement a class to represent the student scores from a class they are enrolled in. The class must provide at least the following methods:

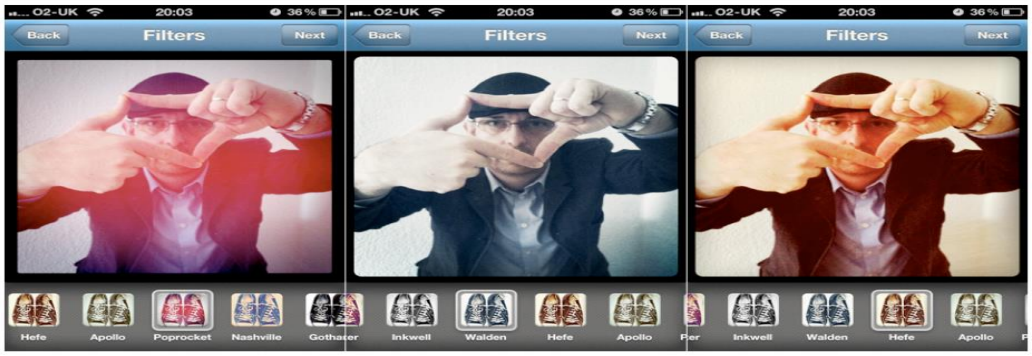
```
void addAssignmentScore (double as); //0 or more assignments
void addExamScore (double es); //0 or more exams
double getAverage(); //the final class average
```

The algorithm to compute the average can be selected at runtime. It also must be possible to add new algorithms to compute the average to the program without modifying the above class. Your task is to design such class that satisfies the above requirements.

Use the following two algorithms for computing the average in your implementation:
A. The Assignment average contributes 40%, and the Exam average contributes 60% to the final class average.
B. Use the same percentages as the first algorithm, but first drop the lowest Assignment score.

Problem2: Photo Sharing

Instagram is a free photo sharing program and social network that was launched in 2010 and had a tremendous success since then. The principle of Instagram is quite simple: the app allow you to take a picture, apply a digital filter to it, and then share it with other Instagram users or upload the picture to your favorite social networking service. The picture below illustrates how different filters can be applied to a picture taken with a mobile phone.



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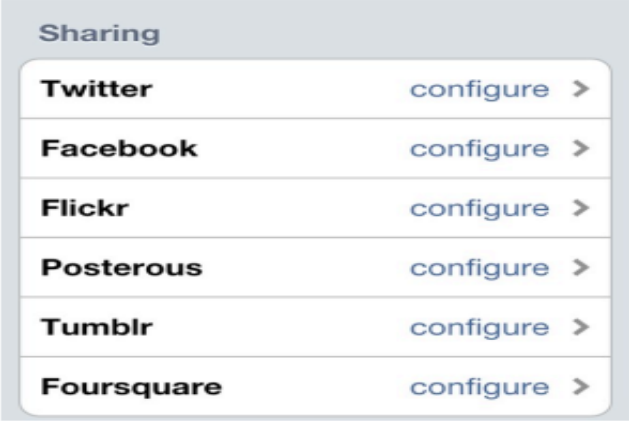
You snap a picture then choose a filter from the bottom of your screen: you can scroll left and right to see different filters. Once you apply a filter on the picture the picture will change its visual appearance.

a) Assuming only one filter can be applied on an image, how you would implement the filter functionality in Instagram? Which design pattern shall we use to make the application of different filters on the picture possible in the app? Provide the implementation.
b) How would you implement the filter functionality if more than one filter can be applied on an image?

Once you have taken a picture and applied a filter on it you have also the option to share it on your favorite social network. The user interface below illustrates this:



You can click any of the social networks from the list presented in the "Sharing" window of the application that you want to post your photo on. Enter the username and password associated with your account to link it with your Instagram account. Your photo will appear in your "Feed" and also the feed of other Instagram users that are following you. It will also be posted to any of the social networks you selected.

c) How you would implement this functionality? Which design pattern would you use for sharing your Instagram picture with your favourite social network?

Problem3: Facebook

In principle a social network service focuses on building online communities of people who share interests and/or activities, or who are interested in exploring the interests and activities of others. Facebook support groups that people can join. Each group has a title, administrative members, a group type (open/ closed), and a list of related groups. If somebody writes on the wall page of the group, the information is broadcasted to all the

members and it is visualized in the news feeds of the members. Users should be able to join a group as well as leave a group if they get bored. Once a user has joined a group it will automatically receive any updates that are published on the wall. Which design pattern is the most appropriate to handle this basic functionality of such a Facebook group? Provide the Design as well. The following test code provides details about the group operation:

```
public static void main(String[] args) {

        System.out.println("Testing the Facebook Application");

        //Create a group
        FacebookGroup dp = new FacebookGroup();

        //Create users
        FacebookUser user1 = new FacebookUser( "XYZ", 23);
        FacebookUser user2 = new FacebookUser( "ABC", 20);
        FacebookUser user3 = new FacebookUser( "AXY", 25);

        //Add users to the newly created group
        dp.addUser(user1);
        dp.addUser(user2);
        dp.addUser(user3);

        //write something on the wall
        dp.setState("Hello World");

        //users can also write on the wall
        user1.writeOnTheWall("Hi");
}
```

Problem4: Groupon

Groupon webpage shows deeply discounted offers from different business located in the city where you are living. As an example, it might show a beauty salon offer that has a 50% discount on women's haircut. You do nothing if you are not interested. If you like the Groupon deal, you select "buy" before the expiration date and your credit card is charged. If enough people select the deal, you will be sent a link for your rebate coupon at the end of the offer. Once you receive your coupon you can claim it at the specified store, usually within a period of time before it expires as noted on the website. If enough people do not join for that deal, the Groupon is cancelled and no one gets it and in this case you will get a refund for your money. In case that you have changed your mind you

can also cancel an already made order and you will get a full refund. Provide a design for the specified functionality.