

## 1. Classes exercise.

Implement console program which will meet the following requirements:

- a. Implement class Book that has next properties:
  - i. int id - unique identifier
  - ii. String name - name of a book
  - iii. Author[] authors - array of authors
  - iv. Publisher publisher - book publisher
  - v. int publishingYear - year of publishing
  - vi. int amountOfPages - amount of pages
  - vii. BigDecimal price - price of a book
  - viii. CoverType coverType - type of book binding, enum (Paperback, Hardcover)
- b. Implement Author class that has next properties:
  - i. int id - unique identifier
  - ii. String firstName - author's first name
  - iii. String lastName - author's last name
- c. Implement Publisher class that has next properties:
  - i. int id - unique identifier
  - ii. String publisherName - name of a publisher
- d. Implement multiple constructors for Book, Author and Publisher class.
- e. Implement enum type CoverType with two enums - Paperback and Hardcover
- f. Override toString methods for Book, Author and Publisher class.
- g. Implement class BookService with the next methods

```
public Book[] filterBooksByAuthor(Author author, Book[] books) {  
    <write your code here>  
}
```

```
public Book[] filterBooksByPublisher(Publisher publisher, Book[]  
books) {  
    <write your code here>  
}
```

```
// methods keeps books with publishing year inclusively.  
public Book[] filterBooksAfterSpecifiedYear(int yearFromInclusively,  
Book[] books) {  
    <write your code here>  
}
```

- h. Implement a Demo class that has the main method. In demo class perform next actions:

- i. Create an array of books. You can use the next variable for demo purposes.

```
Book[] books = new Book[] {  
    new Book(1, "Book_1", new Author[] { new Author(1, "Jon", "Johnson")  
    }, new Publisher(1, "Publisher_1"), 1990, 231,  
    BigDecimal.valueOf(24.99), CoverType.PAPERBACK),  
  
    new Book(2, "Book_2", new Author[] { new Author(1, "Jon",  
    "Johnson"), new Author(2, "William", "Wilson") }, new Publisher(2,  
    "Publisher_2"), 2000, 120, BigDecimal.valueOf(14.99),  
    CoverType.PAPERBACK),  
  
    new Book(3, "Book_3", new Author[] { new Author(3, "Walter",  
    "Peterson") }, new Publisher(1, "Publisher_1"), 1997, 350,  
    BigDecimal.valueOf(34.99), CoverType.HARDCOVER),  
  
    new Book(4, "Book_4", new Author[] { new Author(4, "Craig",  
    "Gregory") }, new Publisher(3, "Publisher_3"), 1992, 185,  
    BigDecimal.valueOf(19.99), CoverType.PAPERBACK) };
```

- ii. Create an instance of the BookService type and demonstrate the work of BookService methods, namely - filterBooksByAuthor, filterBooksByPublisher, filterBooksAfterSpecifiedYear.

## 2. Inheritance and polymorphism exercise

Implement console program which will meet the following requirements:

- a. Implement a hierarchy of Sweets. All Sweets should have next properties: name, weight and sugarWeight. Weight is a weight of the specific sweet in kilograms. sugarWeight is a weight of sugar in this sweet in kilograms.

I don't want to give you specific directions here to give you an opportunity to decide what will work the best here to start describing the Sweet hierarchy: an interface or an abstract class?

- b. Candy, Lollipop and Cookie - three other types from Sweet hierarchy.
- c. Create class Present. Present has next behavior:

```

// the method filters sweets by sugar weight inclusively
public Sweet[] filterSweetsBySugarRange(double minSugarWeight,
double maxSugarWeight) {
    <write your code here>
}

// the method calculates total weight of the present
public double calculateTotalWeight() {
    <write your code here>
}

// the method that adds sweet to the present
public void addSweet(Sweet sweet) {
    <write your code here>
}

// the method returns copy of the Sweet[] array so that nobody could
// modify state of the present without addSweet() method.
// Also array shouldn't contain null values.
public Sweet[] getSweets() {
    <write your code here>
}

```

### 3. Inner and Nested Classes exercise

Implement console program which will meet the following requirements:

- a. Implement class Account. Class Account has next fields:
  - i. int id
  - ii. Transaction[] transactions
- b. Implement enum StandardAccountOperations that contains next enums:
  - i. MONEY\_TRANSFER\_SEND
  - ii. MONEY\_TRANSFER\_RECEIVE
  - iii. WITHDRAW
- c. Implement nested class Transaction that has next fields:
  - i. Account accountFrom
  - ii. Account accountTo
  - iii. double moneyAmount
  - iv. StandardAccountOperations operation
- d. In Account class implement next methods:

```

public void sendMoneyToAccount(Account accountTo, double

```

```

    moneyAmount) {
        <write your code here>
    }

    public void withdrawMoney(double moneyAmount) {
        <write your code here>
    }

    public Transaction[] getTransactions() {
        <write your code here>
    }

```

- e. Pay attention that when money is sent from one account to another - one transaction MONEY\_TRANSFER\_SEND created in one account, and the second transaction MONEY\_TRANSFER\_RECEIVE is created in other account.

#### 4. EXAM! Implement console program which will meet the following requirements:

You have to implement a backend for an online shop. The system should support such basic operations as:

- User registration
- User sign in and sign out
- Product catalog navigation
- Adding product to cart
- Submitting an order
- Checkout
- Users management
- And others

This code will be used in further education and next topics and will end up with creating your web e-commerce application.

#### \*\*\* MENU NAVIGATION \*\*\*

##### **Scenario - main menu**

GIVEN I'm an app user

WHEN I run the program

THEN I see the main menu

Tech notes:

Main menu consists of the next items:

1. Sign Up
2. Sign In / Sign Out
3. Product Catalog
4. My Orders
5. Settings
6. Customer List

When User is logged in, then paragraph 2 label is changed to “Sign Out” instead of Sign In.

***Scenario - stop the program***

GIVEN I'm an app user  
AND I'm in main menu  
WHEN I enter '**exit**' in console  
THEN program execution is stopped

***Scenario - incorrect input handling***

GIVEN I'm an app user  
WHEN I entered any digit except 1, or 2, or 3, or 4, or 5  
THEN I see the error message “Only 1, 2, 3, 4, 5 is allowed. Try one more time.”  
AND I navigated back to the main menu

**\*\*\* SIGN UP \*\*\***

***Scenario - new user sign up***

GIVEN I'm an app user  
AND I see main menu in console  
WHEN I entered 1  
AND I selected 'Sign Up' in main menu  
THEN registration process is started  
AND I asked to enter my first name  
AND I asked to enter my last name  
AND I asked to enter my password  
AND I asked to enter my email  
AND application successfully registered me  
AND I see notification that 'New user is created'  
AND I navigated back to main menu  
AND instead of 'Sign In' I see 'Sign Out' label

Technical note:

- Each new user should have an ID.
- The ID number should be automatically incremented for each new user (static counter field should be a part of DefaultUser class)

***Scenario - new user sign up - unique email successful validation***

GIVEN I'm an app user  
AND I see main menu in console

WHEN I entered 1  
AND I selected 'Sign Up' in main menu  
THEN registration process is started  
AND I asked to enter my first name  
AND I asked to enter my last name  
AND I asked to enter my password  
AND I asked to enter my email  
AND I enter unique email  
AND application successfully registered me  
AND I see notification that 'new user is created'  
AND I navigated back to main menu  
AND instead of 'Sign In' I see 'Sign Out' label

***Scenario - new user sign up - unique email unsuccessful validation***

GIVEN I'm an app user  
AND I see main menu in console  
WHEN I entered 1  
AND I selected 'Sign Up' in main menu  
THEN registration process is started  
AND I asked to enter my first name  
AND I asked to enter my last name  
AND I asked to enter my password  
AND I asked to enter my email  
AND I enter NOT unique email  
AND application doesn't register me  
AND I see notification that 'This email is already used by another user. Please, use another email'  
AND I navigated back to main menu

***Scenario - new user sign up - empty email unsuccessful validation***

GIVEN I'm an app user  
AND I see main menu in console  
WHEN I entered 1  
AND I selected 'Sign Up' in main menu  
THEN registration process is started  
AND I asked to enter my first name  
AND I asked to enter my last name  
AND I asked to enter my password  
AND I asked to enter my email  
AND I enter empty email  
AND application doesn't register me  
AND I see notification that 'You have to input email to register. Please, try one more time'  
AND I navigated back to main menu

### \*\*\* SIGN IN \*\*\*

#### ***Scenario - successful sign in***

GIVEN I'm an app user  
AND I have registered account  
WHEN I entered 2  
AND I selected 'Sign In' in main menu  
THEN Login process is started  
AND I asked to enter my email  
AND I asked to enter my password  
AND credentials are valid  
AND I see welcome message 'Glad to see you back <First Name> <Last Name>'  
AND I see main menu  
AND instead of 'Sign In' I see 'Sign Out' label

#### ***Scenario - unsuccessful sign in***

GIVEN I'm an app user  
AND I have registered account  
WHEN I entered 2  
AND I selected 'Sign In' in main menu  
THEN Login process is started  
AND I asked to enter my email  
AND I asked to enter my password  
AND credentials are not valid  
AND I see error message 'Unfortunately, such login and password doesn't exist'  
AND I see main menu

Technical notes:

- 'not valid' credentials mean that user either not exist or password is wrong

### \*\*\* SIGN OUT \*\*\*

#### ***Scenario - successful sign out***

GIVEN I'm an app user  
AND I'm logged in  
AND I navigated to the main menu  
WHEN I entered 2  
AND I selected 'Sign Out' in main menu  
THEN I see sign out message 'Have a nice day! Look forward to welcoming back!'  
AND I see main menu  
AND instead of 'Sign Out' I see 'Sign In' label

### \*\*\* PRODUCT CATALOG \*\*\*

#### ***Scenario - list products***

GIVEN I'm an app user  
WHEN I entered 3  
AND I selected 'Product Catalog' in main menu  
THEN I see list of products printed to console

Technical notes:

- Product has next fields:
  - int id
  - String productName
  - String categoryName
  - double price

### ***Scenario - navigate back to menu***

GIVEN I'm an app user  
AND I navigated to Product Catalog menu  
WHEN I enter '**menu**' in console  
THEN I navigated back to the main menu

### ***Scenario - add product to cart***

GIVEN I'm an app user  
AND I entered 3  
AND I selected 'Product Catalog' in main menu  
AND I see product list  
AND I see message 'Enter product id to add it to the cart or 'menu' if you want to navigate back to the main menu'  
WHEN I entered any product id  
THEN I see the message 'Product <PRODUCT\_NAME> has been added to your cart. If you want to add a new product - enter the product id. If you want to proceed with checkout - enter word 'checkout' to console'  
AND I see product list again

### ***Scenario - add product to cart - error handling***

GIVEN I'm an app user  
AND I entered 3  
AND I selected 'Product Catalog' in main menu  
AND I see product list  
AND I see message 'Enter product id to add it to the cart or 'menu' if you want to navigate back to the main menu'  
WHEN I entered any random number that doesn't match with product id  
THEN I see the message 'Please, enter product ID if you want to add product to cart. Or enter 'checkout' if you want to proceed with checkout. Or enter 'menu' if you want to navigate back to the main menu.'  
AND I see product list again

**\*\*\* CHECKOUT \*\*\***



**Scenario - successful checkout**

GIVEN I'm an app user

AND I'm logged in

AND I entered 3

AND I selected 'Product Catalog' in main menu

AND I see product list

AND I see message 'Enter product id to add it to the cart or 'menu' if you want to navigate back to the main menu'

AND I added products to the cart

WHEN I entered 'checkout'

THEN I see the message 'Enter your credit card number without spaces and press enter if you confirm purchase'

AND I entered credit card number

AND I pressed enter

AND I see the message 'Thanks a lot for your purchase. Details about order delivery are sent to your email.'

AND I navigated back to main menu

Technical notes:

- Cart should be cleared after order is created

**Scenario - checkout - error handling - empty cart**

GIVEN I'm an app user

AND I entered 3

AND I selected 'Product Catalog' in main menu

AND I see product list

AND I see message 'Enter product id to add it to the cart or 'menu' if you want to navigate back to the main menu'

AND I have empty cart because I didn't add products yet

WHEN I entered 'checkout'

THEN I see the message 'Your cart is empty. Please, add product to cart first and then proceed with checkout'

AND I see product list again

**Scenario - checkout - error handling - not logged in user**

GIVEN I'm an app user

AND I entered 3

AND I selected 'Product Catalog' in main menu

AND I see product list

AND I see message 'Enter product id to add it to the cart or 'menu' if you want to navigate back to the main menu'

AND I added products to the cart

AND I'm not logged in

WHEN I added products to the cart

THEN I see the message 'You are not logged in. Please, sign in or create new account'

AND I navigated back to the main menu

***Scenario - checkout - error handling - invalid credit card number***

GIVEN I'm an app user

AND I'm logged in

AND I entered 3

AND I selected 'Product Catalog' in main menu

AND I see product list

AND I see message 'Enter product ID to add it to the cart'

AND I added products to the cart

WHEN I entered 'checkout'

THEN I see the message 'Enter your credit card number without spaces and press enter if you confirm purchase'

AND I entered invalid credit card number

AND I pressed enter

AND I see the message 'You entered invalid credit card number. Valid credit card should contain 16 digits. Please, try one more time.'

AND I'm asked to enter credit card number one more time

Technical note:

- Implement credit card validation: any 16 digits

**\*\*\* MY ORDERS \*\*\***

***Scenario - list my orders***

GIVEN I'm an app user

AND I'm logged in

WHEN I entered 4

AND I selected 'My Orders' in main menu

THEN I navigated to 'My Orders'

AND I see list of all my purchases

AND I navigated back to the main menu

***Scenario - list my orders - error handling - not logged in***

GIVEN I'm an app user

WHEN I entered 4

AND I selected 'My Orders' in main menu

THEN I see message 'Please, log in or create new account to see list of your orders'

AND I navigated back to the main menu

***Scenario - list my orders - error handling - no orders***

GIVEN I'm an app user

AND I'm logged in

AND I don't have any purchases yet

WHEN I entered 4

AND I selected 'My Orders' in main menu  
THEN I navigated to 'My Orders'  
AND I see the message 'Unfortunately, you don't have any orders yet. Navigate back to main menu to place a new order'

### **\*\*\* SETTINGS \*\*\***

#### ***Scenario - change password***

GIVEN I'm an app user  
AND I'm logged in  
AND I entered 5  
AND I selected 'Settings' in main menu  
AND I see list of options to change settings  
AND I select option number 1 'Change Password'  
AND I enter 1 in console  
AND I am asked to enter new password  
WHEN I entered new password  
THEN I see message 'Your password has been successfully changed'  
AND I navigated to main menu

#### ***Scenario - change email***

GIVEN I'm an app user  
AND I'm logged in  
AND I entered 5  
AND I selected 'Settings' in main menu  
AND I see list of options to change settings  
AND I select option number 2 'Change Email'  
AND I enter 2 in console  
AND I am asked to enter new email  
WHEN I entered new email  
THEN I see message 'Your email has been successfully changed'  
AND I navigated to main menu

#### ***Scenario - setting - error handling - not valid option***

GIVEN I'm an app user  
AND I'm logged in  
AND I entered 5  
AND I selected 'Settings' in main menu  
AND I see list of options to change settings  
WHEN I enter any number beside 1 and 2  
THEN I see the message 'Only 1, 2 is allowed. Try one more time'  
AND I see settings menu again

#### ***Scenario - setting - navigate back to the main menu***

GIVEN I'm an app user

AND I'm logged in  
AND I entered 5  
AND I selected 'Settings' in main menu  
AND I see list of options to change settings  
WHEN I enter 'menu'  
THEN I navigated back to the main menu

***Scenario - setting - error handling - not logged in***

GIVEN I'm an app user  
WHEN I entered 5  
AND I selected 'Settings' in main menu  
THEN I see message 'Please, log in or create new account to change your account settings'

**\*\*\* CUSTOMER LIST \*\*\***

**Scenario - print list of customers to console**

GIVEN I'm an app user  
WHEN I entered 6  
AND I selected 'Customer List' in main menu  
THEN I see list of customers  
AND I navigated back to the main menu

Technical note:

- We shouldn't print Customer password

**=== Technical details ===**

General technical requirements:

1) instance of each service (UserManagementService, OrderManagementService, ProductManagementService, ApplicationContext) exist in a single copy during the program execution. Access to the single copy is possible via static getInstance() method of each specific type. And I can't create objects of these types via constructor.

2) Each implementation of service should have this method

***void clearServiceState()***

for the sake of testing. This method should reset state of service to default. Taking into account the instance of each service will be in single copy, our tests have to have method that will clear the state of the service to reproduce different test cases.

To reset user counter - implement clearState() method in the DefaultUser class.

3) During implementation of this task you have to implement next interfaces:

```
public interface Cart {
```

```
    boolean isEmpty();
```

```
    void addProduct(Product productById);
```

```
    Product[] getProducts();
```

```
    void clear();
```

```
}
```

```
public interface Order {
```

```
    boolean isCreditCardNumberValid(String userInput);
```

```
    void setCreditCardNumber(String userInput);
```

```
    void setProducts(Product[] products);
```

```
    void setCustomerId(int customerId);
```

```
    int getCustomerId();
```

```
}
```

```
public interface Product {
```

```
    int getId();
```

```
    String getProductName();
```

```
}
```

```
public interface User {
```

```
    String getFirstName();
```

```
    String getLastName();
```

```
    String getPassword();
```

```
    String getEmail();
```

```
    int getId();
```

```
        void setPassword(String newPassword);
        void setEmail(String newEmail);
    }

    public interface Menu {

        void start();

        void printMenuHeader();
    }

    public interface OrderManagementService {

        void addOrder(Order order);

        Order[] getOrdersByUserId(int userId);

        Order[] getOrders();
    }

    public interface ProductManagementService {

        Product[] getProducts();

        Product getProductById(int productIdToAddToCart);
    }

    public interface UserManagementService {

        String registerUser(User user);

        User[] getUsers();

        User getUserByEmail(String userEmail);
    }
```

And here is the class of ApplicationContext which will help you during implementation of this program:

```
public class ApplicationContext {

    private static ApplicationContext instance;

    private User loggedInUser;
    private Menu mainMenu;
    private Cart sessionCart;

    private ApplicationContext() {
    }

    public void setLoggedInUser(User user) {
        if (this.sessionCart != null) {
            this.sessionCart.clear(); // we have to clear session cart when new
user is logged in
        }
        this.loggedInUser = user;
    }

    public User getLoggedInUser() {
        return this.loggedInUser;
    }

    public void setMainMenu(Menu menu) {
        this.mainMenu = menu;
    }

    public Menu getMainMenu() {
        return this.mainMenu;
    }

    public static ApplicationContext getInstance() {
        if (instance == null) {
            instance = new ApplicationContext();
        }
        return instance;
    }

    public Cart getSessionCart() {
        if (this.sessionCart == null) {
            this.sessionCart = new DefaultCart();
        }
        return this.sessionCart;
    }
}
```

```
}  
  
}
```

**To create this program - feel free to use special template of the program which you can find here**

**[https://github.com/AndriiPiatakha/learnit\\_java\\_core/tree/master/src/com/itbulls/learnit/javacore/oop/exam/templates/onlineSHOP](https://github.com/AndriiPiatakha/learnit_java_core/tree/master/src/com/itbulls/learnit/javacore/oop/exam/templates/onlineSHOP)**

Solution of the exam task can be found here

[https://github.com/AndriiPiatakha/learnit\\_java\\_core/tree/master/src/com/itbulls/learnit/javacore/oop/exam/onlineSHOP](https://github.com/AndriiPiatakha/learnit_java_core/tree/master/src/com/itbulls/learnit/javacore/oop/exam/onlineSHOP)