Báo cáo thực hành lập trình hướng đối tượng Lab 3

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I. New written code

1. Working with method overloading

a) Method **addDigitalVideoDisc** which allows to pass an arbitrary number of arguments for dvd.

```java
24 @    public void addDigitalVideoDisc (DigitalVideoDisc[] dvdList) {
25          for(DigitalVideoDisc dvd : dvdList) {
26              if (quantity == MAX_NUMBERS_ORDERED) {
27                  System.out.println( x: "The Cart is full. Can't add!" + dvd.getTilte());
28                  break;
29              }
30              this.itemOrdered[quantity] = dvd;
31              this.quantity++;
32              totalCost += dvd.getCost();
33          }
34      }
```

```java
DigitalVideoDisc[] dvdList = {dvd1,dvd2,dvd3};
anOrder.addDigitalVideoDisc(dvdList);
anOrder.DisplayCart();
//Print total Cost of items in the cart
System.out.println("Total cost is:" + anOrder.Total());
```

```
1: The Lion King
2: Star Wars
3: Aladin
Total cost is:63.89

Process finished with exit code 0
```

b) Method **addDigitalVideoDisc** with 2 parameters

```java
    public void addDigitalVideoDisc (DigitalVideoDisc dvd1, DigitalVideoDisc dvd2) {
        if(quantity == MAX_NUMBERS_ORDERED) {
            System.out.println( x: "The Cart is full. Can't add!" + dvd1.getTilte() + "and" + dvd2.getTilte());
        }
        else {
            if(quantity < MAX_NUMBERS_ORDERED) {
                this.itemOrdered[quantity] = dvd1;
                this.quantity++;
                totalCost += dvd1.getCost();
                System.out.println("Added " + dvd1.getTilte() + " successful!");
            }
            if(quantity < MAX_NUMBERS_ORDERED) {
                this.itemOrdered[quantity] = dvd2;
                this.quantity++;
                totalCost += dvd2.getCost();
                System.out.println("Added " + dvd2.getTilte() + " successful!");
            }
            else {
                System.out.println("The Cart is full. Can't add!" + dvd2.getTilte());
            }
        }
    }
```

```java
        anOrder.addDigitalVideoDisc(dvd1,dvd2);
        //DigitalVideoDisc[] dvdList = {dvd1,dvd2,dvd3};
        //anOrder.addDigitalVideoDisc(dvdList);
        anOrder.DisplayCart();
        //Print total Cost of items in the cart
        System.out.println("Total cost is:" + anOrder.Total());
```

```
Added The Lion King successful!
Added Star Wars successful!
1: The Lion King
2: Star Wars
Total cost is:44.9

Process finished with exit code 0
```

2. Passing parameter
   a) TestingPassingParameter

```java
package Lab02;

public class TestingPassingParameter {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        DigitalVideoDisc jungleDVD = new DigitalVideoDisc("Jungle");
        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc("Cinderella");

        swap(jungleDVD, cinderellaDVD);
        System.out.println("jungle dvd title: " + jungleDVD.getTilte());
        System.out.println("cinderella dvd title: " + cinderellaDVD.getTilte());
        changeTitle(jungleDVD, cinderellaDVD.getTilte());
        System.out.println("jungle dvd title: " + jungleDVD.getTilte());
    }

    public static void swap(Object o1, Object o2) {
        Object tmp = o1;
        o1 = o2;
        o2 = tmp;
    }

    public static void changeTitle(DigitalVideoDisc dvd, String title) {
        String oldTitle = dvd.getTilte();
        dvd.setTilte(title);
        dvd = new DigitalVideoDisc(oldTitle);
    }

}
```

```
jungle dvd title: Jungle
cinderella dvd title: Cinderella
jungle dvd title: Cinderella

Process finished with exit code 0
```

b) Sửa lại hàm swap

```
                1 usage  new *
@              public static void swap(DigitalVideoDisc o1, DigitalVideoDisc o2) {
                    String tmpTilte = o1.getTilte();
        💡          o1.setTilte(o2.getTilte());
                    o2.setTilte(tmpTilte);
                }
                1 usage  new *
```

3. Classifier Member and Instance Member

```
    no usages  new *
    public DigitalVideoDisc(String tilte, String category, String director, int length, float cost) {
        this.tilte = tilte;
        this.category = category;
        this.director = director;
        this.length = length;
        this.cost = cost;
        // Increment the number of DVDs and assign the id
        nbDigitalVideoDiscs++;
        this.id = nbDigitalVideoDiscs;
    }


    no usages  new *
    public DigitalVideoDisc(String tilte, String category, String director, float cost) {
        this.tilte = tilte;
        this.category = category;
        this.director = director;
        this.cost = cost;
        // Increment the number of DVDs and assign the id
        nbDigitalVideoDiscs++;
        this.id = nbDigitalVideoDiscs;
    }

💡  no usages  new *
    public DigitalVideoDisc(String tilte, String category, float cost) {
        this.tilte = tilte;
        this.category = category;
        this.cost = cost;
        // Increment the number of DVDs and assign the id
        nbDigitalVideoDiscs++;
        this.id = nbDigitalVideoDiscs;
    }

    no usages  new *  14 related problems
    public DigitalVideoDisc(String tilte) {
        this.tilte = tilte;
        // Increment the number of DVDs and assign the id
        nbDigitalVideoDiscs++;
        this.id = nbDigitalVideoDiscs;
    }
```

```
1: The Lion King with ID = 1
2: Star Wars with ID = 2
3: Aladin with ID = 3
Total cost is:63.89

Process finished with exit code 0
```

4. Open the Cart

```java
// In giỏ hàng
no usages   new *   1 related problem
public void printCart() {
    System.out.println("***********************CART*********************");
    System.out.println("Ordered Items:");
    float totalCost = 0;
    for (int i = 0; i < quantity; i++) {
        System.out.println((i + 1) + ". " + itemOrdered[i].toString());
        totalCost += itemOrdered[i].getCost();
    }
    System.out.println("Total cost: " + totalCost + " $");
    System.out.println("**********************************************");
}
```

```java
// Tìm kiếm DVD theo id
no usages   new *   2 related problems
public void searchById(int id) {
    boolean found = false;
    for (int i = 0; i < quantity; i++) {
        DigitalVideoDisc disc = itemOrdered[i];
        if (disc.getId() == id) {
            System.out.println("Found: " + disc.toString());
            found = true;
            break;
        }
    }
    if (!found) {
        System.out.println("No DVD found with ID: " + id);
    }
}
```

```java
    // Tìm kiếm DVD theo tiêu đề
    no usages  new *  2 related problems
    public void searchByTitle(String title) {
        boolean found = false;
        for (int i = 0; i < quantity; i++) {
            DigitalVideoDisc disc = itemOrdered[i];
            if (disc.isMatch(title)) {
                System.out.println("Found: " + disc.toString());
                found = true;
            }
        }
        if (!found) {
            System.out.println("No DVD found with title: " + title);
        }
    }
}
```

```
Ordered Items:
1. DVD - The Lion King - Animation - Roger Allers - 87 mins: 19.95 $
2. DVD - Star Wars - Science Fiction - George Lucas - 87 mins: 24.95 $
3. DVD - Aladin - Animation - George Lucas - 0 mins: 18.99 $
Total cost: 63.89 $
**************************************************
Search by ID:
Found: DVD - The Lion King - Animation - Roger Allers - 87 mins: 19.95 $
No DVD found with ID: 4
Search by Title:
Found: DVD - The Lion King - Animation - Roger Allers - 87 mins: 19.95 $
No DVD found with title: Inception

Process finished with exit code 0
```

5. Implement the Store

```java
package Lab02;
import java.util.ArrayList;
no usages  new *  1 related problem
public class Store {
    // Danh sách các DVD trong cửa hàng
    5 usages
    private ArrayList<DigitalVideoDisc> itemsInStore = new ArrayList<>();

    // Phương thức thêm DVD vào cửa hàng
    no usages  new *  3 related problems
    public void addDVD(DigitalVideoDisc dvd) {
        itemsInStore.add(dvd);
        System.out.println("Added to store: " + dvd.getTitle());
    }

    // Phương thức xóa DVD khỏi cửa hàng
    no usages  new *  2 related problems
    public void removeDVD(DigitalVideoDisc dvd) {
        if (itemsInStore.remove(dvd)) {
            System.out.println("Removed from store: " + dvd.getTitle());
        } else {
            System.out.println("DVD not found in store: " + dvd.getTitle());
        }
    }

    // Phương thức in ra danh sách các DVD trong cửa hàng
    no usages  new *  2 related problems
    public void displayStore() {
        System.out.println("**************STORE***************");
        if (itemsInStore.isEmpty()) {
            System.out.println("The store is currently empty.");
        } else {
            for (int i = 0; i < itemsInStore.size(); i++) {
                System.out.println((i + 1) + ". " + itemsInStore.get(i).toString());
            }
        }
        System.out.println("********************************");
    }
}
```

```
package Lab02

public class StoreTest {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        // Tạo cửa hàng
        Store store = new Store();
        // Tạo các DVD mẫu
        DigitalVideoDisc dvd1 = new DigitalVideoDisc("The Lion King", "Animation", "Roger Allers", 87, 19.95f);
        DigitalVideoDisc dvd2 = new DigitalVideoDisc("Star Wars", "Science Fiction", "George Lucas", 87, 24.95f);
        DigitalVideoDisc dvd3 = new DigitalVideoDisc("Aladin", "Animation", "George Lucas",128, 18.99f);
        DigitalVideoDisc dvd4 = new DigitalVideoDisc("The Avengers", "Action", "Joss Whedon", 143, 29.95f);
        // Thêm DVD vào cửa hàng
        store.addDVD(dvd1);
        store.addDVD(dvd2);
        store.addDVD(dvd3);
        // Hiển thị danh sách DVD trong cửa hàng
        store.displayStore();
        // Thử xóa DVD tồn tại
        store.removeDVD(dvd2);
        // Thử xóa DVD không tồn tại
        store.removeDVD(dvd4);
        // Hiển thị danh sách DVD sau khi xóa
        store.displayStore();
    }

}
```

```
 Added to store: The Lion King
 Added to store: Star Wars
 Added to store: Aladin
 ***************STORE****************
 1. DVD - The Lion King - Animation - Roger Allers - 87 mins: 19.95 $
 2. DVD - Star Wars - Science Fiction - George Lucas - 87 mins: 24.95 $
 3. DVD - Aladin - Animation - George Lucas - 128 mins: 18.99 $
 ********************************
 Removed from store: Star Wars
 DVD not found in store: The Avengers
 ***************STORE****************
 1. DVD - The Lion King - Animation - Roger Allers - 87 mins: 19.95 $
 2. DVD - Aladin - Animation - George Lucas - 128 mins: 18.99 $
 ********************************

 Process finished with exit code 0
```

6. String, StringBuilder, and StringBuffer
   a) ConcatenationInLoops

```java
package hust.soict.globalict.garbage;
import java.util.Random;
new *

public class ConcatenationInLoops {

    new *
    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Random r = new Random( seed: 123);
        long start = System.currentTimeMillis();
        String s = "";
        for (int i = 0; i < 65536; i++) {
            s += r.nextInt( bound: 2);
        }
        System.out.println(System.currentTimeMillis() - start);

        r = new Random( seed: 123);
        start = System.currentTimeMillis();
        StringBuilder sb = new StringBuilder();
        for (int i = 0; i < 65536; i++) {
            sb.append(r.nextInt( bound: 2));
        }
        s = sb.toString();
        System.out.println(System.currentTimeMillis() - start);

    }

}
```

```
C:\Users\ACER\.jdks\openjdk-21.0.1\bin
486
2

Process finished with exit code 0
```

b) GarbageCreator

```java
package hust.soict.dsai.garbage;

import ...

public class GarbageCreator {

    public static void main(String[] args) {
        String filename = "C:\\Users\\ACER\\OneDrive - Hanoi University of Science and Technology\\Desktop\\TH OOP\\Lab03\\OtherProject\\hust\\soict\\dsai\\garbage\\test.txt";
        byte[] inputBytes;
        long startTime, endTime;

        try {
            inputBytes = Files.readAllBytes(Paths.get(filename));
            startTime = System.currentTimeMillis();
            String outputString = "";
            for (byte b : inputBytes) {
                outputString += (char) b;
            }
            endTime = System.currentTimeMillis();
            System.out.println("Time taken to concatenate using + operator: " + (endTime - startTime) + "ms");
        } catch (IOException e) {
            e.printStackTrace();
        }
    }
}
```

```
C:\Users\ACER\.jdks\openjdk-21.0.1\bin\java.exe "-javaage
Time taken to concatenate using + operator: 9ms


Process finished with exit code 0
```

c) NoGarbage

```java
package hust.soict.garbage;

import ...

public class NoGarbage {

    public static void main(String[] args) {
        String filename = "C:\\Users\\ACER\\OneDrive - Hanoi University of Science and Technology\\Desktop\\TH OOP\\Lab03\\OtherProject\\hust\\soict\\dsai\\garbage\\test.txt";
        byte[] inputBytes;
        long startTime, endTime;

        try {
            inputBytes = Files.readAllBytes(Paths.get(filename));
            startTime = System.currentTimeMillis();
            StringBuffer outputString = new StringBuffer();
            for (byte b : inputBytes) {
                outputString.append((char) b);
            }
            endTime = System.currentTimeMillis();
            System.out.println("Time taken to concatenate using StringBuffer: " + (endTime - startTime) + "ms");
        } catch (IOException e) {
            e.printStackTrace();
        }
    }
}
```

```
C:\Users\ACER\.jdks\openjdk-21.0.1\bin\java.exe "-javaagent:C:\Program Files\JetBrains\I
Time taken to concatenate using StringBuffer: 0ms


Process finished with exit code 0
```

II. Answer

- Question: *Is JAVA a Pass by Value or a Pass by Reference programming language?*

Answer: Java là ngôn ngữ lập trình theo kiểu Pass-By-Value

Questions:

- After the call of `swap(jungleDVD, cinderellaDVD)` why does the title of these two objects still remain?
- After the call of `changeTitle(jungleDVD, cinderellaDVD.getTitle())` why is the title of the JungleDVD changed?

Answer:

- Trong Java, tham số của phương thức được truyền theo cơ chế **pass-by-value**. Khi hoán đổi chúng chỉ các tham chiếu cục bộ không ảnh hưởng đến các tham chiếu ban đầu.

- Tiêu đề của jungleDVD bị thay đổi vì phương thức **changeTilte(jungleDVD, cinderellaDVD,getTitle())** tham chiếu dvd trỏ trực tiếp đến jungleDVD bằng cách gọi setTitle cập nhật tiêu đề của đối tượng được truyền vào.