

# Object-Oriented Programming

## Lab 03: Basic Object-Oriented Techniques

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### *1.Branch your repository*

### *2.Working with method overloading*

#### *2.1 Overloading by differing types of parameter*

```
18     }
19     public void addDigitalVideoDisc(DigitalVideoDisc[] dvdList) {
20         if (isFulled())
21             System.out.println(x:"The Cart is almost full");
22         for (DigitalVideoDisc i:dvdList){
23             itemsOrdered[qtyOrdered] = i;
24             qtyOrdered++;
25             if (isFulled()){
26                 System.out.println(x:"The Cart almost full");
27                 break;
28             }
29         }
30     }
31
32     public void addDigitalVideoDisc(int dvdNum){
33         if (isFulled())
34             System.out.println(x:"The Cart is almost full");
35         for( int i = 1 ; i<= dvdNum; i++){
36             itemsOrdered[qtyOrdered] = new DigitalVideoDisc(title:null);
37             qtyOrdered++;
38             if (isFulled()){
39                 System.out.println(x:"The Cart almost full");
40                 break;
41             }
42         }
43     }
44
45     public void addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2){
46         if (isFulled())
47             System.out.println(x:"The Cart is almost full");
48         itemsOrdered[qtyOrdered] = dvd1;
49         qtyOrdered++;
50         if (isFulled())
51             System.out.println(x:"The Cart is full. can't input dvd2");
```

What do you prefer in this case?

- I prefer method `addDigitalVideoDisc(DigitalVideoDisc [] dvdList)` in this method I will input an array of Object to cart

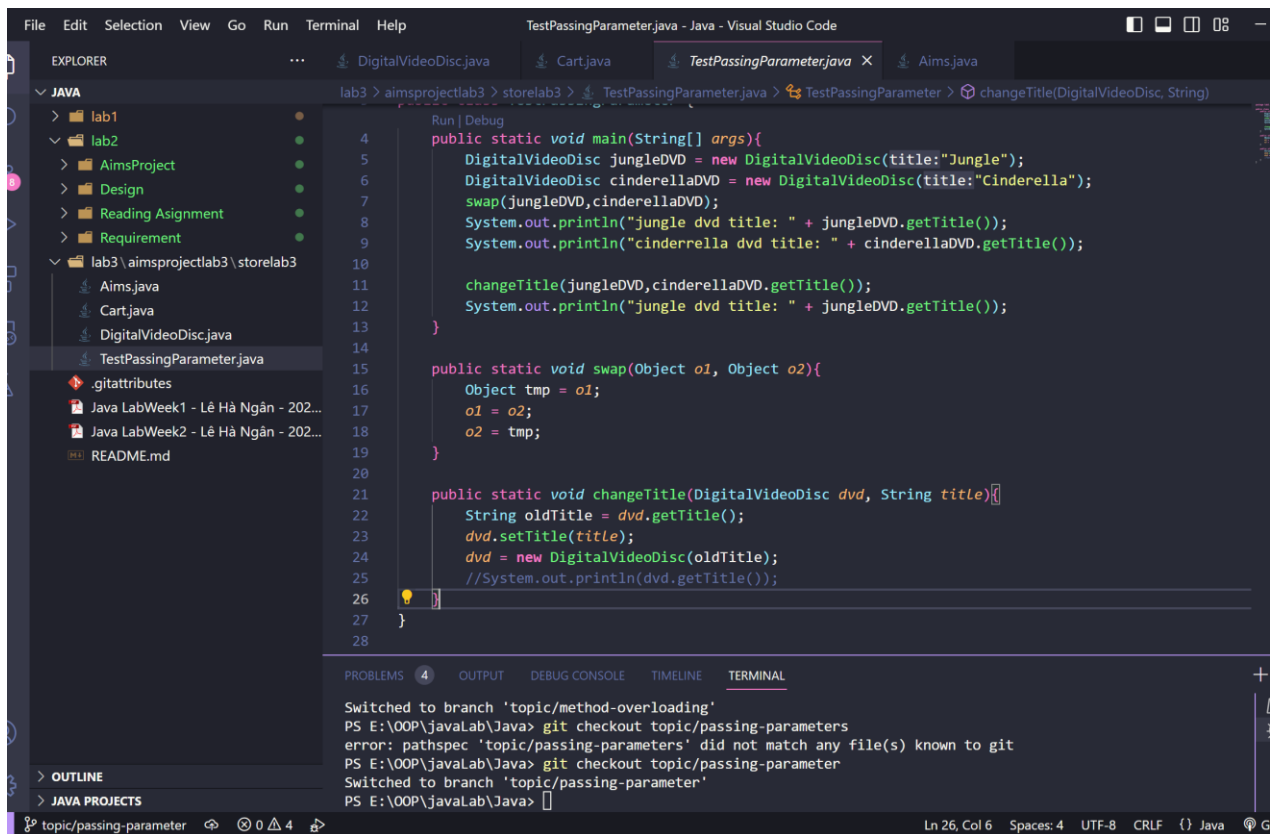
#### *2.2. Overloading by differing the number of parameters*

```

31
32     public void addDigitalVideoDisc(int dvdNum){
33         if (isFulled())
34             System.out.println(x:"The Cart is almost full");
35         for( int i = 1 ; i<= dvdNum; i++){
36             itemsOrdered[qtyOrdered] = new DigitalVideoDisc(title:null);
37             qtyOrdered++;
38             if (isFulled()){
39                 System.out.println(x:"The Cart almost full");
40                 break;
41             }
42         }
43     }
44
45     public void addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2){
46         if (isFulled())
47             System.out.println(x:"The Cart is almost full");
48         itemsOrdered[qtyOrdered] = dvd1;
49         qtyOrdered++;
50         if (isFulled())
51             System.out.println(x:"The Cart is full, can't input dvd2");
52         itemsOrdered[qtyOrdered] = dvd2;
53         qtyOrdered++;
54         System.out.println(x:"2 disc have been added");
55     }
56
57     public void addDigitalVideoDisc(DigitalVideoDisc disc) {
58         if (isFulled())
59             System.out.println(x:"The Cart is almost full");
60         itemsOrdered[qtyOrdered] = disc;
61         qtyOrdered++;
62         System.out.println(x:"The disc has been added");
63     }
64

```

### 3. Passing parameters



After the call of `swap(jungleDVD, cinderellaDVD)` why does the title of these two objects still remain?

- Because java is pass by value, The swap method actually swaps the objects impacting only the copy of the original object.

After the call of `changeTitle(jungleDVD, cinderellaDVD.getTitle())` why is the title of the JungleDVD changed?

- It's change because of calling `setTitle()`. Anytime the method/function uses the formal parameter (for reading or writing), it is actually using the actual parameter. Because java is not pass by reference just pass by value reference of object.

=> swap method

lab3 > aimsprojectlab3 > storelab3 > wrapperDVD.java > ...

```
1 package lab3.aimsprojectlab3.storelab3;
2
3 public class wrapperDVD {
4     DigitalVideoDisc dvd;
5
6     wrapperDVD(DigitalVideoDisc dvd){
7         this.dvd = dvd;
8     }
9 }
10
```

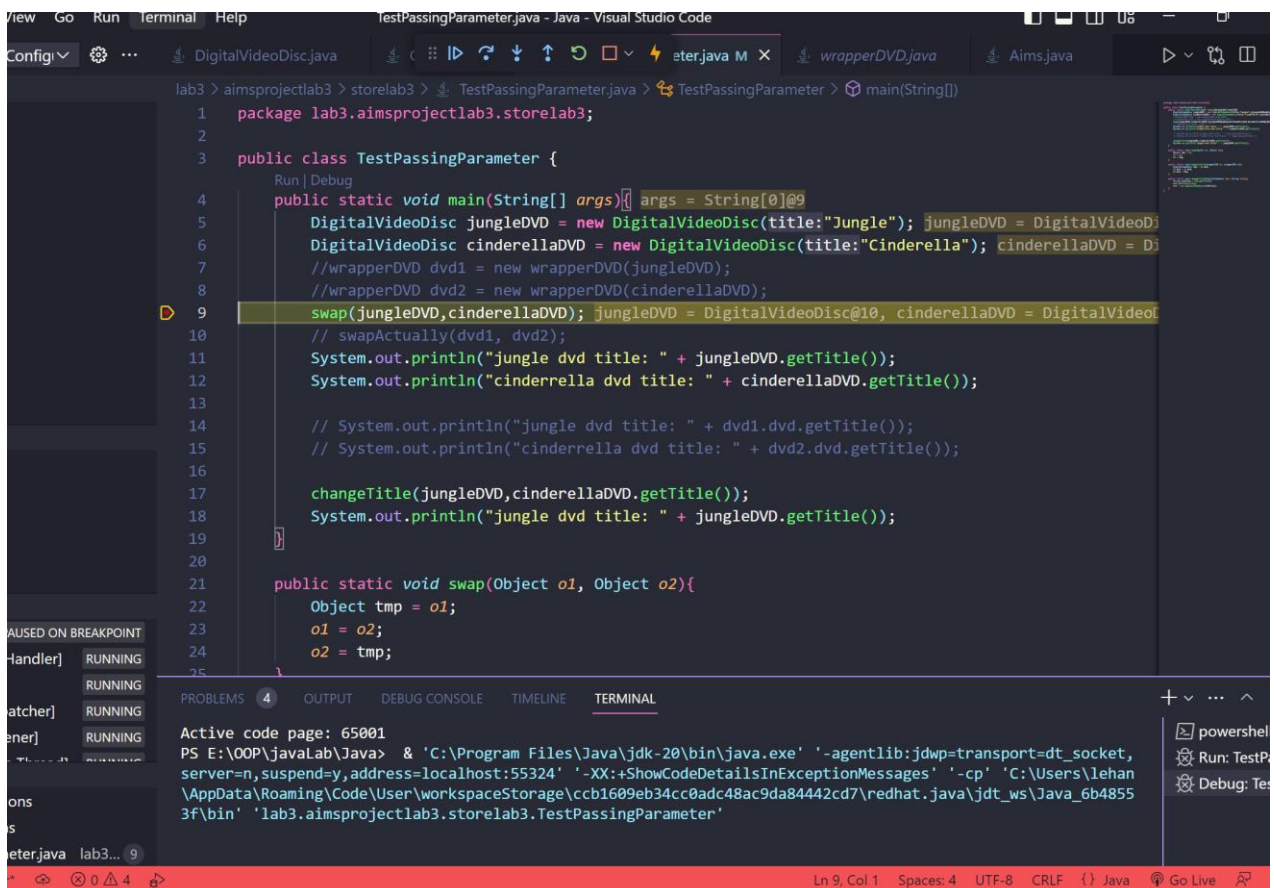
lab3 > aimsprojectlab3 > storelab3 > TestPassingParameter.java > TestPassingParameter > changeTitle(DigitalVideoDisc, String)

```
4 import javax.print.attribute.standard.DialogTypeSelection;
5
6 public class TestPassingParameter {
7     public static void main(String[] args){
8         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
9         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
10        wrapperDVD dvd1 = new wrapperDVD(jungleDVD);
11        wrapperDVD dvd2 = new wrapperDVD(cinderellaDVD);
12        //swap(jungleDVD,cinderellaDVD);
13        swapActually(dvd1, dvd2);
14        // System.out.println("jungle dvd title: " + jungleDVD.getTitle());
15        // System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
16
17        System.out.println("jungle dvd title: " + dvd1.dvd.getTitle());
18        System.out.println("cinderella dvd title: " + dvd2.dvd.getTitle());
19
20        changeTitle(jungleDVD,cinderellaDVD.getTitle());
21        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
22    }
23
24    public static void swap(Object o1, Object o2){
25        Object tmp = o1;
26        o1 = o2;
27        o2 = tmp;
28    }
29
30    public static void swapActually(wrapperDVD o1, wrapperDVD o2){
31        DigitalVideoDisc tmp = o1.dvd;
32        o1.dvd = o2.dvd;
33        o2.dvd = tmp;
34    }
35}
```

#### 4. Use debug run:

##### 4.2.1. Setting, deleting & deactivate breakpoints:

```
1 package lab3.aimsprojectlab3.storelab3;
2
3 public class TestPassingParameter {
4     public static void main(String[] args){
5         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
6         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
7         wrapperDVD dvd1 = new wrapperDVD(jungleDVD);
8         wrapperDVD dvd2 = new wrapperDVD(cinderellaDVD);
9         swap(jungleDVD,cinderellaDVD);
10        // swapActually(dvd1, dvd2);
11        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
12        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
13
14        // System.out.println("jungle dvd title: " + dvd1.dvd.getTitle());
15        // System.out.println("cinderella dvd title: " + dvd2.dvd.getTitle());
16
17        changeTitle(jungleDVD,cinderellaDVD.getTitle());
18        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
19    }
20
21    public static void swap(Object o1, Object o2){
22        Object tmp = o1;
23        o1 = o2;
24        o2 = tmp;
25    }
```



#### 4.2.3. Step Into, Step Over, Step Return, Resume:





Local

- o1: DigitalVideoDisc@10
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - > title: "Jungle"
- o2: DigitalVideoDisc@11
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - > title: "Cinderella"
  - coder: 0
  - hash: 0
  - hashIsZero: false
  - > value: byte[10]@27
  - > tmp: DigitalVideoDisc@10

Run AND ... No Config...

lab3 > aimsprojectlab3 > storelab3 > TestPassingParameter.java > TestPassingParameter > swap(Object, Object)

1 package lab3.aimsprojectlab3.storelab3;

2

3 public class TestPassingParameter {

4

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

6 DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");

7 DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");

8 //wrapperDVD dvd1 = new wrapperDVD(jungleDVD);

9 //wrapperDVD dvd2 = new wrapperDVD(cinderellaDVD);

10 swap(jungleDVD,cinderellaDVD);

11 // swapActually(dvd1, dvd2);

12 System.out.println("jungle dvd title: " + jungleDVD.getTitle());

13 System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());

14

15 // System.out.println("jungle dvd title: " + dvd1.dvd.getTitle());

16 // System.out.println("cinderella dvd title: " + dvd2.dvd.getTitle());

17

18 changeTitle(jungleDVD,cinderellaDVD.getTitle());

19 System.out.println("jungle dvd title: " + jungleDVD.getTitle());

20

21

22 public static void swap(Object o1, Object o2){ o1 = DigitalVideoDisc@11, o2 = DigitalVideoDisc@10

23 Object tmp = o1; tmp = DigitalVideoDisc@10, o1 = DigitalVideoDisc@11

24 o1 = o2; o1 = DigitalVideoDisc@11, o2 = DigitalVideoDisc@11

25 o2 = tmp; o2 = DigitalVideoDisc@11, tmp = DigitalVideoDisc@10

26

27

28 public static void swapActually(wrapperDVD o1, wrapperDVD o2){

29 DigitalVideoDisc tmp = o1.dvd;

30 o1.dvd = o2.dvd;

31 o2.dvd = tmp;

32

33 public static void changeTitle(DigitalVideoDisc dvd, String title){

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lab3 > aimsprojectlab3 > storelab3 > TestPassingParameter.java > TestPassingParameter > swap(Object, Object)

**VARIABLES**

Local

- o1: DigitalVideoDisc@11
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Cinderella"
- o2: DigitalVideoDisc@10
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Jungle"
  - coder: 0
  - hash: 0
  - hashIsZero: false
  - value: byte[6]@29

WATCH

CALL STACK

Thread [main] PAUSED ON STEP

- TestPassingParameter.swap(Object, Object)
- TestPassingParameter.main(String[] args)
- Thread [Reference Handler] RUNNING
- Thread [Finalizer] RUNNING
- Thread [Signal Dispatcher] RUNNING

BREAKPOINTS

- ☐ Uncaught Exceptions
- ☐ Caught Exceptions

```

1 package lab3.aimsprojectlab3.storelab3;
2
3 public class TestPassingParameter {
4     public static void main(String[] args){
5         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
6         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
7         //wrapperDVD dvd1 = new wrapperDVD(jungleDVD);
8         //wrapperDVD dvd2 = new wrapperDVD(cinderellaDVD);
9         swap(jungleDVD,cinderellaDVD);
10        // swapActually(dvd1, dvd2);
11        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
12        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
13
14        // System.out.println("jungle dvd title: " + dvd1.dvd.getTitle());
15        // System.out.println("cinderella dvd title: " + dvd2.dvd.getTitle());
16
17        changeTitle(jungleDVD,cinderellaDVD.getTitle());
18        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
19    }
20
21    public static void swap(Object o1, Object o2){ o1 = DigitalVideoDisc@11, o2 = DigitalVideoDisc@10
22        Object tmp = o1; tmp = DigitalVideoDisc@10, o1 = DigitalVideoDisc@11
23        o1 = o2; o1 = DigitalVideoDisc@11, o2 = DigitalVideoDisc@10
24        o2 = tmp; o2 = DigitalVideoDisc@10, tmp = DigitalVideoDisc@10
25    }
26
27    public static void swapActually(wrapperDVD o1, wrapperDVD o2){
28        DigitalVideoDisc tmp = o1.dvd;
29        o1.dvd = o2.dvd;
30        o2.dvd = tmp;
31    }
32

```

#### 4.2.4. Change value of variables:

lab3 > aimsprojectlab3 > storelab3 > TestPassingParameter.java > TestPassingParameter > main(String[])

**VARIABLES**

Local

- args: String[0]@9
- jungleDVD: DigitalVideoDisc@10
- cinderellaDVD: DigitalVideoDisc@11

WATCH

CALL STACK

Thread [main] PAUSED ON STEP

- TestPassingParameter.main(String[] args)
- Thread [Reference Handler] RUNNING
- Thread [Finalizer] RUNNING
- Thread [Signal Dispatcher] RUNNING

BREAKPOINTS

- ☐ Uncaught Exceptions
- ☐ Caught Exceptions

```

1 package lab3.aimsprojectlab3.storelab3;
2
3 public class TestPassingParameter {
4     public static void main(String[] args){ args = String[0]@9
5         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle"); jungleDVD = DigitalVideoDisc@10
6         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella"); cinderellaDVD = DigitalVideoDisc@11
7         //wrapperDVD dvd1 = new wrapperDVD(jungleDVD);
8         //wrapperDVD dvd2 = new wrapperDVD(cinderellaDVD);
9         swap(jungleDVD,cinderellaDVD); jungleDVD = DigitalVideoDisc@10, cinderellaDVD = DigitalVideoDisc@11
10        // swapActually(dvd1, dvd2);
11        System.out.println("jungle dvd title: " + jungleDVD.getTitle()); jungleDVD = DigitalVideoDisc@10
12        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
13
14        // System.out.println("jungle dvd title: " + dvd1.dvd.getTitle());
15        // System.out.println("cinderella dvd title: " + dvd2.dvd.getTitle());
16
17        changeTitle(jungleDVD,cinderellaDVD.getTitle());
18        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
19    }
20
21    public static void swap(Object o1, Object o2){
22        Object tmp = o1;
23        o1 = o2;
24        o2 = tmp;
25    }
26
27    public static void swapActually(wrapperDVD o1, wrapperDVD o2){
28        DigitalVideoDisc tmp = o1.dvd;
29        o1.dvd = o2.dvd;
30        o2.dvd = tmp;
31    }
32

```



**VARIABLES**

Local

- args: String[0]@9
- jungleDVD: DigitalVideoDisc@10
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "abc"
- cinderellaDVD: DigitalVideoDisc...

**WATCH**

**CALL STACK**

Thread [main] PAUSED ON STEP

TestPassingParameter.main(String...)

**BREAKPOINTS**

- ☐ Uncaught Exceptions
- ☐ Caught Exceptions
- ☒ TestPassingParameter.java lab3... 9

```

lab3 > aimsprojectlab3 > storelab3 > TestPassingParameter.java > TestPassingParameter > main(String[])
1  package lab3.aimsprojectlab3.storelab3;
2
3  public class TestPassingParameter {
4      public static void main(String[] args){ args = String[0]@9
5          DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle"); jungleDVD = DigitalVideoDisc
6          DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella"); cinderellaDVD = Di
7          //wrapperDVD dvd1 = new wrapperDVD(jungleDVD);
8          //wrapperDVD dvd2 = new wrapperDVD(cinderellaDVD);
9          swap(jungleDVD,cinderellaDVD); jungleDVD = DigitalVideoDisc@10, cinderellaDVD = DigitalVideoD
10         // swapActually(dvd1, dvd2);
11         System.out.println("jungle dvd title: " + jungleDVD.getTitle()); jungleDVD = DigitalVideoDisc
12         System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle()); cinderellaDVD = Dig
13
14         // System.out.println("jungle dvd title: " + dvd1.dvd.getTitle());
15         // System.out.println("cinderella dvd title: " + dvd2.dvd.getTitle());
16
17         changeTitle(jungleDVD,cinderellaDVD.getTitle());
18         System.out.println("jungle dvd title: " + jungleDVD.getTitle());
19
20
21     public static void swap(Object o1, Object o2){
22         Object tmp = o1;
23         o1 = o2;
24         o2 = tmp;
25     }
  
```

**PROBLEMS** 4 **OUTPUT** **DEBUG CONSOLE** **TIMELINE** **TERMINAL**

cinderella dvd title: Cinderella

PS E:\OOP\javaLab\Java> e; cd 'e:\OOP\javaLab\Java'; & 'C:\Program Files\Java\jdk-20\bin\java.exe' '-agen  
tlib:jdpw=transport=dt\_socket,server=n,suspend=y,address=localhost:55403' '-XX:+ShowCodeDetailsInExceptionM  
essages' '-cp' 'C:\Users\lehan\AppData\Roaming\Code\User\workspaceStorage\ccb1609eb34cc0adc48ac9da84442cd7\  
redhat.java\jdt\_ws\Java\_6b48553f\bin' 'lab3.aimsprojectlab3.storelab3.TestPassingParameter'  
jungle dvd title: abc

## 5. Classifier Member and Instance Member

```

03 > AimsProjectLab3 > storelab3 > DigitalVideoDisc.java > DigitalVideoDisc > id
1  package lab3.aimsprojectlab3.storelab3;
2
3  public class DigitalVideoDisc {
4      private String title;
5      private String category;
6      private String director;
7      private int length;
8      private float cost;
9      private int id;
10
11     private static int nbDigitalVideoDiscs = 0;
12     DigitalVideoDisc(String title) {
13         this.title = title;
14         this.id = nbDigitalVideoDiscs;
15         nbDigitalVideoDiscs++;
16     }
17
18     DigitalVideoDisc(String title, String category, float cost) {
19         this(title);
20         this.category = category;
21         this.cost = cost;
22     }
23
24     DigitalVideoDisc(String director, String category, String title, float cost) {
25         this(title, category, cost);
26         this.director = director;
27     }
28
29     DigitalVideoDisc(String title, String category, String director, int length, float cost) {
30         this(director, category, title, cost);
31         this.length = length;
32     }
33
34     public String getTitle() {

```

aps > AimsProjectLabs > storelabs > DigitalVideoDisc.java > DigitalVideoDisc > id

```
27     }
28
29     DigitalVideoDisc(String title, String category, String diretor, int length, float cost) {
30         this(diretor, category, title, cost);
31         this.length = length;
32     }
33
34     public String getTitle() {
35         return this.title;
36     }
37
38     public float getCost() {
39         return this.cost;
40     }
41
42     public String getCategory() {
43         return this.category;
44     }
45
46     public int getLength() {
47         return this.length;
48     }
49
50     public String getDirector() {
51         return this.diretor;
52     }
53
54     public static int getnbDigitalVideoDisc(){
55         return nbDigitalVideoDiscs;
56     }
57 }
58
```

```
lab3 > aimsprojectlab3 > storelab3 > Aims.java > Aims
1 package lab3.aimsprojectlab3.storelab3;
2
3 public class Aims {
4     public static void main(String[] args){
5         Cart anOrder = new Cart();
6
7         DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King" , category:"Animation" , c
8         anOrder.addDigitalVideoDisc(dvd1);
9
10        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars" , category:"Science Fiction" ,
11        anOrder.addDigitalVideoDisc(dvd2);
12
13        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin" , category:"Animation", cost:18.9
14        anOrder.addDigitalVideoDisc(dvd3);
15
16        anOrder.removeDigitalVideoDisc(dvd1);
17        System.out.println(x:"Total Cost is:");
18        System.out.println(anOrder.getTotalCost());
19        System.out.println(DigitalVideoDisc.getnbDigitalVideoDisc());
20
21    }
22 }
23
```

PROBLEMS 5 OUTPUT DEBUG CONSOLE TIMELINE TERMINAL

The disc has been added  
The disc has been added  
The disc has been added  
The disc has been removed  
Total Cost is:  
43.945  
3  
PS E:\OOP\javaLab\Java>

Ln 3, Col 20 Spaces: 4 UTF-8 CRLF {} Java

## 6. Open the Cart class

```
public void print() {
    System.out.println(x:"*****CART*****");
    System.out.println(x:"Ordered Items:");
    for (int i = 0; i < qtyOrdered; i++) {
        System.out.println(i + 1 + ".DVD - " + itemsOrdered[i].toString());
        // System.out.println( i+1 + ".DVD - " + itemsOrdered[i].getTitle() + " - " +
        // itemsOrdered[i].getCategory() + " - " +itemsOrdered[i].getDirector()+ " - "
        // +itemsOrdered[i].getLength()+":" + itemsOrdered[i].getCost()+"$");
    }
    System.out.println("Total cost: " + getTotalCost());
    System.out.println(x:"*****");
}
}
```

```

49
50     public String toString(){
51         return getTitle() + " - " + getCategory() + " - " + getDirector() + " - " + getLength() + ": " + getCost() + "$";
52     }
53
54 }
55

```

The disc has been removed

\*\*\*\*\*CART\*\*\*\*\*

Ordered Items:

1.DVD - Star Wars - Science Fiction - George Lucas - 87: 24.95\$

2.DVD - Aladin - Animation - null - 0: 18.995\$

Total cost: 43.945

\*\*\*\*\*

PS E:\OOP\javaLab\Java>

- Search for DVDs in the cart by ID and display the search results. Make sure to notify the user if no match is found.

```

public void search(int id){
    int index = -1;
    for( int i = 0 ;i<qtyOrdered ; i++)
        if( itemsOrdered[i].getId() == id){
            index = i;
        }
    if(index == -1){
        System.out.println("Can't find the disc have " + id + " id");
    }
    else{
        System.out.println(itemsOrdered[index].toString());
    }
}

public void search(String title){
    int index = -1;
    for( int i = 0 ;i<qtyOrdered ; i++)
        if( itemsOrdered[i].isMatch(title)){
            index = i;
        }
    if(index == -1){
        System.out.println("Can't find the disc have " + title + " title");
    }
    else{
        System.out.println(itemsOrdered[index].toString());
    }
}

```



```

    public boolean isMatch(String title){
        return this.title == title;
    }
}

```

```

2
3 public class Aims {
4     Run | Debug
5     public static void main(String[] args){
6         Cart anOrder = new Cart();
7
8         DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King" , category:"Animation" , diretor:"Roger Allers",length:87,
9         anOrder.addDigitalVideoDisc(dvd1);
10
11        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars" , category:"Science Fiction" , diretor:"George Lucas",length:87
12        anOrder.addDigitalVideoDisc(dvd2);
13
14        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin" , category:"Animation", cost:18.995f);
15        anOrder.addDigitalVideoDisc(dvd3);
16
17        anOrder.removeDigitalVideoDisc(dvd1);
18        System.out.println(x:"Total Cost is:");
19        System.out.println(anOrder.getTotalCost());
20        System.out.println(DigitalVideoDisc.getnbDigitalVideoDisc());
21
22        anOrder.search(title:"Star Wars");
23    }
24

```

```

3
Star Wars - Science Fiction - George Lucas - 87: 24.95$
PS E:\000\java\lab\Java>

```

## 7. Implement the Store class

```
aimsprojectlab3 > storelab3 > Store.java > {} lab3.aimsprojectlab3.storelab3
package lab3.aimsprojectlab3.storelab3;

public class Store {
    public static final int MAX_NUMBERS_STORE = 1000001;
    private DigitalVideoDisc itemsInStore[] = new DigitalVideoDisc[MAX_NUMBERS_STORE];
    private int qtyStore = 0;

    public int getQtyStore(){
        return this.qtyStore;
    }

    public void addDVD(DigitalVideoDisc disc) {
        if (qtyStore == MAX_NUMBERS_STORE)
            System.out.println(x:"The Store is almost full");
        itemsInStore[qtyStore] = disc;
        qtyStore++;
        System.out.println(x:"The disc has been added to store");
    }

    public void removeDVD(DigitalVideoDisc disc){
        int index = -1;
        for (int i = 0; i < qtyStore; i++)
            if (itemsInStore[i] == disc)
                index = i;
        if (index == -1) {
            System.out.println(x:"Can't find the disc in the store");
        } else {
            qtyStore--;
            for (int i = index; i < qtyStore; i++) {
                itemsInStore[i] = itemsInStore[i + 1];
            }
        }
        System.out.println(x:"The disc has been removed in store");
    }
}
```

```
File Edit Selection View Go Run Terminal Help StoreTest.java - Java - Visual Studio Code
DigitalVideoDisc.java Cart.java StoreTest.java X Aims.java
lab3 > aimsprojectlab3 > storelab3 > StoreTest.java > {} lab3.aimsprojectlab3.storelab3
1 package lab3.aimsprojectlab3.storelab3;
2
3 public class StoreTest {
4     Run | Debug
5     public static void main(String[] args){
6         Store store = new Store();
7
8         DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", director:"Roger Allers",length:87, cost
9         store.addDVD(dvd1);
10        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", director:"George Lucas",length:87, cc
11        store.addDVD(dvd2);
12
13        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.995f);
14        store.addDVD(dvd3);
15
16        store.removeDVD(dvd1);
17        System.out.println(store.getQtyStore());
18    }
19 }

PROBLEMS 4 OUTPUT DEBUG CONSOLE TIMELINE TERMINAL
Active code page: 65001
PS E:\OOP\javaLab\Java> & 'C:\Program Files\Java\jdk-20\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\lehan\AppData
\Roaming\Code\User\workspaceStorage\ccb1609eb34cc0adc48ac9da84442cd7\redhat.java\jdt_ws\Java_6b48553f\bin' 'lab3.aimsprojectlab3.storelab3.Sto
reTest'
The disc has been added to store
The disc has been added to store
The disc has been added to store
The disc has been removed in store
2
PS E:\OOP\javaLab\Java>
```

## 8. Re-organize your projects

## 9. String, StringBuilder and StringBuffer

```
OtherProjects > hust > soict > globalict > lab01 > garbage > ConcatenationInLoops.java
1  package OtherProjects.hust.soict.globalict.lab01.garbage;
2
3  import java.util.Random;
4
5  public class ConcatenationInLoops {
6      Run | Debug
7      public static void main(String[] args){
8          Random r = new Random(seed:123);
9          Long start = System.currentTimeMillis();
10         String s = "";
11         for( int i = 0 ; i<65536 ; i++)
12             s+=r.nextInt(bound:2);
13         System.out.println(System.currentTimeMillis() - start);
14
15         r = new Random(seed:123);
16         start = System.currentTimeMillis();
17         StringBuilder sb = new StringBuilder();
18
19         for( int i = 0 ; i<65536;i++)
20             sb.append(r.nextInt(bound:2));
21         s = sb.toString();
22         System.out.println(System.currentTimeMillis() - start);
23     }
24 }
```

PROBLEMS 7 OUTPUT DEBUG CONSOLE TIMELINE TERMINAL

```
create mode 100644 OtherProjects/hust/soict/globalict/lab01/garbage/ConcatenationInLoops.java
PS E:\OOP\javaLab\Java> e.;; cd 'e:\OOP\javaLab\Java'; & 'C:\Program Files\Java\jdk-20\bin\jav
a.exe' '-XX:+ShowCodeDetailsInExceptionMessages' '-cp' 'C:\Users\lehan\AppData\Roaming\Code\Us
er\workspaceStorage\ccb1609eb34cc0adc48ac9da84442cd7\redhat.java\jdt_ws\Java_6b48553f\bin' 'Ot
herProjects.hust.soict.globalict.lab01.garbage.ConcatenationInLoops'
592
1
PS E:\OOP\javaLab\Java> 
```

Ln 24, Col 1 Spaces: 4 UTF-8 CRLF {} Java @ G

```
ConcatenationInLoops.java 1  GarbageCreator.java 1, U X  test.txt U
OtherProjects > hust > soict > globalict > garbage > GarbageCreator.java > GarbageCreator > main(String[])
1 package OtherProjects.hust.soict.globalict.garbage;
2
3 import java.io.IOException;
4 import java.nio.file.Files;
5 import java.nio.file.Paths;
6
7 public class GarbageCreator {
8     public static void main(String[] args) throws IOException {
9         String filename = "E:/OOP/javaLab/Java/OtherProjects/hust/soict/globalict/garbage/test.txt";
10        byte[] inputBytes = { 0 };
11        Long startTime, endTime;
12
13        inputBytes = Files.readAllBytes(Paths.get(filename));
14        startTime = System.currentTimeMillis();
15        String outputString = "";
16        for (byte b : inputBytes) {
17            outputString += (char) b;
18        }
19        endTime = System.currentTimeMillis();
20        System.out.println(endTime - startTime);
21    }
22
23 }
24
```

PROBLEMS 9 OUTPUT DEBUG CONSOLE TIMELINE TERMINAL

```
'-cp' 'C:\Users\lehan\AppData\Roaming\Code\User\workspaceStorage\ccb1609eb34cc0adc48ac9da84442cd7\redhat.java\jdt_ws\Java_6b48553f\bin' 'OtherProjects.hust.soict.globalict.garbage.GarbageCreator'
0
PS E:\OOP\javaLab\Java> e; cd 'e:\OOP\javaLab\Java'; & 'C:\Program Files\Java\jdk-20\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages'
'-cp' 'C:\Users\lehan\AppData\Roaming\Code\User\workspaceStorage\ccb1609eb34cc0adc48ac9da84442cd7\redhat.java\jdt_ws\Java_6b48553f\bin' 'OtherProjects.hust.soict.globalict.garbage.GarbageCreator'
1
PS E:\OOP\javaLab\Java>
```

topic/memory-management-string\* 0 9 Ln 14, Col 48 Spaces: 4 UTF-8 CRLF Java

```
OtherProjects > hust > soict > globalict > garbage > NoGarbage.java > ...
1 package OtherProjects.hust.soict.globalict.garbage;
2
3 import java.io.IOException;
4 import java.nio.file.Files;
5 import java.nio.file.Paths;
6
7 public class NoGarbage {
8     public static void main(String[] args) throws IOException {
9         String filename = "E:/OOP/javaLab/Java/OtherProjects/hust/soict/globalict/garbage/test.txt";
10        byte[] inputBytes = { 0 };
11        Long startTime, endTime;
12
13        inputBytes = Files.readAllBytes(Paths.get(filename));
14        startTime = System.currentTimeMillis();
15        StringBuilder outputStringBuilder = new StringBuilder();
16        for (byte b : inputBytes) {
17            outputStringBuilder.append((char)b);
18        }
19        endTime = System.currentTimeMillis();
20        System.out.println(endTime - startTime);
21    }
22
23 }
24
```

PROBLEMS 9 OUTPUT DEBUG CONSOLE TIMELINE TERMINAL

```
herProjects.hust.soict.globalict.garbage.NoGarbage'
0
PS E:\OOP\javaLab\Java> e; cd 'e:\OOP\javaLab\Java'; & 'C:\Program Files\Java\jdk-20\bin\java.exe' '-XX:+ShowCodeDetailsInExceptionMessages'
'-cp' 'C:\Users\lehan\AppData\Roaming\Code\User\workspaceStorage\ccb1609eb34cc0adc48ac9da84442cd7\redhat.java\jdt_ws\Java_6b48553f\bin' 'OtherProjects.hust.soict.globalict.garbage.NoGarbage'
0
PS E:\OOP\javaLab\Java>
```

topic/memory-management-string\* 0 9 Ln 4, Col 28 Spaces: 4 UTF-8 CRLF Java