Lab 03: Basic OO Techinique

Method Overloading

```
2    public static void main(String[] args) {
3        Cart order = new Cart();
4        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"A
5        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Start Wars", category:"Scie
6        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animatio
7        order.addDigitalVideoDisc(dvd1, dvd2, dvd3);
8
9        System.out.println(order);
10       order.removeDigitalVideoDisc(dvd3);
11
12       System.out.println(order);
13   }
14 }
```

```
PROBLEMS  7    OUTPUT    DEBUG CONSOLE    TERMINAL                                    +

Jungle DVD title: Jungle
haidohong@Aircuahaidohong Lab 2 % cd "/Users/haidohong/Programming/
java/oop_lab/Lab 2/" && javac AIMS.java && java AIMS
The disc has been added
The disc has been added
The disc has been added
The cart has 3 items
Item #1, Title: The Lion King, Cost: 19.950001
Item #2, Title: Start Wars, Cost: 24.950001
Item #3, Title: Aladin, Cost: 18.990000
Total Cost: 63.889999

The disc has been removed
The cart has 2 items
Item #1, Title: The Lion King, Cost: 19.950001
Item #2, Title: Start Wars, Cost: 24.950001
```

Passing parameter

```java
19      public static void swap(DigitalVideoDisc disc1, DigitalVideo
20          //This function only apply to DigitalVideoDisc
21          String tmpTitle = disc1.getTitle();
22          disc1.setTitle(disc2.getTitle());
23          disc2.setTitle(tmpTitle);
24
25          String tmpCategory = disc1.getCategory();
26          disc1.setCategory(disc2.getCategory());
27          disc2.setCategory(tmpCategory);
28
29          String tmpDirector = disc1.getDirector();
30          disc1.setDirector(disc2.getDirector());
31          disc2.setDirector(tmpDirector);
32
33          int tmpLength = disc1.getLength();
34          disc1.setLength(disc2.getLength());
35          disc2.setLength(tmpLength);
36
37          float tmpCost = disc1.getCost();
38          disc1.setCost(disc2.getCost());
39          disc2.setCost(tmpCost);
40      }
41      public static void changeTitle(DigitalVideoDisc dvd, String
```

PROBLEMS 7   OUTPUT   DEBUG CONSOLE   TERMINAL   + ˅

```
cd "/Users/haidohong/Programming/java/oop_lab/Lab 2/" && javac Test
PassingParameter.java && java TestPassingParameter
haidohong@Aircuahaidohong oop_lab % cd "/Users/haidohong/Programmin
g/java/oop_lab/Lab 2/" && javac TestPassingParameter.java && java T
estPassingParameter
Jungle DVD title: Jungle
Cinderella DVD title: Cinderella
Jungle DVD title: Cinderella
haidohong@Aircuahaidohong Lab 2 % cd "/Users/haidohong/Programming/
java/oop_lab/Lab 2/" && javac TestPassingParameter.java && java Tes
tPassingParameter
Jungle DVD title: Cinderella
Cinderella DVD title: Jungle
Jungle DVD title: Jungle
```

Use debug run

Debug for the **swap** method

Set breakpoint

```
1    public class TestPassingParameter {
         Run | Debug
2        public static void main(String[] args) {
3            DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
4            DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
5            swap(jungleDVD, cinderellaDVD);
6            System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
```

Run in debug mode

```
∨ Local                             1    public class TestPassingParameter {
  args: String[0]@8                       Run | Debug
  ∨ jungleDVD: DigitalVideoDisc@9    2    public static void main(String[] args) { args = String[0]@8
    category: null                   3        DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle"); jungleDVD = DigitalVideoDisc@9
    cost: 0.000000                   4        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella"); cinderellaDVD = DigitalVideoDisc@10
                                  ▷ 5        swap(jungleDVD, cinderellaDVD); jungleDVD = DigitalVideoDisc@9, cinderellaDVD = DigitalVideoDisc@10
    director: null                   6        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
    length: 0                        7        System.out.println("Cinderella DVD title: " + cinderellaDVD.getTitle());
  > title: "Jungle"                  8
  ∨ cinderellaDVD: DigitalVideoDisc@10  9     changeTitle(jungleDVD, cinderellaDVD.getTitle());
    category: null                   10       System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
                                     11
    cost: 0.000000                   12
    director: null                   13   }
    length: 0                        14   public static void swap(Object o1, Object o2){
  > title: "Cinderella"             15       Object tmp = o1;
                                     16       o1 = o2;
```

Investigate value of variables

```
∨ Local                             1    public class TestPassingParameter {
  ∨ o1: DigitalVideoDisc@9                 Run | Debug
    category: null                   2    public static void main(String[] args) {
    cost: 0.000000                   3        DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
    director: null                   4        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
                                  ● 5        swap(jungleDVD, cinderellaDVD);
    length: 0                        6        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
  > title: "Jungle"                  7        System.out.println("Cinderella DVD title: " + cinderellaDVD.getTitle());
  ∨ o2: DigitalVideoDisc@10          8
    category: null                   9        changeTitle(jungleDVD, cinderellaDVD.getTitle());
                                     10       System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
    cost: 0.000000                   11
    director: null                   12
    length: 0                        13   }
  > title: "Cinderella"             14   public static void swap(Object o1, Object o2){ o1 = DigitalVideoDisc@9, o2 = DigitalVideoDisc@10
                                  ▷ 15       Object tmp = o1; o1 = DigitalVideoDisc@9
```

Screenshot 1

Local
- o1: DigitalVideoDisc@9
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Jungle"
- o2: DigitalVideoDisc@10
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Cinderella"
- tmp: DigitalVideoDisc@9
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Jungle"

```java
public class TestPassingParameter {
    public static void main(String[] args) {
        DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
        swap(jungleDVD, cinderellaDVD);
        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
        System.out.println("Cinderella DVD title: " + cinderellaDVD.getTitle());

        changeTitle(jungleDVD, cinderellaDVD.getTitle());
        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());



    }
    public static void swap(Object o1, Object o2){ o1 = DigitalVideoDisc@9, o2 = DigitalVideoDisc@10
        Object tmp = o1; tmp = DigitalVideoDisc@9, o1 = DigitalVideoDisc@9
        o1 = o2; o1 = DigitalVideoDisc@9, o2 = DigitalVideoDisc@10
        o2 = tmp;
    }
    public static void changeTitle(DigitalVideoDisc dvd, String title){
        String oldTitle = dvd.getTitle();
        dvd.setTitle(title);
        dvd = new DigitalVideoDisc(oldTitle);
```

Screenshot 2

Local
- o1: DigitalVideoDisc@10
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Cinderella"
- o2: DigitalVideoDisc@10
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Cinderella"
- tmp: DigitalVideoDisc@9
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Jungle"

```java
public class TestPassingParameter {
    public static void main(String[] args) {
        DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
        swap(jungleDVD, cinderellaDVD);
        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
        System.out.println("Cinderella DVD title: " + cinderellaDVD.getTitle());

        changeTitle(jungleDVD, cinderellaDVD.getTitle());
        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());



    }
    public static void swap(Object o1, Object o2){ o1 = DigitalVideoDisc@10, o2 = DigitalVideoDisc@10
        Object tmp = o1; tmp = DigitalVideoDisc@9, o1 = DigitalVideoDisc@10
        o1 = o2; o1 = DigitalVideoDisc@10, o2 = DigitalVideoDisc@10
        o2 = tmp; o2 = DigitalVideoDisc@10, tmp = DigitalVideoDisc@9
    }
    public static void changeTitle(DigitalVideoDisc dvd, String title){
        String oldTitle = dvd.getTitle();
        dvd.setTitle(title);
        dvd = new DigitalVideoDisc(oldTitle);
```

Screenshot 3

Local
- o1: DigitalVideoDisc@10
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Cinderella"
- o2: DigitalVideoDisc@9
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Jungle"
- tmp: DigitalVideoDisc@9
  - category: null
  - cost: 0.000000
  - director: null
  - length: 0
  - title: "Jungle"

```java
public class TestPassingParameter {
    public static void main(String[] args) {
        DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
        swap(jungleDVD, cinderellaDVD);
        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
        System.out.println("Cinderella DVD title: " + cinderellaDVD.getTitle());

        changeTitle(jungleDVD, cinderellaDVD.getTitle());
        System.out.println("Jungle DVD title: " + jungleDVD.getTitle());


    }
    public static void swap(Object o1, Object o2){ o1 = DigitalVideoDisc@10, o2 = DigitalVideoDisc@9
        Object tmp = o1; tmp = DigitalVideoDisc@9, o1 = DigitalVideoDisc@10
        o1 = o2; o1 = DigitalVideoDisc@10, o2 = DigitalVideoDisc@9
        o2 = tmp; o2 = DigitalVideoDisc@9, tmp = DigitalVideoDisc@9
    }
    public static void changeTitle(DigitalVideoDisc dvd, String title){
        String oldTitle = dvd.getTitle();
        dvd.setTitle(title);
        dvd = new DigitalVideoDisc(oldTitle);
```

Change value of variables


```
Local
  args: String[0]@8
  jungleDVD: DigitalVideoDisc@9
    category: null
    cost: 0.000000
    director: null
    length: 0
  > title: "NOT Jungle"
  > cinderellaDVD: DigitalVideoDisc@10
```

```java
1   public class TestPassingParameter {
2       public static void main(String[] args) { args = String[0]@8
3           DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle"); jungleDVD = DigitalVideoDisc@9
4           DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella"); cinderellaDVD = DigitalVideoDisc@10
5           swap(jungleDVD, cinderellaDVD); jungleDVD = DigitalVideoDisc@9, cinderellaDVD = DigitalVideoDisc@10
6           System.out.println("Jungle DVD title: " + jungleDVD.getTitle()); jungleDVD = DigitalVideoDisc@9
7           System.out.println("Cinderella DVD title: " + cinderellaDVD.getTitle());
8
9           changeTitle(jungleDVD, cinderellaDVD.getTitle());
10          System.out.println("Jungle DVD title: " + jungleDVD.getTitle());
11
```

```
Jungle DVD title: NOT Jungle
Cinderella DVD title: Cinderella
Jungle DVD title: Cinderella
haidohong@MacBook-Air-cua-haidohong codecademy-github %
```

Classifier Member and Instance Member

```java
2   public class DigitalVideoDisc {
3       private static int nbDigitalVideoDiscs = 0;
4       private int id;
5       private String title;
6       private String category;
7       private String director;
8       private int length;
9       private float cost;
10
11      public DigitalVideoDisc(String title, String category, String director, int length, floa
12          this.title = title;
13          this.category = category;
14          this.director = director;
15          this.length = length;
16          this.cost = cost;
17          ++nbDigitalVideoDiscs;
18          this.id = nbDigitalVideoDiscs;
19      }
20      public DigitalVideoDisc(String title, String category, float cost) {
21          this(title, category, director:null, length:0, cost);
22
23      }
24
25      public DigitalVideoDisc(String title) {
26          this(title, category:null, director:null, length:0, cost:0f);
27      }
28
29
30
31      public DigitalVideoDisc(String title, String category, String director, float cost) {
32          this(title, category, director, length:0, cost);
```

```
***********************CART***********************
Ordered Items:
1. DVD#1 — The Lion King — Animation — 87:   19.95$
2. DVD#2 — Star Wars — Science Fiction — 87:   24.95$
3. DVD#3 — Aladin — Animation — 0:   18.99$
Total Cost: 63.889999
**************************************************
```

Adding toString, search feature

```java
    @Override
    public String toString() {
        String cartString = "";
        String cartHeader = "***********************CART***********************\n";
        String cartTitle = "Ordered Items: \n";
        cartString += cartHeader;
        cartString += cartTitle;
        for (int i = 0; i < qtyOrdered; ++i) {
            String itemString = String.format(format:"%d. %s",
                i + 1,
                itemsOrdered[i]);
            cartString += itemString;
        }
        String totalCostString = String.format(format:"Total Cost: %f\n", totalCost());
        String cartFooter = "**************************************************\n";
        cartString += totalCostString;
        cartString += cartFooter;
        return cartString;
    }
}
```

```java
public Boolean searchDVD(int id){
    for (DigitalVideoDisc dvd: itemsOrdered){
        if (dvd != null && dvd.getId() == id) {
            System.out.println(x:"Found DVD: ");
            System.out.println(dvd);
            return true;
        }
    }
    System.out.println(x:"Not found DVD.");
    return false;
}
public Boolean searchDVD(String title){
    for (DigitalVideoDisc dvd: itemsOrdered){
        if (dvd != null && title.equals(dvd.getTitle())) {
            System.out.println(x:"Found DVD: ");
            System.out.println(dvd);
            return true;
        }
    }
    System.out.println(x:"Not found DVD.");
    return false;
}
```

```java
order.searchDVD(id:3);
order.searchDVD(id:5);
order.searchDVD(title:"Star Wars");
order.searchDVD(title:"Inception");
```

```
Found DVD:
DVD#3 - Aladin - Animation - 0:  18.99$

Not found DVD.
Found DVD:
DVD#2 - Star Wars - Science Fiction - 87:  24.95$

Not found DVD.
```

Implement Store

```java
public class StoreTest {
    Run | Debug
    public static void main(String[] args) {
        Store store = new Store();
        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation
        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fict
        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cos
        DigitalVideoDisc dvd4 = new DigitalVideoDisc(title:"The Avengers", category:"Action",
        DigitalVideoDisc dvd5 = new DigitalVideoDisc(title:"Inception", category:"Sci-Fi", dir
        DigitalVideoDisc dvd6 = new DigitalVideoDisc(title:"The Shawshank Redemption", categor
        store.addDVD(dvd1, dvd2, dvd3, dvd4, dvd5, dvd6);
        System.out.println(store);
        store.removeDVD(dvd4);
        System.out.println(store);
    }
}
```

```
PROBLEMS  10     OUTPUT    DEBUG CONSOLE    TERMINAL                                    +

● haidohong@Aircuahaidohong Lab 2 % cd "/Users/haidohong/Programming/java/oop_lab/Lab 2/" && javac StoreT
est.java && java StoreTest
The disc has been added
The disc has been added
The disc has been added
The disc has been added
The disc has been added
The disc has been added
*******************STORE*********************
All Items:
1. DVD#1 — The Lion King — Animation — 87:  19.95$
2. DVD#2 — Star Wars — Science Fiction — 87:  24.95$
3. DVD#3 — Aladin — Animation — 0:  18.99$
4. DVD#4 — The Avengers — Action — 143:  19.99$
5. DVD#5 — Inception — Sci-Fi — 148:  14.99$
6. DVD#6 — The Shawshank Redemption — Drama — 142:  9.99$
*************************************************

The disc has been removed
*******************STORE*********************
All Items:
1. DVD#1 — The Lion King — Animation — 87:  19.95$
2. DVD#2 — Star Wars — Science Fiction — 87:  24.95$
3. DVD#3 — Aladin — Animation — 0:  18.99$
4. DVD#5 — Inception — Sci-Fi — 148:  14.99$
5. DVD#5 — Inception — Sci-Fi — 148:  14.99$
*************************************************
○ haidohong@Aircuahaidohong Lab 2 % ▢
```

String, StringBuilder and StringBuffer

```java
public class ConcatenationInLoops {

    new *
    public static void main(String[] args) {
        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);
    }
}
```

ConcatenationInLoops ✕

```
/Library/Java/JavaVirtualMachines/jdk-20.jdk/Contents/Home/bin/ja
703
4
```

```java
public class GarbageCreator {
    new *
    public static void main(String[] args) throws IOException {
        String filename = "./resources/random_text.txt";
        byte[] inputBytes = {0};
        long startTime, endTime;

        inputBytes = Files.readAllBytes(Paths.get(filename));
        startTime = System.currentTimeMillis();
        String outputString = "";
        for (byte b : inputBytes){
            outputString += (char)b;
        }
        endTime = System.currentTimeMillis();
        System.out.println(endTime - startTime);
    }
}
```

GarbageCreator ×

/Library/Java/JavaVirtualMachines/jdk-20.jdk/Contents/Home/bin/java

559

```java
public class NoGarbage {
    new *
    public static void main(String[] args) throws IOException {
        String filename = "./resources/random_text.txt";
        byte[] inputBytes = {0};
        long startTime, endTime;


        inputBytes = Files.readAllBytes(Paths.get(filename));
        startTime = System.currentTimeMillis();
        StringBuilder outputStringBuilder = new StringBuilder();
        String outputString = "";
        for (byte b : inputBytes){
            outputStringBuilder.append((char) b);
        }
        outputString = outputStringBuilder.toString();
        endTime = System.currentTimeMillis();
        System.out.println(endTime - startTime);
    }
}
```

🔲 NoGarbage ✕

/Library/Java/JavaVirtualMachines/jdk-20.jdk/Contents/Home/bin/ja

4