

ĐẠI HỌC BÁCH KHOA HÀ NỘI
TRƯỜNG CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG

BÁO CÁO THỰC HÀNH
IT3103-744530-2024.1
BÀI THỰC HÀNH 3

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Hà Nội 11/2024

BÁO CÁO THỰC HÀNH LAB 03

THỰC HÀNH LẬP TRÌNH HƯỚNG ĐỐI TƯỢNG

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1. Working with method overloading

1.1. Overloading by differing types of parameter

Code

```
public boolean addDigitalVideoDisc(DigitalVideoDisc[] dvdlist) {
    if(dvdlist.length < MAX_NUMBERS_ORDERED) {
        for(qtyOrdered = 0; qtyOrdered < dvdlist.length; qtyOrdered++) {
            itemsOrdered[qtyOrdered] = dvdlist[qtyOrdered];
        }
        System.out.println("LeDongCanhPhu-20225755-The dvdlist has been added.");
        return true;
    }
    else {
        System.out.println("LeDongCanhPhu-20225755-The cart is almost full.");
        return false;
    }
}
```

Figure 1 Method addDigitalVideoDisc(DigitalVideoDisc [] dvdList)

```
6 public class Aims {
7     public static void main(String[] args) {
8         //Create a new cart
9         Cart anOrder = new Cart();
10        final int MAX_NUMBERS_ORDERED = 3;
11        DigitalVideoDisc[] dvdlist = new DigitalVideoDisc[MAX_NUMBERS_ORDERED];
12        //Create a new dvd objects and add them to the cart
13        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", director:"Roger Allers", length:87, cost:19.95f);
14        //anOrder.addDigitalVideoDisc(dvd1);
15        dvdlist[0] = dvd1;
16        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", director:"Geogre Lucas", length:87, cost:24.95f);
17        //anOrder.addDigitalVideoDisc(dvd2);
18        dvdlist[1] = dvd2;
19        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", cost:18.99f);
20        dvdlist[2] = dvd3;
21        anOrder.addDigitalVideoDisc(dvdlist);
22        anOrder.addDigitalVideoDisc(dvd1, dvd2);
23        anOrder.addDigitalVideoDisc(dvd3);
24
25        //print total cost of the items in the cart
26        System.out.println("LeDongCanhPhu-20225755-Total cost is: ");
27        System.out.println(anOrder.totalCost());
28
29        //remove a dvd from the cart
30        anOrder.removeDigitalVideoDisc(dvd2);
31        System.out.println("LeDongCanhPhu-20225755-The total cost after removing a dvd is: ");
32        System.out.println(anOrder.totalCost());
33    }
34 }
```

Figure 2 Aims Class

Result

```
LeDongCanhPhu-20225755-The dvdlist has been added.
LeDongCanhPhu-20225755-Total cost is:
63.89
LeDongCanhPhu-20225755-The disc has been removed.
LeDongCanhPhu-20225755-The total cost after removing a dvd is:
38.940002
```

Figure 3 Result

1.2. Overloading by differing the number of parameters

Code

```

public boolean addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2) {
    if(qtyOrdered < MAX_NUMBERS_ORDERED) {
        itemsOrdered[qtyOrdered] = dvd1;
        qtyOrdered++;
        itemsOrdered[qtyOrdered] = dvd2;
        qtyOrdered++;
        System.out.println("LeDongCanhPhu-20225755-The two disc has been added.");
        return true;
    }
    else {
        System.out.println("LeDongCanhPhu-20225755-The cart is almost full.");
        return false;
    }
}

```

Figure 4 Method addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2)

```

6 public class Aims {
7     public static void main(String[] args) {
8         //Create a new cart
9         Cart anOrder = new Cart();
10        final int MAX_NUMBERS_ORDERED = 3;
11        DigitalVideoDisc[] dvdlist = new DigitalVideoDisc[MAX_NUMBERS_ORDERED];
12        //Create a new dvd objects and add them to the cart
13        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", director:"Roger Allers", length:87, cost:19.95f);
14        //anOrder.addDigitalVideoDisc(dvd1);
15        dvdlist[0] = dvd1;
16        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", director:"Geogre Lucas", length:87, cost:24.95f);
17        //anOrder.addDigitalVideoDisc(dvd2);
18        dvdlist[1] = dvd2;
19        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", cost:18.99f);
20        dvdlist[2] = dvd3;
21        anOrder.addDigitalVideoDisc(dvdlist);
22        anOrder.addDigitalVideoDisc(dvd1, dvd2);
23        anOrder.addDigitalVideoDisc(dvd3);
24
25        //print total cost of the items in the cart
26        System.out.println("LeDongCanhPhu-20225755-Total cost is: ");
27        System.out.println(anOrder.totalCost());
28
29        //remove a dvd from the cart
30        anOrder.removedDigitalVideoDisc(dvd2);
31        System.out.println("LeDongCanhPhu-20225755-The total cost after removing a dvd is: ");
32        System.out.println(anOrder.totalCost());
33    }
34 }

```

Figure 5 Aims Class

Result

```

LeDongCanhPhu-20225755-The two disc has been added.
LeDongCanhPhu-20225755-Total cost is:
44.9
LeDongCanhPhu-20225755-The disc has been removed.
LeDongCanhPhu-20225755-The total cost after removing a dvd is:
19.95

```

Figure 6 Result

2. Passing parameter

Code

```
You, 2 days ago | 1 author (You)
1 package hust.soict.ite6.test.disc._TestPassingParameter;
2
3 import hust.soict.ite6.aims.disc.DigitalVideoDisc.DigitalVideoDisc;
4
You, 6 days ago | 1 author (You)
5 public class TestPassingParameter {
    Run | Debug
6     public static void main(String[] args) {
7         //TODO Auto-generated method stub
8         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
9         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
10
11         swap(jungleDVD, cinderellaDVD);
12         System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
13         System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
14
15         changeTitle(jungleDVD, cinderellaDVD.getTitle());
16         System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
17     }
18
19     public static void swap(Object o1, Object o2) {
20         Object temp = o1;
21         o1 = o2;
22         o2 = temp;
23     }
24
25     public static void changeTitle(DigitalVideoDisc dvd, String title) {
26         String oldTitle = dvd.getTitle();
27         dvd.setTitle(title);
28         dvd = new DigitalVideoDisc(oldTitle);
29     }
30 }
31
```

Figure 7 Passing parameter code

Result

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

Figure 8 Passing parameter result

3. New swap method

Code

```

5 public class TestPassingParameter {
6     public static void main(String[] args) {
11         swap(jungleDVD, cinderellaDVD);
12         System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
13         System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
14
15         // changeTitle(jungleDVD, cinderellaDVD.getTitle());
16         // System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
17     }
18
19     public static void swap(Object o1, Object o2) {
20         Object temp = o1;
21         o1 = o2;
22         o2 = temp;
23     }
24
25     public static void changeTitle(DigitalVideoDisc dvd, String title) {
26         String oldTitle = dvd.getTitle();
27         dvd.setTitle(title);
28         dvd = new DigitalVideoDisc(oldTitle);
29     }
30
31     public static void swap(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2) {
32         if(dvd1 == null || dvd2 == null) {
33             System.out.println("One of the discs is null");
34             return;
35         }
36         DigitalVideoDisc temp = new DigitalVideoDisc(dvd1.getTitle(), dvd1.getCategory(),
37             dvd1.getDirector(), dvd1.getLength(), dvd1.getCost()); // Create a temporary disc to store the information of dvd1
38         dvd1.setTitle(dvd2.getTitle());
39         dvd1.setCategory(dvd2.getCategory());
40         dvd1.setDirector(dvd2.getDirector());
41         dvd1.setLength(dvd2.getLength());
42         dvd1.setCost(dvd2.getCost());
43         dvd2.setTitle(temp.getTitle());
44         dvd2.setCategory(temp.getCategory());
45         dvd2.setDirector(temp.getDirector());
46         dvd2.setLength(temp.getLength());
47         dvd2.setCost(temp.getCost());

```

Figure 9 : New swap method

Result

```

Jungle dvd title: Cinderella
cinderella dvd title: Jungle
PS C:\Users\admin\OneDrive - Hanoi University of Science and Technology\Documents\IT3103.744527.2024.1.20225755.LêDongCanhPhu>

```

Figure 10: Result

4. Class Member and Instance Member

Code

```
private static int nbDigitalVideoDiscs = 0; // Class attribute
private int id; // Instance attribute
public void UpdateID() {
    nbDigitalVideoDiscs++; // Increase the number of DigitalVideoDisc objects created
    id = nbDigitalVideoDiscs; // Assign the id of the DigitalVideoDisc object
}
public DigitalVideoDisc(String title) {
    this.title = title;
    UpdateID();
}

public DigitalVideoDisc(String title, String category, float cost) {
    this.title = title;
    this.category = category;
    this.cost = cost;
    UpdateID();
}

public DigitalVideoDisc(String title, String category, String director, float cost) {
    this.title = title;
    this.category = category;
    this.director = director;
    this.cost = cost;
    UpdateID();
}

} You, 4 weeks ago • update DigitalVideoDisc.java

public DigitalVideoDisc(String title, String category, String director, int length, float cost) {
    this.title = title;
    this.category = category;
    this.director = director;
    this.length = length;
    this.cost = cost;
    UpdateID();
}
```

Figure 11: Class member and Instance member

Result

```
1. DVD - The Lion King - Animation - Roger Allers - 87: 19.95$  
2. DVD - Star Wars - Science Fiction - Geogre Lucas - 87: 24.95$  
3. DVD - Aladin - Animation - null - 0: 18.99$
```

Figure 12: Result

5. Open the Cart class

Code

```
public void printCart() {
    System.out.println("*****LeDongCanhPhu-20225755's CART*****");
    System.out.println("Ordered Items:");
    for(int i = 0; i < qtyOrdered; i++) {
        System.out.println(itemsOrdered[i].toString());
    }
    System.out.println("*****");
}

public static int getNbDigitalVideoDiscs() {
    return nbDigitalVideoDiscs; // Get the number of DigitalVideoDisc objects created
}

public int getId() {
    return id; // Get the id of the DigitalVideoDisc object
}

public String toString() {
    return id + ". DVD - " + title + " - " + category + " - " + director + " - " + length + ": " + cost + "$";
}
```

Figure 13 Code method to print the content in Cart

```
public void SearchDVDbyID(int id) {
    for(int i = 0; i < qtyOrdered; i++) {
        if(itemsOrdered[i].getId() == id) {
            System.out.println("LeDongCanhPhu-20225755-The disc is found.");
            System.out.println(itemsOrdered[i].toString());
            return;
        }
    }
    System.out.println("LeDongCanhPhu-20225755-The disc is not found.");
}
```

Figure 14 Code method search by id

```
public void SearchDVDbyTitle(String title) {
    for(int i = 0; i < qtyOrdered; i++) {
        if(itemsOrdered[i].getTitle().equals(title)) {
            System.out.println("LeDongCanhPhu-20225755-The disc is found.");
            System.out.println(itemsOrdered[i].toString());
            return;
        }
    }
    System.out.println("LeDongCanhPhu-20225755-The disc is not found.");
}
```

Figure 15 Code method search by title

```

    public boolean isMatch(String title) {
        for(int i = 0; i < qtyOrdered; i++) {
            if(itemsOrdered[i].getTitle().equals(title)) {
                return true;
            }
        }
        return false;
    }
}

```

Figure 16 IsMatch() in DigitalVideoDisc class

```

You, 2 days ago | 1 author (You)
1 package hust.soict.ite6.test.cart.CartTest;
2
3 import hust.soict.ite6.aims.cart.Cart;
4 import hust.soict.ite6.aims.disc.DigitalVideoDisc.DigitalVideoDisc;
5
You, 2 days ago | 1 author (You)
6 public class CartTest {
7     Run | Debug
8     public static void main(String[] args) { You, 2 days ago * CartTest
9         //Create a new cart
10        Cart cart = new Cart();
11
12        //Create new dvd objects and add them to the cart
13        DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", director:"Roger Allers", length:87, cost:19.95f);
14        cart.addDigitalVideoDisc(dvd1);
15
16        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", director:"Geogre Lucas", length:87, cost:24.95f);
17        cart.addDigitalVideoDisc(dvd2);
18
19        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);
20        cart.addDigitalVideoDisc(dvd3);
21
22        //Test the print method
23        cart.printCart();
24        //To-do: Test the search methods here
25        cart.SearchDVDbyID(id:1);
26        cart.SearchDVDbyID(id:0);
27        cart.SearchDVDbyTitle(title:"The Lion King");
28        cart.SearchDVDbyTitle(title:"Doraemon");
29    }
30 }

```

Figure 17: CartTest class

Result

```

LeDongCanhPhu-20225755-The disc has been added.
LeDongCanhPhu-20225755-The disc has been added.
LeDongCanhPhu-20225755-The disc has been added.
*****LeDongCanhPhu-20225755's CART*****
Ordered Items:
1. DVD - The Lion King - Animation - Roger Allers - 87: 19.95$
2. DVD - Star Wars - Science Fiction - Geogre Lucas - 87: 24.95$
3. DVD - Aladin - Animation - null - 0: 18.99$
*****
LeDongCanhPhu-20225755-The disc is found.
1. DVD - The Lion King - Animation - Roger Allers - 87: 19.95$
LeDongCanhPhu-20225755-The disc is not found.
LeDongCanhPhu-20225755-The disc is found.
1. DVD - The Lion King - Animation - Roger Allers - 87: 19.95$
LeDongCanhPhu-20225755-The disc is not found.

```

Figure 18 Result

6. Implement the Store class

Code

```

You, yesterday | 1 author (You)
1 package hust.soict.ite6.aims.store.Store;
2
3 import hust.soict.ite6.aims.disc.DigitalVideoDisc.DigitalVideoDisc;
4
You, yesterday | 1 author (You)
5 public class Store {
6     public DigitalVideoDisc[] itemsInStore = new DigitalVideoDisc[20];
7     public int qtyInStore = 0;
8     public boolean addDVD(DigitalVideoDisc disc) {
9         if(qtyInStore < 20) {
10             itemsInStore[qtyInStore] = disc;
11             qtyInStore++;
12             System.out.println("LeDongCanhPhu-20225755-The disc has been added.");
13             return true;
14         }
15         else {
16             System.out.println("LeDongCanhPhu-20225755-The store is almost full.");
17             return false;
18         }
19     }
20
21     public void removeDVD(DigitalVideoDisc disc) {
22         for(int i = 0; i < qtyInStore; i++) {
23             if(itemsInStore[i] == disc) {
24                 for(int j = i; j < qtyInStore - 1; j++) {
25                     itemsInStore[j] = itemsInStore[j + 1];
26                 }
27                 qtyInStore--;
28                 System.out.println("LeDongCanhPhu-20225755-The disc has been removed.");
29                 return;
30             }
31         }
32         System.out.println("LeDongCanhPhu-20225755-The disc is not in the store.");
33     }
34 }
35

```

Figure 19 Store class

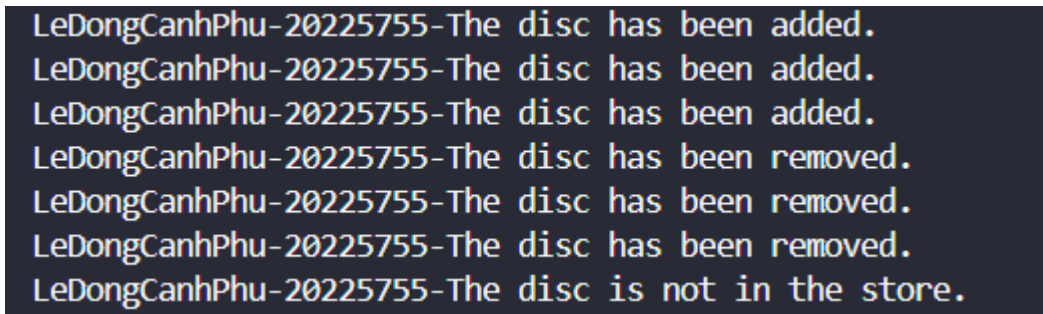
```

You, yesterday | 1 author (You)
1 package hust.soict.ite6.test.store.StoreTest;
2
3 import hust.soict.ite6.aims.disc.DigitalVideoDisc.DigitalVideoDisc;
4 import hust.soict.ite6.aims.store.Store.Store;
5
You, yesterday | 1 author (You)
6 public class StoreTest {
7     //You, 2 days ago * Store test
8     public static void main(String[] args) {
9         //Create a new store
10         Store store = new Store();
11
12         //Create new dvd objects and add them to the store
13         DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", director:"Roger Allers", length:87, cost:19.95f);
14         store.addDVD(dvd1);
15
16         DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", director:"Geogre Lucas", length:87, cost:24.95f);
17         store.addDVD(dvd2);
18
19         DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);
20         store.addDVD(dvd3);
21
22         //Test the removeDVD method
23         store.removeDVD(dvd1);
24         store.removeDVD(dvd2);
25         store.removeDVD(dvd3);
26         store.removeDVD(dvd1);
27     }
28 }
29

```

Figure 20: StoreTest class

Result

A screenshot of a terminal window with a dark background and light-colored text. It displays seven lines of log messages, each starting with the identifier 'LeDongCanhPhu-20225755-'. The messages describe the state of a disc: three 'added' events, three 'removed' events, and one 'not in the store' event.

```
LeDongCanhPhu-20225755-The disc has been added.  
LeDongCanhPhu-20225755-The disc has been added.  
LeDongCanhPhu-20225755-The disc has been added.  
LeDongCanhPhu-20225755-The disc has been removed.  
LeDongCanhPhu-20225755-The disc has been removed.  
LeDongCanhPhu-20225755-The disc has been removed.  
LeDongCanhPhu-20225755-The disc is not in the store.
```

Figure 21 Result

7. String, StringBuilder and StringBuffer

Code&Result

```

1  package OtherProjects.hust.soict.ite6.garbage;
2  import java.util.Random;
3
4  You, yesterday | 1 author (You)
  public class ConcatenationInLoops {
5      Run | Debug
6      public static void main(String[] args) {      You, yesterday • Upload files
7          Random r = new Random(123);
8          long start = System.currentTimeMillis();
9          String s = "";
10         for (int i =0;i<65536;i++) {
11             s += r.nextInt(2);
12         }
13         System.out.print("LeDongCanhPhu-20225755-");
14         System.out.println(System.currentTimeMillis() - start); //This print roughly 4500.
15
16         r = new Random(123);
17         start = System.currentTimeMillis();
18         StringBuilder sb = new StringBuilder();
19         for (int i =0;i<65536;i++) {
20             sb.append(r.nextInt(2));
21         }
22         s = sb.toString();
23         System.out.print("LeDongCanhPhu-20225755-");
24         System.out.println(System.currentTimeMillis() - start); //This prints 5.
25     }
26
  LeDongCanhPhu-20225755-2304
  LeDongCanhPhu-20225755-1

```

Figure 22: So sánh String&StringBuilder

```

1  package OtherProjects.hust.soict.ite6.garbage;
2
3  import java.io.IOException;
4  import java.nio.file.Files;
5  import java.nio.file.Paths;
6
7  ...
8  public class GarbageCreator {
9      Run | Debug
10     public static void main(String[] args) throws IOException {
11         String filename = "test.txt";
12         byte[] inputBytes = { 0 };
13         Long startTime, endTime;
14
15         inputBytes = Files.readAllBytes(Paths.get(filename));
16         startTime = System.currentTimeMillis();
17         String outputString = "";
18         for (byte b : inputBytes) {
19             outputString += (char) b;
20         }
21         // StringBuilder outputStringBuilder = new StringBuilder();
22         // for(byte b : inputBytes) {
23         //     outputStringBuilder.append((char) b);
24         // }
25         endTime = System.currentTimeMillis();
26         System.out.println("LeDongCanhPhu-20225755-"+(endTime - startTime));
27     }
28 }

```

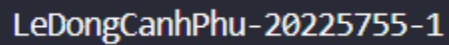
Figure 23: GarbageCreator class

LeDongCanhPhu-20225755-700

Figure 24: GarabeCreator reads file

```
1 package _OtherProjects.hust.soict.ite6.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     Run | Debug
9     public static void main(String[] args) throws IOException {
10         String filename = "test.txt";
11         byte[] inputBytes = { 0 };
12         long startTime, endTime;
13
14         inputBytes = Files.readAllBytes(Paths.get(filename));
15         startTime = System.currentTimeMillis();
16         StringBuilder outputStringBuilder = new StringBuilder();
17         for(byte b : inputBytes) {
18             outputStringBuilder.append((char) b);
19         }
20         endTime = System.currentTimeMillis();
21         System.out.println("LeDongCanhPhu-20225755-"+(endTime - startTime));
22     }
23 }
```

Figure 25: NoGarbage class



LeDongCanhPhu-20225755-1

Figure 26 : Result: Program finishes quickly

8 Class Diagram

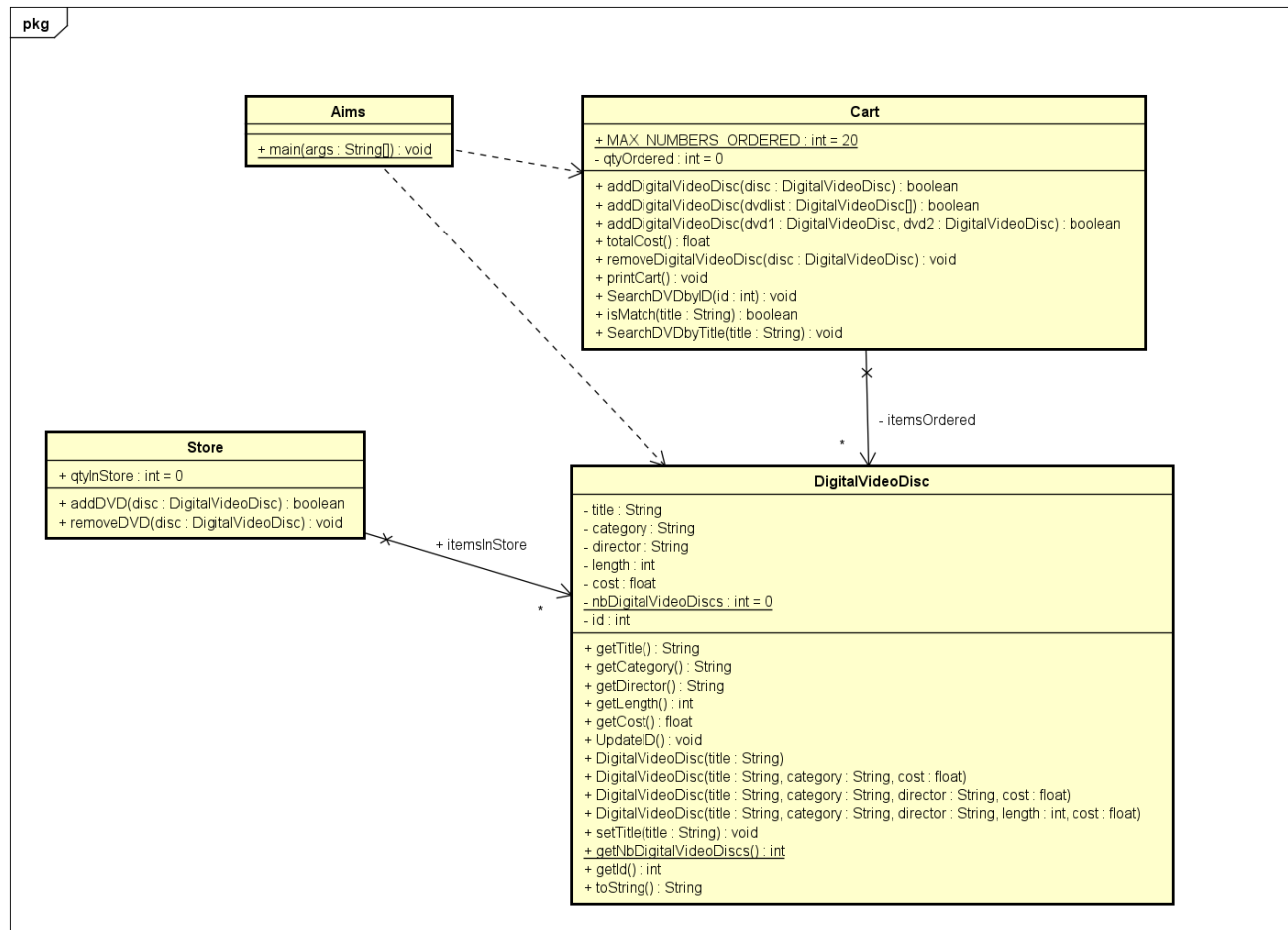


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