BÁO CÁO THỰC HÀNH LAB 03
THỰC HÀNH LẬP TRÌNH HƯỚNG ĐỐI TƯỢNG
Sinh viên: Đỗ Đình Trung, MSSV: 20226128

Contents

1. Working with method overloading

1.1. Overloading by differing types of parameter

Code

```
18⊖    public void addDigitalVideoDisc(DigitalVideoDisc[] dvdList) {
19         for(DigitalVideoDisc disc : dvdList) {
20             addDigitalVideoDisc(disc);
21         }
22     }
23
```

Figure 1 Method addDigitalVideoDisc(DigitalVideoDisc [] dvdList)
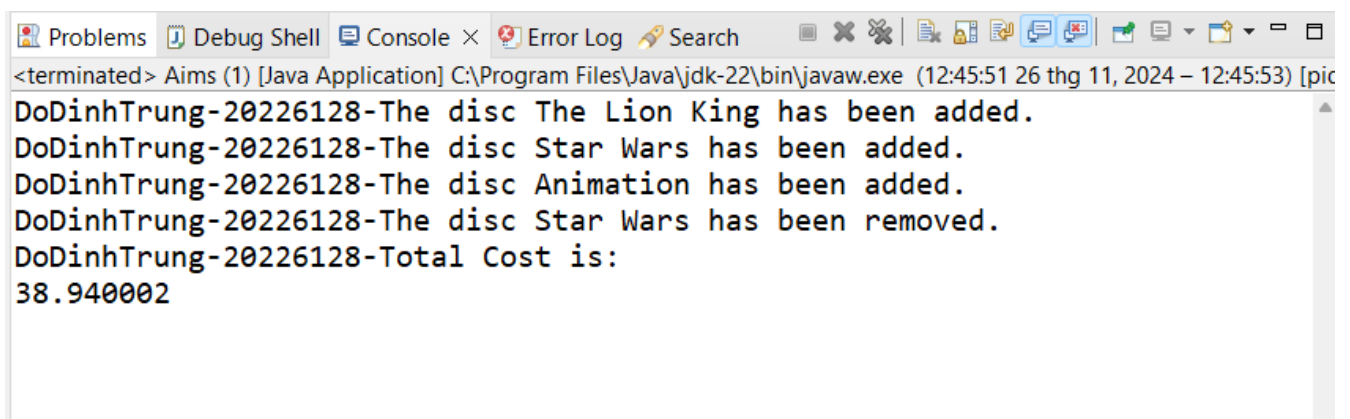
```
1   package sourceCode;
2   public class Aims {
3       //Do Dinh Trung 20226128
4⊖      public static void main(String[] args) {
5           //Create a new cart
6           Cart anOrder = new Cart();
7
8           //Create new dvd objects and add them to the cart
9           DigitalVideoDisc dvd1 = new DigitalVideoDisc("The Lion King", "Animation", "Roger Allers", 87, 19.95f);
10          DigitalVideoDisc dvd2 = new DigitalVideoDisc("Star Wars", "Science Fiction", "George Lucas", 87, 24.95f);
11          DigitalVideoDisc dvd3 = new DigitalVideoDisc("Aladin", "Animation", 18.99f);
12          DigitalVideoDisc[] dvdList = {dvd1,dvd2, dvd3};
13          // add list dvd to the cart
14          anOrder.addDigitalVideoDisc(dvdList);
15          // remove dvd from the cart
16          anOrder.removeDigitalVideoDisc(dvd2);
17          //print total cost of the items in the cart
18          System.out.println("DoDinhTrung-20226128-Total Cost is: ");
19          System.out.println(anOrder.totalCost());
20      }
21  }
22
```

Figure 2 Aims Class

Result

```
Problems   Debug Shell   Console ×   Error Log   Search
<terminated> Aims (1) [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe  (12:45:51 26 thg 11, 2024 – 12:45:53) [pid
DoDinhTrung-20226128-The disc The Lion King has been added.
DoDinhTrung-20226128-The disc Star Wars has been added.
DoDinhTrung-20226128-The disc Animation has been added.
DoDinhTrung-20226128-The disc Star Wars has been removed.
DoDinhTrung-20226128-Total Cost is:
38.940002
```

Figure 3 Result

1.2. Overloading by differing the number of parameters

Code

```
23⊖    public void addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2) {
24         addDigitalVideoDisc(dvd1);
25         addDigitalVideoDisc(dvd2);
26     }
```

Figure 4 Method addDigitalVideoDisc(DigitalVideoDisc dvd1, DigitalVideoDisc dvd2)
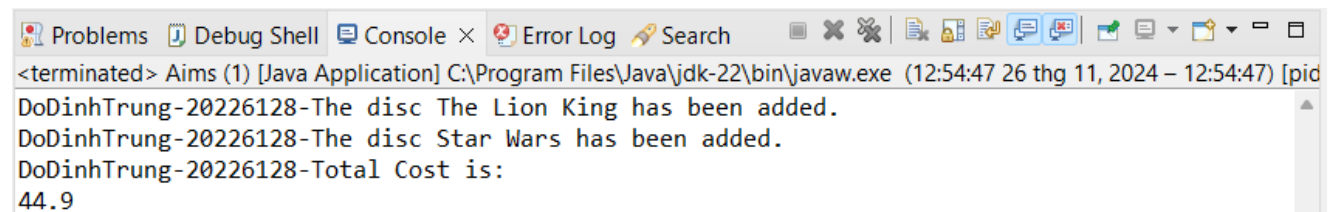
```
1  package sourceCode;
2  public class Aims {
3      //Do Dinh Trung 20226128
4⊖     public static void main(String[] args) {
5          //Create a new cart
6          Cart anOrder = new Cart();
7
8          //Create new dvd objects and add them to the cart
9          DigitalVideoDisc dvd1 = new DigitalVideoDisc("The Lion King", "Animation", "Roger Allers", 87, 19.95f);
10         DigitalVideoDisc dvd2 = new DigitalVideoDisc("Star Wars", "Science Fiction", "George Lucas", 87, 24.95f);
11         DigitalVideoDisc dvd3 = new DigitalVideoDisc("Aladin", "Animation", 18.99f);
12         // add 2 dvd to the cart
13         anOrder.addDigitalVideoDisc(dvd1, dvd2);
14         //print total cost of the items in the cart
15         System.out.println("DoDinhTrung-20226128-Total Cost is: ");
16         System.out.println(anOrder.totalCost());
17     }
18 }
19
```

Figure 5 Aims Class

Result

```
🔲 Problems  🇯 Debug Shell  🖳 Console ×  🕲 Error Log  🔍 Search      ▣ ✖ ✖ | 🔃 🔠 🔃 🔁 🔳 | 🖃 🖳 ▾ 🗗 ▾ ⊏ 🗆
<terminated> Aims (1) [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe (12:54:47 26 thg 11, 2024 – 12:54:47) [pid
DoDinhTrung-20226128-The disc The Lion King has been added.
DoDinhTrung-20226128-The disc Star Wars has been added.
DoDinhTrung-20226128-Total Cost is:
44.9
```
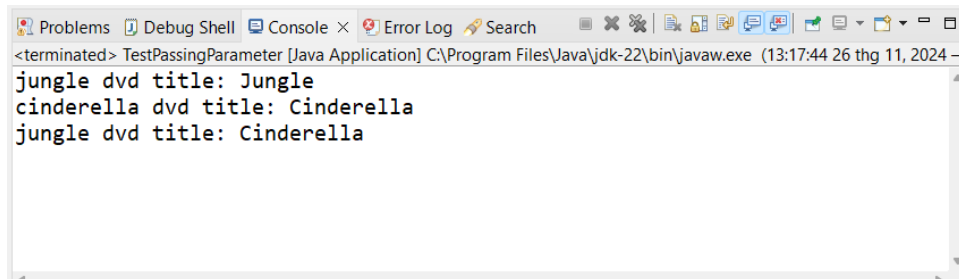
Figure 6 Result

2. Passing parameter

Code

```
1  package sourceCode;
2  //DoDinhTrung-20226128
3  public class TestPassingParameter {
4      public static void main(String[] args) {
5          // TODO Auto-generated method stub
6          DigitalVideoDisc jungleDVD = new DigitalVideoDisc("Jungle");
7          DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc("Cinderella");
8
9          swap(jungleDVD, cinderellaDVD);
10         System.out.println("jungle dvd title: " + jungleDVD.getTitle());
11         System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
12
13         changeTitle(jungleDVD, cinderellaDVD.getTitle());
14         System.out.println("jungle dvd title: " + jungleDVD.getTitle());
15     }
16     public static void swap(Object o1, Object o2) {
17         Object tmp = o1;
18         o1 = o2;
19         o2 = tmp;
20     }
21
22     public static void changeTitle(DigitalVideoDisc dvd, String title) {
23         String oldTitle = dvd.getTitle();
24         dvd.setTitle(title);
25         dvd = new DigitalVideoDisc(oldTitle);
26     }
27 }
```

Figure 7 Passing parameter code

Result

```
Problems  Debug Shell  Console ×  Error Log  Search
<terminated> TestPassingParameter [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe  (13:17:44 26 thg 11, 2024 –
jungle dvd title: Jungle
cinderella dvd title: Cinderella
jungle dvd title: Cinderella
```

Figure 8 Passing parameter result

3. Class Member and Instance Member
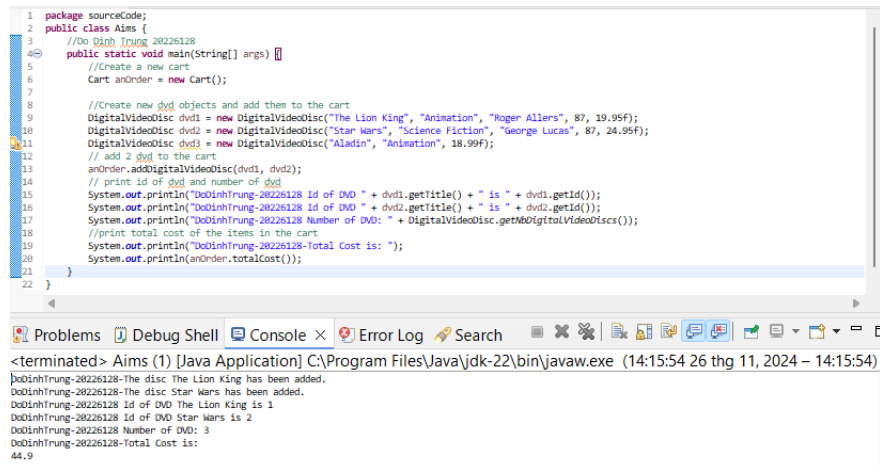
Code

```
1  package sourceCode;
2  public class DigitalVideoDisc {
3      //Do Dinh Trung 20226128
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     private static int nbDigitalVideoDiscs = 0;
11
12     public String getTitle() {
13         return title;
14     }
15
16     public static int getNbDigitalVideoDiscs() {
17         return nbDigitalVideoDiscs;
18     }
19
20     public static void setNbDigitalVideoDiscs(int nbDigitalVideoDiscs) {
21         DigitalVideoDisc.nbDigitalVideoDiscs = nbDigitalVideoDiscs;
22     }
23
24     public void setTitle(String title) {
25         this.title = title;
26     }
27
28     public String getCategory() {
29         return category;
30     }
31
32     public void setCategory(String category) {
33         this.category = category;
34     }
35
36     public String getDirector() {
37         return director;
38     }
39
40     public void setDirector(String director) {
41         this.director = director;
42     }
43
44     public int getLength() {
45         return length;
46     }
47
48     public void setLength(int length) {
49         this.length = length;
50     }
51
52     public float getCost() {
53         return cost;
54     }
55
56     public void setCost(float cost) {
57         this.cost = cost;
58     }
59
60     public int getId() {
61         return id;
62     }
63
64     public void setId(int id) {
65         this.id = id;
66     }
68     public DigitalVideoDisc(String title) {
69         this.title = title;
70         nbDigitalVideoDiscs++;
71         this.id = nbDigitalVideoDiscs;
72     }
73
74     public DigitalVideoDisc(String category, String title, float cost) {
75         this.category = category;
76         this.title = title;
77         this.cost = cost;
78         nbDigitalVideoDiscs++;
79         this.id = nbDigitalVideoDiscs;
80     }
81
82     public DigitalVideoDisc(String director, String category, String title, float cost) {
83         this.director = director;
84         this.category = category;
85         this.title = title;
86         this.cost = cost;
87         nbDigitalVideoDiscs++;
88         this.id = nbDigitalVideoDiscs;
89     }
90
91     public DigitalVideoDisc(String title, String category, String director, int length, float cost) {
92         this.title = title;
93         this.category = category;
94         this.director = director;
95         this.length = length;
96         this.cost = cost;
97         nbDigitalVideoDiscs++;
98         this.id = nbDigitalVideoDiscs;
99     }
100
101 }
```

Figure 9 Class member and Instance member

Result

Figure 10 Result

4. Open the Cart class
   Code

Figure 11 Code method to print the content in Cart

```
62      //DoDinhTrung-20226128
63⊖    public void searchById(int Id) {
64         boolean f = false;
65         for(int i = 0; i < qtyOrdered; i++) {
66             if(itemsOrdered[i].getId() == Id) {
67                 System.out.println("DVD have ID " + Id + ":" + itemsOrdered[i].toString());
68                 f = true;
69                 break;
70             }
71         }
72         if(!f) {
73             System.out.println("DVD have ID " + Id + " not found");
74         }
75     }
76
```

Figure 12 Code method search by id

```
77      //DoDinhTrung-20226128
78⊖    public void searchByTitle(String title) {
79         boolean f = false;
80         for(int i = 0; i < qtyOrdered; i++) {
81             if(itemsOrdered[i].isMatch(title)) {
82                 System.out.println("DVD have title " + title + ":" + itemsOrdered[i].toString());
83                 f = true;
84                 break;
85             }
86         }
87         if(!f) {
88             System.out.println("DVD have title " + title + " not found");
89         }
90     }
91 }
```

Figure 13 Code method search by title

```
101     //DoDinhTrung-20226128
102⊖    public boolean isMatch(String title) {
103         if(this.title.equals(title)) return true;
104         else return false;
105     }
106
```

Figure 14 IsMatch() in DigitalVideoDisc class
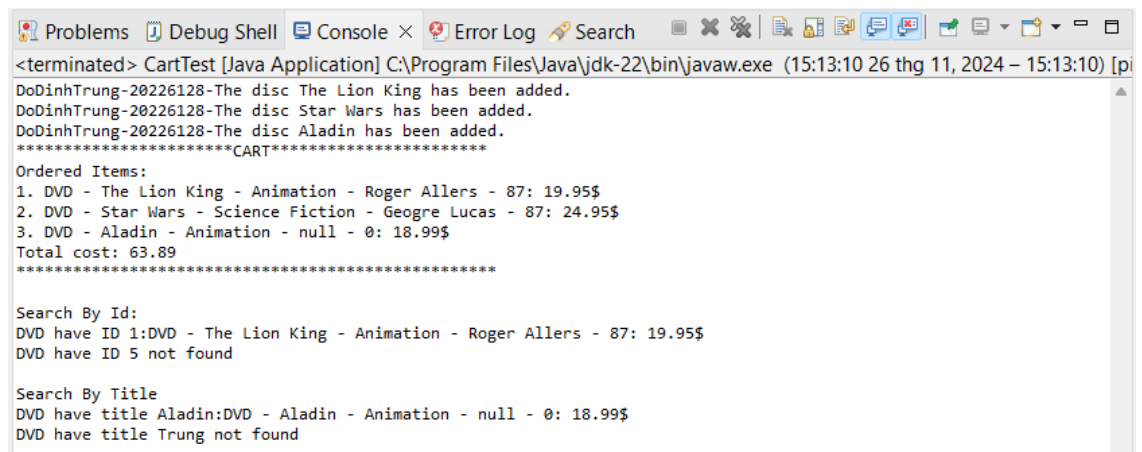
```
1   package sourceCode;
2   //DoDinhTrung-20226128
3   public class CartTest {
4       public static void main(String[] args) {
5           //Create a new cart
6           Cart cart = new Cart();
7
8           //Create new dvd objects and add them to the cart
9           DigitalVideoDisc dvd1 = new DigitalVideoDisc("The Lion King", "Animation", "Roger Allers", 87, 19.95f);
10          cart.addDigitalVideoDisc(dvd1);
11
12          DigitalVideoDisc dvd2 = new DigitalVideoDisc("Star Wars", "Science Fiction", "Geogre Lucas", 87, 24.95f);
13          cart.addDigitalVideoDisc(dvd2);
14
15          DigitalVideoDisc dvd3 = new DigitalVideoDisc("Aladin", "Animation", 18.99f);
16          cart.addDigitalVideoDisc(dvd3);
17
18          //Test the print method
19          cart.print();
20          // Test the search method
21          System.out.println("\nSearch By Id:");
22          cart.searchById(1);
23          cart.searchById(5);
24
25          // Test the search by title
26          System.out.println("\nSearch By Title");
27          cart.searchByTitle("Aladin");
28          cart.searchByTitle("Trung");
29      }
30  }
31
```

Figure 15 CartTest class

Result

```
Problems   Debug Shell   Console ×   Error Log   Search
<terminated> CartTest [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe  (15:13:10 26 thg 11, 2024 – 15:13:10) [pi
DoDinhTrung-20226128-The disc The Lion King has been added.
DoDinhTrung-20226128-The disc Star Wars has been added.
DoDinhTrung-20226128-The disc Aladin has been added.
***********************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$
Total cost: 63.89
*************************************************

Search By Id:
DVD have ID 1:DVD - The Lion King - Animation - Roger Allers - 87: 19.95$
DVD have ID 5 not found

Search By Title
DVD have title Aladin:DVD - Aladin - Animation - null - 0: 18.99$
DVD have title Trung not found
```

Figure 16 Result

5. Implement the Store class

Code

```java
package sourceCode;

public class Store {
    //Do Dinh Trung 20226128
    public static final int MAX_NUMBERS_Items = 20;
    private DigitalVideoDisc items[] = new DigitalVideoDisc[MAX_NUMBERS_Items];
    private int qtyStore = 0;
    //Do Dinh Trung - 20226128 additem
    public void addDVD(DigitalVideoDisc disc) {
        if (qtyStore < MAX_NUMBERS_Items) {
            items[qtyStore] = disc;
            qtyStore++;
            System.out.println("DoDinhTrung-20226128-The disc " + disc.getTitle() +" has been added.");
        } else {
            System.out.println("DoDinhTrung-20226128-The cart is full! Cannot add more discs.");
        }
    }
    // Do Dinh Trung - 20226128 removeitem
    public void removeDigitalVideoDisc(DigitalVideoDisc disc){
        for (int i = 0; i < qtyStore; i++) {
            if (items[i].equals(disc)) {
                for (int j = i; j < qtyStore - 1; j++) {
                    items[j] = items[j + 1];
                }
                items[qtyStore - 1] = null;
                qtyStore--;
                System.out.println("DoDinhTrung-20226128-The disc " + disc.getTitle() + " has been removed.");
                return;
            }
        }
        System.out.println("DoDinhTrung-20226128-Disc not found in cart.");
    }
}
```

Figure 17 Store Class
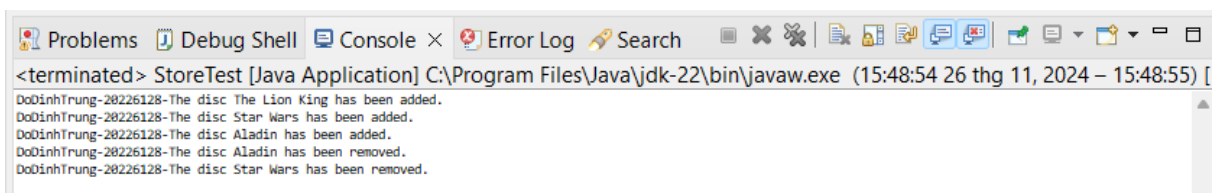
```java
package sourceCode;

public class StoreTest {
    public static void main(String[] args) {
        Store store = new Store();
        //Create new dvd
        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", 18.99f);

        //method add
        store.addDVD(dvd1);
        store.addDVD(dvd2);
        store.addDVD(dvd3);

        //method remove
        store.removeDigitalVideoDisc(dvd3);
        store.removeDigitalVideoDisc(dvd2);
    }
}
```

Figure 18 StoreTest class

Result

```
Problems   Debug Shell   Console ×   Error Log   Search
<terminated> StoreTest [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe  (15:48:54 26 thg 11, 2024 – 15:48:55)
DoDinhTrung-20226128-The disc The Lion King has been added.
DoDinhTrung-20226128-The disc Star Wars has been added.
DoDinhTrung-20226128-The disc Aladin has been added.
DoDinhTrung-20226128-The disc Aladin has been removed.
DoDinhTrung-20226128-The disc Star Wars has been removed.
```

Figure 19 Result

6. String, StringBuilder and StringBuffer

Code

```
1  package hust.soict.itep.garbage;
2
3  import java.util.Random;
4
5  // DoDinhTrung-20226128
6  public class ConcatenationInLoops {
7⊖     public static void main(String[] args) {
8          Random r = new Random(123);
9          long start = System.currentTimeMillis();
10         String s = "";
11         for (int i = 0;i < 65536;i++)
12         s += r.nextInt(2);
13         System.out.println(System.currentTimeMillis() - start);
14
15         r = new Random(123);
16         start = System.currentTimeMillis();
17         StringBuilder sb = new StringBuilder();
18         for(int i = 0;i < 65536;i++)
19             sb.append(r.nextInt(2));
20         s += sb.toString();
21         System.out.println(System.currentTimeMillis() - start);
22     }
23 }
24
```

🔲 Problems @ Javadoc 🔖 Declaration 🖥 Console ✕

<terminated> ConcatenationInLoops [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe (16:32:44

```
910
7
```

Figure 20 So sánh String và StringBuilder

Result

```
1  package hust.soict.itep.garbage;
2
3⊖ import java.io.IOException;
4  import java.nio.file.Files;
5  import java.nio.file.Paths;
6  //DoDinhTrung-20226128
7  public class GarbageCreator {
8⊖     public static void main(String[] args) throws IOException {
9          // path file text
10         String filename = "C:\\Users\\Admin\\OneDrive - Hanoi University of Science and Technology\\JavaBasics\\OtherProjects\\src\\hust\\sd
11         byte[] inputBytes = { 0 };
12         long startTime, endTime;
13         try {
14             inputBytes = Files.readAllBytes(Paths.get(filename));
15         } catch (NullPointerException e) {
16             System.out.println("File not found: " + filename);
17             return;
18         }
19         startTime = System.currentTimeMillis();
20         String outputString = "";
21         for(byte b : inputBytes) {
22             outputString += (char)b;
23         }
24         endTime = System.currentTimeMillis();
25         System.out.println(endTime - startTime);
26     }
27 }
28
```

Figure 21 GarbageCreator class

```
1  package hust.soict.itep.garbage;
2
3⊖ import java.io.IOException;
4  import java.nio.file.Files;
5  import java.nio.file.Paths;
6  //DoDinhTrung-20226128
7  public class GarbageCreator {
8⊖     public static void main(String[] args) throws IOException {
9          // path file text
10         String filename = "C:\\Users\\Admin\\OneDrive - Hanoi University of S
11         byte[] inputBytes = { 0 };
12         long startTime, endTime;
13         try {
14             inputBytes = Files.readAllBytes(Paths.get(filename));
15         } catch (NullPointerException e) {
16             System.out.println("File not found: " + filename);
17             return;
18         }
```

Problems @ Javadoc ⓔ Declaration 🖥 Console ✕

<terminated> GarbageCreator [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe (17:10:47 26 thg 11

48

Figure 22 Result: program hangs

```
1   package hust.soict.itep.garbage;
2
3⊖ import java.io.IOException;
4   import java.nio.file.Files;
5   import java.nio.file.Paths;
6   //DoDinhTrung-20226128
7   public class NoGarbage {
8⊖      public static void main(String[] args) throws IOException {
9           //path file text
10          String filename = "C:\\Users\\Admin\\OneDrive - Hanoi University of Science and Technology\\JavaBasics\\OtherProjects\\src\\hust\\so
11          byte[] inputBytes = { 0 };
12          long startTime, endTime;
13          try {
14              inputBytes = Files.readAllBytes(Paths.get(filename));
15          } catch (NullPointerException e) {
16              System.out.println("File not found: " + filename);
17              return;
18          }
19          startTime = System.currentTimeMillis();
20          StringBuilder outputStringBuilder = new StringBuilder("");
21          for(byte b : inputBytes) {
22              outputStringBuilder.append((char)b);
23          }
24          endTime = System.currentTimeMillis();
25          System.out.println(endTime - startTime);
26      }
27  }
28
```

Figure 23 NoGarbage class

```
1   package hust.soict.itep.garbage;
2
3⊖ import java.io.IOException;
4   import java.nio.file.Files;
5   import java.nio.file.Paths;
6   //DoDinhTrung-20226128
7   public class NoGarbage {
8⊖      public static void main(String[] args) throws IOException {
9           //path file text
10          String filename = "C:\\Users\\Admin\\OneDrive - Hanoi University of S
11          byte[] inputBytes = { 0 };
12          long startTime, endTime;
13          try {
14              inputBytes = Files.readAllBytes(Paths.get(filename));
15          } catch (NullPointerException e) {
16              System.out.println("File not found: " + filename);
17              return;
18          }
```

Problems   @ Javadoc   Declaration   Console ×

<terminated> NoGarbage [Java Application] C:\Program Files\Java\jdk-22\bin\javaw.exe (17:12:37 26 thg 11, 202

2

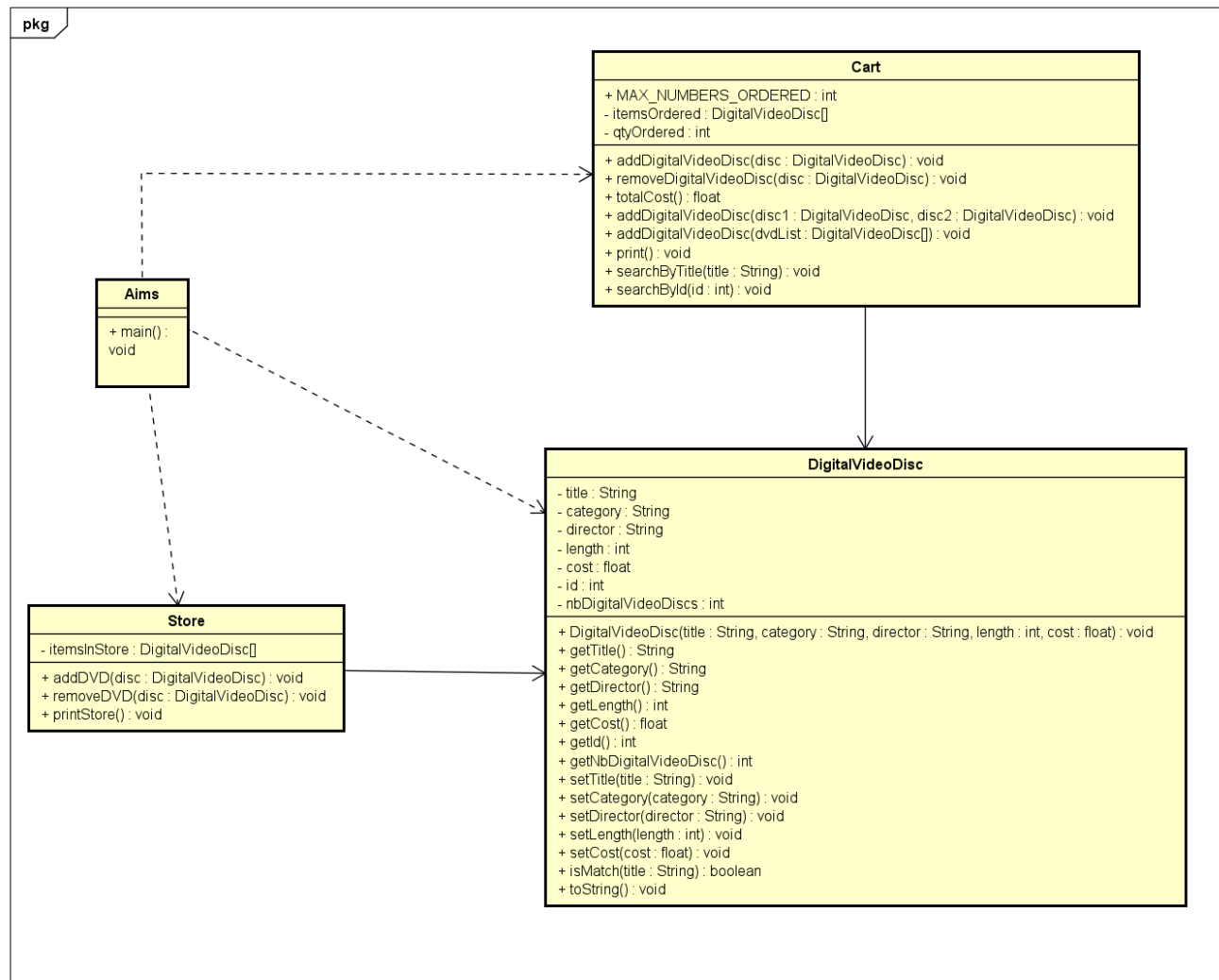*Figure 24 Result: Program finishes quickly*

7 Class Diagram

pkg

Cart

+ MAX_NUMBERS_ORDERED : int
- itemsOrdered : DigitalVideoDisc[]
- qtyOrdered : int

+ addDigitalVideoDisc(disc : DigitalVideoDisc) : void
+ removeDigitalVideoDisc(disc : DigitalVideoDisc) : void
+ totalCost() : float
+ addDigitalVideoDisc(disc1 : DigitalVideoDisc, disc2 : DigitalVideoDisc) : void
+ addDigitalVideoDisc(dvdList : DigitalVideoDisc[]) : void
+ print() : void
+ searchByTitle(title : String) : void
+ searchById(id : int) : void

Aims

+ main() :
void

DigitalVideoDisc

- title : String
- category : String
- director : String
- length : int
- cost : float
- id : int
- nbDigitalVideoDiscs : int

+ DigitalVideoDisc(title : String, category : String, director : String, length : int, cost : float) : void
+ getTitle() : String
+ getCategory() : String
+ getDirector() : String
+ getLength() : int
+ getCost() : float
+ getId() : int
+ getNbDigitalVideoDisc() : int
+ setTitle(title : String) : void
+ setCategory(category : String) : void
+ setDirector(director : String) : void
+ setLength(length : int) : void
+ setCost(cost : float) : void
+ isMatch(title : String) : boolean
+ toString() : void

Store

- itemsInStore : DigitalVideoDisc[]

+ addDVD(disc : DigitalVideoDisc) : void
+ removeDVD(disc : DigitalVideoDisc) : void
+ printStore() : void

Figure 25 Class Diagram

Table of Figures