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IT3103 – LAB 03: Basic Object-Oriented Techniques

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?

Tiêu đề của hai đối tượng không thay đổi vì Java sử dụng cơ chế truyền tham trị (pass-by-value) khi gọi hàm. Khi bạn truyền một tham chiếu đối tượng (như `jungleDVD` hoặc `cinderellaDVD`) vào phương thức, Java chỉ truyền bản sao của tham chiếu chứ không phải bản thân đối tượng.

Tiêu đề của `jungleDVD` thay đổi vì phương thức `changeTitle` trực tiếp thay đổi trạng thái của đối tượng mà tham chiếu `dvd` trỏ tới.

- TestPassingParameter với swap cũ:

```

1 package aims;
2
3 public class TestPassingParameter {
4     public static void main(String[] args) {
5         //TODO Auto-generated method stub
6         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
7         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
8
9
10        swap(jungleDVD, cinderellaDVD);
11        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
12        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
13
14        changeTitle(jungleDVD, cinderellaDVD.getTitle());
15        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
16    }
17
18    public static void swap (Object o1, Object o2) {
19        Object tmp = o1;
20        o1 = o2;
21        o2 = tmp;
22    }
23
24    public static void changeTitle(DigitalVideoDisc dvd, String title) {
25        String oldTitle = dvd.getTitle();
26        dvd.setTitle(title);
27        dvd = new DigitalVideoDisc(oldTitle);
28    }
29 }

```

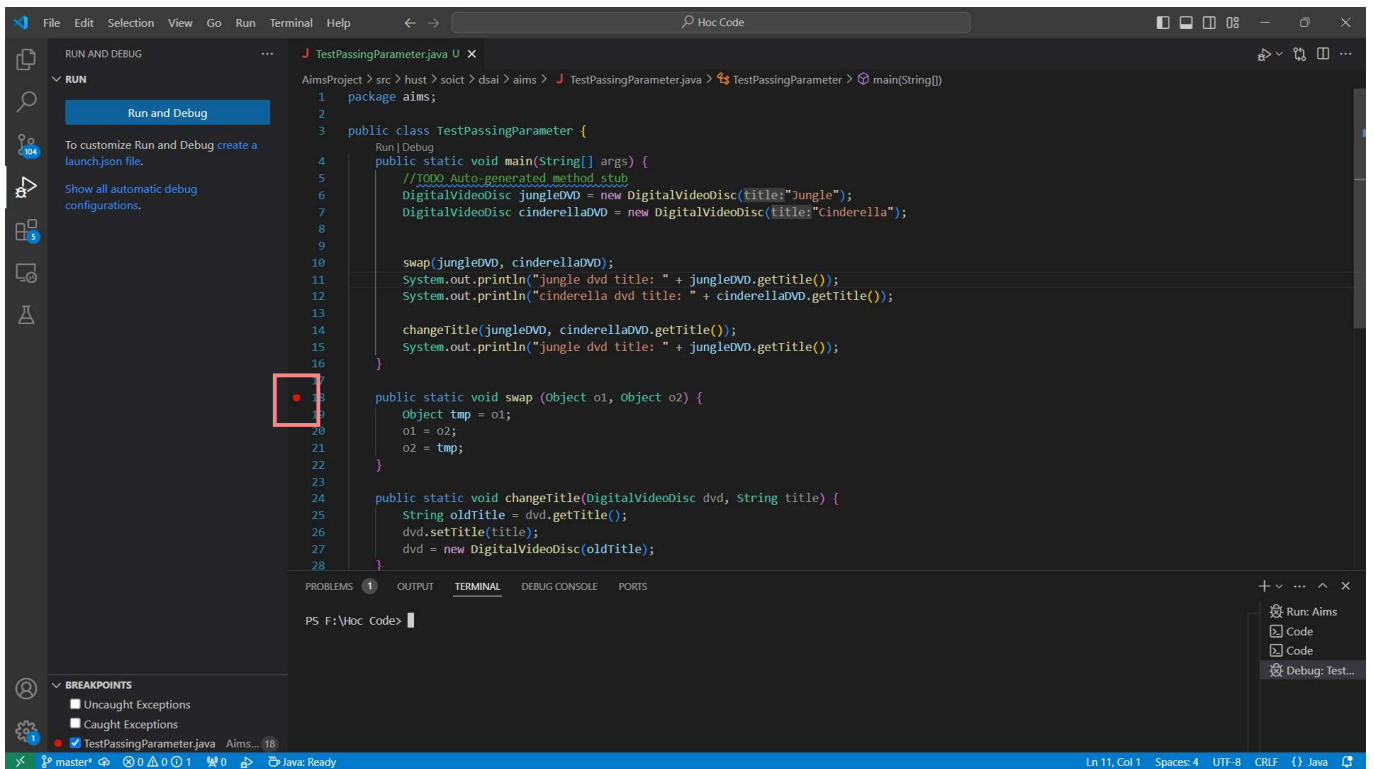
- TestPassingParameter với swap mới:

```

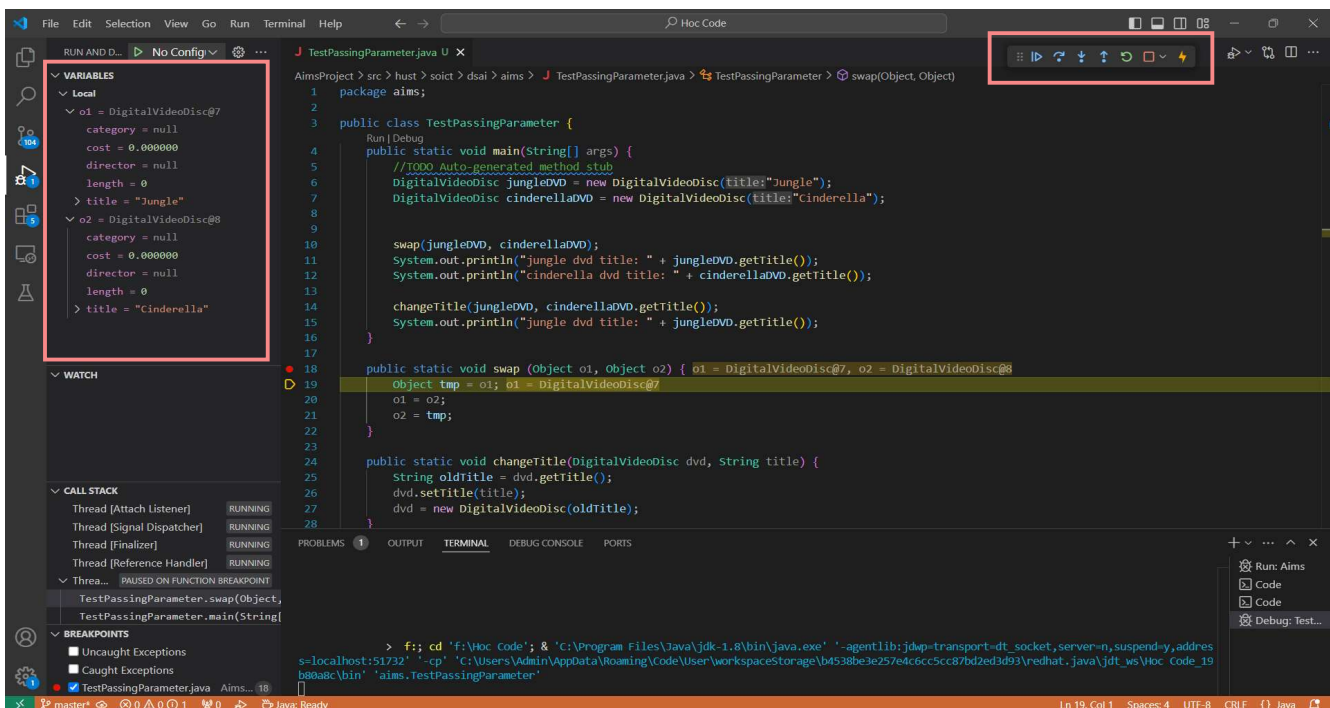
1 package aims;
2
3 public class TestPassingParameter {
4     public static void main(String[] args) {
5         //TODO Auto-generated method stub
6         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
7         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
8
9         Wrapper<DigitalVideoDisc> jungleWrapper = new Wrapper<>(jungleDVD);
10        Wrapper<DigitalVideoDisc> cinderellaWrapper = new Wrapper<>(cinderellaDVD);
11
12        swap(jungleWrapper, cinderellaWrapper);
13
14        jungleDVD = jungleWrapper.value;
15        cinderellaDVD = cinderellaWrapper.value;
16
17        System.out.println("After swap:");
18        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
19        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
20
21        changeTitle(jungleDVD, cinderellaDVD.getTitle());
22        System.out.println("After change title:");
23        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
24    }
25
26    //old swap
27    /*
28    public static void swap (Object o1, Object o2) {
29        Object tmp = o1;
30        o1 = o2;
31        o2 = tmp;
32    }
33    */
34
35    //New swap
36    public static class Wrapper<T> {
37        public T value;
38
39        public Wrapper(T value) {
40            this.value = value;
41        }
42    }
43
44    public static <T> void swap(Wrapper<T> o1, Wrapper<T> o2) {
45        T temp = o1.value;
46        o1.value = o2.value;
47        o2.value = temp;
48    }
49
50
51    public static void changeTitle(DigitalVideoDisc dvd, String title) {
52        String oldTitle = dvd.getTitle();
53        dvd.setTitle(title);
54        dvd = new DigitalVideoDisc(oldTitle);
55    }
56 }

```

- Set up break point:



- Run in debug mode: (Step Into, Step Over, Step Return, value of variables)



- Investigate value of variables:

The screenshot shows an IDE with the following state:

- VARIABLES:**
 - Local
 - o1 = DigitalVideoDisc@7
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Jungle"
 - o2 = DigitalVideoDisc@8
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Cinderella"
- WATCH:** Empty.
- CALL STACK:**
 - Thread [Finalizer] RUNNING
 - Thread [Reference Handler] RUNNING
 - Thread [main] PAUSED ON FUNCTION BREAKPOINT
 - TestPassingParameter.swap(Object, Object)
 - TestPassingParameter.main(String[] args)
- BREAKPOINTS:**
 - Uncaught Exceptions
 - Caught Exceptions
 - TestPassingParameter.java: Aims... (18)
- Code:**

```
1 package aims;
2
3 public class TestPassingParameter {
4     //TODO Auto-generated method stub
5     DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
6     DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
7
8     swap(jungleDVD, cinderellaDVD);
9     System.out.println("jungle dvd title: " + jungleDVD.getTitle());
10    System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
11
12    changeTitle(jungleDVD, cinderellaDVD.getTitle());
13    System.out.println("jungle dvd title: " + jungleDVD.getTitle());
14
15 }
16
17 public static void swap (Object o1, Object o2) { o1 = DigitalVideoDisc@7, o2 = DigitalVideoDisc@8
18     Object tmp = o1; o1 = DigitalVideoDisc@7
19     o1 = o2;
20     o2 = tmp;
21 }
22
23 public static void changeTitle(DigitalVideoDisc dvd, String title) {
24     String oldtitle = dvd.getTitle();
25     dvd.setTitle(title);
26     dvd = new DigitalVideoDisc(oldtitle);
27 }
28 }
```

+ Khởi tạo tmp = o1:

The screenshot shows the IDE after adding a breakpoint and stepping through the swap method:

- VARIABLES:**
 - Local
 - o1 = DigitalVideoDisc@7
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Jungle"
 - o2 = DigitalVideoDisc@8
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Cinderella"
 - tmp = DigitalVideoDisc@7
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Jungle"
- WATCH:** Empty.
- CALL STACK:**
 - Thread [Finalizer] RUNNING
 - Thread [Reference Handler] RUNNING
 - Thread [main] PAUSED ON STEP
 - TestPassingParameter.swap(Object, Object)
 - TestPassingParameter.main(String[] args)
- BREAKPOINTS:**
 - Uncaught Exceptions
 - Caught Exceptions
 - TestPassingParameter.java: Aims... (18)
- Code:**

```
1 package aims;
2
3 public class TestPassingParameter {
4     //TODO Auto-generated method stub
5     DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
6     DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
7
8     swap(jungleDVD, cinderellaDVD);
9     System.out.println("jungle dvd title: " + jungleDVD.getTitle());
10    System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
11
12    changeTitle(jungleDVD, cinderellaDVD.getTitle());
13    System.out.println("jungle dvd title: " + jungleDVD.getTitle());
14
15 }
16
17 public static void swap (Object o1, Object o2) { o1 = DigitalVideoDisc@7, o2 = DigitalVideoDisc@8
18     Object tmp = o1; tmp = DigitalVideoDisc@7, o1 = DigitalVideoDisc@7
19     o1 = o2; 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 }
```


+ o1 = o2 (Title o1 thay đổi)

```
File Edit Selection View Go Run Terminal Help
Hoc Code
RUN AND D... No Config
VARIABLES
  Local
    o1 = DigitalVideoDisc@8
      category = null
      cost = 0.000000
      director = null
      length = 0
      title = "Cinderella"
    o2 = DigitalVideoDisc@8
      category = null
      cost = 0.000000
      director = null
      length = 0
      title = "Cinderella"
    tmp = DigitalVideoDisc@7
      category = null
      cost = 0.000000
      director = null
  WATCH
  CALL STACK
    Thread [Finalizer] RUNNING
    Thread [Reference Handler] RUNNING
    Thread [main] PAUSED ON STEP
      TestPassingParameter.swap(Object, Object)
      TestPassingParameter.main(String[])
  BREAKPOINTS
    Uncaught Exceptions
    Caught Exceptions
    TestPassingParameter.java Aims... 18
  PROBLEMS 1 OUTPUT TERMINAL DEBUG CONSOLE PORTS
  PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s:localhost:51815' '-cp' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat_java\jdt_ws\Hoc Code_19\b80a8c\bin' 'aims.TestPassingParameter'
  PS F:\Hoc Code> ^C
  PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s:localhost:51824' '-cp' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat_java\jdt_ws\Hoc Code_19\b80a8c\bin' 'aims.TestPassingParameter'
```

+ o2 = tmp (Tiêu đề o2 thay đổi)

```
File Edit Selection View Go Run Terminal Help
Hoc Code
RUN AND D... No Config
VARIABLES
  Local
    o1 = DigitalVideoDisc@8
      category = null
      cost = 0.000000
      director = null
      length = 0
      title = "Cinderella"
    o2 = DigitalVideoDisc@7
      category = null
      cost = 0.000000
      director = null
      length = 0
      title = "Jungle"
    tmp = DigitalVideoDisc@7
      category = null
      cost = 0.000000
      director = null
  WATCH
  CALL STACK
    Thread [Finalizer] RUNNING
    Thread [Reference Handler] RUNNING
    Thread [main] PAUSED ON STEP
      TestPassingParameter.swap(Object, Object)
      TestPassingParameter.main(String[])
  BREAKPOINTS
    Uncaught Exceptions
    Caught Exceptions
    TestPassingParameter.java Aims... 18
  PROBLEMS 1 OUTPUT TERMINAL DEBUG CONSOLE PORTS
  PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s:localhost:51815' '-cp' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat_java\jdt_ws\Hoc Code_19\b80a8c\bin' 'aims.TestPassingParameter'
  PS F:\Hoc Code> ^C
  PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s:localhost:51824' '-cp' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat_java\jdt_ws\Hoc Code_19\b80a8c\bin' 'aims.TestPassingParameter'
```

- Change value of variables:

+ The Title of jungleDVD vẫn là “Jungle”:

```
1 package aims;
2
3 public class TestPassingParameter {
4     public static void main(String[] args) { args = String[0]@7
5         //TODO Auto-generated method stub
6         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle"); jungleDVD = DigitalVideoDisc@8
7         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella"); cinderellaDVD = DigitalVideoDisc@9
8
9
10        swap(jungleDVD, cinderellaDVD); jungleDVD = DigitalVideoDisc@8, cinderellaDVD = DigitalVideoDisc@9
11        System.out.println("jungle dvd title: " + jungleDVD.getTitle()); jungleDVD = DigitalVideoDisc@8
12        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
13
14        changeTitle(jungleDVD, cinderellaDVD.getTitle());
15        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
16    }
17
18    public static void swap (Object o1, Object o2) {
19        Object tmp = o1;
20        o1 = o2;
21        o2 = tmp;
22    }
23
24    public static void changeTitle(DigitalVideoDisc dvd, String title) {
25        String oldTitle = dvd.getTitle();
26        dvd.setTitle(title);
27        dvd = new DigitalVideoDisc(oldTitle);
28    }
29 }
```

Variables:

- args = String[0]@7
- jungleDVD = DigitalVideoDisc@8
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Jungle"
- cinderellaDVD = DigitalVideoDisc@9
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Cinderella"

Watch:

- hash = 0
- value = char[3]@27
- cinderellaDVD = DigitalVideoDisc@9
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Cinderella"

Call Stack:

- Thread [main] (dispatcher): RUNNING
- Thread [Signal Dispatcher]: RUNNING
- Thread [Finalizer]: RUNNING
- Thread [Reference Handler]: RUNNING
- Thread [main]: PAUSED ON BREAKPOINT
- TestPassingParameter.main(String[]): PAUSED ON BREAKPOINT

Breakpoints:

- Uncaught Exceptions
- Caught Exceptions
- TestPassingParameter.java: 11

Terminal:

```
PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' -agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s=localhost:51824 -cp 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat.java\jdt_ws\Hoc_Code_19\b80a8c\bin' 'aims.TestPassingParameter'
PS F:\Hoc Code>
PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' -agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s=localhost:51824 -cp 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat.java\jdt_ws\Hoc_Code_19\b80a8c\bin' 'aims.TestPassingParameter'
```

+ Đổi title jungleDVD thành “abc”:

```
1 package aims;
2
3 public class TestPassingParameter {
4     public static void main(String[] args) { args = String[0]@7
5         //TODO Auto-generated method stub
6         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle"); jungleDVD = DigitalVideoDisc@8
7         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella"); cinderellaDVD = DigitalVideoDisc@9
8
9
10        swap(jungleDVD, cinderellaDVD); jungleDVD = DigitalVideoDisc@8, cinderellaDVD = DigitalVideoDisc@9
11        System.out.println("jungle dvd title: " + jungleDVD.getTitle()); jungleDVD = DigitalVideoDisc@8
12        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle());
13
14        changeTitle(jungleDVD, cinderellaDVD.getTitle());
15        System.out.println("jungle dvd title: " + jungleDVD.getTitle());
16    }
17
18    public static void swap (Object o1, Object o2) {
19        Object tmp = o1;
20        o1 = o2;
21        o2 = tmp;
22    }
23
24    public static void changeTitle(DigitalVideoDisc dvd, String title) {
25        String oldTitle = dvd.getTitle();
26        dvd.setTitle(title);
27        dvd = new DigitalVideoDisc(oldTitle);
28    }
29 }
```

Variables:

- args = String[0]@7
- jungleDVD = DigitalVideoDisc@8
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "abc"
- cinderellaDVD = DigitalVideoDisc@9
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Cinderella"

Watch:

- hash = 0
- value = char[3]@27
- cinderellaDVD = DigitalVideoDisc@9
 - category = null
 - cost = 0.000000
 - director = null
 - length = 0
 - title = "Cinderella"

Call Stack:

- Thread [main] (dispatcher): RUNNING
- Thread [Signal Dispatcher]: RUNNING
- Thread [Finalizer]: RUNNING
- Thread [Reference Handler]: RUNNING
- Thread [main]: PAUSED ON BREAKPOINT
- TestPassingParameter.main(String[]): PAUSED ON BREAKPOINT

Breakpoints:

- Uncaught Exceptions
- Caught Exceptions
- TestPassingParameter.java: 11

Terminal:

```
PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' -agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s=localhost:51824 -cp 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat.java\jdt_ws\Hoc_Code_19\b80a8c\bin' 'aims.TestPassingParameter'
PS F:\Hoc Code>
PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' -agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s=localhost:51824 -cp 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat.java\jdt_ws\Hoc_Code_19\b80a8c\bin' 'aims.TestPassingParameter'
```

+ Kết quả in:

The screenshot shows an IDE with a Java project named 'AimsProject'. The main class is 'TestPassingParameter.java'. The program is running, and the output in the terminal is 'jungle dvd title: abc', which is highlighted with a red box. The variables section on the left shows the state of the program, including 'args', 'jungleDVD', 'cinderellaDVD', and 'title'. The call stack shows the method 'main' in 'TestPassingParameter'.

```
package aims;

public class TestPassingParameter {

    public static void main(String[] args) {
        //TODO Auto-generated method stub
        DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"jungle"); jungleDVD = DigitalVideoDisc@8
        DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella"); cinderellaDVD = DigitalVideoDisc@9

        swap(jungleDVD, cinderellaDVD); jungleDVD = DigitalVideoDisc@8, cinderellaDVD = DigitalVideoDisc@9
        System.out.println("jungle dvd title: " + jungleDVD.getTitle()); jungleDVD = DigitalVideoDisc@8
        System.out.println("cinderella dvd title: " + cinderellaDVD.getTitle()); cinderellaDVD = DigitalVideoDisc@9

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

    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.getTitle();
        dvd.setTitle(title);
        dvd = new DigitalVideoDisc(oldTitle);
    }
}
```

Terminal Output:

```
s=localhost:51824 ' -cp' 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat.java\jdt_ws\Hoc Code_19
b80a8c\bin' 'aims.TestPassingParameter'
PS F:\Hoc Code> ^C
PS F:\Hoc Code>
PS F:\Hoc Code> f; cd 'f:\Hoc Code'; & 'C:\Program Files\Java\jdk-1.8\bin\java.exe' '-agentlib:jdwp=transport=dt_socket,server=n,suspend=y,address=s=localhost:51824' -cp 'C:\Users\Admin\AppData\Roaming\Code\User\workspaceStorage\b4538be3e257e4c6cc5cc87bd2ed3d93\redhat.java\jdt_ws\Hoc Code_19
b80a8c\bin' 'aims.TestPassingParameter'
jungle dvd title: abc
```


- **Chỉnh sửa trong class DigitalVideoDisc**
 - + Thêm id và nbDigitalVideoDisc

```
3 public class DigitalVideoDisc {
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    //Đếm số lượng DVD hiện có
11    private static int nbDigitalVideoDisc = 0;
```

- + Thêm setter setTitle

```
38    //Setter
39    public void setTitle(String newTitle) {
40        this.title = newTitle;
41    }
42
```

- + Thêm tự cập nhập id của DVD vào các constructor

```
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;

    //Gán ID và cập nhập biến đếm nbDigitalVideoDisc
    this.id = ++nbDigitalVideoDisc;
}
```

- + Method kiểm tra Title

```
//Kiểm tra xem có đúng Title không
public boolean isMatch(String title){
    return this.title.equalsIgnoreCase(title);
}
```


+ **Chỉnh sửa lại method hiển thị cho phù hợp với format yêu cầu**

```
//Hiển thị thông tin DVD
public void displayInfo() {
    System.out.print(s:"DVD -");
    System.out.print(" " + title);
    if (category != null) {
        System.out.print(" - " + category);
    } else System.out.print(s:" - Not Found" );
    if (director != null) {
        System.out.print(" - " + director);
    } else System.out.print(s:" - Not Found" );
    if (length != 0) {
        System.out.print(" - " + length + " mins");
    } else System.out.print(s:" - Not Found" );
    System.out.print(": " + cost + "$");
    System.out.println();
}
```

- **Chỉnh sửa trong class Cart:**

+ **Overload thêm các method addDigitalVideoDisc:**

```
public void addDigitalVideoDisc (DigitalVideoDisc[] discList) {  
    for (DigitalVideoDisc disc : discList) {  
        if (qtyOrdered < MAX_NUMBERS_ORDERED) {  
            addDigitalVideoDisc(disc);  
        } else System.out.println(x:"The cart is full. Cannot add more items!");  
    }  
}
```

```
public void addDigitalVideoDisc (DigitalVideoDisc disc1, DigitalVideoDisc disc2) {  
    if ((qtyOrdered + 1) < MAX_NUMBERS_ORDERED) {  
        addDigitalVideoDisc(disc1);  
        addDigitalVideoDisc(disc2);  
    } else System.out.print(s:"The cart is full. Cannot add two more items!");  
}
```

+ **Thêm tìm kiếm bằng id:**

```
//Tìm kiếm bằng ID  
public void searchById(int id) {  
    boolean found = false;  
    for (int i = 0; i < qtyOrdered; i++) {  
        if (itemsOrdered[i].getId() == id) {  
            found = true;  
            System.out.println("Found the DVD with ID " + id + ": \n");  
            itemsOrdered[i].displayInfo();  
            break;  
        }  
    }  
    if (!found) System.out.println("No DVD found with ID " + id + "!");  
}
```

+ **Thêm tìm kiếm bằng title:**

```
//Tìm kiếm bằng Title  
public void searchByTitle(String title) {  
    boolean found = false;  
    for (int i = 0; i < qtyOrdered; i++) {  
        if (itemsOrdered[i].isMatch(title)) {  
            found = true;  
            System.out.println("\nFound the DVD with title \"" + title + "\": ");  
            itemsOrdered[i].displayInfo();  
        }  
    }  
    if (!found) {  
        System.out.println("\nNo DVD found with title \"" + title + "\"!");  
    }  
}
```

+ **Chỉnh sửa lại method hiển thị giỏ cho phù hợp với yêu cầu:**

```
//Hiển thị giỏ hàng
public void displayCart() {
    System.out.println();
    System.out.println("Current items in the cart: " + qtyOrdered + " item(s).");
    System.out.println(x:"*****CART*****");
    for (int i = 0; i < qtyOrdered; i++) {
        System.out.print((i+1) + ". ");
        itemsOrdered[i].displayInfo();
    }
    System.out.println(x:"-----");
    System.out.println("Total cost: $" + totalCost());
    System.out.println(x:"*****");
    System.out.println();
}
```

- Thêm class TestPassingParamter:

```
AimsProject > src > hust > soict > dsai > aims > TestPassingParameter.java > TestPassingParameter > main(String[])
1 package aims;
2
3 public class TestPassingParameter {
4     public static void main(String[] args) {
5         // TODO Auto-generated method stub
6         DigitalVideoDisc jungleDVD = new DigitalVideoDisc(title:"Jungle");
7         DigitalVideoDisc cinderellaDVD = new DigitalVideoDisc(title:"Cinderella");
8
9         Wrapper<DigitalVideoDisc> jungleWrapper = new Wrapper<>(jungleDVD);
10        Wrapper<DigitalVideoDisc> cinderellaWrapper = new Wrapper<>(cinderellaDVD);
11
12        swap(jungleWrapper, cinderellaWrapper);
13
14        jungleDVD = jungleWrapper.value;
15        cinderellaDVD = cinderellaWrapper.value;
16
17        System.out.println("After swap:");
18        System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
19        System.out.println("Cinderella dvd title: " + cinderellaDVD.getTitle());
20
21        changeTitle(jungleDVD, cinderellaDVD.getTitle());
22        System.out.println("After change title: ");
23        System.out.println("Jungle dvd title: " + jungleDVD.getTitle());
24    }
25
26    //Old swap
27    /*
28    public static void swap (Object o1, Object o2) {
29        Object tmp = o1;
30        o1 = o2;
31        o2 = tmp;
32    }
33    */
34
35    //New swap
```

```
35    //New swap
36    public static class Wrapper<T> {
37        public T value;
38
39        public Wrapper(T value) {
40            this.value = value;
41        }
42    }
43
44    public static <T> void swap(Wrapper<T> o1, Wrapper<T> o2) {
45        T temp = o1.value;
46        o1.value = o2.value;
47        o2.value = temp;
48    }
49
50
51    public static void changeTitle(DigitalVideoDisc dvd, String title) {
52        String oldTitle = dvd.getTitle();
53        dvd.setTitle(title);
54        dvd = new DigitalVideoDisc(oldTitle);
55    }
56 }
```


- Thêm class CartTest:

```
AimsProject > src > hust > soict > dsai > aims > J CartTest.java > ...
1  package aims;
2
3  public class CartTest {
4      Run | Debug
      public static void main(String[] args) {
5          //create new cart
6          Cart cart = new Cart();
7
8          //Create new DVD and add to Cart
9          DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", director:"Roger Allers", length:87, cost:19.95f);
10         cart.addDigitalVideoDisc(dvd1);
11
12         DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", director:"George Lucas", length:87, cost:24.95f);
13         cart.addDigitalVideoDisc(dvd2);
14
15         DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);
16         cart.addDigitalVideoDisc(dvd3);
17
18         //Test the print method
19         cart.displayCart();
20
21         //Test Search by ID
22         cart.searchById(id:1);
23         cart.searchById(id:10);
24
25         //Test Search by Ttitle
26         cart.searchByTitle(title:"Star Wars");
27         cart.searchByTitle(title:"abc");
28     }
29
30 }
31
```

- Thêm class Store:

```
AimsProject > src > hult > soict > dsai > aims > J Store.java > Store > displayStore()
1 package aims;
2
3 public class Store {
4     private DigitalVideoDisc[] itemsInStore; // Array to hold DVDs
5     private int currentIndex; // Tracks the current index in the store
6
7     // Default Constructor
8     public Store() {
9         itemsInStore = new DigitalVideoDisc[100000]; // Initialize the array
10        currentIndex = 0; // Start from the first position in the store
11    }
12
13    // Constructor with a max items number
14    public Store(int maxItems) {
15        itemsInStore = new DigitalVideoDisc[maxItems]; // Initialize the array
16        currentIndex = 0; // Start from the first position in the store
17    }
18
19    // Method to add a DVD to the store
20    public void addDigitalVideoDisc(DigitalVideoDisc dvd) {
21        if (currentIndex < itemsInStore.length) {
22            itemsInStore[currentIndex] = dvd; // Add DVD to the store
23            currentIndex++; // Move to the next position
24            System.out.println("The DVD \" + dvd.getTitle() + "\" has been added to the store!");
25        } else {
26            System.out.println("The store is full. Cannot add more DVDs!");
27        }
28    }
29
30    // Method to remove a DVD from the store
31    public void removeDigitalVideoDisc(DigitalVideoDisc dvd) {
32        boolean found = false;
33        for (int i = 0; i < currentIndex; i++) {
34            if (itemsInStore[i].getId() == dvd.getId()) { // Find DVD by ID
35                found = true;
36                // Shift items to the left to fill the gap
37                for (int j = i; j < currentIndex - 1; j++) {
38                    itemsInStore[j] = itemsInStore[j + 1];
39                }
40                itemsInStore[currentIndex - 1] = null; // Clear last item
41                currentIndex--; // Decrease the number of DVDs in store
42                System.out.println("The DVD \" + dvd.getTitle() + "\" has been removed from the store!");
43                break;
44            }
45        }
46        if (!found) {
47            System.out.println("The DVD with title '" + dvd.getTitle() + "' was not found in the store!");
48        }
49    }
50
51    // Method to display all DVDs in the store
52    public void displayStore() {
53        System.out.println("***** Store Inventory *****");
54        if (currentIndex == 0) {
55            System.out.println("The store is empty.");
56        } else {
57            for (int i = 0; i < currentIndex; i++) {
58                System.out.print((i + 1) + ". ");
59                itemsInStore[i].displayInfo(); // Display each DVD's info
60            }
61        }
62        System.out.println("*****");
63    }
64
65 }
```

- Thêm class StoreTest:

```
AimsProject > src > hust > soict > dsai > aims > StoreTest.java > StoreTest > main(String[])
1 package aims;
2
3 public class StoreTest {
4     Run | Debug
5     public static void main(String[] args) {
6         Store store = new Store(maxItems:5); //With or without max number of items allow
7
8         DigitalVideoDisc dvd1 = new DigitalVideoDisc(title:"The Lion King", category:"Animation", director:"Roger Allers", length:87, cost:19.95f);
9         store.addDigitalVideoDisc(dvd1);
10        DigitalVideoDisc dvd2 = new DigitalVideoDisc(title:"Star Wars", category:"Science Fiction", director:"George Lucas", length:87, cost:24.95f);
11        store.addDigitalVideoDisc(dvd2);
12        DigitalVideoDisc dvd3 = new DigitalVideoDisc(title:"Aladin", category:"Animation", cost:18.99f);
13        store.addDigitalVideoDisc(dvd3);
14        DigitalVideoDisc dvd4 = new DigitalVideoDisc(title:"Toy Story", category:"Animation", director:"John Lasseter", length:81, cost:17.99f);
15        store.addDigitalVideoDisc(dvd4);
16        DigitalVideoDisc dvd5 = new DigitalVideoDisc(title:"Frozen", category:"Animation", director:"Chris Buck", length:102, cost:16.99f);
17        store.addDigitalVideoDisc(dvd5);
18        DigitalVideoDisc dvd6 = new DigitalVideoDisc(title:"Beauty and the Beast", category:"Animation", director:"Bill Condon", length:129, cost:20.99f);
19
20        //Display store's inventory
21        store.displayStore();
22
23        //Try add more dvd when capacity is full
24        store.addDigitalVideoDisc(dvd6); //Capacity full
25
26        //Remove a dvd
27        store.removeDigitalVideoDisc(dvd4); //Success
28        store.removeDigitalVideoDisc(dvd6); //Not found
29
30        //Display store's inventory after removal
31        store.displayStore();
32
33        //Add dvd 6 again
34        store.addDigitalVideoDisc(dvd6);
35
36        //Final Result
37        store.displayStore();
38    }
39}
```

Ln 16, Col 41 Spaces: 4 UTF-8 CRLF {} Java

- Class và UseCase Diagram:

