

Lesson 01 Demo 03

Using Various Assertions in JUnit5

Objective: To create various assertions in JUnit5

Tool required: Eclipse IDE

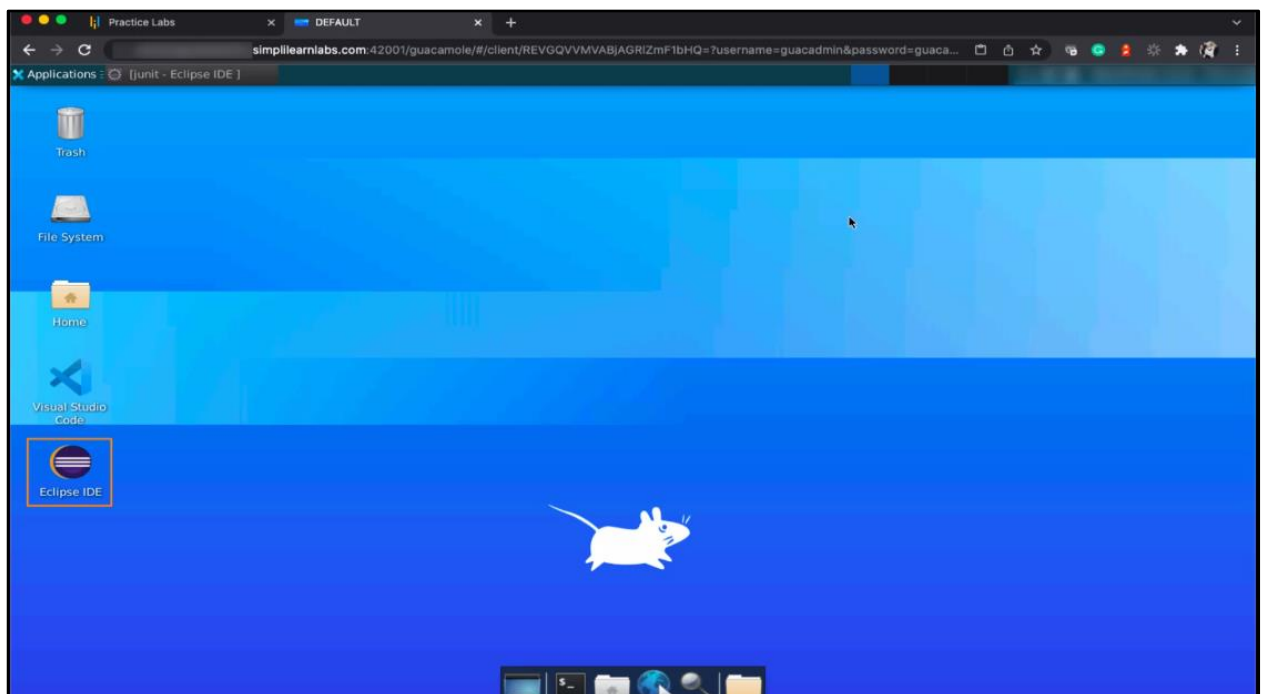
Prerequisites: None

Steps to be followed:

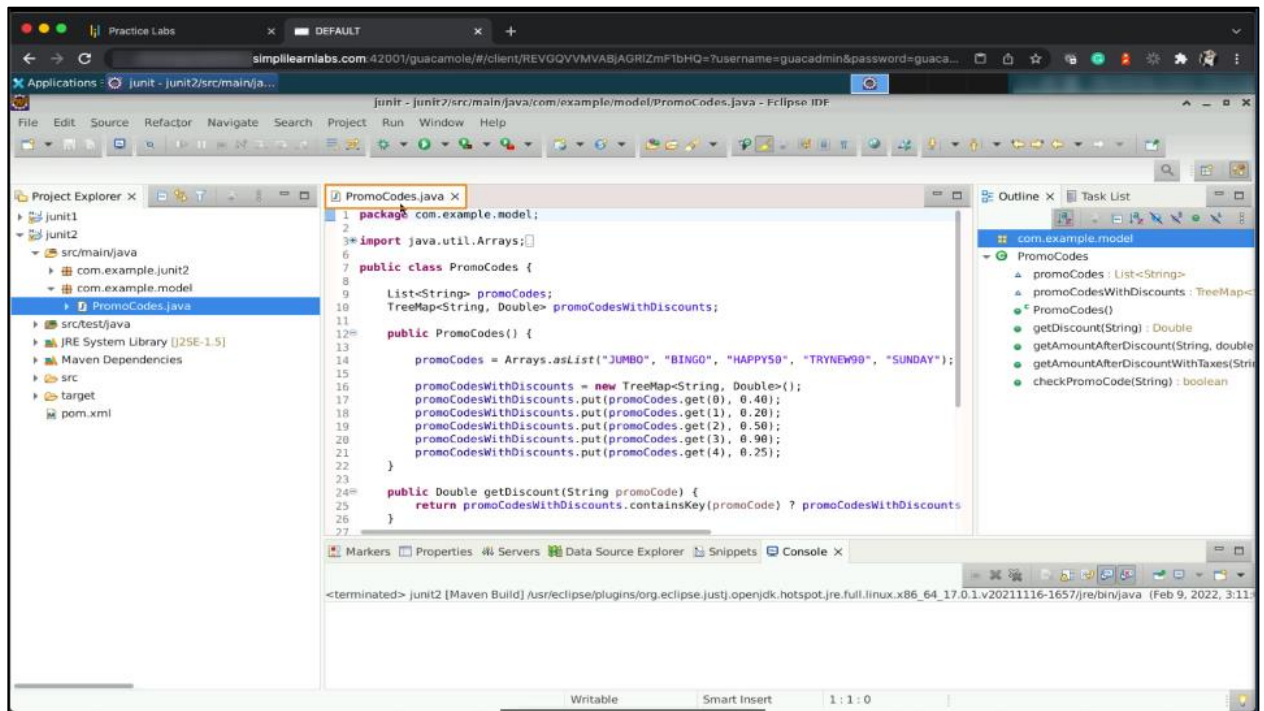
1. Using assertEquals()
2. Using assertAll()
3. Using assertThrows()
4. Using assertTimeout()

Step 1: Using assertEquals()

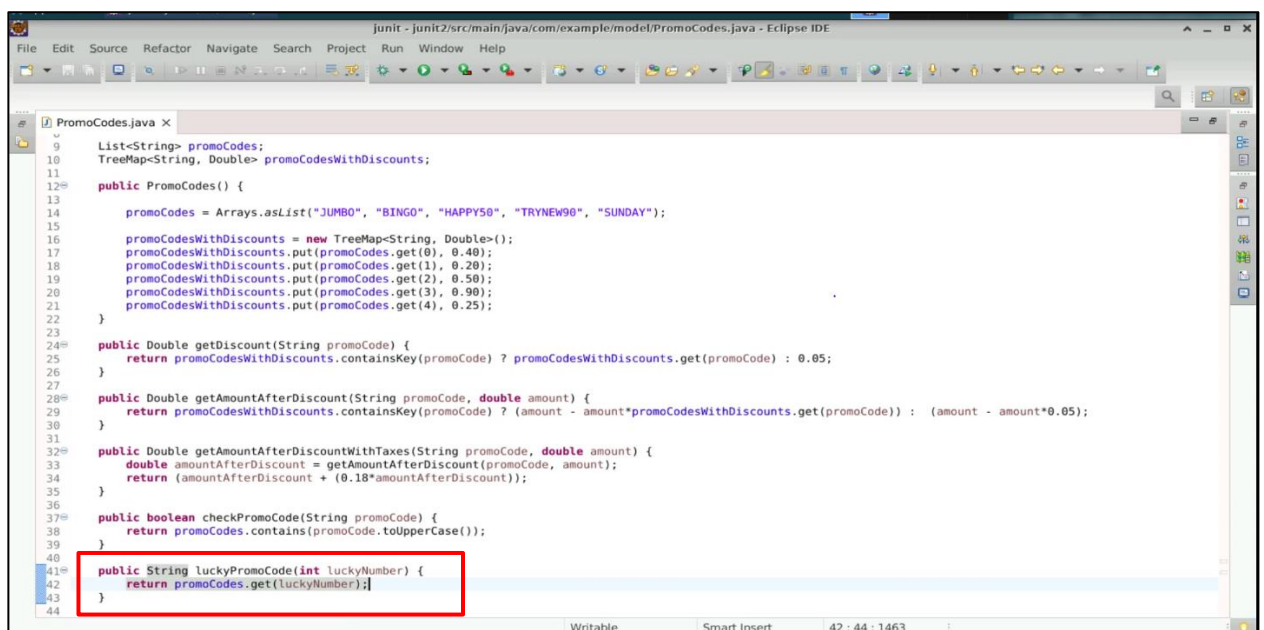
1.1 Open Eclipse IDE



1.2 Go to **junit2** project. Then, go to **src/main/java > com.example.model** and open the **PromoCodes.java** file



1.3 There are four methods available. Create one more method **luckyPromoCode()** and pass **luckyNumber** inside this method. Return the **promo code** from the promo code list



- 1.4 Go to `src/test/java > com.example.junit2` and open the **AppTest.java** file. Create a new test case **basicTest()** to test **assertEquals()** by passing the **expected** and **actual** values. Also, give a failure message to handle errors. Comment on all the other test cases

```

56 }
57
58 @Test
59 public void testDiscount() {
60     String pCode = "JUMBO";
61     double expectedDiscount = 0.4;
62
63     assertEquals(expectedDiscount, promoCodes.getDiscount(pCode));
64 }
65
66 @Test
67 public void testAmountDiscount() {
68     String pCode = "TRYNEW";
69     double amount = 1000;
70     double expectedAmount = 950.0;
71
72     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscount(pCode, amount));
73 }
74
75 @Test
76 public void testAmountDiscountTaxes() {
77     String pCode = "SUNDAY";
78     double amount = 1000;
79     double expectedAmount = 885.0;
80
81     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscountWithTaxes(pCode, amount));
82 }
83
84 @Test
85 public void basicTest() {
86     assertEquals(0.4, promoCodes.getDiscount("JUMBO"));
87     assertEquals(0.4, promoCodes.getDiscount("YEAR2022"), "Sorry!! This Promo Code isnt available");
88 }
89
90 }

```

- 1.5 Now, right-click on project **junit2**. Click **Run As** option and build this project as a **Maven test**

```

<url>http://maven.apache.org</url>
<properties>
<project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
<maven.compiler.source>1.8</maven.compiler.source>
<maven.compiler.target>1.8</maven.compiler.target>
</properties>
<dependencies>
<!--
<dependency>
<groupId>junit</groupId>
<artifactId>junit</artifactId>
<version>3.8.1</version>
<scope>test</scope>
</dependency>
-->
<dependency>
<groupId>org.junit.jupiter</groupId>
<artifactId>junit-jupiter-api</artifactId>
<version>5.8.2</version>
<scope>test</scope>
</dependency>
</dependencies>

```

```

Errors: 0, Skipped: 0, Time elapsed: 0.053 s <<< FAILURE! - in com.example.junit2.AppTest
basicTest Time elapsed: 0.03 s <<< FAILURE!
Sorry!! This Promo Code isnt available ==> expected: <0.4> but was: <0.05>

```

In the console output, you can see 1 test case failed with the same message.

```

<terminated> /usr/eclipse/plugins/org.eclipse.justj.openjdk.hotspot.jre.full/linux.x86_64_17.0.1.v20211116-1657/jre/bin/java (Feb 9, 2022, 3:31:29 PM)
[INFO] -----
[INFO] T E S T S
[INFO] -----
[INFO] Running com.example.junit2.AppTest
[ERROR] Tests run: 1, Failures: 1, Errors: 0, Skipped: 0, Time elapsed: 0.051 s <<< FAILURE! - in com.example.junit2.AppTest
[ERROR] com.example.junit2.AppTest.basicTest Time elapsed: 0.028 s <<< FAILURE!
org.opentest4j.AssertionFailedError: Sorry!! This Promo Code isnt available ==> expected: <0.4> but was: <0.05>
    at com.example.junit2.AppTest.basicTest(AppTest.java:87)
[INFO] -----
[INFO] Results:
[INFO] -----
[ERROR] Failures:
[ERROR]   AppTest.basicTest:87 Sorry!! This Promo Code isnt available ==> expected: <0.4> but was: <0.05>
[INFO] Tests run: 1, Failures: 1, Errors: 0, Skipped: 0
[INFO] -----
[INFO] BUILD FAILURE
[INFO] -----
[INFO] Total time: 1.661 s
[INFO] Finished at: 2022-02-09T15:31:32Z
[INFO] -----
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-surefire-plugin:3.0.0-M5:test (default-test) on project junit2: There are test failures.
[ERROR] Please refer to /home/erishantgmail/junit/junit2/target/surefire-reports for the individual test results.
[ERROR] Please refer to dump files (if any exist) [date].dump, [date]-jvmRun[N].dump and [date].dumpstream.
[ERROR] -> [Help 1]
[ERROR]

```

Step 2: Using assertAll()

2.1 To test multiple cases in one go, create a new test case **groupTest()**. Create **assertAll()** assertion, pass single value, and two lambda expressions

```

65
66
67 @Test
68 public void testAmountDiscount() {
69     String pCode = "TRYNEW";
70     double amount = 1000;
71     double expectedAmount = 950.0;
72     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscount(pCode, amount));
73 }
74
75 @Test
76 public void testAmountDiscountTaxes() {
77     String pCode = "SUNDAY";
78     double amount = 1000;
79     double expectedAmount = 885.0;
80     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscountWithTaxes(pCode, amount));
81 }
82
83 //
84
85 @Test
86 public void basicTest() {
87     assertEquals(0.4, promoCodes.getDiscount("JUMB0"));
88     assertEquals(0.4, promoCodes.getDiscount("YEAR2022"), "Sorry!! This Promo Code isnt available");
89 }
90
91 @Test
92 public void groupTest() {
93     assertAll(0.4,
94         () -> assertEquals(0.4, promoCodes.getDiscount("JUMB0")),
95         () -> assertEquals(0.4, promoCodes.getDiscount("TRYNEW90")),
96     );
97 }
98
99 }

```

2.2 Go to the **PromoCodes.java** file and change the third promo code discount value from **0.90** to **0.40**

```

17 List<String> promoCodes;
18 TreeMap<String, Double> promoCodesWithDiscounts;
19
20 public PromoCodes() {
21     promoCodes = Arrays.asList("JUMBO", "BINGO", "HAPPY50", "TRYNEW90", "SUNDAY");
22     promoCodesWithDiscounts = new TreeMap<String, Double>();
23     promoCodesWithDiscounts.put(promoCodes.get(0), 0.40);
24     promoCodesWithDiscounts.put(promoCodes.get(1), 0.20);
25     promoCodesWithDiscounts.put(promoCodes.get(2), 0.50);
26     promoCodesWithDiscounts.put(promoCodes.get(3), 0.40);
27     promoCodesWithDiscounts.put(promoCodes.get(4), 0.25);
28 }
29
30 public Double getDiscount(String promoCode) {
31     return promoCodesWithDiscounts.containsKey(promoCode) ? promoCodesWithDiscounts.get(promoCode) : 0.05;
32 }
33
34 public Double getAmountAfterDiscount(String promoCode, double amount) {
35     return promoCodesWithDiscounts.containsKey(promoCode) ? (amount - amount*promoCodesWithDiscounts.get(promoCode)) : (amount - amount*0.05);
36 }
37
38 public Double getAmountAfterDiscountWithTaxes(String promoCode, double amount) {
39     double amountAfterDiscount = getAmountAfterDiscount(promoCode, amount);
40     return (amountAfterDiscount + (0.18*amountAfterDiscount));
41 }
42
43 public boolean checkPromoCode(String promoCode) {
44     return promoCodes.contains(promoCode.toUpperCase());
45 }
46
47 public String luckyPromoCode(int luckyNumber) {
48     return promoCodes.get(luckyNumber);
49 }
50 }

```

2.3 Go back to the **AppTest.java** file, and you will get an error. To remove this error, click on the red cross and choose **change project compliance and JRE to 1.8**

```

65 @Test
66 public void testAmountDiscount() {
67     String pCode = "TRYNEW";
68     double amount = 1000;
69     double expectedAmount = 950.0;
70     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscount(pCode, amount));
71 }
72
73 @Test
74 public void testAmountDiscountTaxes() {
75     String pCode = "SUNDAY";
76     double amount = 1000;
77     double expectedAmount = 885.0;
78     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscountWithTaxes(pCode, amount));
79 }
80
81 @Test
82 public void testAmountDiscountTaxes() {
83     String pCode = "SUNDAY";
84     double amount = 1000;
85     double expectedAmount = 885.0;
86     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscountWithTaxes(pCode, amount));
87 }
88
89 @Test
90 public void testAmountDiscountTaxes() {
91     String pCode = "SUNDAY";
92     double amount = 1000;
93     double expectedAmount = 885.0;
94     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscountWithTaxes(pCode, amount));
95 }
96 }
97
98 }
99
100 }

```


2.4 The expected single value we pass in **assterAll()** should be a string. So, pass “**Promo Code Discount as 0.40**”

```

65
66 @Test
67 public void testAmountDiscount() {
68     String pCode = "TRYNEW";
69     double amount = 1000;
70     double expectedAmount = 950.0;
71     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscount(pCode, amount));
72 }
73
74
75 @Test
76 public void testAmountDiscountTaxes() {
77     String pCode = "SUNDAY";
78     double amount = 1000;
79     double expectedAmount = 885.0;
80     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscountWithTaxes(pCode, amount));
81 }
82 }
83
84
85 @Test
86 public void basicTest() {
87     assertEquals(0.4, promoCodes.getDiscount("JUMB0"));
88     assertEquals(0.4, promoCodes.getDiscount("YEAR2022"), "Sorry!! This Promo Code isnt available");
89 }
90
91
92 @Test
93 public void groupTest() {
94     assertionAll("Promo Code Discount as 0.40",
95         ()-> assertEquals(0.4, promoCodes.getDiscount("JUMB0")),
96         ()-> assertEquals(0.4, promoCodes.getDiscount("TRYNEW90"))
97     );
98 }
99
100

```

2.5 Now run the code as a **Maven test** again. In the output, you can see 2 test cases running and 1 failing, which is the previous test case. The new groupTest case will pass.

```

<terminated> /usr/eclipse/plugins/org.eclipse.justi.openjdk.hotspot.jre.full.linux.x86_64_17.0.1.v20211116-1657/jre/bin/java (Feb 9, 2022, 3:35:24 PM)
[INFO] Running com.example.junit2.AppTest
[ERROR] Tests run: 2, Failures: 1, Errors: 0, Skipped: 0, Time elapsed: 0.052 s <<< FAILURE! - in com.example.junit2.AppTest
[ERROR] com.example.junit2.AppTest.basicTest Time elapsed: 0.027 s <<< FAILURE!
org.opentest4j.AssertionFailedError: Sorry!! This Promo Code isnt available ==> expected: <0.4> but was: <0.05>
    at com.example.junit2.AppTest.basicTest(AppTest.java:88)

[INFO]
[INFO] Results:
[INFO]
[ERROR] Failures:
[ERROR]   AppTest.basicTest:88 Sorry!! This Promo Code isnt available ==> expected: <0.4> but was: <0.05>
[INFO]
[ERROR] Tests run: 2, Failures: 1, Errors: 0, Skipped: 0
[INFO]
[INFO] BUILD FAILURE
[INFO] Total time: 1.888 s
[INFO] Finished at: 2022-02-09T15:35:27Z
[INFO]
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-surefire-plugin:3.0.0-M5:test (default-test) on project junit2: There are test failures.
[ERROR] Please refer to /home/erishantgmail/junit/junit2/target/surefire-reports for the individual test results.
[ERROR] Please refer to dump files (if any exist) [date].dump, [date]-jvmRun[N].dump and [date].dumpstream.
[ERROR] -> [Help 1]

```

2.6 Now, go back to the **AppTest.java** file. Change the promo code to **BINGO** which has a **0.20** discount value. Comment the error **assertEquals()** from **basicTest()** test case

```

65
66 @Test
67 public void testAmountDiscount() {
68     String pCode = "TRYNEW";
69     double amount = 1000;
70     double expectedAmount = 950.0;
71
72     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscount(pCode, amount));
73 }
74
75 @Test
76 public void testAmountDiscountTaxes() {
77     String pCode = "SUNDAY";
78     double amount = 1000;
79     double expectedAmount = 885.0;
80
81     assertEquals(expectedAmount, promoCodes.getAmountAfterDiscountWithTaxes(pCode, amount));
82 }
83
84
85 @Test
86 public void basicTest() {
87     assertEquals(0.4, promoCodes.getDiscount("YEAR2022"));
88     //assertEquals(0.4, promoCodes.getDiscount("YEAR2022"), "Sorry!! This Promo Code isn't available!");
89 }
90
91 @Test
92 public void groupTest() {
93     assertEquals("Promo Code Discount as 0.40",
94         () -> assertEquals(0.4, promoCodes.getDiscount("BINGO")),
95         () -> assertEquals(0.4, promoCodes.getDiscount("TRYNEW999"))
96     );
97 }
98
99 }
100

```

2.7 Run the code again as a **Maven test**. You can see both test cases run again in the output, and 1 fails. This time the second test case failed as the **BINGO** promo code has an actual value of **0.20**. The expected value is **0.40**.

```

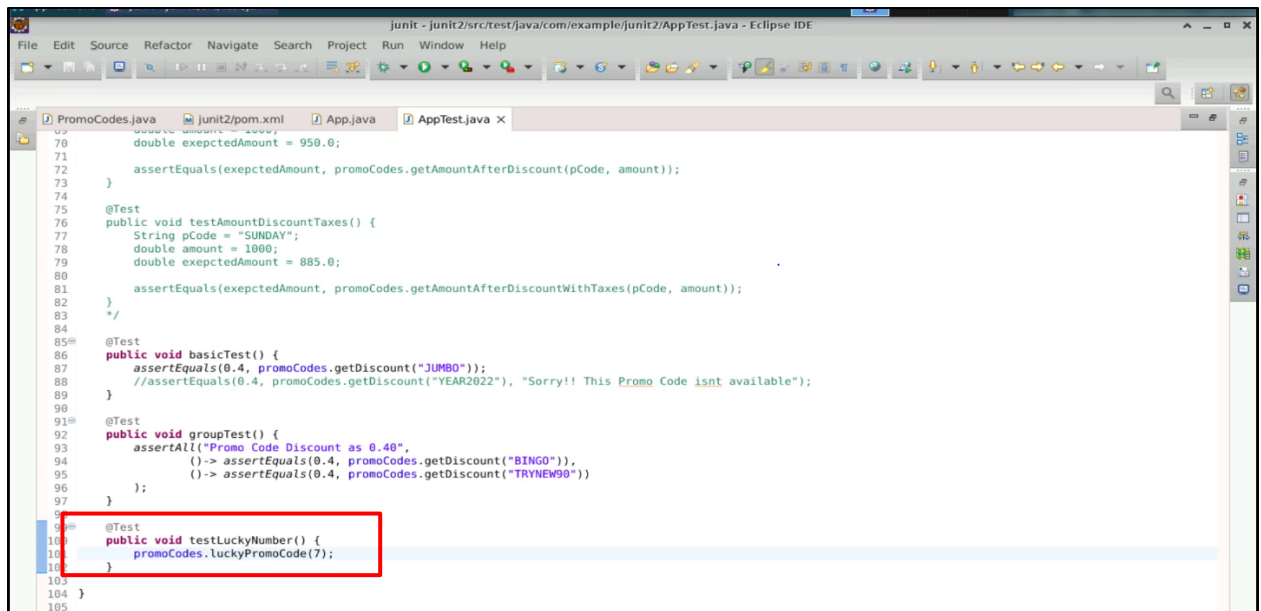
<terminated> /usr/eclipse/plugins/org.eclipse.justj.openjdk.hotspot.jre.full.linux.x86_64.17.0.1.v20211116-1657/jre/bin/java (Feb 9, 2022, 3:36:05 PM)
[ERROR] com.example.junit2.AppTest.groupTest Time elapsed: 0.004 s <<< FAILURE!
org.opentest4j.MultipleFailuresError:
Promo Code Discount as 0.40 (1 failure)
  org.opentest4j.AssertionFailedError: expected: <0.4> but was: <0.2>
    at com.example.junit2.AppTest.groupTest(AppTest.java:93)

[INFO] Results:
[INFO] Failures:
[ERROR] AppTest.groupTest:93 Promo Code Discount as 0.40 (1 failure)
  org.opentest4j.AssertionFailedError: expected: <0.4> but was: <0.2>
[INFO] Tests run: 2, Failures: 1, Errors: 0, Skipped: 0
[INFO] BUILD FAILURE
[INFO] Total time: 1.880 s
[INFO] Finished at: 2022-02-09T15:36:08Z
[INFO]
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-surefire-plugin:3.0.0-M5:test (default-test) on project junit2: There are test failures.
[ERROR] Please refer to /home/erishantgmail/junit/junit2/target/surefire-reports for the individual test results.
[ERROR] Please refer to dump files (if any exist) [date].dump, [date]-jvmRun[N].dump and [date].dumpstream.
[ERROR] -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/MojoFailureException

```

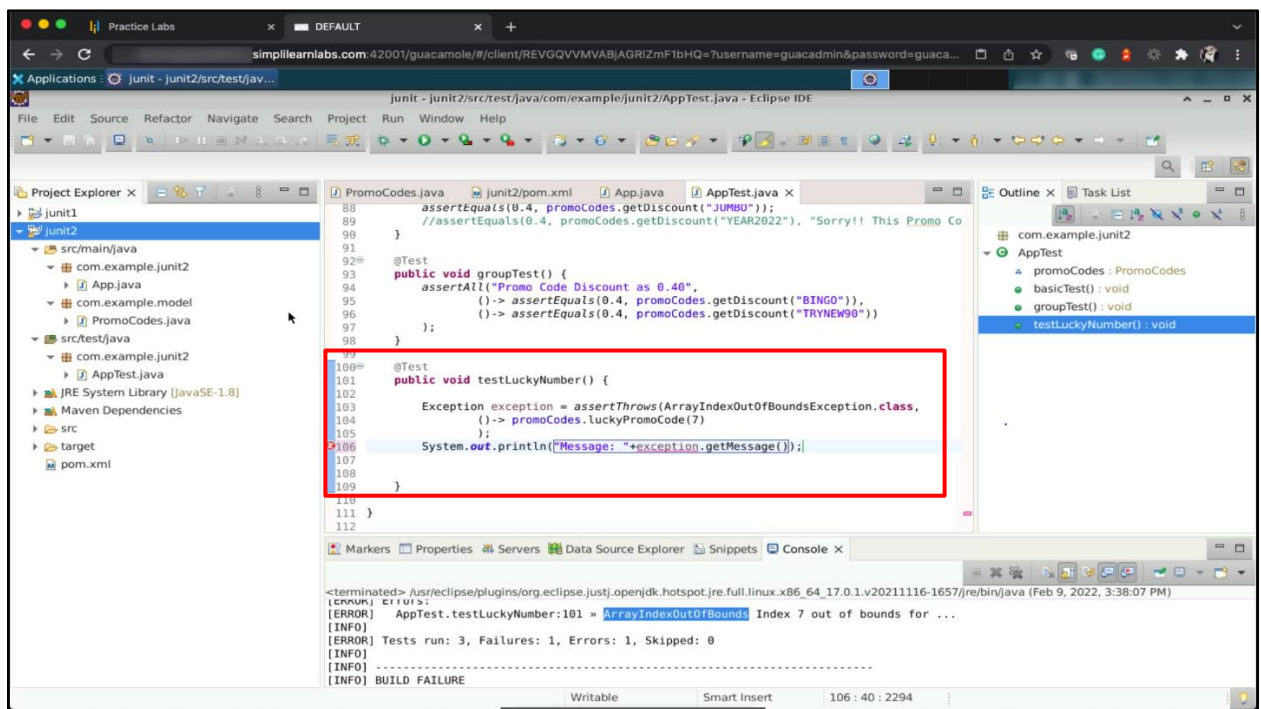
Step 3: Using assertThrows()

3.1 Now, go back to the **AppTest.java** file. Create a new test case name **testLuckyNumber()** and execute this method for the lucky number **7**, which is not available in the list

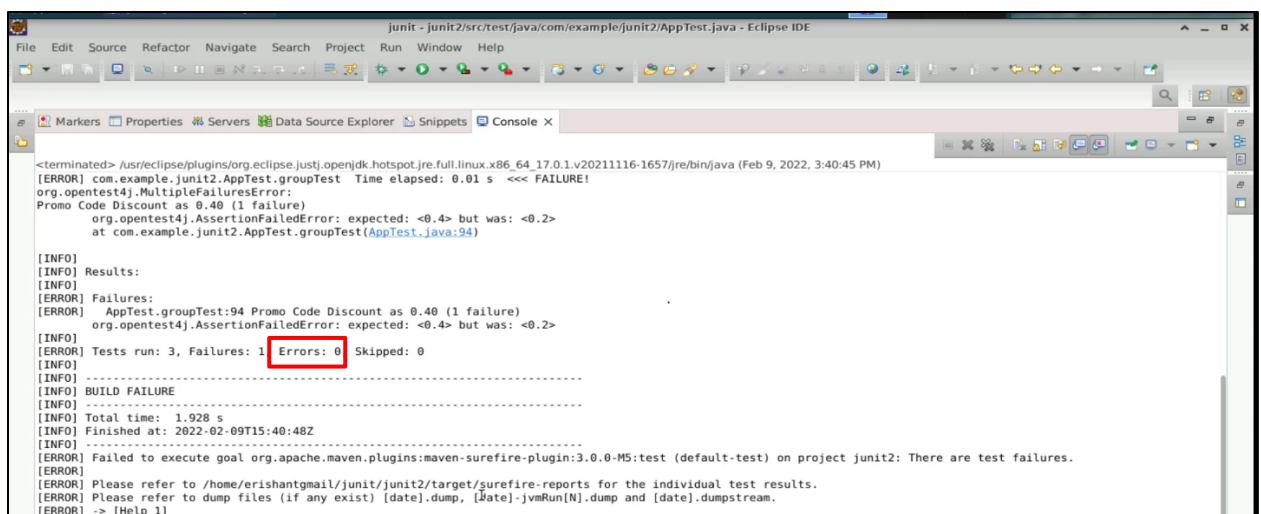


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```


3.3 To handle such scenarios, go back to the **AppTest.java** file and use the **assertThrows()** assertion to handle this type of exception. In **assertThrows()**, first, specify the type of class as **ArrayIndexOutOfBoundsException.class**, then pass the Lambda expression with **luckyPromoCode(7)**. Also, add a message to identify in the console



3.4 Again, run the project as a **Maven test**. You can see the error was handled by the **assertThrows()** assertion



Step 4: Using assertTimeout()

- 4.1 Go to the **PromoCodes.java** file. Add sleep time of 1.5 sec in the method **getAmountAfterDiscount()**, which is calculating the discount. Surround this API with a **try-catch** block

```

11 public PromoCodes() {
12
13
14     promoCodes = Arrays.asList("JUMBO", "BINGO", "HAPPY50", "TRYNEW90", "SUNDAY");
15
16     promoCodesWithDiscounts = new TreeMap<String, Double>();
17     promoCodesWithDiscounts.put(promoCodes.get(0), 0.40);
18     promoCodesWithDiscounts.put(promoCodes.get(1), 0.20);
19     promoCodesWithDiscounts.put(promoCodes.get(2), 0.50);
20     promoCodesWithDiscounts.put(promoCodes.get(3), 0.40);
21     promoCodesWithDiscounts.put(promoCodes.get(4), 0.25);
22 }
23
24 public Double getDiscount(String promoCode) {
25     return promoCodesWithDiscounts.containsKey(promoCode) ? promoCodesWithDiscounts.get(promoCode) : 0.05;
26 }
27
28 public Double getAmountAfterDiscount(String promoCode, double amount) {
29     try {
30         Thread.sleep(1500);
31     } catch (InterruptedException e) {
32         // TODO Auto-generated catch block
33         e.printStackTrace();
34     }
35     return promoCodesWithDiscounts.containsKey(promoCode) ? (amount - amount*promoCodesWithDiscounts.get(promoCode)) : (amount - amount*0.05);
36 }
37
38
39 public Double getAmountAfterDiscountWithTaxes(String promoCode, double amount) {
40     double amountAfterDiscount = getAmountAfterDiscount(promoCode, amount);
41     return (amountAfterDiscount + (0.18*amountAfterDiscount));
42 }

```

- 4.2 Go back to the **AppTest.java** file. Create a new test named **testWithtimeout()**. Use **assertTimeout()** to fix the time at which you need the results. Use the method **ofMinutes()** and give the expected return value through the Lambda function. Also, add the **assertEquals()** to compare the expected and actual amount

```

87
88
89 @Test
90 public void basicTest() {
91     assertEquals(0.4, promoCodes.getDiscount("JUMBO"));
92     //assertEquals(0.4, promoCodes.getDiscount("YEAR2022"), "Sorry!! This Promo Code isnt available");
93 }
94
95 @Test
96 public void groupTest() {
97     assertEquals("Promo Code Discount as 0.40",
98         ()-> assertEquals(0.4, promoCodes.getDiscount("BINGO")),
99         ()-> assertEquals(0.4, promoCodes.getDiscount("TRYNEW90"))
100     );
101 }
102
103 @Test
104 public void testLuckyNumber() {
105     Exception exception = assertThrows(ArrayIndexOutOfBoundsException.class,
106         ()-> promoCodes.luckyPromoCode(7)
107     );
108     //System.out.println("Message: "+exception.getMessage());
109     assertEquals("Index 7 out of bounds for length 5", exception.getMessage());
110 }
111
112
113
114 @Test
115 public void testWithtimeout() {
116     double amount = assertTimeout(ofMinutes(1), ()->{
117         return promoCodes.getAmountAfterDiscount("SUNDAY", 1000);
118     });
119     assertEquals(885.0, amount);
120 }

```

4.3 Scroll up and check `ofMinutes()` method was imported or not, if not import manually

```

1 package com.example.junit2;
2
3 import static org.junit.jupiter.api.Assertions.assertAll;
4 import static org.junit.jupiter.api.Assertions.assertEquals;
5 import static org.junit.jupiter.api.Assertions.assertThrows;
6 import static org.junit.jupiter.api.Assertions.assertTimeout;
7
8 import org.junit.jupiter.api.Test;
9
10 import static java.time.Duration.ofMinutes;
11
12 import com.example.model.PromoCodes;
13
14 /**
15  *
16  */
17 import junit.framework.Test;
18 import junit.framework.TestCase;
19 import junit.framework.TestSuite;
20
21 public class AppTest
22     extends TestCase
23 {
24     PromoCodes promoCodes;
25
26
27     public AppTest( String testName )
28     {
29         super( testName );
30         promoCodes = new PromoCodes();
31     }
32
33
34     public static Test suite()
35     {
36

```

4.4 Run the code as a **Maven test**. You can see the test has failed because the expected discount is **885** and we got **750**.

```

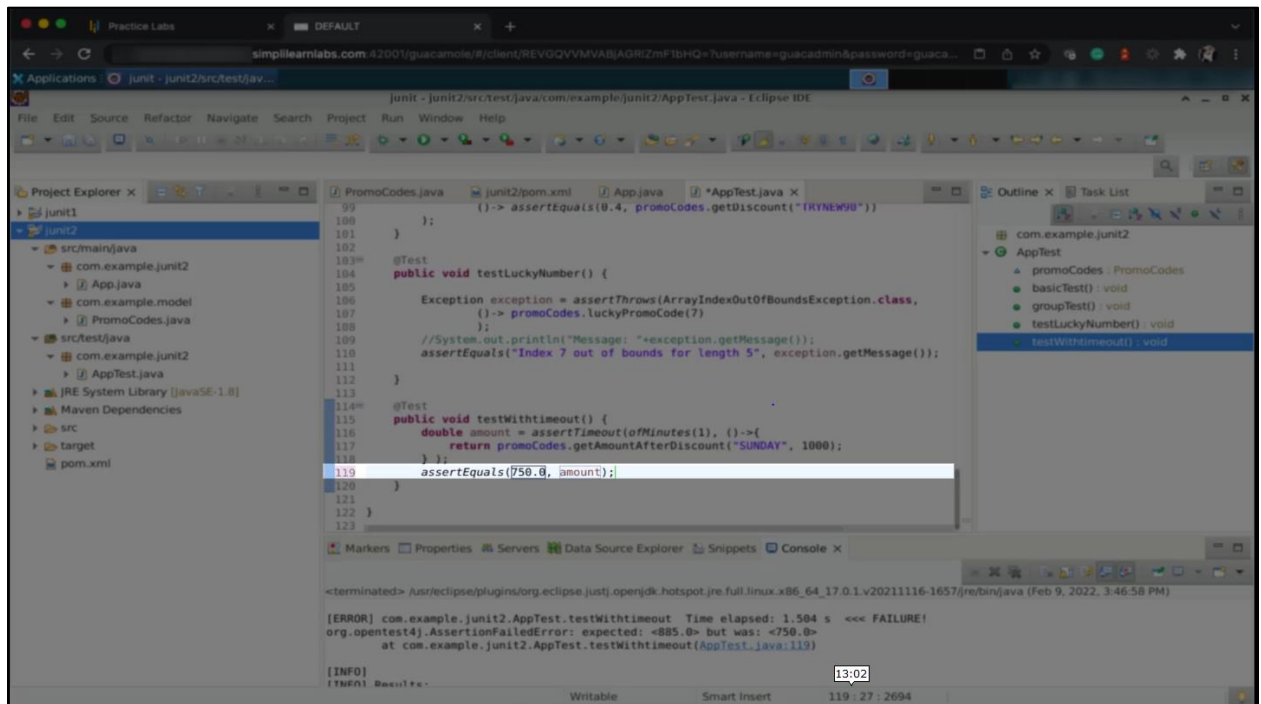
<terminated> /usr/eclipse/plugins/org.eclipse.justi.openjdk.hotspot.jre.full.linux.x86_64_17.0.1.v20211116-1657/jre/bin/java (Feb 9, 2022, 3:46:58 PM)

[ERROR] com.example.junit2.AppTest.testWithTimeout Time elapsed: 1.504 s <<< FAILURE!
org.opentest4j.AssertionFailedError: expected: <885.0> but was: <750.0>
    at com.example.junit2.AppTest.testWithTimeout(AppTest.java:119)

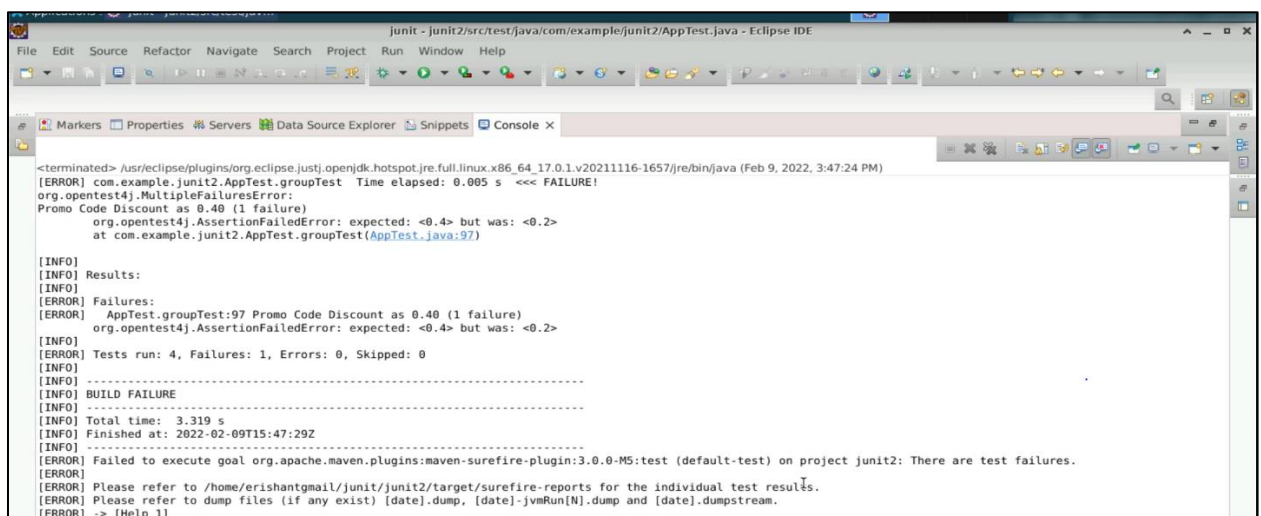
[INFO]
[INFO] Results:
[INFO]
[ERROR] Failures:
[ERROR]   AppTest.groupTest:97 Promo Code Discount as 0.40 [1 failure]
[ERROR]   org.opentest4j.AssertionFailedError: expected: <0.4> but was: <0.2>
[ERROR]   AppTest.testWithTimeout:119 expected: <885.0> but was: <750.0>
[INFO]
[ERROR] Tests run: 4, Failures: 2, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] BUILD FAILURE
[INFO] -----
[INFO] Total time: 3.343 s
[INFO] Finished at: 2022-02-09T15:47:03Z
[INFO]
[ERROR] Failed to execute goal org.apache.maven.plugins:maven-surefire-plugin:3.0.0-M5:test (default-test) on project junit2: There are test failures.
[ERROR]
[ERROR] Please refer to /home/erishantgmail/junit2/target/surefire-reports for the individual test results.
[ERROR] Please refer to dump files (if any exist) [date].dump, [date]-jvmRun[N].dump and [date].dumpstream.
[ERROR] -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/MojoFailureException

```

4.5 Go back to the **AppTest.java** file and change the expected amount to **750**



4.6 Rerun the project. You will see that the **testWithTimeout()** test case passed.



This is how we can perform different assertion methods in the Java-JUnit project using the **assertEquals()**, **assertAll()**, **assertThrows()**, and **assertTimeout()**.