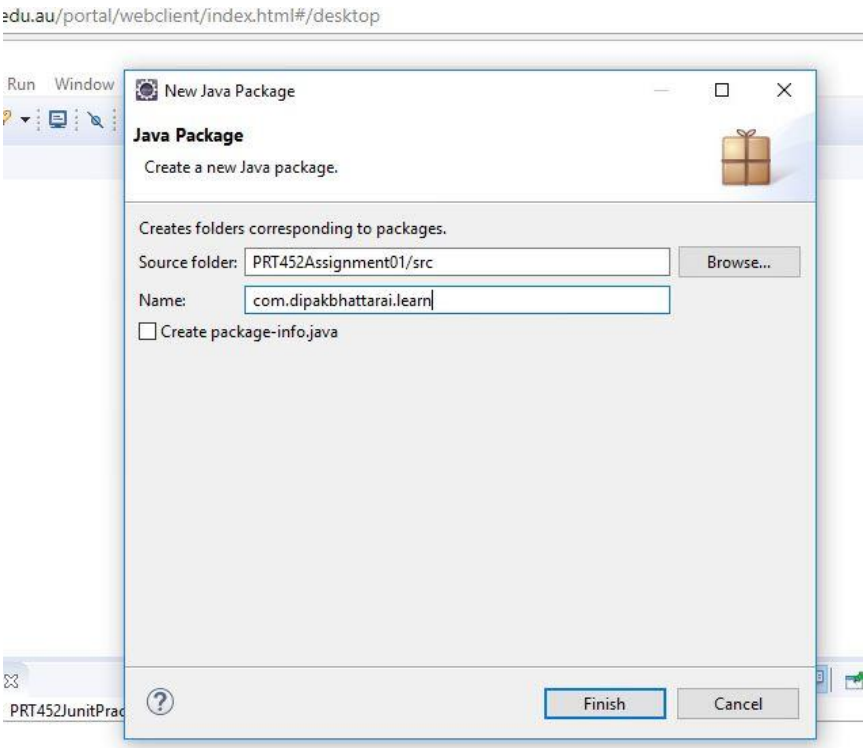
# Part 1: Test Cases:

TDD Test Cases for gradient, distance and equation of line between two points:

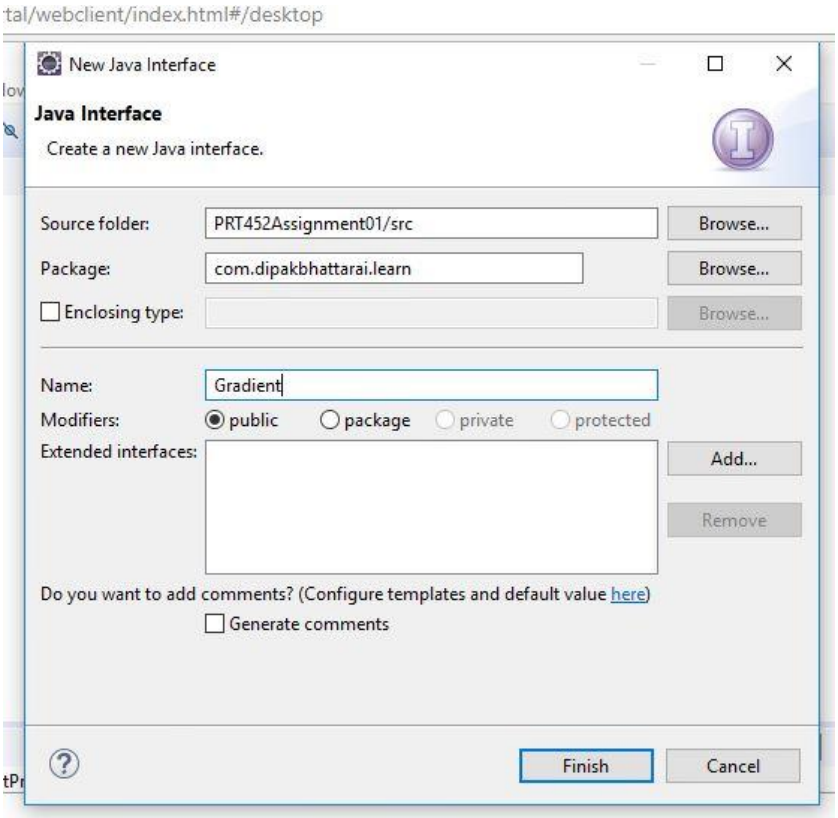
| S.N | Test Case Description | Input | | | | Expected Output | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | **X1** | **Y1** | **X2** | **Y2** | **Gradient (y2-y1)/ (x2-x1)** | **Distance √(x2-x1)$^2$ –(y2-y1)$^2$** | **Equation y-y1=m(x-x1) or y=mx +c** | |
| **1** | User enters the coordinates A(0,0), B(0,0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **2** | User enters the coordinates A(1,1), B(1,1) | 1 | 1 | 1 | 1 | unidentified | 0 | Y=0 | |
| **3** | User enters the coordinates A(-2,1), B(-1,1) | -2 | 1 | -1 | 1 | 1 | 0 | Y=1 | |
| **4** | User enters the coordinates A(4,3), B(6,7) | 4 | 3 | 6 | 7 | 2 | √20 | Y=2x - 5 | |
| **6** | User enters the coordinates A(0,0), B(0,0) | 2 | 4 | 4 | 6 | 1 | √8 | y = x + 2 | |

# Part 2: Program developing screenshots:

**Step 1**: The project PRT452Assignment01 has been created and the package com.dipakbhattarai.learn is created.




**Step 2**: The Interface Gradient is created. Similarly, the interfaces Distance and Equation are also created.



**Step 3**: The interfaces are created with the methods with their respective parameters.

*Interface1: Gradient and its method with parameters.*

m/dipakbhattarai/learn/Gradient.java - Eclipse

Project Run Window Help

Gradient.java | Distance.java | Equation.java | Mathematics.java

```java
package com.dipakbhattarai.learn;

public interface Gradient {

    double gardient (double x1, double y1, double x2, double y2);
}
```

*Interface2: Distance and its method with parameters.*

m/dipakbhattarai/learn/Distance.java - Eclipse

Project Run Window Help

Gradient.java | Distance.java | Equation.java | Mathematics.java

```java
package com.dipakbhattarai.learn;

public interface Distance {

    double distance (double x1, double y1, double x2, double y2);
}
```

*Interface3: Equation and its method with parameters*.

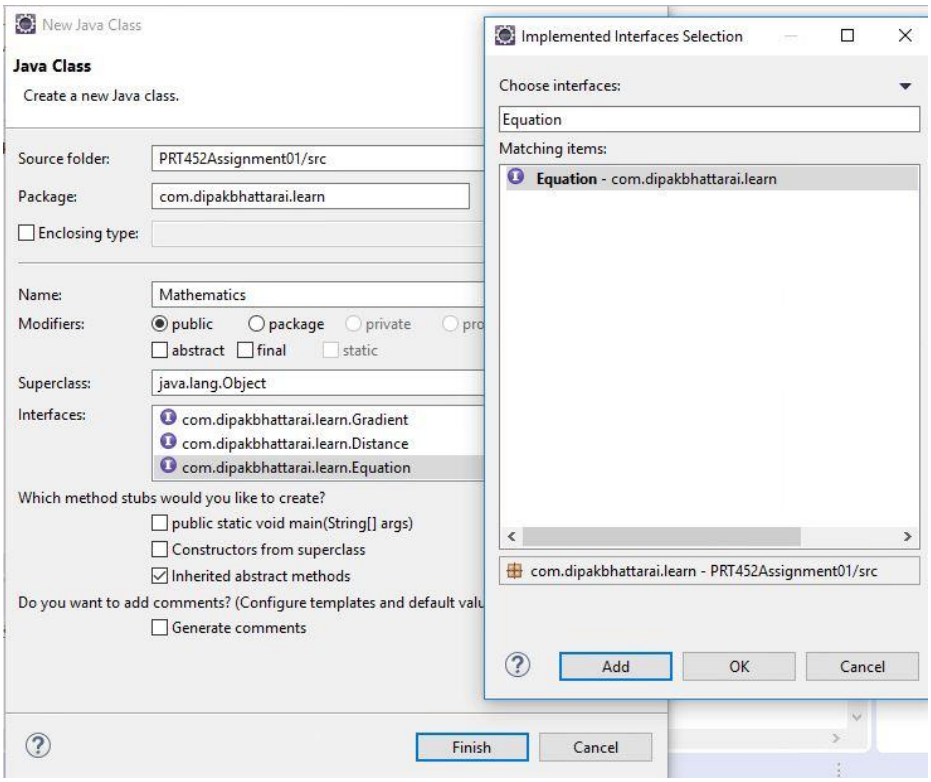
uation.java - Eclipse

Help

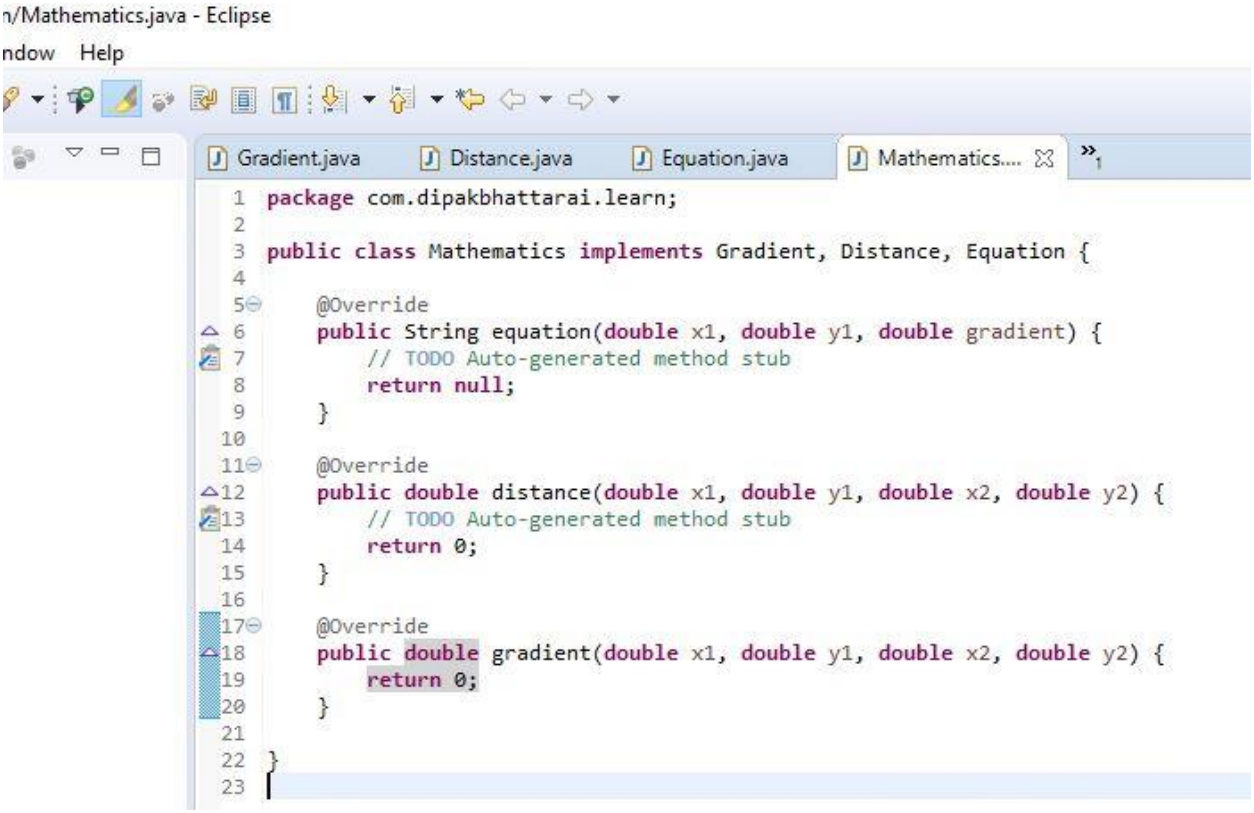
Gradient.java | Distance.java | Equation.java | Mathematics.java

```java
package com.dipakbhattarai.learn;

public interface Equation {

    String equation (double x1, double y1, double gradient);
}
```

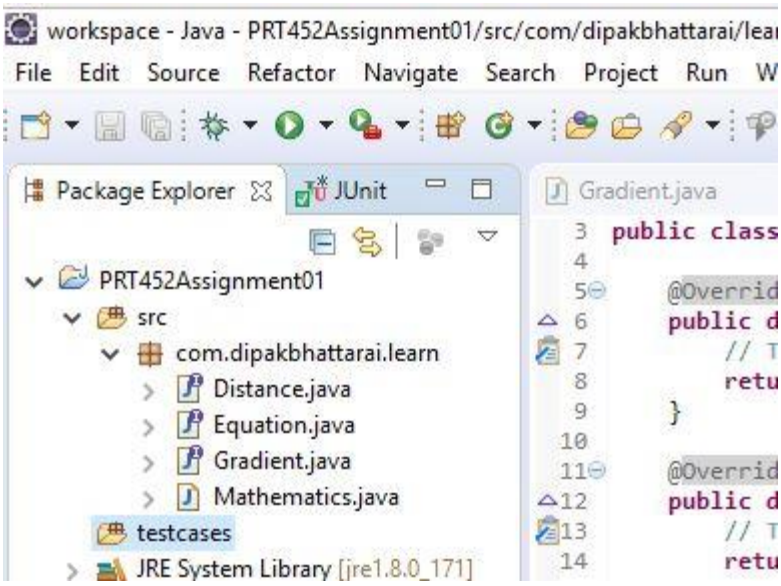
**Steps 4**: The java file "Mathematics.java" is created and the three interfaces are also implemented as shown in the picture:



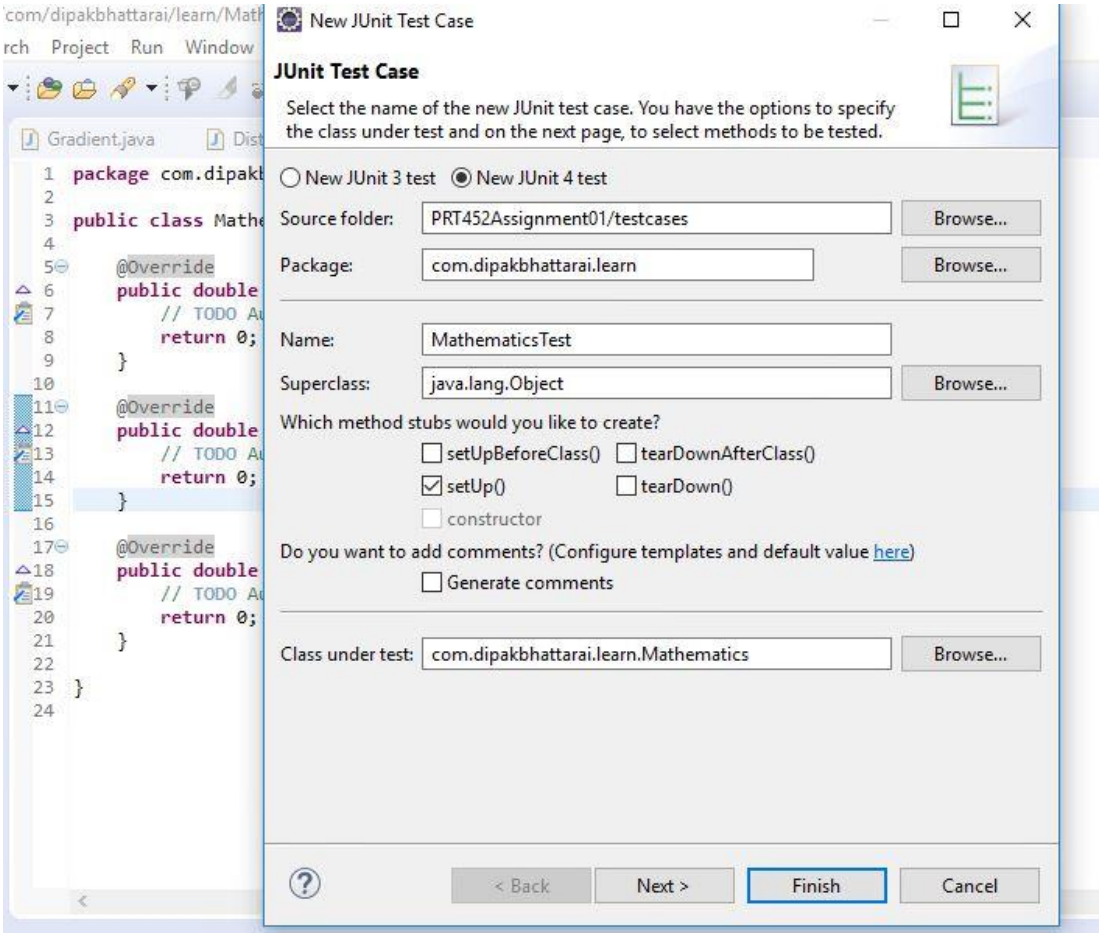

Output: The class Mathematics.java is created with its methods implemented from the interfaces



**Steps 5**: Creating folder testcases in order to separate the test file.




**Steps 6**: Creating the JuntTesting of the file Mathematics.java



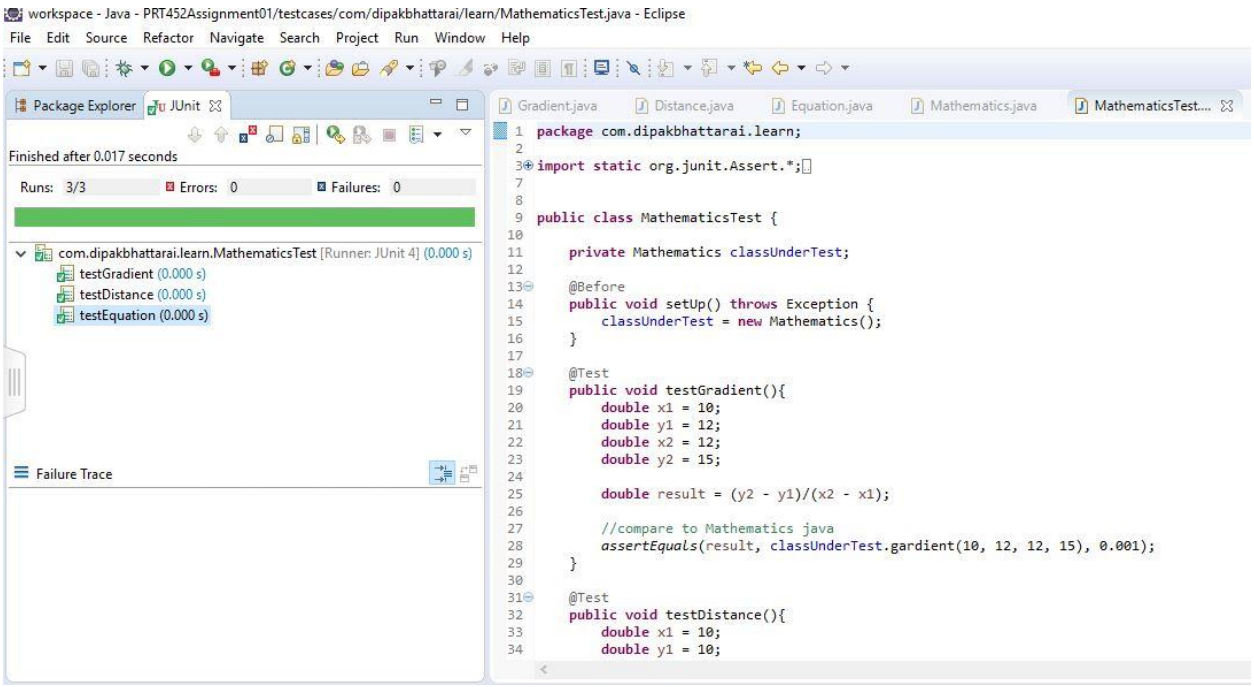
The follow picture shows the JunitTesting of the methods gradient, distance and equation:

```
import static org.junit.Assert.*;

public class MathematicsTest {

    @Before
    public void setUp() throws Exception {
    }

    @Test
    public void test() {
        fail("Not yet implemented");
    }

    @Test
    public void testGradient(){
        fail("Not yet implemented");
    }

    @Test
    public void testDistance(){
        fail("Not yet implemented");
    }

    @Test
    public void testEquation(){
        fail("Not yet implemented");
    }

}
```

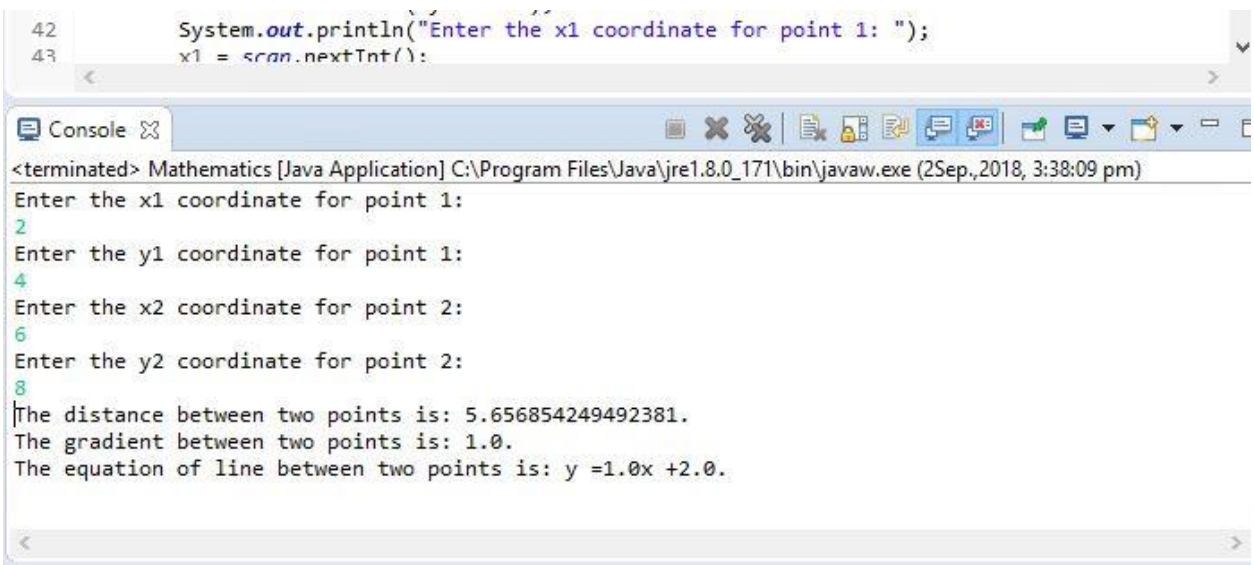
**Steps 7**: The testing fail showing the unmatched result.

```
@Before
public void setUp() throws Exception {
    classUnderTest = new Mathematics();
}

@Test
public void testGradient(){
    double x1 = 10;
    double y1 = 12;
    double x2 = 12;
    double y2 = 15;

    double result = (y2 - y1)/(x2 - x1);

    //compare to Mathematics java
    assertEquals(result, classUnderTest.gardient(10, 12, 12, 15), 0.001);
}

@Test
public void testDistance(){
    fail("Not yet implemented");
}

@Test
public void testEquation(){
    fail("Not yet implemented");
}
```

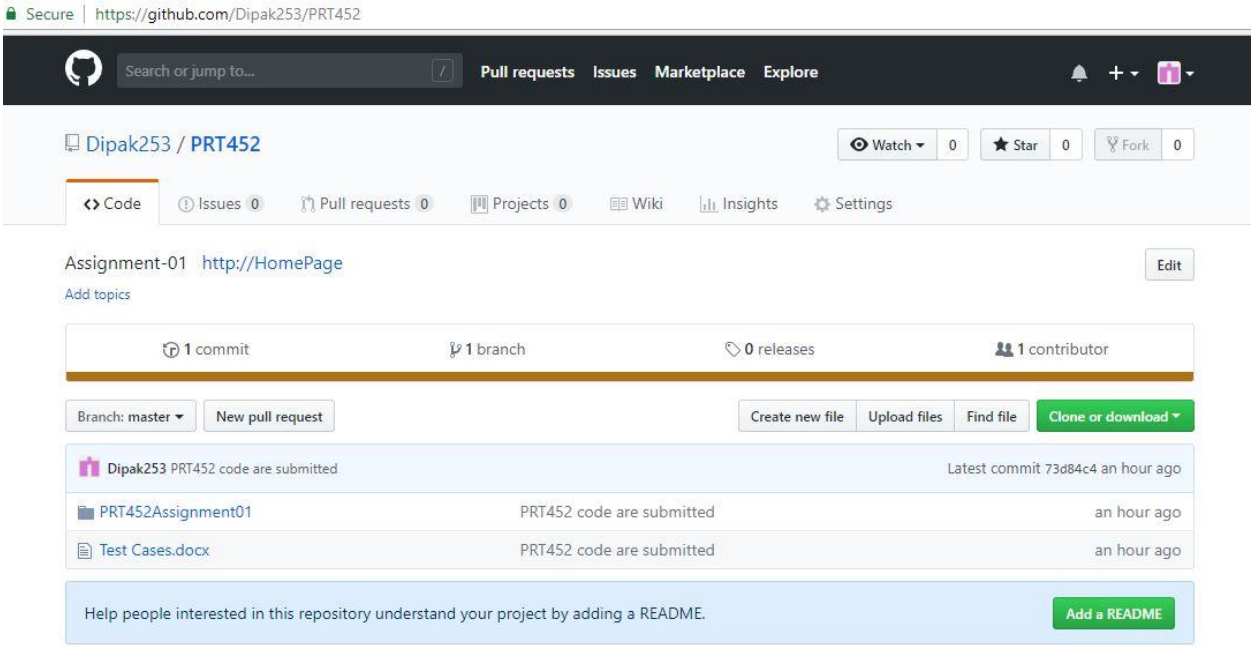
**Steps 8**: After implementing the codes the test is finally passed.




**Steps 9:** The final output of the program when user enters the two points.



**Steps 10**: Creating the github repository for the assignment.




Github link: [https://github.com/Dipak253/PRT452/tree/master/PRT452Assignment01](https://github.com/Dipak253/PRT452/tree/master/PRT452Assignment01)

# Part 3: Code Smells

The five issues related to code smells are identified and the solution for them are discussed below as:

1) **Lazy Class**: Creating a class costs money. If the class which is not doing enough should be eliminated.

   *Solution:*

   - **Collapse Hierarchy**: It will collapse all the subclasses that aren't doing enough.
   - **Inline Component**: The useless components should be subjected using this method.

2) **Temporary Field**: An object needs its variables to be instantiated but sometimes some variables are only set for certain circumstances. Such code is difficult to understand.

   *Solution:*

   - **Extract Component**: It helps to collect all the concerns variables in the component.
   - **Introduce Null Object**: It helps to eliminate conditional code and create an alternative component for invalid variables.

3) **Middle Man**: Sometimes the internal details of objects are encapsulated.

   *Solution:*

   - **Move Method** and **Move Field**: This methods are used to move features out the middle man into the other objects making the middle man empty.

4) **Large Class:** In large class, there are number of objects and its variables but all these variables are not be used at all.

   *Solution:*

   - **Extract Component**: It helps to bundle up the variables and
   - **Extract subclass**: If the subset of variables are constant then Extract subclass can be used to overcome this problem

5) **Duplicated code:** It means repetitive use of the code in a program which is not a good practice.

   *Solution:*

   - **Extract Method:** This method is used to separate the similar codes and invoke the code from other place.