INTRODUCTION TO JAVA

Java 1.0

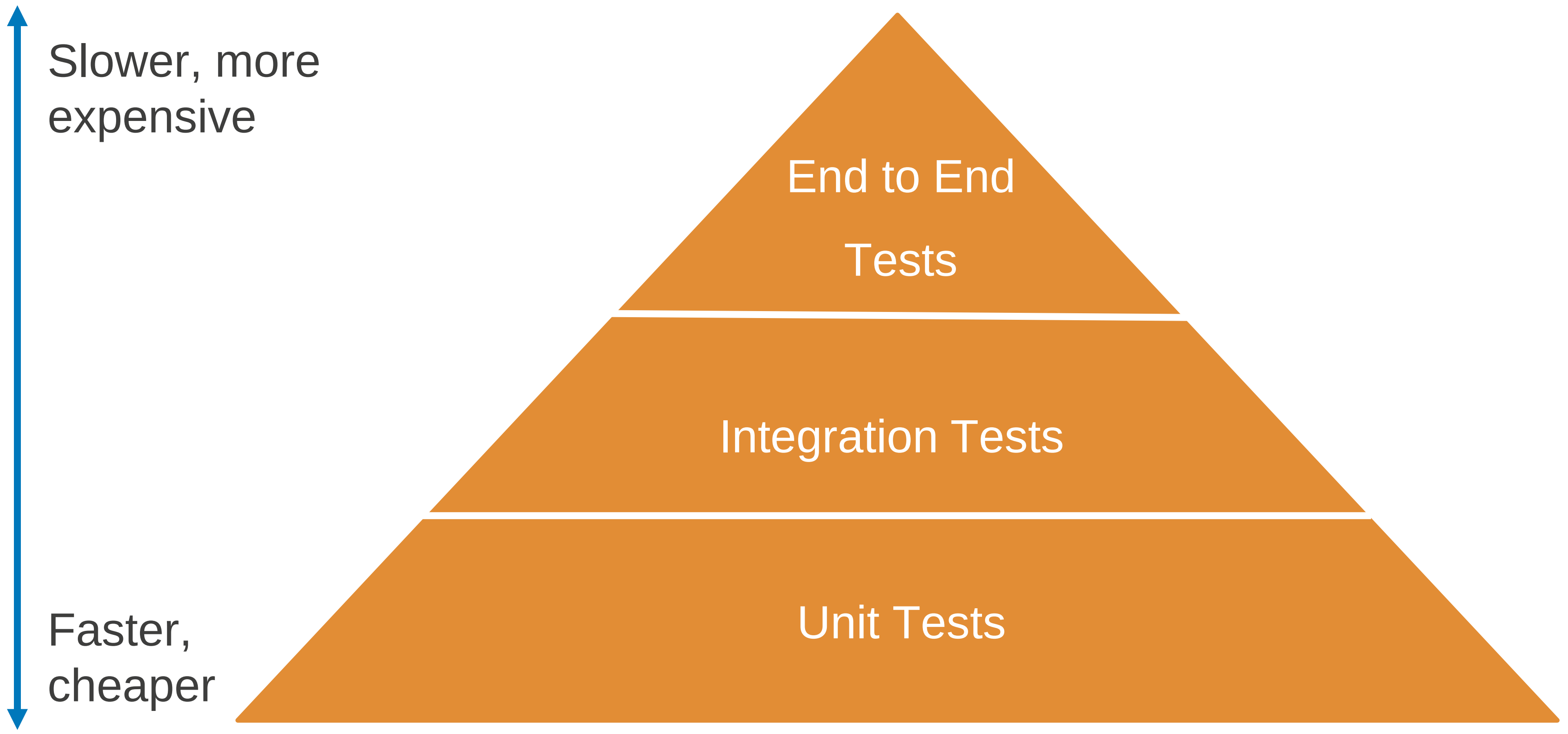
CODE TESTING

Lesson # 13

THE PURPOSE OF SOFTWARE TESTS

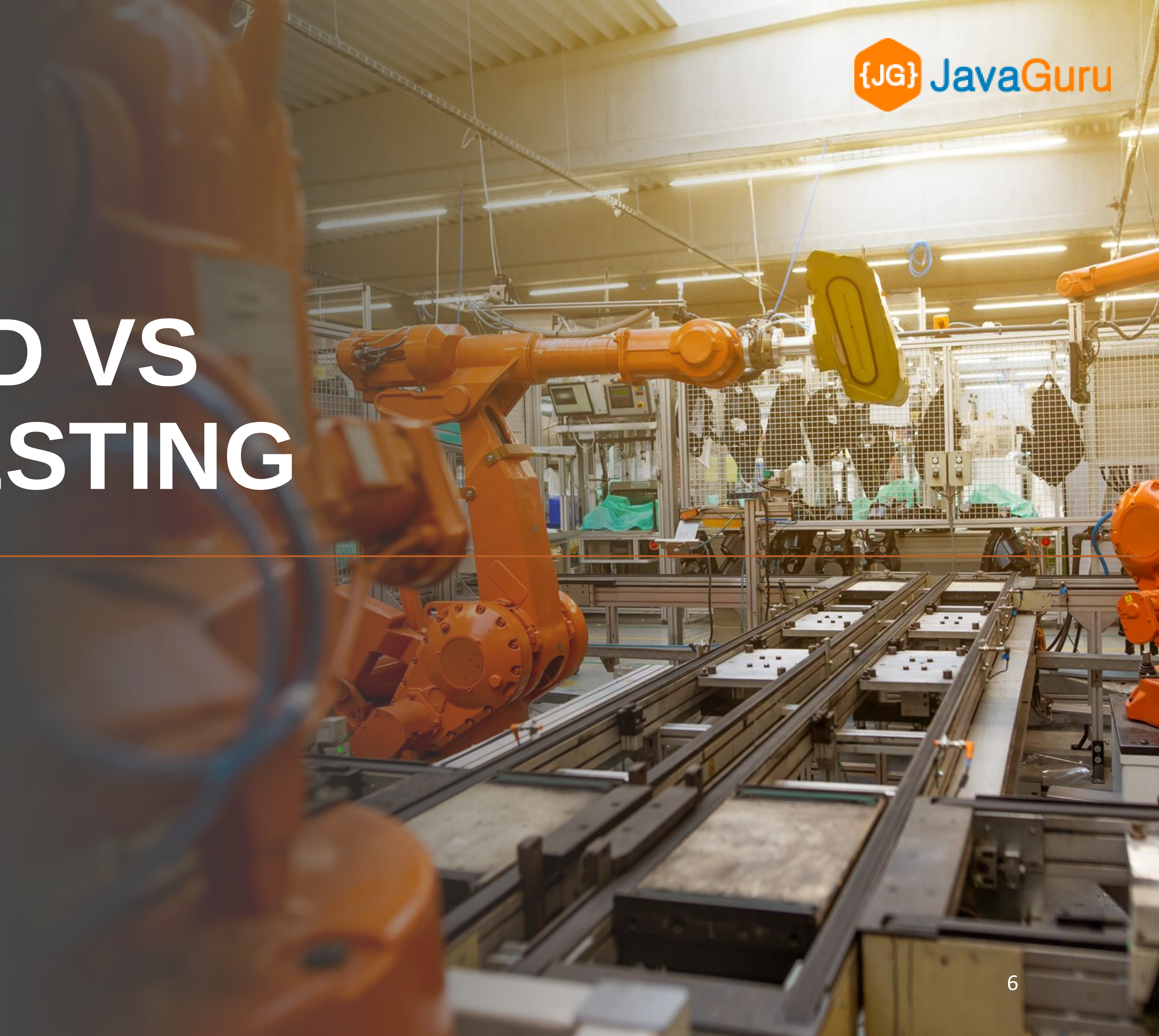
- A test is a piece of software that executes another piece of software in order to confirm that the code operates as expected
- A test can check
  - Expected state (state testing)
  - Expected sequence of events (behavior testing)
- Having high test coverage allows the development of new features without being afraid to break existing code

SOFTWARE TESTING SCOPES



SOFTWARE TESTING SCOPES

- Integration tests
  - Aims to test the behavior of a component or the integration between a set of components
  - Check that the whole system works as intended
- Unit tests
  - Targets a small unit of code (e.g., a method or a class)
  - External class dependencies should be replaced with test implementation objects (mocks)



AUTOMATED VS MANUAL TESTING

MANUAL TESTING

- Executing test cases manually without any tool support is known as manual testing
- It’s time-consuming and tedious
  - Since human resources execute test cases, it is very slow and tedious
- Huge investment in human resources
  - As test cases need to be executed manually, more testers are required for manual testing

MANUAL TESTING

- Less reliable
  - Manual testing is less reliable, as it has to account for human errors
- Non-programmable
  - No programming can be done to write sophisticated tests to fetch hidden information

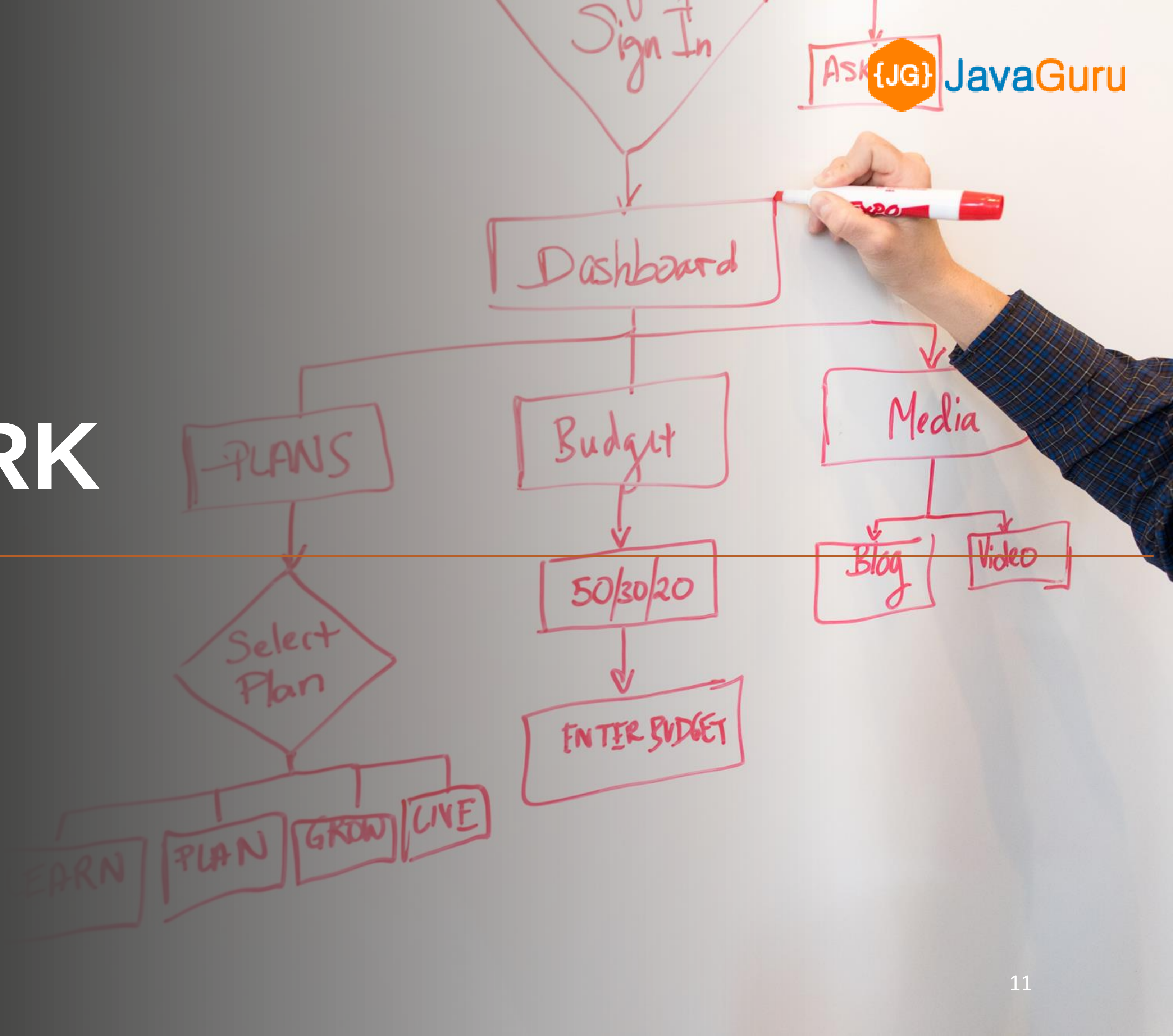
AUTOMATED TESTING

- Taking tool support and executing the test cases by using an automation tool is known as automation testing
- Fast
    - Automation runs test cases significantly faster than human resources
- Less investment in human resources
    - Test cases are executed using automation tools, so less number of testers are required in automation testing

AUTOMATED TESTING

- More reliable
  - Automation tests are precise and reliable
- Programmable
  - Testers can program sophisticated tests to bring out hidden information

JUNIT FRAMEWORK



JUNIT TESTING APROACH

- JUnit is a unit testing framework for the Java programming language
- JUnit test is a method contained in a class that is only used for testing (also called a test class)
- Formally written unit test case is characterized by:
  - Known input
  - Expected output

SYSTEM UNDER TEST

```java
public class Calculator {

    public int sum(int a, int b) {
        return a + b;
    }

}
```

TEST CLASS

```java
public class CalculatorTest {

    private Calculator calculator;

    @BeforeEach
    public void setUp() {
        calculator = new Calculator();
    }

   @Test
   public void shouldCalculateSum() {
       int result = calculator.sum(3, 5);
       assertEquals(8, result);
   }

}
```

TEST PREPARATION ANNOTATIONS

Annotation	Description
@Test **public void** testCase() {}	The @Test annotation indicates the following method as a test method
@Disabled **public void** testCase() {}	This annotation is useful when you want temporarily disable the execution of a specific test
@Test @Timeout(value = 500, unit = MILLISECONDS) **public void** testCase() {}	If the method takes longer than 500 milliseconds, the test will fail

TEST DECLARATION ANNOTATIONS

Annotation	Description
@BeforeEach **public void** setUp() {}	This method is executed before each test
@AfterEach **public void** tearDown() {}	This method is executed after each test
@BeforeAll **public static void** setUp(){}	The following static method is executed once, before the start of all tests
@AfterAll **public static void** tearDown(){}	The following static method is executed once after all tests have been completed

ASSERT STATEMENTS

Assertion	Desscription

Assertions.assertEquals(expected, actual);
Assertions.assertNotEquals(expected, actual);
	Asserts that expected and actual are equal or not equal

Assertions.assertTrue(actual);
Assertions.assertFalse(actual);
	Asserts that the supplied condition is true or not true

Assertions.assertNull(actual);
Assertions.assertNotNull(actual);
	Asserts that actual is null or not null

Assertions.assertSame(expected, actual);
Assertions.assertNotSame(expected, actual);
	Asserts that expected and actual refer to the same object

Assertions.assertThrows(expectedType, executable);	Asserts that execution of the supplied executable throws an exception of the expectedType and returns the exception

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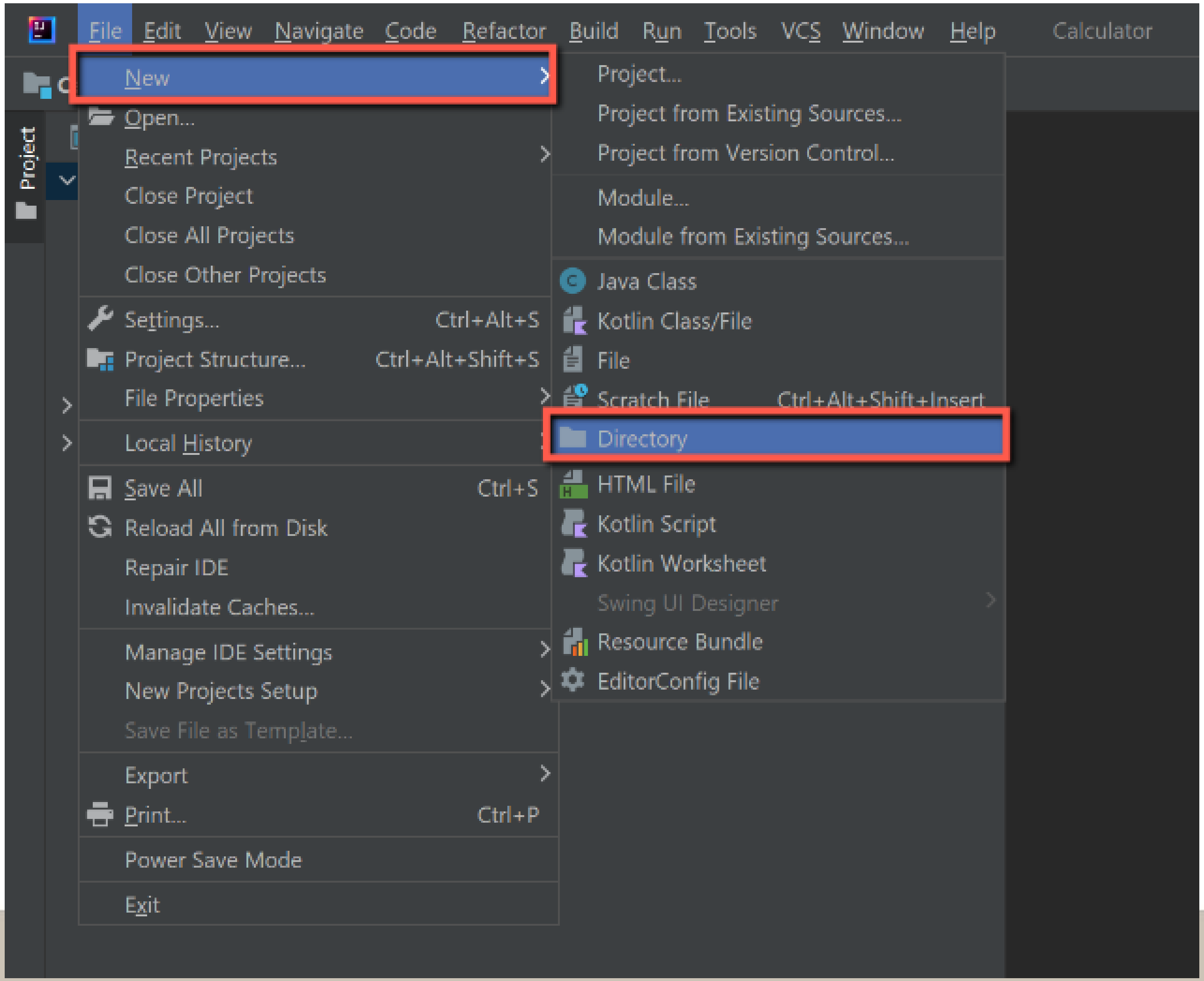
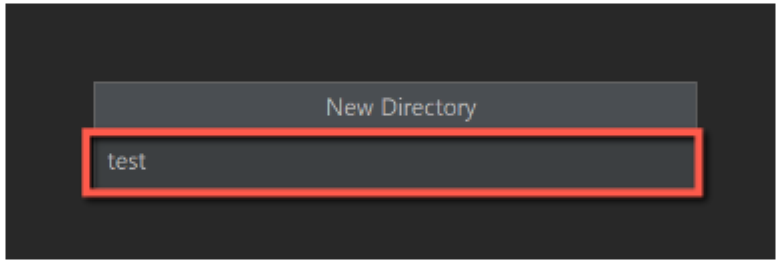
MANUAL JUNIT PROJECT SETUP

MANUAL JUNIT SETUP

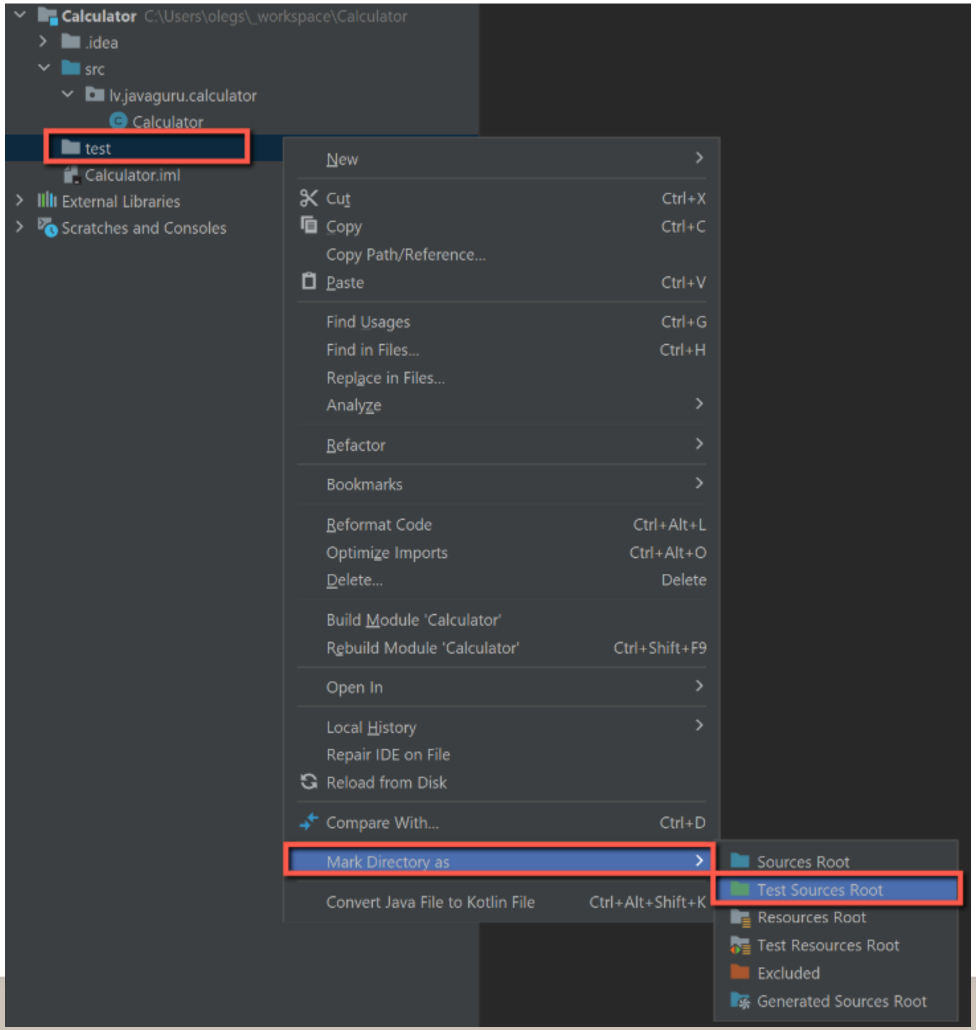


MANUAL JUNIT SETUP

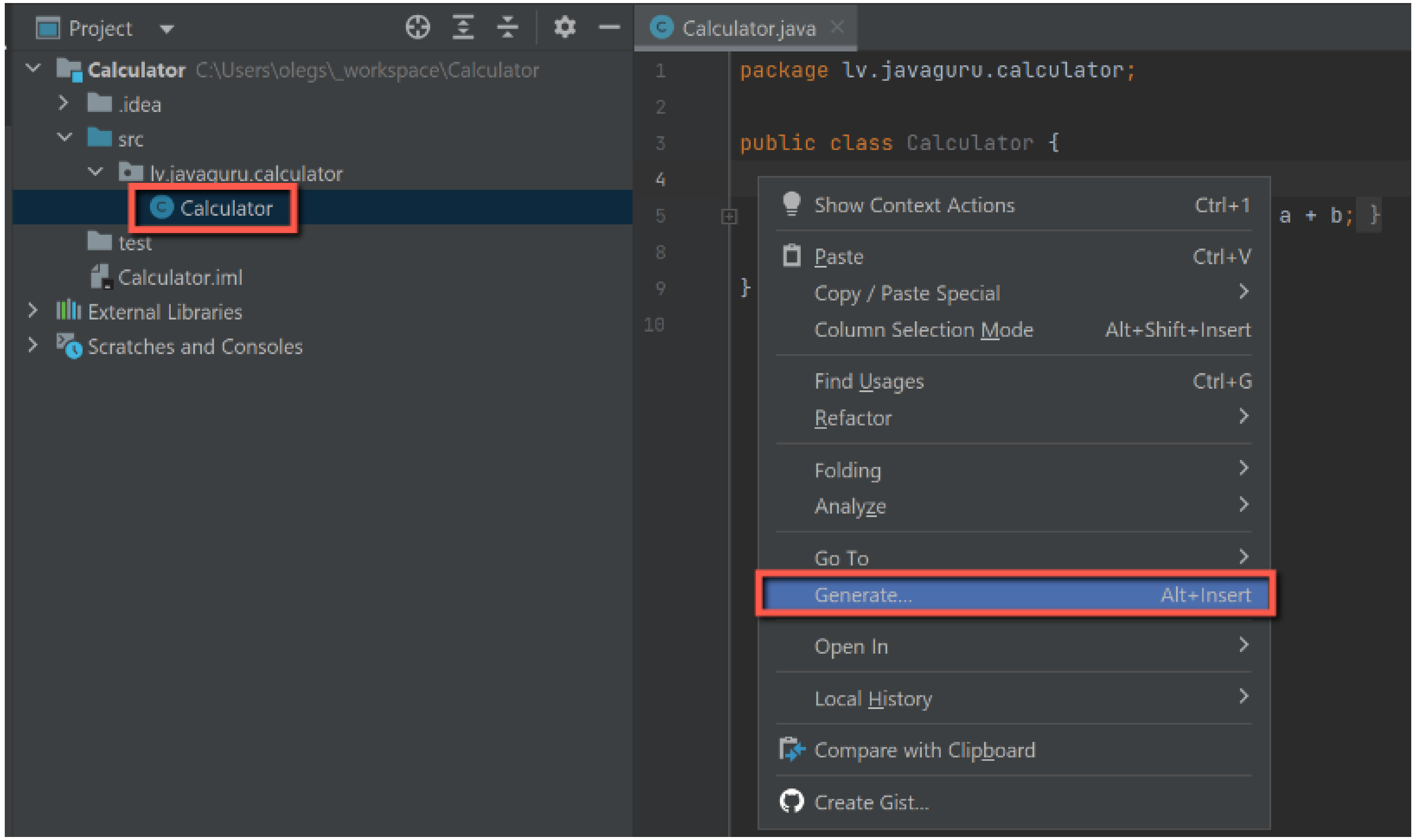


test

MANUAL JUNIT SETUP

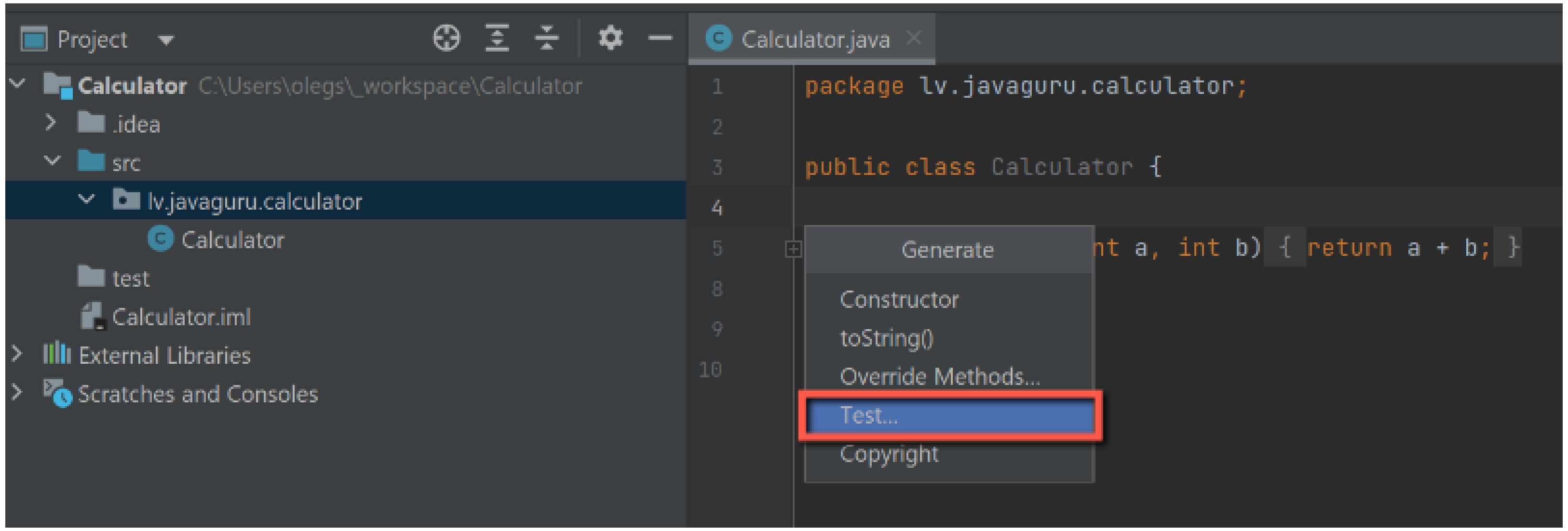


MANUAL JUNIT SETUP



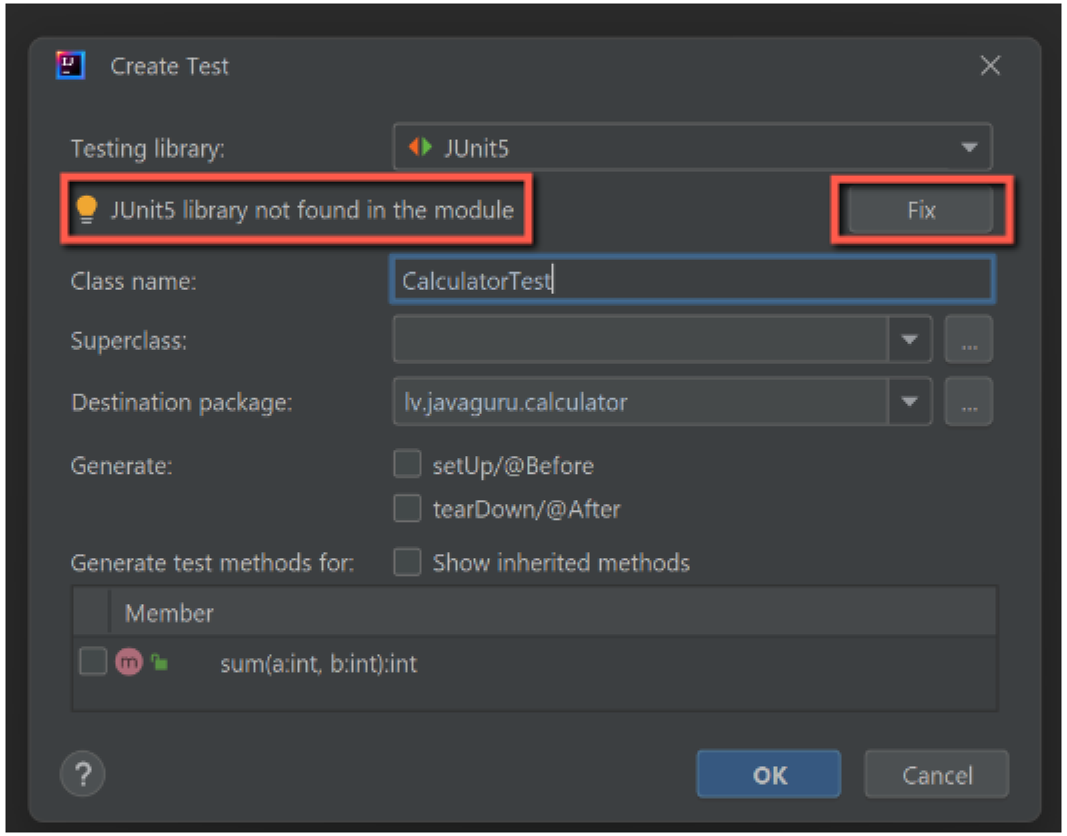
```
package lv.javaguru.calculator;

public class Calculator {

}
```

MANUAL JUNIT SETUP



```
package lv.javaguru.calculator;

public class Calculator {

    nt a, int b) { return a + b; }
```

MANUAL JUNIT SETUP



Testing library: JUnit5

JUnit5 library not found in the module

Class name: CalculatorTest

Superclass:

Destination package: lv.javaguru.calculator

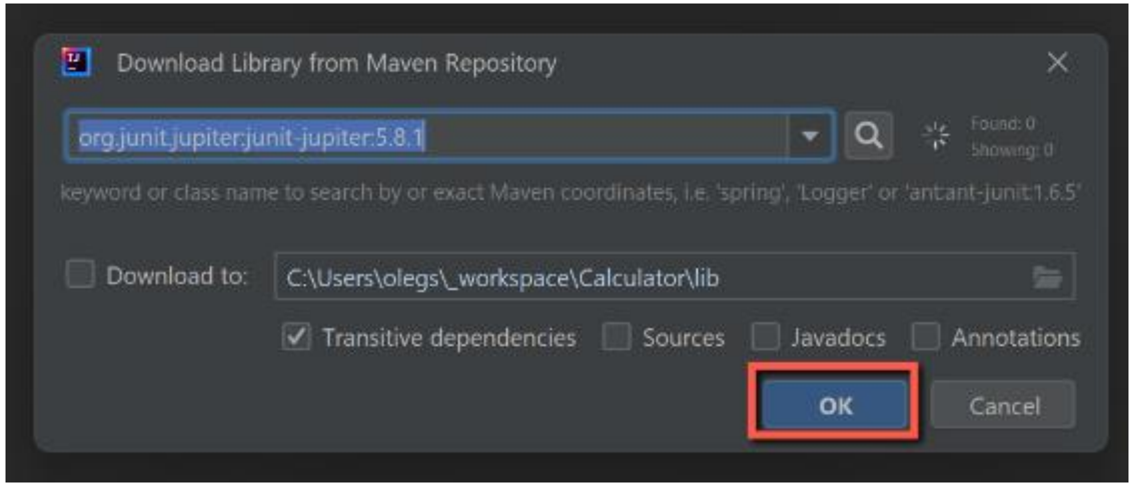
Generate: setUp/@Before, tearDown/@After

Generate test methods for: Show inherited methods

Member

sum(a:int, b:int):int

MANUAL JUNIT SETUP


Download Library from Maven Repository

org.junit.jupiter:junit-jupiter:5.8.1

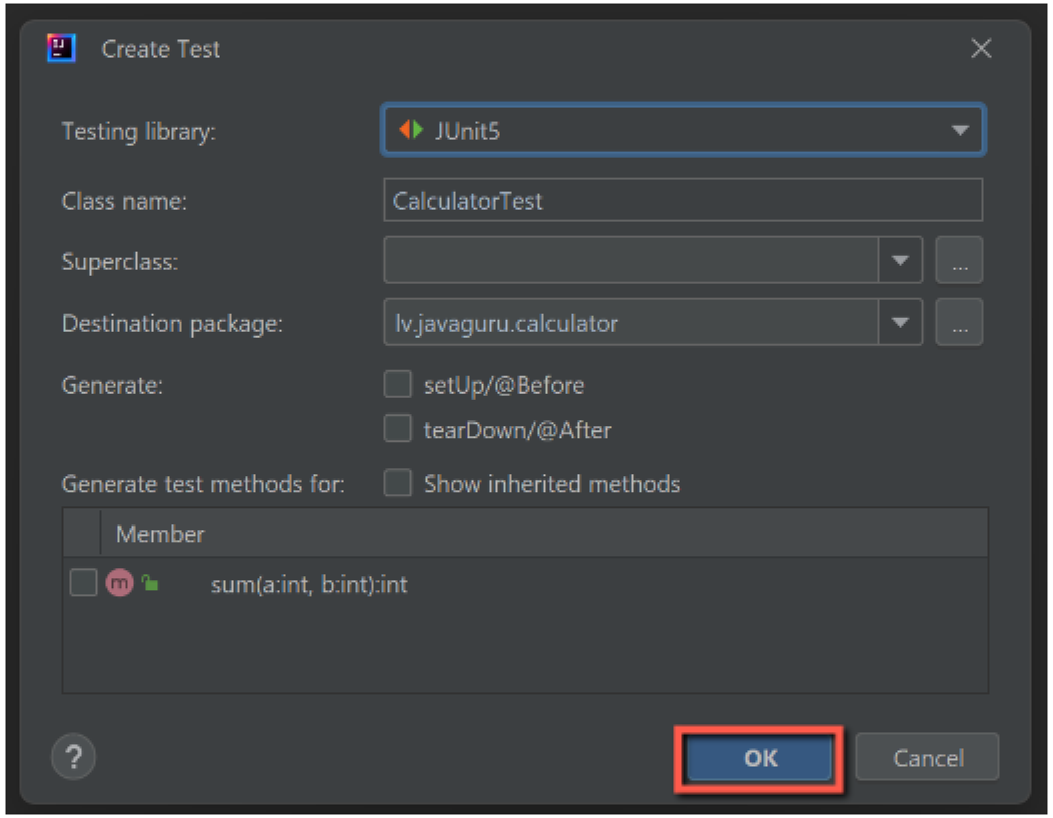
Found: 0
Showing: 0

keyword or class name to search by or exact Maven coordinates, i.e. 'spring', 'Logger' or 'ant:ant-junit:1.6.5'

☐ Download to: C:\Users\olegs_workspace\Calculator\lib

☑ Transitive dependencies ☐ Sources ☐ Javadocs ☐ Annotations

MANUAL JUNIT SETUP


Create Test

Testing library: JUnit5

Class name: CalculatorTest

Superclass:

Destination package: lv.javaguru.calculator

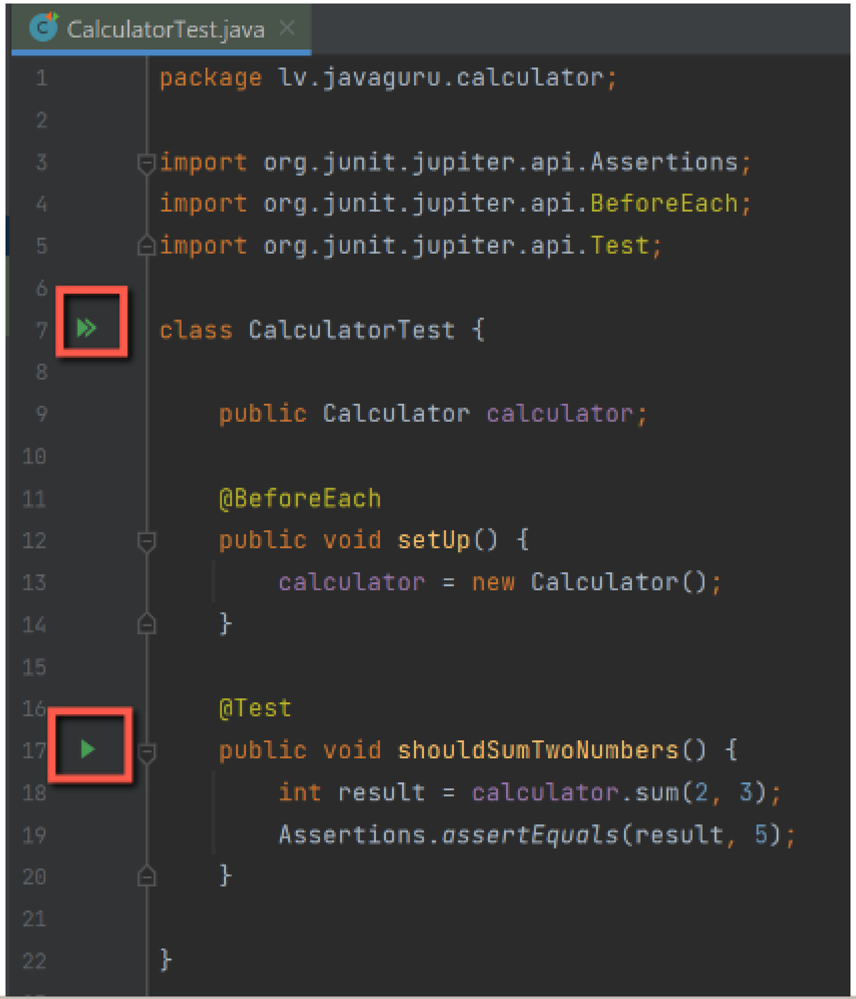
Generate: setUp/@Before, tearDown/@After

Generate test methods for: Show inherited methods

Member

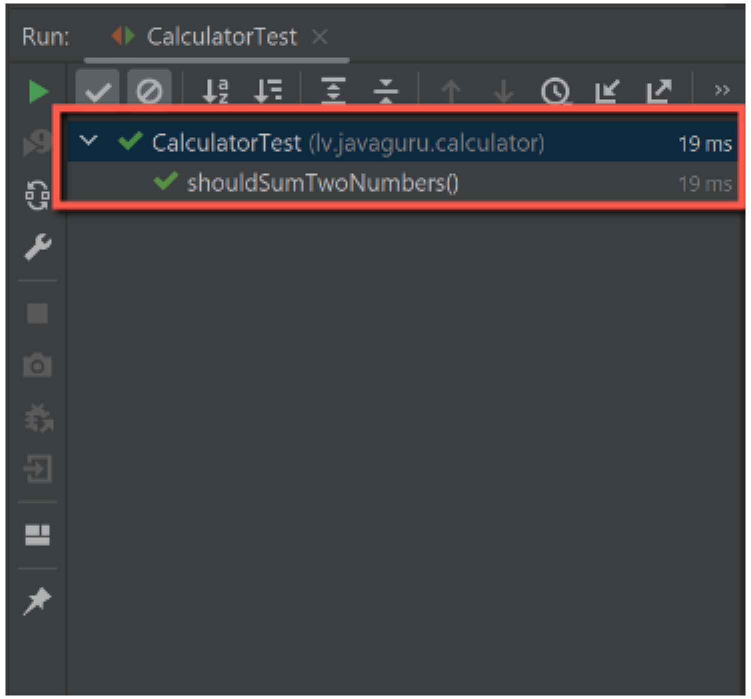
sum(a:int, b:int):int

MANUAL JUNIT SETUP


CalculatorTest.java

```
package lv.javaguru.calculator;

import org.junit.jupiter.api.Assertions;
import org.junit.jupiter.api.BeforeEach;
import org.junit.jupiter.api.Test;

class CalculatorTest {

    public Calculator calculator;

    @BeforeEach
    public void setUp() {
        calculator = new Calculator();
    }

    @Test
    public void shouldSumTwoNumbers() {
        int result = calculator.sum(2, 3);
        Assertions.assertEquals(result, 5);
    }

}
```

MANUAL JUNIT SETUP



```
CalculatorTest (lv.javaguru.calculator)   19 ms
    shouldSumTwoNumbers()                 19 ms
```

REFERENCES

REFERENCES

- https://junit.org/junit4/
- https://www.tutorialspoint.com/junit/junit_basic_usage.htm
- https://www.vogella.com/tutorials/JUnit/article.html
- https://www.swtestacademy.com/junit4/
- https://dzone.com/articles/7-popular-unit-test-naming

QUESTIONS?

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THANK YOU!