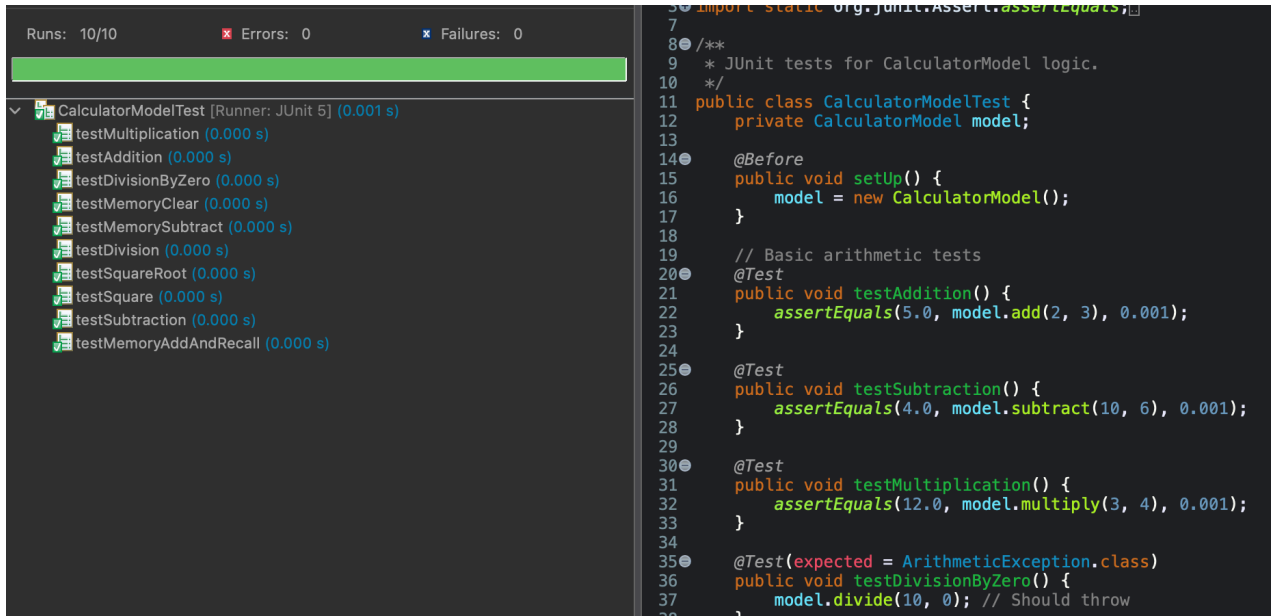


SE 317 - Lab 7: Scientific Calculator - Test Plan

A. Model Unit Tests

These tests directly invoke methods in CalculatorModel to ensure arithmetic and memory operations are accurate.

Test Case	Input	Expected Output
Add	<code>model.add(12, 8)</code>	20.0
Subtract	<code>model.subtract(100, 45.5)</code>	54.5
Multiply	<code>model.multiply(6, 7)</code>	42.0
Divide	<code>model.divide(20, 4)</code>	5.0
Square	<code>model.square(9)</code>	81.0
Square Root	<code>model.squareRoot(16)</code>	4.0
Divide by Zero	<code>model.divide(5, 0)</code>	throws ArithmeticException
Memory Add	<code>addToMemory(50); recallMemory()</code>	50.0
Memory Subtract	<code>subtractFromMemory(10)</code>	40.0
Memory Clear	<code>clearMemory(); recallMemory()</code>	0.0



B. GUI Test Cases (AssertJ-Swing)

1. [TR1] GUI Functional Tests

Test Case	Sequence	Expected Result
TC1	12 + 34 =	46.0
TC2	90 - 25 =	65.0
TC3	7 * 6 =	42.0
TC4	84 / 21 =	4.0
TC5	-9 $\sqrt{\quad}$	Error
TC6	5 x^2	25.0

2. [TR2] Display Operand/Result Only Tests

Test Case	Sequence	Expected Result
TC7	123 +	123
TC8	45 + 67	67
TC9	89 + 11 =	100.0

3. [TR3] Operation Button State Feedback Tests

Test Case	Sequence	Expected Result
TC10	34 + 5 =	39.0 (+ is active)
TC11	10 + - 5 =	5.0 (- is active)
TC12	9 + C 2 =	Error (clears op state)

4. [TR4] Chained & Memory Operation Tests

Test Case	Sequence	Expected Result
TC13	12 + 8 = * 3 = - 10 =	50.0
TC14	5 x ² = + 20 = √	6.708... (±0.01)
TC15	Full chain: 12+8=, M+, *3=, M+, -10=, M-, MR, x ² , C, MR+1=	31.0, MC, MR => 0.0
TC16	1 0 + 5 +/-=	5.0 (sign changed second operand)

Finished after 48.831 seconds

Runs: 16/16 Errors: 0 Failures: 0

16/16

CalculatorGUITest [Runner: JUnit 5] (48.711 s)

testOperationChangeMidway (5.207 s)

testOperandOnlyDisplaySecond (2.203 s)

testOperationChangeSign (2.530 s)

testOnlyResultOnEquals (2.544 s)

testClearRemovesOperationState (2.190 s)

testOperandOnlyDisplayFirst (1.877 s)

testNegativeNumberSquareRoot (1.541 s)

testMultiplication (1.877 s)

testSquareFunction (1.240 s)

testChainWithAllButtons (10.350 s)

testOperationPersistsUntilEquals (2.198 s)

testDivision (2.532 s)

testChainedCalculations (4.510 s)

testAdditionSimple (2.525 s)

testSubtraction (2.531 s)

testFunctionChainedOperations (2.854 s)

```
9 import org.assertj.swing.core.BasicRobot;
10 import org.assertj.swing.core.Robot;
11 import org.assertj.swing.fixture.FrameFixture;
12 import org.junit.After;
13 import org.junit.Before;
14 import org.junit.Test;
15
16 public class CalculatorGUITest {
17
18     private FrameFixture window;
19     private Robot robot;
20
21     @Before
22     public void setUp() {
23         robot = BasicRobot.robotWithNewAwtHierarchy();
24         robot.settings().delayBetweenEvents(100);
25
26         CalculatorModel model = new CalculatorModel();
27         CalculatorView view = new CalculatorView();
28         new CalculatorController(model, view);
29
30         window = new FrameFixture(robot, view);
31         window.show();
32     }
```

