1. Write a JUnit program to demonstrate lifecycle methods.

import org.junit.After;

import org.junit.AfterClass;

import org.junit.Before;

import org.junit.BeforeClass;

import org.junit.Test;

import static org.junit.Assert.\*;

public class LifecycleExampleTest {

@BeforeClass

public static void setUpClass() {

System.out.println("BeforeClass: Setting up class-level resources");

}

@AfterClass

public static void tearDownClass() {

System.out.println("AfterClass: Cleaning up class-level resources");

}

@Before

public void setUp() {

System.out.println("Before: Setting up test-level resources");

}

@After

public void tearDown() {

System.out.println("After: Cleaning up test-level resources");

}

// Test method

@Test

public void testAddition() {

System.out.println("Test: Performing addition test");

assertEquals(4, 2 + 2);

}

@Test

public void testSubtraction() {

System.out.println("Test: Performing subtraction test");

assertEquals(2, 4 - 2);

}

}

1. Write a JUnit program to demonstrate assertions.

import org.junit.Test;

import static org.junit.Assert.\*;

public class AssertionExampleTest {

@Test

public void testAssertEquals() {

assertEquals("String comparison", "Hello", "Hello");

assertEquals("Integer comparison", 2, 1 + 1);

}

@Test

public void testAssertNotEquals() {

assertNotEquals("String comparison", "Hello", "World");

assertNotEquals("Integer comparison", 3, 1 + 1);

}

@Test

public void testAssertTrueFalse() {

assertTrue("True assertion", 10 > 5);

assertFalse("False assertion", 4 < 2);

}

@Test

public void testAssertNullNotNull() {

String nullString = null;

assertNull("Should be null", nullString);

String notNullString = "Hello";

assertNotNull("Should not be null", notNullString);

}

@Test

public void testAssertArrayEquals() {

int[] expectedArray = {1, 2, 3};

int[] actualArray = {1, 2, 3};

assertArrayEquals("Array comparison", expectedArray, actualArray);

}

}

1. Write a JUnit program to demonstrate how tests are disabled.

import org.junit.Test;

import org.junit.Ignore;

import static org.junit.Assert.\*;

public class DisabledTestExample {

@Test

public void testEnabled() {

System.out.println("This test is enabled and should run.");

assertTrue(true);

}

@Ignore

@Test

public void testDisabled() {

System.out.println("This test is disabled and should not run.");

assertTrue(false);

disabled

}

@Test

@Ignore("Reason for disabling this test")

public void testDisabledWithReason() {

System.out.println("This test is disabled with a reason and should not run.");

assertTrue(false); }

@Test

@Disabled

public void testDisabledJUnit5() {

System.out.println("This test is disabled in JUnit 5 and should not run.");

assertTrue(false); disabled

}

}

1. Write a JUnit program to demonstrate assumptions in JUnit.

import org.junit.Test;

import static org.junit.Assume.\*;

public class AssumptionExampleTest {

@Test

public void testAssumptionPass() {

assumeTrue("Assumption is true, so the test should run", true);

System.out.println("Test passed!");

}

@Test

public void testAssumptionFail() {

assumeTrue("Assumption is false, so the test should be skipped", false);

System.out.println("This line won't be executed because the assumption failed.");

}

@Test

public void testAssumptionWithMessage() {

String environment = System.getProperty("env");

assumeNotNull("Assumption is based on a system property", environment);

System.out.println("Test passed with environment: " + environment);

}

@Test

public void testAssumptionWithMultipleConditions() {

String environment = System.getProperty("env");

assumeTrue("Assumption is based on multiple conditions",

environment != null && environment.equals("test"));

System.out.println("Test passed with environment: " + environment);

}

}

1. Write a JUnit program to demonstrate test interfaces and default methods in JUnit.

import org.junit.jupiter.api.Test;

interface MathOperationsTest {

@Test

default void testAddition() {

System.out.println("Testing addition");

int result = add(2, 3);

assert result == 5 : "Addition failed!";

}

@Test

default void testSubtraction() {

System.out.println("Testing subtraction");

int result = subtract(5, 3);

assert result == 2 : "Subtraction failed!";

}

int add(int a, int b);

int subtract(int a, int b);

}

class MathOperations implements MathOperationsTest {

@Override

public int add(int a, int b) {

return a + b;

}

@Override

public int subtract(int a, int b) {

return a - b;

}

}

class AnotherMathOperations implements MathOperationsTest {

@Override

public int add(int a, int b) {

return b - a; // Incorrect implementation for testing purposes

}

@Override

public int subtract(int a, int b) {

return a \* b; // Incorrect implementation for testing purposes

}

}

public class TestInterfaceExample {

public static void main(String[] args) {

System.out.println("Running tests for MathOperations");

MathOperations mathOperations = new MathOperations();

mathOperations.testAddition();

mathOperations.testSubtraction();

System.out.println("\nRunning tests for AnotherMathOperations");

AnotherMathOperations anotherMathOperations = new AnotherMathOperations();

anotherMathOperations.testAddition();

anotherMathOperations.testSubtraction();

}

}

1. Write a JUnit program to demonstrate how tests are repeated in JUnit.

import org.junit.jupiter.api.RepeatedTest;

import org.junit.jupiter.api.RepetitionInfo;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class RepeatedTestExample {

@RepeatedTest(3)

void testAddition(RepetitionInfo repetitionInfo) {

int result = add(2, 3);

assertEquals(5, result, "Addition failed in repetition " + repetitionInfo.getCurrentRepetition());

}

@RepeatedTest(value = 5, name = "{displayName} - Repetition {currentRepetition}/{totalRepetitions}")

void testSubtraction() {

int result = subtract(5, 3);

assertEquals(2, result, "Subtraction failed");

}

int add(int a, int b) {

return a + b;

}

int subtract(int a, int b) {

return a - b;

}

}

1. Write a JUnit program to demonstrate how dynamic tests are created in JUnit.

import org.junit.jupiter.api.DynamicContainer;

import org.junit.jupiter.api.DynamicTest;

import org.junit.jupiter.api.TestFactory;

import java.util.Arrays;

import java.util.Collection;

import java.util.stream.Stream;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class DynamicTestExample {

@TestFactory

Collection<DynamicTest> dynamicTestsFromCollection() {

return Arrays.asList(

DynamicTest.dynamicTest("Addition Test", () -> assertEquals(5, add(2, 3))),

DynamicTest.dynamicTest("Subtraction Test", () -> assertEquals(2, subtract(5, 3)))

);

}

@TestFactory

Stream<DynamicTest> dynamicTestsFromStream() {

return Stream.of(

DynamicTest.dynamicTest("Multiplication Test", () -> assertEquals(12, multiply(4, 3))),

DynamicTest.dynamicTest("Division Test", () -> assertEquals(4, divide(12, 3)))

);

}

@TestFactory

Stream<DynamicContainer> dynamicContainer() {

return Stream.of(

DynamicContainer.dynamicContainer("Math Operations",

Stream.of(

DynamicTest.dynamicTest("Addition Test", () -> assertEquals(7, add(4, 3))),

DynamicTest.dynamicTest("Subtraction Test", () -> assertEquals(2, subtract(5, 3)))

)),

DynamicContainer.dynamicContainer("More Math Operations",

Stream.of(

DynamicTest.dynamicTest("Multiplication Test", () -> assertEquals(20, multiply(4, 5))),

DynamicTest.dynamicTest("Division Test", () -> assertEquals(3, divide(15, 5)))

))

);

}

int add(int a, int b) {

return a + b;

}

int subtract(int a, int b) {

return a - b;

}

int multiply(int a, int b) {

return a \* b;

}

int divide(int a, int b) {

return a / b;

}

}

1. Write a JUnit program to demonstrate how parameterized tests are created in JUnit.

import org.junit.jupiter.api.Test;

import org.junit.jupiter.params.ParameterizedTest;

import org.junit.jupiter.params.provider.CsvSource;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class ParameterizedTestExample {

@ParameterizedTest

@CsvSource({ "2, 3, 5", "5, 3, 8", "0, 0, 0", "-5, 5, 0" })

void testAddition(int a, int b, int expectedSum) {

int result = add(a, b);

assertEquals(expectedSum, result, () -> "Sum of " + a + " and " + b + " should be " + expectedSum);

}

@ParameterizedTest

@CsvSource({ "4, 2, 2", "9, 3, 6", "0, 5, -5", "-8, 4, -12" })

void testSubtraction(int a, int b, int expectedDifference) {

int result = subtract(a, b);

assertEquals(expectedDifference, result, () -> "Difference of " + a + " and " + b + " should be " + expectedDifference);

}

@Test

void regularTest() {

assertEquals(6, add(2, 4));

}

int add(int a, int b) {

return a + b;

}

int subtract(int a, int b) {

return a - b;

}

1. Write a JUnit program to demonstrate how argument sources are used in in JUnit.

import org.junit.jupiter.params.ParameterizedTest;

import org.junit.jupiter.params.provider.Arguments;

import org.junit.jupiter.params.provider.CsvSource;

import org.junit.jupiter.params.provider.MethodSource;

import java.util.stream.Stream;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class ArgumentSourceExample {

@ParameterizedTest

@CsvSource({ "2, 3, 5", "5, 3, 8", "0, 0, 0", "-5, 5, 0" })

void testAddition(int a, int b, int expectedSum) {

int result = add(a, b);

assertEquals(expectedSum, result, () -> "Sum of " + a + " and " + b + " should be " + expectedSum);

}

@ParameterizedTest

@MethodSource("subtractArguments")

void testSubtraction(int a, int b, int expectedDifference) {

int result = subtract(a, b);

assertEquals(expectedDifference, result, () -> "Difference of " + a + " and " + b + " should be " + expectedDifference);

}

static Stream<Arguments> subtractArguments() {

return Stream.of(

Arguments.of(4, 2, 2),

Arguments.of(9, 3, 6),

Arguments.of(0, 5, -5),

Arguments.of(-8, 4, -12)

);

}

int add(int a, int b) {

return a + b;

}

int subtract(int a, int b) {

return a - b;

}

}

10. Write a JUnit program to demonstrate argument conversion in JUnit.

import org.junit.jupiter.api.extension.ParameterContext;

import org.junit.jupiter.params.ParameterizedTest;

import org.junit.jupiter.params.converter.ArgumentConversionException;

import org.junit.jupiter.params.converter.ConvertWith;

import org.junit.jupiter.params.converter.SimpleArgumentConverter;

import org.junit.jupiter.params.provider.Arguments;

import org.junit.jupiter.params.provider.CsvSource;

import org.junit.jupiter.params.provider.MethodSource;

import java.util.stream.Stream;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class ArgumentConversionExample {

@ParameterizedTest

@CsvSource({ "2, 3, 5", "5, 3, 8", "0, 0, 0", "-5, 5, 0" })

void testAddition(int a, int b, int expectedSum) {

int result = add(a, b);

assertEquals(expectedSum, result, () -> "Sum of " + a + " and " + b + " should be " + expectedSum);

}

@ParameterizedTest

@MethodSource("subtractArguments")

void testSubtraction(@ConvertWith(MyConverter.class) CustomNumber a,

@ConvertWith(MyConverter.class) CustomNumber b,

int expectedDifference) {

int result = subtract(a.getValue(), b.getValue());

assertEquals(expectedDifference, result, () -> "Difference of " + a + " and " + b + " should be " + expectedDifference);

}

static Stream<Arguments> subtractArguments() {

return Stream.of(

Arguments.of(new CustomNumber(4), new CustomNumber(2), 2),

Arguments.of(new CustomNumber(9), new CustomNumber(3), 6),

Arguments.of(new CustomNumber(0), new CustomNumber(5), -5),

Arguments.of(new CustomNumber(-8), new CustomNumber(4), -12)

);

}

int add(int a, int b) {

return a + b;

}

int subtract(int a, int b) {

return a - b;

}

static class MyConverter extends SimpleArgumentConverter {

@Override

protected Object convert(Object source, Class<?> targetType) throws ArgumentConversionException {

if (source instanceof String && targetType == CustomNumber.class) {

return new CustomNumber(Integer.parseInt((String) source));

}

throw new ArgumentConversionException("Cannot convert source to target type");

}

}

static class CustomNumber {

private final int value;

CustomNumber(int value) {

this.value = value;

}

int getValue() {

return value;

}

@Override

public String toString() {

return String.valueOf(value);

}

}

}

11 . Write a JUnit program to demonstrate extension points.

import org.junit.jupiter.api.Test;

import org.junit.jupiter.api.extension.ExtensionContext;

import org.junit.jupiter.api.extension.ExtensionContext.Namespace;

import org.junit.jupiter.api.extension.ExtensionContext.Store;

import org.junit.jupiter.api.extension.ExtensionContext.Store.CloseableResource;

import org.junit.jupiter.api.extension.RegisterExtension;

import org.junit.jupiter.api.extension.Extension;

import org.junit.jupiter.api.extension.ExtensionContextException;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class ExtensionExample {

@RegisterExtension

static MyExtension myExtension = new MyExtension();

@Test

void testWithExtension() {

int result = addWithExtension(2, 3);

assertEquals(5, result, "Addition with extension failed");

}

int addWithExtension(int a, int b) {

return myExtension.add(a, b);

}

static class MyExtension implements Extension {

int add(int a, int b) {

ExtensionContext context = ExtensionContext.getRootStore().get(Namespace.create(getClass()));

MyCloseableResource resource = context.getStore(Namespace.create(getClass())).getOrComputeIfAbsent(

MyCloseableResource.class, k -> new MyCloseableResource(), MyCloseableResource.class);

return resource.add(a, b);

}

}

static class MyCloseableResource implements CloseableResource {

private int count = 0;

int add(int a, int b) {

count++;

System.out.println("Count: " + count);

return a + b;

}

@Override

public void close() {

System.out.println("Closing MyCloseableResource");

}

}

}

12. Write a JUnit program to demonstrate meta-annotation.

import org.junit.jupiter.api.Test;

import org.junit.jupiter.api.condition.DisabledIfEnvironmentVariable;

import java.lang.annotation.ElementType;

import java.lang.annotation.Retention;

import java.lang.annotation.RetentionPolicy;

import java.lang.annotation.Target;

import static org.junit.jupiter.api.Assertions.assertTrue;

public class MetaAnnotationExample {

@Test

@CustomEnabledOnCI

void testOnCI() {

assertTrue(true, "Test passed");

}

@Test

@CustomEnabledOnCI

void anotherTestOnCI() {

assertTrue(true, "Another test passed");

}

@Test

@DisabledIfEnvironmentVariable(named = "CI", matches = "true")

void testDisabledOnCI() {

assertTrue(true, "Test passed");

}

@Target(ElementType.METHOD)

@Retention(RetentionPolicy.RUNTIME)

@CustomEnabledOnCI

@DisabledIfEnvironmentVariable(named = "DATABASE\_URL", matches = ".\*")

public @interface CustomEnabledOnDatabase {

}

@Test

@CustomEnabledOnDatabase

void testEnabledOnDatabase() {

assertTrue(true, "Test passed");

}

@Target(ElementType.METHOD)

@Retention(RetentionPolicy.RUNTIME)

@DisabledIfEnvironmentVariable(named = "CI", matches = "false")

public @interface CustomEnabledOnCI {

}

}

13. Write a JUnit program to demonstrate how tests are run from the console.

import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class MyTest {

@Test

void testAddition() {

int result = add(2, 3);

assertEquals(5, result, "Addition failed");

}

int add(int a, int b) {

return a + b;

}

}

14. Write a JUnit program to demonstrate how tests are run on Gradle.

import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class MyTest {

@Test

void testAddition() {

int result = add(2, 3);

assertEquals(5, result, "Addition failed");

}

int add(int a, int b) {

return a + b;

}

}

15. Write a JUnit program to demonstrate how tests are run on Maven.

import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class MyTest {

@Test

void testAddition() {

int result = add(2, 3);

assertEquals(5, result, "Addition failed");

}

int add(int a, int b) {

return a + b;

}

}

16 .Write a JUnit program to demonstrate how tests with tags are included or excluded.

import org.junit.jupiter.api.Tag;

import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class TaggedTestExample {

@Test

@Tag("slow")

void slowTest() {

try {

Thread.sleep(2000);

} catch (InterruptedException e) {

e.printStackTrace();

}

assertEquals(2 + 2, 4, "Slow test failed");

}

@Test

@Tag("fast")

void fastTest() {

assertEquals(3 \* 4, 12, "Fast test failed");

}

@Test

@Tag("integration")

void integrationTest() {

assertEquals("integration", "integration", "Integration test failed");

}

@Test

@Tag("unit")

void unitTest() {

assertEquals("unit", "unit", "Unit test failed");

}

}

17. Write a JUnit program to demonstrate code coverage.

import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.assertEquals;

public class SampleTest {

@Test

void testAddition() {

Calculator calculator = new Calculator();

int result = calculator.add(2, 3);

assertEquals(5, result, "Addition failed");

}

@Test

void testSubtraction() {

Calculator calculator = new Calculator();

int result = calculator.subtract(5, 3);

assertEquals(2, result, "Subtraction failed");

}

}