

## Exercise 1: Basic Unit Test for a Service Method

### CODE:

#### CalculatorService.java:

```
public class CalculatorService {  
    public int add(int a, int b) {  
        return a + b;  
    }  
}
```

#### CalculatorServiceTest.java:

```
import org.junit.jupiter.api.Test;  
import static org.junit.jupiter.api.Assertions.assertEquals;  
public class CalculatorServiceTest {  
    @Test  
    public void testAdd() {  
        CalculatorService calculatorService = new CalculatorService();  
        int result = calculatorService.add(3, 4);  
        assertEquals(7, result);  
    }  
}
```

## OUTPUT:

```
>_ Console  Shell x +
~/workspace: mvn test

Downloading from central: https://repo.maven.apache.org/maven2/org/junit/platform/junit-platf
orm-commons/1.3.1/junit-platform-commons-1.3.1.jar
Downloading from central: https://repo.maven.apache.org/maven2/org/junit/platform/junit-platf
orm-launcher/1.3.1/junit-platform-launcher-1.3.1.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apiguardian/apiguardian-api
/1.0.0/apiguardian-api-1.0.0.jar (2.2 kB at 42 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/opentest4j/opentest4j/1.1.
1/opentest4j-1.1.1.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/surefire/suref
ire-junit-platform/2.22.2/surefire-junit-platform-2.22.2.jar (66 kB at 1.2 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/junit/platform/junit-platfo
rm-engine/1.3.1/junit-platform-engine-1.3.1.jar (135 kB at 2.2 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/junit/platform/junit-platfo
rm-launcher/1.3.1/junit-platform-launcher-1.3.1.jar (95 kB at 1.8 MB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/opentest4j/opentest4j/1.1.1
/opentest4j-1.1.1.jar (7.1 kB at 81 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/junit/platform/junit-platfo
rm-commons/1.3.1/junit-platform-commons-1.3.1.jar (78 kB at 506 kB/s)
[INFO] -----
[INFO]  T E S T S
[INFO] -----
[INFO] Running CalculatorServiceTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.09 s - in Calculator
ServiceTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 7.820 s
[INFO] Finished at: 2025-06-29T15:42:59Z
[INFO] -----
~/workspace$
```

## Exercise 2: Mocking a Repository in a Service Test

### CODE:

#### User.java:

```
import javax.persistence.Entity;
```

```
import javax.persistence.Id;
```

```
@Entity
```

```
public class User {
```

```
    @Id
```

```
    private Long id;
```

```
    private String name;
```

```
    public User() {}
```

```
    public User(Long id, String name) {
```

```
        this.id = id;
```

```
        this.name = name;
```

```
    }
```

```
    public Long getId() { return id; }
```

```
    public void setId(Long id) { this.id = id; }
```

```
    public String getName() { return name; }
```

```
    public void setName(String name) { this.name = name; }
```

```
}
```

#### UserRepository.java:

```
import org.springframework.data.jpa.repository.JpaRepository;
```

```
public interface UserRepository extends JpaRepository<User, Long> {  
}
```

### **UserService.java:**

```
import org.springframework.beans.factory.annotation.Autowired;  
import org.springframework.stereotype.Service;
```

```
@Service
```

```
public class UserService {  
    @Autowired  
    private UserRepository userRepository;  
  
    public User getUserById(Long id) {  
        return userRepository.findById(id).orElse(null);  
    }  
}
```

### **UserServiceTest.java:**

```
import org.junit.jupiter.api.Test;  
import static org.junit.jupiter.api.Assertions.*;  
import static org.mockito.Mockito.*;  
import java.util.Optional;  
public class UserServiceTest {  
  
    @Test  
    public void testGetUserById_ReturnsUser() {  
        UserRepository mockRepository = mock(UserRepository.class);  
        UserService userService = new UserService();  
        User expectedUser = new User(1L, "Alice");  
        java.lang.reflect.Field field;  
        try {
```

```
        field = UserService.class.getDeclaredField("userRepository");
        field.setAccessible(true);
        field.set(userService, mockRepository);
    } catch (Exception e) {
        fail("Failed to inject mock repository");
    }
    when(mockRepository.findById(1L)).thenReturn(Optional.of(expectedUser));
    User actualUser = userService.getUserById(1L);

    assertNotNull(actualUser);
    assertEquals("Alice", actualUser.getName());
}
}
```

## OUTPUT:

```
>_ Console  Shell x +
~ /workspace: mvn test

[INFO] -----[ jar ]-----
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ myartifacid ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/runner/workspace/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.1:compile (default-compile) @ myartifacid ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ myartifacid --
-
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/runner/workspace/src/test/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.1:testCompile (default-testCompile) @ myartifacid ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-surefire-plugin:2.22.2:test (default-test) @ myartifacid ---
[INFO]
[INFO] -----
[INFO] T E S T S
[INFO] -----
[INFO] Running UserServiceTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 2.4 s - in UserService
Test
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 6.318 s
[INFO] Finished at: 2025-06-29T15:57:40Z
[INFO] -----
~/workspace$
```

## Exercise 3: Testing a REST Controller with MockMvc

### CODE:

#### User.java:

```
public class User {  
    private Long id;  
    private String name;  
    public User() {}  
    public User(Long id, String name) {  
        this.id = id;  
        this.name = name;  
    }  
    public Long getId() {  
        return id;  
    }  
    public void setId(Long id) {  
        this.id = id;  
    }  
    public String getName() {  
        return name;  
    }  
    public void setName(String name) {  
        this.name = name;  
    }  
}
```

#### UserController.java:

```
import org.springframework.beans.factory.annotation.Autowired;  
import org.springframework.http.ResponseEntity;  
import org.springframework.web.bind.annotation.*;
```

```

@RestController
@RequestMapping("/users")
public class UserController {

    @Autowired
    private UserService userService;

    @GetMapping("/{id}")
    public ResponseEntity<User> getUser(@PathVariable Long id) {

        User user = userService.getUserById(id);

        return ResponseEntity.ok(user);

    }
}

```

#### **UserService.java:**

```

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

@Service
public class UserService {

    @Autowired
    private UserRepository userRepository;

    public User getUserById(Long id) {

        return userRepository.findById(id).orElse(null);

    }
}

```

#### **UserControllerTest.java:**

```

import com.fasterxml.jackson.databind.ObjectMapper;
import org.junit.jupiter.api.Test;
import org.mockito.Mockito;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.boot.test.autoconfigure.web.servlet.WebMvcTest;

```



```
import org.springframework.boot.test.mock.mockito.MockBean;
import org.springframework.http.MediaType;
import org.springframework.test.web.servlet.MockMvc;
import static org.mockito.ArgumentMatchers.anyLong;
import static org.springframework.test.web.servlet.request.MockMvcRequestBuilders.get;
import static org.springframework.test.web.servlet.result.MockMvcResultMatchers.*;

@WebMvcTest(UserController.class)
public class UserControllerTest {

    @Autowired
    private MockMvc mockMvc;

    @MockBean
    private UserService userService;

    @Autowired
    private ObjectMapper objectMapper;

    @Test
    public void testGetUserById() throws Exception {
        User mockUser = new User(1L, "John Doe");
        Mockito.when(userService.getUserById(anyLong())).thenReturn(mockUser);
        mockMvc.perform(get("/users/1")
            .contentType(MediaType.APPLICATION_JSON))
            .andExpect(status().isOk())
            .andExpect(jsonPath("$.id").value(1))
            .andExpect(jsonPath("$.name").value("John Doe"));
    }
}
```

## OUTPUT:

```
~/workspace$ mvn test
[INFO] --- maven-compiler-plugin:3.8.1:testCompile (default-testCompile)
@ JUnitDemo ---
[INFO] Changes detected - recompiling the module!
[WARNING] File encoding has not been set, using platform encoding UTF-8,
i.e. build is platform dependent!
[INFO] Compiling 1 source file to /home/runner/workspace/target/test-cla
sses
[INFO]
[INFO] --- maven-surefire-plugin:3.0.0-M9:test (default-test) @ JUnitDem
o ---
[INFO] Using auto detected provider org.apache.maven.surefire.junitplatf
orm.JUnitPlatformProvider
[INFO]
[INFO] -----
[INFO] T E S T S
[INFO] -----
[INFO] Running UserServiceTest
OpenJDK 64-Bit Server VM warning: Sharing is only supported for boot loa
der classes because bootstrap classpath has been appended
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 4
.011 s - in UserServiceTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 26.095 s
[INFO] Finished at: 2025-06-29T15:47:06Z
[INFO] -----
~/workspace$
```

## Exercise 4: Integration Test with Spring Boot

### CODE:

#### UserIntegrationTest.java:

```
import org.junit.jupiter.api.Test;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.boot.test.context.SpringBootTest;
import org.springframework.boot.test.web.client.TestRestTemplate;
import org.springframework.boot.test.autoconfigure.jdbc.AutoConfigureTestDatabase;
import
org.springframework.boot.test.autoconfigure.jdbc.AutoConfigureTestDatabase.Replace;
import org.springframework.boot.web.server.LocalServerPort;
import org.springframework.http.ResponseEntity;

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

@SpringBootTest(webEnvironment = SpringBootTest.WebEnvironment.RANDOM_PORT)
@AutoConfigureTestDatabase(replace = Replace.ANY)
public class UserIntegrationTest {

    @LocalServerPort
    private int port;

    @Autowired
    private TestRestTemplate restTemplate;

    @Autowired
    private UserRepository userRepository;

    @Test
```

```
public void testGetUserById() {  
    // Arrange: create and save user  
    User user = new User();  
    user.setId(1L);  
    user.setName("John Doe");  
    userRepository.save(user);  
  
    // Act: call REST endpoint  
    String url = "http://localhost:" + port + "/users/1";  
    ResponseEntity<User> response = restTemplate.getForEntity(url, User.class);  
  
    // Assert  
    assertEquals(200, response.getStatusCodeValue());  
    assertNotNull(response.getBody());  
    assertEquals("John Doe", response.getBody().getName());  
}  
}
```

## OUTPUT:

```
> Console  Shell  x  +
~/workspace: mvn test

[INFO] -----[ jar ]-----
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ myartifacid ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/runner/workspace/src/main/resources
[INFO] --- maven-compiler-plugin:3.8.1:compile (default-compile) @ myartifacid ---
[INFO] Nothing to compile - all classes are up to date
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ myartifacid --
-
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/runner/workspace/src/test/resources
[INFO] --- maven-compiler-plugin:3.8.1:testCompile (default-testCompile) @ myartifacid ---
[INFO] Nothing to compile - all classes are up to date
[INFO] --- maven-surefire-plugin:2.22.2:test (default-test) @ myartifacid ---
[INFO] -----
[INFO] T E S T S
[INFO] -----
[INFO] Running UserServiceTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 2.4 s - in UserService
Test
[INFO] Results:
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 6.318 s
[INFO] Finished at: 2025-06-29T15:57:40Z
[INFO] -----
~/workspace$
```