**Calculator.java**

**package quangnc.example;  
  
public class Calculator {  
 public int add(int a, int b) {  
 return a + b;  
 }  
  
 public int divide(int a, int b) {  
 if (b == 0) throw new IllegalArgumentException("Cannot divide by zero");  
 return a / b;  
 }  
  
 public int multiply(int a, int b) {  
 return a \* b;  
 }  
  
  
}**

**CalculatorTest.java**

**import org.junit.jupiter.api.Test;  
import org.junit.jupiter.params.ParameterizedTest;  
import org.junit.jupiter.params.provider.CsvFileSource;  
import quangnc.example.Calculator;  
  
import static org.junit.jupiter.api.Assertions.*assertEquals*;  
import static org.junit.jupiter.api.Assertions.*assertThrows*;  
  
public class CalculatorTest {  
 Calculator calculator = new Calculator();  
 @Test  
 void testAddition() {  
 *assertEquals*(5, calculator.add(2, 3), "Addition should return 5");  
 }  
  
 @Test  
 void testDivide() {  
 *assertEquals*(2, calculator.divide(6, 3));  
 }  
  
 @Test  
 void testDivideByZero() {  
 Exception exception = *assertThrows*(IllegalArgumentException.class, () -> {  
 calculator.divide(10, 0);  
 });  
  
 *assertEquals*("Cannot divide by zero", exception.getMessage());  
 }  
  
 @ParameterizedTest(name = "Test {index} => {0} \* {1} = {2}")  
 @CsvFileSource(resources = "/data.csv", numLinesToSkip = 0)  
 void testMultiplyFromFile(int a, int b, int expected) {  
 int result = calculator.multiply(a, b);  
 *assertEquals*(expected, result, () -> a + " \* " + b + " should be " + expected);  
 }  
  
  
}**

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**InsuranceClaim.java:**

package quangnc.example;  
  
public class InsuranceClaim {  
  
 private String claimId;  
 private double amount;  
 private String claimStatus;  
  
 private static final double *PAYOUT\_RATE* = 0.85;  
  
 */\*\*  
 \* Constructor to initialize the insurance claim.  
 \* @param id Claim ID  
 \* @param claimAmount Amount claimed  
 \* @throws IllegalArgumentException if amount is zero or negative  
 \*/* public InsuranceClaim(String id, double claimAmount) {  
 if (claimAmount <= 0) {  
 throw new IllegalArgumentException("Claim amount must be positive.");  
 }  
 if (id == null || id.isEmpty()) {  
 throw new IllegalArgumentException("Claim ID cannot be null or empty");  
 }  
  
 this.claimId = id;  
 this.amount = claimAmount;  
 this.claimStatus = "Pending";  
 }  
  
  
  
 */\*\*  
 \* Processes the claim by updating its status if currently pending.  
 \* @param statusUpdate New status to apply  
 \* @return true if update was applied, false otherwise  
 \*/* public boolean processClaim(String statusUpdate) {  
 if (statusUpdate == null) {  
 throw new IllegalArgumentException("Status update cannot be null");  
 }  
  
 if ("Pending".equals(this.claimStatus)) {  
 this.claimStatus = statusUpdate;  
 return true;  
 }  
 return false;  
 }  
  
  
 */\*\*  
 \* Calculates payout based on approval.  
 \* @return payout amount or 0 if not approved  
 \*/* public double calculatePayout() {  
 if ("Approved".equals(this.claimStatus)) {  
 return amount \* *PAYOUT\_RATE*;  
 } else {  
 return 0;  
 }  
 }  
  
 */\*\*  
 \* Updates the amount of the claim.  
 \* @param newAmount new claim amount  
 \*/* public void updateClaimAmount(double newAmount) {  
 if (newAmount <= 0) {  
 throw new IllegalArgumentException("New amount must be positive.");  
 }  
 this.amount = newAmount;  
 }  
  
 // Getters  
 public String getClaimId() {  
 return claimId;  
 }  
  
 public double getAmount() {  
 return amount;  
 }  
  
 public String getClaimStatus() {  
 return claimStatus;  
 }  
  
 @Override  
 public String toString() {  
 return "InsuranceClaim{" +  
 "claimId='" + claimId + '\'' +  
 ", amount=" + amount +  
 ", claimStatus='" + claimStatus + '\'' +  
 '}';  
 }  
}

InsuranceClaimTest.java:

import org.junit.jupiter.api.BeforeEach;  
import org.junit.jupiter.api.DisplayName;  
import org.junit.jupiter.api.Test;  
import org.junit.jupiter.params.ParameterizedTest;  
import org.junit.jupiter.params.provider.CsvSource;  
import quangnc.example.InsuranceClaim;  
  
import static org.junit.jupiter.api.Assertions.\*;  
  
class InsuranceClaimTest {  
  
 private InsuranceClaim claim;  
  
 @BeforeEach  
 void setUp() {  
 claim = new InsuranceClaim("C001", 1000.0);  
 }  
  
 @Test  
 @DisplayName("Constructor throws exception for null claim ID")  
 void testConstructorNullClaimId() {  
 *assertThrows*(IllegalArgumentException.class, () -> new InsuranceClaim(null, 1000.0));  
 }  
  
 @Test  
 @DisplayName("processClaim throws exception for null input")  
 void testProcessClaimNullInput() {  
 *assertThrows*(IllegalArgumentException.class, () -> claim.processClaim(null));  
 }  
  
  
 @Test  
 @DisplayName("Constructor initializes correctly")  
 void testConstructorInitializesValues() {  
 *assertEquals*("C001", claim.getClaimId());  
 *assertEquals*(1000.0, claim.getAmount());  
 *assertEquals*("Pending", claim.getClaimStatus());  
 }  
  
 @Test  
 @DisplayName("Constructor throws exception for invalid amount")  
 void testConstructorInvalidAmount() {  
 *assertThrows*(IllegalArgumentException.class, () -> new InsuranceClaim("C002", -500));  
 }  
  
 @Test  
 @DisplayName("processClaim updates status if Pending")  
 void testProcessClaimWhenPending() {  
 boolean result = claim.processClaim("Approved");  
 *assertTrue*(result);  
 *assertEquals*("Approved", claim.getClaimStatus());  
 }  
  
 @Test  
 @DisplayName("processClaim returns false if not Pending")  
 void testProcessClaimWhenNotPending() {  
 claim.processClaim("Approved");  
 boolean result = claim.processClaim("Rejected");  
 *assertFalse*(result);  
 *assertEquals*("Approved", claim.getClaimStatus());  
 }  
  
 @Test  
 @DisplayName("calculatePayout returns correct amount when Approved")  
 void testCalculatePayoutApproved() {  
 claim.processClaim("Approved");  
 *assertEquals*(850.0, claim.calculatePayout(), 0.001);  
 }  
  
 @Test  
 @DisplayName("calculatePayout returns 0 if not Approved")  
 void testCalculatePayoutNotApproved() {  
 *assertEquals*(0, claim.calculatePayout());  
 }  
  
 @Test  
 @DisplayName("updateClaimAmount updates successfully")  
 void testUpdateClaimAmount() {  
 claim.updateClaimAmount(2000.0);  
 *assertEquals*(2000.0, claim.getAmount());  
 }  
  
 @Test  
 @DisplayName("updateClaimAmount throws exception for invalid amount")  
 void testUpdateClaimAmountInvalid() {  
 *assertThrows*(IllegalArgumentException.class, () -> claim.updateClaimAmount(0));  
 }  
  
 @ParameterizedTest  
 @CsvSource({  
 "Approved,850.0",  
 "Rejected,0",  
 "Pending,0"  
 })  
 @DisplayName("Parameterized Test - calculatePayout for various statuses")  
 void testCalculatePayoutVariousStatuses(String status, double expectedPayout) {  
 claim.processClaim(status);  
 *assertEquals*(expectedPayout, claim.calculatePayout(), 0.001);  
 }  
  
 @Test  
 @DisplayName("toString returns expected format")  
 void testToStringFormat() {  
 String output = claim.toString();  
 *assertTrue*(output.contains("InsuranceClaim"));  
 *assertTrue*(output.contains("claimId='C001'"));  
 *assertTrue*(output.contains("amount=1000.0"));  
 *assertTrue*(output.contains("claimStatus='Pending'"));  
 }  
}

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Homework:  
AccountService.java

package quangnc.example;  
  
import java.util.regex.Pattern;  
  
public class AccountService {  
  
 public boolean isValidEmail(String email) {  
 if (email == null || email.isEmpty()) return false;  
 String emailRegex = "^[A-Za-z0-9+\_.-]+@[A-Za-z0-9.-]+\\.[A-Za-z]{2,6}$";  
 return Pattern.*matches*(emailRegex, email);  
 }  
  
 public boolean registerAccount(String username, String password, String email) {  
 if (username == null || username.isEmpty()) return false;  
 if (password == null || password.length() <= 6) return false;  
 return isValidEmail(email);  
 }  
}

AccountServiceTest.java:  
import static org.junit.jupiter.api.Assertions.\*;  
import org.junit.jupiter.api.BeforeAll;  
import org.junit.jupiter.api.Test;  
import org.junit.jupiter.params.ParameterizedTest;  
import org.junit.jupiter.params.provider.CsvFileSource;  
import quangnc.example.AccountService;  
  
public class AccountServiceTest {  
  
 static AccountService *service*;  
  
 @BeforeAll  
 static void setup() {  
 *service* = new AccountService();  
 }  
  
   
 @ParameterizedTest(name = "Test {index}: register({0}, {1}, {2}) => {3}")  
 @CsvFileSource(resources = "/test-data.csv", numLinesToSkip = 1)  
 void testRegisterAccount(String username, String password, String email, boolean expected) {  
 boolean result = *service*.registerAccount(username, password, email);  
 *assertEquals*(expected, result,  
 () -> "Expected: " + expected + ", but got: " + result);  
 }  
  
   
 @Test  
 void testIsValidEmail\_validCases() {  
 *assertTrue*(*service*.isValidEmail("test@example.com")); // email hợp lệ  
 *assertTrue*(*service*.isValidEmail("user.name@domain.co")); // email hợp lệ dạng khác  
 }  
  
   
 @Test  
 void testIsValidEmail\_invalidCases() {  
 *assertFalse*(*service*.isValidEmail("invalid-email")); // thiếu @ và domain  
 *assertFalse*(*service*.isValidEmail("user@domain")); // thiếu đuôi .com  
 *assertFalse*(*service*.isValidEmail("user@.com")); // thiếu domain  
 *assertFalse*(*service*.isValidEmail("")); // chuỗi rỗng  
 *assertFalse*(*service*.isValidEmail(null)); // null  
 }  
  
   
 @Test  
 void testRegisterAccount\_emptyPassword() {  
 boolean result = *service*.registerAccount("john", "", "john@example.com");  
 *assertFalse*(result); // vì mật khẩu rỗng  
 }  
  
   
 @Test  
 void testRegisterAccount\_nullEmail() {  
 boolean result = *service*.registerAccount("john", "password123", null);  
 *assertFalse*(result); // vì email null  
 }  
  
   
 @Test  
 void testRegisterAccount\_passwordLengthExactly7() {  
 boolean result = *service*.registerAccount("john", "pass777", "john@example.com");  
 *assertTrue*(result); // đúng vì pass có 7 ký tự  
 }  
  
   
 @Test  
 void testRegisterAccount\_specialCharEmail() {  
 boolean result = *service*.registerAccount("john", "password123", "john.doe+test@domain.co");  
 *assertTrue*(result); // email có + vẫn hợp lệ  
 }  
}

pom.xml:

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Code + kết quả chạy:

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Test-data.csv:

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