

◆ Java & Data Structures

1. Reverse a string without using reverse()

```
public class ReverseString {
    public static void main(String[] args) {
        String input = "hello";
        String reversed = "";
        for (int i = input.length() - 1; i >= 0; i--) {
            reversed += input.charAt(i);
        }
        System.out.println("Reversed: " + reversed);
    }
}
```

2. Check if a string is a palindrome

```
public class PalindromeCheck {
    public static void main(String[] args) {
        String input = "madam";
        String reversed = new StringBuilder(input).reverse().toString();
        System.out.println("Is palindrome: " + input.equals(reversed));
    }
}
```

3. Find the first non-repeating character in a string

```
import java.util.*;
public class FirstNonRepeatingChar {
    public static void main(String[] args) {
        String input = "aabbcdeff";
        Map<Character, Integer> map = new LinkedHashMap<>();
        for (char c : input.toCharArray()) {
            map.put(c, map.getOrDefault(c, 0) + 1);
        }
        for (char c : map.keySet()) {
            if (map.get(c) == 1) {
                System.out.println("First non-repeating: " + c);
                break;
            }
        }
    }
}
```

4. Count frequency of each character in a string

```
import java.util.*;
public class CharFrequency {
    public static void main(String[] args) {
        String input = "aabbcddde";
        Map<Character, Integer> freq = new HashMap<>();
        for (char c : input.toCharArray()) {
            freq.put(c, freq.getOrDefault(c, 0) + 1);
        }
        System.out.println(freq);
    }
}
```

5. Remove duplicate characters from a string

```
public class RemoveDuplicatesFromString {
    public static void main(String[] args) {
        String input = "aabbccde";
        StringBuilder result = new StringBuilder();
        Set<Character> seen = new HashSet<>();
        for (char c : input.toCharArray()) {
            if (!seen.contains(c)) {
                seen.add(c);
                result.append(c);
            }
        }
    }
}
```

```
        System.out.println("Without duplicates: " + result.toString());
    }
}
```

6. Check if two strings are anagrams

```
import java.util.*;
public class AnagramCheck {
    public static void main(String[] args) {
        String s1 = "listen";
        String s2 = "silent";
        char[] arr1 = s1.toCharArray();
        char[] arr2 = s2.toCharArray();
        Arrays.sort(arr1);
        Arrays.sort(arr2);
        System.out.println("Are anagrams: " + Arrays.equals(arr1, arr2));
    }
}
```

7. Sort an array using bubble sort

```
import java.util.*;
public class BubbleSort {
    public static void main(String[] args) {
        int[] arr = {5, 2, 9, 1};
        for (int i = 0; i < arr.length - 1; i++) {
            for (int j = 0; j < arr.length - 1 - i; j++) {
                if (arr[j] > arr[j + 1]) {
                    int temp = arr[j];
                    arr[j] = arr[j + 1];
                    arr[j + 1] = temp;
                }
            }
        }
        System.out.println(Arrays.toString(arr));
    }
}
```

8. Sort an array using selection sort

```
import java.util.*;
public class SelectionSort {
    public static void main(String[] args) {
        int[] arr = {5, 2, 9, 1};
        for (int i = 0; i < arr.length - 1; i++) {
            int minIndex = i;
            for (int j = i + 1; j < arr.length; j++) {
                if (arr[j] < arr[minIndex]) {
                    minIndex = j;
                }
            }
            int temp = arr[minIndex];
            arr[minIndex] = arr[i];
            arr[i] = temp;
        }
        System.out.println(Arrays.toString(arr));
    }
}
```

9. Find the second largest number in an array

```
public class SecondLargest {
    public static void main(String[] args) {
        int[] arr = {10, 20, 4, 45, 99};
        int first = Integer.MIN_VALUE;
        int second = Integer.MIN_VALUE;
        for (int num : arr) {
            if (num > first) {
                second = first;
                first = num;
            } else if (num > second && num != first) {
```

```
        second = num;
    }
}
System.out.println("Second largest: " + second);
}
}
```

10. Find the missing number from an array of 1 to n

```
public class MissingNumber {
    public static void main(String[] args) {
        int[] arr = {1, 2, 4, 5, 6};
        int n = 6;
        int sum = n * (n + 1) / 2;
        for (int num : arr) {
            sum -= num;
        }
        System.out.println("Missing number: " + sum);
    }
}
```

11. Find all pairs in an array with a given sum

```
public class PairWithSum {
    public static void main(String[] args) {
        int[] arr = {2, 4, 3, 5, 7};
        int target = 7;
        for (int i = 0; i < arr.length; i++) {
            for (int j = i + 1; j < arr.length; j++) {
                if (arr[i] + arr[j] == target) {
                    System.out.println("Pair: (" + arr[i] + ", " + arr[j] + ")");
                }
            }
        }
    }
}
```

12. Remove duplicates from an array

```
import java.util.*;
public class RemoveDuplicatesArray {
    public static void main(String[] args) {
        int[] arr = {1, 2, 2, 3, 4, 4, 5};
        Set<Integer> set = new LinkedHashSet<>();
        for (int num : arr) {
            set.add(num);
        }
        System.out.println("Array without duplicates: " + set);
    }
}
```

13. Reverse each word in a sentence

```
public class ReverseWordsInSentence {
    public static void main(String[] args) {
        String input = "Hello World";
        String[] words = input.split(" ");
        StringBuilder result = new StringBuilder();
        for (String word : words) {
            result.append(new StringBuilder(word).reverse()).append(" ");
        }
        System.out.println("Reversed words: " + result.toString().trim());
    }
}
```

14. Convert Roman numerals to integer

```
import java.util.*;
public class RomanToInteger {
    public static void main(String[] args) {
        String roman = "IX";
        Map<Character, Integer> map = new HashMap<>();
```

```

        map.put('I', 1);
        map.put('V', 5);
        map.put('X', 10);
        map.put('L', 50);
        map.put('C', 100);
        map.put('D', 500);
        map.put('M', 1000);
        int sum = 0;
        for (int i = 0; i < roman.length(); i++) {
            if (i > 0 && map.get(roman.charAt(i)) > map.get(roman.charAt(i - 1))) {
                sum += map.get(roman.charAt(i)) - 2 * map.get(roman.charAt(i - 1));
            } else {
                sum += map.get(roman.charAt(i));
            }
        }
        System.out.println("Integer: " + sum);
    }
}

```

15. Convert integer to Roman numerals

```

public class IntegerToRoman {
    public static void main(String[] args) {
        int num = 58;
        int[] values = {1000, 900, 500, 400, 100, 90, 50, 40, 10, 9, 5, 4, 1};
        String[] symbols = {"M", "CM", "D", "CD", "C", "XC", "L", "XL", "X", "IX", "V", "IV", "I"};
        StringBuilder roman = new StringBuilder();
        for (int i = 0; i < values.length; i++) {
            while (num >= values[i]) {
                num -= values[i];
                roman.append(symbols[i]);
            }
        }
        System.out.println("Roman: " + roman.toString());
    }
}

```

16. Merge two sorted arrays into one sorted array

```

import java.util.*;
public class MergeSortedArrays {
    public static void main(String[] args) {
        int[] a = {1, 3, 5};
        int[] b = {2, 4, 6};
        int[] merged = new int[a.length + b.length];
        int i = 0, j = 0, k = 0;
        while (i < a.length && j < b.length) {
            if (a[i] < b[j]) {
                merged[k++] = a[i++];
            } else {
                merged[k++] = b[j++];
            }
        }
        while (i < a.length) {
            merged[k++] = a[i++];
        }
        while (j < b.length) {
            merged[k++] = b[j++];
        }
        System.out.println(Arrays.toString(merged));
    }
}

```

17. Implement binary search

```

public class BinarySearch {
    public static void main(String[] args) {
        int[] arr = {1, 3, 5, 7, 9};
        int target = 5;
        int left = 0, right = arr.length - 1;

```

```

        while (left <= right) {
            int mid = left + (right - left) / 2;
            if (arr[mid] == target) {
                System.out.println("Found at index: " + mid);
                return;
            } else if (arr[mid] < target) {
                left = mid + 1;
            } else {
                right = mid - 1;
            }
        }
        System.out.println("Not found");
    }
}

```

18. Find longest common prefix among an array of strings

```

public class LongestCommonPrefix {
    public static void main(String[] args) {
        String[] strs = {"flower", "flow", "flight"};
        if (strs == null || strs.length == 0) {
            System.out.println("");
            return;
        }
        String prefix = strs[0];
        for (int i = 1; i < strs.length; i++) {
            while (strs[i].indexOf(prefix) != 0) {
                prefix = prefix.substring(0, prefix.length() - 1);
                if (prefix.isEmpty()) {
                    System.out.println("");
                    return;
                }
            }
        }
        System.out.println("Longest Common Prefix: " + prefix);
    }
}

```

19. Count vowels and consonants in a string

```

public class VowelConsonantCount {
    public static void main(String[] args) {
        String input = "Hello World".toLowerCase();
        int vowels = 0, consonants = 0;
        for (char c : input.toCharArray()) {
            if (Character.isLetter(c)) {
                if ("aeiou".indexOf(c) != -1) vowels++;
                else consonants++;
            }
        }
        System.out.println("Vowels: " + vowels + ", Consonants: " + consonants);
    }
}

```

20. Move all zeros to the end of the array

```

import java.util.*;
public class MoveZerosToEnd {
    public static void main(String[] args) {
        int[] arr = {0, 1, 0, 3, 12};
        int index = 0;
        for (int num : arr) {
            if (num != 0) {
                arr[index++] = num;
            }
        }
        while (index < arr.length) {
            arr[index++] = 0;
        }
        System.out.println(Arrays.toString(arr));
    }
}

```

```
}
```

21. Rotate an array to the right by k steps

```
public class RotateArray {  
    public static void main(String[] args) {  
        int[] arr = {1,2,3,4,5,6};  
        int k = 2;  
        int n = arr.length;  
        k = k % n;  
        reverse(arr, 0, n - 1);  
        reverse(arr, 0, k - 1);  
        reverse(arr, k, n - 1);  
        for (int num : arr) System.out.print(num + " ");  
    }  
    static void reverse(int[] arr, int start, int end) {  
        while (start < end) {  
            int temp = arr[start];  
            arr[start++] = arr[end];  
            arr[end--] = temp;  
        }  
    }  
}
```

22. First repeated character in a string

```
public class FirstRepeatedChar {  
    public static void main(String[] args) {  
        String str = "programming";  
        Set<Character> set = new HashSet<>();  
        for (char c : str.toCharArray()) {  
            if (!set.add(c)) {  
                System.out.println("First repeated: " + c);  
                break;  
            }  
        }  
    }  
}
```

23. Sort characters by frequency

```
public class FrequencySort {  
    public static void main(String[] args) {  
        String s = "tree";  
        Map<Character, Integer> freq = new HashMap<>();  
        for (char c : s.toCharArray()) freq.put(c, freq.getOrDefault(c, 0) + 1);  
        List<Character> sorted = new ArrayList<>(freq.keySet());  
        sorted.sort((a, b) -> freq.get(b) - freq.get(a));  
        StringBuilder sb = new StringBuilder();  
        for (char c : sorted) sb.append(String.valueOf(c).repeat(freq.get(c)));  
        System.out.println(sb.toString());  
    }  
}
```

24. Stack using array

```
public class StackUsingArray {  
    static class Stack {  
        int[] arr = new int[5];  
        int top = -1;  
        void push(int val) {  
            if (top < arr.length - 1) arr[++top] = val;  
        }  
        int pop() {  
            return top >= 0 ? arr[top--] : -1;  
        }  
    }  
    public static void main(String[] args) {  
        Stack s = new Stack();  
        s.push(10); s.push(20); System.out.println(s.pop());  
    }  
}
```

```
}
```

25. Queue using LinkedList

```
public class QueueUsingLinkedList {  
    public static void main(String[] args) {  
        Queue<Integer> q = new LinkedList<>();  
        q.add(1); q.add(2);  
        System.out.println(q.poll());  
    }  
}
```

26. Longest substring without repeating characters

```
public class LongestUniqueSubstring {  
    public static void main(String[] args) {  
        String s = "abcabcbb";  
        Set<Character> set = new HashSet<>();  
        int left = 0, max = 0;  
        for (int right = 0; right < s.length(); right++) {  
            while (!set.add(s.charAt(right)))  
                set.remove(s.charAt(left++));  
            max = Math.max(max, right - left + 1);  
        }  
        System.out.println("Max length: " + max);  
    }  
}
```

27. Find common elements in two arrays

```
public class CommonElements {  
    public static void main(String[] args) {  
        int[] a = {1, 2, 3, 4}, b = {3, 4, 5, 6};  
        Set<Integer> set = new HashSet<>();  
        for (int x : a) set.add(x);  
        for (int y : b) if (set.contains(y)) System.out.print(y + " ");  
    }  
}
```

28. Count number of words in sentence

```
public class WordCount {  
    public static void main(String[] args) {  
        String sentence = "Hello from the other side";  
        String[] words = sentence.trim().split("\\s+");  
        System.out.println("Word count: " + words.length);  
    }  
}
```

29. Count digit frequency in a number

```
public class DigitFrequency {  
    public static void main(String[] args) {  
        int num = 112345211;  
        int[] freq = new int[10];  
        while (num > 0) {  
            freq[num % 10]++;  
            num /= 10;  
        }  
        for (int i = 0; i < 10; i++) if (freq[i] > 0)  
            System.out.println(i + ":" + freq[i]);  
    }  
}
```

30. Perfect square check (without Math.sqrt)

```
public class PerfectSquareCheck {  
    public static void main(String[] args) {  
        int n = 49;  
        int i = 1;  
        while (i * i <= n) {  
            if (i * i == n) {  
                System.out.println("Perfect Square");  
            }  
            i++;  
        }  
    }  
}
```

```

        System.out.println("Perfect square");
        return;
    }
    i++;
}
System.out.println("Not a perfect square");
}
}

```

31. Generate Fibonacci series up to n terms

```

public class FibonacciSeries {
    public static void main(String[] args) {
        int n = 10, a = 0, b = 1;
        System.out.print(a + " " + b);
        for (int i = 2; i < n; i++) {
            int next = a + b;
            System.out.print(" " + next);
            a = b;
            b = next;
        }
    }
}

```

32. Check if an array is sorted in ascending order

```

public class IsArraySorted {
    public static void main(String[] args) {
        int[] arr = {1, 2, 3, 5, 6};
        boolean sorted = true;
        for (int i = 1; i < arr.length; i++) {
            if (arr[i] < arr[i - 1]) {
                sorted = false;
                break;
            }
        }
        System.out.println("Is sorted: " + sorted);
    }
}

```

33. Check if a string has balanced brackets

```

import java.util.Stack;

public class BalancedBrackets {
    public static void main(String[] args) {
        String str = "{}()";
        Stack<Character> stack = new Stack<>();
        for (char ch : str.toCharArray()) {
            if ("[({".contains(String.valueOf(ch))) {
                stack.push(ch);
            } else if ("})]".contains(String.valueOf(ch))) {
                if (stack.isEmpty() || !isMatch(stack.pop(), ch)) {
                    System.out.println("Not balanced");
                    return;
                }
            }
        }
        System.out.println(stack.isEmpty() ? "Balanced" : "Not balanced");
    }

    private static boolean isMatch(char open, char close) {
        return (open == '{' && close == '}') ||
               (open == '[' && close == ']') ||
               (open == '(' && close == ')');
    }
}

```

34. Find GCD of two numbers

```
public class FindGCD {  
    public static void main(String[] args) {  
        int a = 36, b = 60;  
        while (b != 0) {  
            int temp = b;  
            b = a % b;  
            a = temp;  
        }  
        System.out.println("GCD: " + a);  
    }  
}
```

35. Count and print duplicate elements in an array

```
import java.util.*;  
  
public class DuplicateElements {  
    public static void main(String[] args) {  
        int[] arr = {1, 2, 3, 2, 3, 4, 5};  
        Map<Integer, Integer> map = new HashMap<>();  
        for (int num : arr) map.put(num, map.getOrDefault(num, 0) + 1);  
        for (Map.Entry<Integer, Integer> entry : map.entrySet())  
            if (entry.getValue() > 1)  
                System.out.println("Duplicate: " + entry.getKey());  
    }  
}
```

36. Sort a list of integers using Java Collections

```
import java.util.*;  
  
public class SortList {  
    public static void main(String[] args) {  
        List<Integer> list = Arrays.asList(5, 3, 8, 1);  
        Collections.sort(list);  
        System.out.println(list);  
    }  
}
```

37. Find factorial using recursion

```
public class FactorialRecursion {  
    public static void main(String[] args) {  
        int n = 5;  
        System.out.println("Factorial: " + factorial(n));  
    }  
  
    static int factorial(int n) {  
        return (n == 0) ? 1 : n * factorial(n - 1);  
    }  
}
```

38. Reverse a LinkedList without using Collections.reverse()

```
import java.util.LinkedList;  
  
public class ReverseLinkedList {  
    public static void main(String[] args) {  
        LinkedList<Integer> list = new LinkedList<>();  
        list.add(1); list.add(2); list.add(3);  
        for (int i = list.size() - 1; i >= 0; i--)  
            System.out.print(list.get(i) + " ");  
    }  
}
```

39. Remove all non-alphanumeric characters from a string

```
public class RemoveNonAlphanumeric {  
    public static void main(String[] args) {  
        String s = "He@#llo! 123";  
        s = s.replaceAll("[^a-zA-Z0-9]", "");  
    }  
}
```

```
        System.out.println(s);
    }
}
```

40. Convert a sentence to title case

```
public class TitleCase {
    public static void main(String[] args) {
        String sentence = "java is fun to learn";
        String[] words = sentence.split(" ");
        StringBuilder sb = new StringBuilder();
        for (String word : words)
            sb.append(Character.toUpperCase(word.charAt(0)))
              .append(word.substring(1)).append(" ");
        System.out.println(sb.toString().trim());
    }
}
```

◆ Automation-Specific Logic (Java + Selenium)

1. Log in with username/password and validate successful login

```
public class LoginTest {
    public static void main(String[] args) {
        WebDriver driver = new ChromeDriver();
        driver.get("https://example.com/login");
        driver.findElement(By.id("username")).sendKeys("testuser");
        driver.findElement(By.id("password")).sendKeys("password");
        driver.findElement(By.id("loginBtn")).click();
        boolean success = driver.findElement(By.id("welcomeMsg")).isDisplayed();
        System.out.println("Login successful: " + success);
        driver.quit();
    }
}
```

2. Select value from a dynamic dropdown

```
public class DynamicDropdown {
    public static void main(String[] args) {
        WebDriver driver = new ChromeDriver();
        driver.get("https://example.com");
        List<WebElement> options = driver.findElements(By.cssSelector(".dropdown li"));
        for (WebElement option : options) {
            if (option.getText().equals("OptionValue")) {
                option.click();
                break;
            }
        }
        driver.quit();
    }
}
```

3. Handle stale element exception

```
public class HandleStaleElement {
    public static void main(String[] args) {
        WebDriver driver = new ChromeDriver();
        driver.get("https://example.com");
        WebElement element = driver.findElement(By.id("refreshElement"));
        driver.navigate().refresh();
        try {
            element.click();
        } catch (StaleElementReferenceException e) {
            element = driver.findElement(By.id("refreshElement"));
            element.click();
        }
        driver.quit();
    }
}
```

4. Validate file download using Selenium

```
public class FileDownloadValidation {  
    public static void main(String[] args) throws InterruptedException {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com/download");  
        driver.findElement(By.id("downloadBtn")).click();  
        Thread.sleep(5000);  
        File folder = new File("C:/Downloads");  
        File[] files = folder.listFiles();  
        boolean downloaded = Arrays.stream(files).anyMatch(f -> f.getName().contains("fileName"));  
        System.out.println("Download success: " + downloaded);  
        driver.quit();  
    }  
}
```

5. Automate file upload using Selenium

```
public class FileUpload {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com/upload");  
        WebElement upload = driver.findElement(By.id("fileUpload"));  
        upload.sendKeys("C:/path/to/file.txt");  
        driver.findElement(By.id("submitBtn")).click();  
        driver.quit();  
    }  
}
```

6. Capture all broken links on a webpage

```
public class BrokenLinksChecker {  
    public static void main(String[] args) throws IOException {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        List<WebElement> links = driver.findElements(By.tagName("a"));  
        for (WebElement link : links) {  
            String url = link.getAttribute("href");  
            if (url != null) {  
                HttpURLConnection conn = (HttpURLConnection) new URL(url).openConnection();  
                conn.setRequestMethod("HEAD");  
                conn.connect();  
                if (conn.getResponseCode() >= 400) {  
                    System.out.println("Broken link: " + url);  
                }  
            }  
        }  
        driver.quit();  
    }  
}
```

7. Take a screenshot only if test fails

```
public class ScreenshotOnFailure {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        try {  
            driver.get("https://example.com");  
            WebElement el = driver.findElement(By.id("notExist"));  
            el.click();  
        } catch (Exception e) {  
            File scr = ((TakesScreenshot) driver).getScreenshotAs(OutputType.FILE);  
            File dest = new File("Screenshot.png");  
            scr.renameTo(dest);  
        } finally {  
            driver.quit();  
        }  
    }  
}
```

8. Custom retry logic in TestNG

```
public class RetryAnalyzer implements IRetryAnalyzer {  
    int count = 0, maxRetry = 2;  
    public boolean retry(ITestResult result) {  
        if (count < maxRetry) {  
            count++;  
            return true;  
        }  
        return false;  
    }  
}
```

9. Dynamic XPath for changing ID

```
// Example: //*[@id='user_1234'] → //*[@starts-with(@id, 'user_')]  
By dynamicId = By.xpath("//*[starts-with(@id, 'user_')]");
```

10. Read data from Excel using Apache POI

```
public class ExcelReader {  
    public static void main(String[] args) throws IOException {  
        FileInputStream fis = new FileInputStream("data.xlsx");  
        Workbook workbook = new XSSFWorkbook(fis);  
        Sheet sheet = workbook.getSheetAt(0);  
        for (Row row : sheet) {  
            for (Cell cell : row) {  
                System.out.print(cell.toString() + " ");  
            }  
            System.out.println();  
        }  
        workbook.close();  
    }  
}
```

11. Scroll to an element using JavaScriptExecutor

```
public class ScrollToElement {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        WebElement element = driver.findElement(By.id("target"));  
        ((JavascriptExecutor) driver).executeScript("arguments[0].scrollIntoView(true);", element);  
        driver.quit();  
    }  
}
```

12. Handle JavaScript alert

```
public class HandleAlert {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        driver.findElement(By.id("alertButton")).click();  
        Alert alert = driver.switchTo().alert();  
        alert.accept();  
        driver.quit();  
    }  
}
```

13. Wait until element is visible using WebDriverWait

```
public class WaitUntilVisible {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        WebDriverWait wait = new WebDriverWait(driver, Duration.ofSeconds(10));  
        WebElement el = wait.until(ExpectedConditions.visibilityOfElementLocated(By.id("delayedElement")));  
        el.click();  
        driver.quit();  
    }  
}
```

14. Highlight element using JavaScriptExecutor

```
public class HighlightElement {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        WebElement element = driver.findElement(By.id("highlight"));  
        JavascriptExecutor js = (JavascriptExecutor) driver;  
        js.executeScript("arguments[0].style.border='3px solid red'", element);  
        driver.quit();  
    }  
}
```

15. Capture console logs using Chrome DevTools

```
public class CaptureConsoleLogs {  
    public static void main(String[] args) {  
        ChromeOptions options = new ChromeOptions();  
        options.setCapability("goog:loggingPrefs", Map.of("browser", Level.ALL));  
        WebDriver driver = new ChromeDriver(options);  
        driver.get("https://example.com");  
        LogEntries logs = driver.manage().logs().get(LogType.BROWSER);  
        logs.forEach(log -> System.out.println(log.getMessage()));  
        driver.quit();  
    }  
}
```

16. Hover over element using Actions

```
public class HoverAction {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        WebElement element = driver.findElement(By.id("hoverTarget"));  
        Actions actions = new Actions(driver);  
        actions.moveToElement(element).perform();  
        driver.quit();  
    }  
}
```

17. Drag and drop using Actions

```
public class DragAndDrop {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        WebElement source = driver.findElement(By.id("draggable"));  
        WebElement target = driver.findElement(By.id("droppable"));  
        Actions actions = new Actions(driver);  
        actions.dragAndDrop(source, target).perform();  
        driver.quit();  
    }  
}
```

18. Handle multiple windows

```
public class HandleMultipleWindows {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        String parent = driver.getWindowHandle();  
        driver.findElement(By.id("openWindow")).click();  
        Set<String> handles = driver.getWindowHandles();  
        for (String handle : handles) {  
            if (!handle.equals(parent)) {  
                driver.switchTo().window(handle);  
                break;  
            }  
        }  
        driver.quit();  
    }  
}
```

```
}
```

19. Clear browser cookies and cache

```
public class ClearCookies {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.manage().deleteAllCookies();  
        driver.get("https://example.com");  
        driver.quit();  
    }  
}
```

20. Verify dropdown contains expected values

```
public class DropdownValidation {  
    public static void main(String[] args) {  
        WebDriver driver = new ChromeDriver();  
        driver.get("https://example.com");  
        WebElement dropdown = driver.findElement(By.id("dropdown"));  
        Select select = new Select(dropdown);  
        List<String> expected = List.of("Option 1", "Option 2", "Option 3");  
        List<String> actual = select.getOptions().stream().map(WebElement::getText).collect(Collectors.toList());  
        System.out.println("Dropdown valid: " + actual.containsAll(expected));  
        driver.quit();  
    }  
}
```

◆ API Testing / Backend Automation (Java + RestAssured)

1. Send GET request and validate status code

```
public class GetStatusCodeTest {  
    public static void main(String[] args) {  
        given()  
            .baseUri("https://reqres.in/api")  
        .when()  
            .get("/users/2")  
        .then()  
            .statusCode(200)  
            .log().all();  
    }  
}
```

2. Send POST request with JSON body from a file

```
public class PostWithJsonFile {  
    public static void main(String[] args) {  
        File file = new File("src/test/resources/user.json");  
  
        given()  
            .baseUri("https://reqres.in/api")  
            .contentType("application/json")  
            .body(file)  
        .when()  
            .post("/users")  
        .then()  
            .statusCode(201)  
            .log().body();  
    }  
}
```

3. Chain two APIs (extract token, reuse in next call)

```
public class TokenChainingTest {  
    public static void main(String[] args) {  
        String token = given()  
            .contentType("application/json")  
            .body("{\"username\":\"admin\", \"password\":\"admin\"}")  
        .when()  
            .post("https://example.com/api/login")
```

```

.then()
.statusCode(200)
.extract().path("token");

given()
.header("Authorization", "Bearer " + token)
.when()
.get("https://example.com/api/profile")
.then()
.statusCode(200);
}
}

```

4. Validate fields inside a JSON response using JSONPath

```

public class JsonFieldValidation {
    public static void main(String[] args) {
        Response response = given()
            .get("https://reqres.in/api/users/2");

        JsonPath json = response.jsonPath();
        String email = json.getString("data.email");
        System.out.println("Email: " + email);
    }
}

```

5. Upload a file using multipart API request

```

public class FileUploadExample {
    public static void main(String[] args) {
        File file = new File("src/test/resources/sample.pdf");

        given()
            .multiPart("file", file)
            .post("https://example.com/api/upload")
        .then()
            .statusCode(200);
    }
}

```

6. Add headers and query params dynamically to request

```

public class DynamicHeaderQueryParam {
    public static void main(String[] args) {
        given()
            .header("Authorization", "Bearer myToken")
            .queryParam("page", 2)
        .when()
            .get("https://reqres.in/api/users")
        .then()
            .statusCode(200);
    }
}

```

7. Validate response time and schema of an API

```

public class ResponseTimeAndSchemaValidation {
    public static void main(String[] args) {
        given()
            .baseUri("https://reqres.in")
        .when()
            .get("/api/users/2")
        .then()
            .time(lessThan(2000L))
            .assertThat()
            .body(matchesJsonSchemaInClasspath("schema.json"));
    }
}

```

8. Create a reusable API utility class for GET/POST

```

public class ApiUtils {

```

```

public static Response getRequest(String endpoint) {
    return given()
        .baseUri("https://reqres.in/api")
        .when()
        .get(endpoint);
}

public static Response postRequest(String endpoint, Object body) {
    return given()
        .baseUri("https://reqres.in/api")
        .contentType("application/json")
        .body(body)
        .when()
        .post(endpoint);
}

```

9. Retry failed API call 3 times before failing

```

public class RetryLogicTest {
    public static void main(String[] args) {
        int maxRetries = 3;
        int count = 0;
        Response response = null;

        while (count < maxRetries) {
            response = given().get("https://reqres.in/api/users/2");
            if (response.statusCode() == 200) break;
            count++;
        }

        assert response != null;
        System.out.println("Final status: " + response.statusCode());
    }
}

```

10. Assert a nested JSON field using RestAssured

```

public class NestedJsonFieldAssert {
    public static void main(String[] args) {
        given()
            .baseUri("https://reqres.in")
        .when()
            .get("/api/users/2")
        .then()
            .body("data.first_name", equalTo("Janet"));
    }
}

```

11. RequestSpecification vs Response Parsing

```

public class RequestResponseParserDemo {
    public static void main(String[] args) {
        RequestSpecification reqSpec = given()
            .baseUri("https://api.example.com")
            .header("Authorization", "Bearer token")
            .contentType("application/json");

        Response response = reqSpec.when().get("/users/1");
        JsonPath json = response.jsonPath();
        System.out.println("Name: " + json.getString("name"));

    }
}

```

12. Response.asString() vs Response.as(Class)

```

public class ResponseParsingVariants {
    public static void main(String[] args) {
        Response res = given().get("https://api.example.com/users/1");

        String rawBody = res.asString();

```

```

System.out.println("Raw Body: " + rawBody);

User user = res.as(User.class);
System.out.println("User Name from POJO: " + user.getName());
}

}

class User {
private int id;
private String name;
private String email;

public String getName() { return name; }
public String getEmail() { return email; }
public int getId() { return id; }
}

```

13. Validate API with Path Parameters

```

public class PathParamTest {
public static void main(String[] args) {
given()
.pathParam("id", 101)
.when()
.get("https://api.example.com/users/{id}")
.then()
.statusCode(200)
.log().all();
}

```

14. Validate API with Form Parameters

```

public class FormParamTest {
public static void main(String[] args) {
given()
.contentType("application/x-www-form-urlencoded")
.formParam("username", "testUser")
.formParam("password", "pass123")
.when()
.post("https://api.example.com/login")
.then()
.statusCode(200);
}

```

15. Handle Cookie in Request and Response

```

public class CookieExample {
public static void main(String[] args) {
Response response = given()
.cookie("session_id", "xyz123")
.when()
.get("https://example.com/home");

String cookie = response.getCookie("session_id");
System.out.println("Session Cookie: " + cookie);
}

```

16. Create and send a PATCH request

```

public class PatchExample {
public static void main(String[] args) {
given()
.contentType("application/json")
.body("{\"name\":\"updatedName\"}")
.when()
.patch("https://reqres.in/api/users/2")
.then()
.statusCode(200)

```

```
        .log().all();
    }
}
```

17. Delete request and validate response

```
public class DeleteExample {
    public static void main(String[] args) {
        given()
            .when()
                .delete("https://reqres.in/api/users/2")
        .then()
            .statusCode(204);
    }
}
```

18. Deserialize response array into POJO list

```
public class DeserializeArray {
    public static void main(String[] args) {
        Response response = given().get("https://reqres.in/api/users?page=2");
        List<User> users = response.jsonPath().getList("data", User.class);
        users.forEach(u -> System.out.println(u.getEmail()));
    }
}
```

19. Log request and response details

```
public class LoggingExample {
    public static void main(String[] args) {
        given()
            .log().all()
        .when()
            .get("https://reqres.in/api/users/2")
        .then()
            .log().all();
    }
}
```

20. Extract full response and use assertions

```
public class FullResponseExtract {
    public static void main(String[] args) {
        Response res = given().get("https://reqres.in/api/users/2");
        assertEquals(200, res.getStatusCode());
        assertTrue(res.asString().contains("Janet"));
    }
}
```