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CS 401
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Test Plan

Test Plan: String Manipulation Functions

Objective:
The objective of the test plan is to verify the correctness of the string manipulation functions for combining two strings, reversing a string, converting a string to uppercase conversion, and trimming whitespace before and after a string but not in the middle of a string. The tests aim to ensure that each function operates according to its specification. Test cases were developed to evaluate unusual edge cases.

Test Scenario Creation:
Test scenarios were designed based on various usage scenarios of the string manipulation functions. Each test scenario was created to cover normal cases (e.g., empty strings, special characters, long strings), edge cases (e.g., single character inputs, already uppercase strings), and complex combinations of methods (e.g., combining then reversing, and eventually trimming). Test cases with various types of string inputs, including empty strings, single characters, alphanumeric strings, and strings with whitespace were implemented.

Test Implementation:

Junit methods were used to embed the test report into the code so that the person conducting the test can clearly see what happened with each test case and be able to review the final test statistics.

Test Cases:

1. **Combine Function Tests**
    - **Test case 1: Combine two words**
        - **Input:** "Hello", "World"
        - **Expected Output:** "HelloWorld"
        - **Purpose:** Verify that two strings are concatenated correctly.
    - **Test case 2: Combine two empty strings**
        - **Input:** "", ""
        - **Expected Output:** ""
        - **Purpose:** Ensure handling of empty input strings.
    - **Test case 3: Combine word with empty string**
        - **Input:** "Test", ""
        - **Expected Output:** "Test"
        - **Purpose:** Test behavior when one input is empty.
    - **Test case 4: Combine empty string with word**
        - **Input:** "", "Case"
        - **Expected Output:** "Case"
        - **Purpose:** Test behavior when one input is empty.

- **Test case 5: Combine two numbers as strings**
  - **Input:** "123", "456"
  - **Expected Output:** "123456"
  - **Purpose:** Verify concatenation of numeric strings.
- **Test case 6: Combine long strings**
  - **Input:** "a".repeat(1000), "b".repeat(1000)
  - **Expected Output:** "a".repeat(1000) + "b".repeat(1000)
  - **Purpose:** Test performance and concatenation of very long strings.
- **Test case 7: Combine strings with special characters**
  - **Input:** "!@#", "$%^"
  - **Expected Output:** "!@#$%^"
  - **Purpose:** Verify concatenation of strings containing special characters.
- **Test case 8: Combine strings with spaces**
  - **Input:** "Hello ", " World"
  - **Expected Output:** "Hello World"
  - **Purpose:** Test concatenation with leading and trailing spaces.

2. **Reverse Function Tests**

- **Test case 9: Reverse a word**
  - **Input:** "Hello"
  - **Expected Output:** "olleH"
  - **Purpose:** Verify correct reversal of a single word.
- **Test case 10: Reverse an empty string**
  - **Input:** ""
  - **Expected Output:** ""
  - **Purpose:** Ensure handling of empty input.
- **Test case 11: Reverse a single character**
  - **Input:** "a"
  - **Expected Output:** "a"
  - **Purpose:** Verify correct handling of single character input.
- **Test case 12: Reverse a string of numbers**
  - **Input:** "12345"
  - **Expected Output:** "54321"
  - **Purpose:** Test reversal of numeric strings.
- **Test case 13: Reverse a phrase with space**
  - **Input:** "Test Case"
  - **Expected Output:** "esaC tseT"
  - **Purpose:** Verify reversal of a phrase containing spaces.
- **Test case 14: Reverse a long string**
  - **Input:** "a".repeat(1000)
  - **Expected Output:** "a".repeat(1000)
  - **Purpose:** Test performance with very long strings.
- **Test case 15: Reverse a string with special characters**
  - **Input:** "!@# $%^"
  - **Expected Output:** "^%$ #@!"

        - **Purpose:** Verify reversal of strings containing special characters.
    - **Test case 16: Reverse a palindrome**
        - **Input:** "madam"
        - **Expected Output:** "madam"
        - **Purpose:** Test behavior when the input is already a palindrome.

3. **UpperCase Function Tests**

    - **Test case 17: Convert lowercase to uppercase**
        - **Input:** "hello"
        - **Expected Output:** "HELLO"
        - **Purpose:** Verify conversion of lowercase letters to uppercase.
    - **Test case 18: Convert empty string to uppercase**
        - **Input:** ""
        - **Expected Output:** ""
        - **Purpose:** Ensure handling of empty input.
    - **Test case 19: Convert already uppercase string**
        - **Input:** "ALREADY UPPER"
        - **Expected Output:** "ALREADY UPPER"
        - **Purpose:** Verify behavior when input is already in uppercase.
    - **Test case 20: Convert mixed case to uppercase**
        - **Input:** "MixEd CaSe"
        - **Expected Output:** "MIXED CASE"
        - **Purpose:** Test conversion of mixed case input to uppercase.
    - **Test case 21: Convert alphanumeric to uppercase**
        - **Input:** "123abc"
        - **Expected Output:** "123ABC"
        - **Purpose:** Verify conversion of alphanumeric input to uppercase.
    - **Test case 22: Convert string with special characters to uppercase**
        - **Input:** "!@# abc"
        - **Expected Output:** "!@# ABC"
        - **Purpose:** Test conversion of strings containing special characters to uppercase.
    - **Test case 23: Convert long lowercase string to uppercase**
        - **Input:** "a".repeat(1000)
        - **Expected Output:** "A".repeat(1000)
        - **Purpose:** Test performance with very long strings.
    - **Test case 24: Convert mixed case with spaces to uppercase**
        - **Input:** "Mix Ed CaSe"
        - **Expected Output:** "MIX ED CASE"
        - **Purpose:** Verify conversion of mixed case input with spaces to uppercase.

4. **TrimWhitespace Function Tests**

- **Test case 25: Trim whitespace from both ends**
  - **Input:** " Hello World! "
  - **Expected Output:** "Hello World!"
  - **Purpose:** Verify trimming of leading and trailing whitespace.
- **Test case 26: Trim whitespace from both ends of a word**
  - **Input:** " Spaces "
  - **Expected Output:** "Spaces"
  - **Purpose:** Ensure trimming behavior on a word with leading and trailing spaces.
- **Test case 27: Trim string with no whitespace**
  - **Input:** "NoSpaces"
  - **Expected Output:** "NoSpaces"
  - **Purpose:** Verify behavior when input contains no whitespace.
- **Test case 28: Trim string with only whitespaces**
  - **Input:** " "
  - **Expected Output:** ""
  - **Purpose:** Ensure trimming behavior on strings containing only whitespace.
- **Test case 29: Trim string with multiple internal spaces**
  - **Input:** " Multiple Spaces "
  - **Expected Output:** "Multiple Spaces"
  - **Purpose:** Verify preservation of internal spaces after trimming.
- **Test case 30: Trim long string with whitespaces**
  - **Input:** " ".repeat(1000) + "Text" + " ".repeat(1000)
  - **Expected Output:** "Text"
  - **Purpose:** Test performance with very long strings containing whitespace.
- **Test case 31: Trim string with newline characters**
  - **Input:** "\n\t Hello \t\n"
  - **Expected Output:** "Hello"
  - **Purpose:** Verify trimming behavior on strings containing newline characters.
- **Test case 32: Trim string with mixed whitespace characters**
  - **Input:** " \t Mixed \n "
  - **Expected Output:** "Mixed"
  - **Purpose:** Ensure consistent trimming across mixed whitespace characters.

5. **Combination Function Tests**
   - **Test case 33: Combine and reverse**
     - **Input:** "Hello", "World"
     - **Expected Output:** "dlroWolleH"
     - **Purpose:** Verify combined functionality of combining and reversing strings.
   - **Test case 34: Combine, reverse, and uppercase**
     - **Input:** "Hello", "World"
     - **Expected Output:** "DLROWOLLEH"

        - **Purpose:** Test combined functionality of combining, reversing, and converting to uppercase.
    - **Test case 35: Combine, trim, and uppercase**
        - **Input:** " Hello", "World "
        - **Expected Output:** "HELLOWORLD"
        - **Purpose:** Verify combined functionality of combining, trimming, and converting to uppercase.
    - **Test case 36: Combine, reverse, and trim**
        - **Input:** " Hello", "World "
        - **Expected Output:** "dlroWolleH"
        - **Purpose:** Test combined functionality of combining, reversing, and trimming strings.