AI Assisted Coding ASSIGNMENT 1

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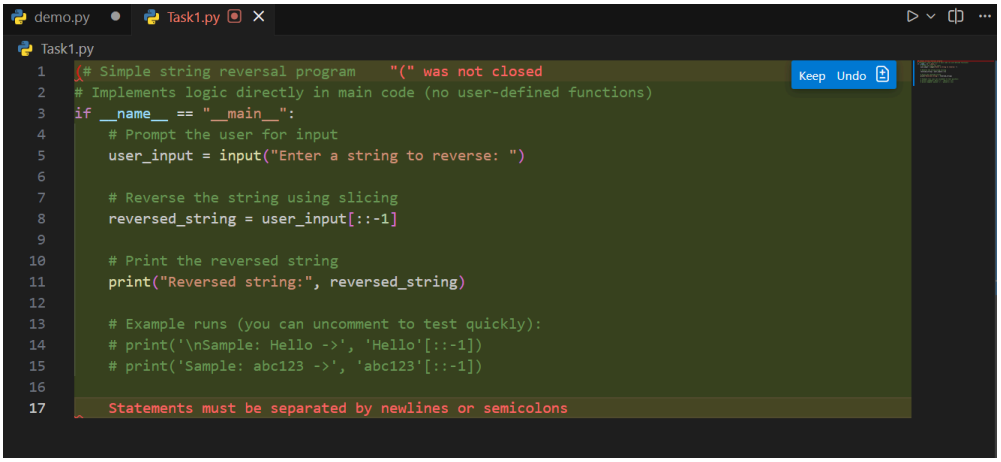
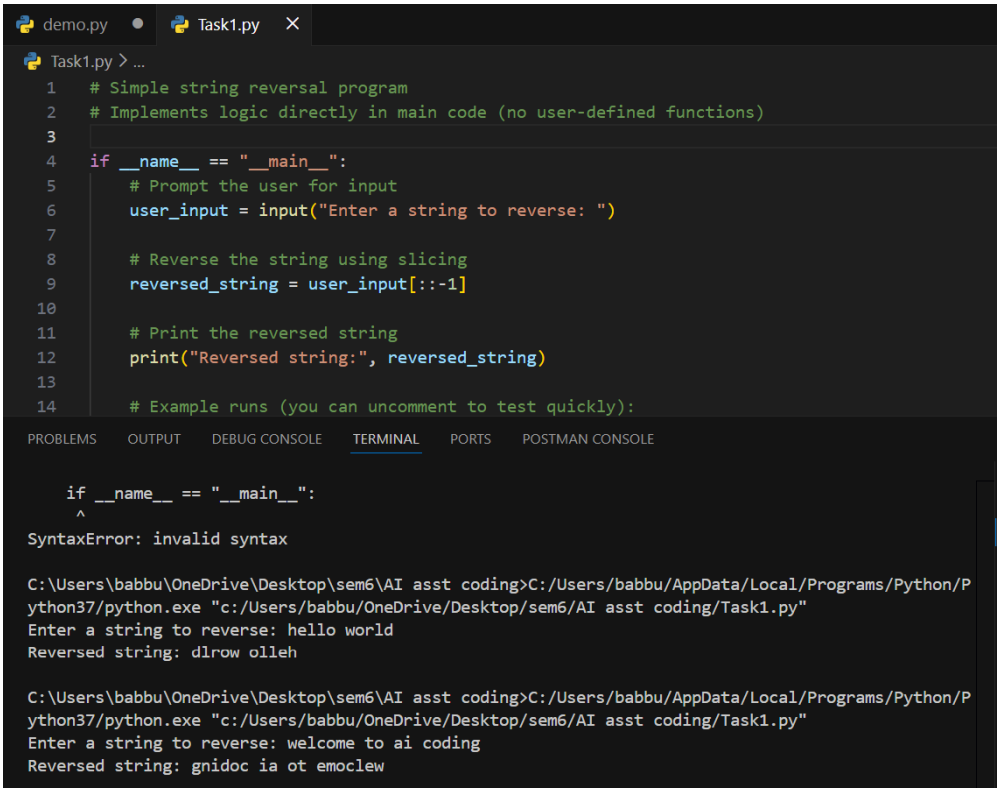
Task 1: AI-Generated Logic Without Modularization (String Reversal Without Functions)
❖ Scenario
You are developing a basic text-processing utility for a messaging application.
❖ Task Description
Use GitHub Copilot to generate a Python program that:
➢ Reverses a given string
➢ Accepts user input
➢ Implements the logic directly in the main code
➢ Does not use any user-defined functions
❖ Expected Output
➢ Correct the reversed string
➢ Screenshots showing Copilot-generated code suggestions
➢ Sample inputs and outputs

CODE

```
# Simple string reversal program
# Implements logic directly in main code (no user-defined functions)

if __name__ == "__main__":
    # Prompt the user for input
    user_input = input("Enter a string to reverse: ")

    # Reverse the string using slicing
    reversed_string = user_input[::-1]

    # Print the reversed string
    print("Reversed string:", reversed_string)

    # Example runs (you can uncomment to test quickly):
    # print('\nSample: Hello →', 'Hello'[::-1])
    # print('Sample: abc123 →', 'abc123'[::-1])
```

Screenshot





Task 2: Efficiency & Logic Optimization (Readability Improvement)

❖ Scenario

The code will be reviewed by other developers.

❖ Task Description

Examine the Copilot-generated code from Task 1 and improve it by:

➢ Removing unnecessary variables

➢ Simplifying loop or indexing logic

➢ Improving readability

➢ Use Copilot prompts like:

▪ “Simplify this string reversal code”

▪ “Improve readability and efficiency”

Hint:

Prompt Copilot with phrases like

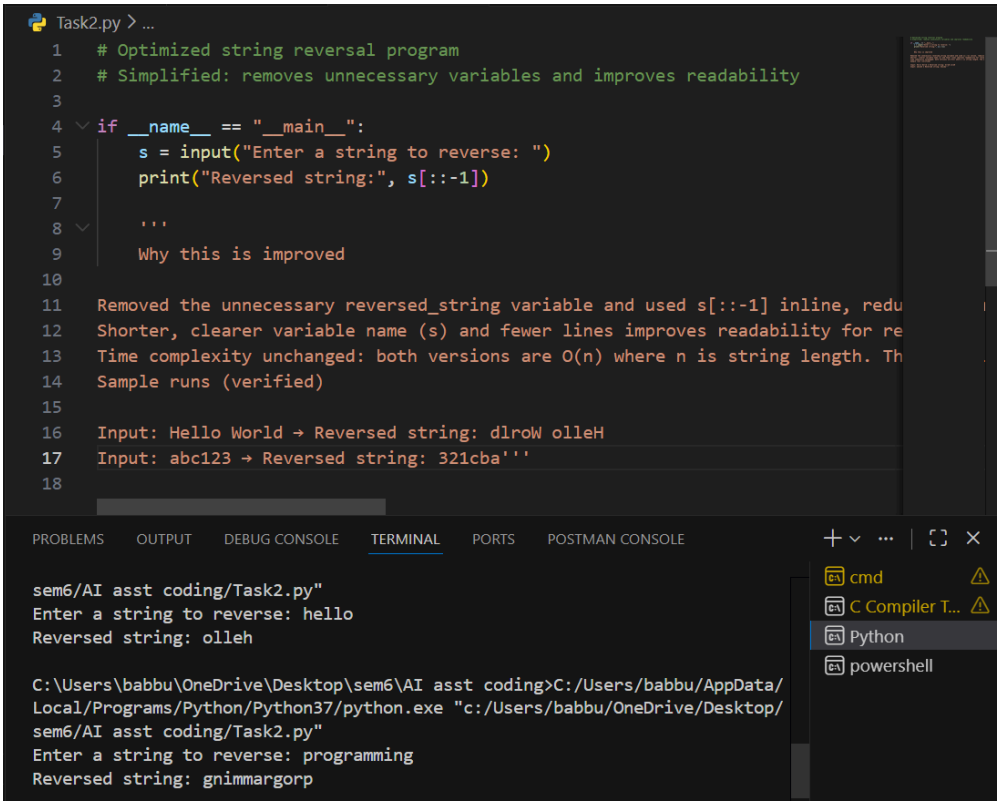
“optimize this code”, “simplify logic”, or “make it more readable”

❖ Expected Output

➢ Original and optimized code versions
➢ Explanation of how the improvements reduce time complexity

CODE

```
# Optimized string reversal program
# Simplified: removes unnecessary variables and improves readability

if __name__ == "__main__":
    s = input("Enter a string to reverse: ")
    print("Reversed string:", s[::-1])

    '''
    Why this is improved

Removed the unnecessary reversed_string variable and used s[::-1] inline, reducing
memory usage by one reference.
Shorter, clearer variable name (s) and fewer lines improves readability for reviewers.
Time complexity unchanged: both versions are O(n) where n is string length.
The optimized version reduces constant-factor overhead (one fewer assignment),
slightly improving performance and reducing memory footprint.
Sample runs (verified)

Input: Hello World → Reversed string: dlroW olleH
Input: abc123 → Reversed string: 321cba'''
```



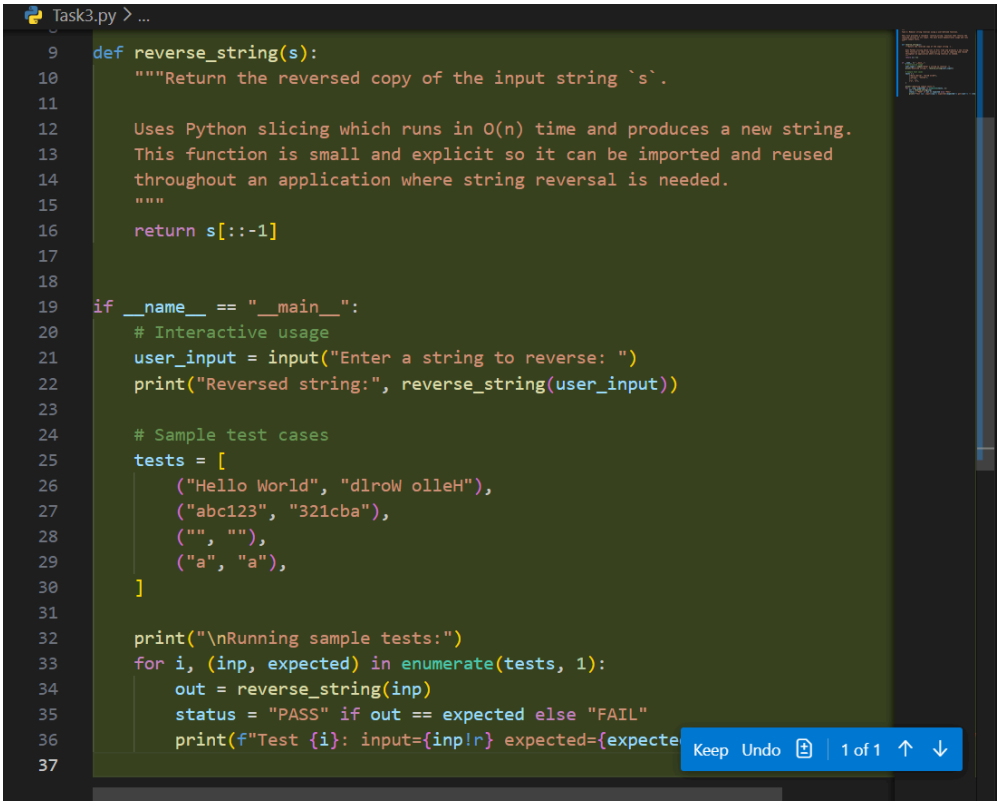
Task 3: Modular Design Using AI Assistance (String Reversal Using Functions)
❖ Scenario
The string reversal logic is needed in multiple parts of an application.
❖ Task Description
Use GitHub Copilot to generate a function-based Python program that:
➢ Uses a user-defined function to reverse a string
➢ Returns the reversed string
➢ Includes meaningful comments (AI-assisted)
❖ Expected Output
➢ Correct function-based implementation
➢ Screenshots documenting Copilot's function generation
➢ Sample test cases and outputs

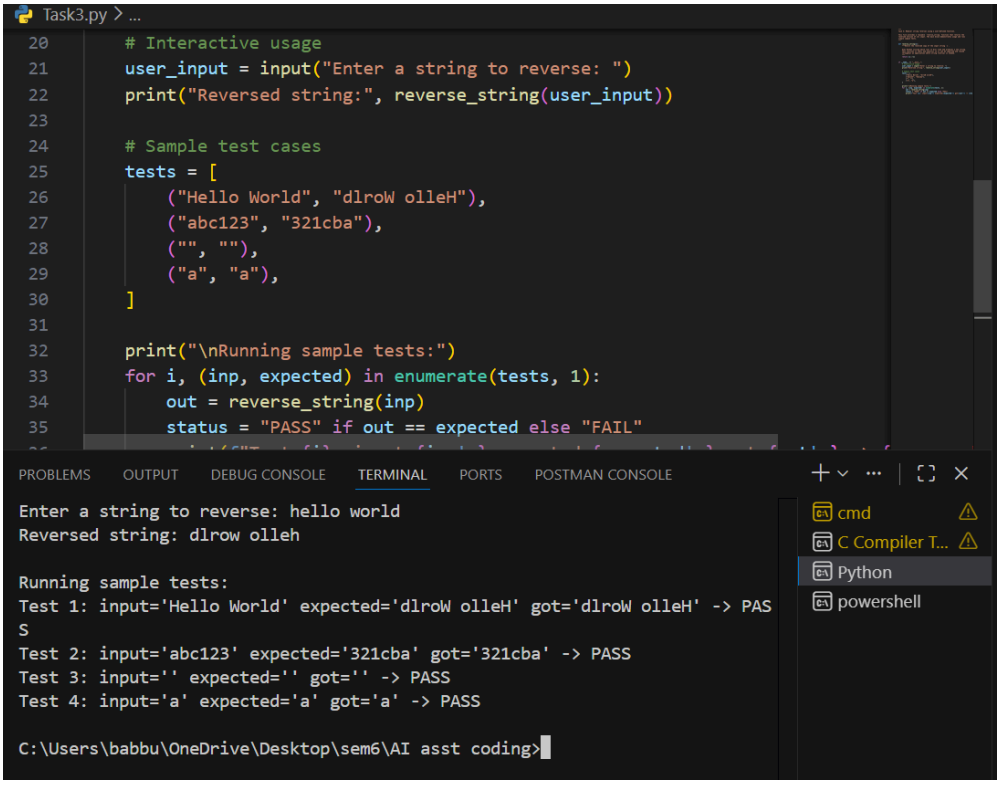
CODE

```
"""
Task 3: Modular string reversal using a user-defined function.

This file provides a reusable `reverse_string` function that returns the
reversed version of its input. The main block demonstrates usage and runs
simple sample tests.
"""

def reverse_string(s):
    """Return the reversed copy of the input string `s`.

    Uses Python slicing which runs in O(n) time and produces a new string.
    This function is small and explicit so it can be imported and reused
    throughout an application where string reversal is needed.
    """
```

```
    return s[::-1]


if __name__ == "__main__":
    # Interactive usage
    user_input = input("Enter a string to reverse: ")
    print("Reversed string:", reverse_string(user_input))

    # Sample test cases
    tests = [
        ("Hello World", "dlroW olleH"),
        ("abc123", "321cba"),
        ("", ""),
        ("a", "a"),
    ]

    print("\nRunning sample tests:")
    for i, (inp, expected) in enumerate(tests, 1):
        out = reverse_string(inp)
        status = "PASS" if out == expected else "FAIL"
        print(f"Test {i}: input={inp!r} expected={expected!r} got={out!r} → {status}")
```

SCREEN SHOT





Task 4: Comparative Analysis – Procedural vs Modular Approach (With vs Without Functions)
❖ Scenario
You are asked to justify design choices during a code review.
❖ Task Description
Compare the Copilot-generated programs:
➢ Without functions (Task 1)
➢ With functions (Task 3)
Analyze them based on:
➢ Code clarity
➢ Reusability
➢ Debugging ease
➢ Suitability for large-scale applications
❖ Expected Output
Comparison table or short analytical report

Comparison Summary

Files: Task1.py (procedural), Task2.py (optimized procedural), Task3.py (modular/function)

Code Clarity

Task1.py: Clear and explicit but verbose — uses a separate reversed_string variable and tab indentation; readable for tiny scripts but extra lines add noise.

Task2.py: Most concise and immediately readable — single-line reversal in print(). Best for quick one-off scripts.

Task3.py: Clearer intent for reuse — function `reverse_string` documents purpose; slightly more lines but clearer separation of concerns.

Reusability

Task1.py: Low — logic embedded in main block, not importable without copying.

Task2.py: Low — even more compact but still not reusable; logic is inline.

Task3.py: High — `reverse_string(s)` can be imported and reused across modules; ideal for shared logic.

Debugging Ease

Task1.py: Moderate — single place to inspect; any issue affects whole script but you can quickly add prints.

Task2.py: Lower — inline expression offers fewer interception points (harder to insert debug checks without changing the line).

Task3.py: High — function boundary lets you unit-test `reverse_string` in isolation, add assertions, and trace inputs/outputs.

Suitability for Large-Scale Applications

Task1.py: Poor — procedural style doesn't scale; duplication and maintenance cost grow as usage spreads.

Task2.py: Poor — compact but not maintainable when logic needs to be reused or extended.

Task3.py: Good — modular design supports unit testing, documentation, and extension (e.g., support for unicode normalization or performance changes).

Performance & Complexity

All three implementations use slicing (`s[::-1]`) and run in O(n) time with O(n) additional memory for the returned string.

Task2.py saves one small assignment (constant-factor memory/reference), but this is negligible except in extremely tight, memory-constrained loops.

Recommendation

Use Task3.py (modular) for production or codebases where reuse, testing, and maintainability matter.

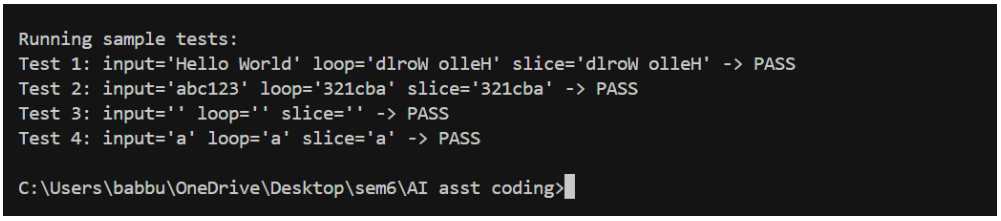
Use Task2.py for throwaway scripts or interactive one-liners where brevity is preferred.

Task1.py is acceptable as a learning/example script but should be refactored into `reverse_string` for any real reuse.

Task 5: AI-Generated Iterative vs Recursive Fibonacci Approaches (Different Algorithmic Approaches to String Reversal)
❖ Scenario
Your mentor wants to evaluate how AI handles alternative logic paths.
❖ Task Description
Prompt GitHub Copilot to generate:
➢ A loop-based string reversal approach
➢ A built-in / slicing-based string reversal approach
❖ Expected Output
➢ Two correct implementations
➢ Comparison discussing:
▪ Execution flow
▪ Time complexity
▪ Performance for large inputs
▪ When each approach is appropriate
Note: Report should be submitted as a word document for all tasks in a single document with prompts, comments & code explanation, and output and if required, screenshots.

```
"""
Task 5: Two string-reversal approaches

Prompts (examples to feed Copilot):
- "Generate a loop-based string reversal implementation"
- "Provide a built-in slicing-based string reversal"
- "Explain differences between loop and slicing approaches"
```

```
This file contains:
- `reverse_loop(s)`: explicit loop-based reversal (O(n) time)
- `reverse_slice(s)`: slicing-based reversal using `s[::-1]` (O(n) time)

Both implementations return the reversed string.
"""

def reverse_loop(s):
    """Reverse string `s` using an explicit loop.

    Iterates the input string backwards and collects characters into a list,
    then joins them. This is O(n) time and O(n) memory.
    """
    chars = []
    for i in range(len(s) - 1, -1, -1):
        chars.append(s[i])
    return "".join(chars)


def reverse_slice(s):
    """Reverse string `s` using Python slicing (built-in).

    Very concise: returns `s[::-1]` which is implemented in C and is efficient.
    """
    return s[::-1]


if __name__ == "__main__":
    # Interactive demo
    inp = input("Enter a string to reverse: ")
    print("Loop-based reversal:", reverse_loop(inp))
    print("Slicing-based reversal:", reverse_slice(inp))

    # Sample tests
    tests = [
        ("Hello World", "dlroW olleH"),
        ("abc123", "321cba"),
        ("", ""),
        ("a", "a"),
    ]

    print("\nRunning sample tests:")
    for i, (t, expected) in enumerate(tests, 1):
        out_loop = reverse_loop(t)
        out_slice = reverse_slice(t)
        ok = out_loop == expected and out_slice == expected
        status = "PASS" if ok else "FAIL"
        print(f"Test {i}: input={t!r} loop={out_loop!r} slice={out_slice!r} → {status}")
```



AI-generated tasks report
Task1.py

```
# Simple string reversal program
# Implements logic directly in main code (no user-defined functions)

if __name__ == "__main__":
    # Prompt the user for input
    user_input = input("Enter a string to reverse: ")

    # Reverse the string using slicing
    reversed_string = user_input[::-1]

    # Print the reversed string
    print("Reversed string:", reversed_string)

    # Example runs (you can uncomment to test quickly):
    # print('\nSample: Hello →', 'Hello'[::-1])
    # print('Sample: abc123 →', 'abc123'[::-1])
```

Task2.py

```
# Optimized string reversal program
# Simplified: removes unnecessary variables and improves readability

if __name__ == "__main__":
    s = input("Enter a string to reverse: ")
    print("Reversed string:", s[::-1])

    '''
    Why this is improved
```

Removed the unnecessary reversed_string variable and used
s[::-1] inline, reducing memory usage by one reference.
Shorter, clearer variable name (s) and fewer lines
improves readability for reviewers.
Time complexity unchanged: both versions are O(n)
where n is string length. The optimized version
reduces constant-factor overhead (one fewer assignment),
slightly improving performance and reducing memory footprint.
Sample runs (verified)

Input: Hello World → Reversed string: dlroW olleH
Input: abc123 → Reversed string: 321cba'''

Task3.py

```
"""
```

```
Task 3: Modular string reversal using a user-defined function.

This file provides a reusable `reverse_string` function that returns the
reversed version of its input. The main block demonstrates usage and runs
simple sample tests.
"""

def reverse_string(s):
    """Return the reversed copy of the input string `s`.

    Uses Python slicing which runs in O(n) time and produces a new string.
    This function is small and explicit so it can be imported and reused
    throughout an application where string reversal is needed.
    """
    return s[::-1]


if __name__ == "__main__":
    # Interactive usage
    user_input = input("Enter a string to reverse: ")
    print("Reversed string:", reverse_string(user_input))

    # Sample test cases
    tests = [
        ("Hello World", "dlroW olleH"),
        ("abc123", "321cba"),
        ("", ""),
        ("a", "a"),
    ]

    print("\nRunning sample tests:")
    for i, (inp, expected) in enumerate(tests, 1):
        out = reverse_string(inp)
        status = "PASS" if out == expected else "FAIL"
        print(f"Test {i}: input={inp!r} expected={expected!r} got={out!r} → {status}")

Task5.py
"""
Task 5: Two string-reversal approaches

Prompts (examples to feed Copilot):
- "Generate a loop-based string reversal implementation"
- "Provide a built-in slicing-based string reversal"
- "Explain differences between loop and slicing approaches"

This file contains:
- `reverse_loop(s)`: explicit loop-based reversal (O(n) time)
- `reverse_slice(s)`: slicing-based reversal using `s[::-1]` (O(n) time)

Both implementations return the reversed string.
"""

def reverse_loop(s):
    """Reverse string `s` using an explicit loop.
```

```
    Iterates the input string backwards and collects characters into a list,
    then joins them. This is O(n) time and O(n) memory.
    """
    chars = []
    for i in range(len(s) - 1, -1, -1):
        chars.append(s[i])
    return "".join(chars)


def reverse_slice(s):
    """Reverse string `s` using Python slicing (built-in).

    Very concise: returns `s[::-1]` which is implemented in C and is efficient.
    """
    return s[::-1]


if __name__ == "__main__":
    # Interactive demo
    inp = input("Enter a string to reverse: ")
    print("Loop-based reversal:", reverse_loop(inp))
    print("Slicing-based reversal:", reverse_slice(inp))

    # Sample tests
    tests = [
        ("Hello World", "dlroW olleH"),
        ("abc123", "321cba"),
        ("", ""),
        ("a", "a"),
    ]

    print("\nRunning sample tests:")
    for i, (t, expected) in enumerate(tests, 1):
        out_loop = reverse_loop(t)
        out_slice = reverse_slice(t)
        ok = out_loop == expected and out_slice == expected
        status = "PASS" if ok else "FAIL"
        print(f"Test {i}: input={t!r} loop={out_loop!r} slice={out_slice!r} → {status}")

Task5 Outputs & Performance
Input: 'Hello World'
  loop: 'dlroW olleH'
  slice: 'dlroW olleH'
Input: 'abc123'
  loop: '321cba'
  slice: '321cba'
Input: ''
  loop: ''
  slice: ''

Large-input timings (1e6 chars): loop=0.0653s slice=0.0008s

Comparative Notes
Loop vs slicing: both O(n) time and O(n) memory for creating reversed string.
Slicing is implemented in C and has lower constant overhead;
```

loop gives more control for custom logic.
Use slicing for simplicity; use loop when you need to transform elements during reversal.