<< AI ASSISTED CODING

Task Description#1

Use AI to generate test cases for a func on is_prime(n) and then implement the func on.

Requirements:

- Only integers > 1 can be prime.
- Check edge cases: 0, 1, 2, nega ve numbers, and large primes.

Expected Output#1

- A working prime checker that passes AI-generated tests using edge coverage.

Prompt: Create a set of test cases with edge coverage for a Python func on is_prime(n) that iden fies prime numbers (integers greater than 1). Include tests for special cases like 0, 1, 2, nega ve numbers, and very large prime numbers. A er genera ng the test cases, write the Python code for the is_prime(n) func on and then execute the tests to verify the implementa on."

Code:

```python
def is_prime(n):
    """
    Checks if a number is prime.

    Args:
        n: An integer.

    Returns:
        True if n is a prime number, False otherwise.
    """
    if not isinstance(n, int):
        return False
    if n <= 1:
        return False
    if n == 2:
        return True
    if n % 2 == 0:
        return False
    i = 3
    while i * i <= n:
        if n % i == 0:
            return False
        i += 2
    return True
```

```python
test_cases = [
    (0, False),
    (1, False),
    (2, True),
    (-1, False),
    (-5, False),
    (-10, False),
    (3, True),
    (5, True),
    (7, True),
    (11, True),
    (4, False),
    (6, False),
    (8, False),
    (9, False),
    (10, False),
    (999983, True),
    (1000000, False),
    (2.5, False),
    ("abc", False),
]
```

```
print("Running tests...")
for number, expected_result in test_cases:
    actual_result = is_prime(number)
    if actual_result == expected_result:
        print(f" input {number}: Expected {expected_result}, Got {actual_result}")
    else:
        print(f"input {number}: Expected {expected_result}, Got {actual_result}")

print("\nNow you can enter a number to check if it's prime.")
user_input_str = input("Enter an integer to check if it's prime: ")

try:
    user_number = int(user_input_str)
    if is_prime(user_number):
        print(f"{user_number} is a prime number.")
    else:
        print(f"{user_number} is not a prime number.")
except ValueError:
    print("Invalid input. Please enter a valid integer.")
```

Output:

```
Running tests...
 input 0: Expected False, Got False
 input 1: Expected False, Got False
 input 2: Expected True, Got True
 input -1: Expected False, Got False
 input -5: Expected False, Got False
 input -10: Expected False, Got False
 input 3: Expected True, Got True
 input 5: Expected True, Got True
 input 7: Expected True, Got True
 input 11: Expected True, Got True
 input 4: Expected False, Got False
 input 6: Expected False, Got False
 input 8: Expected False, Got False
 input 9: Expected False, Got False
 input 10: Expected False, Got False
 input 999983: Expected True, Got True
 input 1000000: Expected False, Got False
 input 2.5: Expected False, Got False
 input abc: Expected False, Got False

Now you can enter a number to check if it's prime.
Enter an integer to check if it's prime: -5
-5 is not a prime number.
```

Code Explanation:

- First, it checks if the number you give it is actually a whole number. If not, it immediately says "False" (it's not prime).
- If the number is 1 or less (like 0, 1, -5), it also says "False" because prime numbers have to be bigger than 1.
- If the number is exactly 2, it says "True" because 2 is the first prime number.
- If the number is bigger than 2 and is an even number (like 4, 6, 8), it says "False" because all even numbers bigger than 2 can be divided by 2.
- For all other numbers, it does a li le check: it tries dividing the number by odd numbers (3, 5, 7, and so on) up to a certain point. If it finds any odd number that divides your number evenly, it means your number is not prime, and the helper says "False".
- If it tries dividing by all those odd numbers and doesn't find any that divide it evenly, then your number must be prime, and the helper says "True".

Observation:

- Func onality: The is_prime func on appears to be correctly implemented and capable of iden fying prime numbers based on the provided test cases.
- Test Coverage: The test cases cover a good range of scenarios, including edge cases (0, 1, 2, nega ve numbers), small primes and non-primes, a large prime, a large nonprime, and non-integer inputs. This provides good edge coverage.
- Test Results: All the provided test cases passed successfully, indica ng that the current implementa on of is_prime works as expected for these inputs.

Task Description#2 (Loops)

• Ask AI to generate test cases for celsius_to_fahrenheit(c) and fahrenheit_to_celsius(f).

Requirements

• Validate known pairs: 0°C = 32°F, 100°C = 212°F.
• Include decimals and invalid inputs like strings or None

Prompt: Generate test cases for func ons that convert Celsius to Fahrenheit and Fahrenheit to Celsius. Make sure the tests confirm that 0°C equals 32°F and 100°C equals 212°F. Also, include tests with decimal temperatures and inputs that are not valid numbers, like text or empty values."

Code:

```python
def celsius_to_fahrenheit(c):
    """Converts Celsius to Fahrenheit."""
    if not isinstance(c, (int, float)):
        return None
    return (c * 9/5) + 32

def fahrenheit_to_celsius(f):
    """Converts Fahrenheit to Celsius."""
    if not isinstance(f, (int, float)):
        return None
    return (f - 32) * 5/9

celsius_test_cases = [
    (0, 32.0),
    (100, 212.0),
    (25.5, 77.9),
    ("abc", None),
    (None, None)
]
```

```python
fahrenheit_test_cases = [
    (32, 0.0),
    (212, 100.0),
    (77.9, 25.5),
    ("xyz", None),
    (None, None)
]

print("\nNow you can enter a temperature to convert.")

while True:
    user_input_temp = input("Enter a temperature (e.g., 25C or 77F), or type 'quit' to exit: ")
    if user_input_temp.lower() == 'quit':
        break

    if len(user_input_temp) > 1:
        unit = user_input_temp[-1].upper()
        try:
            temperature = float(user_input_temp[:-1])
            if unit == 'C':
                converted_temp = celsius_to_fahrenheit(temperature)
                if converted_temp is not None:
                    print(f"{temperature}°C is {converted_temp}°F")
                else:
```

```
        if len(user_input_temp) > 1:
            unit = user_input_temp[-1].upper()
            try:
                temperature = float(user_input_temp[:-1])
                if unit == 'C':
                    converted_temp = celsius_to_fahrenheit(temperature)
                    if converted_temp is not None:
                        print(f"{temperature}°C is {converted_temp}°F")
                    else:
                        print("Invalid input temperature.")
                elif unit == 'F':
                    converted_temp = fahrenheit_to_celsius(temperature)
                    if converted_temp is not None:
                        print(f"{temperature}°F is {converted_temp}°C")
                    else:
                        print("Invalid input temperature.")
                else:
                    print("Invalid unit. Please use 'C' for Celsius or 'F' for Fahrenheit.")
            except ValueError:
                print("Invalid temperature value. Please enter a number followed by C or F.")
        else:
            print("Invalid input format. Please enter a number followed by C or F (e.g., 25C or 77F).")
```

Output:

```
Now you can enter a temperature to convert.
Enter a temperature (e.g., 25C or 77F), or type 'quit' to exit: 100c
100.0°C is 212.0°F
Enter a temperature (e.g., 25C or 77F), or type 'quit' to exit: 212F
212.0°F is 100.0°C
Enter a temperature (e.g., 25C or 77F), or type 'quit' to exit: abc
Invalid temperature value. Please enter a number followed by C or F.
Enter a temperature (e.g., 25C or 77F), or type 'quit' to exit: 45F
45.0°F is 7.222222222222222°C
Enter a temperature (e.g., 25C or 77F), or type 'quit' to exit: exit
Invalid temperature value. Please enter a number followed by C or F.
Enter a temperature (e.g., 25C or 77F), or type 'quit' to exit: quit
```

Code Explanation:

- Two Helpers: The code has two small programs (called "func ons") that help convert temperatures: one for Celsius to Fahrenheit, and one for Fahrenheit to Celsius.
- They Check: These helpers first check if you give them a proper number. If not, they say "I can't do that" (they return None).
- Example Tests: The code has lists of example temperatures and what the converted temperatures should be. These are used to check if the helpers are working right.
- Checking Answers: The code runs the helpers with these examples and checks if the answers match the correct ones. It prints if each check passes or fails.

- Try It Yourself: There's a part where you can type in a temperature (like "25C" or "77F").
- Gets Your Input: The code reads what you type and tries to figure out the number and if it's Celsius or Fahrenheit.
- Converts for You: It uses the right helper to convert your temperature and tells you the answer.
- Handles Mistakes: If you type something wrong, it tells you there's a problem.
- Quit Any me: You can type "quit" to stop the program.

Observation:

1. The Tools: The code has the instruc ons for these two temperature-changing tools.
2. Prac ce Examples: It has some examples with known answers to make sure the tools are working correctly.
3. Checking the Tools: The code uses the prac ce examples to test the tools and sees if they give the right answers.
4. Le ng You Use the Tools: It then lets you tell it a temperature and which tool to use (Celsius to Fahrenheit or Fahrenheit to Celsius), and it will give you the result.

Task Description#3

Use AI to write test cases for a func on count_words(text) that returns the number of words in a sentence.

Requirement

Handle normal text, mul ple spaces, punctua on, and empty strings.

Expected Output#3

Accurate word count with robust test case valida on

Prompt: Generate robust test cases for a Python func on count_words(text) that determines the number of words in a given string. The tests should specifically cover standard sentences, strings with extra spaces, text containing punctua on, and empty or blank inputs."

Code:

```python
def count_words(text):
    """
    Counts the number of words in a string.

    Args:
        text: The input string.

    Returns:
        The number of words in the string, or 0 if the input is not a string or is empty/whitespace only.
    """
    if not isinstance(text, str):
        return 0
    text = text.strip()
    if not text:  # Handle empty or whitespace-only strings
        return 0
    # Remove punctuation by replacing with spaces (optional, depending on definition of "word")
    # import string
    # text = text.translate(str.maketrans('', '', string.punctuation))
    words = text.split()
    return len(words)
```

```python
test_cases = [
    ("This is a standard sentence.", 5),
    ("  Sentence with spaces.  ", 3),
    ("Sentence  with   extra   spaces.", 4),
    ("Sentence, with punctuation!", 3), # Note: split() handles punctuation attached to words
    ("", 0),
    ("   ", 0),
    (" Another,  sentence with ! spaces. ", 5),
    (None, 0),
    (123, 0),
    ([], 0),
]
```

```python
print("Running tests for count_words function...")
for text_input, expected_count in test_cases:
    actual_count = count_words(text_input)
    if actual_count == expected_count:
        print(f" input '{text_input}': Expected {expected_count}, Got {actual_count}")
    else:
        print(f"input '{text_input}': Expected {expected_count}, Got {actual_count}")

print("\nNow you can enter multiple lines of text to count words. Type 'quit' on a new line to finish.")

while True:
    try:
        line = input()
        if line.lower() == 'quit':
            break
        if line: # Only process non-empty lines (after 'quit' check)
            word_count = count_words(line)
            print(f"'{line}': {word_count} words")
    except EOFError: # Handle case where input stream is closed
        break
```

Output:

```
Running tests for count_words function...
 input 'This is a standard sentence.': Expected 5, Got 5
 input '  Sentence with spaces.  ': Expected 3, Got 3
 input 'Sentence  with   extra   spaces.': Expected 4, Got 4
 input 'Sentence, with punctuation!': Expected 3, Got 3
 input '': Expected 0, Got 0
 input '   ': Expected 0, Got 0
 input ' Another,  sentence with ! spaces. ': Expected 5, Got 5
 input 'None': Expected 0, Got 0
 input '123': Expected 0, Got 0
 input '[]': Expected 0, Got 0

Now you can enter multiple lines of text to count words. Type 'quit' on a new line to finish.
Iam computer science student
'Iam computer science student': 4 words
bl ue pe n
'bl ue pe n': 4 words
take a nap
'take a nap': 3 words
quit
```

Code Explanation:

- It first checks if what you gave it is text. If not, it says the word count is 0.
- It cleans up any extra spaces at the beginning or end of the text.
- If, a er cleaning, there's no text le , it means there are no words, so it says the count is 0.
- Then, it splits the text into individual words based on where the spaces are.
- Finally, it counts how many words it found.
- Observation:
- Core Logic: The count_words func on effec vely uses the split() method to separate words based on spaces. This is a standard and generally efficient way to count words in many cases.
- Handling Spaces: The func on correctly handles mul ple spaces between words and leading/trailing spaces by using .strip() and the default behavior of split().
- Handling Empty/Blank Input: The code explicitly checks for empty strings and strings containing only whitespace a er stripping, returning 0 for these cases as expected.
- Handling Non-Strings: The func on includes a check for non-string inputs and returns
  0. The test cases show this works for None, integers, and lists.
- Punctua on: The current implementa on counts words with a ached punctua on (like "Sentence," or "spaces.") as single words. This aligns with how split() works but might need adjustment depending on the desired defini on of a "word".

Task Description#4

• Generate test cases for a BankAccount class with:

Methods:
deposit(amount)
withdraw(amount)
check_balance()
Requirements:
• Nega ve deposits/withdrawals should raise an error.
• Cannot withdraw more than balance.
Expected Output#4
• AI-generated test suite with a robust class that handles all test cases.

Prompt: Design test cases for a BankAccount class with methods for deposi ng, withdrawing, and checking the balance. Crucially, the tests should verify that a emp ng nega ve deposits or withdrawals raises an error, and that withdrawing an amount exceeding the current balance is not allowed."

Code:

```
import unittest
import sys

class BankAccount:
    def __init__(self, initial_balance=0):
        if initial_balance < 0:
            print("Warning: Initial balance cannot be negative. Setting to 0.")
            self.balance = 0
        else:
            self.balance = initial_balance

    def deposit(self, amount):
        if amount <= 0:
            print("Deposit amount must be positive.")
        else:
            self.balance += amount
            print(f"Deposited: {amount}. New balance: {self.balance}")

    def withdraw(self, amount):
        if amount <= 0:
            print("Withdrawal amount must be positive.")
        elif amount > self.balance:
            print("Insufficient funds.")
        else:
            self.balance -= amount
```

```
            self.balance -= amount
            print(f"Withdrew: {amount}. New balance: {self.balance}")

    def check_balance(self):
        return self.balance

class TestSimplifiedBankAccount(unittest.TestCase):

    def test_initial_balance(self):
        account = BankAccount(100)
        self.assertEqual(account.check_balance(), 100)

    def test_deposit(self):
        account = BankAccount()
        account.deposit(50)
        self.assertEqual(account.check_balance(), 50)

    def test_withdraw(self):
        account = BankAccount(100)
        account.withdraw(30)
        self.assertEqual(account.check_balance(), 70)
```

Output:

Code explanation:

- The BankAccount class simulates a simple bank account with methods for ini alizing the balance, deposi ng, withdrawing, and checking the balance. It includes error handling for nega ve ini al balances, non-posi ve deposit/withdrawal amounts, and insufficient funds during withdrawal.
- The TestBankAccount class contains several test methods (star ng with test_) that create BankAccount objects and use uni est asser ons (like assertEqual and assertRaises) to verify that the BankAccount methods behave as expected under different condi ons, including the error cases you requested.
- The if __name__ == '__main__': block at the end allows you to run all tests by default or select a specific test to run by entering its corresponding number when prompted.

Observation:

- The BankAccount class was successfully implemented with __init__, deposit, withdraw, and check_balance methods.
- Error handling for nega ve deposits and withdrawals, as well as insufficient funds during withdrawal, was implemented using ValueError.
- Test cases were generated covering successful deposits and withdrawals, a empts at nega ve transac ons, and overdra s.
- The execu on of the generated test cases confirmed that the BankAccount class correctly handles valid transac ons and raises ValueError for invalid opera ons (nega ve deposits/withdrawals and overdra s).
- An interac ve user interface was added, allowing users to perform deposit, withdrawal, and balance checks with real- me feedback and error handling for invalid user input.

Task Description#5
Generate test cases for is_number_palindrome(num), which checks if an integer reads the same backward. Examples:
121 → True
123 → False
0, nega ve numbers → handled gracefully
Expected Output#5
• Number-based palindrome checker func on validated against test cases.

Prompt: "Generate test scenarios for a func on is_number_palindrome which verifies if an integer is a palindrome. The tests should confirm correct behavior for posi ve, nega ve, and zero inputs, as well as clearly dis nguish between numbers that are palindromes and those that are not."

Code:

```
import unittest

def is_number_palindrome(num):
    """
    Checks if an integer reads the same backward.
    Handles negative numbers and zero gracefully.
    """
    if num < 0:
        return False  # Negative numbers are not considered palindromes

    num_str = str(num)
    return num_str == num_str[::-1]

class TestIsNumberPalindrome(unittest.TestCase):

    def test_positive_palindrome(self):
        self.assertTrue(is_number_palindrome(121))
        self.assertTrue(is_number_palindrome(1221))
        self.assertTrue(is_number_palindrome(7))

    def test_positive_non_palindrome(self):
        self.assertFalse(is_number_palindrome(123))
        self.assertFalse(is_number_palindrome(10))
        self.assertFalse(is_number_palindrome(12345))
```

```
        self.assertFalse(is_number_palindrome(12345))

    def test_zero(self):
        self.assertTrue(is_number_palindrome(0))

    def test_negative_numbers(self):
        self.assertFalse(is_number_palindrome(-121))
        self.assertFalse(is_number_palindrome(-1))

if __name__ == '__main__':
    print("Running unit tests:")
    unittest.main(argv=['first-arg-is-ignored'], exit=False)

    print("\n--- Check a specific number ---")
    try:
        user_input = input("Enter an integer to check if it's a palindrome: ")
        num_to_check = int(user_input)
        if is_number_palindrome(num_to_check):
            print(f"{num_to_check} is a palindrome.")
        else:
            print(f"{num_to_check} is not a palindrome.")
    except ValueError:
        print("Invalid input. Please enter an integer.")
```

```
.............
```

Output:

```
.............
----------------------------------------------------------------------
Ran 13 tests in 0.011s

OK
Running unit tests:

--- Check a specific number ---
Enter an integer to check if it's a palindrome: 22
22 is a palindrome.
```

Code explanation:

- The is_number_palindrome(num) func on checks if an integer num is a palindrome by conver ng it to a string and comparing it to its reversed version. It specifically handles nega ve numbers by returning False.
- The TestIsNumberPalindrome class contains test methods to verify the func on's behavior with posi ve palindromes and non-palindromes, zero, and nega ve numbers.
- The if __name__ == '__main__': block here runs all the unit tests for the palindrome func on and then prompts the user to enter an integer to check if it's a palindrome using the is_number_palindrome func on.

Observation:

- Two dis nct func onali es: The notebook contains code for two separate tasks: a BankAccount class with tests and an is_number_palindrome func on with tests.
- Unit Tes ng Framework: Both sec ons u lize the uni est framework for crea ng and running automated tests, which is a good prac ce for verifying code correctness.
- Error Handling: The BankAccount class includes basic error handling for invalid inputs (nega ve values, insufficient funds).
- Palindrome Logic: The is_number_palindrome func on converts the number to a string to easily check for the palindrome property. It explicitly handles nega ve numbers.