

LAB 2.2

Name: S.vignesh

HallTicket : 2303A51217

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Task 1: Cleaning Sensor Data

PROMPT:

- K Generate a Python function that removes all negative numbers from a list of integers and returns the cleaned list.
- ◆ Sure, here's a Python function that removes all negative numbers from a list of integers and returns the cleaned list. I've also included an example of how to use it.

[Run an example usage of the function](#)

[Explain the 'remove_negative_numbers' function](#)

What can I help you build?



Gemini 2.5 Flash ▾ ▶

CODE:

```
[1] 0s  def remove_negative_numbers(numbers):
    """
        Removes all negative numbers from a list of integers.

    Args:
        numbers: A list of integers.

    Returns:
        A new list containing only the non-negative numbers from the input list.
    """
    return [num for num in numbers if num >= 0]

# Example Usage
my_list = [1, -2, 3, -4, 0, 5, -6]
cleaned_list = remove_negative_numbers(my_list)
print(f"Original list: {my_list}")
print(f"Cleaned list (without negative numbers): {cleaned_list}")

...
Original list: [1, -2, 3, -4, 0, 5, -6]
Cleaned list (without negative numbers): [1, 3, 0, 5]
```

OUTPUT:

Original list: [1, -2, 3, -4, 0, 5, -6]

Cleaned list (without negative numbers): [1, 3, 0, 5]

Task 2: String Character Analysis

PROMPT:

- K Generate a Python function to count vowels, consonants, and digits in a given string.
- ◆ Certainly! Here's a Python function to count vowels, consonants, and digits in a given string, along with an example of how to use it:

▶ Accept and run ✓ Accept ✘ Cancel

CODE:

```

def count_char_types(input_string):
    vowels = "aeiouAEIOU"
    digits = "0123456789"
    vowel_count = 0
    consonant_count = 0
    digit_count = 0

    for char in input_string:
        if char.isalpha(): # Check if the character is an alphabet
            if char in vowels:
                vowel_count += 1
            else:
                consonant_count += 1
        elif char.isdigit(): # Check if the character is a digit
            digit_count += 1

    return {"vowels": vowel_count, "consonants": consonant_count, "digits": digit_count}

my_string = "Hello World 123!"
counts = count_char_types(my_string)
print(f"Original string: '{my_string}'")
print(f"Vowel count: {counts['vowels']}") 
print(f"Consonant count: {counts['consonants']}") 
print(f"Digit count: {counts['digits']}")
```

OUTPUT:

Original string: 'Hello World 123!'

Vowel count: 3

Consonant count: 7

Digit count: 3

Task 3: Palindrome Check – Tool Comparison

PROMPT:

K Generate a Python function to check whether a string is a palindrome.

◆ Sure! Here's a Python function to check if a string is a palindrome, along with an example of how to use it.

Working...

What can I help you build?

+ Gemini 2.5 Flash ▾

CODE: GEMINI GENERATED

```
def is_palindrome(s):
    # Convert to lowercase and remove non-alphanumeric characters
    cleaned_s = ''.join(char.lower() for char in s if char.isalnum())

    # Compare the cleaned string with its reverse
    return cleaned_s == cleaned_s[::-1]

print(f"'madam' is a palindrome: {is_palindrome('madam')}")  
print(f"'A man, a plan, a canal: Panama' is a palindrome: {is_palindrome('A  
man, a plan, a canal: Panama')}")  
print(f"'hello' is a palindrome: {is_palindrome('hello')}")  
print(f"'Racecar' is a palindrome: {is_palindrome('Racecar')}")  
print(f"'No lemon, no melon' is a palindrome: {is_palindrome('No lemon, no  
melon')}")
```

OUTPUT:

```
'madam' is a palindrome: True
'A man, a plan, a canal: Panama' is a palindrome: True
'hello' is a palindrome: False
'Racecar' is a palindrome: True
'No lemon, no melon' is a palindrome: True
```

CODE :(COPILOT GENERATED):

```

s ⏎ def is_palindrome(s):
    s = s.lower().replace(" ", "") # normalize: lowercase and remove spaces
    return s == s[::-1]

# Example usage:
print(is_palindrome("madam"))      # True
print(is_palindrome("racecar"))     # True
print(is_palindrome("hello"))       # False
print(is_palindrome("A man a plan a canal Panama")) # True

...
True
True
False
True

```

SIDE BY SIDE OBSERVATION TABLE :

Tool	Code Clarity	Simplicity	Readability
Gemini	High	Very simple	Easy to understand
Copilot	Medium	Slightly complex	More control

◊ Student Observation:

Gemini generated more concise and beginner-friendly code, while Copilot provided a detailed implementation with better input handling.

Task 4: Code Explanation Using AI

CODE:

```
def find_max_difference(nums):
    if len(nums) < 2:
        return 0

    min_val = nums[0]
    max_diff = 0

    for i in range(1, len(nums)):
        if nums[i] < min_val:
            min_val = nums[i]
        else:
            max_diff = max(max_diff, nums[i] - min_val)

    return max_diff
```

PROMPT:

- K Explain the following Python function line by line in simple terms.
- ```
def find_max_difference(nums):
 if len(nums) < 2:
 return 0
 min_val = nums[0]
 max_diff = 0
 for i in range(1, len(nums)):
 if nums[i] < min_val:
 min_val = nums[i]
 else:
 max_diff = max(max_diff, nums[i] - min_val)
 return max_diff
```

AI EXPLANATION:

Let's go through the `find_max_difference` function line by line:

1. `def find_max_difference(nums):`

- o This line defines a new function called `find_max_difference`. A function is a block of organized, reusable code that performs a single, related action.

- `nums` is the input to this function. It's expected to be a list of numbers.
2. **`if len(nums) < 2:`**
- This is a check to see if the `nums` list has fewer than 2 elements. ○ If a list has less than two numbers, you can't find a "difference" between two *different* numbers where the second number appears after the first, which is what this function is designed to do (finding the maximum difference between `nums[j] - nums[i]` where  $j > i$ ).
3. **`return 0`**
- If the list has less than 2 elements (as checked in the previous line), the function immediately stops and returns 0 because no meaningful difference can be calculated.
4. **`min_val = nums[0]`**
- We initialize a variable called `min_val` with the value of the first number in the `nums` list.
  - This `min_val` will keep track of the smallest number encountered *so far* as we go through the list.
5. **`max_diff = 0`** ○ We initialize a variable called `max_diff` to 0. ○ This variable will store the largest difference we find between any number and the `min_val` encountered *before* it.
6. **`for i in range(1, len(nums)):`**
- This line starts a loop that will go through each number in the `nums` list, starting from the *second* number (at index 1) up to the end of the list. ○ We start from the second number because we've already used the first number to initialize `min_val`.
7. **`if nums[i] < min_val:`**
- Inside the loop, for each number `nums[i]`, this line checks if the current number is smaller than the `min_val` we've tracked so far.
8. **`min_val = nums[i]`**
- If the current number `nums[i]` is smaller than `min_val`, it means we've found a new, smaller minimum value. So, we update `min_val` to this new smaller number.

**max\_diff = max(max\_diff, nums[i] - min\_val)**

- In this case, `nums[i]` is a number that came *after* `min_val` (or is the same as `min_val`). We calculate the difference between the current number `nums[i]` and our `min_val`.
- Then, we compare this new difference with the `max_diff` we've found so far. The `max()` function picks the larger of the two values.
- `max_diff` is then updated to store the largest difference found up to this point.

9. **return max\_diff**

- After the loop has finished checking all numbers in the list, this line returns the final `max_diff` value, which represents the largest difference found between any two numbers  $\text{nums}[j] - \text{nums}[i]$  where  $j > i$ .

**Student Understanding / Comments:**

Initially, I found the logic confusing. After Gemini's explanation, I understood that the function finds the maximum difference between two elements such that the smaller number appears before the larger number. The explanation helped me understand how minimum tracking works.