Day 4: Data Structures – Lists (Material)

1. Introduction to Lists

- Definition: In Python, a list is an ordered, mutable collection of items. This means:
    - Ordered: The items in a list have a specific position (index) – the first item has index 0, the second has index 1, and so on.
    - Mutable: You can change the elements of a list after it's created – add, remove, or modify items.
- How to create a list:
    - my_list = [1, 2, 3, "hello", True]

2. Common List Methods

- append(item): Adds an item to the end of the list.
    - Example: my_list.append(4)
- remove(item): Removes the first occurrence of a specific item from the list.
    - Example: my_list.remove("hello")
- pop(index): Removes and returns the item at the given index. If no index is specified, it removes and returns the last item.
    - Example: removed_item = my_list.pop(1)
- slicing: Extracts a portion of the list.
    - new_list = my_list[start:end:step]
        - start (inclusive): The index of the first element to include.
        - end (exclusive): The index of the first element to *not* include.
        - step (optional): The step size (default is 1).

Examples for Common List method:

- append(item): Adds an item to the end of the list.
  - Example 1: numbers = [1, 2, 3];

numbers.append(4)

# numbers is now [1, 2, 3, 4]

  - Example 2: colors = ["red", "green"];

colors.append("blue")

  - Example 3: scores = [85, 92, 78];

scores.append(95)

  - Example 4: names = ["Alice", "Bob"];

names.append("Charlie")

  - Example 5: empty_list = [];

empty_list.append(10)

- remove(item): Removes the first occurrence of a specific item from the list.
  - Example 1: fruits = ["apple", "banana", "orange"];

fruits.remove("banana")

  - Example 2: numbers = [1, 2, 2, 3];

numbers.remove(2) # Removes the first occurrence of 2

  - Example 3: colors = ["red", "green", "red"];

colors.remove("red")

  - Example 4: names = ["Alice", "Bob", "Alice"];

names.remove("Alice")

  - Example 5: my_list = [1, "hello", True];

my_list.remove(True)

- pop(index): Removes and returns the item at the given index. If no index is specified, it removes and returns the last item.
    - Example 1: numbers = [1, 2, 3];

removed_item = numbers.pop(1)

# numbers is now [1, 3],

removed_item is 2

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    - Example 2: fruits = ["apple", "banana", "orange"];

last_fruit = fruits.pop()

# fruits is now ["apple", "banana"],

last_fruit is "orange"

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    - Example 3: colors = ["red", "green", "blue"];

second_color = colors.pop(1)

# colors is now ["red", "blue"],

second_color is "green"

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    - Example 4: my_list = [1, 2, "hello"];

removed_item = my_list.pop(2)

# my_list is now [1, 2],

removed_item is "hello"

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    - Example 5: empty_list = [];

removed_item = empty_list.pop()

# Raises an IndexError

- slicing: Extracts a portion of the list.
    - new_list = my_list[start:end:step]
        - start (inclusive): The index of the first element to include.
        - end (exclusive): The index of the first element to *not* include.

    - step (optional): The step size (default is 1).

  - Example 1: numbers = [1, 2, 3, 4, 5]; new_numbers = numbers[1:4] # new_numbers is [2, 3, 4]
  - Example 2: fruits = ["apple", "banana", "orange", "grape"]; new_fruits = fruits[0:2] # new_fruits is ["apple", "banana"]
  - Example 3: colors = ["red", "green", "blue", "yellow"]; every_other_color = colors[::2] # every_other_color is ["red", "blue"]
  - Example 4: my_list = [1, 2, 3, 4, 5]; reversed_list = my_list[::-1] # reversed_list is [5, 4, 3, 2, 1]
  - Example 5: numbers = [1, 2, 3, 4, 5]; selected_numbers = numbers[1:4:2] # selected_numbers is [2, 4]