Day 9 (4/9/25): Collections Data Types – Tuples, Lists, Sets, Dictionaries in Python

1. Introduction

Collections are **data types that can store multiple values**. Python provides four main collection types:

Collection Type	Description	Mutable?	Syntax Example
List	Ordered sequence of elements	Yes	[1, 2, 3]
Tuple	Ordered sequence of elements	No	(1, 2, 3)
Set	Unordered collection of unique elements	Yes	{1, 2, 3}
Dictionary	Key-value pairs	Yes	{'a': 1, 'b': 2}

2. Lists

- **Ordered** and **mutable**.
- Can contain elements of **different types**.
- Common operations: append, insert, remove, pop, slicing.

```
# List Example
fruits = ["apple", "banana", "cherry"]
fruits.append("orange")
fruits.remove("banana")
print(fruits)
```

Output:

```
['apple', 'cherry', 'orange']
```

3. Tuples

- **Ordered** but **immutable**.
- Useful for **fixed data** like coordinates or RGB values.
- Can be **nested** or **sliced**.

```
# Tuple Example
point = (10, 20)
print("X:", point[0], "Y:", point[1])
```

Output:

X: 10 Y: 20

4. Sets

- **Unordered**, **unique elements**, **mutable**.
- Useful for **removing duplicates** and **set operations**.

```
# Set Example
numbers = {1, 2, 3, 3, 4}
numbers.add(5)
numbers.remove(2)
print(numbers)
```

Output:

{1, 3, 4, 5}

- **Set Operations:** union (|), intersection (&), difference (-)

```
a = {1, 2, 3}
b = {3, 4, 5}
print("Union:", a | b)
print("Intersection:", a & b)
```

Output:

Union: {1, 2, 3, 4, 5}
Intersection: {3}

5. Dictionaries

- **Key-value pairs**, **unordered**, **mutable**.
- Keys must be **unique and immutable**.
- Values can be of **any type**.

```
# Dictionary Example
student = {"name": "Alice", "age": 20, "marks": 95}
print(student["name"])  # Access value by key

# Add or update
student["grade"] = "A"
student["marks"] = 98
print(student)
```

Output:

```
Alice
{'name': 'Alice', 'age': 20, 'marks': 98, 'grade': 'A'}
```

6. Summary

- **Lists**: Ordered, mutable, allows duplicates.
- **Tuples**: Ordered, immutable, allows duplicates.
- **Sets**: Unordered, mutable, unique elements only.
- **Dictionaries**: Unordered, mutable, key-value pairs.