# Python Academy Course - Module 5

## Lesson 5.3 — Sets in Python (Very Detailed)

### 🌟 Learning Goal:

Understand what sets are, how they differ from lists/tuples, and how to use set operations to handle unique and unordered collections in Python.

## 🔢 1. What is a Set?

* A **set** is an unordered collection of **unique** items.
* Sets are **mutable** (can be changed), but **cannot contain duplicate values**.
* Sets are defined using **curly braces {}** or the set() constructor.

**Example:**

colors = {"red", "green", "blue"}

## 🔢 2. Creating Sets

### a) Using {}:

fruits = {"apple", "banana", "cherry"}

### b) Using set() constructor:

empty\_set = set() # not {}

{} creates an empty dictionary by default!

## 🔢 3. Set Properties

* **Unordered**: No indexing, no order guaranteed.
* **No duplicates**:

numbers = {1, 2, 2, 3, 3, 3}  
print(numbers) # Output: {1, 2, 3}

## 🔢 4. Accessing and Iterating

You **cannot** access items by index. Use loops:

for fruit in fruits:  
 print(fruit)

## 🔢 5. Adding and Removing Items

### a) .add() — add one item:

fruits.add("mango")

### b) .update() — add multiple items:

fruits.update(["orange", "grape"])

### c) .remove() — remove specific item (raises error if not found):

fruits.remove("apple")

### d) .discard() — remove item if it exists (no error):

fruits.discard("banana")

### e) .clear() — remove all items:

fruits.clear()

## 🔢 6. Set Operations

Sets are useful for **mathematical set operations**:

### a) Union — combine all elements

A = {1, 2, 3}  
B = {3, 4, 5}  
print(A | B) # {1, 2, 3, 4, 5}

### b) Intersection — common elements

print(A & B) # {3}

### c) Difference — items in A but not in B

print(A - B) # {1, 2}

### d) Symmetric Difference — not common in either

print(A ^ B) # {1, 2, 4, 5}

## 🛠️ Hands-On Exercise 5.3

1. Create a set of employee roles: {"Analyst", "Manager", "Engineer"}.
2. Add “Intern” to the set.
3. Remove “Manager” using .discard().
4. Create another set: {"Consultant", "Engineer"}
5. Find:
   * Union of both sets
   * Intersection
   * Difference (roles in first set but not in second)

## 🔍 Mini Quiz 5.3

1. What is the main difference between a set and a list?
2. Can a set contain duplicate values?
3. Which method allows you to safely remove an item without error?
4. What does the ^ operator do between two sets?
5. What is the output of {1, 2, 3} & {2, 3, 4}?

## 🔹 Summary of Lesson 5.3

* Sets store unique, unordered items.
* No duplicates, and no indexing.
* Use .add(), .update(), .remove(), .discard() to manage items.
* Support union, intersection, difference, and symmetric difference operations.

*End of Lesson 5.3*