🧮 Assignment: Set in Python

🎯 **Objective:**
Understand the concept of sets in Python and practice basic operations such as union, intersection, difference, and set methods.

🟢 Level 1: Beginner – Understanding Basics

✅ Task 1: Creating and Printing Sets

- Create a set of your three favorite fruits.
- Print the set and its type.

✅ Task 2: Adding and Removing Elements

- Add a new fruit to the set.
- Remove one existing fruit.
- Try removing an element that doesn't exist using `discard()` and `remove()`. Observe the difference.

✅ Task 3: Membership Test

- Check if `"apple"` is in the set.
- Check if `"mango"` is not in the set.

✅ Task 4: Convert List to Set

Given the list `nums = [1, 2, 2, 3, 4, 4, 5]`, convert it to a set and print the result.

🟡 Level 2: Intermediate – Set Operations

✅ Task 5: Mathematical Set Operations

A = {1, 2, 3, 4}
B = {3, 4, 5, 6}

Perform the following:

- Union of A and B
- Intersection of A and B
- Difference of A - B and B - A
- Symmetric Difference

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✅ Task 6: Set Methods Practice

- Create a copy of set A.
- Update A with elements from B.
- Clear all elements from B and print both sets.

✅ Task 7: Frozen Sets

- Create a frozenset of vowels: `{'a', 'e', 'i', 'o', 'u'}`.
- Try to add and remove an element. What happens? Explain.

🔵 Level 3: Advanced – Real-World Applications

✅ Task 8: Student Attendance System

You have two sets:

enrolled = {"Alice", "Bob", "Charlie", "Diana", "Evan"}

attended = {"Charlie", "Diana", "Frank"}

Find out:

1. Students who attended but were not enrolled.
2. Students who enrolled but did not attend.
3. Students who both enrolled and attended.

✅ Task 9: Duplicate Detection

Write a function `has_duplicates(lst)` that:

- Takes a list as input.
- Returns `True` if there are duplicates, else `False`.

Test with:

```
has_duplicates([1, 2, 3, 4, 5])

has_duplicates([1, 2, 2, 3])
```

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🔴 Level 4: Expert – Set Applications in Algorithms

✅ Task 10: Unique Words in a Paragraph

Write a function that:

- Takes a paragraph of text.
- Returns a set of all unique words (ignore punctuation and case).

Example input:

paragraph = "Python is great. Python is dynamic. Sets are useful in Python!"

Expected output:
{"python", "is", "great", "dynamic", "sets", "are", "useful", "in"}

✅ Task 11: Set-Based Venn Diagram

Use matplotlib to draw a basic Venn diagram of two sets:

Set A: {1, 2, 3, 4, 5}

Set B: {4, 5, 6, 7}

(Hint: Use `matplotlib_venn` library.)

✅ Task 12: Unique Pair Sums (Interview Style)

Write a function that:

- Accepts a list of integers.
- Returns a set of all unique sums you can make by picking any two distinct numbers.

Example

```
unique_pair_sums([1, 2, 3]) # Output: {3, 4, 5}
```