Case Study 6: Traffic Violation Analysis (Dictionaries, Lists, Loops)

Scenario:

A city traffic department wants to analyze violations. You need to:

1. Store data in a dictionary, where keys are **license plate numbers**, and values are **(driver name, violation type, fine amount)**.

2. Implement functions to:

    o **Find the driver with the highest fine**.

    o **Count violations per driver**.

    o **Identify the most common violation type**.

Hints:

- Use a **dictionary** to store violation data.

- Use a **loop** to analyze violations.

- Use a **secondary dictionary** to track counts.

Case Study 7: Grocery Store Inventory Management (Sets, Dictionaries, Loops)

Scenario:

A grocery store needs to track available and sold-out items. You need to:

1. Maintain two sets:

    o available_items = {"Milk", "Bread", "Eggs", "Rice", "Sugar"}

    o sold_out_items = {"Eggs", "Sugar"}

2. Implement functions to:

    o **Get all available items** (remove sold-out items).

    o **Add new stock to available items**.

    o **Check if an item is in stock**.

Hints:

- Use **sets** to manage available and sold-out items.

- Use **set operations** (difference, union, intersection).

Case Study 8: Social Media Hashtag Analysis (Dictionaries, Sets, Loops)

Scenario:

A social media company wants to analyze trending hashtags. You need to:

1. Store hashtag usage in a dictionary where keys are **hashtags**, and values are **usage counts**.

2. Implement functions to:

   o **Find the top 3 trending hashtags**.

   o **Filter out hashtags with low usage (less than a given threshold)**.

   o **Identify common hashtags used by two users** (use sets).

Hints:

• Use a **dictionary** to count occurrences.

• Use **sorting** to get top hashtags.

• Use **sets** to compare hashtag usage across users.

Case Study 9: Airline Ticket Booking System (Lists, Tuples, Loops)

Scenario:

An airline company needs to manage ticket bookings. You need to:

1. Store bookings in a **list of tuples** where each tuple contains (passenger_name, flight_number, seat_number).

2. Implement functions to:

   o **Find all passengers on a specific flight**.

   o **Check if a seat is already booked**.

   o **Sort passengers by flight number**.

Hints:

• Use a **list of tuples** to store bookings.

• Use **loops** to filter and find passengers.

• Use **sorting** for better organization.

Case Study 10: Library Book Management (Dictionaries, Lists, Sets, Loops)

Scenario:

A library maintains a record of books and their borrowers. You need to:

1. Store books in a dictionary where keys are **book titles**, and values are **(author, borrower_name or None if available)**.

2. Implement functions to:

   o **Get a list of all available books**.

   o **Find books borrowed by a specific person**.

- **Identify duplicate books using a set**.

Hints:

- Use a **dictionary** to track books.

- Use **loops** to filter available books.

- Use a **set** to find duplicate books.