Experiment 4.2

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1. **Aim:** To develop a Java-based Card Collection System that manages and retrieves playing cards efficiently using Collections.

2. **Objective:**
   - Implement CRUD operations for managing playing cards.
   - Use ArrayList, HashSet, and HashMap for efficient data storage and retrieval.
   - Prevent duplicate card entries using HashSet.

3. **Implementation/Code:**

```
import java.util.*;

class Card {

   String suit;

   String rank;

   public Card(String rank, String suit) {

      this.rank = rank;

      this.suit = suit;

   }

   public String toString() {

      return rank + " of " + suit;

   }
```

```
}
class CardCollectionSystem {
    Set<String> cards = new HashSet<>();
    Map<String, List<Card>> suitMap = new HashMap<>();
    public void addCard(String rank, String suit) {
        String cardKey = rank + " of " + suit;
        if (cards.contains(cardKey)) {
            System.out.println("Error: Card \"" + cardKey + "\" already exists.");
            return;
        }
        cards.add(cardKey);
        suitMap.putIfAbsent(suit, new ArrayList<>());
        suitMap.get(suit).add(new Card(rank, suit));
        System.out.println("Card added: " + cardKey);
    }
    public void findCardsBySuit(String suit) {
        if (suitMap.containsKey(suit) && !suitMap.get(suit).isEmpty()) {
            for (Card card : suitMap.get(suit)) {
                System.out.println(card);
            }
        } else {
            System.out.println("No cards found for " + suit + ".");
        }
```

```
    }
    public void removeCard(String rank, String suit) {
        String cardKey = rank + " of " + suit;
        if (cards.remove(cardKey)) {
            suitMap.get(suit).removeIf(card -> card.rank.equals(rank));
            System.out.println("Card removed: " + cardKey);
        } else {
            System.out.println("Error: Card \"" + cardKey + "\" not found.");
        }
    }
    public void displayAllCards() {
        if (cards.isEmpty()) {
            System.out.println("No cards found.");
        } else {
            for (String card : cards) {
                System.out.println(card);
            }}}}
public class CardMain {
    public static void main(String[] args) {
        CardCollectionSystem ccs = new CardCollectionSystem();
        ccs.displayAllCards();
        ccs.addCard("Ace", "Spades");
        ccs.addCard("King", "Hearts");
```

```
        ccs.addCard("10", "Diamonds");
        ccs.addCard("5", "Clubs");
        ccs.findCardsBySuit("Hearts");
        ccs.findCardsBySuit("Diamonds");
        ccs.displayAllCards();
        ccs.addCard("King", "Hearts");
        ccs.removeCard("10", "Diamonds");
    }
}
```

4. Output

```
No cards found.
Card added: Ace of Spades
Card added: King of Hearts
Card added: 10 of Diamonds
Card added: 5 of Clubs
King of Hearts
10 of Diamonds
5 of Clubs
King of Hearts
10 of Diamonds
Ace of Spades
Error: Card "King of Hearts" already exists.
Card removed: 10 of Diamonds
PS D:\java lab>
```

5. Learning Outcome:

- Understanding Java Collections Framework (List, Set, and Map).
- Implementing data organization using HashMap for fast lookups.
- Applying object-oriented programming (OOP) principles.