4. Map Interface ◆

Direct:

Write a program using HashMap to store student names and their marks.

```
import java.util.HashMap;
import java.util.Map;

public class StudentMarks {

   public static void main(String[] args) {
      // Create a HashMap to store student names (key) and marks (value)
      Map<String, Integer> studentMarks = new HashMap<>();

      // Add some student names and their marks
      studentMarks.put("Alice", 85);
      studentMarks.put("Bob", 90);
      studentMarks.put("Charlie", 78);
      studentMarks.put("Diana", 92);

      // Print the student names and their marks
      System.out.println("Student Marks:");
      for (Map.Entry<String, Integer> entry : studentMarks.entrySet()) {
         System.out.println(entry.getKey() + ": " + entry.getValue());
      }
   }
}
```

Demonstrate how to iterate over a Map using entrySet().

```
import java.util.HashMap;
import java.util.Map;

public class IterateMapExample {

   public static void main(String[] args) {
      // Create a Map with some entries
      Map<String, Integer> studentMarks = new HashMap<>();
      studentMarks.put("Alice", 85);
      studentMarks.put("Bob", 90);
      studentMarks.put("Charlie", 78);

      // Iterate over the map using entrySet()
      System.out.println("Student Marks:");
      for (Map.Entry<String, Integer> entry : studentMarks.entrySet()) {
         String student = entry.getKey();
         Integer marks = entry.getValue();
```

```
            System.out.println(student + " : " + marks);
        }
    }
}
```

Show how to update the value associated with a key in a Map.

```
import java.util.HashMap;
import java.util.Map;

public class UpdateMapValue {

    public static void main(String[] args) {
        // Create a Map to store student marks
        Map<String, Integer> studentMarks = new HashMap<>();

        // Add initial entries
        studentMarks.put("Alice", 85);
        studentMarks.put("Bob", 90);

        System.out.println("Before update:");
        System.out.println(studentMarks);

        // Update Bob's marks
        studentMarks.put("Bob", 95);  // This replaces the old value for "Bob"

        System.out.println("After update:");
        System.out.println(studentMarks);
    }
}
```

◆ Scenario-Based:

Build a phone directory where names are keys and phone numbers are values.

```
import java.util.HashMap;
import java.util.Map;
import java.util.Scanner;

public class PhoneDirectory {

    public static void main(String[] args) {
        Map<String, String> phoneDirectory = new HashMap<>();
        Scanner scanner = new Scanner(System.in);

        System.out.print("How many contacts do you want to add? ");
        int n = scanner.nextInt();
```

```
        scanner.nextLine(); // consume newline

        // Input contacts
        for (int i = 0; i < n; i++) {
            System.out.print("Enter name: ");
            String name = scanner.nextLine();

            System.out.print("Enter phone number: ");
            String phone = scanner.nextLine();

            phoneDirectory.put(name, phone);
        }

        // Print the phone directory
        System.out.println("\nPhone Directory:");
        for (Map.Entry<String, String> entry : phoneDirectory.entrySet()) {
            System.out.println(entry.getKey() + " : " + entry.getValue());
        }

        scanner.close();
    }
}
```

Create a frequency counter for words in a sentence using a Map.

```
import java.util.HashMap;
import java.util.Map;
import java.util.Scanner;

public class WordFrequencyCounter {

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter a sentence:");
        String sentence = scanner.nextLine();

        // Convert sentence to lowercase and split into words by spaces
        String[] words = sentence.toLowerCase().split("\\s+");

        Map<String, Integer> wordCount = new HashMap<>();

        // Count frequency of each word
        for (String word : words) {
            // If word is already in map, increment count, else add with count 1
```

```
            wordCount.put(word, wordCount.getOrDefault(word, 0) + 1);
        }

        // Print word frequencies
        System.out.println("\nWord Frequencies:");
        for (Map.Entry<String, Integer> entry : wordCount.entrySet()) {
            System.out.println(entry.getKey() + " : " + entry.getValue());
        }

        scanner.close();
    }
}
```