Program -20

Aim :- Write a Program to Implement Two sums using HASHMAP

The "Two Sum" problem is a common algorithmic challenge that can be stated as follows:

Given an array of integers nums and an integer target, you need to find two distinct indices i and j in the array such that:

- **nums[i] + nums[j] = target**
- **i** and **j** are not the same (i.e., **i != j**).

You should return the indices of the two numbers in the form of an array. If no such indices exist, you can throw an exception or return an empty array.

Input:-

```
nums = [2, 7, 11, 15]
target = 9
```

Execution of the twoSum Method

1. **Initialization**: A **HashMap** named **map** is created to store numbers and their corresponding indices.
2. **Iteration**:
    - **First Iteration (i = 0)**:
        - Current number: **nums[0] = 2**
        - Complement: **9 - 2 = 7**
        - Check

if **map** contains **7**: **map.containsKey(7) → fals e**
    - Add **2** to the map: **map.put(2, 0) → map = {2: 0}**
- **Second Iteration (i = 1)**:
    -
    - Complement: **9 - 7 = 2**
    - Check
      if **map** contains **2**: **map.containsKey(2) → true**
    - Found the complement! Return indices: **return new int[] { map.get(2), 1 }** → returns **{0, 1}**

```
1  Indices of the two numbers are: 0 and 1
```

Program:-

```
import java.util.HashMap;

public class TwoSum {
    public static int[] twoSum(int[] nums, int target) {
        // Create a HashMap to store the numbers and their indices
        HashMap<Integer, Integer> map = new HashMap<>();

        // Iterate through the array
        for (int i = 0; i < nums.length; i++) {
            // Calculate the complement of the current number
            int complement = target - nums[i];
```

```
            // Check if the complement exists in the map
            if (map.containsKey(complement)) {
                // If found, return the indices of the two
numbers
                return new int[] { map.get(complement), i };
            }

            // If not found, add the current number and its
index to the map
            map.put(nums[i], i);
        }

        // If no solution is found, return an empty array or
throw an exception
        throw new IllegalArgumentException("No two sum
solution");
    }

    public static void main(String[] args) {
        // Example usage
        int[] nums = {2, 7, 11, 15};
        int target = 9;

        try {
            int[] result = twoSum(nums, target);
            System.out.println("Indices of the two numbers
are: " + result[0] + " and " + result[1]);
        } catch (IllegalArgumentException e) {
            System.out.println(e.getMessage());
        }
    }
}
```