Day 12:

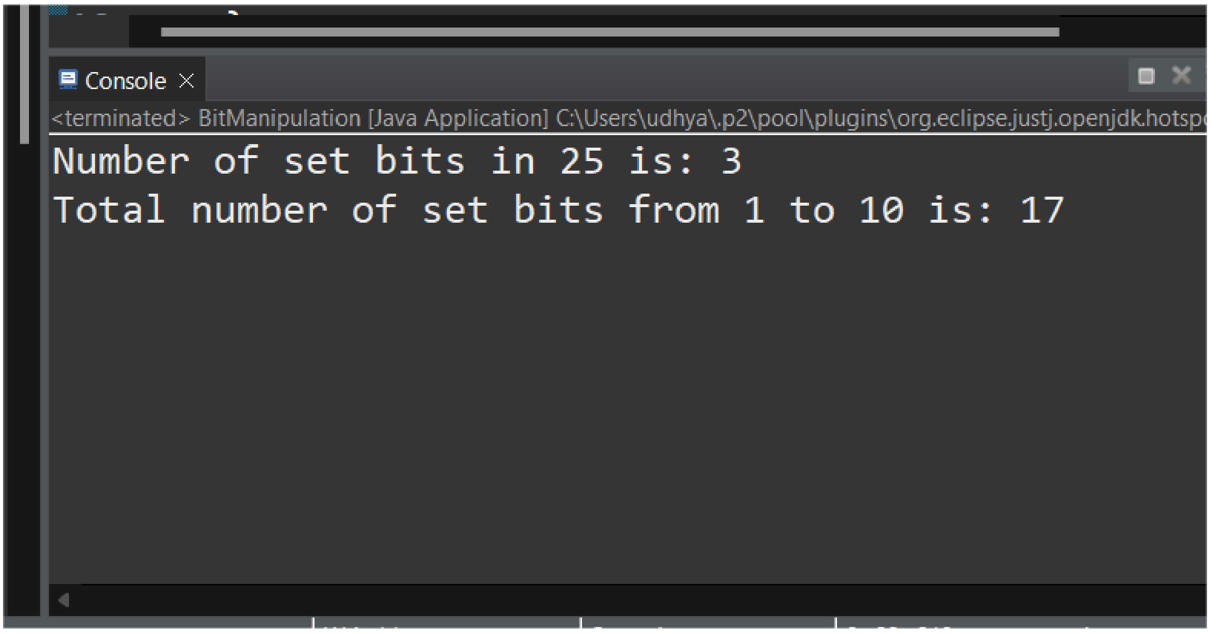
Task 1: Bit Manipulation Basics

Create a function that counts the number of set bits (1s) in the binary representation of an integer. Extend this to count the total number of set bits in all integers from 1 to n.

```
package com.wipro.patterns;


public class BitManipulation {


	public static int countSetBits(int num) {
    int count = 0;
    while (num > 0) {
      count += num & 1;
      num >>= 1;
    }
    return count;
  }


  public static int countTotalSetBits(int n) {
    int totalCount = 0;
    for (int i = 1; i <= n; i++) {
      totalCount += countSetBits(i);
    }
    return totalCount;
  }
```

```
    public static void main(String[] args) {
        int num = 25;
        System.out.println("Number of set bits in " + num + " is: " + countSetBits(num));

        int n = 10;
        System.out.println("Total number of set bits from 1 to " + n + " is: " + countTotalSetBits(n));
    }
}
```

OUTPUT:



```
<terminated> BitManipulation [Java Application] C:\Users\udhya\.p2\pool\plugins\org.eclipse.justj.openjdk.hotsp
Number of set bits in 25 is: 3
Total number of set bits from 1 to 10 is: 17
```

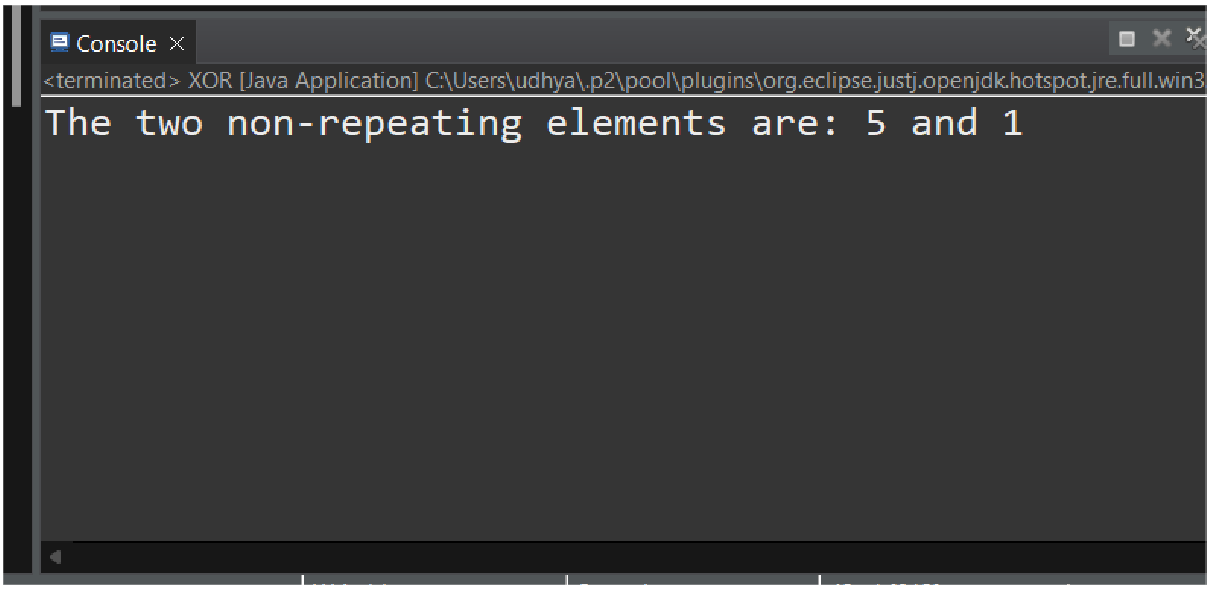
Task 2: Unique Elements Identification

Given an array of integers where every element appears twice except for two, write a function that efficiently finds these two non-repeating elements using bitwise XOR operations.

```
package com.wipro.patterns;
```

```
public class XOR {

        public static void findNonRepeatingElements(int[] nums) {
          int xor = 0;


          for (int num : nums) {
            xor ^= num;
          }


          int rightmostSetBit = xor & -xor;

          int firstUnique = 0;
          int secondUnique = 0;


          for (int num : nums) {
            if ((num & rightmostSetBit) != 0) {

              firstUnique ^= num;
            } else {

              secondUnique ^= num;
            }
          }
        System.out.println("The two non-repeating elements are: " +
firstUnique + " and " + secondUnique);
    }

    public static void main(String[] args) {
        int[] nums = {4, 2, 4, 5, 2, 3, 3, 1};
        findNonRepeatingElements(nums);
    }
}
```

OUTPUT:



```
<terminated> XOR [Java Application] C:\Users\udhya\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win3
The two non-repeating elements are: 5 and 1
```