ADS - Assignment - 1
Q1.
C-DAC Mumbai Date 25/09/2024

Subject: Algorithm and Data Structure
Assignment 1

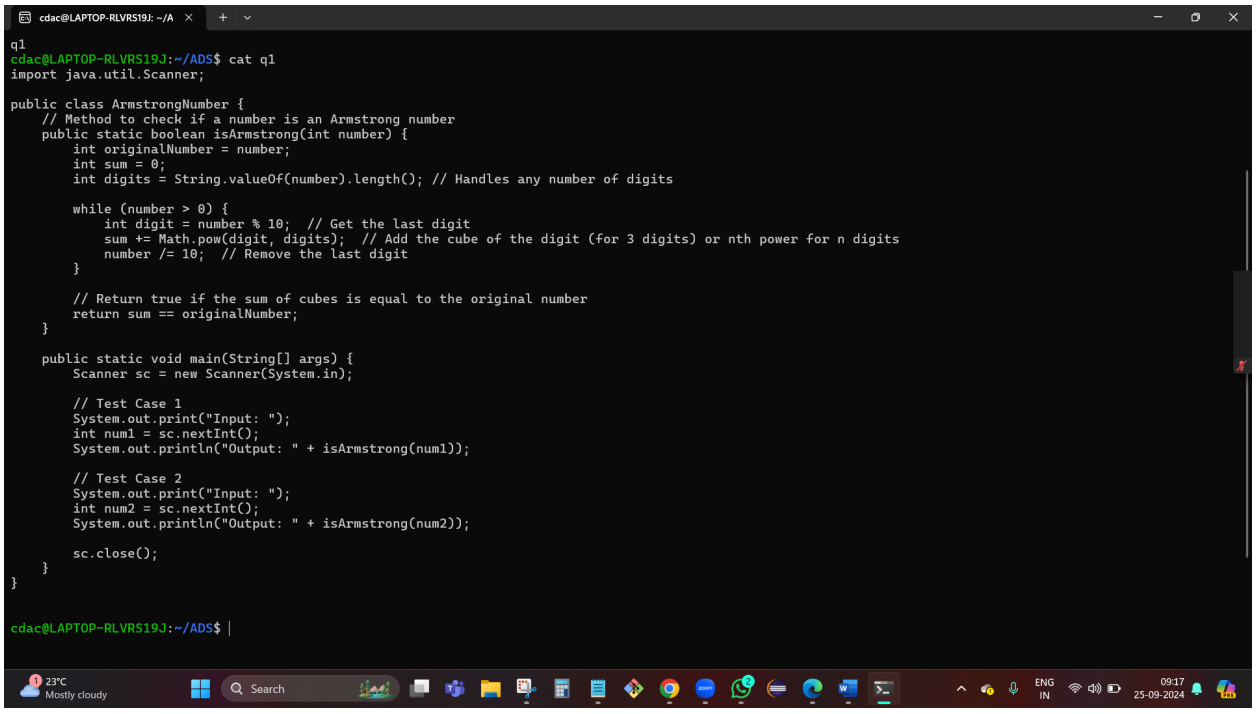
Solve the assignment with following thing to be added in each question.

-Program
-Flow chart
-Explanation
-Output
-Time and Space complexity

1. Armstrong Number
Problem: Write a Java program to check if a given number is an Armstrong number.

Test Cases:

Input: 153
Output: true
Input: 123
Output: false



```
C:\Users\Debasmita\OneDrive\Documents\CDAC-KH\ADS\Assignment>javac ArmstrongNumber.java

C:\Users\Debasmita\OneDrive\Documents\CDAC-KH\ADS\Assignment>java ArmstrongNumber
Input: 153
Output: true
Input:
```

```
C:\Users\Debasmita\OneDrive\Documents\CDAC-KH\ADS\Assignment>java ArmstrongNumber
Input: 153
Output: true
Input: 123
Output: false
```

Q1.

```java
import java.util.*;
class Q1 {      //armstrong number
public static void main (String args[]) {
        Scanner sc = new Scanner (System.in);
        int a,b, d, sum = 0;
        System.out.println("Enter a number");
        b = sc.nextInt();
        a = b;
        while (b > 0)
        {
                d = b % 10;
                sum = sum+(d*d*d);
                b = b / 10;
        }
        if (a  == sum)
                System.out.println(true);
        else
                System.out.println(false);
        }
}
// Time Complexity  O(n)
// Space Complexity O(1)
```

Q2.

```java
import java.util.*;
class Q2 //prime
{
        public static void main (String args[] ) {
        System.out.println("Take any number of your choice to check prime: ");
        Scanner sc = new Scanner (System.in);
        int num = sc.nextInt();
        boolean flag = false; //set default value of boolean as false
        for (int i=2; i <=num/2; i++) {
        if (num % i == 0) {
        flag = true;
        break;
        }
        }
        if (!flag)
        System.out.println(true);
        else
        System.out.println(false);
        }
}
// Time Complexity  O(n)
// Space Complexity O(1)
```

Q3.

```java
import java.util.*;
class Q3 {
        public static void main(String args[]) {
                Scanner sc = new Scanner(System.in);
                System.out.println("Enter any number whose factorial you want: ?");
                int fact=1;
                int n = sc.nextInt();
                for (int i=1; i<=n; i++)
                {
                        fact=fact*i;
                }
                System.out.println("The factorial of the number " +n+ " is " +fact);
        }
}
// Time Complexity  O(n)
// Space Complexity O(1)
```

Q4..

```java
import java.util.*;
class Q4 {
        public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the number upto which you want Fibonacci series");
        int n = sc.nextInt();
        int a=0, b=1;
        System.out.println("Fibonacci series till: "+n+" terms");
                for (int i=0; i<=n; i++) {
                System.out.print(a + " ");
                int c = a + b;
                a = b;
                b = c;
                }
        }
}
// Time Complexity  O(n)
// Space Complexity O(1)
```

Q5.

```java
public class Q5 //Calculate GCD
{
    public static int euclideanGCD(int a, int b) {
        while (b != 0) {
            int temp = a;
            a = b;                              //swapping but b % b
            b = temp % b;
        }
        return a;
    }

    public static void main(String[] args) {
        int num1 = 54;          // input constraints
        int num2 = 24;

                int num3 = 13;
                int num4 = 17;
        int gcd = euclideanGCD(num1, num2);
                int gcd = euclideanGCD(num3, num4);

        System.out.println("GCD of " + num1 + " and " + num2 + " is: " + gcd);
                System.out.println("GCD of " + num3 + " and " + num4 + " is: " + gcd);
    }
}
// Time Complexity  O(n)
// Space Complexity O(1)
```

Q6.

```java
import java.util.*;
class Q6  {
//Square root
        public static void main (String args[]) {
        Scanner sc = new Scanner (System.in);
        System.out.println("Enter the number whose square root you want: ");
        double x = sc.nextDouble();
        double ans = (int) Math.sqrt(x);        //narrowing conversion - data type
        System.out.println(ans);
        }
}
// Time Complexity  O(1)
// Space Complexity O(1)
```

Q7.

```java
import java.util.Scanner;
public class Q7 {       //show repeat characters (only lowercase)
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String input = scanner.nextLine();

        int[] charCount = new int[26]; // Assuming only lowercase letters

        for (int i = 0; i < input.length(); i++) {
            charCount[input.charAt(i) - 'a']++;
        }

        System.out.print("Repeated characters: ");
        for (int i = 0; i < charCount.length; i++) {
            if (charCount[i] > 1) {
                System.out.print((char) ('a' + i) + ", ");
            }
        }
    }
}
```

Q8.

```java
import java.util.Scanner;
public class Q8 //NonRepeatedCharacter
{
	public static void main(String[] args)
	{
		Scanner sc = new Scanner(System.in);
		System.out.println("Enter String");
		String str = sc.nextLine();

		char[] arr = str.toCharArray();

		for(int i=0; i<arr.length; i++)
		{
			for(int j=i+1; j<arr.length; j++)
			{
				if(arr[i] != arr[j])
				{
					System.out.println(arr[j]);
					System.exit(0);

				}
				else
				{
					System.out.println("null");
					System.exit(0);
				}
			}
		}
	}
}
```

Q9.

```java
import java.util.Scanner;
public class Q9 {       //palindrome
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a word: ");
        String input = scanner.nextLine();

        boolean isPalindrome = true;
        int left = 0;
        int right = input.length() - 1;

        while (left < right) {
            if (input.charAt(left) != input.charAt(right)) {
                isPalindrome = false;
                break;
            }
            left++;
            right--;
        }

        if (isPalindrome) {
            System.out.println(input + " is a palindrome.");
        } else {
            System.out.println(input + " is not a palindrome.");
        }
    }
}
// Time Complexity  O(n)
// Space Complexity O(1)
```

Q10.

```java
import java.util.*;
class Q10 {
        public static void main(String args[]) {
                Scanner sc = new Scanner(System.in);
                System.out.println("Enter the year you want to choose: ");
                int year = sc.nextInt();
                if (year % 4 == 0 && year %100 != 0 || year % 400 == 0)
                {
                        System.out.println(true);
                }
                else
                {
                                System.out.println(false);
                }
        }
}
```