C-DAC Mumbai

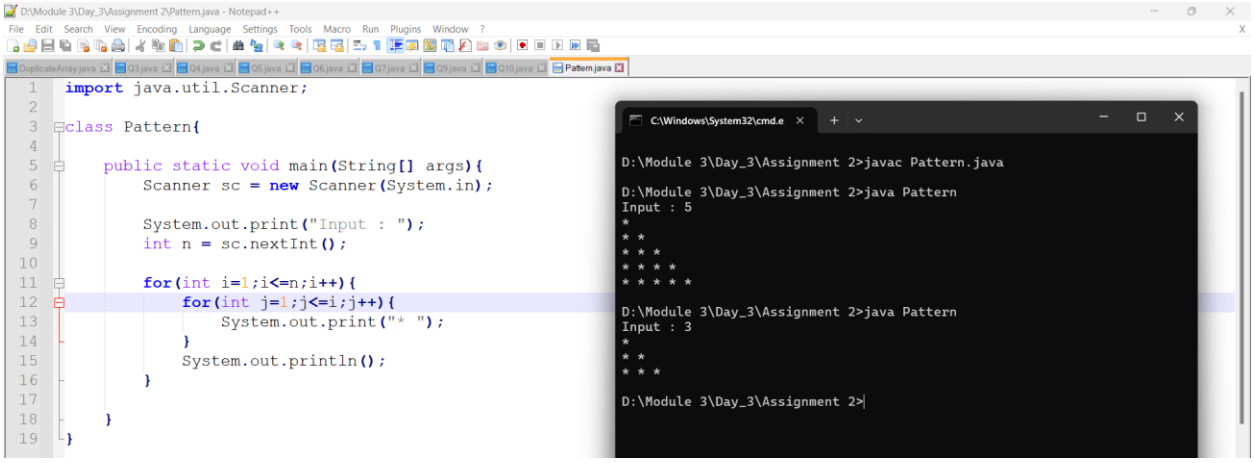
Algorithm and Data Structure
Assignment 1

1. Printing Patterns
Problem: Write a Java program to print patterns such as a right triangle of stars.

Test Cases:

Input: n = 3
Output:
*
**
***
Input: n = 5
Output:
*
**
***
****
*****

```
import java.util.Scanner;
class Pattern{
	public static void main(String[] args){
		Scanner sc = new Scanner(System.in);
		System.out.print("Input : ");
		int n = sc.nextInt();
		for(int i=1;i<=n;i++){
			for(int j=1;j<=i;j++){
				System.out.print("* ");
			}
			System.out.println();
		}}}
```



Explain:-

1) Use two for loop to get this star pattern
2) 1st for loop check check row elements
3) 2nd for loop check check column elements
4) Use print to print on same line not another line.

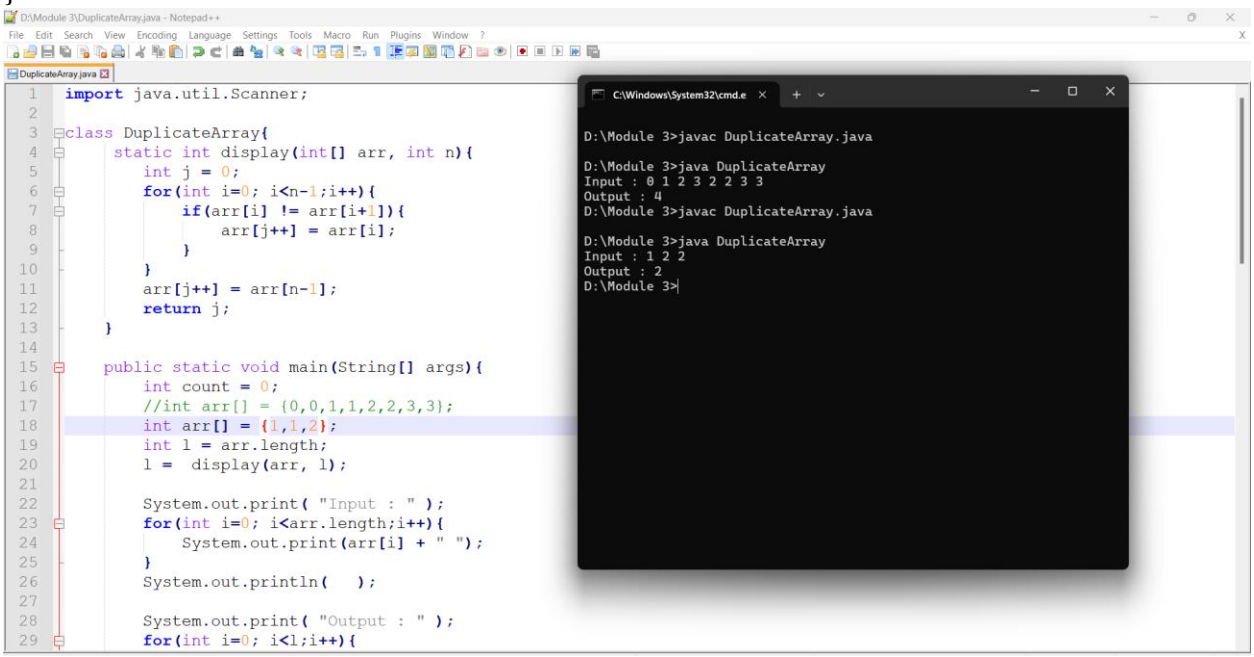
2. Remove Array Duplicates
Problem: Write a Java program to remove duplicates from a sorted array and return the new length of the array.

Test Cases:

Input: arr = [1, 1, 2]
Output: 2
Input: arr = [0, 0, 1, 1, 2, 2, 3, 3]
Output: 4

```
import java.util.Scanner;

class DuplicateArray{
	static int display(int[] arr, int n){
		int j = 0;
		for(int i=0; i<n-1;i++){
			if(arr[i] != arr[i+1]){
				arr[j++] = arr[i];
			}
		}
		arr[j++] = arr[n-1];
		return j;
	}

	public static void main(String[] args){
		int count = 0;
		//int arr[] = {0,0,1,1,2,2,3,3};
		int arr[] = {1,1,2};
		int l = arr.length;
		l =  display(arr, l);

		System.out.print( "Input : " );
		for(int i=0; i<arr.length;i++){
			System.out.print(arr[i] + " ");
		}
		System.out.println(   );

		System.out.print( "Output : " );
		for(int i=0; i<l;i++){
```

```
                count++;
            }

            System.out.print( count );

        }
}
```



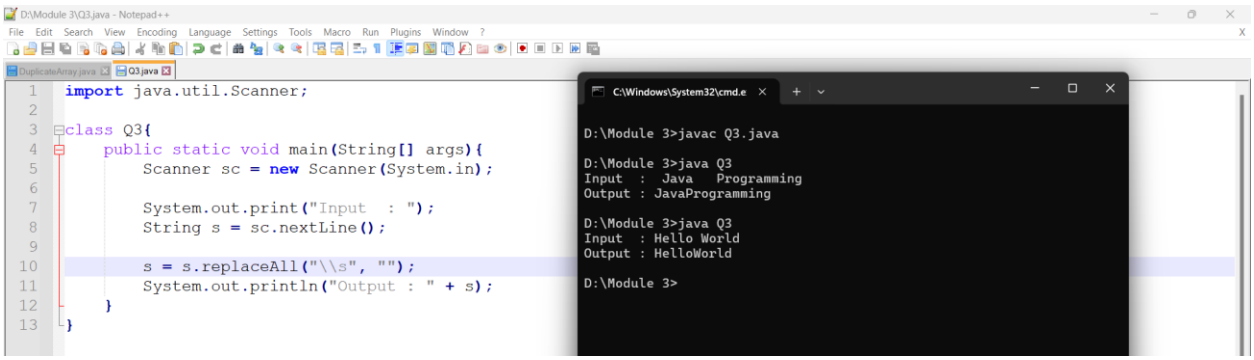
Explain:-

1) Checking wheather the endered array index value maches with any other array index value or not
2) If it is matching then print only one value to automatically there will be no duplicate value for this I have taken for loop to check this.
3) Then count the no of new elements using count variable.
4) And print it.

3. Remove White Spaces from String
Problem: Write a Java program to remove all white spaces from a given string.

Test Cases:

Input: "Hello World"
Output: "HelloWorld"
Input: " Java Programming "
Output: "JavaProgramming"



```java
import java.util.Scanner;

class Q3{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);

        System.out.print("Input  : ");
        String s = sc.nextLine();

        s = s.replaceAll("\\s", "");
        System.out.println("Output : " + s);
    }
}
```

```
D:\Module 3>javac Q3.java

D:\Module 3>java Q3
Input  :  Java   Programming
Output : JavaProgramming

D:\Module 3>java Q3
Input  : Hello World
Output : HelloWorld

D:\Module 3>
```

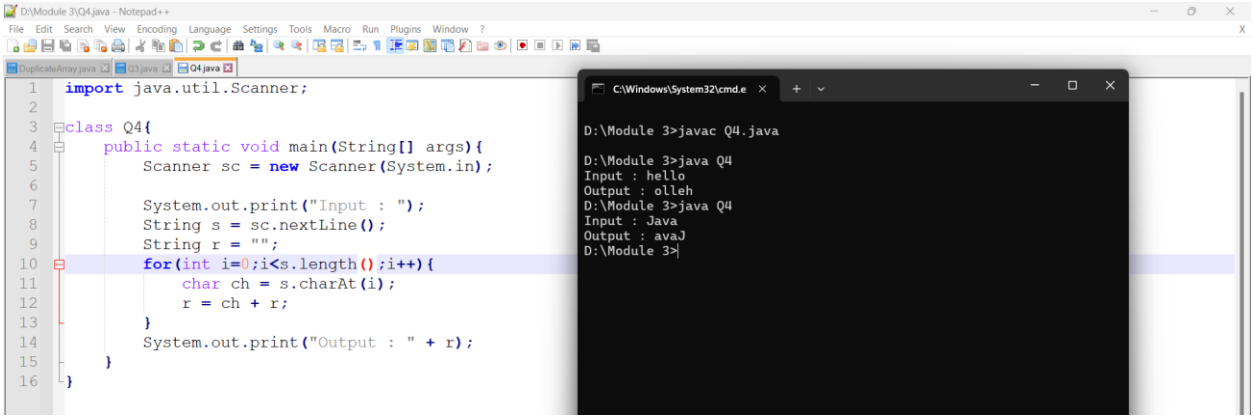
Explain:-

1) 1st take i/p of string from user
2) Then use replaceAll method to replace all while spaces with no space.
3) "\\s" indicate white space
4) Then print the new string.

4. Reverse a String
Problem: Write a Java program to reverse a given string.

Test Cases:

Input: "hello"
Output: "olleh"
Input: "Java"
Output: "avaJ"



```java
import java.util.Scanner;

class Q4{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);

        System.out.print("Input : ");
        String s = sc.nextLine();
        String r = "";
        for(int i=0;i<s.length();i++){
            char ch = s.charAt(i);
            r = ch + r;
        }
        System.out.print("Output : " + r);
    }
}
```

```
D:\Module 3>javac Q4.java

D:\Module 3>java Q4
Input : hello
Output : olleh
D:\Module 3>java Q4
Input : Java
Output : avaJ
D:\Module 3>
```

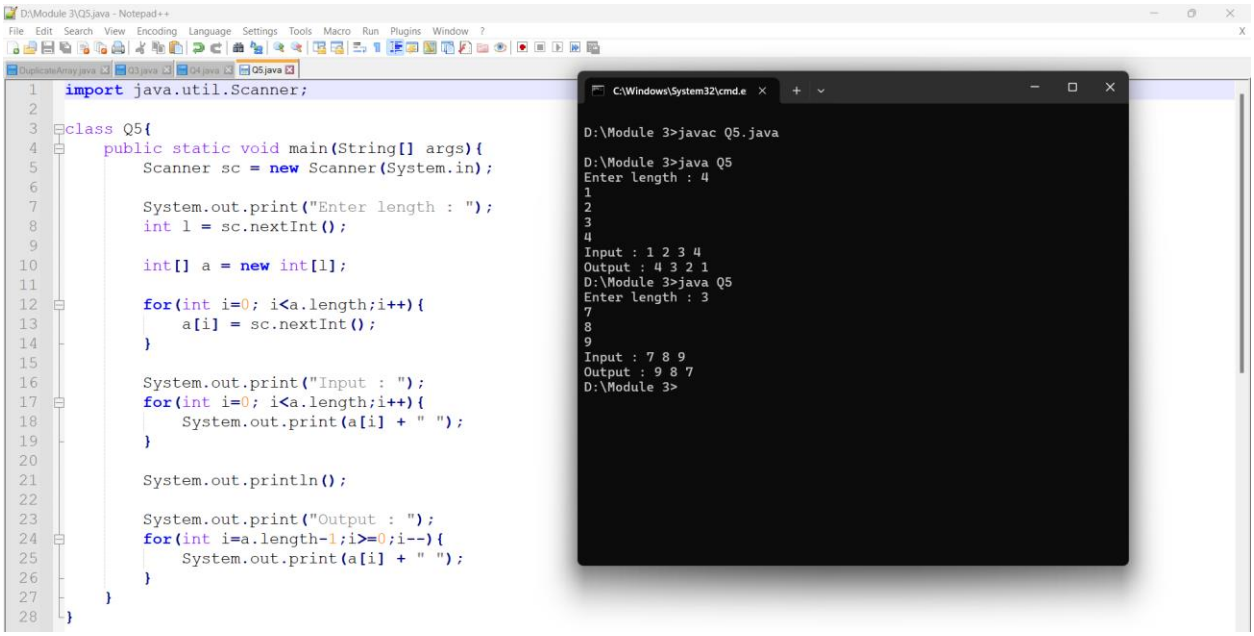
Explaination:-

1) Take i/p from user
2) Convert string to character using .charAt() so that I can reverse that string using characters
3) Add empty character string to each of that string character so it will add in front of each and every string character.
4) Then print new string means reversed string.

5. Reverse Array in Place
Problem: Write a Java program to reverse an array in place.

Test Cases:

Input: arr = [1, 2, 3, 4]
Output: [4, 3, 2, 1]
Input: arr = [7, 8, 9]
Output: [9, 8, 7]



```java
import java.util.Scanner;

class Q5{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);

        System.out.print("Enter length : ");
        int l = sc.nextInt();

        int[] a = new int[l];

        for(int i=0; i<a.length;i++){
            a[i] = sc.nextInt();
        }

        System.out.print("Input : ");
        for(int i=0; i<a.length;i++){
            System.out.print(a[i] + " ");
        }

        System.out.println();

        System.out.print("Output : ");
        for(int i=a.length-1;i>=0;i--){
            System.out.print(a[i] + " ");
        }
    }
}
```

```
D:\Module 3>javac Q5.java

D:\Module 3>java Q5
Enter length : 4
1
2
3
4
Input : 1 2 3 4
Output : 4 3 2 1
D:\Module 3>java Q5
Enter length : 3
7
8
9
Input : 7 8 9
Output : 9 8 7
D:\Module 3>
```

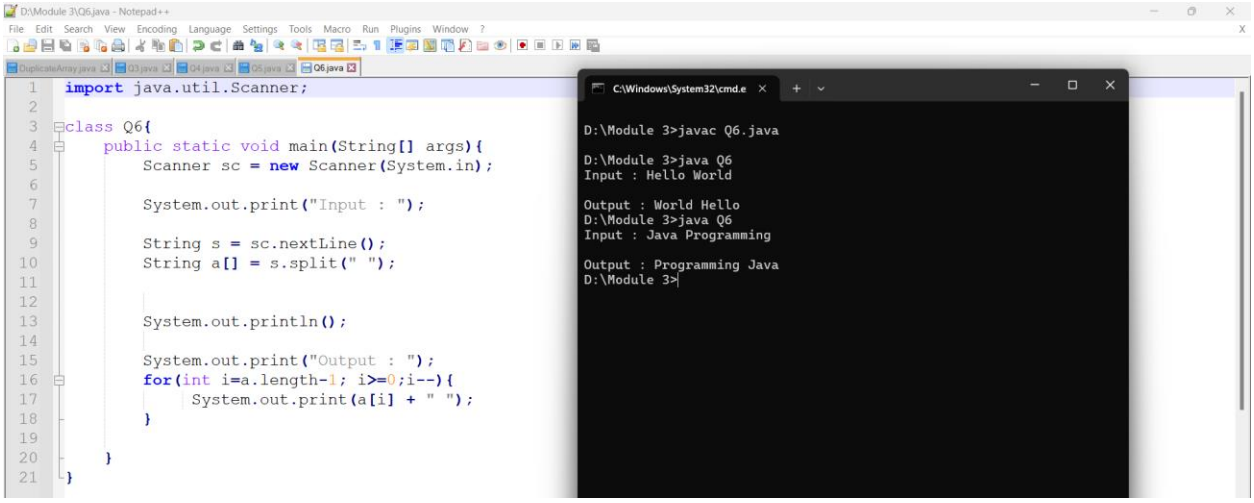
Explain:-

1) Take i/p from user
2) Print that particular input using for loop
3) Then use a reverse for loop to reverse the element
4) Then print that elements

6. Reverse Words in a String
Problem: Write a Java program to reverse the words in a given sentence.

Test Cases:

Input: "Hello World"
Output: "World Hello"
Input: "Java Programming"
Output: "Programming Java"



```java
import java.util.Scanner;

class Q6{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);

        System.out.print("Input : ");

        String s = sc.nextLine();
        String a[] = s.split(" ");


        System.out.println();

        System.out.print("Output : ");
        for(int i=a.length-1; i>=0;i--){
            System.out.print(a[i] + " ");
        }

    }
}
```

```
D:\Module 3>javac Q6.java

D:\Module 3>java Q6
Input : Hello World

Output : World Hello
D:\Module 3>java Q6
Input : Java Programming

Output : Programming Java
D:\Module 3>
```

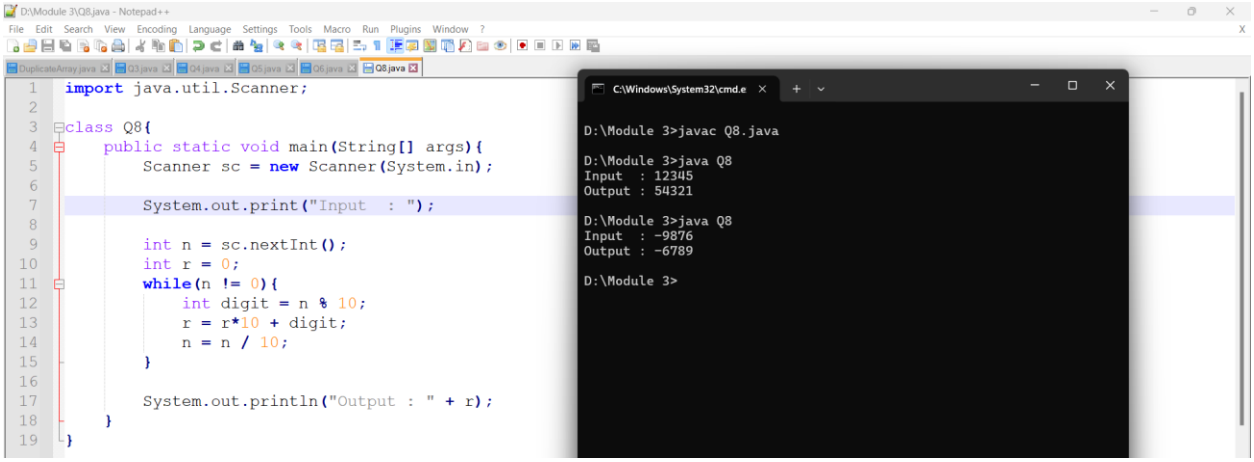
Explain:-

1) Take i/p from user as string
2) Then apply split() method on it to check from where we have to split the word
3) So I use " " to show that whenever we get a white space then at that time we have to split the word
4) Use reverse for loop to print that string words in reverse order.
5) Then print that reverse order word.

7. Reverse a Number
Problem: Write a Java program to reverse a given number.

Test Cases:

Input: 12345
Output: 54321
Input: -9876
Output: -6789



```java
import java.util.Scanner;

class Q8{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);

        System.out.print("Input  : ");

        int n = sc.nextInt();
        int r = 0;
        while(n != 0){
            int digit = n % 10;
            r = r*10 + digit;
            n = n / 10;
        }

        System.out.println("Output : " + r);
    }
}
```

```
D:\Module 3>javac Q8.java

D:\Module 3>java Q8
Input  : 12345
Output : 54321

D:\Module 3>java Q8
Input  : -9876
Output : -6789

D:\Module 3>
```

Explain:-

1) Take i/p from user as integer
2) Use while loop to iterate throuch each digit in a no.

3) Then use some mathematical expressions to get the remainder then add that remainder to the variable and loop continue till I get 0.
4) Then I get a reversed no. as o/p.

8. Array Manipulation
Problem: Perform a series of operations to manipulate an array based on range update queries. Each query adds a value to a range of indices.

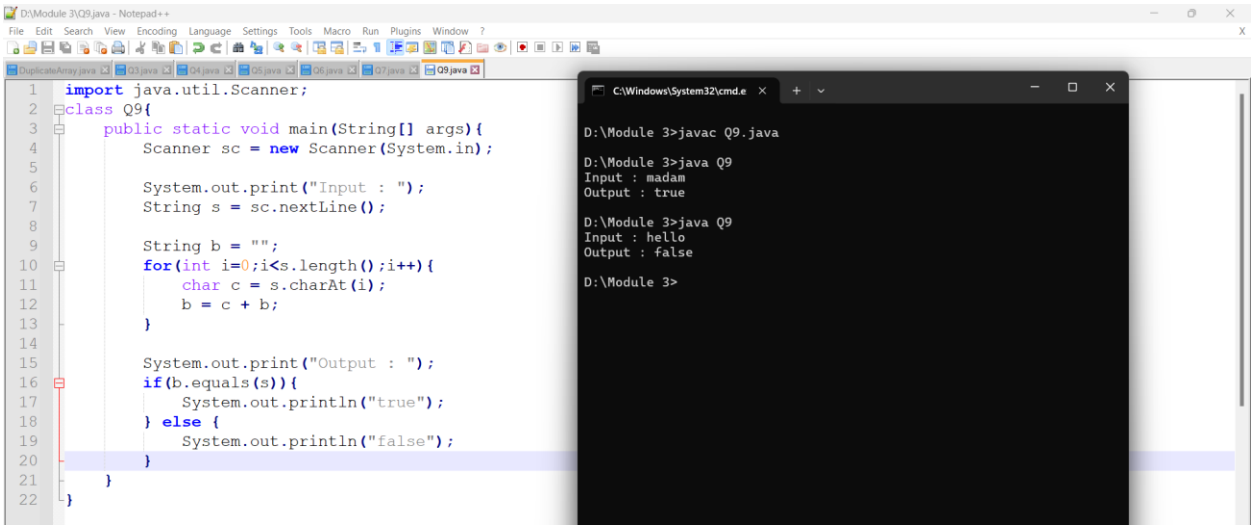
Test Cases:

Input: n = 5, queries = [[1, 2, 100], [2, 5, 100], [3, 4, 100]]
Output: 200
Input: n = 4, queries = [[1, 3, 50], [2, 4, 70]]
Output: 120

9. String Palindrome
Problem: Write a Java program to check if a given string is a palindrome.

Test Cases:

Input: "madam"
Output: true
Input: "hello"
Output: false
Here's a continuation of the list of assignment questions starting from question 21, with two test cases for each:



Explain:-
1) Take i/p from user as string
2) Then reversed that string using the same logic that I have used to reversed the string in above question.
3) Then checked that, that the string I have taken as i/p is equal to the reversed string or not using .equals() because to check the equality of non primitive data types we have to use .equals() only
4) If it is equal then prints true, If not then prints false.

10. Array Left Rotation
Problem: Write a Java program to rotate an array to the left by d positions.

Test Cases:

Input: arr = [1, 2, 3, 4, 5], d = 2
Output: [3, 4, 5, 1, 2]
Input: arr = [10, 20, 30, 40], d = 1
Output: [20, 30, 40, 10]