ADS Ass 2 Solution

Monday, September 30, 2024 9:02 AM

C-DAC Mumbai **Date 26/09/2024**

Subject: Algorithm and Data Structure
Assignment 1

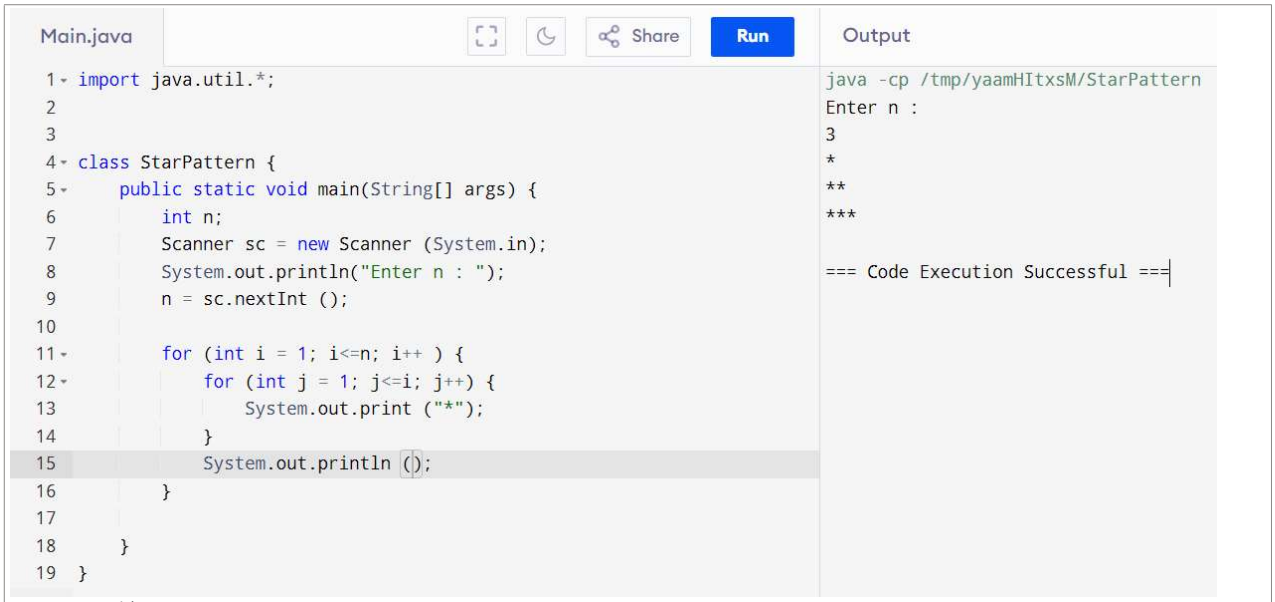
Solve the assignment with following thing to be added in each question.

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

1. 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.*;


class StarPattern {
  public static void main(String[] args) {
    int n;
    Scanner sc = new Scanner (System.in);
    System.out.println("Enter n : ");
    n = sc.nextInt ();

    for (int i = 1; i<=n; i++ ) {
      for (int j = 1; j<=i; j++) {
        System.out.print ("*");
      }
      System.out.println (" ");
    }

  }
}
```

Main.java | Share | Run | Output

```
import java.util.*;


class StarPattern {
    public static void main(String[] args) {
        int n;
        Scanner sc = new Scanner (System.in);
        System.out.println("Enter n : ");
        n = sc.nextInt ();

        for (int i = 1; i<=n; i++ ) {
            for (int j = 1; j<=i; j++) {
                System.out.print ("*");
            }
            System.out.println ();
        }

    }
}
```

```
java -cp /tmp/96geqyFISN/StarPattern
Enter n :
5
*
**
***
****
*****

=== Code Execution Successful ===
```

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

Main.java | Share | Run | Output

```
class DuplicateArrayRemoval {

    public int removeDuplicates(int arr[]) {
        if (arr.length == 0)
        return 0;

        int j = 0;
        for (int i = 1; i < arr.length; i++) {  // Start from i = 1,
            since arr[0] is unique by default
            if (arr[j] != arr[i]) {
                arr[++j] = arr[i];
            }
        }

        return j + 1;  // Length of unique elements
    }

    public static void main(String[] args) {
        DuplicateArrayRemoval arrm = new DuplicateArrayRemoval();
        int arr[] = {1, 1, 2};
        int uniqueCount = arrm.removeDuplicates(arr);

        // Print the number of unique elements
        System.out.println("Number of unique elements: " +
            uniqueCount);
    }
```

```
java -cp /tmp/qycQqbWDup/DuplicateArrayRemoval
Number of unique elements: 2

=== Code Execution Successful ===
```

```
class DuplicateArrayRemoval {

  public int removeDuplicates(int arr[]) {
    if (arr.length == 0)
    return 0;

    int j = 0;
    for (int i = 1; i < arr.length; i++) {  // Start from i = 1, since arr[0] is unique by default
      if (arr[j] != arr[i]) {
        arr[++j] = arr[i];
      }
    }

    return j + 1;  // Length of unique elements
  }

  public static void main(String[] args) {
    DuplicateArrayRemoval arrm = new DuplicateArrayRemoval();
    int arr[] = {1, 1, 2};
    int uniqueCount = arrm.removeDuplicates(arr);
```

```
    // Print the number of unique elements
    System.out.println("Number of unique elements: " + uniqueCount);
  }
}
```

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

Test Cases:

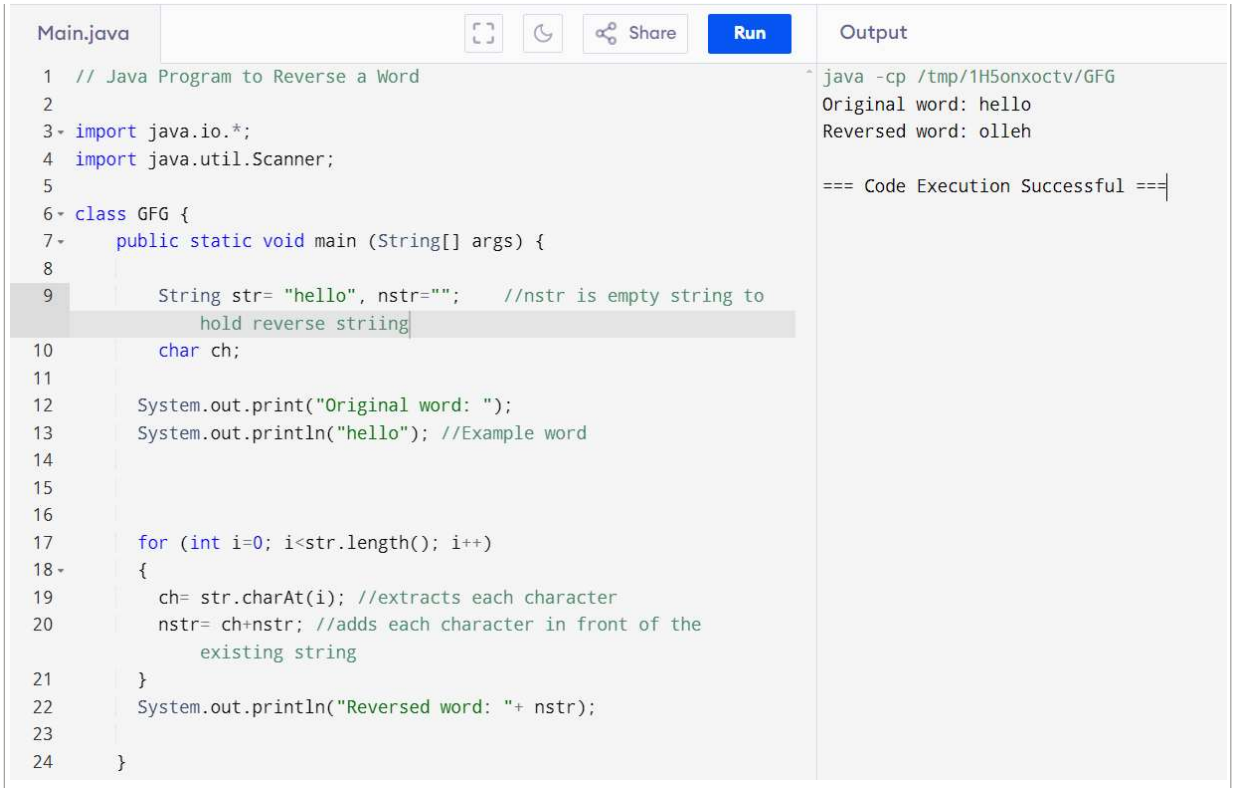
Input: "Hello World"
Output: "HelloWorld"
Input: " Java Programming "
Output: "JavaProgramming"


```
class StringSpaceRemoval {

  public static void main(String[] args) {
    String str1 = "Hello World";
    String str2 = "Java Programming";

    String new1 = str1.replace (" ", "");
    System.out.println (new1);

    String new2 = str2.replace (" ", "");
    System.out.println (new2);
  }
}
```

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 Program to Reverse a Word

import java.io.*;
import java.util.Scanner;

class GFG {
   public static void main (String[] args) {

      String str= "hello", nstr="";   //nstr is empty string to hold reverse striing
      char ch;

     System.out.print("Original word: ");
     System.out.println("hello"); //Example word



     for (int i=0; i<str.length(); i++)
     {
       ch= str.charAt(i); //extracts each character
       nstr= ch+nstr; //adds each character in front of the existing string
     }
     System.out.println("Reversed word: "+ nstr);

   }
}
```

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.Arrays;

class ReverseArrayInPlace {

    // Method to reverse the array in place
    public static void reverseArray(int[] arr) {
        int start = 0;
        int end = arr.length - 1;

        while (start < end) {
            // Swap the elements at start and end
            int temp = arr[start];
            arr[start] = arr[end];
            arr[end] = temp;

            // Move towards the middle
            start++;
            end--;
        }
    }

    public static void main(String[] args) {
        // Test case 1
        int[] arr1 = {1, 2, 3, 4};
        System.out.println("Original array: " + Arrays.toString(arr1
            ));
        reverseArray(arr1);
```

```
java -cp /tmp/wfLsLYoF04/ReverseArrayInPlace
Original array: [1, 2, 3, 4]
Reversed array: [4, 3, 2, 1]
Original array: [7, 8, 9]
Reversed array: [9, 8, 7]

=== Code Execution Successful ===
```

```java
    public static void main(String[] args) {
        // Test case 1
        int[] arr1 = {1, 2, 3, 4};
        System.out.println("Original array: " + Arrays.toString(arr1
            ));
        reverseArray(arr1);
        System.out.println("Reversed array: " + Arrays.toString(arr1
            ));

        // Test case 2
        int[] arr2 = {7, 8, 9};
        System.out.println("Original array: " + Arrays.toString(arr2
            ));
        reverseArray(arr2);
        System.out.println("Reversed array: " + Arrays.toString(arr2
            ));
    }
}
```

```java
import java.util.Arrays;

class ReverseArrayInPlace {

  // Method to reverse the array in place
  public static void reverseArray(int[] arr) {
    int start = 0;
    int end = arr.length - 1;

    while (start < end) {
      // Swap the elements at start and end
      int temp = arr[start];
      arr[start] = arr[end];
      arr[end] = temp;

      // Move towards the middle
      start++;
      end--;
    }
  }

  public static void main(String[] args) {
    // Test case 1
```

```
    int[] arr1 = {1, 2, 3, 4};
    System.out.println("Original array: " + Arrays.toString(arr1));
    reverseArray(arr1);
    System.out.println("Reversed array: " + Arrays.toString(arr1));

    // Test case 2
    int[] arr2 = {7, 8, 9};
    System.out.println("Original array: " + Arrays.toString(arr2));
    reverseArray(arr2);
    System.out.println("Reversed array: " + Arrays.toString(arr2));
  }
}
```

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"

```
import java.util.Scanner;
class ReverseWordsInString {
    // Method to reverse the words in a string
    public static String reverseWords(String sentence) {
        // Split the sentence into words
        String[] words = sentence.split(" ");
        StringBuilder reversedSentence = new StringBuilder();

        // Iterate through the array of words in reverse order
        for (int i = words.length - 1; i >= 0; i--) {
            reversedSentence.append(words[i]);
            // Add space after each word (except for the last one)
            if (i != 0) {
                reversedSentence.append(" ");
            }
        }
        return reversedSentence.toString();
    }

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

        // Test case 1
        System.out.println("Enter a sentence:");
        String sentence1 = sc.nextLine();
        String result1 = reverseWords(sentence1);
        System.out.println("Reversed words: " + result1);
```

```
java -cp /tmp/nv4dRsmHNQ/ReverseWordsInString
Enter a sentence:
Hello World
Reversed words: World Hello

=== Code Execution Successful ===
```

```
import java.util.Scanner;
class ReverseWordsInString {
  // Method to reverse the words in a string
  public static String reverseWords(String sentence) {
    // Split the sentence into words
    String[] words = sentence.split(" ");
    StringBuilder reversedSentence = new StringBuilder();

    // Iterate through the array of words in reverse order
    for (int i = words.length - 1; i >= 0; i--) {
      reversedSentence.append(words[i]);
      // Add space after each word (except for the last one)
      if (i != 0) {
        reversedSentence.append(" ");
      }
    }
    return reversedSentence.toString();
  }

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

    // Test case 1
    System.out.println("Enter a sentence:");
    String sentence1 = sc.nextLine();
    String result1 = reverseWords(sentence1);
    System.out.println("Reversed words: " + result1);
```

```
    }
}
```

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

Test Cases:

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

```
class ReverseNumberUsingStringBuilder {

    public static int reverseNumber(int num) {
        // Convert the number to a string and handle negative
            numbers
        String str = Integer.toString(Math.abs(num));

        // Reverse the string using StringBuilder
        String reversedStr = new StringBuilder(str).reverse
            ().toString();

        // Convert the reversed string back to an integer and
            restore the sign
        int reversed = Integer.parseInt(reversedStr);
        return num < 0 ? -reversed : reversed;  // Apply the
            original sign
    }

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

        System.out.println("Enter a number to reverse:");
        int number = sc.nextInt();
        int reversedNumber = reverseNumber(number);

        System.out.println("Reversed number: " + reversedNumber);
```

```
java -cp /tmp/rqQigTC5hb/ReverseNumberUsingStringBuilder
Enter a number to reverse:
12345
Reversed number: 54321

=== Code Execution Successful ===
```

```
import java.util.Scanner;

class ReverseNumberUsingStringBuilder {

  public static int reverseNumber(int num) {
    // Convert the number to a string and handle negative numbers
    String str = Integer.toString(Math.abs(num));

    // Reverse the string using StringBuilder
    String reversedStr = new StringBuilder(str).reverse().toString();

    // Convert the reversed string back to an integer and restore the sign
    int reversed = Integer.parseInt(reversedStr);
    return num < 0 ? -reversed : reversed;  // Apply the original sign
  }

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

    System.out.println("Enter a number to reverse:");
    int number = sc.nextInt();
    int reversedNumber = reverseNumber(number);

    System.out.println("Reversed number: " + reversedNumber);
  }
}
```

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:

```
import java.io.*;
// Driver Class
class Palindrome {
    // main function
    public static boolean isPalindrome(String str) {
        // Initializing an empty string to store the reverse of the original str
        String rev = "";

        // Initializing a new boolean variable for the answer
        boolean ans = false;
        for (int i = str.length() - 1; i >= 0; i--) {
            rev = rev + str.charAt(i);
        }
        // Checking if both the strings are equal
        if (str.equals(rev)) {
            ans = true;
        }
        return ans;
    }
    public static void main(String[] args) {
        // Input string
        String str = "madam";

        // Convert the string to lowercase
        str = str.toLowerCase();
        boolean A = isPalindrome(str);
        System.out.println(A);
```

```
java -cp /tmp/bcRqACdBtJ/Palindrome
true

=== Code Execution Successful ===
```

```
import java.io.*;
// Driver Class
class Palindrome {
  // main function
  public static boolean isPalindrome(String str) {
    // Initializing an empty string to store the reverse of the original str
    String rev = "";

    // Initializing a new boolean variable for the answer
    boolean ans = false;
    for (int i = str.length() - 1; i >= 0; i--) {
      rev = rev + str.charAt(i);
    }
    // Checking if both the strings are equal
    if (str.equals(rev)) {
      ans = true;
    }
    return ans;
  }
  public static void main(String[] args) {
    // Input string
    String str = "madam";

    // Convert the string to lowercase
    str = str.toLowerCase();
    boolean A = isPalindrome(str);
    System.out.println(A);
  }
}
```

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]