NOV 10, 24 **PRACTICE SET-1**

MEENA RHOSHINI. C

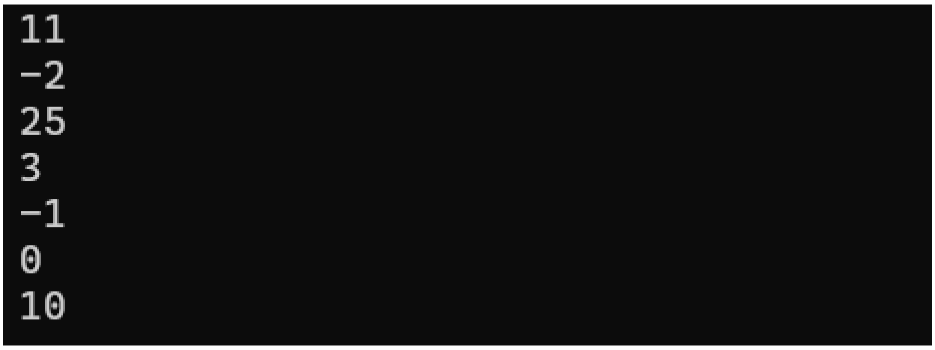
22CS034

1. Maximum Subarray Sum – Kadane's Algorithm:

```
public class KadaneAlgorithm {
    public static int maxSubarraySum(int arr[]) {
        int currentMax = arr[0];
        int globalMax = arr[0];
        for (int i = 1; i < arr.length; i++) {
            currentMax = Math.max(arr[i], currentMax + arr[i]);
            globalMax = Math.max(currentMax, globalMax);
        }
        return globalMax;
    }
    public static void main(String[] args) {
        int[] arr1 = {2, 3, -8, 7, -1, 2, 3};
        int[] arr2 = {-2, -4};
        int[] arr3 = {5, 4, 1, 7, 8};
        int[] arr4 = {1, -3, 2, 1, -1}; // Hidden test case 1
        int[] arr5 = {-1, -2, -3, -4};  // Hidden test case 2
        int[] arr6 = {0, 0, 0, 0, 0};   // Hidden test case 3
        int[] arr7 = {3, -1, 4, -1, 5, -9, 2, 6}; // Hidden test case 4
        System.out.println(maxSubarraySum(arr1));
        System.out.println(maxSubarraySum(arr2));
        System.out.println(maxSubarraySum(arr3));
        System.out.println(maxSubarraySum(arr4));
        System.out.println(maxSubarraySum(arr5));
        System.out.println(maxSubarraySum(arr6));
        System.out.println(maxSubarraySum(arr7));
    }
```

}

OUTPUT:



```
11
-2
25
3
-1
0
10
```

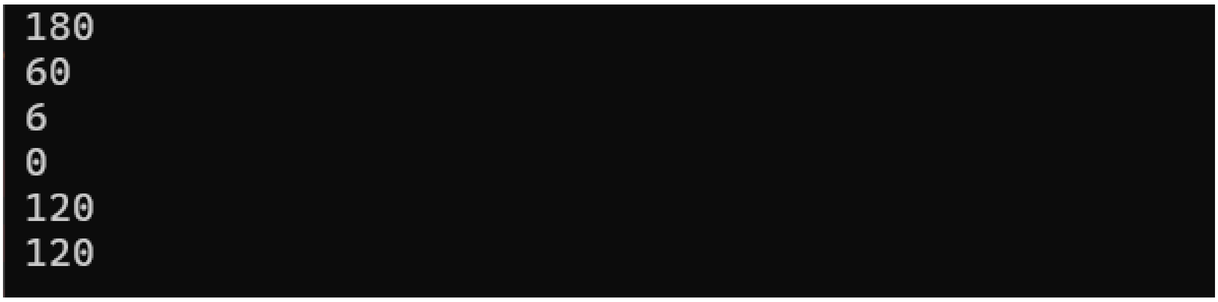
Time Complexity: O(n)

Space complexity: O(1)

2. Maximum Product Subarray

```
public class maxProductSubarray {
    public static int maxSubarrProduct(int[] arr) {
        int max = arr[0];
        int min = arr[0];
        int res = arr[0];
        int temp;
        for (int i = 1; i < arr.length; i++) {
            if (arr[i] < 0) {
                temp = max;
                max = min;
                min = temp;
            }
            max = Math.max(arr[i], max * arr[i]);
            min = Math.min(arr[i], min * arr[i]);
            res = Math.max(res, max);
        }
        return res;
    }
    public static void main(String[] args) {
        int[] arr1 = {-2, 6, -3, -10, 0, 2};
        int[] arr2 = {-1, -3, -10, 0, 60};
        int[] arr3 = {2, 3, -2, 4}; // Hidden test case 1
        int[] arr4 = {-2, 0, -1};   // Hidden test case 2
        int[] arr5 = {1, 2, 3, 4, 5}; // Hidden test case 3
        int[] arr6 = {-1, -2, -3, -4, -5}; // Hidden test case 4
        System.out.println(maxSubarrProduct(arr1));
        System.out.println(maxSubarrProduct(arr2));
        System.out.println(maxSubarrProduct(arr3));
        System.out.println(maxSubarrProduct(arr4));
        System.out.println(maxSubarrProduct(arr5));
        System.out.println(maxSubarrProduct(arr6));
    }
}
```

OUTPUT:



```
180
60
6
0
120
120
```

Time complexity: O(n)

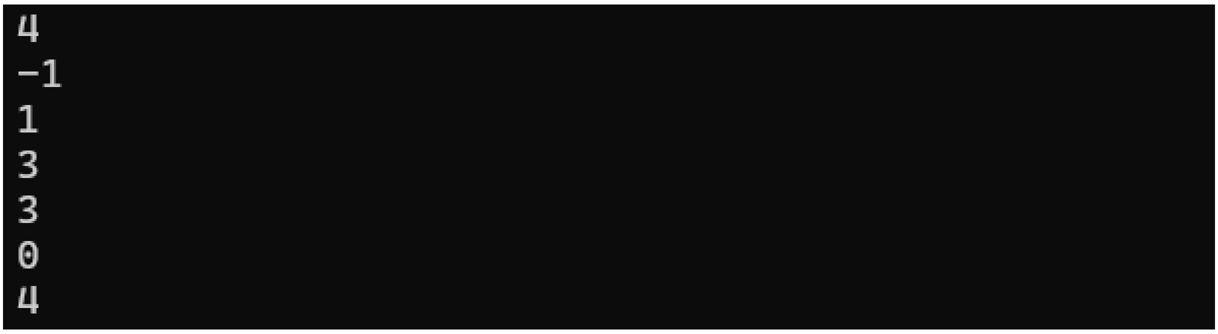
Space complexity: O(1)

3. Search in a sorted and rotated Array

```
public class searchInRotatedArr {
    public static int searchSort(int[] arr, int key) {
        int left = 0, right = arr.length - 1;
        while (left <= right) {
            int mid = left + (right - left) / 2;
            if (arr[mid] == key) {
                return mid;
            }
            if (arr[left] <= arr[mid]) {
                if (key >= arr[left] && key < arr[mid]) {
                    right = mid - 1;
                } else {
                    left = mid + 1;
                }
            }
            else {
                if (key > arr[mid] && key <= arr[right]) {
                    left = mid + 1;
                } else {
                    right = mid - 1;
                }
            }
        }

        return -1;
    }
    public static void main(String[] args) {
        int[] arr1 = {4, 5, 6, 7, 0, 1, 2};
        int[] arr2 = {4, 5, 6, 7, 0, 1, 2};
        int[] arr3 = {50, 10, 20, 30, 40};
        int[] arr4 = {3, 4, 5, 1, 2};  // Hidden test case 1
        int[] arr5 = {10, 20, 30, 40, 50}; // Hidden test case 2
        int[] arr6 = {1};  // Hidden test case 3
        int[] arr7 = {2, 3, 4, 5, 1}; // Hidden test case 4
        System.out.println(searchSort(arr1, 0));
        System.out.println(searchSort(arr2, 3));
```

```
        System.out.println(searchSort(arr3, 10));
        System.out.println(searchSort(arr4, 1));
        System.out.println(searchSort(arr5, 40));
        System.out.println(searchSort(arr6, 1));
        System.out.println(searchSort(arr7, 1));
    }
}
```

OUTPUT:



```
4
-1
1
3
3
0
4
```

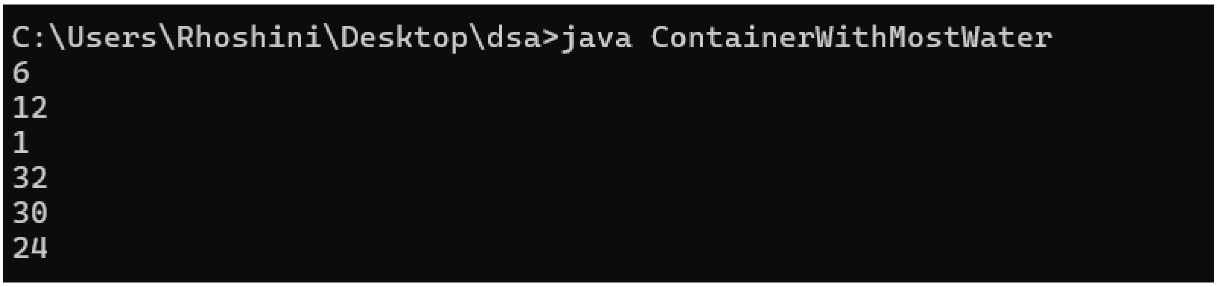
Time complexity: O(log n)

Space complexity: O(1)

4. Container with Most Water

```
import java.util.*;
public class ContainerWithMostWater {
    public static int calculateMaxArea(int[] heightArray) {
        int leftPointer = 0, rightPointer = heightArray.length - 1;
        int maxWaterArea = 0;
        while (leftPointer < rightPointer) {
            int height = Math.min(heightArray[leftPointer], heightArray[rightPointer]);
            int width = rightPointer - leftPointer;
            maxWaterArea = Math.max(maxWaterArea, height * width);
            if (heightArray[leftPointer] < heightArray[rightPointer]) {
                leftPointer++;
            } else {
                rightPointer--;
            }
        }
        return maxWaterArea;
    }
    public static void main(String[] args) {
        int[] testCase1 = {1, 5, 4, 3};
        int[] testCase2 = {3, 1, 2, 4, 5};
        int[] testCase3 = {1, 1};         // Hidden test case 1
        int[] testCase4 = {6, 9, 3, 4, 5, 8}; // Hidden test case 2
        int[] testCase5 = {8, 10, 14, 0, 4, 6}; // Hidden test case 3
        int[] testCase6 = {1, 3, 2, 5, 25, 24, 5}; // Hidden test case 4
        System.out.println(calculateMaxArea(testCase1));
        System.out.println(calculateMaxArea(testCase2));
        System.out.println(calculateMaxArea(testCase3));
        System.out.println(calculateMaxArea(testCase4));
        System.out.println(calculateMaxArea(testCase5));
        System.out.println(calculateMaxArea(testCase6));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java ContainerWithMostWater
6
12
1
32
30
24
```

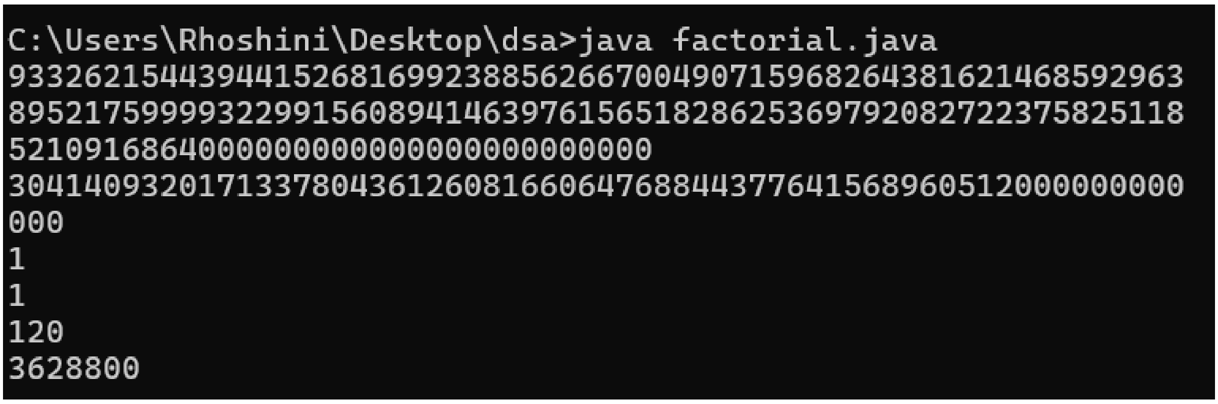
Time Complexitty: O(n)

Space Complexity: O(1)

5. Find the Factorial of a large number

```
import java.math.BigInteger;
public class Factorial {
    public static BigInteger factorialOfN(int n) {
        BigInteger res = BigInteger.ONE;
        for (int i = 2; i <= n; i++) {
            res = res.multiply(BigInteger.valueOf(i));
        }
        return res;
    }
    public static void main(String[] args) {
        System.out.println(factorialOfN(100));
        System.out.println(factorialOfN(50));
        int[] hiddenTestCase1 = {0};           // Hidden test case 1
        int[] hiddenTestCase2 = {1};           // Hidden test case 2
        int[] hiddenTestCase3 = {5};           // Hidden test case 3
        int[] hiddenTestCase4 = {10};          // Hidden test case 4
        System.out.println(factorialOfN(hiddenTestCase1[0]));
        System.out.println(factorialOfN(hiddenTestCase2[0]));
        System.out.println(factorialOfN(hiddenTestCase3[0]));
        System.out.println(factorialOfN(hiddenTestCase4[0]));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java factorial.java
93326215443944152681699238856266700490715968264381621468592963
89521759999322991560894146397615651828625369792082722375825118
52109168640000000000000000000000
30414093201713378043612608166064768844377641568960512000000000
000
1
1
120
3628800
```

Time Complexitty: O(n)

Space Complexity: O(1)

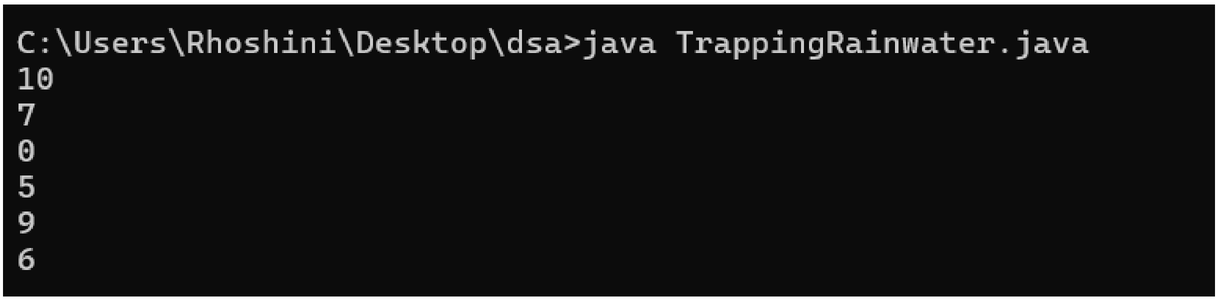
6. Trapping Rainwater Problem

public class TrappingRainwater {

```
public static int calculateTrappedWater(int[] elevationMap) {
    int n = elevationMap.length;
    if (n <= 2) return 0;
    int[] leftMax = new int[n];
    int[] rightMax = new int[n];
    int totalWater = 0;
    leftMax[0] = elevationMap[0];
    for (int i = 1; i < n; i++) {
        leftMax[i] = Math.max(leftMax[i - 1], elevationMap[i]);
    }
    rightMax[n - 1] = elevationMap[n - 1];
    for (int i = n - 2; i >= 0; i--) {
        rightMax[i] = Math.max(rightMax[i + 1], elevationMap[i]);
    }
    for (int i = 0; i < n; i++) {
        totalWater += Math.min(leftMax[i], rightMax[i]) - elevationMap[i];
    }
    return totalWater;
}
public static void main(String[] args) {
    int[] testCase1 = {3, 0, 1, 0, 4, 0, 2};
    int[] testCase2 = {3, 0, 2, 0, 4};
    int[] testCase3 = {1, 2, 3, 4};
    int[] testCase4 = {10, 9, 0, 5};
    int[] testCase5 = {4, 2, 0, 3, 2, 5};
    int[] testCase6 = {0, 1, 0, 2, 1, 0, 1, 3, 2, 1, 2, 1};
    System.out.println(calculateTrappedWater(testCase1));
    System.out.println(calculateTrappedWater(testCase2));
    System.out.println(calculateTrappedWater(testCase3));
    System.out.println(calculateTrappedWater(testCase4));
    System.out.println(calculateTrappedWater(testCase5));
```

```
        System.out.println(calculateTrappedWater(testCase6));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java TrappingRainwater.java
10
7
0
5
9
6
```

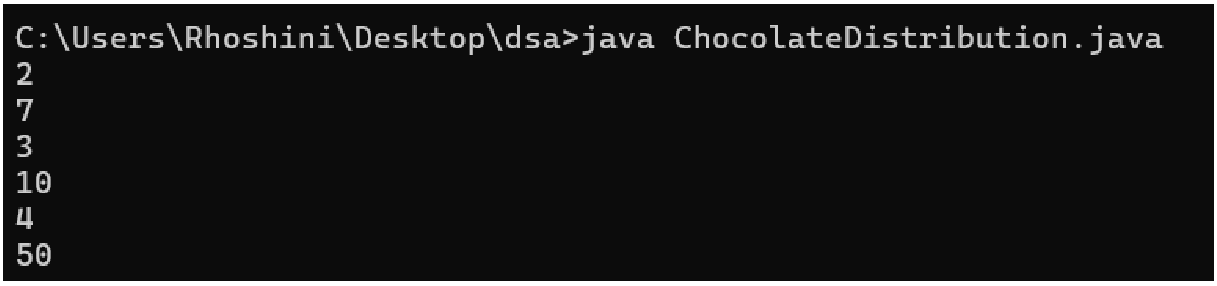
Time Complexitty: O(n)

Space Complexity: O(n)

7. Chocolate Distribution Problem

```
import java.util.Arrays;
public class ChocolateDistribution {
    public static int findMinDifference(int[] chocolatePackets, int students) {
        int n = chocolatePackets.length;
        if (students == 0 || n == 0) return 0;
        Arrays.sort(chocolatePackets);
        if (n < students) return -1;
        int minDifference = Integer.MAX_VALUE;
        for (int i = 0; i + students - 1 < n; i++) {
            int difference = chocolatePackets[i + students - 1] - chocolatePackets[i];
            minDifference = Math.min(minDifference, difference);
        }
        return minDifference;
    }
    public static void main(String[] args) {
        int[] testCase1 = {7, 3, 2, 4, 9, 12, 56};
        int[] testCase2 = {7, 3, 2, 4, 9, 12, 56};
        int[] testCase3 = {1, 2, 3, 4, 5, 6, 7, 8, 9};
        int[] testCase4 = {5, 10, 15, 20, 25};
        int[] testCase5 = {1, 2, 4, 5, 6, 8, 10};
        int[] testCase6 = {100, 200, 300, 350, 400};
        System.out.println(findMinDifference(testCase1, 3));
        System.out.println(findMinDifference(testCase2, 5));
        System.out.println(findMinDifference(testCase3, 4));
        System.out.println(findMinDifference(testCase4, 3));
        System.out.println(findMinDifference(testCase5, 4));
        System.out.println(findMinDifference(testCase6, 2));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java ChocolateDistribution.java
2
7
3
10
4
50
```

Time Complexitty: O(n log n)

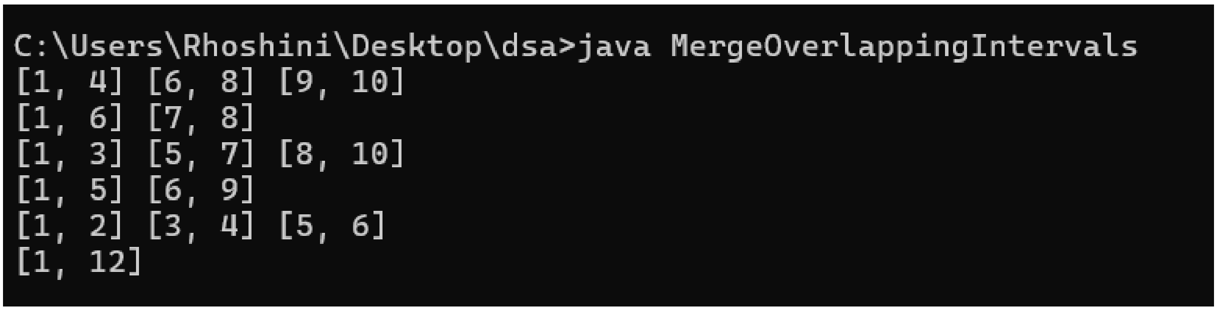
Space Complexity: O(1)

8. Merge Overlapping Intervals

```
import java.util.Arrays;
import java.util.ArrayList;
public class MergeOverlappingIntervals {
    public static ArrayList<int[]> mergeIntervals(int[][] intervals) {
        if (intervals.length == 0) return new ArrayList<>();
        Arrays.sort(intervals, (a, b) -> Integer.compare(a[0], b[0]));
        ArrayList<int[]> mergedIntervals = new ArrayList<>();
        int[] currentInterval = intervals[0];
        mergedIntervals.add(currentInterval);
        for (int i = 1; i < intervals.length; i++) {
            if (currentInterval[1] >= intervals[i][0]) {
```

```
            currentInterval[1] = Math.max(currentInterval[1], intervals[i][1]);
        } else {
            currentInterval = intervals[i];
            mergedIntervals.add(currentInterval);
        }
    }
    return mergedIntervals;
}
public static void main(String[] args) {
    int[][] testCase1 = {{1, 3}, {2, 4}, {6, 8}, {9, 10}};
    int[][] testCase2 = {{7, 8}, {1, 5}, {2, 4}, {4, 6}};
    int[][] testCase3 = {{1, 3}, {5, 7}, {8, 10}};
    int[][] testCase4 = {{1, 3}, {3, 5}, {6, 8}, {7, 9}};
    int[][] testCase5 = {{1, 2}, {3, 4}, {5, 6}};
    int[][] testCase6 = {{1, 10}, {2, 6}, {8, 12}};
    ArrayList<int[]> result1 = mergeIntervals(testCase1);
    ArrayList<int[]> result2 = mergeIntervals(testCase2);
    ArrayList<int[]> result3 = mergeIntervals(testCase3);
    ArrayList<int[]> result4 = mergeIntervals(testCase4);
    ArrayList<int[]> result5 = mergeIntervals(testCase5);
    ArrayList<int[]> result6 = mergeIntervals(testCase6);
    printIntervals(result1);
    printIntervals(result2);
    printIntervals(result3);
    printIntervals(result4);
    printIntervals(result5);
    printIntervals(result6);
}
private static void printIntervals(ArrayList<int[]> intervals) {
    for (int[] interval : intervals) {
        System.out.print("[" + interval[0] + ", " + interval[1] + "] ");
        }
        System.out.println();
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java MergeOverlappingIntervals
[1, 4] [6, 8] [9, 10]
[1, 6] [7, 8]
[1, 3] [5, 7] [8, 10]
[1, 5] [6, 9]
[1, 2] [3, 4] [5, 6]
[1, 12]
```

Time Complexitty: O(n log n)

Space Complexity: O(n)

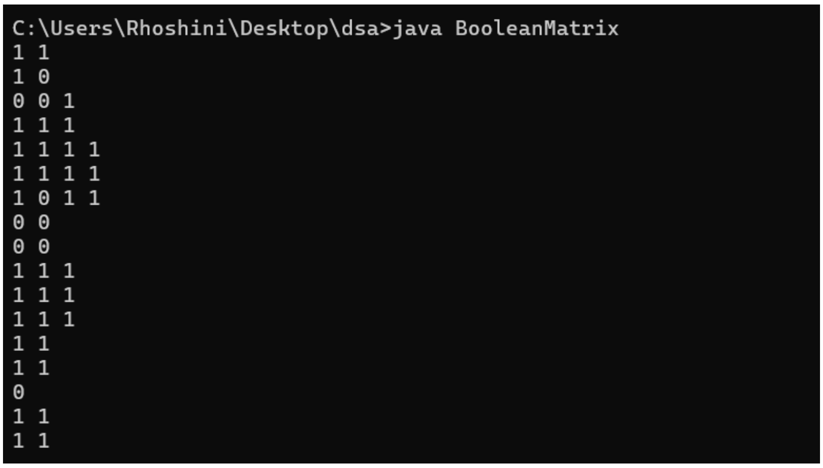
9. A Boolean Matrix Question

```
public class BooleanMatrix {
    public static void modifyMatrix(int[][] matrix) {
        int m = matrix.length;
        int n = matrix[0].length;
        boolean[] rowFlag = new boolean[m];
        boolean[] colFlag = new boolean[n];
        for (int i = 0; i < m; i++) {
            for (int j = 0; j < n; j++) {
                if (matrix[i][j] == 1) {
                    rowFlag[i] = true;
                    colFlag[j] = true;
                }
            }
        }
        for (int i = 0; i < m; i++) {
            for (int j = 0; j < n; j++) {
                if (rowFlag[i] || colFlag[j]) {
```

```
                matrix[i][j] = 1;
            }
        }
    }
}
public static void printMatrix(int[][] matrix) {
    for (int[] row : matrix) {
        for (int cell : row) {
            System.out.print(cell + " ");
        }
        System.out.println();
    }
}
public static void main(String[] args) {
    int[][] testCase1 = {{1, 0}, {0, 0}};
    int[][] testCase2 = {{0, 0, 0}, {0, 0, 1}};
    int[][] testCase3 = {{1, 0, 0, 1}, {0, 0, 1, 0}, {0, 0, 0, 0}};
    int[][] testCase4 = {{0, 0}, {0, 0}};
    int[][] testCase5 = {{1, 1, 1}, {0, 0, 0}, {1, 0, 1}};
    int[][] testCase6 = {{0, 1}, {1, 0}};
    int[][] testCase7 = {{0}};
    int[][] testCase8 = {{1, 0}, {0, 1}};
    modifyMatrix(testCase1);
    printMatrix(testCase1);
    modifyMatrix(testCase2);
    printMatrix(testCase2);
    modifyMatrix(testCase3);
    printMatrix(testCase3);
    modifyMatrix(testCase4);
    printMatrix(testCase4);
    modifyMatrix(testCase5);
```

```
        printMatrix(testCase5);

        modifyMatrix(testCase6);

        printMatrix(testCase6);

        modifyMatrix(testCase7);

        printMatrix(testCase7);

        modifyMatrix(testCase8);

        printMatrix(testCase8);

    }

}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java BooleanMatrix
1 1
1 0
0 0 1
1 1 1
1 1 1 1
1 1 1 1
1 0 1 1
0 0
0 0
1 1 1
1 1 1
1 1 1
1 1
1 1
0
1 1
1 1
```

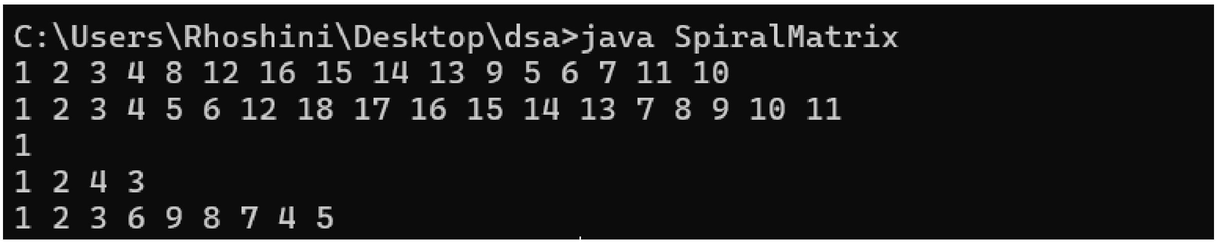
Time Complexitty: O(MN)

Space Complexity: O(M+N)

10. Print a given matrix in spiral form

```
public class SpiralMatrix {

    public static void printSpiral(int[][] matrix) {

        int m = matrix.length;

        int n = matrix[0].length;

        int top = 0, left = 0, bottom = m - 1, right = n - 1;

        while (top <= bottom && left <= right) {

            for (int i = left; i <= right; i++) {

                System.out.print(matrix[top][i] + " ");

            }
            top++;
            for (int i = top; i <= bottom; i++) {
                System.out.print(matrix[i][right] + " ");
            }
            right--;
            if (top <= bottom) {
                for (int i = right; i >= left; i--) {
                    System.out.print(matrix[bottom][i] + " ");
                }
                bottom--;
            }
            if (left <= right) {
                for (int i = bottom; i >= top; i--) {
                    System.out.print(matrix[i][left] + " ");
                }
                left++;
            }
        }
    }
    public static void main(String[] args) {
        int[][] testCase1 = {{1, 2, 3, 4}, {5, 6, 7, 8}, {9, 10, 11, 12}, {13, 14, 15, 16}};  // Hidden test case 1
        int[][] testCase2 = {{1, 2, 3, 4, 5, 6}, {7, 8, 9, 10, 11, 12}, {13, 14, 15, 16, 17, 18}};  // Hidden test case 2
        int[][] testCase3 = {{1}};  // Hidden test case 3
        int[][] testCase4 = {{1, 2}, {3, 4}};  // Hidden test case 4
        int[][] testCase5 = {{1, 2, 3}, {4, 5, 6}, {7, 8, 9}};
        printSpiral(testCase1);
        System.out.println();
        printSpiral(testCase2);
        System.out.println();
        printSpiral(testCase3);
        System.out.println();
        printSpiral(testCase4);
        System.out.println();
        printSpiral(testCase5);
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java SpiralMatrix
1 2 3 4 8 12 16 15 14 13 9 5 6 7 11 10
1 2 3 4 5 6 12 18 17 16 15 14 13 7 8 9 10 11
1
1 2 4 3
1 2 3 6 9 8 7 4 5
```

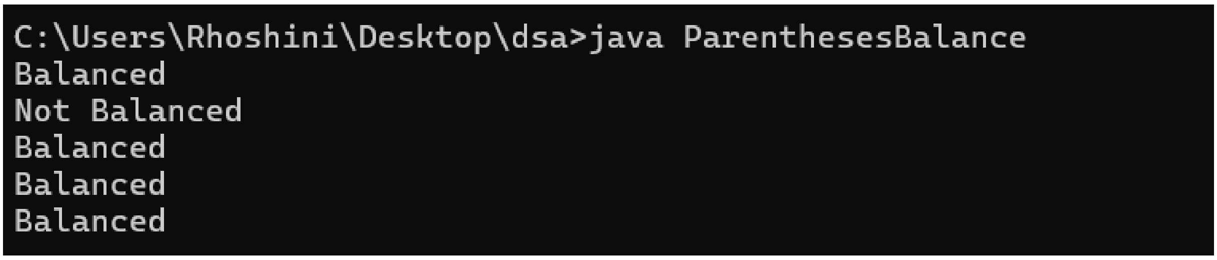
Time Complexitty: O(MN)

Space Complexity: O(1)

13. Check if given Parentheses expression is balanced or not

```
import java.util.Stack;
public class ParenthesesBalance {
    public static String checkBalance(String str) {
        Stack<Character> stack = new Stack<>();
        for (int i = 0; i < str.length(); i++) {
            char ch = str.charAt(i);
            if (ch == '(') {
                stack.push(ch);
            } else if (ch == ')') {
                if (stack.isEmpty()) {
                    return "Not Balanced";
                }
                stack.pop();
            }
        }
        return stack.isEmpty() ? "Balanced" : "Not Balanced";
    }
    public static void main(String[] args) {
        String testCase1 = "((()))()()";  // Hidden test case 1
        String testCase2 = "())((())";  // Hidden test case 2
        String testCase3 = "(((())))";  // Hidden test case 3
        String testCase4 = "()()()";  // Hidden test case 4
        String testCase5 = "((())())";
        System.out.println(checkBalance(testCase1));
        System.out.println(checkBalance(testCase2));
        System.out.println(checkBalance(testCase3));
        System.out.println(checkBalance(testCase4));
        System.out.println(checkBalance(testCase5));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java ParenthesesBalance
Balanced
Not Balanced
Balanced
Balanced
Balanced
```

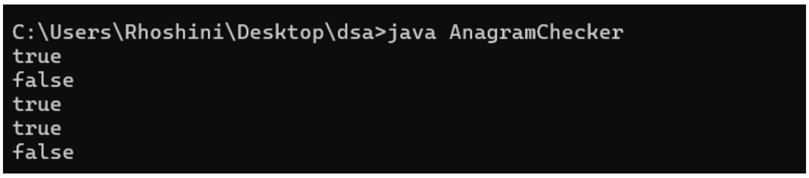
Time Complexitty: O(n)

Space Complexity: O(n)

14. Check if two Strings are Anagrams of each other

```
import java.util.Arrays;
public class AnagramChecker {
    public static boolean areAnagrams(String s1, String s2) {
        if (s1.length() != s2.length()) {
            return false;
        }
        char[] arr1 = s1.toCharArray();
        char[] arr2 = s2.toCharArray();
        Arrays.sort(arr1);
        Arrays.sort(arr2);
        return Arrays.equals(arr1, arr2);
    }
    public static void main(String[] args) {
        String testCase1 = "geeks";
        String testCase2 = "kseeg";
        String testCase3 = "allergy";
        String testCase4 = "allergic";
        String testCase5 = "g";
        String testCase6 = "g";  // Hidden test case 1
        String testCase7 = "silent";  // Hidden test case 2
        String testCase8 = "listen";  // Hidden test case 3
        String testCase9 = "hello";  // Hidden test case 4
        System.out.println(areAnagrams(testCase1, testCase2));
        System.out.println(areAnagrams(testCase3, testCase4));
        System.out.println(areAnagrams(testCase5, testCase6));
        System.out.println(areAnagrams(testCase7, testCase8));
        System.out.println(areAnagrams(testCase9, testCase1));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java AnagramChecker
true
false
true
true
false
```

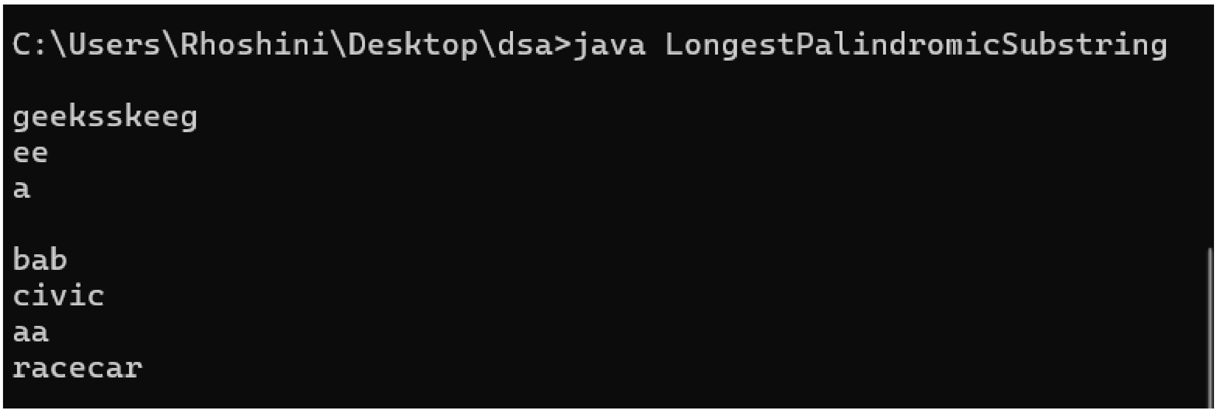
Time Complexitty: O(n log n)

Space Complexity: O(n)

15. Longest Palindromic Substring

```
public class LongestPalindromicSubstring {
    public static String longestPalindrome(String str) {
        if (str == null || str.length() < 1) {
            return "";
        }
        int start = 0, maxLength = 1;
        for (int i = 0; i < str.length(); i++) {
            int len1 = expandFromCenter(str, i, i);
            int len2 = expandFromCenter(str, i, i + 1);
            int len = Math.max(len1, len2);
            if (len > maxLength) {
                maxLength = len;
                start = i - (maxLength - 1) / 2;
            }
        }
        return str.substring(start, start + maxLength);
    }
    private static int expandFromCenter(String str, int left, int right) {
        while (left >= 0 && right < str.length() && str.charAt(left) == str.charAt(right)) {
            left--;
            right++;
        }
        return right - left - 1;
    }
    public static void main(String[] args) {
        String testCase1 = "forgeeksskeegfor";
        String testCase2 = "Geeks";
        String testCase3 = "abc";
        String testCase4 = "";
        String testCase5 = "babad";  // Hidden test case 1
        String testCase6 = "civic";  // Hidden test case 2
        String testCase7 = "aabbcc";  // Hidden test case 3
        String testCase8 = "racecar";  // Hidden test case 4
        System.out.println(longestPalindrome(testCase1));
        System.out.println(longestPalindrome(testCase2));
        System.out.println(longestPalindrome(testCase3));
        System.out.println(longestPalindrome(testCase4));
        System.out.println(longestPalindrome(testCase5));
        System.out.println(longestPalindrome(testCase6));
        System.out.println(longestPalindrome(testCase7));
        System.out.println(longestPalindrome(testCase8));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java LongestPalindromicSubstring

geeksskeeg
ee
a

bab
civic
aa
racecar
```

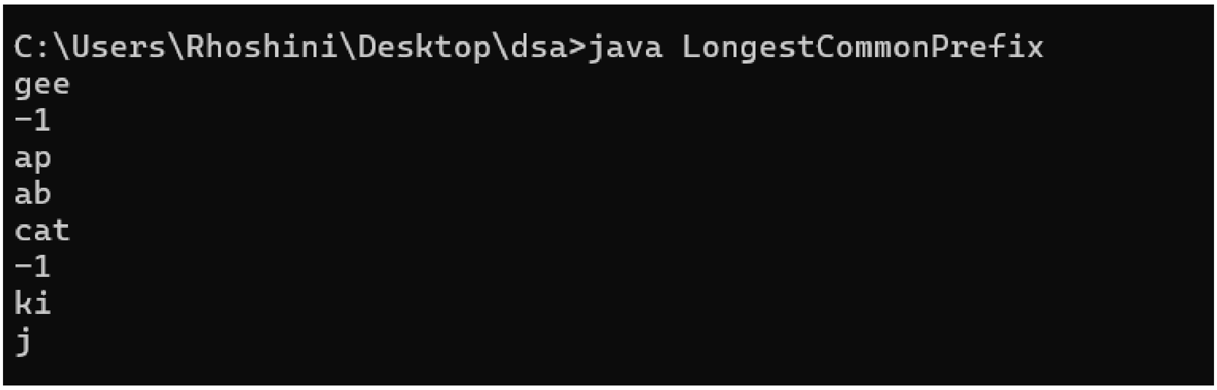
Time Complexitty: O(n^2)

Space Complexity: O(1)

16. Longest Common Prefix using Sorting

```
import java.util.Arrays;
public class LongestCommonPrefix {
    public static String longestCommonPrefix(String[] arr) {
        if (arr == null || arr.length == 0) {
            return "-1";
        }
        Arrays.sort(arr);
        String first = arr[0];
        String last = arr[arr.length - 1];
        int minLength = Math.min(first.length(), last.length());
        int i = 0;
        while (i < minLength && first.charAt(i) == last.charAt(i)) {
            i++;
        }
        String commonPrefix = first.substring(0, i);
        return commonPrefix.isEmpty() ? "-1" : commonPrefix;
    }
    public static void main(String[] args) {
        String[] testCase1 = {"geeksforgeeks", "geeks", "geek", "geezer"};
        String[] testCase2 = {"hello", "world"};
        String[] testCase3 = {"apple", "ape", "apricot", "appliance"};
        String[] testCase4 = {"abcd", "abef", "ab"};
        String[] testCase5 = {"cat", "catalog", "caterpillar"};  // Hidden test case 1
        String[] testCase6 = {"dog", "race", "car"};  // Hidden test case 2
        String[] testCase7 = {"king", "kind", "kiss", "kid"};  // Hidden test case 3
        String[] testCase8 = {"java", "jazz", "jupiter"};  // Hidden test case 4
        System.out.println(longestCommonPrefix(testCase1));
        System.out.println(longestCommonPrefix(testCase2));
        System.out.println(longestCommonPrefix(testCase3));
        System.out.println(longestCommonPrefix(testCase4));
        System.out.println(longestCommonPrefix(testCase5));
        System.out.println(longestCommonPrefix(testCase6));
        System.out.println(longestCommonPrefix(testCase7));
        System.out.println(longestCommonPrefix(testCase8));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java LongestCommonPrefix
gee
-1
ap
ab
cat
-1
ki
j
```

Time Complexitty: O(n lod n+ m)

Space Complexity: O(1)

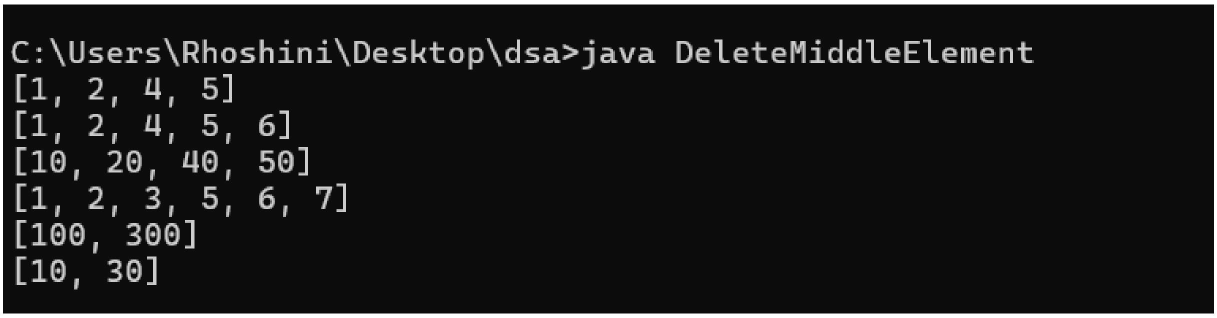
17. Delete middle element of a stack

```
import java.util.Stack;
public class DeleteMiddleElement {
    public static void deleteMiddle(Stack<Integer> stack, int size, int currentIndex) {
        if (stack.isEmpty() || currentIndex == size / 2) {
            stack.pop();
            return;
        }
        int top = stack.pop();
        deleteMiddle(stack, size, currentIndex + 1);
        stack.push(top);
    }
    public static void main(String[] args) {
        Stack<Integer> stack1 = new Stack<>();
        stack1.push(1);
        stack1.push(2);
        stack1.push(3);
        stack1.push(4);
        stack1.push(5);
        deleteMiddle(stack1, stack1.size(), 0);
        System.out.println(stack1);
```

```
Stack<Integer> stack2 = new Stack<>();
stack2.push(1);
stack2.push(2);
stack2.push(3);
stack2.push(4);
stack2.push(5);
stack2.push(6);
deleteMiddle(stack2, stack2.size(), 0);
System.out.println(stack2);
// Hidden test cases
Stack<Integer> stack3 = new Stack<>();
stack3.push(10);
stack3.push(20);
stack3.push(30);
stack3.push(40);
stack3.push(50);
deleteMiddle(stack3, stack3.size(), 0);
System.out.println(stack3);
Stack<Integer> stack4 = new Stack<>();
stack4.push(1);
stack4.push(2);
stack4.push(3);
stack4.push(4);
stack4.push(5);
stack4.push(6);
stack4.push(7);
deleteMiddle(stack4, stack4.size(), 0);
System.out.println(stack4);
Stack<Integer> stack5 = new Stack<>();
stack5.push(100);
stack5.push(200);
```

```
        stack5.push(300);
        deleteMiddle(stack5, stack5.size(), 0);
        System.out.println(stack5);
        Stack<Integer> stack6 = new Stack<>();
        stack6.push(10);
        stack6.push(20);
        stack6.push(30);
        deleteMiddle(stack6, stack6.size(), 0);
        System.out.println(stack6);
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java DeleteMiddleElement
[1, 2, 4, 5]
[1, 2, 4, 5, 6]
[10, 20, 40, 50]
[1, 2, 3, 5, 6, 7]
[100, 300]
[10, 30]
```

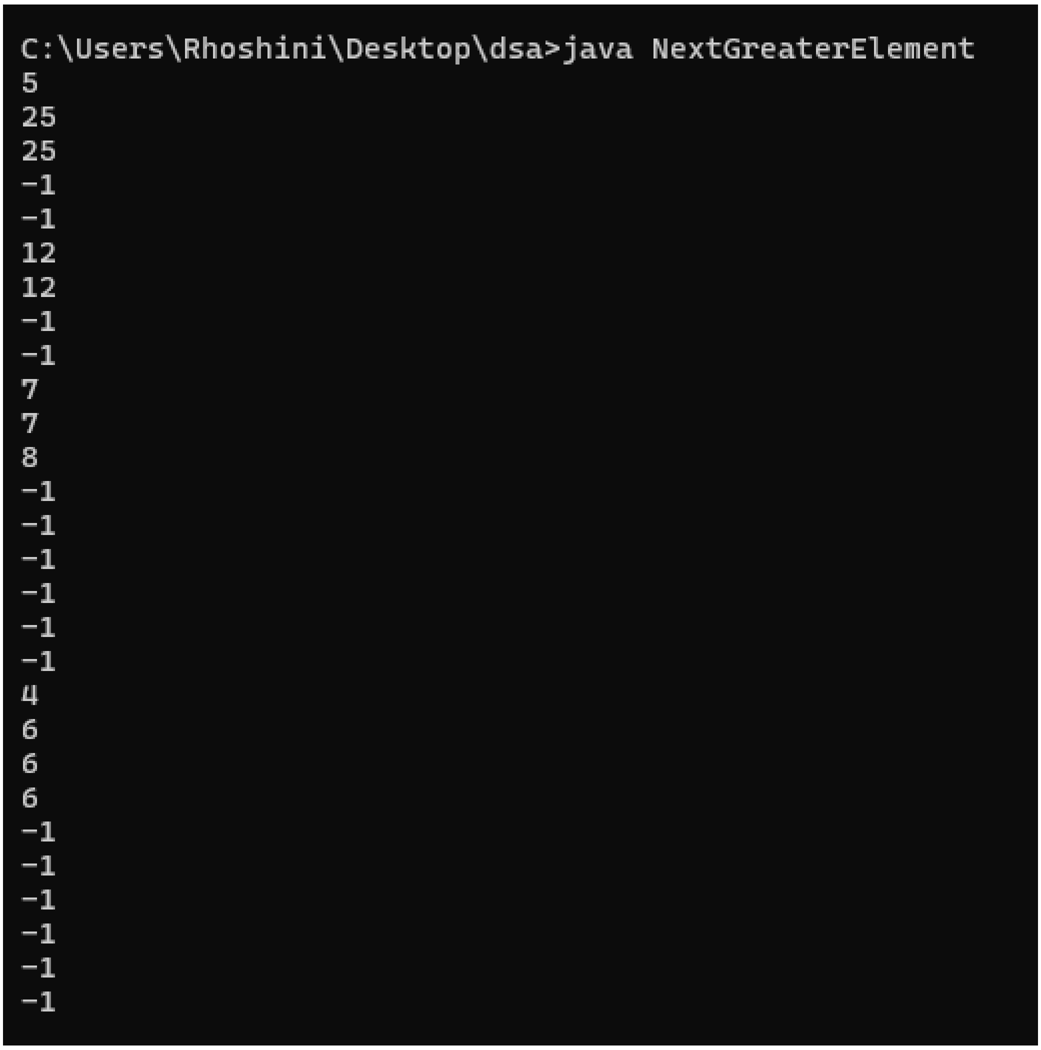
Time Complexitty: O(n)

Space Complexity: O(n)

18. Next Greater Element (NGE) for every element in given Array

```
import java.util.Stack;
public class NextGreaterElement {
    public static void printNextGreater(int[] arr) {
        Stack<Integer> stack = new Stack<>();
        int[] nge = new int[arr.length];
        for (int i = 0; i < arr.length; i++) {
            nge[i] = -1;
        }
        for (int i = 0; i < arr.length; i++) {
            while (!stack.isEmpty() && arr[stack.peek()] < arr[i]) {
                int index = stack.pop();
                nge[index] = arr[i];
            }
            stack.push(i);
        }
        for (int i = 0; i < arr.length; i++) {
            System.out.println(nge[i]);
        }
    }
    public static void main(String[] args) {
        int[] arr1 = {4, 5, 2, 25};
        printNextGreater(arr1);
        int[] arr2 = {13, 7, 6, 12};
        printNextGreater(arr2);
        // Hidden test cases
        int[] arr3 = {10, 5, 3, 7, 8};
        printNextGreater(arr3);
        int[] arr4 = {15, 8, 4, 2, 1};
        printNextGreater(arr4);
        int[] arr5 = {3, 4, 2, 1, 6};
        printNextGreater(arr5);
        int[] arr6 = {5, 4, 3, 2, 1};
        printNextGreater(arr6);
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java NextGreaterElement
5
25
25
-1
-1
12
12
-1
-1
7
7
8
-1
-1
-1
-1
-1
-1
4
6
6
6
-1
-1
-1
-1
-1
-1
```

Time Complexitty: O(n)

Space Complexity: O(n)

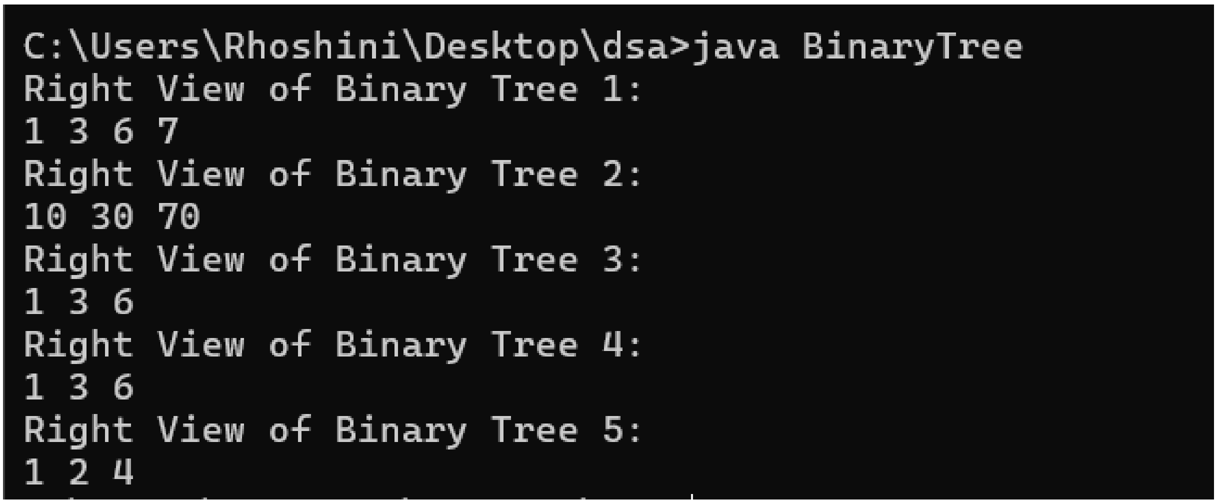
19. Print Right View of a Binary Tree

```
import java.util.*;
class BinaryTree {
    static class Node {
        int data;
        Node left, right;
        Node(int item) {
            data = item;
            left = right = null;
        }
```

```
}
public static void printRightView(Node root) {
    if (root == null) return;
    Queue<Node> queue = new LinkedList<>();
    queue.add(root);
    while (!queue.isEmpty()) {
        int n = queue.size();
        for (int i = 1; i <= n; i++) {
            Node node = queue.poll();
            if (i == n) {
                System.out.print(node.data + " ");
            }
            if (node.left != null) queue.add(node.left);
            if (node.right != null) queue.add(node.right);
        }
    }
}
public static void main(String[] args) {
    Node root1 = new Node(1);
    root1.left = new Node(2);
    root1.right = new Node(3);
    root1.left.left = new Node(4);
    root1.left.right = new Node(5);
    root1.right.right = new Node(6);
    root1.left.left.left = new Node(7);
    System.out.println("Right View of Binary Tree 1:");
    printRightView(root1);
    Node root2 = new Node(10);
    root2.left = new Node(20);
    root2.right = new Node(30);
    root2.left.left = new Node(40);
```

```
        root2.right.left = new Node(60);
        root2.right.right = new Node(70);
        System.out.println("\nRight View of Binary Tree 2:");
        printRightView(root2);
        // Hidden test cases
        Node root3 = new Node(1);
        root3.left = new Node(2);
        root3.right = new Node(3);
        root3.left.right = new Node(4);
        root3.right.left = new Node(5);
        root3.right.right = new Node(6);
        System.out.println("\nRight View of Binary Tree 3:");
        printRightView(root3);
        Node root4 = new Node(1);
        root4.left = new Node(2);
        root4.right = new Node(3);
        root4.left.left = new Node(4);
        root4.left.right = new Node(5);
        root4.right.left = new Node(6);
        System.out.println("\nRight View of Binary Tree 4:");
        printRightView(root4);
        Node root5 = new Node(1);
        root5.left = new Node(2);
        root5.left.left = new Node(3);
        root5.left.right = new Node(4);
        System.out.println("\nRight View of Binary Tree 5:");
        printRightView(root5);      }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java BinaryTree
Right View of Binary Tree 1:
1 3 6 7
Right View of Binary Tree 2:
10 30 70
Right View of Binary Tree 3:
1 3 6
Right View of Binary Tree 4:
1 3 6
Right View of Binary Tree 5:
1 2 4
```

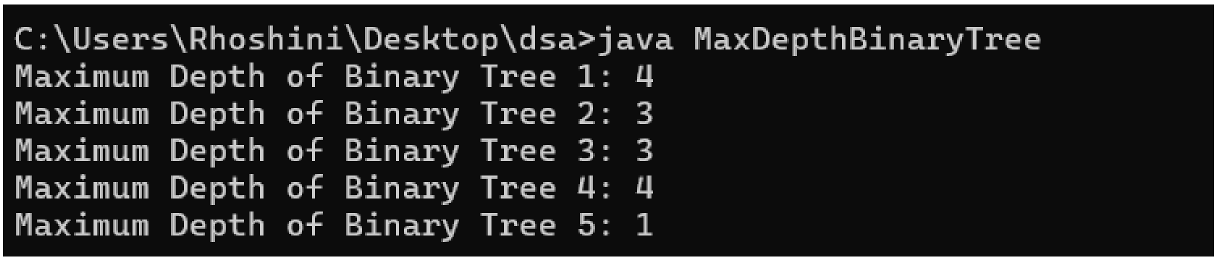
Time Complexitty: O(n)

Space Complexity: O(h)

20. Maximum Depth or Height of Binary Tree

```
class MaxDepthBinaryTree {
    static class Node {
        int data;
        Node left, right;
        Node(int item) {
            data = item;
            left = right = null;
        }
    }
    public static int maxDepth(Node root) {
        if (root == null) {
            return 0;
        }
        int leftDepth = maxDepth(root.left);
        int rightDepth = maxDepth(root.right);
        return Math.max(leftDepth, rightDepth) + 1;
    }
    public static void main(String[] args) {
        MaxDepthBinaryTree tree = new MaxDepthBinaryTree();
        Node root1 = new Node(1);
        root1.left = new Node(2);
        root1.right = new Node(3);
        root1.left.left = new Node(4);
        root1.left.right = new Node(5);
        root1.right.right = new Node(6);
        root1.left.left.left = new Node(7);
        System.out.println("Maximum Depth of Binary Tree 1: " + tree.maxDepth(root1));
        Node root2 = new Node(10);
        root2.left = new Node(20);
        root2.right = new Node(30);
        root2.left.left = new Node(40);
        root2.right.left = new Node(60);
        root2.right.right = new Node(70);
        System.out.println("Maximum Depth of Binary Tree 2: " + tree.maxDepth(root2));
        // Hidden test cases
        Node root3 = new Node(1);
        root3.left = new Node(2);
        root3.left.left = new Node(3);
        System.out.println("Maximum Depth of Binary Tree 3: " + tree.maxDepth(root3));
        Node root4 = new Node(1);
        root4.left = new Node(2);
        root4.left.left = new Node(3);
        root4.left.left.left = new Node(4);
        System.out.println("Maximum Depth of Binary Tree 4: " + tree.maxDepth(root4));
        Node root5 = new Node(1);
        System.out.println("Maximum Depth of Binary Tree 5: " + tree.maxDepth(root5));
    }
}
```

OUTPUT:



```
C:\Users\Rhoshini\Desktop\dsa>java MaxDepthBinaryTree
Maximum Depth of Binary Tree 1: 4
Maximum Depth of Binary Tree 2: 3
Maximum Depth of Binary Tree 3: 3
Maximum Depth of Binary Tree 4: 4
Maximum Depth of Binary Tree 5: 1
```

Time Complexitty: O(n)

Space Complexity: O(h)