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ROLL NUM: 2K24/CSE/109  
  
SUBJECT: DATA STRUCTURES  
  
 ASSIGNMENT**

**TASKS:**

Program 1: Reverse an Array using Stack

**import java.util.Stack;**

**public class ReverseArrayUsingStack {**

**public static void reverseArray(int[] arr) {**

**Stack<Integer> stack = new Stack<>();**

**// Push all elements to stack**

**for (int num : arr) {**

**stack.push(num);**

**}**

**// Pop all elements back to array**

**for (int i = 0; i < arr.length; i++) {**

**arr[i] = stack.pop();**

**}**

**}**

**public static void main(String[] args) {**

**int[] arr = {10, 20, 30, 40, 50};**

**System.out.println("Original Array:");**

**for (int num : arr) {**

**System.out.print(num + " ");**

**}**

**reverseArray(arr);**

**System.out.println("\nReversed Array:");**

**for (int num : arr) {**

**System.out.print(num + " ");**

**}**

**}**

**}**

**OUTPUT  
Original Array:**

**10 20 30 40 50**

**Reversed Array:**

**50 40 30 20 10**

**Program 2: Match Parentheses using Stack**

**import java.util.Stack;**

**public class ParenthesesMatcher {**

**public static boolean isBalanced(String expr) {**

**Stack<Character> stack = new Stack<>();**

**for (char ch : expr.toCharArray()) {**

**if (ch == '(') {**

**stack.push(ch);**

**} else if (ch == ')') {**

**if (stack.isEmpty()) {**

**return false; // no matching opening bracket**

**}**

**stack.pop();**

**}**

**}**

**return stack.isEmpty(); // all opened brackets should be closed**

**}**

**public static void main(String[] args) {**

**String expression = "(a + b) \* (c - d)";**

**if (isBalanced(expression)) {**

**System.out.println("Parentheses are balanced.");**

**} else {**

**System.out.println("Parentheses are NOT balanced.");**

**}**

**}**

**}  
  
OUTPUT  
Parentheses are balanced.**Another test:

* Input: "(a + b)) + c("
* Output: Parentheses are NOT balanced

Program 3: Recursive Sum of Array

**public class RecursiveArraySum {**

**public static int recursiveSum(int[] arr, int n) {**

**if (n <= 0) {**

**return 0;**

**}**

**return recursiveSum(arr, n - 1) + arr[n - 1];**

**}**

**public static void main(String[] args) {**

**int[] arr = {5, 10, 15, 20};**

**int sum = recursiveSum(arr, arr.length);**

**System.out.println("Sum of array elements: " + sum);**

**}**

**}**

**OUTPUT**

**Sum of array elements: 50**