DSA Practice - 2

Roll No : 22AD126
Name : Sidharth .N

1.Palindrome Linked List

```java
import java.util.Scanner;

class ListNode {
    int val;
    ListNode next;

    ListNode(int val) {
        this.val = val;
        this.next = null;
    }
}

class PalindromeLinkedList {
    public boolean isPalindrome(ListNode head) {
        if (head == null || head.next == null) {
            return true;
        }

        ListNode slow = head, fast = head;
        while (fast != null && fast.next != null) {
            slow = slow.next;
            fast = fast.next.next;
        }

        ListNode prev = null, curr = slow;
        while (curr != null) {
            ListNode nextNode = curr.next;
            curr.next = prev;
            prev = curr;
            curr = nextNode;
        }

        ListNode p1 = head, p2 = prev;
        while (p2 != null) {
            if (p1.val != p2.val) {
```

```
                return false;
            }
            p1 = p1.next;
            p2 = p2.next;
        }

        return true;
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the number of nodes: ");
        int n = scanner.nextInt();

        System.out.println("Enter the node values:");
        ListNode head = null, tail = null;
        for (int i = 0; i < n; i++) {
            int val = scanner.nextInt();
            ListNode newNode = new ListNode(val);
            if (head == null) {
                head = newNode;
                tail = newNode;
            } else {
                tail.next = newNode;
                tail = newNode;
            }
        }

        PalindromeLinkedList solution = new PalindromeLinkedList();
        System.out.println("Is the linked list a palindrome? " +
solution.isPalindrome(head));
        scanner.close();
    }
}
```

```
C:\Users\sidha> cmd /C "C:\Users\sidha\AppData\Roaming\Code\User\globalStorage\pleiades.java-extension-pack-jdk\java\21\bin\java.exe -agent
lib:jdwp=transport=dt_socket,server=n,suspend=y,address=localhost:56087 -XX:+ShowCodeDetailsInExceptionMessages -cp C:\Users\sidha\AppData\
Local\Temp\vscodesws_c5e63\jdt_ws\jdt.ls-java-project\bin PalindromeLinkedList "
Enter the number of nodes: 5
Enter the node values:
1
2
3
4
5
Is the linked list a palindrome? false
```

Time Complexity : log(n)

2.Floor in sorted array

```java
public class FloorinSortedArray{
    int binarysearch(int[] arr , int target){
        int left = 0;
        int right = arr.length-1;
        int mid = 0;
        while (left <= right){
            mid = (left+right)/2;
            if(arr[mid] == target){
                return mid;
            }
            else if (target > arr[mid]){
                left = mid + 1;
            }
            else{
                right = mid - 1;
            }
        }
        if(left == 0){
            return -1;
        }
        return left;
    }
    public static void main(String[] args){
        FloorinSortedArray sol = new FloorinSortedArray();
        int [] arr1 = {1,2,8,10,11,12,19};
        int [] arr2 = {1,2,8,10,11,12,19};
        int [] arr3 = {1,2,8};
        int t1 = 0;
        int t2 = 5;
        int t3 = 1;
        System.out.println("Testcase 1 :" + sol.binarysearch(arr1,t1));
        System.out.println("Testcase 2 :" + sol.binarysearch(arr2,t2));
        System.out.println("Testcase 3 :" + sol.binarysearch(arr3,t3));
    }
}
```

```
C:\Users\sidha> cmd /C "C:\Users\sidha\AppData\Roaming\Code\User\globalStorage\pleiades.java-extension-pack-jdk\java\21\bin\java.exe -agentlib:jdwp=
transport=dt_socket,server=n,suspend=y,address=localhost:50536 -XX:+ShowCodeDetailsInExceptionMessages -cp C:\Users\sidha\AppData\Local\Temp\vscodes
ws_f4976\jdt_ws\jdt.ls-java-project\bin FloorinSortedArray "
Testcase 1 :-1
Testcase 2 :2
Testcase 3 :0
```

Time Complexity : O(nlogn)

3.Triplet Sum

```java
import java.util.Arrays;

public class TripletSum{
    int twopointerapproach(int[]arr,int target){
        Arrays.sort(arr);
        for(int i =0; i < arr.length-2; i++){
            int k = arr.length -1;
            int j = i+1;
            while (j < k){
                int sum = arr[i]+ arr[j] + arr[k];
                if(sum == target){
                    return 1;
                }
                else if (sum > target){
                    k--;
                }
                else{
                    j++;
                }
            }
        }
        return 0;
    }
    public static void main(String[] neitzsche){
        TripletSum sol = new TripletSum();
        int [] arr1 = {1,4,45,6,10,8};
        int [] arr2 = {1,2,4,3,6,7};
        int [] arr3 = {40,20,10,3,6,7};
        int t1 = 13;
        int t2 = 10;
        int t3 = 24;
        System.out.println("Testcase 1 :" +
sol.twopointerapproach(arr1,t1));
```

```
        System.out.println("Testcase 2 :" +
sol.twopointerapproach(arr2,t2));
        System.out.println("Testcase 3 :" +
sol.twopointerapproach(arr3,t3));
    }
}
```

```
C:\Users\sidha> cmd /C "C:\Users\sidha\AppData\Roaming\Code\User\globalStorage\pleiades.java-extension-pack-jdk\java\21\bin\java.exe -agentlib:jdwp=
transport=dt_socket,server=n,suspend=y,address=localhost:50529 -XX:+ShowCodeDetailsInExceptionMessages -cp C:\Users\sidha\AppData\Local\Temp\vscodes
ws_f4976\jdt_ws\jdt.ls-java-project\bin TripletSum "
Testcase 1 :1
Testcase 2 :1
Testcase 3 :0
```

3. 0-1 Knapsack

```
public class Knapsack {

    public static int classics(int capacity, int[] wt, int[] val) {
        int n = val.length;
        int[][] dp = new int[n + 1][capacity + 1];

        for (int i = 1; i <= n; i++) {
            for (int w = 0; w <= capacity; w++) {
                if (wt[i - 1] <= w) {
                    dp[i][w] = Math.max(dp[i - 1][w], dp[i - 1][w -
wt[i - 1]] + val[i - 1]);
                } else {
                    dp[i][w] = dp[i - 1][w];
                }
            }
        }
        return dp[n][capacity];
    }

    public static void main(String[] args) {
        int[] val1 = {1, 2, 3};
        int[] wt1 = {4, 5, 1};
        int capacity1 = 4;
        System.out.println("TestCase1: " + classics(capacity1, wt1,
val1));

        int[] val2 = {1, 2, 3};
        int[] wt2 = {4, 5, 6};
```

```
        int capacity2 = 3;
        System.out.println("Testcase2: " + classics(capacity2, wt2,
val2));

        int[] val3 = {10, 40, 30, 50};
        int[] wt3 = {5, 4, 6, 3};
        int capacity3 = 5;
        System.out.println("Testcase3: " + classics(capacity3, wt3,
val3));
    }
}
```

```
C:\Users\sidha> cmd /C "C:\Users\sidha\AppData\Roaming\Code\User\globalStorage\pleiades.java-extension-pack-jdk\java\21\bin\java.exe -agentlib:jdwp=
transport=dt_socket,server=n,suspend=y,address=localhost:50678 -XX:+ShowCodeDetailsInExceptionMessages -cp C:\Users\sidha\AppData\Local\Temp\vscodes
ws_f4976\jdt_ws\jdt.ls-java-project\bin Knapsack "
TestCase1: 3
Testcase2: 0
Testcase3: 50
```

Time Complexity : O(n^2)

4. Equal Arrays

```
import java.util.HashMap;

public class EqualArrays{
    public static boolean hashingtech(int[] a,int[] b){
        if(a.length != b.length){
            return false;
        }
        HashMap<Integer,Integer> hash= new HashMap<>();
        for(int i : a){
            hash.put(i,hash.getOrDefault(i,0)+1);
        }
        for(int j : b){
            if(!hash.containsKey(j)){
                return false;
            }
            hash.put(j, hash.get(j)-1);
            if(hash.get(j) < 0){
                return false;
            }
        }
```

```
        return true;
    }
    public static void main(String[] socrates){
        int[] arr1 = {1, 2, 5, 4, 0};
        int[] arr2 = {2, 4, 5, 0, 1};
        System.out.println("Testcase1: " + hashingtech(arr1, arr2));

        int[] arr3 = {1, 2, 5};
        int[] arr4 = {2, 4, 15};
        System.out.println("Testcase2: " + hashingtech(arr3, arr4));
    }
}
```

```
C:\Users\sidha> cmd /C "C:\Users\sidha\AppData\Roaming\Code\User\globalStorage\pleiades.java-extension-pack-jdk\java\21\bin\java.exe -agentlib:jdwp=
transport=dt_socket,server=n,suspend=y,address=localhost:51551 -XX:+ShowCodeDetailsInExceptionMessages -cp C:\Users\sidha\AppData\Local\Temp\vscodes
ws_f4976\jdt_ws\jdt.ls-java-project\bin EqualArrays "
Testcase1: true
Testcase2: false
```

Time Complexity : O(n)

5.Balanced Tree Check

```
class TreeNode {
    int data;
    TreeNode left, right;

    TreeNode(int data) {
        this.data = data;
        left = right = null;
    }
}

public class BinaryTree {

    private static int checkHeightBalance(TreeNode node) {
        if (node == null) {
            return 0;
        }

        int leftHeight = checkHeightBalance(node.left);
        int rightHeight = checkHeightBalance(node.right);
```

```
        if (leftHeight == -1 || rightHeight == -1 ||
Math.abs(leftHeight - rightHeight) > 1) {
            return -1;
        }

        return Math.max(leftHeight, rightHeight) + 1;
    }

    public static boolean isBalanced(TreeNode root) {
        return checkHeightBalance(root) != -1;
    }

    public static void main(String[] args) {
        TreeNode root1 = new TreeNode(1);
        root1.left = new TreeNode(2);
        root1.left.right = new TreeNode(3);
        System.out.println("Tree 1 is balanced: " + isBalanced(root1));

        TreeNode root2 = new TreeNode(10);
        root2.left = new TreeNode(20);
        root2.right = new TreeNode(30);
        root2.left.left = new TreeNode(40);
        root2.left.right = new TreeNode(60);
        System.out.println("Tree 2 is balanced: " + isBalanced(root2));
    }
}
```

```
C:\Users\sidha> cmd /C "C:\Users\sidha\AppData\Roaming\Code\User\globalStorage\pleiades.java-extension-pack-jdk\java\21\bin\java.exe -agentlib:jdwp=
transport=dt_socket,server=n,suspend=y,address=localhost:51912 -XX:+ShowCodeDetailsInExceptionMessages -cp C:\Users\sidha\AppData\Local\Temp\vscodes
ws_e4afa\jdt_ws\jdt.ls-java-project\bin BinaryTree "
Tree 1 is balanced: false
Tree 2 is balanced: true
```

Time Complexity : O(n)