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Practice set – 2

1. 0-1 knapsack problem:

Java code:

```
public class Knapsack {
   public static int result(int capacity,int[] wt,int[] val,int n){
      int[][] dp=new int[n+1][capacity+1];
      for (int i=1;i<=n;i++){
         for (int w=1;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}, wt1={4,5,1};
      int[] val2={1,2,3}, wt2={4,5,6};
      int[] val3={10,40,30,50}, wt3={5,4,6,3};
      int c1=4,c2=3,c3=5;
      System.out.println(result(c1, wt1, val1, val1.length));
      System.out.println(result(c2, wt2, val2, val2.length));
      System.out.println(result(c3, wt3, val3, val3.length));
   }}
```

Output:

```
ta\Roaming\Code\User\workspaceStorage\523cfcfe70afc85c5bbe661f188bf040\redhat.j
ava\jdt_ws\javacodingPractice_2211b306\bin' 'Knapsack'
3
0
50
PS C:\Users\nirma\OneDrive\Documents\javacodingPractice>
```

Time complexity: O(nxCapacity)

Space complexity: O(nxCapacity)

2. Floor in sorted array:

Java code:

```
public class FloorinSortedArray {
   public static int floor(int[] arr,int k){
      for (int i=arr.length-1;i>=0;i--){
         if (arr[i]<=k){
            return i;
         }
      }
      return -1;
   }
   public static void main(String[] args) {
      int[] arr1={1, 2, 8, 10, 11, 12, 19};
      int[] arr2={1, 2, 8};
      int k1=0,k2=5,k3=1;
      System.out.println(floor(arr1, k1));
      System.out.println(floor(arr1, k2));
      System.out.println(floor(arr2, k3));


   }
}
```

Output:

```
88bf040\redhat.java\jdt_ws\javacodingPractice_2211b306\bin' 'FloorinSortedArray
'
-1
1
0
PS C:\Users\nirma\OneDrive\Documents\javacodingPractice>
```

Time complexity: O(n)

Space complexity: O(1)

3. Check equal arrays:

Java code:

```
import java.util.HashMap;
import java.util.Arrays;
public class CheckEqualArray {
   public static boolean check(int[] arr1,int[] arr2){
      if (arr1.length!=arr2.length){
         return false;
      }
      HashMap<Integer,Integer> map=new HashMap<>();
      for (int i:arr1){
         map.put(i, map.getOrDefault(i,0)+1);
      }
      for (int j:arr2){
         if (!map.containsKey(j)){
            return false;
         }
         map.put(j, map.get(j)-1);
         if (map.get(j)<0){
            return false;
         }
      }
      for (int k:map.values()){
         if (k!=0){
            return false;
         }
      }
      return true;
   }
   public static void main(String[] args) {
      int[] arr1={1,2,5,4,0};
      int[] arr2={2,4,5,0,1};
      int[] arr3={1,2,5};
      int[] arr4={2,4,15};
      System.out.println(Arrays.toString(arr1)+", "+Arrays.toString(arr2)+": "+check(arr1, arr2));
      System.out.println(Arrays.toString(arr3)+", "+Arrays.toString(arr4)+": "+check(arr3, arr4));
```

```
  }
}
```

Output:

```
ta\Roaming\Code\User\workspaceStorage\523cfcfe70afc85c5bbe661f188bf040\redhat.j
ava\jdt_ws\javacodingPractice_2211b306\bin' 'CheckEqualArray'
[1, 2, 5, 4, 0], [2, 4, 5, 0, 1]: true
[1, 2, 5], [2, 4, 15]: false
PS C:\Users\nirma\OneDrive\Documents\javacodingPractice>
```

Time complexity: O(n)

Space complexity: O(n)

4. Palindrome linked list

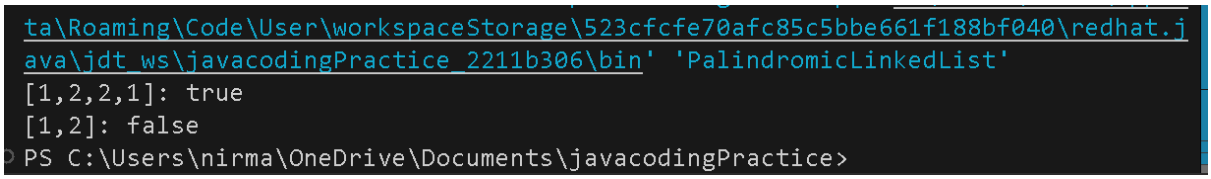
Java Code:

```
import java.util.Stack;
class Node{
  int data;
  Node next;
  Node(int d){
    data=d;
    next=null;
  }
}

public class PalindromicLinkedList {
  public static boolean palindrome(Node head){
    Node curr=head;
    Stack<Integer> st=new Stack<>();
    while (curr!=null){
      st.push(curr.data);
      curr=curr.next;
    }
    while (head!=null){
      int a=st.pop();
      if (head.data!=a){
        return false;
```

```
        }
        head=head.next;
      }
      return true;
    }
    public static void main(String[] args) {
      Node head=new Node(1);
      head.next=new Node(2);
      head.next.next=new Node(2);
      head.next.next.next=new Node(1);
      Node head2=new Node(1);
      head2.next=new Node(2);
      System.out.println(palindrome(head));
      System.out.println(palindrome(head2));
    }
}
```

Output:



Time complexity: O(n)

Space complexity: O(n)

5. Balanced tree check:

Java code:

```
class Tree{
   int data;
   Tree left,right;
   Tree (int d){
      data=d;
      left=null;
      right=null;
```

```
    }
}
public class BalancedTreeCheck {
    public static int height(Tree root){
        if (root==null){
            return 0;
        }
        int lefth=height(root.left);
        if (lefth==-1){
            return -1;
        }
        int righth=height(root.right);
        if (righth==-1){
            return -1;
        }
        if (Math.abs(lefth-righth)>1){
            return -1;
        }
        return Math.max(lefth, righth)+1;
    }
    public static boolean checkbalance(Tree root){
        if (height(root)!=-1){
            return true;
        }else{
            return false;
        }
    }
    public static void main(String[] args) {
        Tree t1=new Tree(1);
        t1.left=new Tree(2);
        t1.left.right=new Tree(3);
        System.out.println(checkbalance(t1));
        Tree t2=new Tree(10);
        t2.left=new Tree(20);
```

```
        t2.right=new Tree(30);
        t2.left.left=new Tree(40);
        t2.left.right=new Tree(60);
        System.out.println(checkbalance(t2));
    }
}
```

Output:

```
ta\Roaming\Code\User\workspaceStorage\523cfcfe70afc85c5bbe661f188bf040\redhat.j
ava\jdt_ws\javacodingPractice_2211b306\bin' 'BalancedTreeCheck'
false
true
PS C:\Users\nirma\OneDrive\Documents\javacodingPractice>
```

Time complexity: O(n)

Space complexity: O(n)

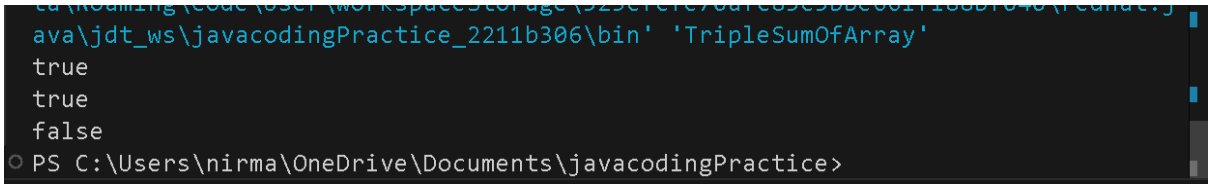
6. Triplet sum in array

Java code:

```
import java.util.Arrays;
public class TripleSumOfArray {
    public static boolean sum(int[] arr, int x){
        Arrays.sort(arr);
        for (int i=0;i<arr.length;i++){
            int left=i+1;
            int right=arr.length-1;
            while (left<right){
                int s=arr[i]+arr[left]+arr[right];
                if (s==x){
                    return true;
                }else if (s<x){
                    left++;
                }else{
                    right--;
                }
            }
        }
        return false;
```

```
    }
    public static void main(String[] args) {
        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 k1=13,k2=10,k3=24;
        System.out.println(sum(arr1, k1));
        System.out.println(sum(arr2, k2));
        System.out.println(sum(arr3, k3));
    }
}
```

Output:



Time complexity: O(n^2)

Space complexity: O(1)