Coding practice Problems:

1. Maximum Subarray Sum – Kadane’s Algorithm:
   Given an array arr[], the task is to find the subarray that has the maximum sum and return its sum.
   Input: arr[] = {2, 3, -8, 7, -1, 2, 3}
   Output: 11
   Explanation: The subarray {7, -1, 2, 3} has the largest sum 11.

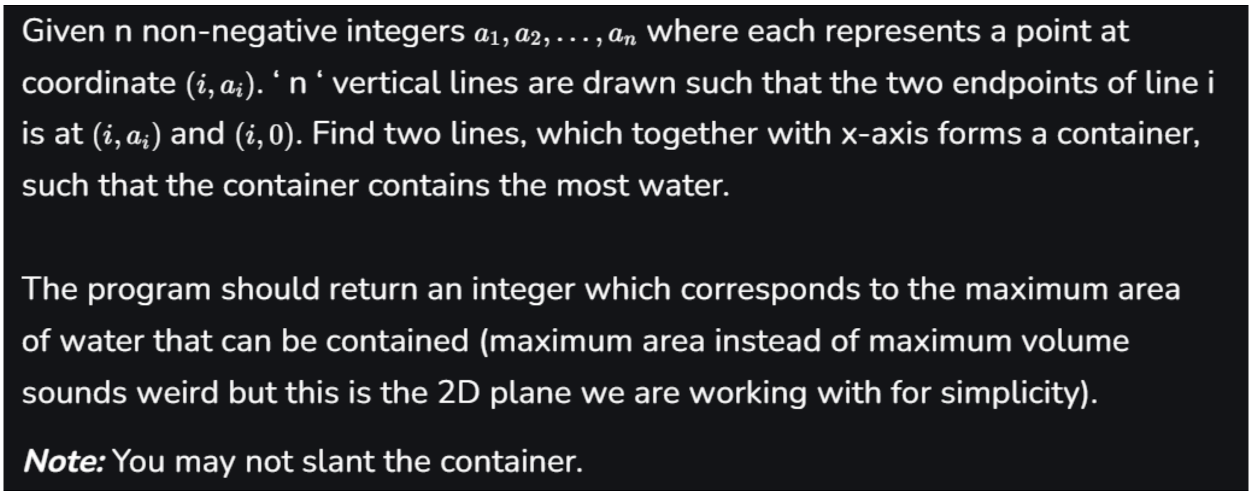
   Input: arr[] = {-2, -4}
   Output: –2
   Explanation: The subarray {-2} has the largest sum -2.

   Input: arr[] = {5, 4, 1, 7, 8}
   Output: 25
   Explanation: The subarray {5, 4, 1, 7, 8} has the largest sum 25.
2. Maximum Product Subarray
   Given an integer array, the task is to find the maximum product of any subarray.
   Input: arr[] = {-2, 6, -3, -10, 0, 2}
   Output: 180
   Explanation: The subarray with maximum product is {6, -3, -10} with product = 6 * (-3) * (-10) = 180

   Input: arr[] = {-1, -3, -10, 0, 60}
   Output: 60
   Explanation: The subarray with maximum product is {60}.
3. Search in a sorted and rotated Array
   Given a sorted and rotated array arr[] of n distinct elements, the task is to find the index of given key in the array. If the key is not present in the array, return -1.
   Input : arr[] = {4, 5, 6, 7, 0, 1, 2}, key = 0
   Output : 4

   Input : arr[] = { 4, 5, 6, 7, 0, 1, 2 }, key = 3
   Output : -1

   Input : arr[] = {50, 10, 20, 30, 40}, key = 10
   Output : 1
4. Container with Most Water



Given n non-negative integers $a_1, a_2, \ldots, a_n$ where each represents a point at coordinate (i, a_i). ‘ n ‘ vertical lines are drawn such that the two endpoints of line i is at (i, a_i) and $(i, 0)$. Find two lines, which together with x-axis forms a container, such that the container contains the most water.

The program should return an integer which corresponds to the maximum area of water that can be contained (maximum area instead of maximum volume sounds weird but this is the 2D plane we are working with for simplicity).

Note: You may not slant the container.

Input: arr = [1, 5, 4, 3]

Output: 6

Explanation:

5 and 3 are distance 2 apart. So the size of the base = 2.

Height of container = min(5, 3) = 3. So total area = 3 * 2 = 6

Input: arr = [3, 1, 2, 4, 5]

Output: 12

Explanation:

5 and 3 are distance 4 apart. So the size of the base = 4.

Height of container = min(5, 3) = 3. So total area = 4 * 3 = 12

5. Find the Factorial of a large number
   Input: 100
   Output:
   933262154439441526816992388562667004907159682643816214685929638952175999932299
   156089414639761565182862536979208272237582511852109168640000000000000000000000
   00

   Input: 50
   Output: 30414093201713378043612608166064768844377641568960512000000000000

6. Trapping Rainwater Problem states that given an array of n non-negative integers arr[] representing an elevation map where the width of each bar is 1, compute how much water it can trap after rain.
   Input: arr[] = {3, 0, 1, 0, 4, 0, 2}
   Output: 10
   Explanation: The expected rainwater to be trapped is shown in the above image.

   Input: arr[]   = {3, 0, 2, 0, 4}
   Output: 7
   Explanation: We trap 0 + 3 + 1 + 3 + 0 = 7 units.

   Input: arr[] = {1, 2, 3, 4}
   Output: 0
   Explanation : We cannot trap water as there is no height bound on both sides

   Input: arr[] = {10, 9, 0, 5}
   Output: 5
   Explanation : We trap 0 + 0 + 5 + 0 = 5
7. Chocolate Distribution Problem
   Given an array arr[] of n integers where arr[i] represents the number of chocolates in ith packet. Each packet can have a variable number of chocolates. There are m students, the task is to distribute chocolate packets such that:

   Each student gets exactly one packet.
   The difference between the maximum and minimum number of chocolates in the packets given to the students is minimized.
   Input: arr[] = {7, 3, 2, 4, 9, 12, 56}, m = 3
   Output: 2
   Explanation: If we distribute chocolate packets {3, 2, 4}, we will get the minimum difference, that is 2.

   Input: arr[] = {7, 3, 2, 4, 9, 12, 56}, m = 5
   Output: 7
   Explanation: If we distribute chocolate packets {3, 2, 4, 9, 7}, we will get the minimum difference, that is 9 – 2 = 7.
8. Merge Overlapping Intervals
   Given an array of time intervals where arr[i] = [starti, endi], the task is to merge all the overlapping intervals into one and output the result which should have only mutually exclusive intervals.
   Input: arr[] = [[1, 3], [2, 4], [6, 8], [9, 10]]
   Output: [[1, 4], [6, 8], [9, 10]]
   Explanation: In the given intervals, we have only two overlapping intervals [1, 3] and [2, 4]. Therefore, we will merge these two and return [[1, 4}], [6, 8], [9, 10]].

Input: arr[] = [[7, 8], [1, 5], [2, 4], [4, 6]]
Output: [[1, 6], [7, 8]]
Explanation: We will merge the overlapping intervals [[1, 5], [2, 4], [4, 6]] into a single interval [1, 6].

9. A Boolean Matrix Question
   Given a boolean matrix mat[M][N] of size M X N, modify it such that if a matrix cell mat[i][j] is 1 (or true) then make all the cells of ith row and jth column as 1.
   Input: {{1, 0},
   {0, 0}}
   Output: {{1, 1}
   {1, 0}}
   Input: {{0, 0, 0},
   {0, 0, 1}}
   Output: {{0, 0, 1},
   {1, 1, 1}}

   Input: {{1, 0, 0, 1},
   {0, 0, 1, 0},
   {0, 0, 0, 0}}
   Output: {{1, 1, 1, 1},
   {1, 1, 1, 1},
   {1, 0, 1, 1}}
10. Print a given matrix in spiral form
    Given an m x n matrix, the task is to print all elements of the matrix in spiral form.
    Input: matrix = {{1, 2, 3, 4},
    {5, 6, 7, 8},
    {9, 10, 11, 12},
    {13, 14, 15, 16 }}
    Output: 1 2 3 4 8 12 16 15 14 13 9 5 6 7 11 10
    Input: matrix = { {1, 2, 3, 4, 5, 6},
    {7, 8, 9, 10, 11, 12},
    {13, 14, 15, 16, 17, 18}}

    Output: 1 2 3 4 5 6 12 18 17 16 15 14 13 7 8 9 10 11
    Explanation: The output is matrix in spiral format.

13. Check if given Parentheses expression is balanced or not
    Given a string str of length N, consisting of '(' and ')' only, the task is to check whether it is balanced or not.

Input: str = “((()))()()”
Output: Balanced
Input: str = “())((())”
Output: Not Balanced

14. Check if two Strings are Anagrams of each other
    Given two strings s1 and s2 consisting of lowercase characters, the task is to check whether the two given strings are anagrams of each other or not. An anagram of a string is another string that contains the same characters, only the order of characters can be different.
    Input: s1 = “geeks” s2 = “kseeg”
    Output: true
    Explanation: Both the string have same characters with same frequency. So, they are anagrams.

    Input: s1 = “allergy” s2 = “allergic”
    Output: false
    Explanation: Characters in both the strings are not same. s1 has extra character ‘y’ and s2 has extra characters ‘i’ and ‘c’, so they are not anagrams.

    Input: s1 = “g”, s2 = “g”
    Output: true
    Explanation: Characters in both the strings are same, so they are anagrams.

15. Longest Palindromic Substring
    Given a string str, the task is to find the longest substring which is a palindrome. If there are multiple answers, then return the first appearing substring.
    Input: str = “forgeeksskeegfor”
    Output: “geeksskeeg”
    Explanation: There are several possible palindromic substrings like “kssk”, “ss”, “eeksskee” etc. But the substring “geeksskeeg” is the longest among all.

    Input: str = “Geeks”
    Output: “ee”

    Input: str = “abc”
    Output: “a”

    Input: str = “”
    Output: “”

16. Longest Common Prefix using Sorting
    Given an array of strings arr[]. The task is to return the longest common prefix among each and every strings present in the array. If there’s no prefix common in all the strings, return “-1”.
    Input: arr[] = [“geeksforgeeks”, “geeks”, “geek”, “geezer”]
    Output: gee
    Explanation: “gee” is the longest common prefix in all the given strings.

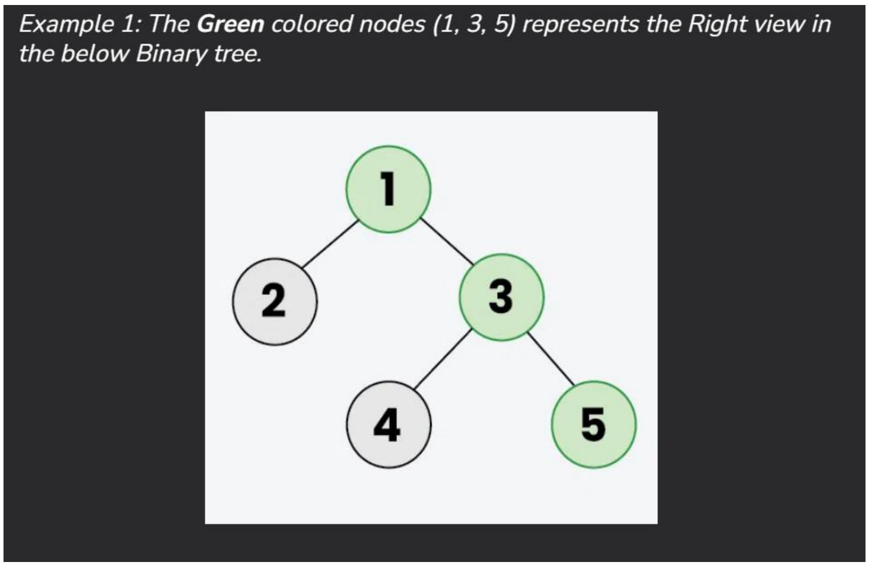
Input: arr[] = [“hello”, “world”]
Output: -1
Explanation: There’s no common prefix in the given strings.

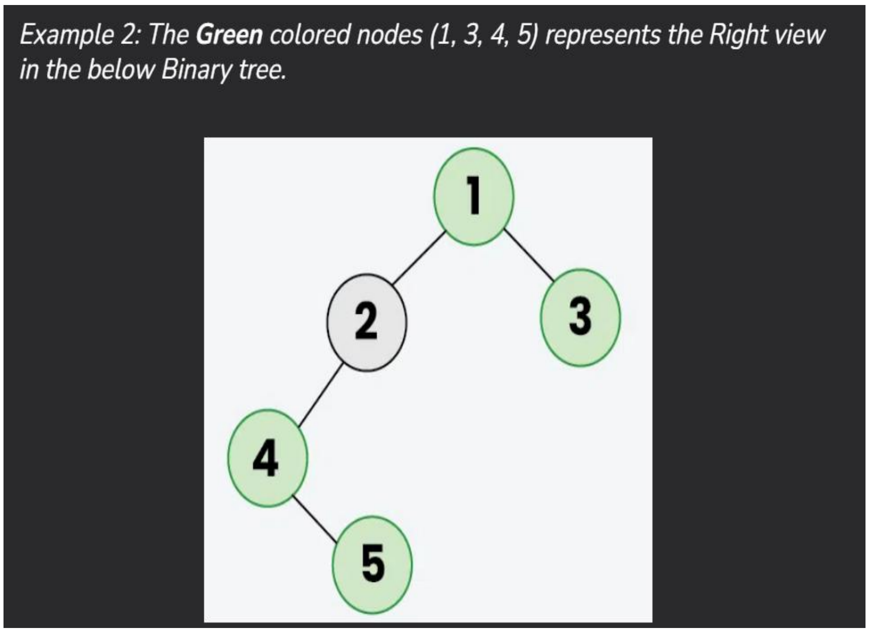
17. Delete middle element of a stack
    Given a stack with push(), pop(), and empty() operations, The task is to delete the middle element of it without using any additional data structure.
    Input : Stack[] = [1, 2, 3, 4, 5]
    Output : Stack[] = [1, 2, 4, 5]

    Input : Stack[] = [1, 2, 3, 4, 5, 6]
    Output : Stack[] = [1, 2, 4, 5, 6]
18. Next Greater Element (NGE) for every element in given Array
    Given an array, print the Next Greater Element (NGE) for every element.

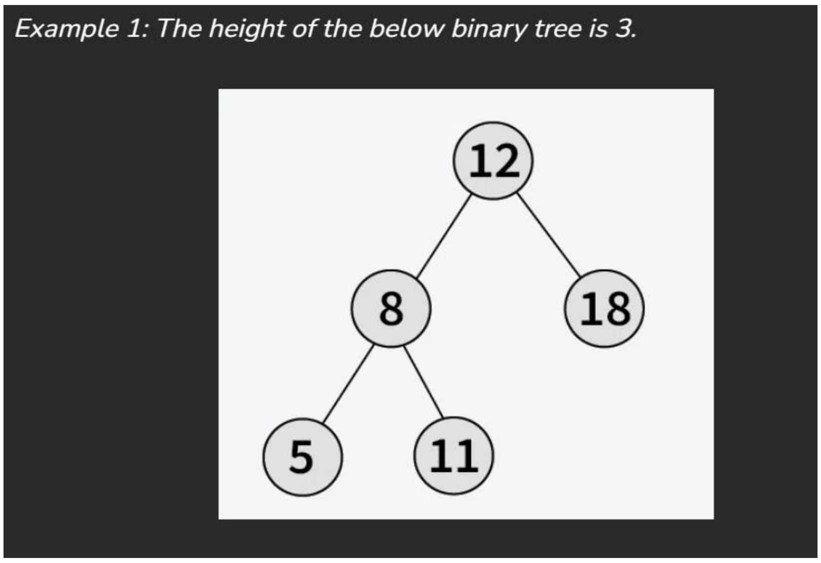
    Note: The Next greater Element for an element x is the first greater element on the right side of x in the array. Elements for which no greater element exist, consider the next greater element as -1.
    Input: arr[] = [4 , 5 , 2 , 25]
    ```
    Output:  4     –>   5
             5     –>   25
             2     –>   25
            25     –>   -1
    ```
    Explanation: Except 25 every element has an element greater than them present on the right side

    Input: arr[] = [13 , 7, 6 , 12]
    ```
    Output:  13     –>    -1
              7      –>     12
              6      –>     12
             12     –>    -1
    ```
    Explanation: 13 and 12 don’t have any element greater than them present on the right side
19. Print Right View of a Binary Tree
    Given a Binary Tree, the task is to print the Right view of it. The right view of a Binary Tree is a set of rightmost nodes for every level.


*Example 1: The **Green** colored nodes (1, 3, 5) represents the Right view in the below Binary tree.*


*Example 2: The **Green** colored nodes (1, 3, 4, 5) represents the Right view in the below Binary tree.*

20. Maximum Depth or Height of Binary Tree
    Given a binary tree, the task is to find the maximum depth or height of the tree. The height of the tree is the number of vertices in the tree from the root to the deepest node.


Example 1: The height of the below binary tree is 3.

Example 2: The height of the below binary tree is 4