# Amazon Interview Preparation Sheet

**1.** Given that integers are read from a data stream. Find median of elements read so for in efficient way. For simplicity assume there are no duplicates. For example, let us consider the stream 5, 15, 1, 3 …

**Explanation:**
After reading 1st element of stream - 5 -> median – 5
After reading 2nd element of stream - 5, 15 -> median – 10
After reading 3rd element of stream - 5, 15, 1 -> median – 5
After reading 4th element of stream - 5, 15, 1, 3 -> median - 4, so on...

**2.** Given a Graph, write the code to generate topological sort.

**3.** Given a binary tree (not a binary search tree) and two values say n1 and n2, write a program to find the least common ancestor.

**Explanation:** Let T be a rooted tree. The lowest common ancestor between two nodes n1 and n2 is defined as the lowest node in T that has both n1 and n2 as descendants

**4.** The cost of a stock on each day is given in an array, find the max profit that you can make by buying and selling in those days.

**Explanation:** If the given array is {100, 180, 260, 310, 40, 535, 695}, the maximum profit can earned by buying on day 0, selling on day 3. Again buy on day 4 and sell on day 6. If the given array of prices is sorted in decreasing order, then profit cannot be earned at all.

**5.** Given a array of positive and negative integers, and a number X. Find whether there exist two numbers in the array whose sum will be equal to X.

**6.** Given a one-dimensional array of positive and negative integers, write a program to find the sum of contiguous subarray within the given array which has the largest sum.

**7.** Given a total possible page numbers that can be referred and cache (or memory) size (Number of page frames that cache can hold at a time). Write a program to implement LRU caching scheme.

**Explanation:** The LRU caching scheme is to remove the least recently used frame when the cache is full and a new page is referenced which is not there in cache.

**8.** You are given a list of n-1 integers and these integers are in the range of 1 to n. There are no duplicates in the list. One of the integers is missing in the list. Write a program to find the missing integer.

**9.** Given k sorted arrays of size n each, merge them and print the sorted output.

**10.** Given a binary tree, a node N present in the binary tree and a value K. Write a program to find all the nodes that are at distance K from node N.

**11.** You are given a Double Link List with one pointer of each node pointing to the next node just like in a single link list. The second pointer however can point to any node in the list and not just the previous node. Write a program which will create a copy of this list.

**Input Example:**
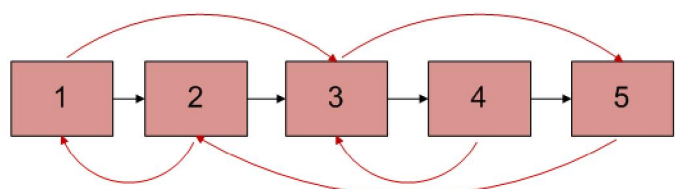
**12.** Given a string of arrays, write a program to print all anagram pairs in the given array.
**Explanation:** Input string { cat, dog, dot, act, god}. Output {cat, act} {dog, god}

**13.** Find the distance between two keys in a binary tree, no parent pointers are given.
**Explanation:** Distance between two nodes is the minimum number of edges to be traversed to reach one node from other.

**14.** Given a input string and a pattern, write a program to print all the start index numbers from where the anagram of the given pattern matches.
**Explanation:** Input string { abcbaabcdba} and Pattern {ab}, Output { 0,3,5,9}

**15.** Write a program to reverse a stack using recursion.

**16.** Given an array, print the Next Greater Element (NGE) for every element.
**Explanation:** The Next greater Element for an element x is the first greater element on the right side of x in array. Elements for which no greater element exist, consider next greater element as -1.

**17.** Given a text and a wildcard pattern, implement wildcard pattern matching algorithm that finds if wildcard pattern is matched with text. The matching should cover the entire text (not partial text).
**Explanation:** The wildcard pattern can include the characters '?' and '*'
'?' – matches any single character
'*' – Matches any sequence of characters (including the empty sequence)

Input String = "baaabab",
Pattern = "*****ba*****ab", Output : true
Pattern = "baaa?ab", Output : true
Pattern = "ba*a?", Output : true
Pattern = "a*ab", output : false

**18.** Given an array of integers which is initially increasing and then decreasing, find the maximum value in the array.

**19. The Celebrity Problem:** In a party of N people, only one person is known to everyone. Such a person may be present in the party, if yes, (s)he doesn't know anyone in the party. We can only ask questions like "does A know B? ". Find the stranger (celebrity) in minimum number of questions.

**20.** Given a array of strings, write a program to find all pairs that can be joined to form a palindrome.

**21.** Given a NXM matrix containing 0's and 1's, where 1 means blocked shell. The problem is to count all the possible paths from top left to bottom right with the constraints that from each cell you can either move only to right or down.

**22.** Given a binary tree containing positive and negative numbers, find the maximum path sum. The path may start and end at any node in the tree.

**23.** Given an integer array find the number of merge operations required to make it a palindrome.
Input : arr[] = {15, 4, 15}, Output : 0 (Array is already a palindrome. So we do not need any merge operation.)
**24.** Input : arr[] = {1, 4, 5, 1}, Output : 1 (We can make given array palindrome with minimum one merging (merging 4 and 5 to make 9))

**25. Knight Walk problem:** Given a square chessboard of N x N size, the position of Knight and position of a target is given. We need to find out minimum steps a Knight will take to reach the target position.

**26.** There are two singly linked lists in a system, find the point where two lists are converging.
**Explanation:** Convergence point is the point or node where both the linked lists got linked, forming an inverted Y shaped list.

**27.** Given a Binary Tree, we need to print the bottom view from left to right. A node x is there in output if x is the bottommost node at its horizontal distance. Horizontal distance of left child of a node x is equal to horizontal distance of x minus 1, and that of right child is horizontal distance of x plus 1.

**28. Handshake Problem:** There are N persons in a room. Find the maximum number of Handshakes possible. Given the fact that any two persons shake hand exactly once.

**29.** Given a binary search tree, task is to find Kth largest element in the binary search tree.

**30.** Given a directed graph, check whether the graph contains a cycle or not.

**31.** Given a binary search tree, convert this to a tree into sum tree.
Explanation: A sum tree is a tree in which each node contains the sum of the left and right sub trees in the original tree. The values of leaf nodes are changed to 0.

**32.** Given an array and a number k where k is smaller than size of array, write a program for printing k largest elements in that given array.

**33.** Given a string, write a program to print count of all duplicate characters present in the string.

**34. Gold Mine Problem:** Given a gold mine of n*m dimensions. Each field in this mine contains a positive integer which is the amount of gold in tons. Initially the miner is at first column but can be at any row. He can move only (right->,right up /,right down\) that is from a given cell, the miner can move to the cell diagonally up towards the right or right or diagonally down towards the right. Find out maximum amount of gold he can collect.

**35.** Given a Binary Tree, find the vertical sum of the nodes that are in the same vertical line. Print all sums through different vertical line.
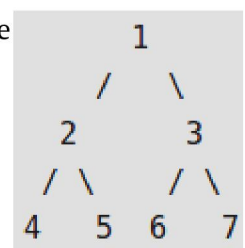**Explanation: Input tree**
Vertical-Line-1 has only one node 4 => vertical sum is 4
Vertical-Line-2: has only one node 2=> vertical sum is 2
Vertical-Line-3: has three nodes: 1,5,6 => vertical sum is 1+5+6 = 12
Vertical-Line-4: has only one node 3 => vertical sum is 3
Vertical-Line-5: has only one node 7 => vertical sum is 7

**36.** Given a Linked List and a number N, write a function that returns the value at the N'th node from the end of the Linked List.

**37.** Given a matrix of size N*M, and a number K. We have to rotate the matrix K times to the right side.

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Input:
        20
        /
      8
     /
   10
   /
  5
Output: 20 8 10 5 -1 -1 -1 -1 -1
```

**38.** Given a binary tree, write a program to serialize and deserialize it. Mark the NULL pointer as -1.
Explanation: Serialization is to store tree in a file so that it can be later restored. The structure of tree must be maintained. Deserialization is reading tree back from file.

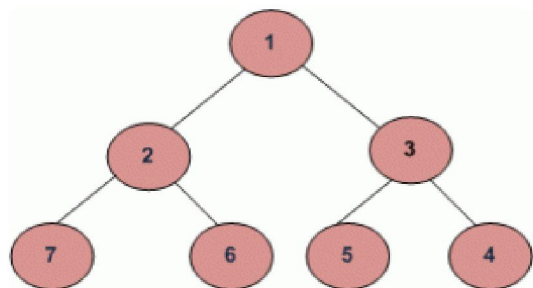**39.** Given a string, find the longest substring which is palindrome.

**40.** Given a array of n positive elements we need to find the lowest possible sum of max and min elements in a subarray given that size of subarray should be greater than equal to 2.

**41.** Given a singly linked list, write a function to swap elements pairwise.

**42.** Given a binary tree, print all cousins of a given node. Two nodes of binary tree are cousins of each other only if they have different parents but they have same level.

**43.** Write a function to print ZigZag order traversal of a binary tree.
**Input Tree:**



**Output:** 1 3 2 7 6 5 4