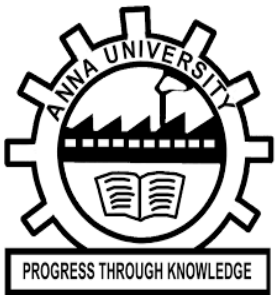


MADRAS INSTITUTE OF TECHNOLOGY
ANNA UNIVERSITY
ASSOCIATION OF COMPUTER TECHNOLOGISTS

ONSITE PROGRAMMING CONTEST

INSTRUCTIONS:

- On the answer sheet team member should stick their team **QR** and write their unique participant id below it.
- Don't leave the app during the test.
- Time limit – **45 minutes.**
- Keep your mobile in airplane mode.
- A team can comprise of a maximum of three members. Optimal solution will be given extra weightage.

PART A (9*2=18)

1. Subtract two numbers without using arithmetic operators.
2. Swapping two numbers without a temporary variable.
3. Multiplication of two numbers using a shift operator.
4. Given a tree such that all nodes have 0 or 2 children, find the number of leaf nodes if the number of non-leaf nodes is given as X.
5. Complete the code below to fill a n x n matrix in the following fashion,

```
-3  -2 -1  0

-2  -1  0  1

-1   0  1  2

 0   1  2  3

for (i=0; i<n; i++) {
        for (j=0; j<n; j++) {
                        a[i][j] = _______; }
 }
```

6. Convert the given binary tree into a DLL, with the left pointer pointing to the previous node, and the right pointer pointing to the next. The order of nodes in the list must be the same as the inorder traversal of the tree.
7. Print “hello world” 1000 times in C/C++ without using any loops, user-defined functions or classes. (main function is allowed).
8. Construct a BST from the given inorder and postorder traversals,

   Inorder: 5 6 1 2 9 3 10

   PostOrder: 6 5 2 9 10 3 1

9. Given an array of **N** integers. The task is to print the sorted array such that all numbers that are **prime** stay in the same place, sort only the **non-prime** numbers.

   Input: arr[] = {100, 11, 500, 2, 17, 1}

   Output: 1, 11, 100, 2, 17, 500

PART B (4*3=12)

10. Given n non-negative integers representing an elevation map where the width of each bar is 1, compute how much water it is able to trap after raining.

    Input: arr[] = {3, 0, 0, 2, 0, 4}

    Output: 10

    Structure is like below,

```
     |
 |   |
 | | |
 |__|_|
```

11. Given K sorted linked lists of size N each, merge them and print the sorted output.
    Input: k = 3, n = 4

    list1 = 1->3->5->7->NULL
    list2 = 2->4->6->8->NULL
    list3 = 0->9->10->11

    Output:
    0->1->2->3->4->5->6->7->8->9->10->11

12. Given that integers are read from a data stream. Find the median of elements read so for in an efficient way. For simplicity assume there are no duplicates. **Time Complexity:** O(nlogn).

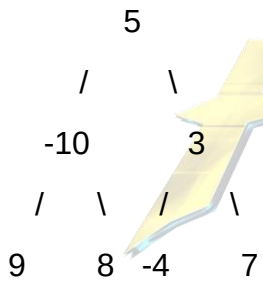
PART C (2*5=10)

13. Given a binary tree containing N+1 with N edges nodes and an integer X. Your task is to complete the function **countSubtreesWithSumX()** that returns the count of the number of sub tress having total node's data sum equal to a value X.

Input:

5 -10 3 9 8 -4 7

7



Output:

2

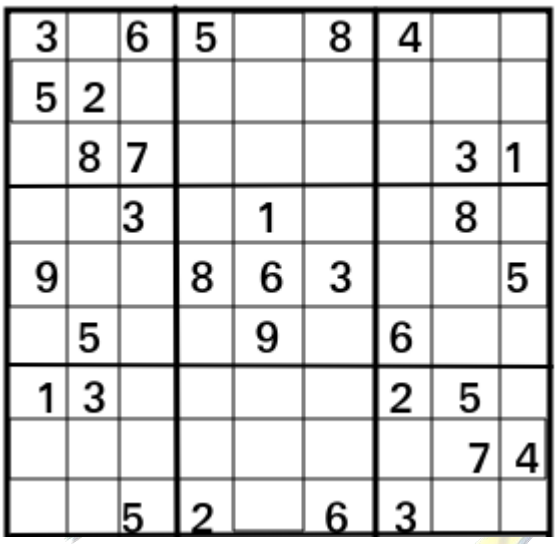
14. Given two integers 'n' and 'm', find all the stepping numbers in range [n, m]. A number is called a stepping number if all adjacent digits have an absolute difference of 1. 321 is a Stepping Number while 421 is not.

Input : n = 0, m = 21

Output : 0 1 2 3 4 5 6 7 8 9 10 12 21

PART D (1*10=10)

15. Given an incomplete Sudoku configuration in terms of a 9 x 9 2-D square matrix (mat [][]). The task to print a solved Sudoku. For simplicity you may assume that there will be only one unique solution. The first line of input contains an integer T denoting the no of test cases. Then T test cases follow. Each test case contains 9 x 9 space separated values of the matrix mat [][] representing an incomplete Sudoku state where a 0 represents empty block. For each test case, print the space separated values of the solution of the sudoku.



Input:

1

3 0 6 5 0 8 4 0 0

5 2 0 0 0 0 0 0 0

0 8 7 0 0 0 0 3 1

0 0 3 0 1 0 0 8 0

9 0 0 8 6 3 0 0 5

0 5 0 0 9 0 6 0 0

1 3 0 0 0 0 2 5 0

0 0 0 0 0 0 0 7 4

0 0 5 2 0 6 3 0 0

Output:

3 1 6 5 7 8 4 9 2

5 2 9 1 3 4 7 6 8

4 8 7 6 2 9 5 3 1

2 6 3 4 1 5 9 8 7

9 7 4 8 6 3 1 2 5

8 5 1 7 9 2 6 4 3

1 3 8 9 4 7 2 5 6

6 9 2 3 5 1 8 7 4

7 4 5 2 8 6 3 1 9