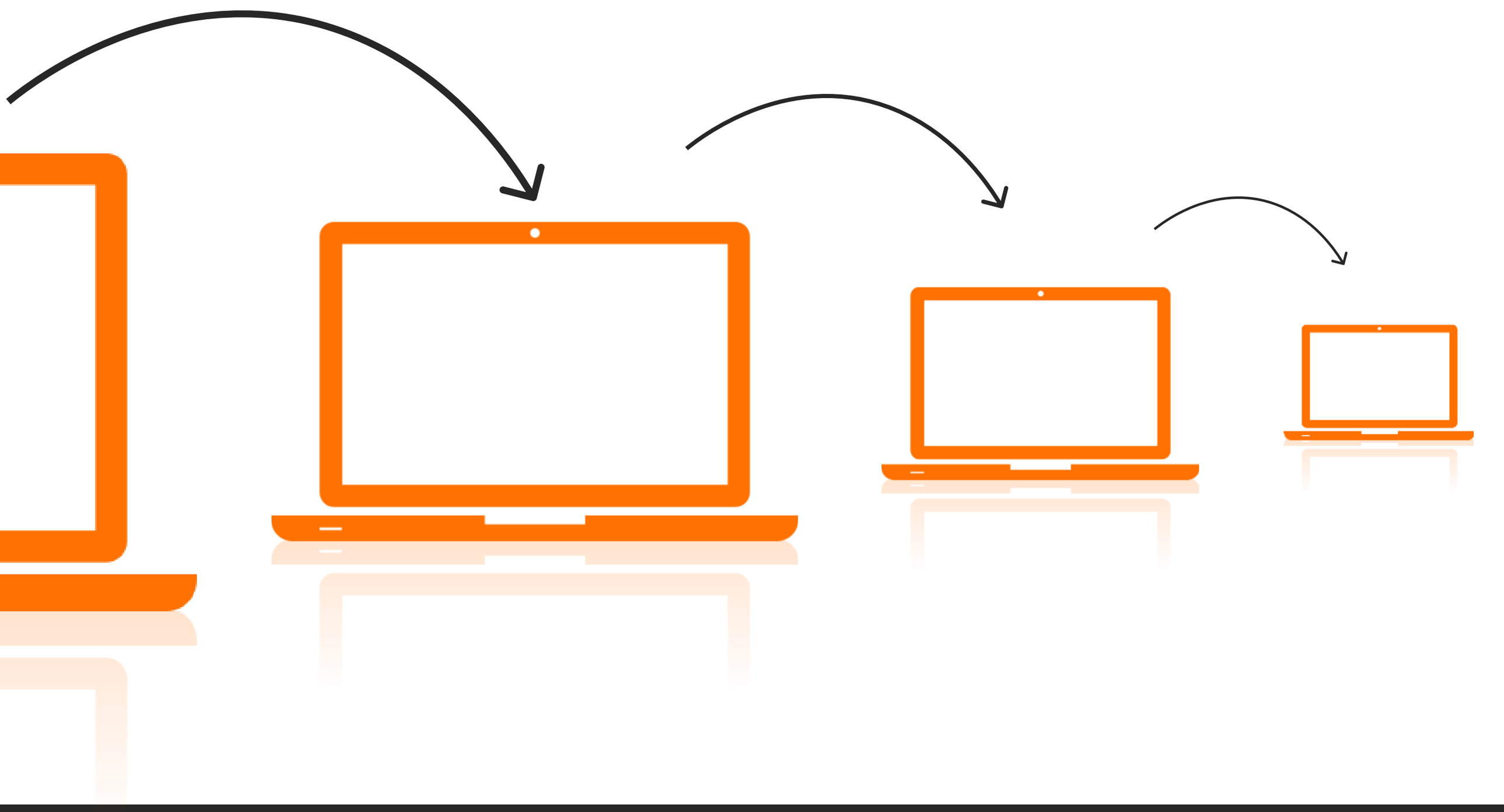
BOSSCODER ACADEMY

MASTER

RECURSION

in DSA



IN JUST 10 DAYS

Disclaimer

Everyone learns uniquely.
What matters is your focus on specific aspects of Recursion, ensuring a comprehensive understanding.

This Doc will help you with the same.

Day 1

Goal:

Understand the basic definition of recursion and its characteristics

Topics to Cover:

- Definition and characteristics of recursion
- Recursion vs. Iteration
- Recursive Stacks
- Types of recursion
- Tail Recursion Optimization

Resources:

- Introduction to Recursion - Data Structure and Algorithm Tutorials - GeeksforGeeks

- Recursion and stack

- Types of Recursions - GeeksforGeeks

Questions

1. Write a recursive function to compute sum of list of numbers
2. Write a program based on recursion to calculate the nth Fibonacci number
3. Write a program to print 1 to N without using any loops
4. Write a program to multiply two numbers using recursion
5. Write a program to get the sum of digits of a number using recursion
6. Write a program to get the length of a string using recursion
7. Write a program to calculate the value of nCr using recursion
8. Write a program to print first N terms in Fibonacci series in reverse order
9. Implement a recursive function to reverse a string.
10. Implement a recursive function to solve the Tower of Hanoi problem.

Day 2

Goal:

Gain a clear understanding on Writing and calling recursive functions and how to compute the base cases and recursive cases.

Topics to Cover:

- Base Case in Recursion
- Recursive Case
- Writing and Calling Different Types of Recursive Functions

Resources:

- Recursive Functions - GeeksforGeeks
- 11 Recursion Function Examples for Practice (Easiest 😎 to Hardest🤯) | by Co-Learner | Co-Learning Lounge | Medium
- Programming - Recursion
- Recursive Functions in JavaScript: 10 Examples - Software Development

Questions

1. Write a recursive function to compute sum of list of numbers
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Day 3

Goal:

To learn more about Divide and Conquer methods based on Recursion.

Topics to Cover:

- Algorithms using Divide and Conquer technique
- Recurrence Relation for Divide and Conquer
- Problems using Divide and Conquer technique.

Resources:

- Introduction to Divide and Conquer Algorithm - Data Structure and Algorithm Tutorials - GeeksforGeeks
- Divide and Conquer (Problem Solving Using Recursion)
- Divide and Conquer - LeetCode

Questions

1. Write a program to calculate pow(x,n) using Divide and Conquer approach
2. Demonstrate Binary Search using Divide and Conquer
3. Implement merge sort using recursion
4. Write a program to calculate square root of an integer using recursion
5. Find frequency of each element in a sorted array in less than O(n) time, assuming all elements are less than some constant M
6. Given an n x n matrix, where every row and column is sorted in increasing order check if a given key exists in the matrix
7. Given an array of 1s and 0s which has all 1s first followed by all 0s. Count the number of zeroes in the given array.
8. Given an integer array, find the peak element in it. A peak element is an element that is greater than its neighbours.
9. Given two sorted arrays of size m and n respectively, find the element that would be at the k'th position of the final sorted array.
10. Given two sorted arrays nums1 and nums2 of size m and n respectively, return the median of the two sorted arrays.

Day 4

Goal:

To learn more about Backtracking methods based on Recursion.

Topics to Cover:

- Algorithms using Backtracking technique
- Implementation of Backtracking
- Problems using Backtracking technique.

Resources:

- Introduction to Backtracking - Data Structure and Algorithm Tutorials - GeeksforGeeks

- Backtracking - LeetCode

- Backtracking (Think Like a Programmer)

Questions

1. Implement a solution to the N Queens problem using Backtracking
2. Given an undirected graph and a number m, determine if the graph can be colored with at most m colors such that no two adjacent vertices of the graph are colored with the same color
3. Write a program to remove minimum number of parentheses to make the input string valid
4. Given a N*N board with the Knight placed on the first block of an empty board. Moving according to the rules of chess, knights must visit each square exactly once. Print the order of each cell in which they are visited.
5. Write a program to count the total number of ways or paths that exist between two vertices in a directed graph.
6. Given a string you need to print all possible strings that can be made by placing spaces (zero or one) in between them.

Questions

7. Given an array of positive integers arr[] and an integer x, The task is to find all unique combinations in arr[] where the sum is equal to x.
8. Given a square maze containing positive numbers, find all paths from a corner cell (any of the extreme four corners) to the middle cell. We can move exactly n steps from a cell in 4 directions i.e. North, East, West and South where n is value of the cell.

Day 5 (Optional)

Quiz Day

Test yourself on the various topics of Recursion you learnt so far.

Resources:

- Practice Questions for Recursion | Set 1 - GeeksforGeeks
- Top MCQs on Recursion Algorithm with Answers - GeeksforGeeks
- C programming exercises: Recursion - w3resource
- https://www.sanfoundry.com/data-structure-questions-answers-recursion/

Day 6 - 10

Practice and Advanced Topics

Goal:

Strengthen your command on Recursion by Solving a wide range of questions.

Resources:

You can refer to any popular coding platform to look for Recursion tagged questions

- https://leetcode.com/tag/recursion/
- https://www.geeksforgeeks.org/recursion-practice-problems-solutions/
- https://www.hackerearth.com/practice/basic-programming/recursion/recursion-and-backtracking/practice-problems/
- https://codeforces.com/problemset?tags=divide+and+conquer

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