



CS/IS

A walkthrough to the important CS/IS topics

# Today's Presentation

- Important Algorithms
- Must do coding problems
- Core subjects
- Platforms to practice



# Algorithms

# SORTING TECHNIQUES

Sorting is the algorithm used to arrange the elements of the list in a certain order. One of the most important algorithms as it can reduce the complexity of the problem significantly and is often used for database algorithms and searches.

# SORTING ALGORITHMS



QUICK SORT



MERGE SORT



HEAP SORT



INSERTION SORT



SELECTION SORT



BUBBLE SORT

# TIME COMPLEXITY

SORTING ALGORITHM	BEST CASE	AVERAGE CASE	WORST CASE
QUICK SORT	$\Omega(N \log(N))$	$\Theta(N \log(N))$	$O(N^2)$
MERGE SORT	$\Omega(N \log(N))$	$\Theta(N \log(N))$	$O(N \log(N))$
HEAP SORT	$\Omega(N \log(N))$	$\Theta(N \log(N))$	$O(N \log(N))$
INSERTION SORT	$\Omega(N)$	$\Theta(N^2)$	$O(N^2)$
SELECTION SORT	$\Omega(N^2)$	$\Theta(N^2)$	$O(N^2)$
BUBBLE SORT	$\Omega(N)$	$\Theta(N^2)$	$O(N^2)$

# SEARCHING TECHNIQUES

Searching is the process of finding an item with specified properties from a collection of items. Computers store a lot of information and to retrieve this information proficiently we need very efficient searching algorithms. There are certain ways of organizing the data,i.e., sorting, that improves the searching process.



# **SEARCH ALGORITHM**

- **LINEAR SEARCH**
- **BINARY SEARCH**
- **INTERPOLATION SEARCH**

# STRING ALGORITHMS



KMP



RABIN KARP



BOYRE MOORE



BRUTE FORCE

**STRING MATCHING ALGORITHMS**



HASHING TABLE

BINARY SEARCH TREE

TRIES

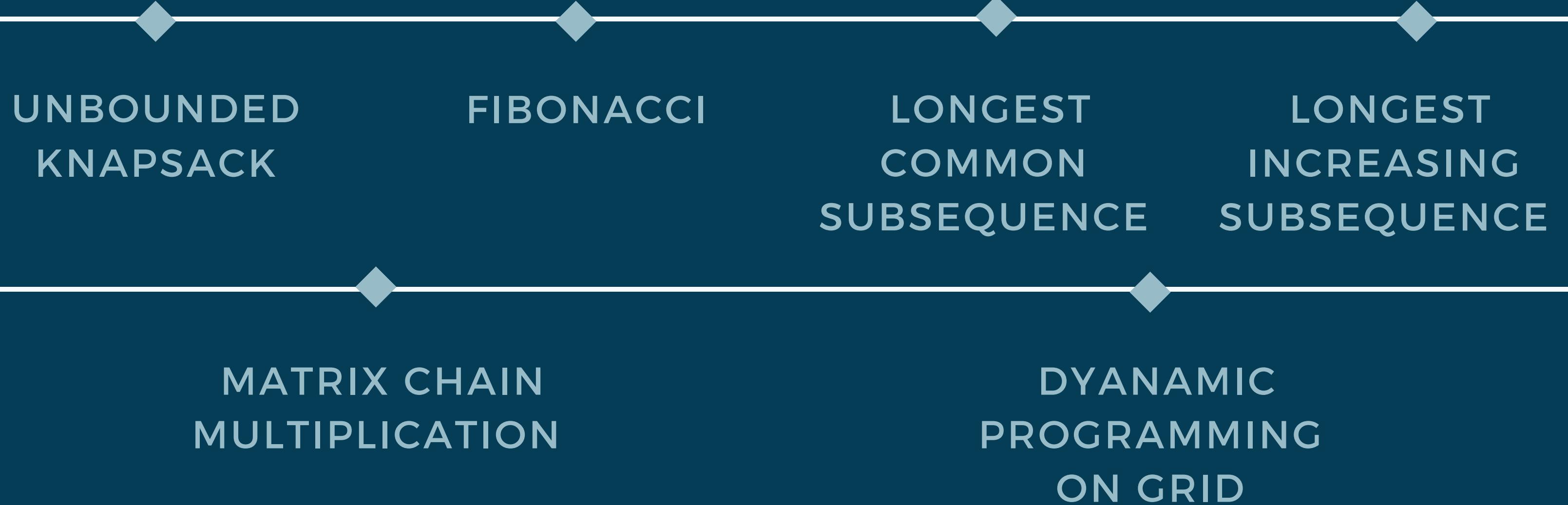
STRING STORING  
DATA STRUCTURES



The only topic that prevails in almost all the high package companies' recruitment process. Mastering this can land you in your dream companies. There are some standard problems on DP resembling what questions are posed. 0-1 Knapsack problem

# DYNAMIC PROGRAMMING

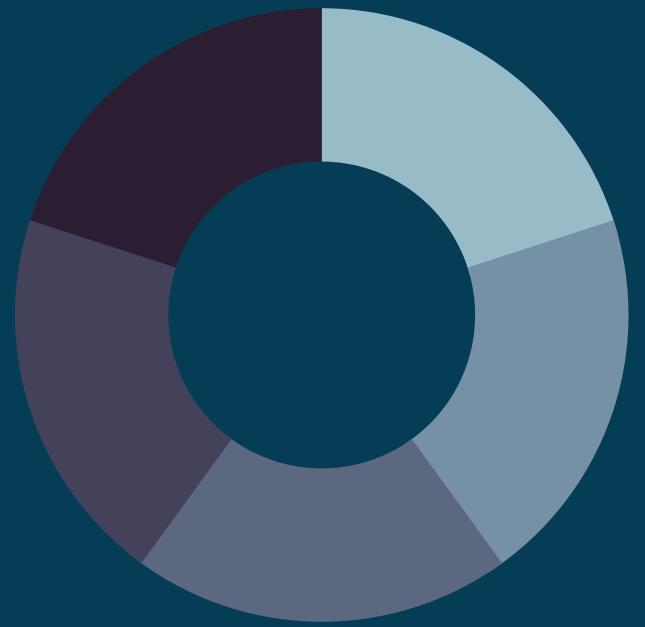
# STANDARD PROBLEMS



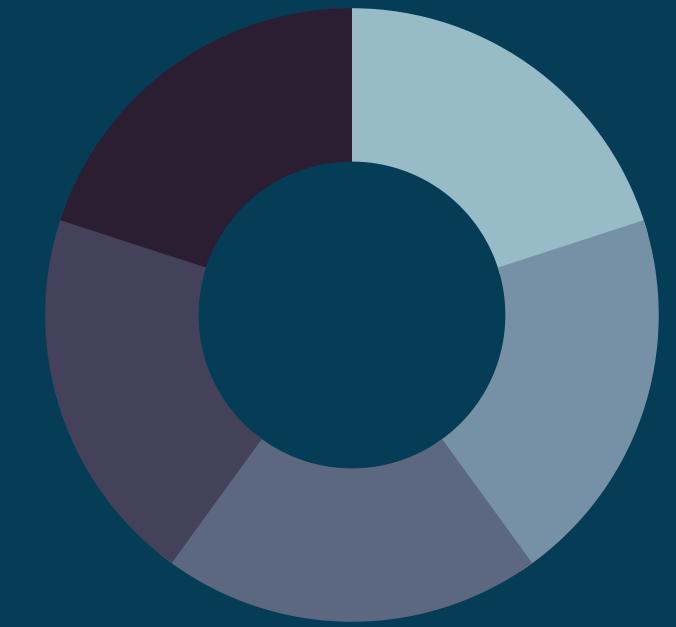
# HASHING TECHNIQUES

Being an important topic, it is rarely asked to mention the hashing techniques. Rather one is expected to solve a question with these techniques be it in the interviews or online coding rounds.

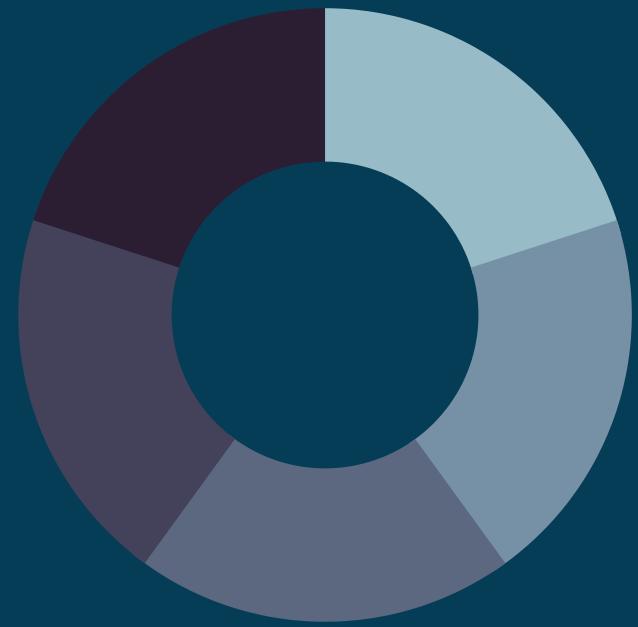
TWO POINTER



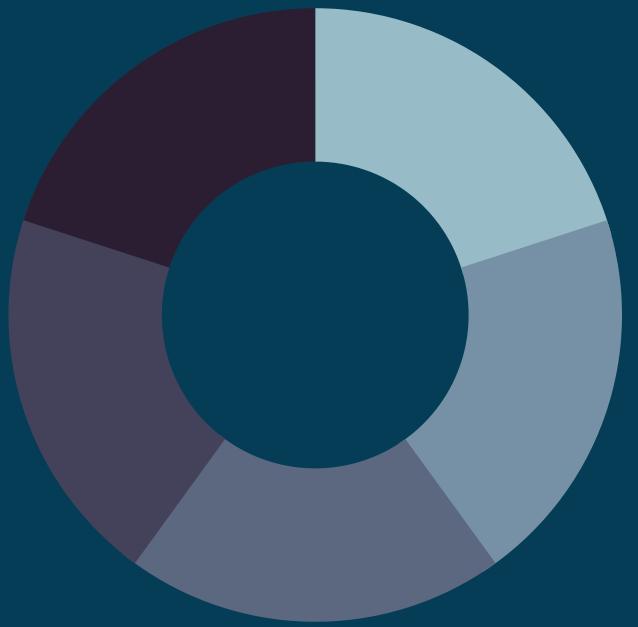
SLIDING WINDOW



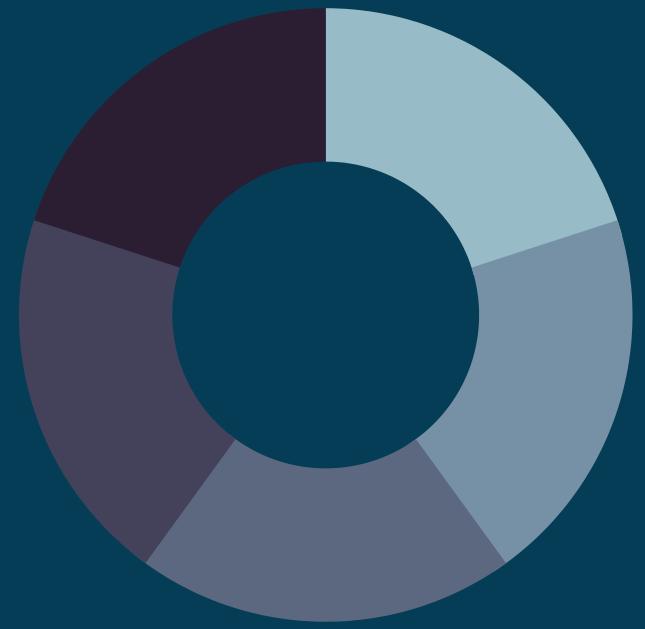
FAST AND SLOW  
POINTER



MERGE INTERVALS



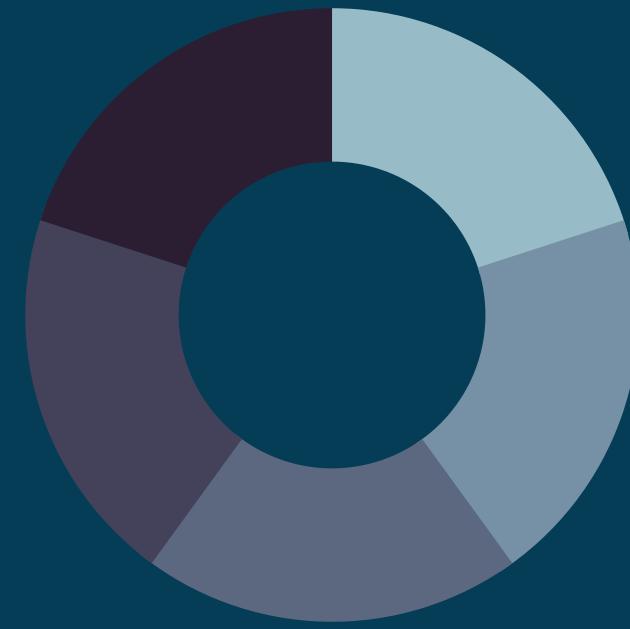
MUST DO CODING ALGORITHMS



DFS



BFS



DYNAMIC  
PROGRAMMING



OTHER PROBLEMS

# MUST DO CODING ALGORITHMS

# MUST DO CODING QUESTIONS FOR: ARRAYS, SORTING & SEARCHING

1. Finding the duplicate number
2. Sort an array's of 0's 1's and 2's
3. Finding missing number
4. Finding Repeating number
5. Merge Two Sorted arrays in  $O(1)$  space
6. Maximum sub-array sum
7. Buy and Sell Stock
8. Rotate Image
9. Grid Unique Path
10. Merge Interval

# MUST DO CODING QUESTIONS FOR:

## 2 POINTER

1. Three sum
2. Trapping Rainwater
3. Remove Duplicates from sorted array
4. Max Consecutive Ones
5. Reverse Pairs
6. Four Sum

# MUST DO CODING QUESTIONS FOR:

## LINKED LIST

1. Reverse a Linked List
2. Remove Nth node from the End of Linked list
3. Intersection point of Two linked list
4. Detect a cycle in linked list
5. Palindrome Linked list
6. Starting point of the cycle in Linked List

# MUST DO CODING QUESTIONS FOR:

## HASHING

- 1.Two Sum
- 2.Sorting element of arrays by frequency
- 3.Longest Consecutive sequence
- 4.Largest subarray with 0 sum
- 5.Longest substring without repeating characters

# MUST DO CODING QUESTIONS FOR:

## RECURSION

1. Subset sum
2. Flood Fill Algorithm
3. Rat in a Maze
4. Kth Permutation Sequence

# MUST DO CODING QUESTIONS FOR:

## GREEDY

1. All Job Sequencing Problem
2. Fractional Knapsack Problem
3. Travelling Salesman Problem
4. Greedy algorithm on Arrays
5. Largest Number Problems

# MUST DO CODING QUESTIONS FOR:

## GRAPHS

1. BFS
2. DFS
3. Detect Cycle in undirected graph
4. Detect Cycle in directed graph
5. Minimum Cost Path
6. Minimum Spanning Tree
7. Bellman Ford

# MUST DO CODING QUESTIONS FOR:

## DYNAMIC PROGRAMMING

1. Minimum number of coins
2. Max Path sum
3. Longest Common Subsequence
4. Longest Common Substring

# CORE SUBJECTS



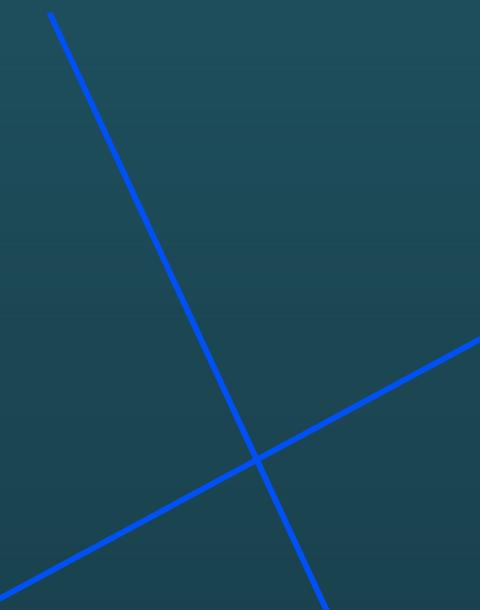


- Computer Networks
- Operating system
- DBMS

# COMPUTER NETWORKING



As technologies have evolved networking came into the picture and slowly from initial wired network technology we moved to this wireless network technology. computer networking acts as base of everything as the best and most important IT solutions



# IMPORTANT TOPICS

- CONCEPT OF LAYERING
- FLOW AND ERROR CONTROL TECHNIQUES, SWITCHING-IPV4/IPV6, ROUTERS AND ROUTING ALGORITHMS (DISTANCE VECTOR, LINK STATE)
- TCP/UDP AND SOCKETS, CONGESTION CONTROL
- APPLICATION LAYER PROTOCOLS (DNS, SMTP, POP, FTP, HTTP)
- BASICS OF WI-FI
- NETWORK SECURITY: AUTHENTICATION, BASICS OF PUBLIC KEY AND PRIVATE KEY CRYPTOGRAPHY, DIGITAL SIGNATURES AND CERTIFICATES, FIREWALLS



DBMS IS ONE OF THE CORE SUBJECTS TAUGHT IN COMPUTER SCIENCE, SOFTWARE ENGINEERING, AND OTHER IT DEGREES. IN THIS SUBJECT, THE STUDENTS ARE TAUGHT THE BASIC TO ADVANCE LEVEL CONCEPTS OF SAVING, RETRIEVING, AND UPDATING DATA



# DATABASE MANAGEMENT SYSTEM

# IMPORTANT TOPICS

NORMALIZATION

RELATIONAL  
ALGEBRA

NORMAL FORMS

LOCK BASED,  
TWO PHASE AND  
TIME STAMP

SQL QUERIES

JOINS

SERIALIZABILITY  
AND CONFLICT  
SERIALIZABILITY

DECOMPOSITION  
OF RELATION

# Operating System

Operating systems are the engines that power computing resources for all employers in the digital age. Without an operating system, even a very basic one, a computer would be practically useless. Many roles in IT may need to answer operating system interview questions

# Important Topics

- PROCESSES
- THREADS
- INTER-PROCESS
- COMMUNICATION
- CONCURRENCY AND SYNCHRONIZATION
- DEADLOCK
- CPU SCHEDULING
- MEMORY MANAGEMENT AND VIRTUAL MEMORY



**DATA STRUCTURES AND ALGORITHMS  
PLAY A MAJOR ROLE IN  
IMPLEMENTING SOFTWARE AND IN  
THE HIRING PROCESS AS WELL.**

# Data Structure

- ARRAYS, STACKS, QUEUES, LINKED LIST
- TREES
- GRAPHS

# CODING PLATFORMS



# HACKERRANK

HACKERRANK IS A LEADING PLATFORM FOR COMPETITIVE PROGRAMMING CHALLENGES WHERE YOU HAVE TO SOLVE THE PROBLEMS AS PER THE GIVEN SPECIFICATIONS. HACKERRANK OFFERS YOU TO SOLVE THESE PROGRAMMING CHALLENGES IN ANY OF VARIOUS PROGRAMMING LANGUAGES APART FROM THIS, PARTICIPANTS CAN SOLVE THE PROBLEMS IN VARIOUS COMPUTER SCIENCE DOMAINS LIKE ALGORITHMS, MACHINE LEARNING, AND ARTIFICIAL INTELLIGENCE. YOU CAN ALSO EARN BADGES BY SOLVING CHALLENGES ON THE HACKERRANK WEBSITE AND THESE BADGES WILL BE ADDED TO YOUR PROFILE.



# CODECHEF

CODECHEF IS A COMPETITIVE PROGRAMMING WEBSITE THAT OFFERS SEVERAL CHALLENGES FOR ASPIRING PROGRAMMERS TO PRACTICE AND SHARPEN THEIR PROGRAMMING SKILLS THROUGH VARIOUS ONLINE CONTESTS. CODECHEF CONDUCTS A PROGRAMMING COMPETITION AT THE START OF EVERY MONTH AND ALSO CONDUCTS 2 SMALLER PROGRAMMING CONTESTS AT THE MIDDLE AND END OF THE MONTH. YOU CAN SUBMIT YOUR SOLUTION IN ANY OF THE PROGRAMMING LANGUAGES AS THE CONTESTS ACCEPT SOLUTIONS IN OVER 55+ PROGRAMMING LANGUAGES



LEETCODE IS THE LEADING PLATFORM THAT OFFERS VARIOUS CODING CHALLENGES TO ENHANCE YOUR CODING SKILLS. IT OFFERS VARIOUS WEEKLY AND BIWEEKLY PROGRAMMING COMPETITIONS FOR THE PARTICIPANTS. THE CONTESTS ARE GENERALLY OF A DURATION OF 90 MINUTES. APART FROM THE CODING CONTEST, VARIOUS ADDITIONAL FEATURES SUCH AS JOB INTERVIEW PREPARATION, DISCUSSIONS, ETC ARE ALSO PROVIDED ON LEETCODE

# LEETCODE



LeetCode



Codeforces is a Russian website that hosts competitive programming competitions where the number of competitive coders across the world competes with each other. The contests conducted by Codeforces allow you to write solutions to the problems that are tested during the contest. Those who pass that set of solution tests receive the opportunity to go through the sources of other contestants, search for mistakes there and suggest the tests on which these solutions do not work.

# QUIZ TIME

## RULES:

1. Login to the website **www.kahoot.it**
2. A link will be shared along with the pin in the chat box. Enter the pin once the website prompts for the same.
3. Nickname to be entered has to be in the format of USN. Any other name will not be entertained and the score will not be considered.
4. The questions will be shared on the screen in the meeting. Look for the question on the meeting screen and mark your answer on the kahoot account.
5. The scores of all the rounds will be counted and the one who has attended all the quizzes and has the maximum scores will be awarded with some exciting prizes.



**THANK YOU**