Ace the Coding Interview (ATCI)

Problem solving approach
Today’s session

- Quick introduction of how to approach any technical problem. [10 Minutes]
- Students do a small exercise with a basic problem. [15 minutes]
- Quick evaluation of the small exercise [5 minutes]
- Students pick problem form list of suggested problems based on difficulty.
- Facilitators help students submit their code on platform. [30 minutes]
## Problem solving approach

### Problem Understanding
1. Clarify with few examples
2. Identify missing information
3. State assumptions
4. Note down properties

### Brute force analysis
1. State brute force approach
2. Do complexity analysis
3. Identify parts that can be optimized

### Ideate
- Solve on paper
- Sub-problems
- Use recursion
- Brainstorm Data structures
- Brainstorm Algorithms
- Unused properties
- Time - Space tradeoff
Practice problem - Two Sum

Given an array of integers, return indices of two numbers such that they add up to a specific target.

source: https://leetcode.com/problems/two-sum/
Problem solving approach - Two Sum

Given an array of integers, return indices of two numbers such that they add up to a specific target.

Problem Understanding

1. Clarify with few examples
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- Given Nums = [2, 7, 11, 15], target = 9,
  - nums[0] + nums[1] = 2 + 7 = 9, return [0, 1].

- Given Nums = [2, 7, 11, 15], target = 8
  - Assume solution always possible

- Given Nums = [2, 7, 10, 15], target = 17
  - Assume only 1 exact solution

- Given Nums = [2, 7, 10, 15], target = 14
  - You may not use an element twice
Problem solving approach - Two Sum

Given an array of integers, return indices of two numbers such that they add up to a specific target.

Problem Understanding

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Properties
- Integers
- Exactly one solution
- Negative values?
Given an array of integers, return indices of two numbers such that they add up to a specific target.

**Problem solving approach - Two Sum**

1. **State brute force approach**
   - Go through every possible pairs of numbers, stop if sum is equal to target
   - Complexity - $O(N^2)$ time

2. **Do complexity analysis**

3. **Identify parts that can be optimized**
Problem solving approach - Two Sum

Given an array of integers, return indices of two numbers such that they add up to a specific target.

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- Paper - Modify problem of \( a + b = T \), to \( T - a = b \)
- Sub-problem - Search for \( b \)
- Data Structure - Hashmap
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### Brute force analysis

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### Ideate

- Solve on paper
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- Use recursion
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Given a string, find the length of the longest substring without repeating characters.

Examples:

Given "abcabcbb", the answer is "abc", which the length is 3.

Given "bbbbb", the answer is "b", with the length of 1.

Given "pwwkew", the answer is "wke", with the length of 3. Note that the answer must be a substring, "pwke" is a subsequence and not a substring.

Easy

- Valid Parentheses
- Merge Two Sorted Lists

Medium

- 3Sum
- Generate Parentheses

Hard

- Median of Two Sorted Arrays
- Regular Expression Matching

Source: Leetcode