Algorithms

Effective usage of the course

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Studying Algorithms

- Algorithms course is one the hardest courses for most students!
- Here are the possible scenarios:
  - You **don’t understand** the algorithm itself.
    - Repeating the materials 2-3 times, or using alternative sources will resolve this
  - You got the algorithm and its intuition, but you can’t understand the formal proof
    - I don’t present formal proofs in this course. You will do that on your own
    - You will give a trial. Keep going. Repeat **later**.
  - You got everything, but **can’t solve** non-trivial problems: this is the obstacle!
    - People who love problem solving, puzzles, and mathematics find it a reasonable challenge
    - Others may find it more difficult to proceed smoothly

Gaining the skill: Fundamental facts!

- Problem-solving is NOT an easy skill to master
  - It will be painful but fun
  - It will take a lot of time and repetition
  - You will even fail to re-solve a problem you solved before
  - The process will change your mind totally
  - You must be patient!
  - You will have to repeat topics related to recursion a lot. This is normal!
- Make sure you have basic problem-solving skills from programming
  - Optional but recommended; solve easy algorithmic problems
  - You may use LeetCode website for that
  - Or solve from my Interviews sheet
  - Or solve from my competitions sheet if you target competitive programming

Gaining the skill: Fundamental facts!

- Practice makes perfect!
  - Consistency is KEY! Stopping/Starting is INEFFECTIVE and INEFFICIENT, and leads to WEAK SKILLS.
  - Make sure to dedicate 5-10+ hours weekly
  - You must solve in the right way: you have to make an honest and earnest initial attempt
    - Never go to the solution without first making a SERIOUS attempt at the problem
    - Always approach learning with a positive attitude.
    - Dismiss doubts such as 'you can't do this'/'you're not good enough'

A serious trial for solving

- A common highly wrong approach
  - Try the problem for a few minutes
  - Tell yourself: 'I can't do it'/'It's too hard' etc...
  - 'I'll just check the solution, and learn from that!'
- Challenge yourself
  - When you read the problem, make a determined effort to solve it by yourself
  - When you get a hint, make another determined effort to solve it by yourself
  - When you think for X minutes, then your mind was training for X minutes, regardless of the output!
    - Many students think *If I couldn't solve it, I wasted my time* ⇒ This is wrong!
- Use a time-limit. Maybe 45-60 minutes. Don't waste days on a few problems
  - If you have more thoughts, feel free to occasionally go beyond your self-imposed limit

Tackling a problem

- Please take 45-60 minutes to make a determined attempt at the solution. (Feel free to take longer if necessary)
  - If you can’t make progress, check out my solution
  - If a hint is given, stop the video and make another sustained attempt for 5-10 minutes
  - If you eventually have to listen to my solution: please **rewrite** the code
    - It's BEST to try to rewrite it in your own style
- What if you can’t understand my solution?
  - Put it in a **ToDo list** and try it again later
- Think ahead
  - When you read an editorial or listen to a solution, don't listen to it all the way through
  - With every clarification or hint, think for another 5 minutes about it
  - This will make you stronger. You will learn the materials faster

ToDo list approach

- This is simple and effective
- When you can’t solve a problem
  - You made a sustained attempt for 45-60 minutes, without success.
  - Then you tried to understand my videos and editorials, but still can’t get it
- Don’t feel frustrated. This will happen a lot!
- Just mark it in your ToDo list
- Keep going and solve other problems
  - This, by itself, is increasing your problem-solving skills
- From time to time, return to the ToDo list
  - Surprise: you will likely find yourself able to solve some of them
- It's still okay if some problems remain unsolved!
  - Improvement will come over time

Solving order

- Some students just keep learning the algorithms and later, after the course is done, they come back to solve the challenges
  - DON’T DO That
- What matters is the skill NOT the knowledge!
- There are a few ways to order the challenges
  - Path1: Solve easy and a few medium problems per topic first. Later solve the remaining challenges. Recommended.
  - Path2: For each topic, try/finish all its problems.
- If you did well in this course, preparing for interviews is a smooth experience

Psychological Concerns

- Don’t compare yourself with your friends
  - Many factors decide the speed and level of progress in each one of us
  - Compare against yourself!
- Be cautious about unrealistic expectations: it is a long and difficult path
  - But you can do it with: 1) proper prerequisites/background 2) consistent long effort
- Be careful about the illusion of effort
  - E.g. solving a lot of easy problems. You must challenge yourself!
- It WILL be frustrating
  - You will fail a lot. You will have to repeatedly cover challenging materials.
- Some boredom might be inevitable

Eliminating Boredom

- Avoid distractions & social media
- Think about your priorities:
  - Don’t train less or more than you scheduled
- Stay motivated … be positive
- Google ‘Relaxation Techniques’
- Spirituality
- Learn new things … do other activities
- Socialize
- Arrange breaks: daily, weekly and long-term

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."