How to prepare tech interviews

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Technical interview overview

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What is a technical interview?

- **Purpose and misunderstandings**
  - **Purpose**
    - It's a specialized, rigorous process that **tests your coding skills, problem-solving abilities, your skill fit**, **communications**, and **personality**
    - It involves **challenges** and **assignments**
      - They're more like an exam than a typical question-and-answer interview
      - You have to prove that you have the skills required to do the job, rather than just tell the interviewer that you have them
      - It's to see how you tackle real-world problems – like the ones you might be facing once you have the job!
  - **Common misunderstanding**
    - The purpose of the technical interview is to trick you with **brain teasers** or **impossible questions**. ➔ **NO!!!!!!!**
    - Some hedge-fund companies still ask those questions

What is a technical interview?

- **Types of technical interviews**
  - **Tech phone screening**
    - It is conducted right after your resume is accepted
    - This interview stage is designed to see the following things
      - If you are a good fit for the company's need
      - If you are qualified and enthusiastic enough to proceed to the next stage
  - **Behavioral**
    - It checks whether you have a good fit with the company's culture
  - **Pop quiz**
    - A quick way of weeding out extremely weak (or even non-tech) candidates
  - **Take home assignment or online test**
    - To overcome limitations and drawbacks of real-time coding interviews
    - This interview format takes up more time from both the candidates and the company

- What is 4 & 5 (in binary)? Answer: 4
- What is the time complexity of bubble sort? Answer: O(n^2)

- Build a snake game
- Math exams

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What is a technical interview?

- **Types of technical interviews**

  - **Algorithm & data structure**
    - It mainly asks for knowledge about algorithms and coding
    - Most big tech firms conduct more than one algorithm & data structure interview
  - **System design**
    - It asks about the overall design for the system
    - This interview is usually not for the entry level
  - **Domain specific interview**
    - It asks about basic knowledge on specific domains
    - This interview is usually not for the entry level
  - **Project interview**
    - It asks about the projects and what you did
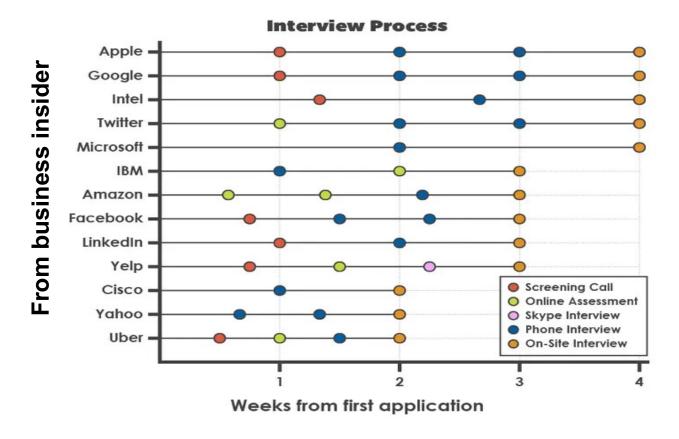   - It could be parts of other interviews or the one entire interview

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Interview process & format

- **Typical tech recruiting process**

Step 1	Express initial interest *Career fairs, events, or via email*
Step 2	First round of the technical interview *Coding challenge, 30 - 60 minute tech screen*
Step 3	Final round of interviews *In person, 3 - 6 interview rounds lasting ~60 minutes each*
Step 4	Decision & offer *Good luck!*

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Interview process & format

- **Processes of different companies**

Interview process & format

- **Interview process and format (depending on different companies)**
  - We will look at interview formats of the following companies
    - Google
    - Facebook
    - Airbnb
  - Note that **these formats can be changed** by companies and several roles may have role-specific sessions

Interview process & format

- **Google**
  - Recruiter phone screen
  - Technical phone interview
    - 1 or 2 algorithm on a virtual coding doc – highlight supports depending on programming languages but no auto completions
  - On-site (Usually 3~5 interviews):
    - 1 or 2 system design or domain specific coding
    - 2 to 4 algorithm on whiteboard
    - 1 general cognitive ability, leadership and googleyness
  - Team matching
    - Speak with managers from different teams who are interested in your profile
  - In some cases, candidates may even be allowed to skip the phone interview round and advanced to on-site directly
  - Sometimes, you only receive an offer if you are successfully matched with a team

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Interview process & format

- **Facebook**
  - Recruiter phone screen
  - Tech phone interviews
    - 1 or 2 algorithm on CoderPad
  - On-site
    - 2 Technical coding interview on whiteboard (Ninja)
    - 1 behavioral (Jedi). Meet with an engineering manager and discussing past experiences and working style
    - 1 design / architecture on whiteboard (Pirate)
  - For the Jedi round, you may be asked a tech question at the end of it
  - For the Ninja rounds, you may be asked one to two questions depending on how fast you progress through the question
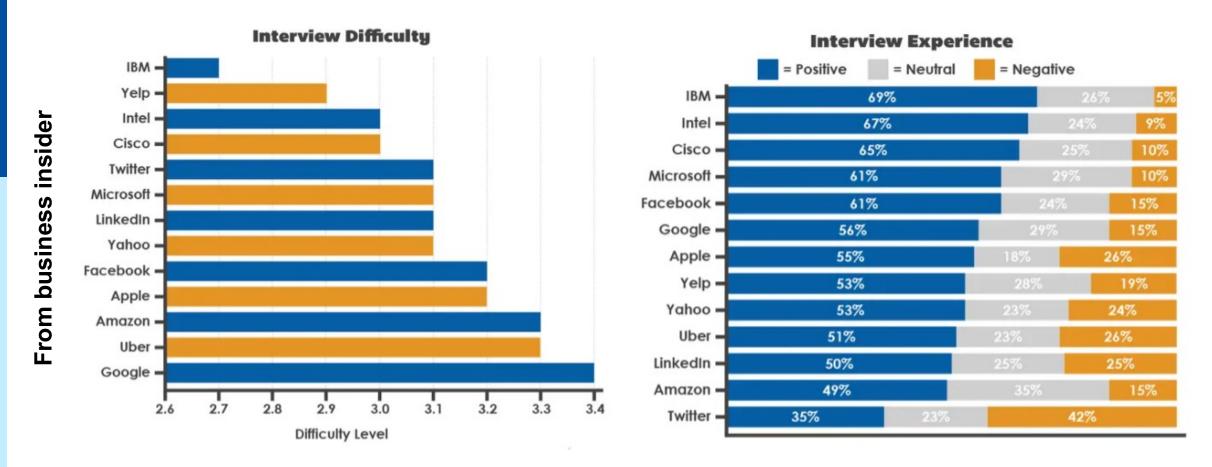
Interview process & format

- **AirBnB**
  - Recruiter phone screen
  - Tech phone interview:
    - 1 or 2 algorithm on CoderPad
  - On-site:
    - 2 algorithm coding on CoderPad
    - 1 system design / architecture / domain specific coding
    - 1 past experience / project
    - 2 cross functional
  - All sessions involve coding on your own laptop (prepare your development environment)
  - You are allowed to look up APIs if you need to
  - Cross functional interviews will involve getting Airbnb employees from any discipline to speak with you (important since it checks cultural fits)

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Interview process & format

From business insider

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What do we need to do? – in general

- **Focusing on**
  - Preparation & research
  - Practice
  - Common pitfalls

- **Prerequisites**
  - We expect you have a good resume and skill sets for the company

What do we need to do? – in general

- **Resume**
  - Up to date
  - Simple but clean
  - Succinct but contains details
  - Aligned with the job description

Work experience & projects
- What did you have done?
- What was your role?
  - Succinct, but with enough details
- What did you have achieved?

Education
- School name, major, duration
- Degree (with dissertation or senior project)
- Scholarships, etc.

Your Name

123 Your Street
Your City, ST 12345
(123) 456-7890
no_reply@example.com

Lorem ipsum dolor sit amet, consectetuer adipiscing elit

EXPERIENCE

Company, Location — *Job Title*
MONTH 20XX - PRESENT
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Company, Location — *Job Title*
MONTH 20XX - MONTH 20XX
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Company, Location — *Job Title*
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EDUCATION

School Name, Location — *Degree*
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School Name, Location — *Degree*
MONTH 20XX - MONTH 20XX
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PROJECTS

Project Name — *Detail*
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SKILLS

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AWARDS

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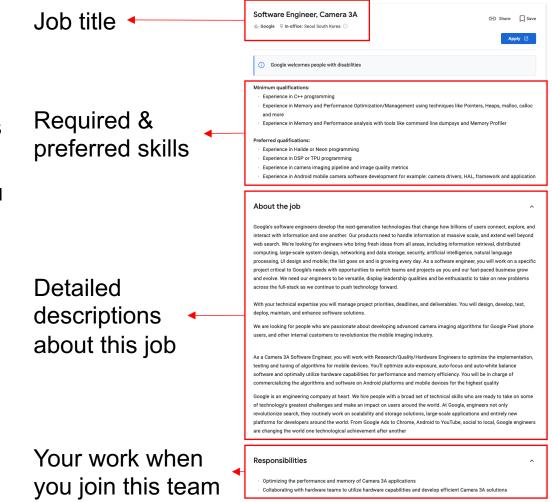**LANGUAGES**

Lorem ipsum, Dolor sit amet, Consectetuer

Name and contact information

Extra information
- Skills
- Extracurricular activities
- Programming languages & proficiency
- Etc

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What do we need to do? – in general

- **Preparation & research**
  - **Learn about the company**
    - Visit website
    - Talk to recruiters when at career fairs
    - Visit online job sites
  - **Learn about the position for which you are applying**
    - Ask for a job description before your interview
    - Ask about the position to people at the same company
    - **Make a resume that is suitable for the job description**

Job title

Required & preferred skills

Detailed descriptions about this job

Your work when you join this team

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What do we need to do? – in general

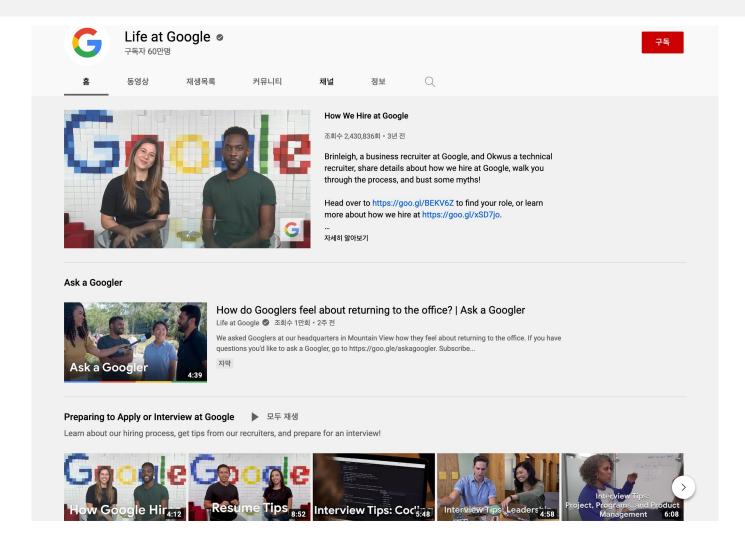- **Preparation & research**
  - **Research interviewing style**
    - Talk to people who have been through the interviewing process before
    - Talk to recruiters about what you can expect from your interview day (They will actually provide you interview preparation materials)
  - **Prepare interviewers' questions as well as your questions**
    - Make sure you know the things you claim to know
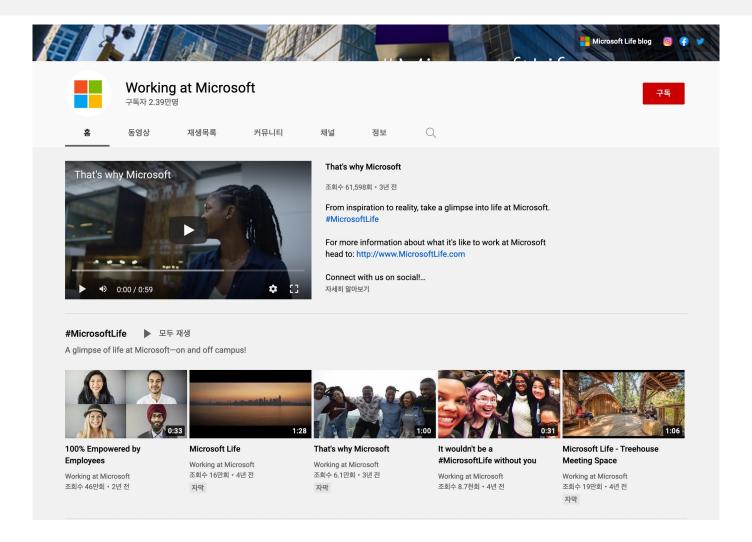   - Be prepared to ask meaningful questions

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What do we need to do? – in general

- **Practice**
  - **Review your coursework** to make sure you are on top of the material and can effectively discuss concepts
    - Data structure and algorithm are must to do
    - Architecture, network, database, security etc. are important for role-specific interviews
      - E.g., front-end, system design, testing
  - **Collect sample interview questions**
    - Google it!
    - Don't forget interviews except algorithm/data structure interviews
      - E.g., leadership, project, architecture, data analysis, etc. based on your applied role
  - **Prep with real people**
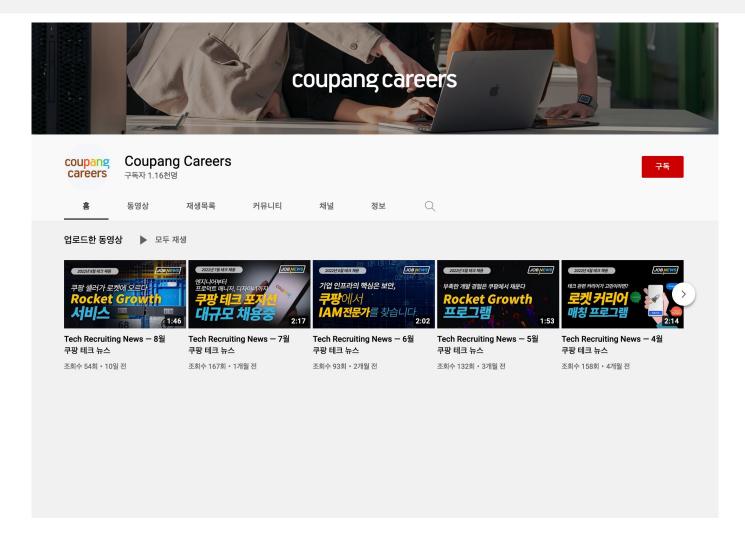   - E.g., friends, web-based tools, people at the company, etc.

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What do we need to do? – in general

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What do we need to do? – in general

What do we need to do? – in general

Coding interview

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Coding interview process

- **What is a coding interview?**
  - The coding interview is the most common, but a scary interview session for many people
  - It usually **consists of the following steps**
    - **Introductions**
    - **Project discussion**
    - **Coding exercise**
    - **Your questions**
  - Interview format may vary depending on companies/interviewers

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Coding interview process

- **Introduction**
  - **Develop your pitch**
    - Who are you?
    - What are your interests? Goals?
    - Why are you interested in the position?
    - Very short (around 1 minutes).
  - **Show the following things!**
    - You know **SOMETHING about the company**
    - **Why** you're interviewing with them

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Coding interview process

- **Project discussion**
  - **Pick 1-2 projects off your resume** you can speak in depth about
    - Pick your biggest or most technically interesting project
    - It's ok to talk about school projects
  - Don't assume subject domain expertise, but **be able to go into detail when asked**
  - Always **clarify your role** and teammates' roles in those projects
  - In several cases, it will be **replaced with warm-up questions**

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Coding interview process

- **Coding exercise**
  - **Steps 1 & 2. repeat the problem and give examples**
    - Clarify the question
    - Talk through sample input and expected output
  - **Step 3. approach**
    - **Brute force**: what is the simplest way to solve this?
    - **Optimize**: can you save run time or memory?
    - **Walk through**: clarify your algorithm with complexity
  - **Step 4. code**
    - Write the code
  - **Step 5. test and big O**
    - List test cases, walk through your code with test cases, and calculate time (and space) complexity

Coding interview process

- **Your questions**
  - Interviewers will mention your questions will not be part of assessment, but…
  - **Show your interest! with good questions**.
    - "What is your favorite part about working for X?"
    - "What are some projects you've worked on at X?"
    - "Where do you see X in 5 years?"
  - **Don't ask rude questions**.
    - "Did I pass?"
    - "How much do you make?"
    - "What is your salary?"

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What do we need to do? – specific for coding interview

- Decide on a programming language

- Study CS fundamentals

- Internalize the Do's and Don'ts of interviews

- Practice solving algorithm questions & doing mock interviews

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What do we need to do?
– specific for coding interview

- **Decide on programming languages**
  - **Strongly recommended: Pick something OOP**
    - C++, Java, Python
    - **Python** is strongly recommended thanks to its rich libraries
    - But **pick up your favorite language** is better than using unfamiliar OOP
      - When choosing C, you can assume some basic data structures and functions on it (e.g., sort, hashtable, etc.) are pre-defined
      - When you assume them, please ask about them to the interviewer whether it's OK
    - Some roles require specific languages (e.g., Objective-C/Swift for iOS)
  - **Syntax** typically **doesn't matter** a lot
  - **Review helpful APIs**
    - String manipulation, popular data structures, searching and sorting algorithms, etc
  - Be able to talk about why you picked that language

What do we need to do? – specific for coding interview

- **Study CS fundamentals**
  - Need to learn the following concepts but not limited to them
    - **String or array manipulation** – Great for tech screens
    - **Linked lists** – Often used in whiteboard interviews because they expect you to draw pictures.
    - **Trees** – BSTs, self balancing. Often used when building up directories or searching for something.
    - **Hash Tables** – If you are organizing data for lookups… chances are the answer is a hash table.
    - Graph traversal, BFS, DFS, Greedy, Dynamic programming, etc.
  - Fortunately, there are several online materials to study them with coding

What do we need to do? – specific for coding interview

- **Do's**
  - Explain what you are coding/typing to the interviewer, what you are trying to achieve
  - Practice good coding style. Clear variable names, consistent operator spacing, proper indentation, etc.
  - Type / write at a reasonable speed
  - As much as possible, write actual compilable code, not pseudocode
  - Demonstrate mastery of your chosen programming language
  - …

- **Don'ts**
  - Remain quiet the whole time
  - Spend too much time writing comments
  - Use extremely verbose or single-character (unless they're common like i, n) variable names
  - Copy and paste code without checking (e.g., variables need to be renamed)
  - Write too big (takes up too much space) or too small (illegible) if on a whiteboard
  - …

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What do we need to do? – specific for coding interview

- **Practice**
  - Treat the interview like a standardized test
  - **Practice coding without an IDE/Compiler/Computer**
    - Working with a whiteboard is a great idea
  - Practice coding and talking aloud at the same time

What do we need to do? – specific for coding interview

- **Study materials**
  - Listed items are small portions among what you can find on the internet
  - Learning concepts and basic knowledges
    - **Cracking the Coding Interview**
      - The ultimate material that you have to look at first
    - Hackerrank
      - Providing step-by-step prep
      - Used in several company interviews
    - GeeksforGeeks
      - Good for studying not only interview questions but also other materials (e.g., details about languages)
    - Educative.io
      - Good for taking several well-structured courses (e.g., system design, algorithm, etc.)

What do we need to do?
– specific for coding interview

- **Study materials**
  - Personal practice
    - **LeetCode**
      - Lots of questions in real interviews
      - Online mock interviews, solutions, and statistics when you paid
    - BAEKJOON (백준)
      - Korean prep website
      - Not only for coding interviews but also for complex programming problems (e.g., ICPC)
  - Practice with others
    - **Pramp**
      - Mock interview with arbitrary people around the world or friends
      - Creating a mock interview automatically selects a mock interview problem inside its interview question pool

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Coding interview example – step by step

Find the Kth Largest Element in an Array

Given an integer array *nums* and an integer *k*, return *the kth largest element in the array*

- Remember the previous slide! (slide num. 26)
  - Steps 1 & 2. repeat the problem and give examples
  - Step 3. approach
  - Step 4. code
  - Step 5. test and big O

Coding interview example – step by step

- **Steps 1 & 2. repeat the problem and give examples**
  - Repeat and rephrase the main question to clarify it
  - Create examples

    ```
    Input: nums = [3,2,1,5,6,4], k = 2
    Output: 5
    ```

    "*OK, I'm just going to reread the question… So, given a list of numbers and a target number, … Let's make an example with the array of integers like 3, 2 … 4, and k = 2. Then, since… I would return an output of 5 in this case. Is that right?*"

  - With example, ask other clarification questions
    - You will naturally discuss data structures for the input and output
    - You can clarify whether or not you really understand the question
    - You will naturally come up with clarifying questions
      - "*Will **k** be less or equal to the array length?*"
      - "*Will we have duplicated numbers?*"

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Coding interview example – step by step

- **Step 3. approach**
  - Explain our solution without coding
  - **Conversation is extremely important**
    - Silent is the worst thing
    - If you cannot find out a good approach at the beginning, start with the brute-force solution
  - Drawing is good, especially for list, graph, tree problems
  - If the interviewer gives you a crazy look or say something, you might want to rethink your solution
    - Interviewer will help you to find out the optimized answer
    - They do not provide a direct solution, but their comments usually have hints

"*OK, so I think there's a couple different ways we can approach this one. First, we could sort the entire array, … This is kind of a brute force method, so it would take about O(N log N) time. Another thing we could do is create a max heap … So that would take about O(N) time to create the heap, and then it takes O(log N) time to pop the root of the heap … O(N + K log N) which is better than method 1.*
…
How does that sound?"

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Coding interview example – step by step

- **Step 4. code**
  - Explain your code
    - Talk about your code when you write
  - Don't forget boundary conditions
    - E.g., when the input array is empty
  - Write TODO
    - E.g., "*# TODO: check for value k is less or equal to the length of list.*"
  - Use helper functions (when needed)
    - Remember code review examples in previous sessions
    - You can leave those helper functions empty and fill out them later - discuss it with the interviewer

Example code
- Using the standard sorting function
- inefficient, but for the simplicity of our example

```
def kthLargest(nums, k):
  # TODO: check nums length
  # TODO: check k value
  # Sort the given list
  nums.sort(reverse=True)

  # Return k'th element in the
  # sorted array
  return nums[k - 1]
```

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Coding interview example – step by step

- **Step 5. test and big O**
  - Test
    - Test your solution step-by-step
    - Say the following thing to the interviewer!
      - *"If you're OK, I'd like to move on to test cases to make sure I didn't miss anything in the code."*
  - Big O
    - You should find out the correct Big O notation for your answer
    - It should be same with the thing that you mentioned during the "Step 3. Approach" phase

```
Input: nums = [3,2,1,5,6,4], k = 2
Output: 5
nums = [3,2,1,5,6,4]
```

```
def kthLargest(nums, k):
    # TODO: check nums length
    # TODO: check k value
    # Sort the given list
    nums.sort(reverse=True)

    nums = [6,5,4,3,2,1]

    # Return k'th element in the
    # sorted array
    return nums[k - 1]
```

```
nums[2 - 1] = 5   O(n log(n))
                  when n = len(nums)
```

Feedback format

- **Feedback format overview**
    - Consists of overall grade, raw notes, short feedbacks for each rubrics
    - Overall grade (example): rubric is between 1 ~ 6
    - Example
        - Rubric: 4
        - Short description: "*I accessed TC with entry level rubrics. TC has solid understanding on algorithms and data structures, but TC's code has several minor flaws. And, TC did not check corner cases when doing verification.*"

Feedback format

- **Raw notes**

Clarification
- After a short intro, starts on 03:00
- TC asked about how to treat empty case
- TC did not raise any questions about buffer overflow

Approach

06:00

- TC explained brute force approach
- I gave hints with one simple 2x2 matrix

11:00

- TC explained well-defined $O(n^2)$ approach with examples

…

Code

15:00

- Start coding, made a signature

20:00

- TC made code for case analysis, but code is a little bit redudant

…

Full transcripts

…

Feedback format

- **Rubric**
  - For each rubric, select one of points between 1 and 4 and add short descriptions
  - **Comm. & Comprehension**
    ➔ **3**, TC shows great communication skills. …
  - **DS & Algorithm**
    ➔ **3**,TC shows great understanding on algorihtm and time complexity
  - **Coding**
    ➔ **2**, TC's code has errors and redundant parts. …
  - **Efficacy**
    ➔ **2**, when compared to other solid L3 candidates, TC couldn't not proceed follow-up questions, which is accetapble, but not solid.

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Questions?

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