Preparing for Google Technical Internship Interviews

This guide is intended to help you prepare for Software Engineering internship and Engineering Practicum interviews at Google. If you have any additional questions, please don't hesitate to get in touch with your recruiter.

Recruitment Process: Software Engineering Internships

Interview Tips

Technical Preparation

Extra Prep Resources

The Recruitment Process - Software Engineering Intern

The Process

Technical Interviews
At least 2 x 45 min interviews with a Google Engineer. A Google doc will be used as a virtual whiteboard for coding and algorithmic problems.

Committee Review
An independent committee of Googlers review the Interview feedback. They ensure our hiring process is fair and that we're holding true to our "good for Google" standards as we grow.

Project Search
During the second stage of the interview process, your application is reviewed by our potential project hosts and engineers to determine if there is a skill match to a project. This can result in an additional phone interview with a potential host to discuss their project.

Offer!!
We'll take a look at the additional information gathered and if your application is approved, we will make you an offer, confirm it in writing and talk to you about possible relocation, visas and starting your internship at Google!

Internship Project Interviews

As we assess you, your skills and strengths throughout the interview process, we consider potential project matches here at Google. We take into consideration your interests as well as the current needs of the various Google projects before making a project match.

During the Project Search stage, you'll be asked to fill in a questionnaire that details your skills and interests. As your completed questionnaire is used during the review, please be thoughtful and thorough in your responses.

Once a potential project has been identified, you'll have a call with the engineer hosting the project to ensure that it is a fit for your skills.

Occasionally we will not have an internship project with a strong alignment to your interests and skills. Unfortunately, if this happens, the interview process will conclude and your recruiter will let you know. We'll make a note to follow up with you about future opportunities.

Interview Tips

Substantiate

Make sure that you substantiate what your CV/resume says – for instance, if you list Java or Python as your key programming language, questions about this are fair game and may be asked of you.

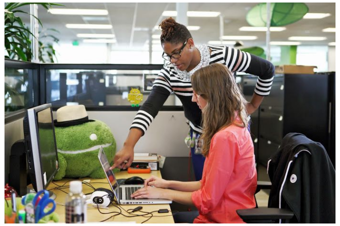
Explain

Explain your thought process and decision making throughout the interview. In all of Google's interviews, our engineers are evaluating not only your technical abilities but also how you approach problems and how you try to solve them. Many of the questions asked in Google interviews are open-ended because our engineers are looking to see how you break down and approach the problem. There is no "one true answer" to them. We want to understand how you think. This would include ***explicitly stating and checking any assumptions*** you make in your problem solving to ensure they are reasonable. **Think out loud.**

Clarify

Ask clarifying questions if you do not understand the problem or need more information. Many of the questions asked in Google interviews are deliberately underspecified because our engineers are looking to see how you engage the problem. In particular, they are looking to see which areas you see as the most important piece of the technological puzzle you've been presented. Clarifying questions are encouraged!

Also, **take interviewer tips seriously** because they're trying to give you helpful hints. They may ask some additional questions or share comments when you're solving a problem. Take a minute to think through these prompts -- they can help you land on a more optimal solution!



Get some practice!
To practice for your interview, you may want to try:

Google Code Jam questions - samples from Google coding competitions.

Take Dean's advice! - Try practicing coding in a Google doc or on a whiteboard with a friend.

Interview Tips

Improve

Think about ways to improve the solution. Share the different options or tradeoffs you're considering. **Be flexible.** In many cases, the first answer that springs to mind may need some refining. It is worthwhile to talk about your initial thoughts to a question. Here are some guidelines:

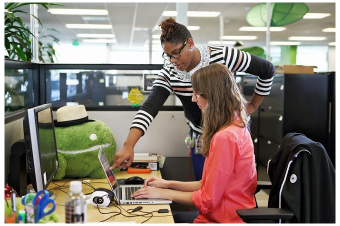
- You want to get to the simplest solution as quickly as possible. You can start with a brute force solution, but then...
- **Discuss tradeoffs.** How would you improve your solution? How do you make it faster? Use less memory? Know the time and space tradeoffs of the solution/data structures you pick.
- Code. We generally don't want pseudocode. It might be acceptable in some limited cases. If you are not sure, ask the interviewer. The interviewer will guide you through.
- If you don't remember the exact interface to a library class or method, that is OK, as long as you let the interviewer know, and you postulate a substitute with a conforming interface.

Practice

Make sure you practice writing code on paper or a whiteboard in preparation for in-person interviews, or code in a Google Doc for phone interviews. Be sure to test your own code and ensure it's easily readable without bugs. Keep in mind, **you can choose the programming language** you're most comfortable coding in, but we encourage Java, C++, or Python.

Ask Questions

At the end of the interview, most interviewers will ask you if you have any questions about the company, work environment, their experience, etc. It's always good to have some pre-prepared for each interview.



Still want more info?

Interviewing @ Google

Hiring process for students

Technical Preparation

Coding: Google Engineers primarily code in C++, Java, or Python. We ask that you use one of these languages during your interview. For phone interviews, you will be asked to write code real time in Google Docs. You may be asked to:

- Construct / traverse data structures
- Implement system routines
- Distill large data sets to single values
- Transform one data set to another

Algorithms: You will be expected to know the complexity of an algorithm and how you can improve/change it. You can find examples that will help you prepare on TopCoder. Some examples of algorithmic challenges you may be asked about include:

- Big-O analysis: understanding this is particularly important
- Sorting and hashing
- Handling obscenely large amounts of data

Sorting: We recommend that you know the details of at least one n*log(n) sorting algorithm, preferably two (say, quicksort and merge sort). Merge sort can be highly useful in situations where quicksort is impractical, so take a look at it. What common sorting functions are there? On what kind of input data are they efficient, when are they not? What does efficiency mean in these cases in terms of runtime and space used? E.g. in exceptional cases insertion-sort or radix-sort are much better than the generic QuickSort / MergeSort / HeapSort answers.

Technical Preparation

Data structures: Study up on as many other structures and algorithms as possible. We recommend you know about the most famous classes of NP-complete problems, such as traveling salesman and the knapsack problem. Be able to recognize them when an interviewer asks you in disguise. Find out what NP-complete means. You will also need to know about Trees, basic tree construction, traversal and manipulation algorithms, hash tables, stacks, arrays, linked lists, priority queues.

Hashtables and Maps: Hashtables are arguably the single most important data structure known to mankind. You should be able to implement one using only arrays in your favorite language, in about the space of one interview. You'll want to know the O() characteristics of the standard library implementation for Hashtables and Maps in the language you choose to write in.

Trees: We recommend you know about basic tree construction, traversal and manipulation algorithms. You should be familiar with binary trees, n-ary trees, and trie-trees at the very least. You should be familiar with at least one flavor of balanced binary tree, whether it's a red/black tree, a splay tree or an AVL tree. You'll want to know how it's implemented. You should know about tree traversal algorithms: BFS and DFS, and know the difference between inorder, postorder and preorder.

Min/Max Heaps: Heaps are incredibly useful. Understand their application and O() characteristics. We probably won't ask you to implement one during an interview, but you should know when it makes sense to use one.

Technical Preparation

Graphs: To consider a problem as a graph is often a very good abstraction to apply, since well known graph algorithms for distance, search, connectivity, cycle-detection etc. will then yield a solution to the original problem. There are 3 basic ways to represent a graph in memory (objects and pointers, matrix, and adjacency list); familiarize yourself with each representation and its pros/cons. You should know the basic graph traversal algorithms, breadth-first search and depth-first search. Know their computational complexity, their tradeoffs and how to implement them in real code.

Recursion: Many coding problems involve thinking recursively and potentially coding a recursive solution. Prepare for recursion, which can sometimes be tricky if not approached properly. Practice some problems that can be solved iteratively, but a more elegant solution is recursion.

Operating systems: You should understand processes, threads, concurrency issues, locks, mutexes, semaphores, monitors and how they all work. Understand deadlock, livelock and how to avoid them. Know what resources a process needs and a thread needs. Understand how context switching works, how it's initiated by the operating system and underlying hardware. Know a little about scheduling. The world is rapidly moving towards multi-core, so know the fundamentals of "modern" concurrency constructs.

Mathematics: Some interviewers ask basic discrete math questions. This is more prevalent at Google than at other companies because counting problems, probability problems and other Discrete Math 101 situations surrounds us. Spend some time before the interview refreshing your memory on (or teaching yourself) the essentials of elementary probability theory and combinatorics. You should be familiar with n-choose-k problems and their ilk – the more the better.

Still want more info?

Tech interviews @ Google

Distributed systems & parallel programming

Scalable Web Architecture & Distributed systems

How search works

Extra Prep Resources You Might Find Useful

Recommended by Googlers

Online resources

Dean Jackson's ACM article
Cracking the Coding Interview Video and Cracking the Coding Interview
Five Essential Phone Screen Questions by Steve Yegge
Google+ Technical Interview Coaching Session
TopCoder Tutorials

For Underclassmen

Guide for Technical Development
How to Get Hired - What CS students need to know

Books

Programming Interviews Exposed: Secrets to Landing Your Next Job
Programming Pearls
Introduction to Algorithms
Programming Interviews Exposed; Secrets to Landing your Next Job

Learn about Google products and technologies

About Google
Google Spanner: Google's Globally-Distributed Database
Google Chubby
Industry News: Search Engine Land
Google File System
Google Bigtable
Google MapReduce

Get some practice!

To practice for your interview, you may want to try:
Project Euler
ACM-ICPC Live Archive
UVa Online Judge
UVA Toolkit
Programming Challenges (Text with solutions)