Problem Solving Workshop #26 Tech Interviews and Competitive Programming Meetup
July 8, 2017 https://www.meetup.com/tech-interviews-and-competitive-programming/
Instructor: Eugene Yarovoi (can be contacted through the group Meetup page above under Organizers)

More practice questions: glassdoor.com, careercup.com, geeksforgeeks.org
Books: Elements of Programming Interviews, Cracking the Coding Interview
Have questions you want answered? Contact the instructor, or ask people on Quora. You can post questions and follow the instructor and other people who write about algorithms.

Generally speaking, in design questions, there's always lots of ambiguity, so you would start by asking clarifying questions to the interviewer. Since you don't have an interviewer here, assume what you think are reasonable answers to the questions you would ask.

Feature Design

We want to design a mobile app whose purpose is to allow friends that travel together or have other events together track their expenses and in the end reconcile their finances. For example, while traveling as a group of four, any given expense might be paid by a single person. That person would want to track the expense, and in the end, collect from everyone else their share. The app should support the following use cases:

- A user creates a group and invites their friends to it
- People in a group can submit expenses, of either the form "I paid $X for person Y, therefore they owe me $X" or "I paid $X for the group, and they all owe me equally"
- People can see what transactions have happened in the group.
- Eventually, money is collected from people, though a person must approve an expense (agree that it happened) before that expense is collected from them.

These are only some very high-level requirements. Specify in more detail how you would implement these rtequirements, and discuss additional features you want to add to improve the app. One simple example: when users see what transactions have taken place, they should be able to sort chronologically, and also by amount, so that they can reivew the most significant transactions first.

This question does not have to be a front-end UI question, but you could use it as such if you wanted to. Depending on which direction you're more interested in exploring, you could show some UIs, or you could stick to talking about the logic and features of the app.

Follow-up (algorithmic). Suppose that when it is time to collect money from the group, you want to minimize the number of total transactions, to reduce credit card fees and the like. However, everyone must end up with the same amount of money as they would have if all transactions had been processed as-is. For example, suppose that A and C both owe B $50, and then A owes C $20. That's 3 transactions. However, we can instead convert this to A owes B $70, and C owes B $30, which is only 2 transactions.

Distributed Systems

Suppose you have a distributed system of hundreds or thousands of worker machines, and they all need to query a time server, queries to which should be low-latency. However, there is only one time server (and you can't simply spin up more), and it can't handle that much load, or maybe can't handle that much load at peak usage times. What are some ideas for how to make the system work?

Follow-up: in your solution to the above, you probably added some new servers, since having the worker machines coordinate their access is complex. How would you solve this problem if for some reason you couldn't do that and you had to modify the code on the worker machines to coordinate with one another?

Requirements Analysis & High-Level System Design

How would you design the Facebook news feed?

Questions like this are obviously too broad to be answered fully within the timeframe of an interview, but the goal with questions such as these is to see whether you can identify all the major subsystems that would be involved and envision the final result. If there's time, you can dive deeper into one or more of the sub-systems.

Follow-up: Suppose that after you've outlined the high-level components, the interviewer asks: "You show people ads in the news feed. How would you select the ads to show?"