A Programmer's Guide to Computer Science

Self-Assessment Questions

Part One

Chapter One

Q: What is the difference between a program and an algorithm?

Q: Why is it usually impossible to have a runtime faster than O(n), and what is the exception?

Chapter Two

Q: When are arrays a good option for storing data?

Q: What are the advantages of a linked list over an array?

Q: How long does it take to retrieve an item from a hash table?

Q: What is locality of reference?

Q: How do you determine the order of the items in a set?

Chapter Three

Q: Which is larger, P or NP?

Q: Are all NP-hard problems also NP-complete?

Part Two

Chapter Four

Q: What are two ways for the computer to store a graph?

Q: What is a tree?

Chapter Five

Q: How long does it take to find an element in a binary search tree?

Q: How long does it take to add an element to a heap or extract the top element from a heap?

Chapter Six

Q: What is a spanning tree of a graph?

Q: What is Djikistra's algorithm?

Chapter Seven

Q: What is a forbidden subgraph characterization?

Q: What does it mean for a property to be hereditary? Give an example.

Part Three

Chapter Eight

Q: What are some factors that can influence the decision to use a particular sort?

Q: What is the best possible worst-case runtime for a comparison sort?

Q: Describe a situation in which it is possible to sort a list in O(n) time.

Part Four

Chapter Nine

Q: In what situation would you use brute force to solve a problem rather than seeking a more efficient algorithm?

Chapter Ten

Q: What is the difference between dynamic programming and divide and conquer?

Q: What does it mean for a problem to have optimal substructure?

Chapter Eleven

Q: Why do greedy algorithms only give the best answer in some cases?

Part Five

Chapter Twelve

Q: What do we use complexity theory for?

Chapter Thirteen

Q: What are two ways to show that a language is regular?

Q: What is the difference between a deterministic finite automata (DFA) and a nondeterministic finite automata (NFA)?

Q: In plain English, how does a pumping lemma work?

Chapter Fourteen

Q: What is an undecidable problem?