Computing Basics

1. Use recursion to write a function that determines the length of a string
2. What's the number after F in hexadecimal?
3. Bitwise: what is 7 | 1? 7 & 1? ~7?
4. Write a script that prints the numbers from 1 to 100. But for multiples of four print "Four" instead of the number and for the multiples of seven print "Seven". For numbers which are multiples of both four and seven print "FourSeven".

Data Structures

1. Find the largest int value in an int array (try to not use native functionality like "max()")
2. What's the difference between a stack and a queue?
3. Write a function to reverse a string (try to not use native functionality like strrev() or text[::-1])
4. Write a function that determines if two strings are anagrams. From wikipedia: an anagram is "the result of rearranging the letters of a Word or phrase to produce a new word or phrase, using all the original Letters exactly once." ("abc" "bac" "cba" are anagrams, "abc" and "bba" are not)
5. Implement Insert and Delete for
    * a singly-linked linked list
    * [bonus] a sorted linked list
    * [bonus] a circular linked list

Runtime Complexity

1. Given a list of 1000 user IDs, how would you fetch their names And email addresses from a database? Assume the database has millions of rows, and all you have are random primary keys.
2. Is it faster to remove an integer from the middle of a singly-linked list, or is it faster to remove an integer from the middle of a doubly-linked list?
3. You are writing an application for a video store. You need to be able to look up rentals by the customer's name, as well as generate a report of the customers who have overdue movies today. Describe the data structure you would use to track the customers, and the algorithms you'd use to look up rentals and generate the reports. Use basic in-memory types; do not use a database.

OOPs

1. Your codebase has classes Pencils and Pens, both subclasses of Writing Instrument?. How do you implement Eraser?
2. What is the difference between prototype and class-based inheritance?

Database

1. Assume you're creating a database of books:

```
CREATE TABLE books(
```

```
    id int unsigned not null primary key auto_increment,
    title text(40) not null,
    author text(40) not null
);
```

Rank the following queries from "fastest" (1) to "slowest" (4), and give your reasons:

* SELECT * FROM books WHERE author LIKE '%Coupland%';
* SELECT * FROM books WHERE id = 15;
* SELECT * FROM books WHERE title LIKE 'Micro%';
* SELECT * FROM books WHERE title = 'Microserfs';

2. Write a query to get the number of books where the auther is "Douglas Coupland?"
3. Given the database schema and queries above, what changes would you make to optimize these queries? That is, how would you design a database that stores books and authors? You can assume a high traffic situation, with a low ratio of writes to the database.

Puzzles

1. With a pencil and paper:
    1. Draw a large square
    2. Inscribe a circle inside the large square
    3. Inscribe a small square inside the circle
    4. What is the ratio of the area of the large square to the area

of the small square?

2. [Bonus] You wake up one morning to find an intact Boeing 747 in your front yard. You need to rent a crane to remove it. You need to determine the weight of the airplane in order to rent the correct crane. How do you figure out the weight of the airplane?

3. [Bonus] On a traditional analog clock, how many degrees separate the hour and minute hands at 3:15?