Cooliris Engineering Evaluation Questions:

Instructions: You have up to two hours to complete these questions. Once you have finished, please email back your answers to ericb@cooliris.com.

1) Let's say you want to make a web page with a grid of content. The grid can be an arbitrary number of cells high and wide, but each cell has the same dimensions. Each cell will contain arbitrary html (for example, an image and a caption). List all the ways this layout can be coded. Any method is acceptable, as long as it will render properly. Also list the method you would generally prefer, and why.

1b) Now that you have your data grid, describe in great detail the code involved to:

- put a checkbox on each of the rows to allow row selection
- enable row selection by clicking on the rows
- enable multi-row selection by selecting every row between the 2 rows clicked in subsequent clicks if the shift key was held while clicking the last row.
- make this code work if there were an arbitrary number of data grids on your page.

2) Your boss at the CIA has given you plans for a top-secret defense system that you are to deliver to your counterpart in another part of town. While walking to make the delivery, an enemy agent bumps into you, scattering the plans on the ground. Despite your years of training, he has time to grab a single page before you chase him from the scene. You return and pick up the remaining pages. On your way to report the incident to your superiors, your immediate goal becomes clear: you must determine which page was stolen, and let your superiors know what information was compromised. Fortunately, the pages are numbered. If only there were an order n solution for finding the missing page number...
Please write an algorithm that will identify the missing page. You may use any language.

3) Contact information for our company is hard coded on a number of pages on our site. We have decided to relocate, and suddenly need to change all of our phone numbers. Please write a regular expression that will match most common phone number formats, so that we can quickly identify pages that need to change.

4) Please define the following, and demonstrate their usage in the language of your choice:

Polymorphism
Singleton
Abstract Class

5) Please design a schema to model the following requirements:

Entities:
   Company
   Employee
   Manager
   Project
An Employee can work for multiple Companies
An Employee can work on multiple Projects
A Project can only be worked on by people from a single Company.
An Employee can only have one Manager

Note: You only need to define fields that are necessary to model the requirements, and to make the following queries.

Given the schema from above, please write SQL statements to fetch the following information. If the information cannot be fetched using a single query, please explain why.

• A list of employees for a given company
• A list of projects a given employee works on
• Average salaries of people who work in companies with at least 500 employees
• The total number of people a given person directly or indirectly manages. For example, the VP of engineering manages the entire engineering department, even though he may directly manage only a few people.
• Companies having employees who work for at least one other company.