Section 6 of the NP-completeness homework will be due Friday, December 2.

1. For the following two questions, briefly show your calculations.
   (a) Exactly how many comparisons does Bubble Sort use on a list of size 9.
   (b) Exactly how many comparisons does Mergesort use on a list of size 9 (in the worst case)?

2. Assume you use the selection algorithm from class (and from CLRS) but we use columns of size 9. Assume we use (the full) Bubble Sort to find the median of each column.
   (a) Briefly list each step of the algorithm and show how many comparisons the step takes. Do not optimize the partition step.
   (b) Write a recurrence for the number of comparisons the algorithm uses.
   (c) Solve the recurrence using constructive induction. Just get the high order term exactly.
   (d) How does this value compare to what we got in class with columns of size 5?

3. Assume you have two sorted lists A, B each of size n. You would like to find the nth smallest element of all $2n$ elements. Give an algorithm that uses $\Theta(\log n)$ comparisons to do this. As usual, try to minimize the number of comparisons, and give the high order term exactly.

4. Let $G = (V, E)$ be a directed graph.
   (a) Assuming that G is represented by an adjacency matrix $A[1..n, 1..n]$, give a $\Theta(n^2)$-time algorithm to compute the adjacency list representation of G. (Represent the addition of an element v to a list l using pseudocode by $l \leftarrow l \cup \{v\}$.)
   (b) Assuming that G is represented by an adjacency list $\mathrm{Adj}[1..n]$, give a $\Theta(n^2)$-time algorithm to compute the adjacency matrix of G.

5. **Challenge problem**. Show how to find the median of 5 numbers with only 6 comparisons.