Problem 1. In class, we solved the selection problem by breaking the list into groups of 5 elements each.

(a) We used the fact that you can find the median of 5 numbers with 10 comparisons (by sorting). It turns out that you can find the median with only 6 comparisons.

   (i) Write down the recurrence for the running time using this new fact. (You can ignore floors and ceilings, as we did in class.)

   (ii) Solve the recurrence.

(b) (i) How many comparisons do you need to find the median of 3 elements? Justify your answer.

   (ii) Write down the recurrence for a selection algorithm based on columns with three elements each. (You can ignore floors and ceilings, as we did in class.)

   (iii) Solve the recurrence.

(c) You need 10 comparisons to find the median of 7 elements.

   (i) Write down the recurrence for a selection algorithm based on columns with 7 elements each. (You can ignore floors and ceilings, as we did in class.)

   (ii) Solve the recurrence.

(d) What did you learn?

Problem 2. Show that quicksort can be implemented with worst case $\Theta(n \log n)$.

Problem 3. **Challenge Problem. Will not be graded.** Show how to find the median of 5 numbers with only 6 comparisons.