

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.