1. In the algorithm select the input elements are divided into groups of 5. Will the algorithm work in linear time if they are divided into groups of 7? Argue that select will not work in linear time if groups of size 3 are used.

2. Let $X[1 \ldots n]$ and $Y[1 \ldots n]$ be two arrays, each containing $n$ elements already in sorted order. Give an $O(\log n)$-time algorithm to find the median of all $2n$ elements in arrays $X$ and $Y$. (The median of a set of size $n$ is the $\lceil \frac{n}{2} \rceil$ smallest element).

3. Suppose you have a “black-box” worst-case linear-time median subroutine. Give a simple, linear-time algorithm that solves the selection problem for an arbitrary order-statistic.

4. Prove a lower bound of $n + \lceil \log n \rceil - 3$ on the number of comparisons required to find the second largest element of a set of distinct elements. An upper bound of this value was shown in the class, in the form of an algorithm using that many comparisons. You might try and use ideas similar to the proof of lower bound for the problem of finding the simultaneous-max-and-min.