Pre-lecture exercises will not be collected for credit. However, you will get more out of each lecture if you do them, and they will be referenced during lecture. We recommend **writing out** your answers to pre-lecture exercises before class. Pre-lecture exercises usually should not take you more than 30 minutes.

In this pre-lecture exercise, you'll get acquainted with the k-SELECT problem which we'll see in Lecture 4.

Consider the problem k-SELECT: When given an array A of n distinct numbers, find the k'th smallest one. For example, if the input were

$$A = [6, 4, 8, 9, 5, 2, 1],$$

then the output to 3-select should be "$A[1] = 4$," since 4 is the 3rd smallest item in this array.

1. Give an $O(n \log(n))$-time algorithm for k-SELECT (for any fixed k).

2. Give an $O(n)$-time algorithm for 1-SELECT. (That is, k-SELECT for $k = 1$).

3. Give an $O(n)$-time algorithm for 2-SELECT.

4. Question to ponder before Lecture 4: can you come up with an $O(n)$-time algorithm for k-SELECT for general k? (It's okay if not—as we'll see in Lecture 4, this is tricky!)