Problem numbers are from the second edition or the third of “Introduction to algorithms”. If unsure about which problem to solve, ask. Collaboration is permitted; looking for solutions from external sources (books, the web, etc.) is prohibited.

1. 6.1-7
2. 6.4-3
3. (a) What is the running time of (deterministic) quicksort when all elements of the input are equal? Explain.
   (b) Show that the following problem can be solved in time $O(n \log n)$:
   Given an array of $n$ numbers, determine whether all the elements in the array are distinct.
4. 7.4-4
5. (a) What is the smallest possible depth of a leaf in a decision tree for a comparison sort? Explain.
   (b) Describe an algorithm that, given $n$ integers in the range 0 to $k$, preprocesses its input and then answers any query about how many of the $n$ integers fall into a range $[a..b]$ in $O(1)$ time. Your algorithm should use $\Theta(n+k)$ preprocessing time. (Hint: counting sort)