You're expected to work on the problems before coming to the lab. Discussion session is not meant to be a one-way lecture. The TA will lead the discussion and correct your solutions if needed. For many problems, we will not release 'official' solutions. If you're better prepared for discussion, you will learn more. The TA is allowed to give some bonus points to students who actively engage in discussion and report them to the instructor. The bonus points earned will be factored in the final grade.

In the following, you can assume that all elements in the input are distinct.

1. (Basic) Using Figure 7.1 as a model, illustrate the operation of Partition on the array $A = \langle 13, 19, 9, 5, 12, 8, 7, 4, 21, 2 \rangle$. Do the same thing when we have $A = \langle 13, 19, 9, 5, 12, 8, 7, 4, 21, 11 \rangle$

2. (Basic) Is Quick-Sort an in-place sorting algorithm? How about Merge-sort, Heap-sort, Insertion-sort?

3. (Basic) The running time of Randomized-Quicksort that picks the pivot uniformly at random is always $O(n \log n)$ for any input of size n. True of False?

4. (Basic) The expected running time of Randomized-Quicksort that picks the pivot uniformly at random is $O(n \log n)$ for any input of size n. True of False?

5. (Basic) The worst-case running time of (Deterministic) Quicksort is $\Theta(n^2)$. True of False?

6. (Basic) Suppose the input is a random permutation of integers 1 through n. The average-case running time of (Deterministic) Quicksort is $\Theta(n^2)$. True of False?

7. (Basic) Solve $T(n) = T(0.9n) + T(0.1n) + \Theta(n)$. What is your answer? No need to give any explanations. Solve $T(n) = T((2/3)n) + T((1/3)n) + \Theta(n)$. What is your answer?