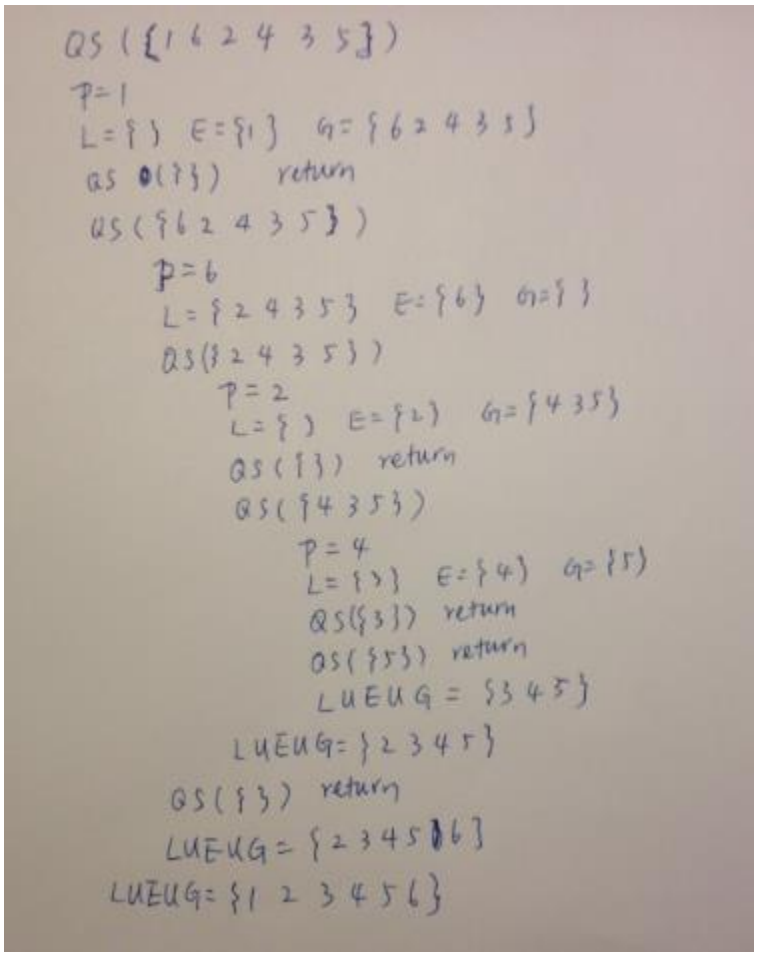
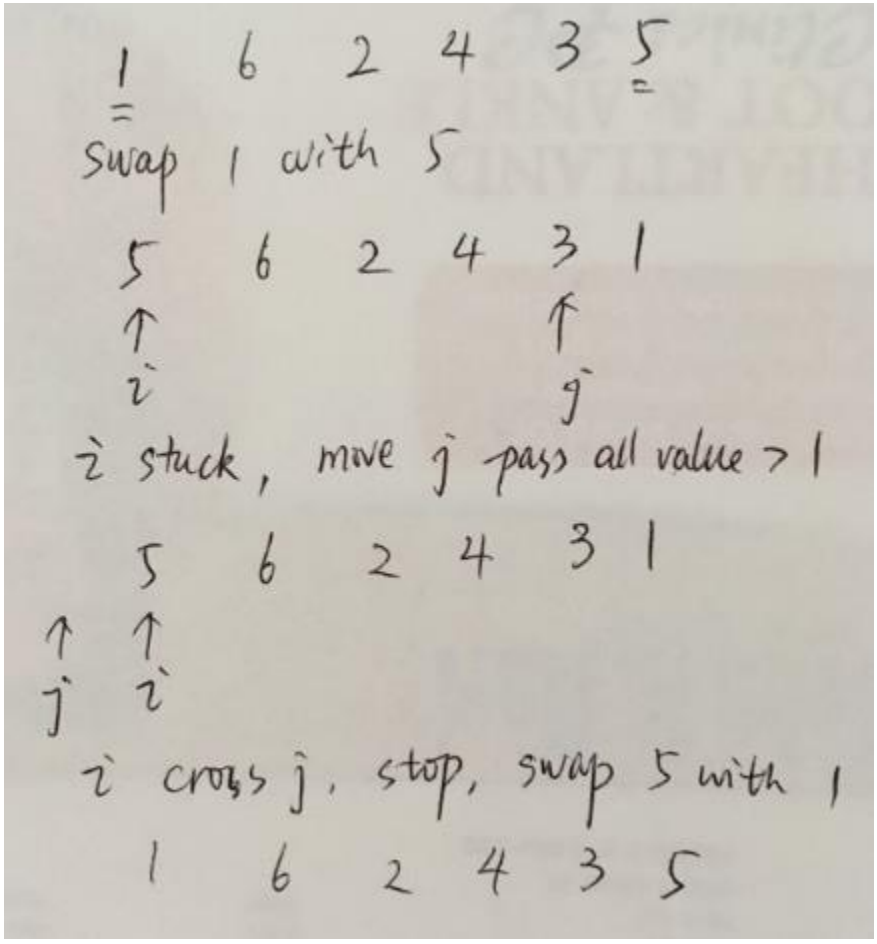
Lab 5 Solutions

Problem 1



Problem 2



Problem 3.

a. Good pivots: 2,3,3,4,5

b. Yes: 5/9 of the elements are good pivots.

Problem 4.

[22/6] Give an o(n) (that is, better than $\Theta(n)$) algorithm for determining whether a sorted array A of distinct integers contains an element m for which $A[m] = m$, and then implement as a Java function

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int findFixedPoint(int[] A)
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which returns such an m if found, or -1 if no such m is found. You must also provide a proof that your algorithm runs in o(n) time.

Step 1: If A[0] = 0, return 0.

Step 2: If A[0] > 0, return -1.

Step 3: Do binary search. The base case will examine A[mid] to see if A[mid] = mid, and if so, return A[mid] (it's the a fixed point). If A[mid] > mid, search the left side. If A[mid] < mid, search the right side. If the usual failure signal occurs (lower > upper) return -1. This solves the problem in O(log n).