

CS 5300 Advanced Algorithms
HW # 5

1. Illustrate the operation of PARTITION on the array
 $A = \langle 13, 19, 9, 5, 12, 8, 7, 4, 21, 2, 6, 11 \rangle$
2. Use the substitution method to prove that the recurrence $T(n) = T(n - 1) + \Theta(n)$ has the solution $T(n) = \Theta(n^2)$
3. Show that the expression $q^2 + (n - q - a)^2$ achieves a maximum over
 $q = 0, 1, \dots, n - 1$ when $q = 0$ or $q = n - 1$
4. Give a brief argument that the running time of PARTITION on a subarray of size n is $\Theta(n)$
5. How would you modify QUICKSORT to sort into nonincreasing order?
6. Draw the decision tree for sorting 4 numbers (Hint: see figure 8.1 page 192)
7. Illustrate the operation of COUNTING-SORT on the array
 $A = \langle 6, 0, 2, 0, 1, 3, 4, 6, 4, 6, 1, 3, 2 \rangle$
8. Illustrate the operation of RADIX-SORT on the following list of English words: COW, DOG, SEA, RUG, ROW, MOB, BOX, TAB, BAR, EAR, TAR, DIG, BIG, TEA, NOW, FOX.
9. Illustrate the operation of BUCKET-SORT on the array
 $A = \langle .79, .13, .16, .64, .39, .20, .89, .53, .71, .42 \rangle$