Homework 7
CS 3385

1. Show that there is no comparison sort whose running time is linear for at least half of the $n!$ inputs of length n. *Hint:* think depth of the decision tree.

2. Show that there is no comparison sort whose running time is linear for a fraction of $1/n$ of the $n!$ inputs of length n.

3. Show that there is no comparison sort whose running time is linear for a fraction of $1/2^n$ of the $n!$ inputs of length n.

4. Using figure 8.2 as a model, illustrate the operation of `countingSort` on the array $A = \langle 1, 4, 1, 3, 2, 1, 3 \rangle$. Unlike figure 8.2, you need to show every step of building the array B.

5. Using figure 8.3 as a model, illustrate the operation of `radixSort` on the following list of words: COW, DOG, SEA, RUG, ROW, MOB, BOX, TAB, BAR, EAR, TAR, DIG, BIG, TEA, NOW, FOX.

6. Using figure 8.4 as a model, illustrate the operation of `bucketSort` on the array $A = \langle .79, .13, .16, .64, .39, .20, .89, .53, .71, .42 \rangle$.

7. Explain why the worst-case running time for bucket sort (as written on page 201) is $\Theta(n^2)$. What simple change to the algorithm makes its worst-case running time $O(n \lg n)$?