

## Homework 7

CS 3385

Due Feb 17 at the end of class

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 is  $\Theta(n^2)$ . What simple change to the algorithm makes its worst-case running time  $O(n \lg n)$ ?