

## Assignment #2

Due: Thursday, May 3rd, 2001. In class.

**Problem 1.** For  $n$  distinct elements  $x_1, x_2, \dots, x_n$  with positive weights  $w_1, w_2, \dots, w_n$  such that  $\sum_{i=1}^n w_i = W$ , the *weighted median* is the element  $x_k$  satisfying:

$$\sum_{x_i < x_k} w_i \leq \frac{W}{2}$$

and

$$\sum_{x_i > x_k} w_i \leq \frac{W}{2}$$

- Let  $x_1, \dots, x_n$  be a set of  $n$  distinct elements. Prove that for any choice of positive weights  $w_1, \dots, w_n$  there are at most two elements that could be considered to be the weighed median.
- Show how to compute all weighted medians of  $n$  elements in  $O(n \log n)$  worst-case time using sorting.
- Show how to compute all weighted medians in  $\Theta(n)$  worst-case time using a linear-time median algorithm such as SELECT from the text.

**Problem 2.** Do problem 7.5–5 in CLR. (page 151)

**Problem 3.** Radix sort.

- Do problem 9.3–1 in CLR. (page 180)
- Do problem 9.3–3 in CLR. (page 180)

**Problem 4.** Do Problem 7.5–6 in CLR (page 151).

**Problem 5.** Show how to sort  $n$  integers in the range 1 to  $n^{10}$  in  $O(n)$  time. You may use  $O(n)$  auxiliary space.

**Problem 6.** Do Problem 9.1–4 in CLR (page 175).