1 Administrative

• Expect Homework 03 soon.
• Expect Midterm Exam 1 grades by Wednesday night.

2 Results of Midterm Exam 1

Problem 1 $O$

• must show factor $(c_1c_2)$ and starting point $(\max(n_1,n_2))$
• working with inequalities, not equations

Problem 2, 3 (master theorem)

• some used a different version of the master theorem and didn’t explain it
• must state that $n \log n = O(n^{2-\epsilon})$
• result is $\Theta$-bound, not $O$-bound

Problem 4 (heaps)

• circle pairs of nodes violating heap property

2.1 Problem 5 (lower-half sum)

Correct solution (20 points)

1. Use Randomized-Select algorithm (based on quicksort’s Random-Partition subroutine) to select the median (the $\text{floor}(n/2)$ order statistic).

2. Afterwards, as a side effect, the elements of the array from 1 to $\text{floor}(n/2)$ are the $\text{floor}(n/2)$ smallest elements.

3. Calculate the sum of $A[1..\text{floor}(n/2)]$. 
Average-case run time: $O(n)$

Almost as good (19 points)

1. Find the median (using \textsc{Randomized-Select} or the non-random algorithm).

2. Calculate the sum of all elements in the array that are $\leq$ the median.

This algorithm can be \textit{incorrect} if the median occurs multiple times.

Average-case run time: $O(n)$

Correct but slower than necessary (15 points)

1. Sort the array.

2. Calculate the sum of $A[1..\lfloor n/2 \rfloor]$.

Average-case run time: $O(n \log n)$

Other issues

- incorrect analysis ("sorting takes time $O(n)$")
- complexity presented in unreduced form, like "$O(n + n \log n)$"

3 \textbf{Greedy Algorithms}

(ended on slide 16)