cs140 – algorithms
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Order statistics

- input: array of numbers A[n], index k
- output: value of k^{th} smallest number in A[n]
- specific cases?
- variations?
- bounds on the general case?

Order statistics: expected linear time

- random partition

Order statistics: worst cast linear time

- median-of-medians idea

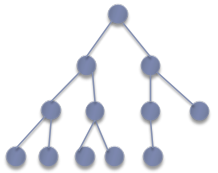
- does it work? how fast?

Data structures (1-slide review)

- "dynamic set"
- examples of common operations
  - search(S,k), insert(S,x), delete(S,x)
  - minimum(S), maximum(S), successor(S,x), predecessor(S,x)
- examples of common data structures
  - arrays
  - linked lists (and variants)
  - stacks
  - queues
  - trees (binary and otherwise)
  - priority queues

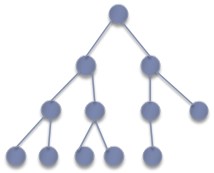
Heaps

- definition
  - almost-full binary tree
  - heap property
- implementation using arrays
- operations?



heapsort

- heapify(A,i)
- buildheap(A,n)
- heapsort(A,n)



1	10	4	2	8	0	8	1

Analyzing data structures

- How efficiently does it execute supported operations?
- On *average* how efficiently does it execute supported operations?

Amortized analysis

- idea: analyze a sequence of operations in order to show that although a single operation may be expensive, on average the cost per operation is small.
- observation: *not* probabilistic analysis
- plan: go over 3 methods for doing amortized analysis