Overview

- Merge Sort
- Heap Sort

A Sorting Taxonomy (cont.)

Announcements: Java I/O Tutorial, Sunday, 2-3PM, Location: TBA

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public abstract void join(int[] a, int lo, int hi) {
}

public abstract int split(int[] a, int lo, int hi) {

}

public final void sort() {

}

Recall the abstract class Abstracter in the handout.

Sorting by Divide and Conquer
- Because each split() divides the array into two (almost) equal-sized parts, each element is joined \( \log n \) times.

- Merge sort takes \( O(n \log n) \) steps.

- Merge sort is easy-split, hard-join method.
Heap Sort

Heap Sort takes \( (n \log n) \) steps. Since \( \text{split}() \) is performed \( n \) times, where \( n \) is the (overall) array length, \( (n \log n) \) steps, where \( n \) is the subarray length, \( (n \log n) \) steps instead of \( (n) \) steps in the subarray, is made to run in \( \log(n) \) steps instead of \( (n) \) steps in the subarray, which finds the minimum (maximum) element.

- Specifically, \( \text{split}() \), which finds the minimum (maximum) element.

Think of Heap Sort as an improved (faster) version of Selection Sort.

- Heap Sort is a hard-split, easy-join method.
Progress

Unsorted: Heap

Sorted: Heap

- The elements in the unsorted portion of the array are organized into a heap.

How is split( ) speed up?
Children are heaps.

- The root, if non-null, is the largest key in the tree, and its left and right subtrees are themselves heaps.

A heap is a binary tree that is almost balanced (we allow a variation of at most 1 in path length from the root to the leaves) and that exhibits the heap property:

What is a Heap?