CSSE 220

Merge Sort
Comparable/Comparator

Today's Plan

- Merge sort
- How to use Java's sort functions (Comparable and Comparator)
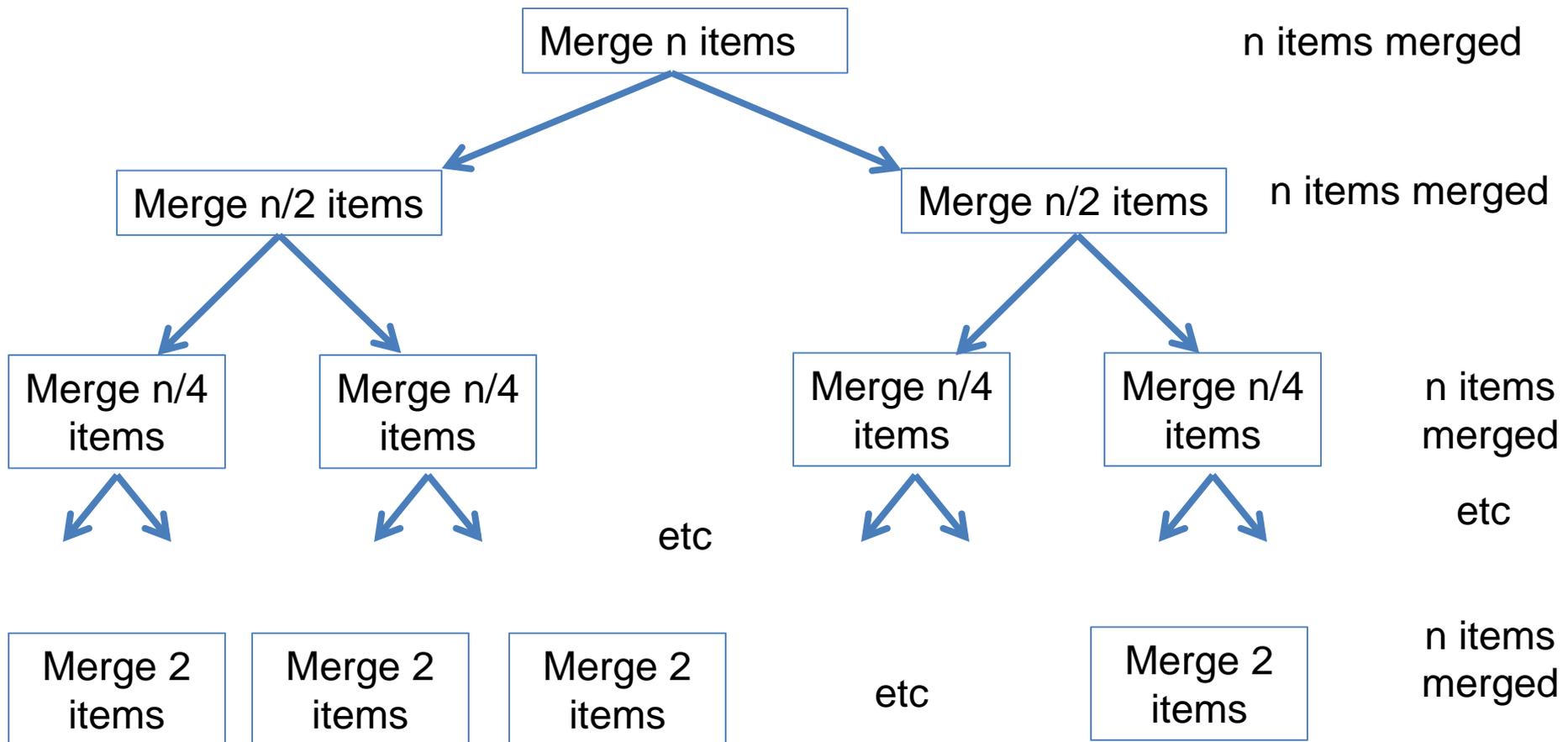
Merge Sort

- Basic recursive idea:
  - If list is length 0 or 1, then it's already sorted
  - Otherwise:
    - Divide list into two halves
    - Recursively sort the two halves
    - **Merge** the sorted halves back together

Analyzing Merge Sort

If list is length 0 or 1,
  then it's already sorted
- Otherwise:
  – Divide list into two halves
  – Recursively sort the two halves
  – **Merge** the sorted halves back together

| Merge n items | n items merged |

Merge n items → n items merged

Merge n/2 items   Merge n/2 items   n items merged

Merge n/4 items   Merge n/4 items   Merge n/4 items   Merge n/4 items   n items merged

etc   etc

Merge 2 items   Merge 2 items   Merge 2 items   etc   Merge 2 items   n items merged

How to Sort in Java

- For arrays:

`Arrays.sort(myArray);`

- For ArrayLists or other stuff:

`Collections.sort(myArrayList)`

- For stuff like Strings and ints, the expected sorting is already built in. But what if you have a new class you want to sort?

When Your Object is Sortable

- You should implement the Comparable<YourObjectType> interface
- You need to implement 1 method: compareTo
- See section 10.3 of your text for details
- Let's do an example

A Sort of a Different Order

- Java libraries provide efficient sorting algorithms
  - `Arrays.sort(…)` and `Collections.sort(…)`

- But suppose we want to sort by something other than the "natural order" given by `compareTo()`

- *Function objects* to the rescue!

Function Objects

- Objects defined to just "wrap up" functions so we can pass them to other (library) code

- For sorting we can create a function object that implements Comparator

- Let's try it!