Extra Lecture – Introduction to Sorting

- What is sorting?
- Given an array R[1..N] of N numbers, re-order the elements of R[] such that after re-ordering,
  - R[1] ≤ R[2] ≤ … ≤ R[N]
- Sorting is an extremely well studied problem in Computing. Many algorithms exist, including
  - **bubble sort**
  - heap sort
  - quick sort

Bubble Sort [Knuth, Vol 3, p.107]

Algorithm B (BubbleSort)

B1. [Initialize BOUND] Set BOUND := N

B2. [Loop on j] Set t := 0. Perform B3 for j=1,2,…,BOUND-1 and then go to step B4.

B3. [Compare/Exchange] If R[j] > R[j+1], interchange R[j] with R[j+1] and set t := j;

B4. [Any exchanges?] If t=0, the algorithm terminates. Otherwise set BOUND := t and return to step B2. ■

BubbleSort - Notes

- BOUND is the highest index for which the element is not known to be in its final (sorted) position.
  - BOUND = N ⇒ Nothing is known about ordering
  - BOUND = 0 ⇒ Array is in perfect order
- t holds the last index at which an exchange was performed
  - t=0 ⇒ No exchanges were performed
- Algorithm as presented sorts in ascending order of R_j

Bubble Sort - Example

R[1]	43	34	34	34	34	34
R[2]	34	43	43	43	35	35
R[3]	64	64	48	35	43	43
R[4]	64	48	35	48	48	48
R[5]	48	35	64	64	64	64
R[6]	35	64	64	64	64	64
R[7]	84	84	84	84	84	84