

CS 305
Design and Analysis of Algorithms

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Today's Topics

- Questions / Comments?
- Revisit the end of the analysis of the expected running time of Randomized Quicksort (with the Sum of Sums)
- Clarify Decision tree from last time – it represented
- Lower bound running time on comparison sorts
- Start Counting Sort
- Idea of a Stable sort

$$\sum_{i=1}^n i$$

$$= \frac{n(n+1)}{2}$$

$$\sum_{i=0}^n x^i$$

$$= \frac{x^{n+1} - 1}{x - 1}$$

where $|x| < 1$

$$\sum_{i=0}^{\infty} x^k$$

$$= \frac{1}{1-x}$$

$$\sum_{i=1}^n \frac{1}{i}$$

$$= \ln(n) + O(1)$$

Decision Trees

- Decision tree – any comparison algorithm can be viewed as a tree of all possible comparisons and their outcomes and resulting answers.
- Internal node - decision / comparison
- Leaf - answer found
- A path from root to leaf - execution of algorithm
- Path length - running time
- Height of tree - worst case running time