Design and Analysis
of Algorithms I

Master Method

The Precise Statement

The Master Method

<u>Cool Feature</u> : a "black box" for solving recurrences.

<u>Assumption</u> : all subproblems have equal size.

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Recurrence Format

1. <u>Base Case</u> : T(n) <= a constant for all sufficiently small n
2. For all larger n :

$$T(n) \leq aT(n/b) + O(n^d)$$

where

    a = number of recursive calls (>= 1)

    b = input size shrinkage factor (> 1)

    d = exponent in running time of "combine step" (>=0)

    [a,b,d <u>independent of n</u>]

The Master Method

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$$T(n) = \begin{cases} O(n^d \log n) & \text{if } a = b^d \quad \text{(Case 1)} \\ O(n^d) & \text{if } a < b^d \quad \text{(Case 2)} \\ O(n^{\log_b a}) & \text{if } a > b^d \quad \text{(Case 3)} \end{cases}$$

Base doesn't matter (only changes leading constants)

Base matters

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