$$T(n) = \begin{cases} 1 & n = 1 \\ aT(n/b) + D(n) & n > 1,\ n \text{ a power of } b \end{cases}$$

F Master Theorem. For any nondecreasing function $f(n)$ and any $d \geq 0$,

$$T(n) = \begin{cases} \Theta(D(n)) & D(n) = \Theta(n^d f(n)) & h < d \\ O(D(n)\log n) & D(n) = \Theta(n^h f(n)) & \\ \Theta(n^h) & D(n) = O(n^d) & h > d \end{cases}$$

3. the middle case is tight, i.e., $T(n) = \Theta(D(n)\log n)$ for $D(n) = \Theta(n^h f(n))$, if $f(n)$ satisfies this "flatness condition":
   (F) $\quad f(\sqrt{n}) = \Omega(f(n))$

   e.g., $f(n) = \log n$ satisfies (F), $f(n) = n$ doesn't

   the set of f's satisfying (F) is closed under product, powers, logs
   e.g., $\log^2 n$, $\sqrt{\log n}$, $\log\log n$ satisfy (F)

   we can also relax (F), requiring it only for sufficiently large n

F Master Theorem for Unequal Subproblems.
Consider any recurrence

$$T(n) = \sum_{i=1}^{k} T(a_i n) + D(n)$$

where $0 < a_i < 1$, $i = 1, ..., k$ and $D(n) = n^d f(n)$ for a nondecreasing function $f(n)$.
(change the arguments $a_i n$ to $a_i n + A_i$ if you wish).

Set $s = \sum_{i=1}^{k} a_i^d$.

$$T(n) = \begin{cases} \Theta(D(n)) & s < 1 \\ O(D(n)\log n) & s = 1 \\ \Theta(n^h) & s > 1 \end{cases}$$

where h satisfies $\sum_{i=1}^{k} a_i^h = 1$.

The middle case is tight, $T(n) = \Theta(D(n)\log n)$, for $s = 1$ and f satisfying (F).