Cheat Sheet

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1. For $T(n) = T(\sqrt{n})$ there are $\log \log n$ levels.
2. Markov's Inequality: $P(X \geq a) \leq E[X]/a$.
3. For $T(n) = aT(n/b) + O(n^c)$
   (a) $b^c < a \Rightarrow T(n) \in \Theta(n^{\log_b a})$
   (b) $b^c = a \Rightarrow T(n) \in \Theta(n^c \log n)$
   (c) $b^c > a \Rightarrow T(n) \in \Theta(n^c)$
4. Root dominated means take work at root node, leaf dominated means count number of leaves, and balanced means multiply work per level by number of levels.
5. $\log(n!) \in \Theta(n \log n)$.
6. Collect takes a sequence of tuples and then collects together all of the elements that have the same first element.
7. Contraction versus divide and conquer; they are different styles
8. $E[S_i] = \sum_{j=1}^{n} P(A_i^j) = \sum_{j=1}^{n} \frac{1}{|j-i|+1} \in \log(n)$
9. $W_{BFS}(n, m, d) = O(m), S = O(d \log n)$ for STS
10. DFS has work/span $n + m$
11. toposort: sort the exit times of the nodes after a dfs largest to smallest
12. Dijkstra's uses PQ for minimum total sum with $m \log n$.
13. Bellman-Ford work is mn, span $n \log n$ with sequences.
14. Kruskal's keeps choosing the edge with minimum weight that does not create a loop, but has $m \log n$.
15. $m + n$, $\log n$ for star contraction.