TCSS 343 - Week 2

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Divide and Conquer

On the previous worksheet I had you write code for binary search. I want you to become more and more comfortable with trees and $\log n$ time. Work is just a function of "How many problems we have" and "the amount of work for each problem". Recursions trees is an extremely powerful way of illustrating the work of recurrence problems.

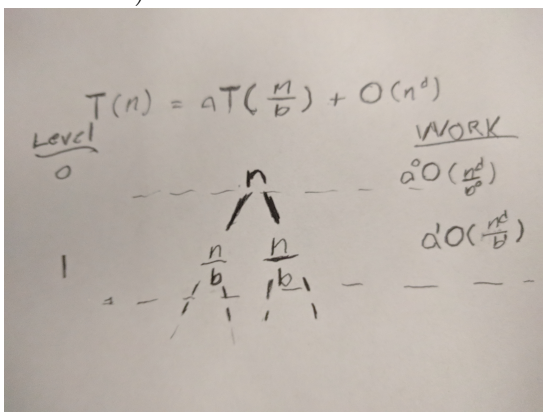
This will appear to be a digression but they are actually tightly connected ideas. Now remember the geometric series?

$$a + ar + ar^2 + ar^3 + \cdots + ar^{n-1} = a\frac{1-r^n}{1-r}$$

Good, yeah I know who could have forgotten it!? It's one of my favourite series and it should be your best friend right about now.The geomtric series is a series which progresses by some multiplicative factor.

0. The first thing I will have you do is find $O(a\frac{1-r^n}{1-r})$ for two cases. When $r > 1$ and $r < 1$ where a is some function of n.

Now that you've solved for those worst-case runtimes keep them for later because they're going to be useful! Now hold onto your butts because we're going to be having a lot of fun today. Complete this tree given the following recurrence for two more levels(The a need not be the same as the previous a...sorry a habit of notation):



Take your previous result, at what level does the tree terminate?

Please, please try your darndest to express the total work as a summation. Remember: Work is just a function of "How many problems we have" and "the amount of work for each problem".