Exam Review

D-don't Act Dumb

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Contents

1 God Please Don't Forget These

- Define Algorithm
- Summations, Logs, Ceiling, Floor
- Counting Operations
- Complexities (O, Ω, Θ)
- Divide & Conquer
- Greedy Algorithms
- Dynamic Programming

2 Logs

When it comes to CS, log always has a base of 2 unless specified otherwise. Let's take a look at $\Theta(n \log n)$.

2.1 Log Identities

$$\log(x^y) = y \log x$$

$$\log(xy) = \log x + \log y$$

$$\log_b a = \frac{\log_x a}{\log_x b}$$

2.2 $\log_{2742} n$ wtf why

$\log_{2742} n \leq c \log n \, n \geq k$
$\frac{\log n}{\log 2742} \leq c \log n$
$\frac{1}{\log 2742} \log n \leq c \log n \, c = \frac{1}{\log 2742}$

Doing it the limit way:
$\lim_{n\to\infty} \frac{\log_{2742} n}{\log n}$
$= \lim_{n\to\infty} \frac{\log n}{\log 2742} \frac{1}{\log n}$
$= \lim_{n\to\infty} \frac{\log n}{\log 2742 * \log n}$
$= \frac{1}{\log 2742}$

3 Complexities

$\Theta(n) + \Theta(1) = \Theta(n+1) = \Theta(n)$
$\Theta(n) + \Theta(n) = \Theta(n)$
$\Theta(n) * \Theta(n) * \Theta(n) = \Theta(n^3)$

4 Dynamic Programming: Optimal Substructure

Optimal answers to smaller problems are still applicable. For example, in the coin changing case, it's still better to use the two 6 cent pieces and not the bigger 10 cent piece.