Table 1: Increasing Order Of Growth

Type	Big-Oh	Asymptotic Order
Logarithmic:	$O(logn)$	$\log n$
Poly Logarithmic:	$O((logn)^2), O((logn)^3), ...$	$(logn)^2 \leq (logn)^3 \leq (logn)^4 \leq ...$
Fractional Power:	$O(n^c) for 0 < c < 1$	$n^{0.1} \leq n^{0.2} \leq n^{0.3} \leq ...$
Linear:	$O(n)$	n
$nlogn$ time:	$O(nlogn)$	$nlogn \leq n(logn)^2 \leq n(logn)^3 \leq ...$
Polynomial Time:	$O(n^a) for a > 1$	$n^2 \leq n^3 \leq ...$
Exponential Time:	$O(2^n)$	$1.5^n \leq 2^n \leq 3^n ...$

Definitions

Big O Notation: Will give us an upper bound for function f(n) when n is very large/asymptotically. This is used extensively to describe the worst case scenario for the number of operations used by an algorithm. The notation used in the definition is: O(g(n)) which is read "big-oh of g of n"
Definition:

> Let $f(n) : N \rightarrow R+$. For a given function g(n), we say that $f(n)$ is $O(g(n))$ if there are constants C and k such that:
> $$f(n) \leq Cg(n) \text{ for all } n > k$$

> $log_2 n \leq n$ for all $n \geq 1$

This inequality is true for all logarithms for any base b > 0

> For a base $b > 1$ and any exponent $a > 0$ we have that $log_b n \leq n^a$ for large enough n (for $n \geq k$ for some constant k)

Big Omega Notation Ω: The notation Big-ω is defined similar to that of Big-O but for a lower bound.
Definition:

> Let f(n) and g(n) be functions on the natural numbers to the positive real numbers. We say that f(n) is $\Omega(g(n))$ if there is a constant C such that $f(n) \geq Cg(n)$ whenever $n > k$

Big Theta Notation θ: Big-θ Notation is used to specify the function f(n) that is sandwiched between multiples of g(n). If being asked for Theta one must prove for Big O AND Big Omega **Definition:**

> Let f(n), and g(n) be functions from the natural numbers to the positive reals. If f(n) is $O(g(n))$ and f(n) is $\Omega(g(n))$ then we say that f(n) is of the order of g(n) and use the notation $\theta(g(n))$

Formulas

Summation Formula:
$$\sum_{k=1}^{n} k = 1/2n(n+1) = \theta(n^2)$$
$$\sum_{k=1}^{n} 10k = 10n(n+1)/2 = \theta(n^2)$$

LOG N Formula: Log N : $50 * Logn^3 <=> 150 * logn$