CSE373 Notes

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Given a problem of size N

- Break problem into several subproblems of size <n
- solve several subproblems of size <n
- Computer solution to the original problem from solutions to subproblems

Examples of DaQ : Quicksort and Merge Sort

1.1 Integer Multiplication

$T(n) =$ number of bit ops to multiple two n bit integers

$$T(n) = 4T(n/2) + O(n)$$
$$T(1) = O(1)$$

By master theorum since $log_b a = 2 > c = 1$

$$T(n) = O(n^{log_b a} = O(n^2))$$

Using karatsube's algorithm

$$T(n) = 3T(n/2) + O(n)$$
$$T(1) = 1$$

By master theorum :

$$T(n) = O(n^{log_2 3}) = O(n^1.6) = O(n^2)$$

1.2 Binary Exponentiation

Goal : Given x, a, m, all n-bit numbers compute $x^a mod m$