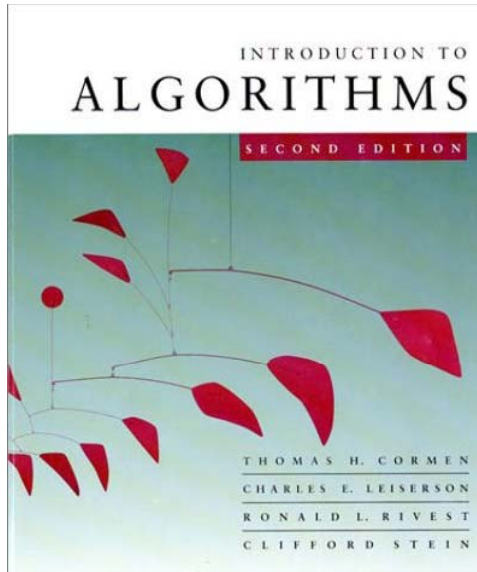# CS 3343 – Fall 2011

Analyzing Algorithms

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Algorithm

What is an algorithm?

- A tool for solving a well-defined problem

- It takes input and produces output

How does one describe an algorithm?

1. Define the problem. (What is the input, what is the output?)

2. Describe the algorithm in words and in pseudo-code

3. Proof of correctness (Convince the reader of correctness)

4. Analysis (Runtime, space)

Insertion sort

Runtime	Reps	
c_1	n	`for j=2 to n {`
c_2	n-1	`    key = A[j]`
		`    // insert A[j] into sorted sequence A[1..j-1]`
c_3	n-1	`    i=j-1`
c_4	$\sum_{j=2..n}(t_j+1)$	`    while(i>0 && A[i]>key){`
c_5	$\sum_{j=2..n} t_j$	`        A[i+1]=A[i]`
c_6	$\sum_{j=2..n} t_j$	`        i--`
		`    }`
c_7	n-1	`    A[i+1]=key`
		`}`

t_j = #times the while loop is executed for that value of j