#### CSC236 fall 2012

Theory of computation

- That's me! Danny Heap heap@cs.toronto.edu BA4270 (behind elevators) Course web page 416-978-5899

Using Introduction to the Theory of Computation





#### Outline

Introduction

Chaper 1, Simple induction

Notes

# Why reason about computing?

Juess that, guess that fast.

It's more than just hacking in fine stings

▶ Testing isn't enough

#### How to reason about computing

many drafts
polished over time.

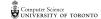
▶ It's messy...

► It's art... → Proof 15 literature — his year.

▶ Read the course information sheet as a two-way promise

Question, answer, record, synthesize

► Collaborate with respect



148 Jecursion

Chapter 0 material from Introduction to Theory of Computation

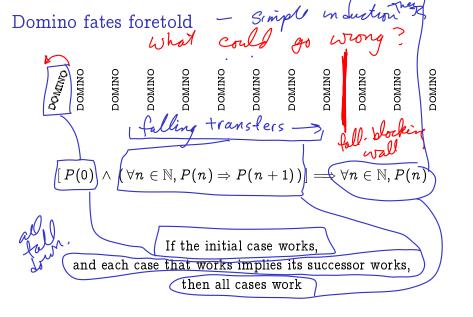
► CSC165 material, especially the mathematical prerequisites (Chapter 1.5), proof techniques (Chapter 4), and the introduction to big-Oh (Chapter 5).

▶ But you can relax the structure

#### What'll you know by December?

- Understand, and use, several flavours of induction Simple, complete, Structured, well-ordering.
- Complexity and correctness of programs both recursive and iterative

Formal languages, regular languages, regular expressions





set with n elements has exactly  $2^n$  subsets

Use: 
$$[P(0) \land (\forall n \in \mathbb{N}, P(n) \Rightarrow P(n+1))] \Longrightarrow \forall n \in \mathbb{N}, P(n)$$

$$\{ \} \longrightarrow \{ \} \longrightarrow \{ \} \longrightarrow \{ \} \longrightarrow \{ \}$$

Scratch work:

## Every set with n elements has exactly $2^n$ subsets...

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#### For every $n \in \mathbb{N}, 12^n - 1$ is a multiple of 11

Use:  $[P(0) \land (\forall n \in \mathbb{N}, P(n) \Rightarrow P(n+1))] \Longrightarrow \forall n \in \mathbb{N}, P(n)$ 

Scratch work: How to connect n to n + 1?

## For every $n \in \mathbb{N}$ , $12^n - 1$ is a multiple of 11

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