

# Lurch

## **a word processor that checks students' mathematical reasoning**

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## **Mission Statement**

1. Lurch should be as indistinguishable from the ordinary activities of mathematics as possible, except for the additional services it provides. That is, it should only add to your math experience, not change your math experience.
2. Lurch should provide the software infrastructure the mathematical community needs for validating rigorous mathematics. That is, it should validate mathematical content created by you — a “spell-checker” for mathematical rigor.

# A Lesson in Canceling

The following is a common error.

*If  $a \cdot b = a \cdot c$  then  $b = c$ .* 🟡 (erroneous canceling)

We can correct that statement as follows.

*If  $a \cdot b = a \cdot c$  and  $a \neq 0$  then  $b = c$ .* 🟢 (canceling)

## Example 1:

From  $2 \cdot x = 2 \cdot y$  🟡 and the fact that  $2 \neq 0$  🟡, we can conclude  $x = y$  🟢 by canceling.

But from  $0 \cdot 5 = 0 \cdot 6$  🟡, erroneous canceling would give us  $5 = 6$  🟡  
...yikes!

## Example 2:

The following proof, for example, would be invalid.

Assume  $t \cdot (s - r) = t \cdot (r - s)$ .

Then  $s - r = r - s$  🟡, by canceling.

It could be corrected with an additional assumption, as follows.

Assume  $t \cdot (s - r) = t \cdot (r - s)$  🟡, and  $t \neq 0$  🟡.

Then  $s - r = r - s$  🟢, by canceling.

## What Lurch Can Do

- Ordinary word processing tasks
- Tasks involving mathematical meaning
  - Highlight sections of text as meaningful
  - Read structured mathematical arguments
  - Give validation feedback to the user

## What Lurch Cannot Do

- Typeset mathematics  
(neither for input nor output)
- Customizable language  
(i.e., the built-in parser knows many common operations, but cannot be changed)
- Shortcuts  
(the "secret handshakes" of mathematics)

## **Built-in Topics**

- Propositional Logic
- Predicate Logic with equality
- Elementary set theory
- Divisibility of Natural Numbers
- Introduction to Functions

## **Topics Coming in Spring 2013**

- Relations and Orderings
- Number Theory with Induction
- Graph Theory
- Boolean Algebras
- ...and more in the summer

## What Can You Do?

- Download it and try it out in a course (Windows/Mac/Linux, and **free!**)

<http://lurch.sf.net>

- Create new math topics and (optionally) email them to us for inclusion in future versions