A Reason to Reason: Rich Problems and Interactive Tools

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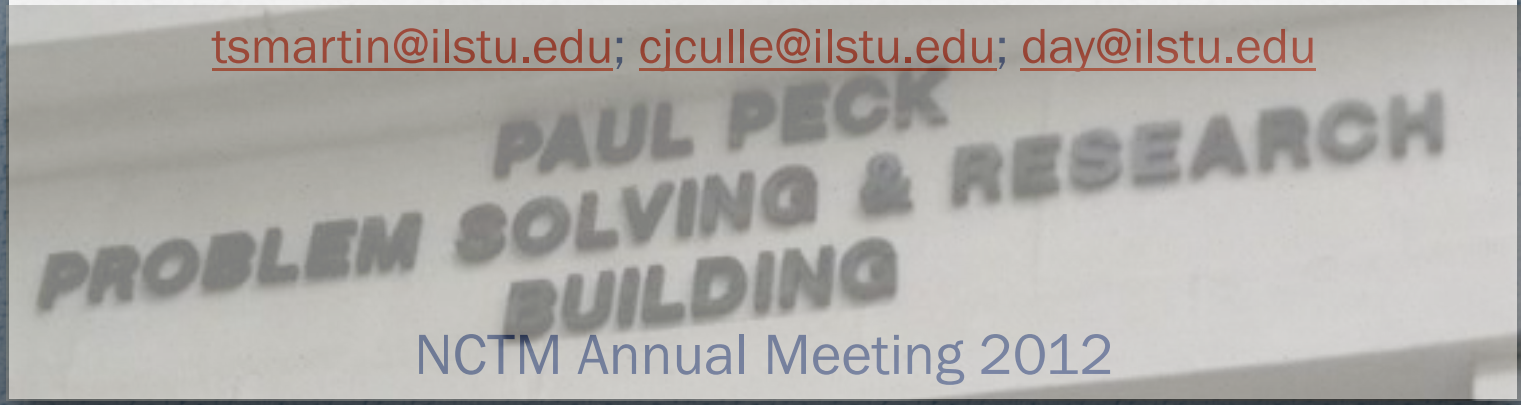

NCTM Annual Meeting 2012

Session components

- Introduction – Why use technology as a support for reasoning and sense making
- Baseball Problem
- Deicer Problem
- Rectangle Problem (or other lower-entry problem)
- Wrap up

A reason to reason…

(Tami Martin, Craig Cullen, Roger Day)

Warm up: Baseball Problem

- Is it easier to hit a home run in Fenway Park or Wrigley Field?

Wireless connection for this workshop only:

- Set network to DHCP
- Connect to SSID: “Illinois_State_University” (no password required)
- Launch your browser

CCSS-M Connections

- Mathematics: Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. **Model with mathematics**
5. **Use appropriate tools strategically**
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Model with mathematics

- Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later.
- They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
- They can analyze those relationships mathematically to draw conclusions.
- They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense…

Use appropriate tools strategically

- Mathematically proficient students consider the available tools …computer algebra system, a statistical package, or dynamic geometry software.
- For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator.
- They detect possible errors by strategically using estimation and other mathematical knowledge.
- When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data.

Modeling the Baseball Problem

- Review factors to consider
- Explore GSP and Geogebra files
- Explore multiple representations in Geogebra

Files available at:

http://math.illinoisstate.edu/day/

Reflections on the Baseball Problem

- What components of reasoning are evident in the problem?
- What extensions could you pose to this problem?
- Can this problem be extended to other sports or contexts?
- How did the tools enhance or detract from the problem exploration?
- What problems have you explored with students that use similar reasoning or tools?

Deicer Problem

- While living in Norway, Roger drove a 1967 Volkswagon Beetle. As cold temperatures approached, the mechanic at a local garage suggested that he use a gasoline additive (deicer) to absorb moisture that might condense in the fuel line of the Beetle. Roger was told to pour in a bottle of deicer with every fuel fill.
- What happens in the fuel tank over time?
- Eventually, will the tank be filled with only deicer?

Modeling the Deicer Problem

- Review factors to consider
- Explore GSP file
- Explore Excel file
- What is the underlying mathematical structure that leads to the result?

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Reflections on the Deicer Problem

- What components of reasoning are evident in the problem?
- What extensions could you pose to this problem?
- In what other contexts do similar mathematical relationships arise?
- How did the tools enhance or detract from the problem exploration?
- What problems have you explored with students that use similar reasoning or tools?

Rectangle Problem

- For a fixed rectangle width, what length will produce an area value (unit free) that is the same as the perimeter value (unit free)?

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Reflections on the Rectangle Problem

- What components of reasoning are evident in the problem?
- What extensions could you pose to this problem?
- In what other contexts do similar mathematical relationships arise?
- What problems have you explored with students that use similar reasoning or tools?

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