

**Reclaiming Lost Ground:  
Research-based Interventions for Under-prepared Algebra Students**  
*NCTM 2010 Regional Conference — Thursday, October 28, 2010*

**Opener:** Consider the following problem.

Write an algebraic rule to describe the relationship between the number of sides of a polygon,  $n$ , and the number of diagonals that can be drawn from one vertex,  $d$ .

Use  $n$  as the independent variable, and express your rule using function notation.

Explain how you found the rule.

Work on the problem. (How are you approaching it? What ideas is it connected to?)

Then, think of your students.

What are some challenges 9th-grade students would face in solving a problem like this?

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*The text of two slides is provided here in case it's hard to read up front.*

**Activity 2.1 Opener: Generalizing a dot pattern**

A sequence is shown in picture form. Assume that the sequence continues to grow in the same way. Study the pattern. Then complete the following tasks.

1. Organize the information for the figures into an input-output table.

Figure number, $n$	Number of dots, $d$

2. Write an input-output rule for the table. Your rule should use the variables  $n$  and  $d$ .

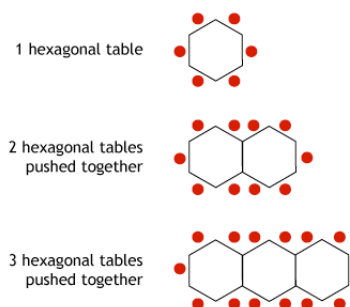
**Activity 12.1 Opener: Return of the shape equations**

**Work on the following problems in your activity book.**

1. Evaluate  $ab + 2c$  when  $a = -2$ ,  $b = 3$ , and  $c = 5$ .
2. Following is a set of three shape equations. The value for each shape is constant in the three equations. Find the values for the shapes. Then explain your reasoning.

## The Banquet Table Problem

Erlinda and Chris continue their work on the dance committee. Erlinda just found out the hall where the tables will be located is long and narrow. There is not enough room to spread the tables out. Chris suggests pushing the tables together in a row. He makes diagrams showing the arrangements of tables and chairs.



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### Selected research citations

*How People Learn: Brain, Mind, Experience, and School*, ed. Bransford, Brown, & Cocking (NRC 2000)

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*Adding It Up: Helping Children Learn Mathematics*, ed. Kilpatrick, Swafford, & Findell (NRC 2001)

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*Second handbook of research on mathematics teaching and learning*, ed. Lester (NCTM 2007)

<http://www.nctm.org/catalog/product.aspx?ID=13224>

- Kieran: “Learning and Teaching Algebra at the Middle School through College Levels: Building Meaning for Symbols and Their Manipulation”, pages 707–62

“Conceptions of school algebra and uses of variables” by Usiskin

In *The Ideas of Algebra, K–12* (NCTM 1988 Yearbook: ISBN 0-87353-250-3)

“Students’ interpretations of literal symbols in algebra” by Christou, Vosniadou, and Vamvakoussi (2007)

In Vosniadou, Baltas & Vamvakoussi, *Re-Framing the Conceptual Change Approach in Learning and Instruction*

*Knowing what Students Know: The Science and Design of Educational Assessment*,

Ed. Pellegrino, Chudowsky, & Glaser (NRC 2001)

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In *Journal for Research in Mathematics Education*, **28**(5), 524–549.

“What is high-quality instruction?” by Weiss & Pasley in *Educational Leadership* **61**(5), 24–28 (Feb. 2004)

[http://www.ascd.org/authors/ed\\_lead/el200402\\_weiss.html](http://www.ascd.org/authors/ed_lead/el200402_weiss.html)

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“The impact of task-based professional development on teachers’ practices and beliefs: A design research study” by

Swan in *Journal of Mathematics Teacher Education*, **10**, 217-237 (2007)

*Improving learning in mathematics: Challenges and strategies* by Swan (2005)

“The perils and promises of praise” by Dweck in *Educational Leadership*, **65**(2), 34–39 (2007)

<http://people.stfx.ca/aforan/Perils-and-Promise-of-Praise.pdf>

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Slides will be posted at [utdanacenter.org/intensifiedalgebra](http://utdanacenter.org/intensifiedalgebra)