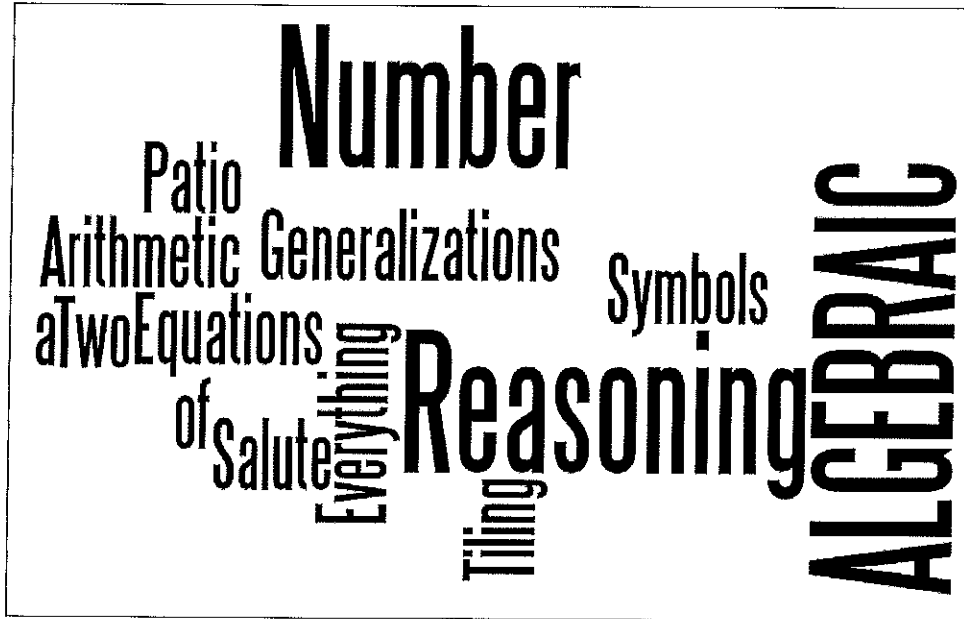


Where is Number in Algebraic Reasoning?



Rice University School Mathematics Project

Houston, Texas

<http://rusmp.rice.edu>

Susan Troutman

troutman@rice.edu

Associate Director for Secondary Programs

Carolyn L. White

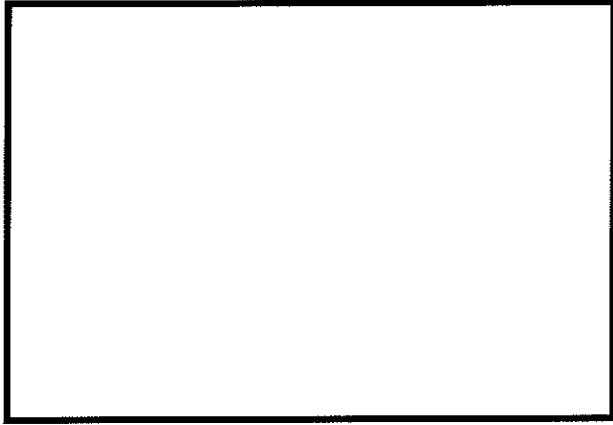
clwhite@rice.edu

Associate Director of Elementary and Intermediate Programs

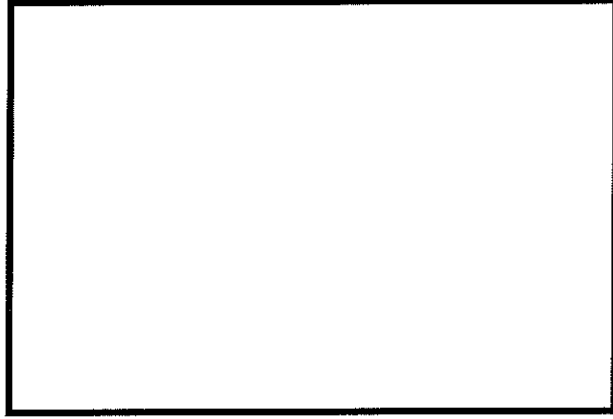
Using Playing Cards

Let's play the game 'Salute'

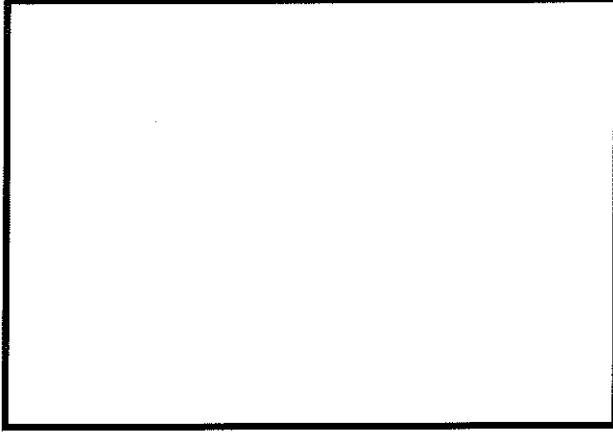
- Need three players on the team
- Deck of cards
- Paper to write problem

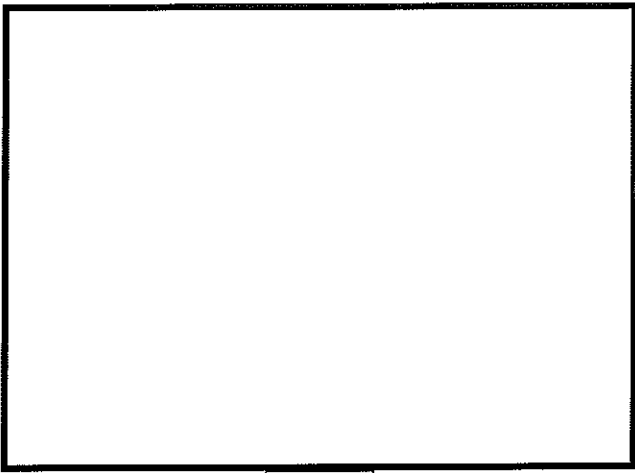


+

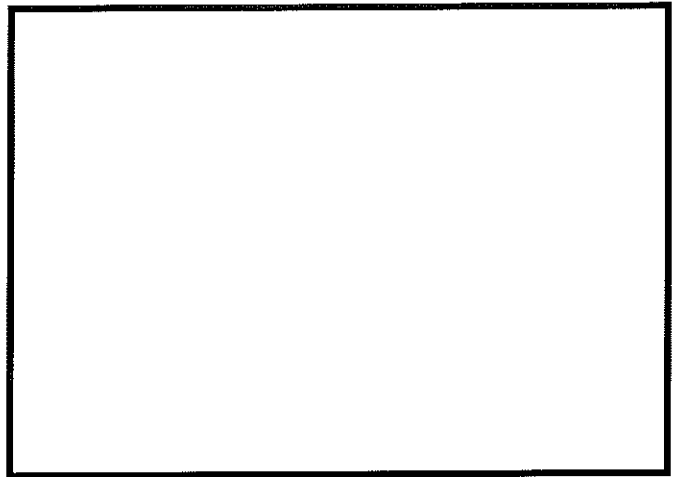


=

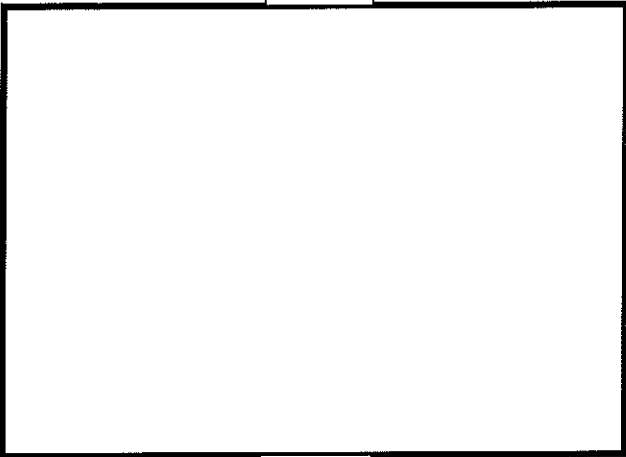




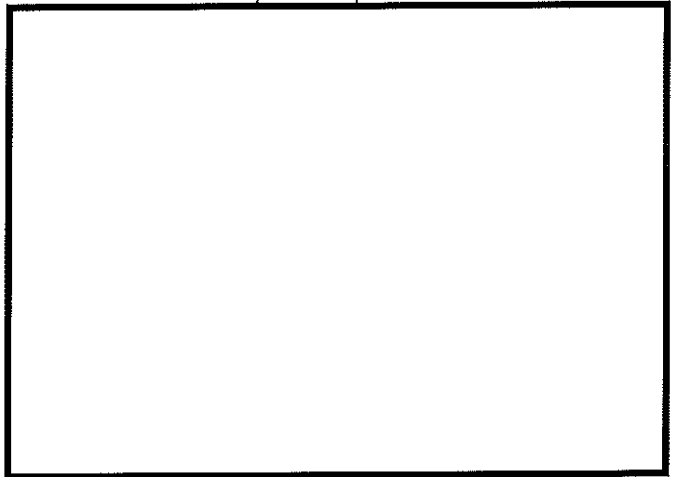
||



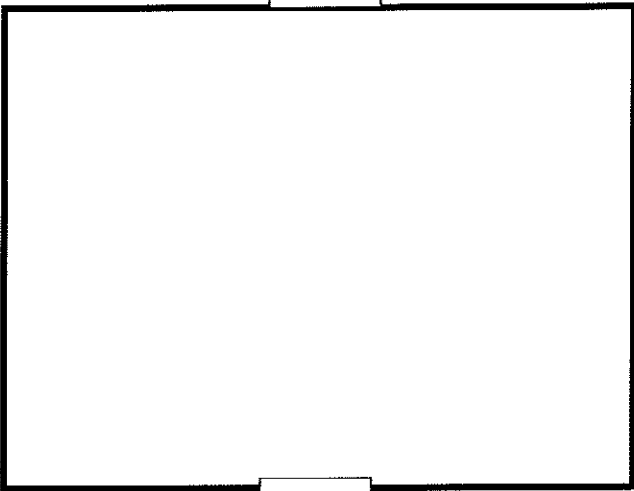
+



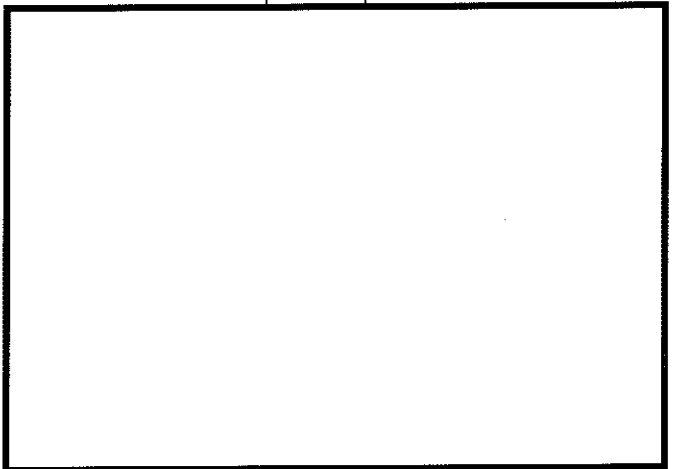
+



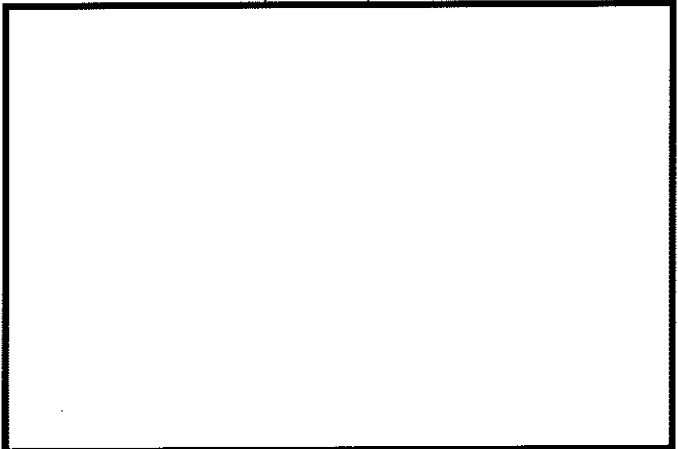
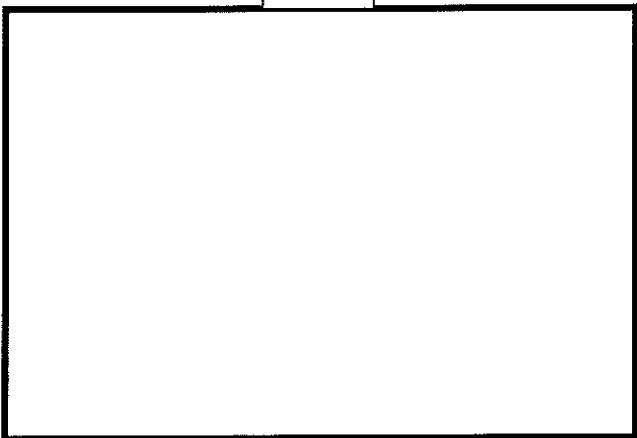
||



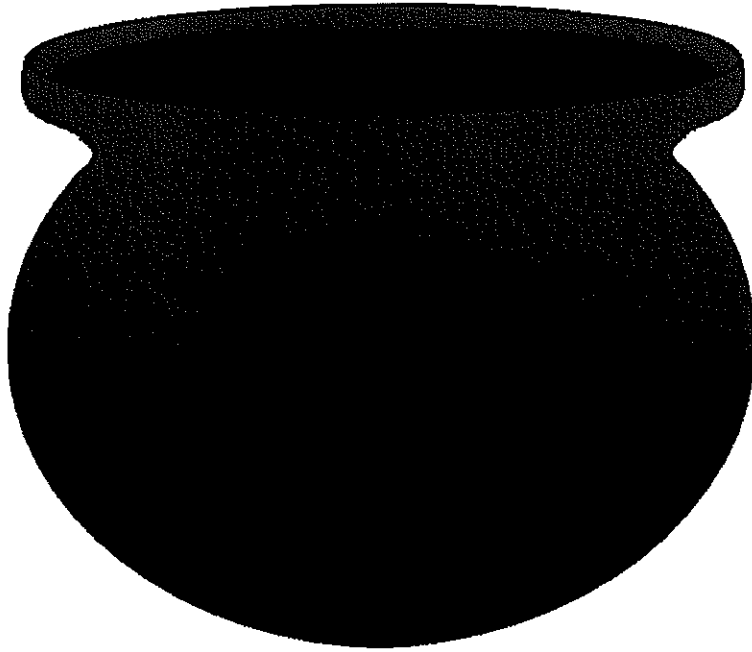
+



+



Two of Everything



Input	Output

Rule _____

Activity Sheet 1. What Would You Choose?

Circle your choice.

- Choice A: 100 coins each day for 10 days
- Choice B: 5 coins and a magic pot that doubled the coins each day for 10 days



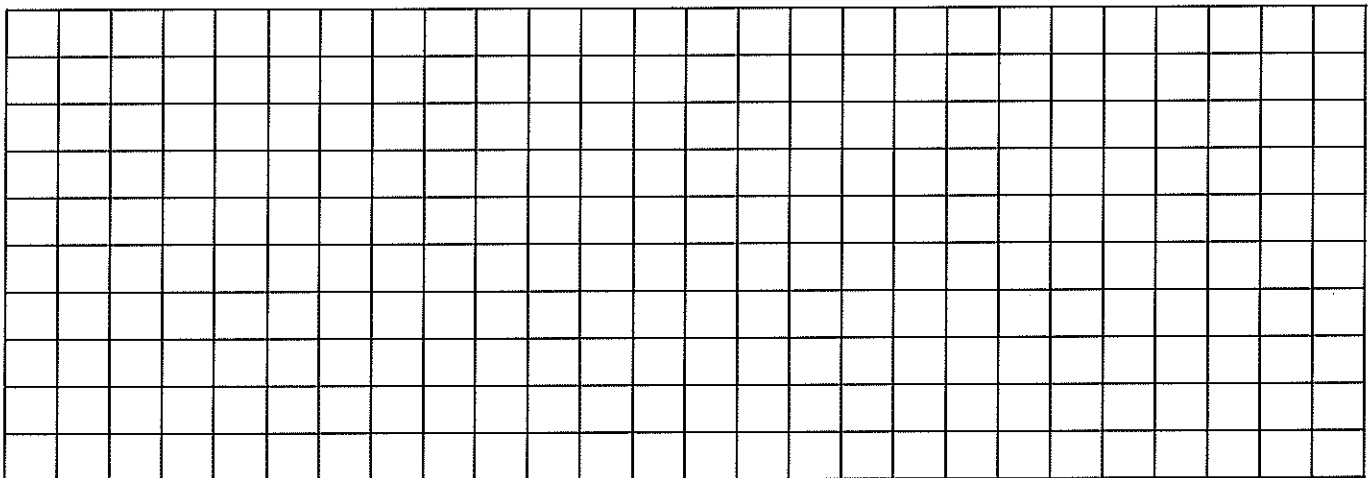
Work it out: How many coins would you have in 10 days with choice A? With choice B? Show your work on the back of this page.

Final thought: After working through the problem, would you still make the same choice? Why or why not? _____

TEACHING CHILDREN
From the November 2007 issue of **Mathematics**

Activity Sheet 2. Pattern Seekers

1. On the graph paper below, draw the pattern you see.




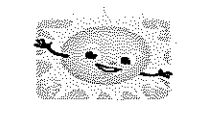




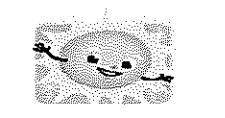


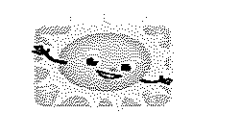
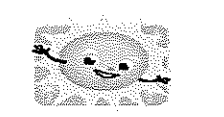
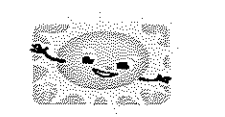



2. Create a table of the pattern you see.

Step	1	2	3	4	5	6
Number of Cubes						

3. On the back of this page, describe the pattern in your own words. Then write a rule for the pattern.

TEACHING CHILDREN
From the November 2007 issue of **Mathematics**

The students were introduced to a system of equations.
HOW MUCH IS EACH SYMBOL WORTH?
















			32
			29
			25
			24
33	40	37	
			

How much is each symbol worth?

Sun? _____ Cloud? _____ Flower? _____

Explain your reasoning.

HOW MUCH DOES EACH FISH COST?
















				SUM
				\$6
				\$12
				\$19
				\$16
SUM	\$13	\$19	\$21	
				
	Goldfish	Beta	Clown Fish	

What is the cost of each fish?

Goldfish? _____ Beta? _____ Clown Fish? _____

Explain your reasoning.

HOW MUCH DOES EACH WHALE WEIGH IN TONS?

				SUM
				330
				170
				200
				185
SUM	215	375	295	
				
	Right Whale	Gray Whale	Blue Whale	

What is the weight of each whale?

Right Whale? _____ Gray Whale? _____ Blue Whale? _____

Explain your reasoning.

Which is worth more, a SMILE or a FROWN?

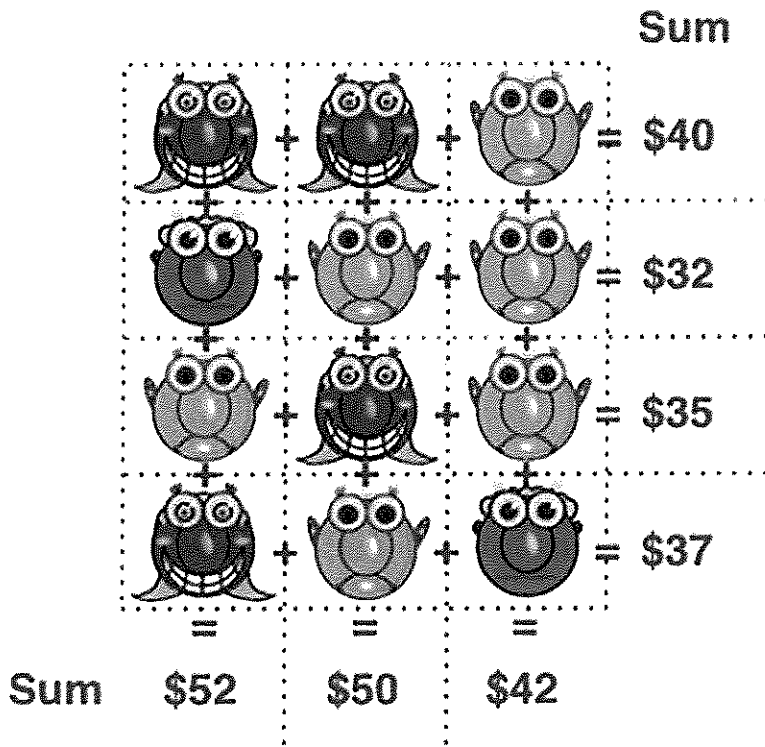


Figure This! The costs of combinations of frowns, smiles, and neutral faces are shown. How much is a smile worth?

Hint: Find a way to combine two of the rows or columns that have something in common.

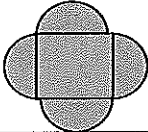
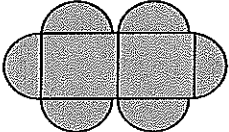
Reasoning about unknowns is essential in studying equations. Economists, nurses, chemists, and engineers all use equations in their work.

What is the value of each face?

Frown? _____ Smile? _____ Neutral face? _____

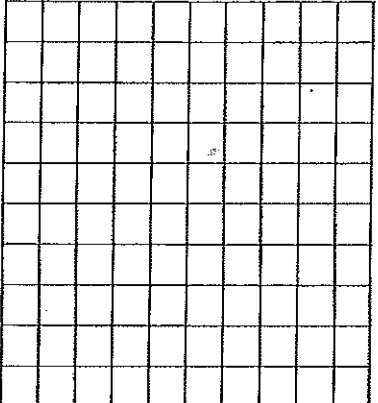
Explain your reasoning.

Dinner Tables

Dinner Tables	Show How	Number of People
1		4
2		
3		
4		
5		
6		
7		

Tiling a Patio

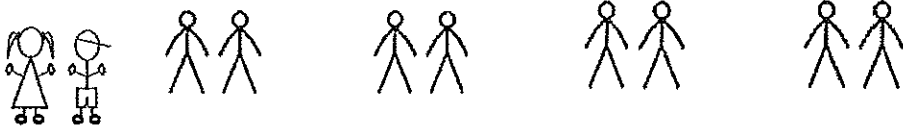
Patio Number	Number of Brown Tiles	Number of White Tiles	Total Number of Brown and White tiles

Graph 	Equation
Table	Solution

Crossing the River Problem

Scenario

Eight adults and two children need to cross a river. A small boat is available that can hold one adult, or one or two children. Everyone can row the boat. How many one-way trips does it take for them all to cross the river?



INTERNET RESOURCES

❖ Scales and Balance



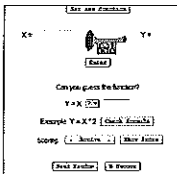
http://nlvm.usu.edu/en/nav/frames_asid_324_g_3_t_2.html

❖ Pan Balance Shapes



<http://illuminations.nctm.org/Activity.aspx?id=3531>

❖ Function Machine:



<http://www.shodor.org/interactivate/activities/FunctionMachine/>

❖ Function Machine Math Playground



<http://www.mathplayground.com/functionmachine.html>

❖ Stop that Creature!



<http://pbskids.org/cyberchase/media/games/functions/>

Free Apps for the iPad

- **Visual Algebra Puzzles**



Create your own algebra puzzles then try to solve them! This easy to use, educational tool was designed to work together with Shuttle Mission Math, an algebraic reasoning game in the app store. Puzzles can be solved with at least one of the following visual strategies: Scale Up, Scale Down (multiply or divide),

<https://itunes.apple.com/us/app/visual-algebra-puzzles/id662990649?mt=8>

- **Shuttle Mission Math**



Shuttle Mission Math is a mathematical puzzle game that makes algebraic thinking both visual and interactive. The goal is to find the weight of each space creature and assemble a team for the next shuttle mission.

<https://itunes.apple.com/us/app/shuttle-mission-math/id498617241?mt=8>

- **Algebra Champ**



Game like environment for solving linear equations

<https://itunes.apple.com/us/app/algebra-champ/id398873050?mt=8>

Bibliography

- Cuevas, G. J., & Yeatts, K. (2001). *Navigating through algebra in grades 3-5*. Reston, VA: National Council of Teachers of Mathematics.
- Cullen, C., & Gaymore, J. (2008). Ocean quest. *Teaching Children Mathematics*. Reston, VA: National Council of Teachers of Mathematics, 14(6), 344 - 351.
- Demi. (1997). *One grain of rice: A mathematical folktale*. New York: Scholastic Press.
- Driscoll, M., & Moyer, J. (2001). Algebraic thinking. *Mathematics Teaching in the Middle School*, 6(5), 282-287.
- Friel, S., Rachlin, S., Doyle, D., Nygard, C., Pugalee, D., & Ellis, M. (2001). *Navigating through algebra in grades 6-8*. Reston, VA: National Council of Teachers of Mathematics.
- Hong, L. T. (1993). *Two of everything*. Morton Grove, IL: Albert Whitman & Company.
- Moses, B. (Ed.). (2000). *Algebraic thinking, grades K-12: Readings from NCTM's school-based journals and other publications*. Reston, VA: National Council of Teachers of Mathematics.
- National Council of Teachers of Mathematics (2000). *Principles and standards of school mathematics*. Reston, VA: Author.
- Suh, J. M. (2007). Developing algebra-rithmetic in the elementary grades. *Teaching Children Mathematics*, 14(4), 246-253.
- Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2010). *Elementary and middle school mathematics: Teaching developmentally*. Boston: Allyn & Bacon.