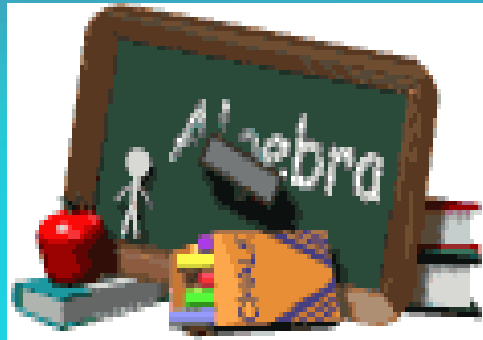


# **ALGEBRAIC REASONING=SUCCESSFUL PROBLEM SOLVING**



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# **Algebraic Reasoning includes:**

- ❖ Pictorial, graphic and verbal descriptions
- ❖ Numeric representations

**How would I use algebraic reasoning in problem solving?**

# **Algebraic Reasoning Forms**

- ❖ Generalization from arithmetic
- ❖ Meaningful use of symbols
- ❖ Study of patterns and functions
- ❖ Study of structure in the number systems

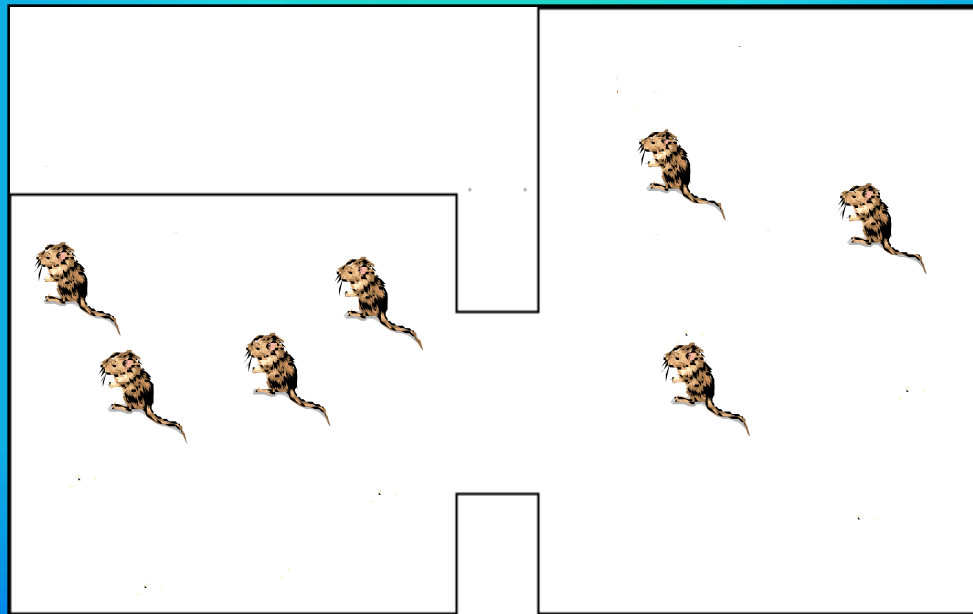
# **Developing Arithmetic in the Elementary Grades**

- ❖ The separation of arithmetic and algebra deprives students of powerful ways of thinking about mathematics.
- ❖ Fundamental properties that children use in calculating are the basis for most of symbolic manipulation in algebra.

# **Generalization from Arithmetic**

# Generalization from Arithmetic

Ricardo has 7 pet mice. He keeps them in two cages that are connected so that the mice can go back and forth between the cages. One of the cages is larger than the other. Show all the ways that 7 mice can be in the two cages.



# Extend the Problem

- ◆ Ricardo has 10 pet mice. He keeps them in two cages that are connected so that the mice can go back and forth between the cages. One of the cages *is larger than the other*. Show all the ways that 10 mice can be in the two cages.
- ◆ Are you sure you have all the possible solutions? How do you know if you have all the possible solutions?



# Let's solve a problem utilizing:

- ❖ Meaningful use of symbols
- ❖ Finding patterns and functions



# Begin the School Year with Algebraic Reasoning

*Two of Everything*

By Lily Toy Hong



# Day 1

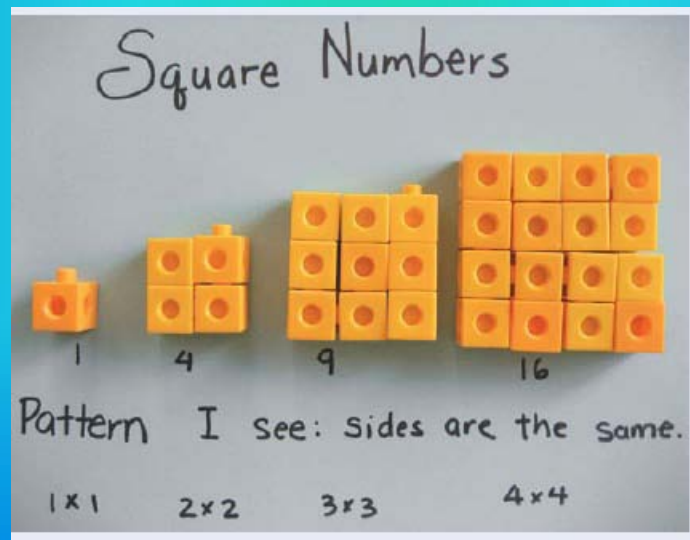
- ❖ Read the book
- ❖ Act out the story using a magical pot
- ❖ Develop a table of values using Input and Output
- ❖ Utilize pattern found in the table to generalize a rule verbally and using symbols

# Day 2

- ❖ Magic pot is doing something different
- ❖ Write a number on the card
- ❖ Develop an input-output chart for your table
- ❖ One individual at each table becomes the magician
- ❖ Generate a rule
- ❖ Tell the class to look for patterns and relations throughout the school year

# Day 3 and Beyond

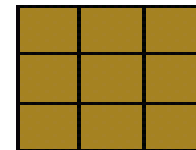
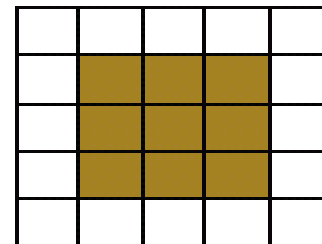
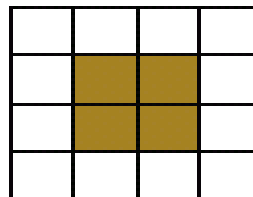
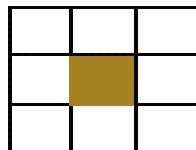
- ❖ Activity Sheet 1
- ❖ Activity Sheet 2



# **Algebraic Reasoning in Geometry**

## The Tiling a Patio problem

Alfredo Gomez is designing square patios. Each patio has a square garden area in the center. Alfredo uses brown tiles to represent the soil of the garden. Around each garden, he designs a border of white tiles. The pictures show the three smallest square patios that he can design with brown tiles for the garden and white tiles for the border.



# Tiling a Patio

Patio Number	Number of Brown Tiles	Number of White Tiles	Total Number of Brown and White Tiles
1	1	8	9
2	4	12	16
3			

Extend activities with graphs of Brown Patio Tiles and White Patio Tiles. Also develop a rule for the relationships.

# Internet Resources

- ❖ **Scales and Balance**

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_324\\_g\\_3\\_t\\_2.html](http://nlvm.usu.edu/en/nav/frames_asid_324_g_3_t_2.html)

- ❖ **Pan Balance Shapes**

<http://illuminations.nctm.org/ActivityDetail.aspx?id=33>

- ❖ **Function Machine**

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_191\\_g\\_3\\_t\\_1.htm](http://nlvm.usu.edu/en/nav/frames_asid_191_g_3_t_1.htm)

- ❖ **Function Machine Math Playground**

[www.mathplayground.com/functionmachine.html](http://www.mathplayground.com/functionmachine.html)

- ❖ **Stop That Creature!**

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



# Contact Information

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