

# Making Algebra Come Alive

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April 7, 2014

## Number Shapes

**Objective:** Determine the numerical value of each shape  
(all values are less than 10).

**Rules:**

You can't show your card to anyone else in the group.

You must share the information on your card with the other members of the group.

Equal™

Mathematicians do not  
study objects, but  
relations between  
objects.

Henri Poincare

## CCSS Mathematical Practices and NCTM Process Standards

<b>NCTM Process Standards</b>	<b>CCSS Mathematical Practices</b>
Problem Solving	Make sense of problems and persevere in solving them. Use appropriate tools strategically
Reasoning and Proof	Reason abstractly and quantitatively. Critique the reasoning of others. Look for and express regularity in repeated reasoning
Communication	Construct viable arguments Attend to precision
Connections	Look for and make use of structure
Representations	Model with mathematics.

## Common Core 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.

## Common Core Standards for Mathematical Practice – ‘Look fors’

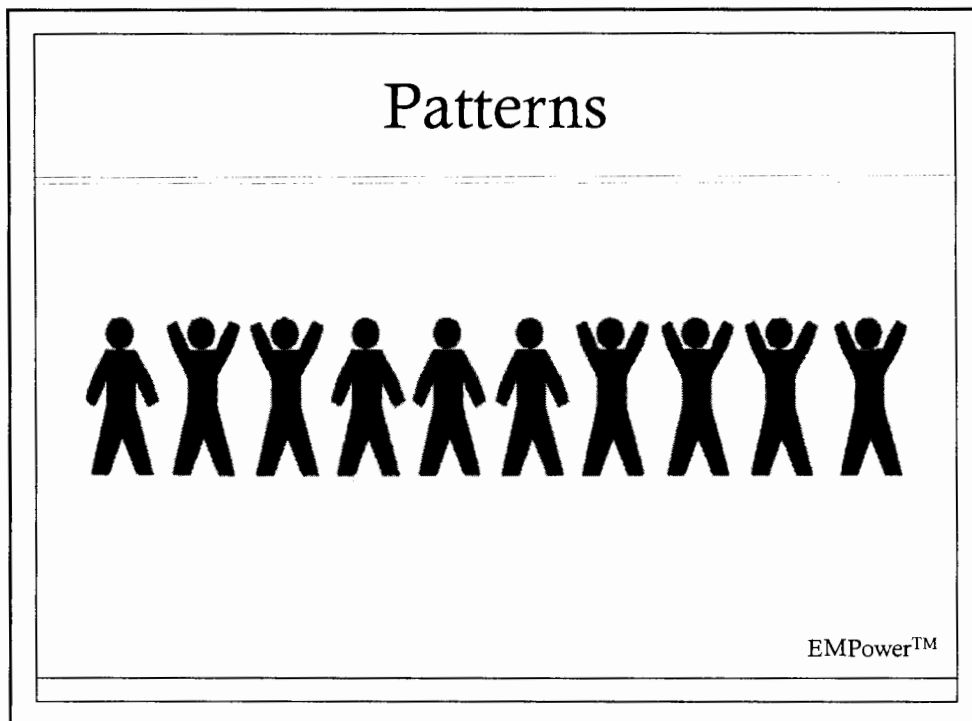
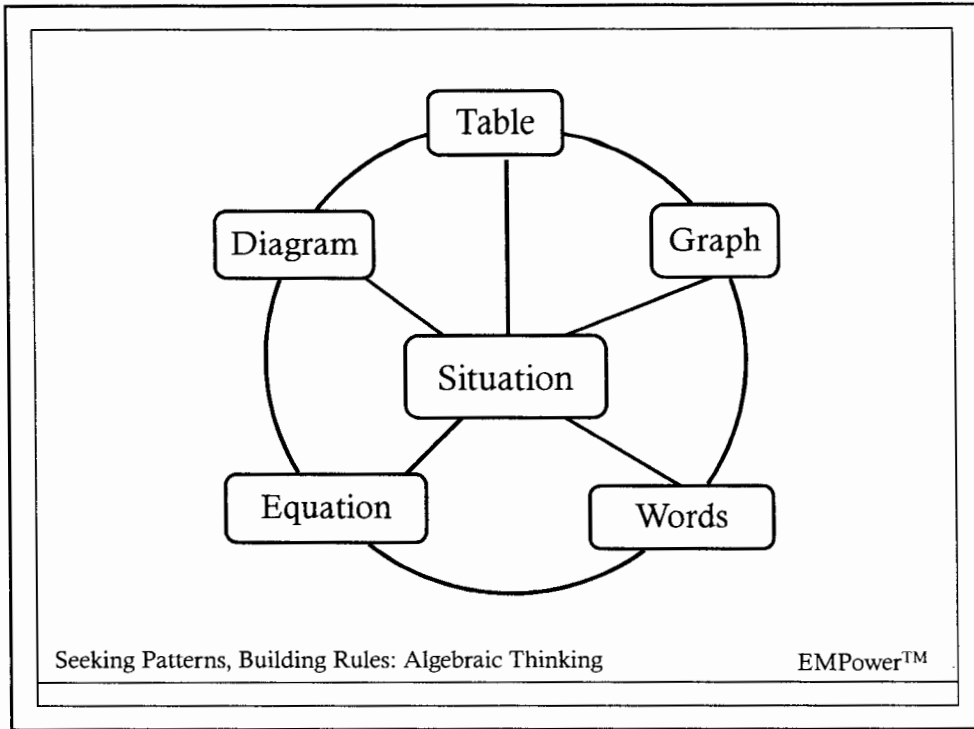
Overarching habits of mind of a productive math thinker	<p><b>problems and persevere in solving them</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> to no solution</li> <li><input type="checkbox"/> Analyze information (given, condition, relationships, goals)</li> <li><input type="checkbox"/> Make conjectures and plan a solution pathway</li> <li><input type="checkbox"/> Monitor and evaluate the progress and change course as necessary</li> <li><input type="checkbox"/> Check answers to problems and ask, "Does this make sense?"</li> </ul> <p>Comments:</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Promote opportunities for students to solve problems that have multiple solutions</li> <li><input type="checkbox"/> Encourage students to represent their thinking while problem solving</li> </ul> <p>Comments:</p>
	<p><b>Attend to precision</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Communicate precisely using their definitions</li> <li><input type="checkbox"/> State the meaning of symbols, carefully specifying units of measure, and providing accurate labels</li> <li><input type="checkbox"/> Calculate accurately and efficiently, expressing numerical answers with a degree of precision</li> <li><input type="checkbox"/> Provide carefully thought-out explanations</li> <li><input type="checkbox"/> Label accurately when measuring and graphing</li> </ul> <p>Comments:</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Emphasize the importance of precise communication by encouraging students to focus on clarity of the definitions, notation, and vocabulary used to convey their reasoning</li> <li><input type="checkbox"/> Encourage accuracy and efficiency in computation and problem-based solutions, especially numerical answers, data, and/or measurements with a degree of precision appropriate for the context of the problem</li> </ul> <p>Comments:</p>
Reasoning and Explaining	<p><b>Reason abstractly and quantitatively</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Make sense of quantities and relationships in problem situations</li> <li><input type="checkbox"/> Represent abstract situations symbolically and understand the meaning of equations</li> <li><input type="checkbox"/> Create a coherent representation of the problem in hand</li> <li><input type="checkbox"/> Consider the units involved</li> <li><input type="checkbox"/> Flexibly use properties of operations</li> </ul> <p>Comments:</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Facilitate opportunities for students to discuss or use representations to make sense of quantities and their relationships</li> <li><input type="checkbox"/> Encourage the flexible use of properties of operations, objects, and solutions strategies when solving problems</li> <li><input type="checkbox"/> Provide opportunities for students to decontextualize (abstract a situation) and/or contextualize (reapply references for symbols involved) the mathematics they are learning</li> </ul> <p>Comments:</p>
	<p><b>Construct viable arguments and critique the reasoning of others</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use definitions and previously established results/divide (results) in constructing arguments</li> <li><input type="checkbox"/> Make conjectures and use counterexamples to build a logical progression of statements to explore and support ideas</li> <li><input type="checkbox"/> Communicate and defend mathematical reasoning using objects, drawings, diagrams, and/or actions</li> <li><input type="checkbox"/> Listen to or read the arguments of others</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Provide and orchestrate opportunities for students to listen to the solutions strategies of others, discuss alternative solutions, and defend their ideas</li> <li><input type="checkbox"/> Ask higher-order questions which encourage students to defend their ideas</li> <li><input type="checkbox"/> Provide prompts that encourage students to think creatively about the mathematics they are learning</li> </ul>

## Common Core Standards Mathematical Shifts

- **Focus** – The focus of math instruction should be narrowed so more time can be spent on core foundational understanding
- **Coherence** – There are coherent progressions from level to level and within levels in order for students to build conceptual understanding.
- **Rigor** – Ensuring that we teach conceptual understanding, procedural fluency, and application – all with equal intensity.

## Making Algebra Come Alive

- Straight Line Graphs
- Algebra Mind Map
- Waitress Problem
- Guess My Rule
- Graphing: Guess My Rule
- Job Offers



## Waitress Problem

Kim was waitressing for the first time. She did not know what to expect for tips. A veteran waitress told her, "Usually folks here give a 25% tip." Kim must have looked confused; the experienced waitress ripped off a piece of paper from her check pad and scribbled on the back:

Bill	Tip
\$1	\$0.25
\$2	\$0.50
\$3	\$0.75

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## Guess My Rule

- Figure out the rule to get from  $x$  to  $y$ 
  - The rule must work for every case
- Write the rule in words
- Write an equation for the rule

## Graphing: Guess My Rule

Complete each graph based on the information for the equation and/or table.

## Straight Line Graphs

- Match the Table, Equation, and Graph

# Job Offers

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**Is there ever a point in time where the accumulated earnings from each job would be the same?**

- Make a table and a graph to answer the question. Start with whichever one you choose, but make both.
- Write a rule in words and/or symbols to show how much money Armand would make at LaserLink for any number of weeks he worked.
- Write a rule in words and/or symbols to show how much money Armand would make at QuinStar for any number of weeks he worked.

# Job Offers

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