

Operations and Algebraic Thinking

From Big Ideas of Early Mathematics

BIG
IDEAS



Number Operations

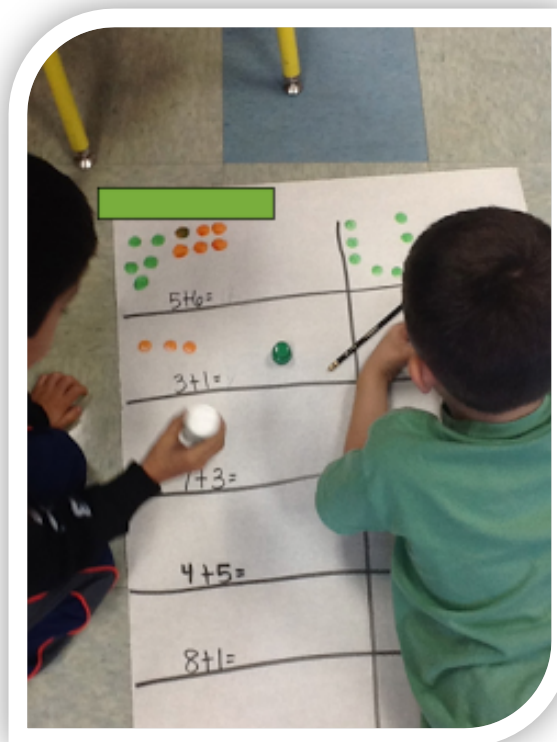
- Sets can be *changed* by adding (joining) or by taking some away (separating)
- Sets can be *compared* using the attribute of numerosity, and *ordered* by more than, less than, and equal to
- A quantity (whole) can be *decomposed* into equal or unequal parts; the parts can be *composed* to form a whole

Pattern

- Patterns are sequences (repeating or growing) governed by a rule; they exist both in the world and in mathematics.
- Identifying the rule of a pattern brings predictability and allows us to make generalizations.
- The same pattern can be found in many different forms.

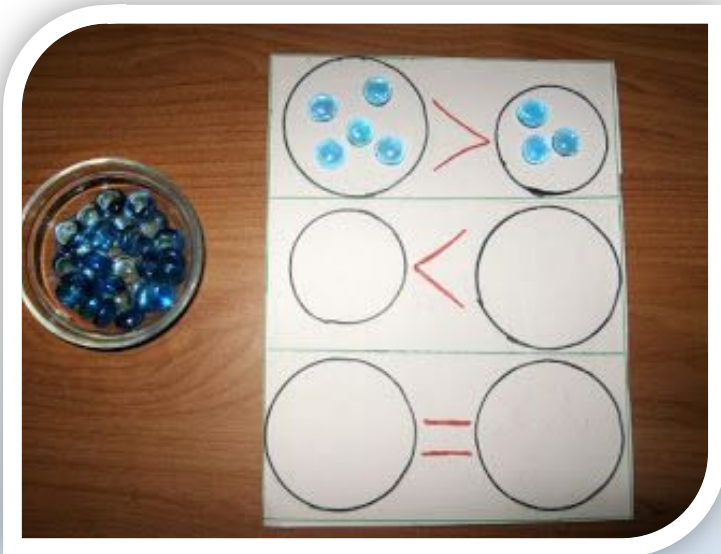
Idea:

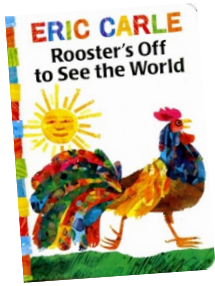
Nana's Fruit: Provide children with 5 apples, 5 bananas, one bowl and a camera. Set the scene that Nana's fruit bowl may only have 5 fruit in it at once. Ask them to arrange the fruit in as many different combinations as possible. The children can use the camera to document their combinations. Print the photos for them to paste on chart paper to create a visual display that highlights different number combinations that make 5. *This can also be practiced/extended with red and yellow cubes and drawing the combinations in their math journals using red and yellow crayons.



Opportunities that Encourage Operations and Algebraic Understanding

BLOCK AREA	ART AREA	LITERACY	MUSIC
<p>Children roll a die with 1s, 2s, and 3s to determine how many blocks to build with. Have them roll a second time to determine how many more blocks to “add” to the structure. Ask them to count how many blocks there are in all. *Children might also draw a diagram and record using paper on a clipboard (e.g. $2+3$ for a while as they get used to the idea that the plus sign means “and”).</p>	<p>Give children a piece of patterned paper (wrapping paper, origami paper). Children can extend the pattern by drawing it.</p>	<p>Identify the pattern in a classic story and create a class adaptation of that book following that same pattern. Book examples could be: <i>Brown Bear, Brown Bear, The Napping House, The Rain Came Down, Mary Wore Her Red Dress</i>, etc.</p>	<p>Children can experience a growing pattern through songs such as, “Tooty Ta.” Use actions to show the repeated and growing pattern. Each additional line incorporates the previous actions.</p>





Library Books with Operations and Algebraic Thinking Concepts:

12 Ways to Get to 11 by Eve Merriam

The Napping House by Audrey Wood

Anno's Counting Book by Mitsumasa Anno

Five Little Ducks by Raffi

Balancing Act by Ellen Stoll Walsh

The Jacket I Wear in the Snow by Shirley Neitzel

Domino Addition by Lynette Long

The Little Old Woman Who Wasn't Afraid of Anything
by Linda Williams

Eggs and Legs by Michael Dahl

The Rain Came Down by David Shannon

Equal Shmequal by Virginia Kroll

Mary Wore a Red Dress and Henry Wore His Green Sneakers
by Merle Peek

Rooster's Off to See the World by Eric Carle



Operations and Algebraic Thinking Songs:

"Five Little Ducks"

"Five Little Monkeys Swinging in the Tree"

"Five Little Monkeys Jumping on the Bed"

"There Were Ten in the Bed"

"Five Green and Speckled Frogs"

"Tooty Ta"

Key Operations and Algebraic Thinking Terms:

direct modeling strategy when a child constructs a solution to a story problem by modeling the action or structure (e.g. uses manipulatives, draws pictures)

counting on strategy when a child recognizes that physically representing each item in a story problem is not necessary, the child begins to use numbers as "stand ins" for items (e.g. When the garden has 5 plants and 2 more plants are added, the child determines the total without manipulatives or pictures- starts with 5 and then goes, "6, 7")

part/whole relationship a quantity (whole) can be decomposed into equal or unequal parts; the parts can also be composed to form the whole

compose when a quantity (whole) is made up from putting together subparts

decompose to break down a quantity (whole) into subparts