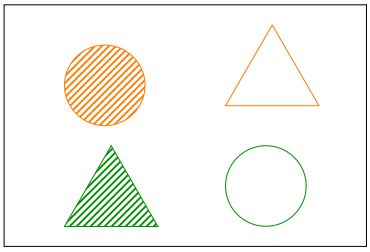
SAME & DifFerEnT

Which of the figures below are the same?



Ways to Sort a Collection

- Binary sort – something & not something
- Color
- Shape
- Material type
- Use
- Size - length, weight, etc
- Texture
- & …

In open sorts, we often mix schemes …

Shoe Sort

What kinds of shoes are we wearing today?

How could we figure it out?

How could we describe these shoes?

How do we want to sort these shoes?

What can we say about our shoes from looking at this object graph?

What is mathematical about sorting?

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What are the Big Ideas about Sets & Sorting?

Topic	Big Ideas	Examples
Sets & Sorting 	•**Attributes** can be used to **sort** collections into sets. •The same collection can be **sorted** in different ways. •Sets can be **compared** and **ordered**.	•Color, size, shape, type of object, etc. •Red bears vs. blue bears; big bears vs. little bears •"There are more red bears than blue bears." (compare); small red bears, medium red bears, large red bears (order)

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Development of Thinking about Sets & Sorting

- At all ages, children classify intuitively to make sense of their world.
- By 2 weeks of age, infants distinguish between objects they suck and those they do not.
- By 2 years, toddlers form sets with objects that are similar.
- By age 4, children can sort objects according to a given attribute and form categories.
  - *They may switch attributes during open sorting.*
- By age 6, children can independently sort by a single attribute and re-classify by different attributes.
- Children aged 5, 6 & 7 are still building their understanding of overlapping sets and hierarchical categories.

3 types of knowledge

Physical

What we learn through direct experience of the physical world, like gravity or texture.

Logico-mathmatical

What we learn by constructing abstract ideas, such as parts of speech, biological classifications, or numbers.

Social

What we learn only from other people, such as our language or manners.

Focus on the Child: Sets & Sorting

Questions to Consider While Viewing the Video Clips

- What Big Ideas about sets and sorting do these children seem to understand?
- What Big Ideas about sets and sorting do these children seem to be learning?
- What, specifically, do the children say or do that gives you evidence of their thinking?
- What opportunities for exploring sets and sorting might a teacher provide for these children to encourage them to develop their understanding further?

Clip/Child		Notes about children's thinking
"Sorting Rocks"	*Child 31, preschool (1:54)*	
	Child 14, kindergarten (2:09)	
"Sorting Commercial Manipulatives"	*Child 33, preschool (2:59)*	

Research Lesson: People Sort

Some Questions to Consider While Viewing the Video Clip (4:13 total time)

Questions	Notes
<u>About the Children</u> ▪ What Big Ideas about sets and sorting do these children seem to understand? ▪ What Big Ideas about sets and sorting do these children seem to be learning? ▪ What, specifically, do the children say or do that gives you evidence of their thinking?	

<u>About the Teacher</u>
▪ What kind of instructional decisions has the teacher made in terms of the logistics of this activity?
  ○ About materials to use?
  ○ About questions to ask?
  ○ About space arrangement?
▪ How does the teacher scaffold the children's thinking and explaining?	

<u>About the Activity</u> ▪ How does the teacher tie the activity to the book *Five Creatures*? ▪ What modifications might you make if you were doing this activity in your classroom? ▪ What opportunities for exploring sets and sorting might a teacher provide for these children to encourage them to develop their understanding further?	

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PEOPLE SORT

Big Idea Focus: Attributes can be used to sort collections into sets. A collection can be sorted in many different ways.

In this lesson, children:

- Identify and describe observable attributes of children and clothing
- Physically form sets according to given attributes
- Use rules to sort and re-sort each other into sets using various attributes (KG goal)

Materials

- *Five Creatures* by Emily Jenkins
- Two large circles made with masking tape or yarn for children to stand in, or two hula-hoops
- Dress-up clothes (for children wearing school uniforms)

1. Review *Five Creatures* and Introduce Activity

Gather a group of about 10 children in an open space where you can place two tape circles or hula-hoops on the floor. Show children the book and remind them how the same five creatures were described in many different ways. Tell them that you are now going to use various descriptions to sort five of them into two different groups, or sets. Five children will form sets by standing in the hoops; other children will be the "audience."

2. Sort and Re-sort Children

Choose easily observable attributes for sorting. For example,

- *I see five children on this rug. Some have curly hair* [point to one hoop], *and some have straight hair* [point to other hoop].

  or

- *I see a child who is wearing a belt* [point to one hoop], *and some who are not* [point to other hoop].

Assist children as necessary to sort themselves into the two sets you have described. Have children in the audience "check" that each set of children shares the same attribute. Ask, *Why do these children belong together? What could we name the group?*

Sort children several more times using other directly observable attributes—color of shirt, type of shoes, wearing of glasses, and so on. (If children wear school uniforms, you can

Planning Tips

Read *Five Creatures* at least once prior to this lesson.

It is best to introduce this activity with a **group of about 10 children**. Later, this is a good whole-group or transition activity. For example, call all children with tie shoes to line up, then children wearing shoes with straps.

Math Note

This lesson is an ***open sort*** in which the categories can include a wide range of attributes that must be identified and described by the sorter.

Most commercially available sorting materials have a limited number of attributes. This leads to a ***closed sort*** in which color and/or size are often the only possible categories.

Why is sorting a precursor to algebra? Sorting is governed by rules that describe relationships. Thus, sorting lays a foundation for algebraic thinking, which is about numeric patterns and relationships, and the rules that govern them.

Differentiation

For a challenge, sort children according to a have/have not rule. For example, group children who have on blue and children who do not have on blue. Help children see that children in the *have not* set are alike in that they are not wearing blue, though they may be wearing many different other colors.

include dress-up clothes for greater variety.) Then, switch roles so that all children get to both be sorted and be in the audience.

3. Scaffold Children Sorting

Some children may now be ready to take on the role of the sorter. Choose a child to be the sorter; you become one of the people to be sorted.

Children may need support to think of attributes for sorting. Ask questions that help them notice observable attributes, such as, *Does everyone have long sleeves? Is anyone wearing short sleeves?* It is best to stick with binary attributes for sorting since it can be challenging for young children to use the same categories with more than 2 sets.

4. Close the Lesson

Remind children that groups of objects or people can be sorted and re-sorted in different ways. Tell them that you will make the hoops available so that they can play People Sort at center time.

Math Language Learning

Attribute words such as *long, straight, yellow, pointy,* and so on give children's language greater precision. Be as specific as possible with the language you model for children.

For English Language Learners, consider the following strategies for this activity:

- Pair attribute words with gestures or props
- Accept children's non-verbal participation
- Ask yes/no questions such as *Do you have a red shirt? Do you have a blue shirt?*

Observation

*How easy is it for children to **sort** themselves according to a given attribute?*

Can any children suggest new ways to sort the group? Do they change categories in the middle of sorting?

Teacher as Learner

Most adults remember algebra as a high school course devoted to learning about equations containing variables. However, the foundations of algebraic thinking begin much earlier.

What do you remember about algebra in school? How do you think your memories influence your teaching of algebraic thinking today?