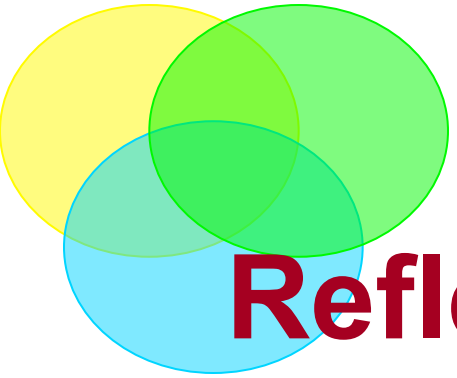
EMC-KCM Mathematics

Good morning, mathematicians!

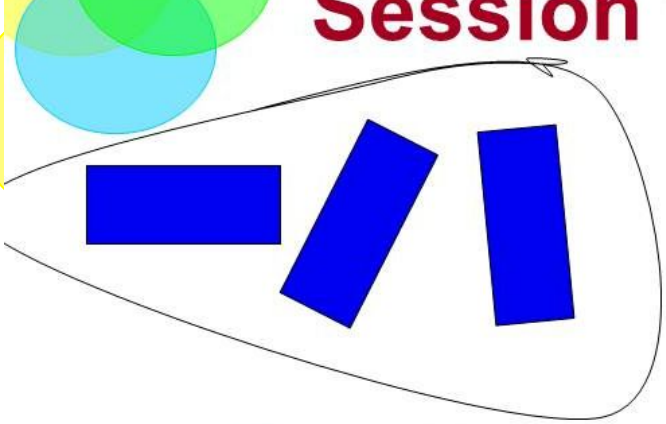
- As you come in, please use the post-it notes to share what happened when you did the research lesson. Place a note on each of the 4 posters on the walls.
- If a category doesn't apply, put up a small blank post-it .
- We are looking for data: No names necessary.



Reflecting on the Napping House research lesson

- In small groups, review and then summarize the comments on one of the topics.
- Share out --Group discussion

Session 1: Sets



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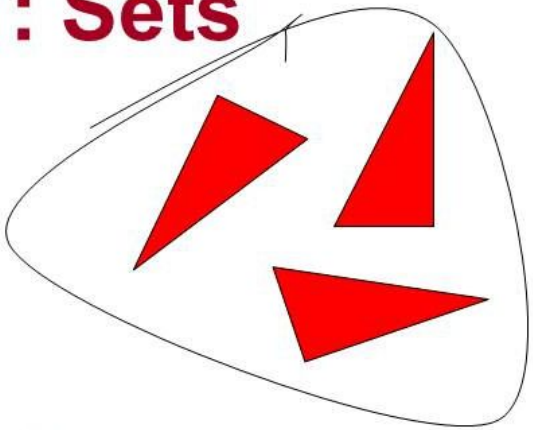

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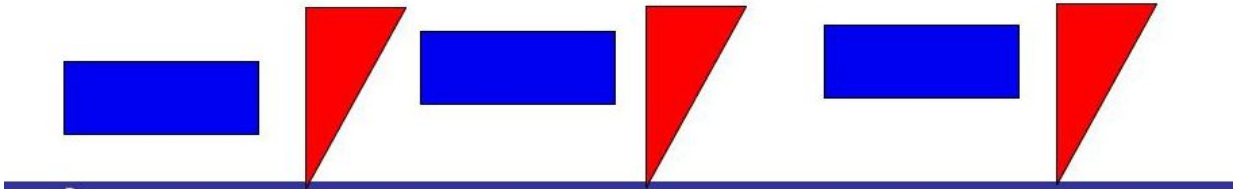
Session 2: Pattern



1 2 3 4 5 6

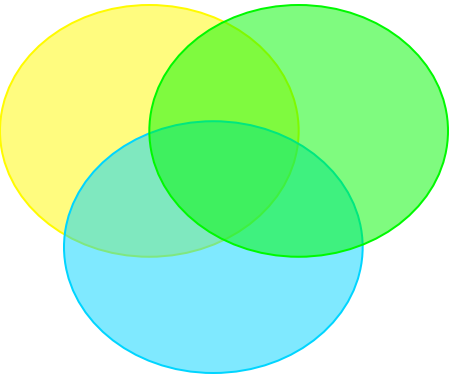
Session 3: Number Sense & numerosity

Let's Do Math

(Adult Learning Experience)

Shepherd's Counting System

"Or we could tally the sheep like this."



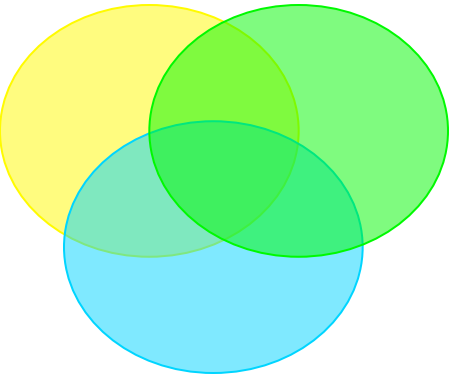
Let's Do Math

(Adult Learning Experience)

Shepherd's Counting System

- What do you notice about these number names?
- How does this number system compare with the base 10 system we use?

- Turn to a partner and talk about your ideas.
- Share your thinking with the rest of the people at your table.

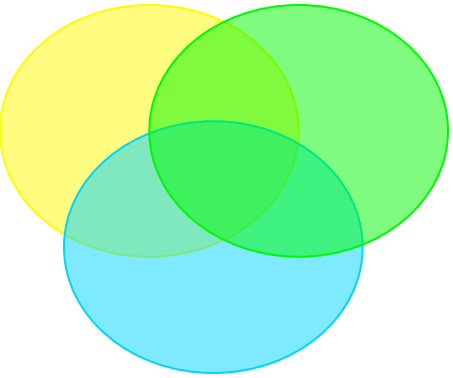


Let's Do Math

(Adult Learning Experience)

Working with a partner to explore how this number system works

1. Use the cubes to represent these quantities: "bumpit," "yan-a-pimp" & "tethera-dik"
2. Draw a picture to show "tan-a-figgit" sheep.
3. Work to create written symbols to represent this number system.

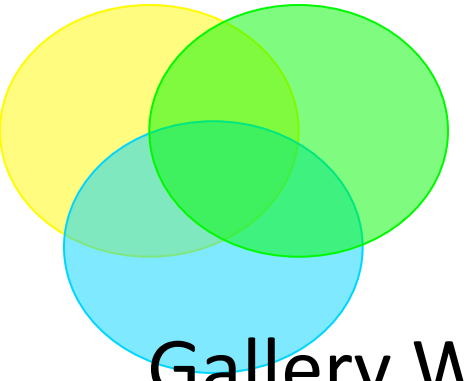


Let's Do Math

(Adult Learning Experience)

A new shepherd has just arrived from distant parts and needs to learn how to count the sheep and keep track of the quantity.

1. Work with the people at your table to create a ***poster to explain how this number system works.***
2. Include any ***questions*** you have about this number system.

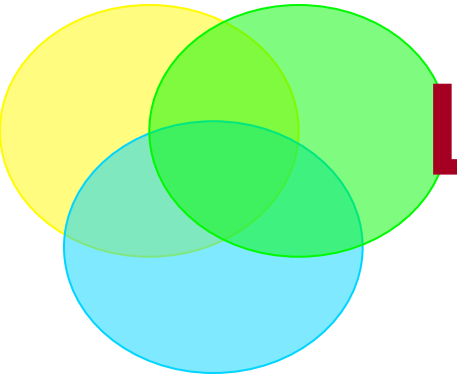


Let's Do Math

(Adult Learning Experience)

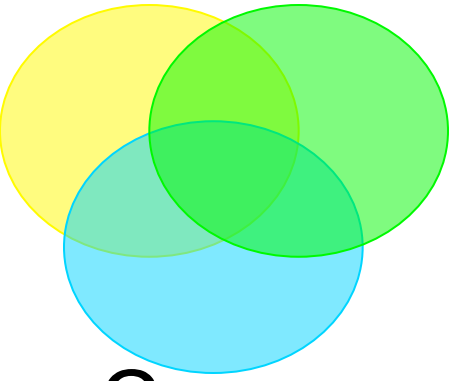
Gallery Walk of Posters

- You now have a few minutes to look at the posters made by other table groups.
- Examine ***at least one*** poster carefully & consider what questions or comments you have about the math you see. *(If time permits, move on to another poster.)*
- Use your sticky notes to leave comments or questions on the poster(s) you examine.
- Put at least one sticky note on each poster you examine.



Let's Talk About It

1. Poster session conversation
2. Reflecting on New Understandings
   - What have we learned about numbers in general?
   - What have we discovered about doing math?



Fixed Sequence

Our number systems use a fixed sequence that allows for predictability.

1 2 3 4 …

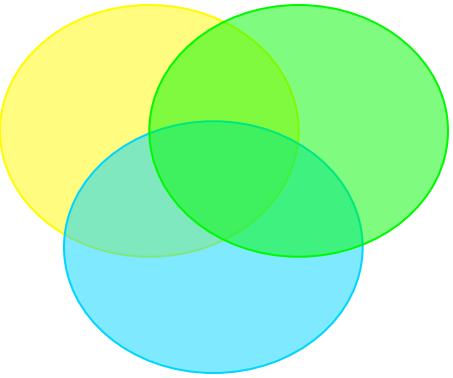
11 12 13 14 …

21 22 23 24 …

31 32 33 34 …

N+1=?

N+2=?



Base 10 System

- Because we group by tens, we can represent all numbers using ten digits (0 to 9).
- There are patterns to how numbers are represented.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Function of Zero

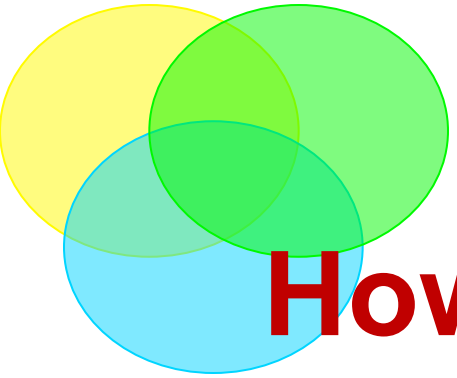
Function of Zero

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

yan	*tan*	*tethera*	*pethera*	***pimp***
yan-a-pimp	*tan-a-pimp*	*tethera-pimp*	*pethera-pimp*	***dik***
yan-a-dik	*tan-a-dik*	*tethera-dik*	*pethera-dik*	***bumpit***
yan-a-bumpit	*tan-a-bumpit*	*tethera-bumpit*	*pethera-bumpit*	***figgit***

Let's Count
Using Shepherds' Numbers

yan	*tan*	*tethera*	*pethera*	*pimp*
yan-a-pimp	*tan-a-pimp*	*tethera-pimp*	*pethera-pimp*	*dik*
yan-a-dik	*tan-a-dik*	*tethera-dik*	*pethera-dik*	*bumpit*
yan-a-bumpit	*tan-a-bumpit*	*tethera-bumpit*	*pethera-bumpit*	*figgit*



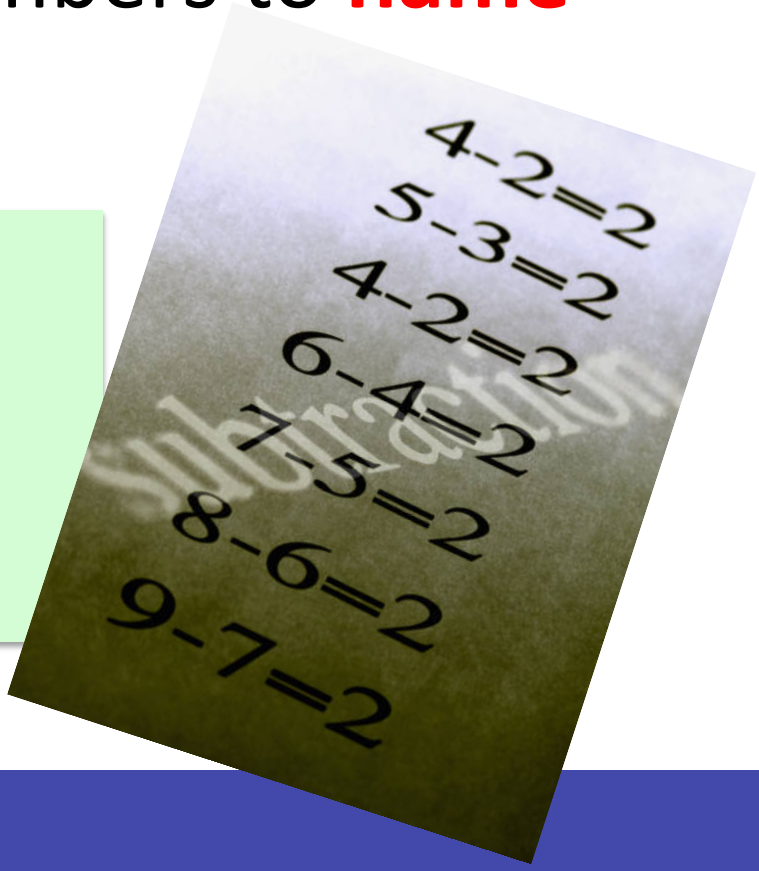
How Do Children Develop Understanding of Numerosity & Number Sense?

What are the ***Big Ideas***?

A Big Idea

- Quantity is an attribute of a set of objects & we use numbers to **name** specific quantities.

- The problem with arithmetic problems is that they are filled with naked numbers.

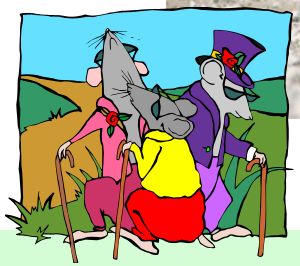


Problems with Naked Numbers

- Naked Numbers don't invite conversation
- Naked Numbers look like nouns

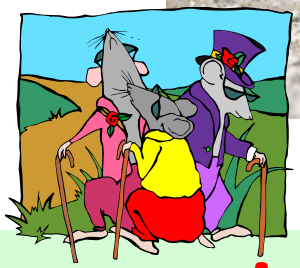
- There is no such thing as 3 or any other number!
- There are always 3 of something
- Number is an **ATTRIBUTE**—an adjective not a noun
- In math this attribute is called **NUMEROSITY**

3 elephants might seem obviously bigger when compared to 3 mice

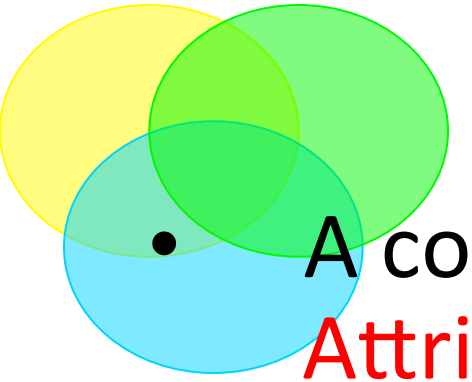


- If you used the attribute of size
- BUT for the attribute of *number/ numerosity* they are identical

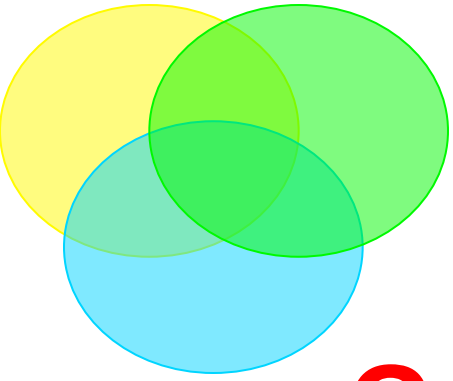
Number Names and symbols are arbitrary



- Numerosity or quantity remains the same, no matter what system
- There are san mice and III elephants—that makes yan-a-pimp animals!



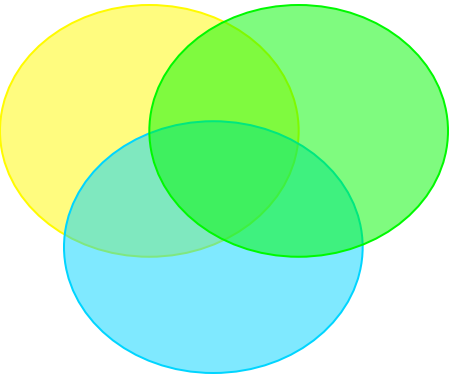
- A collection can have many Attributes.
- Roses: red color is an attribute, round shape is an attribute, sweet smell is an attribute, quantity is another attribute. There are three roses here.



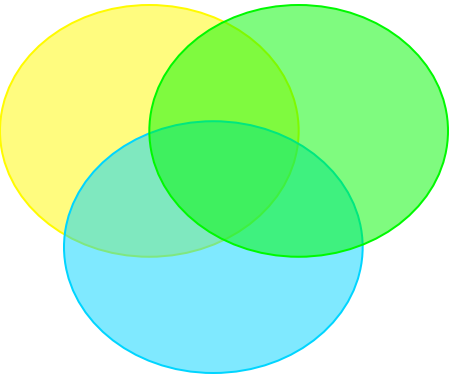
A Big Idea

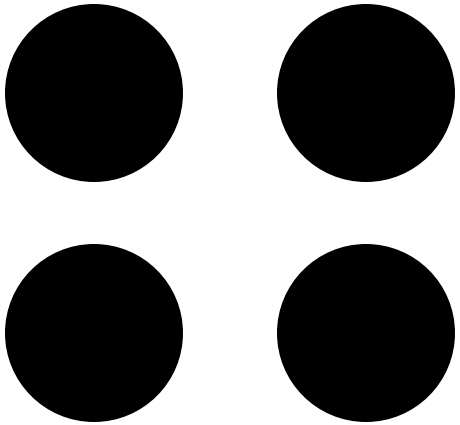
Our brains are hard-wired to perceive small quantities without counting (subitizing).

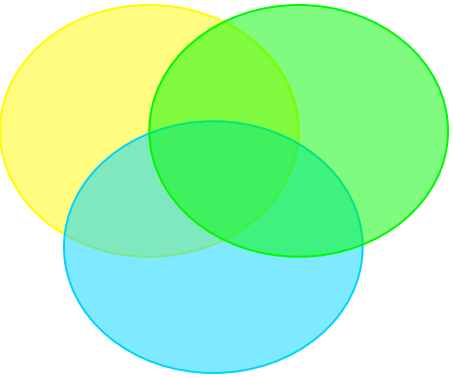
- **Numerosity exists apart from number names & symbols**

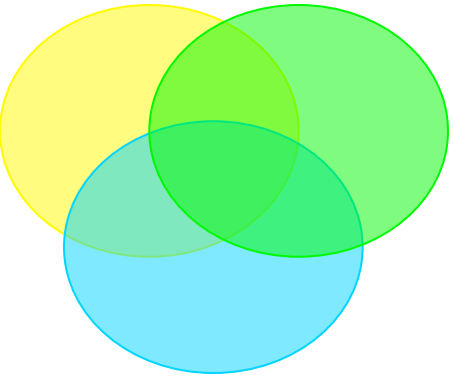


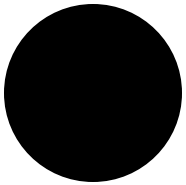
What can you see quickly?

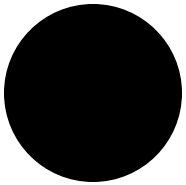


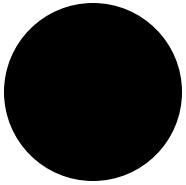


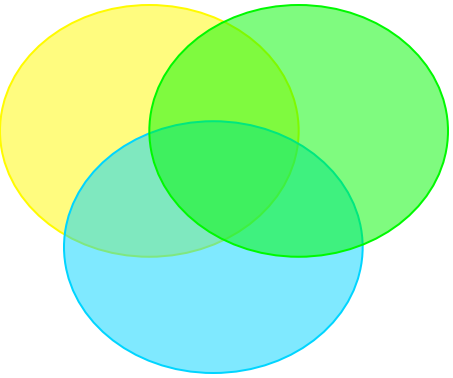


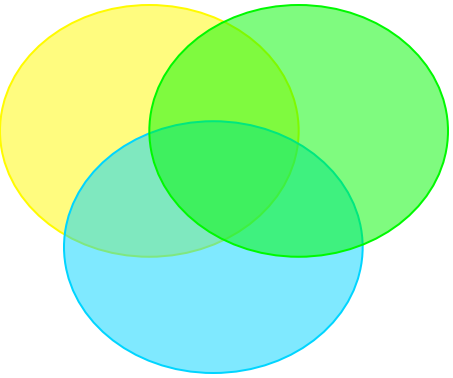


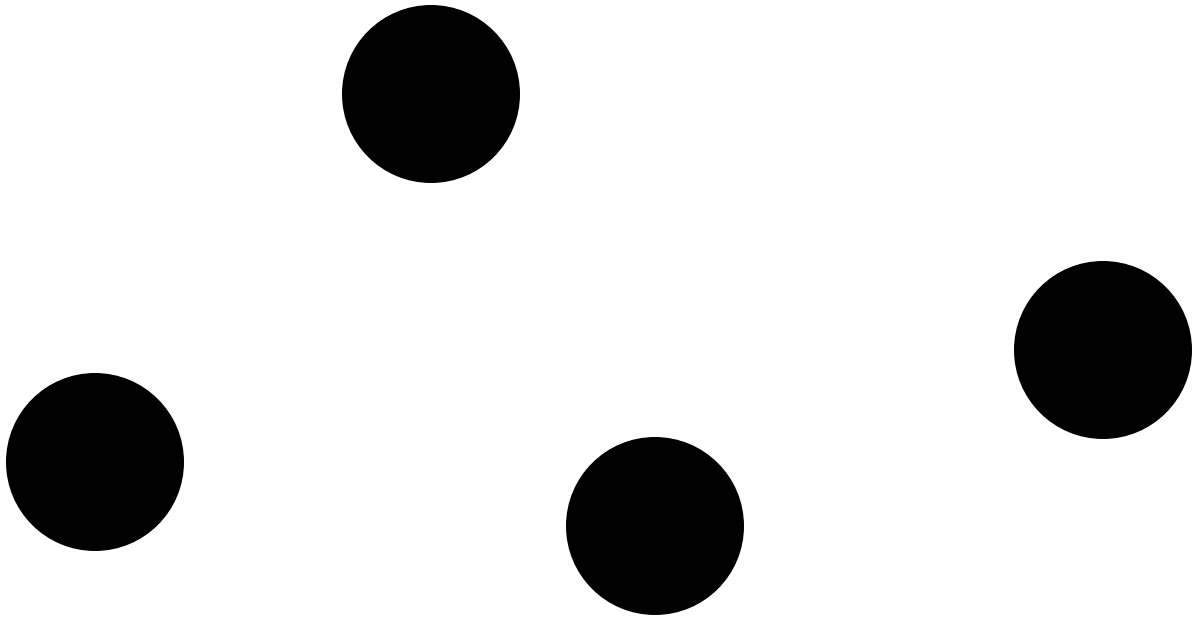


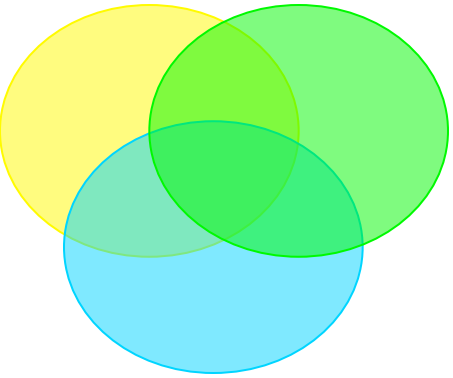


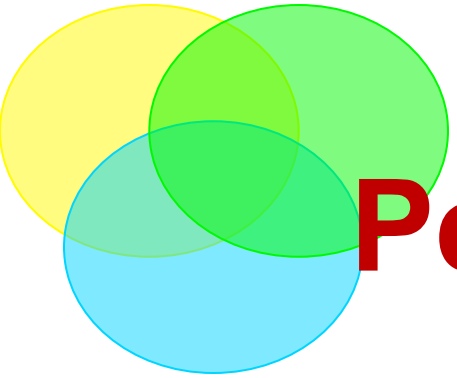






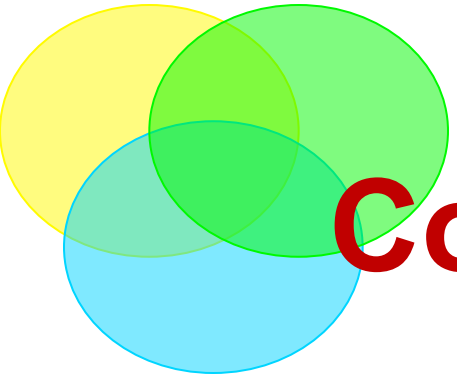






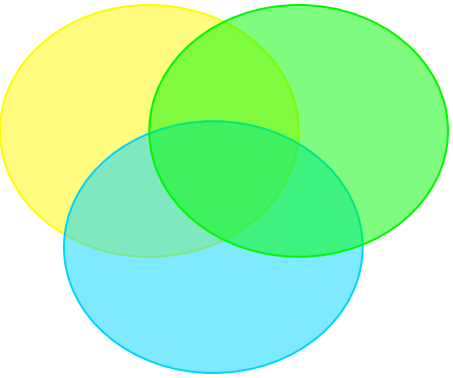
Perceptual Subitizing

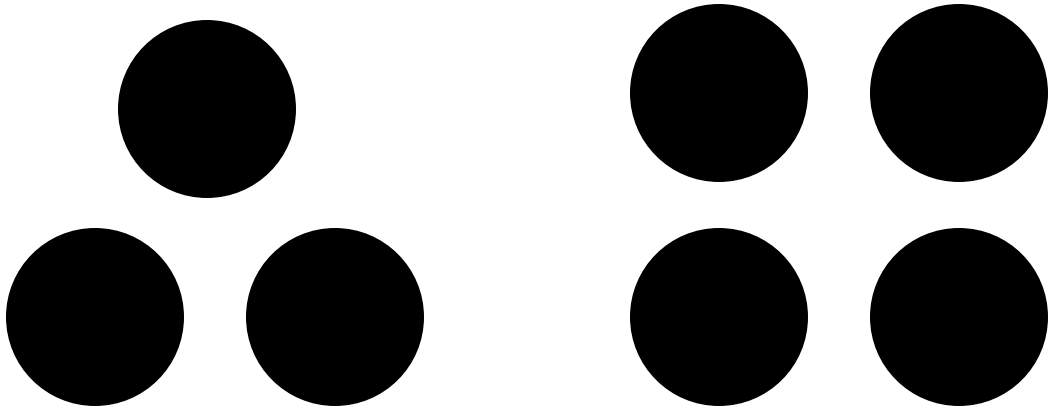
- You perceive the three or four dots simultaneously.
- You “just know.”

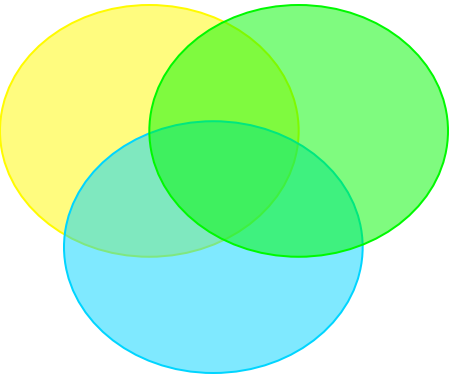


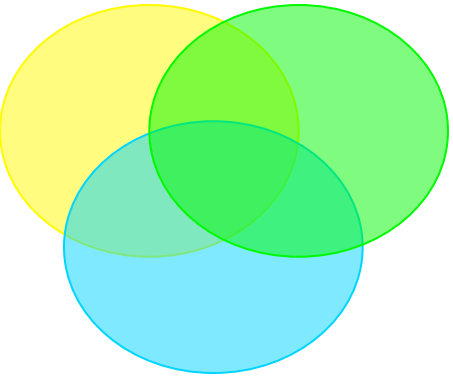
Conceptual Subitizing

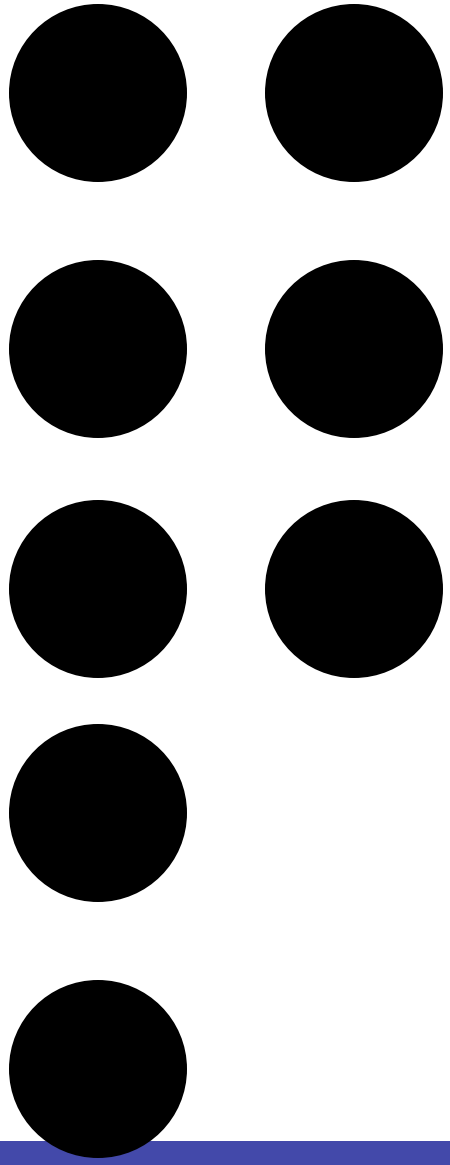
- You perceive the parts and put together the whole.
- All of the this happens quickly and often is not conscious—it is still subitizing.”

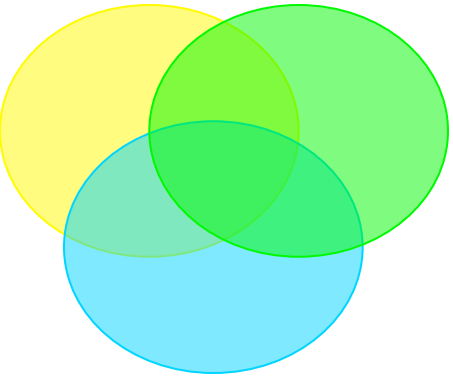


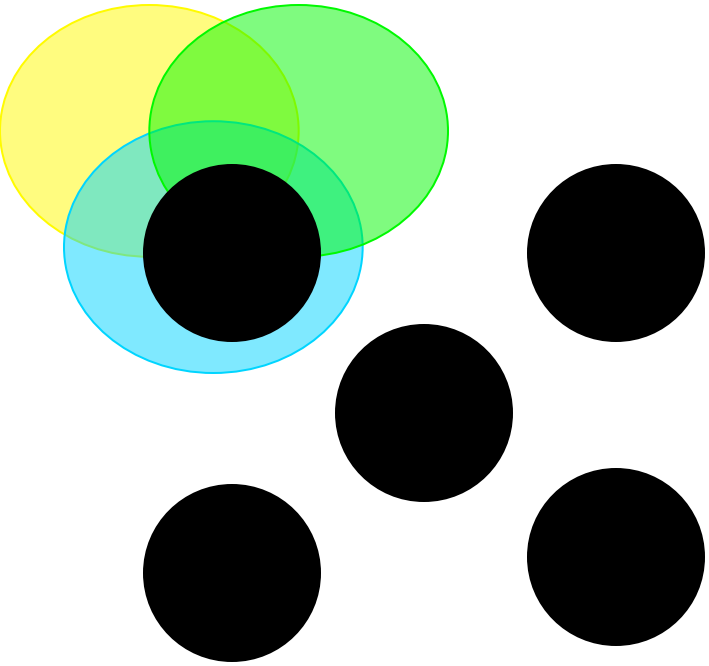


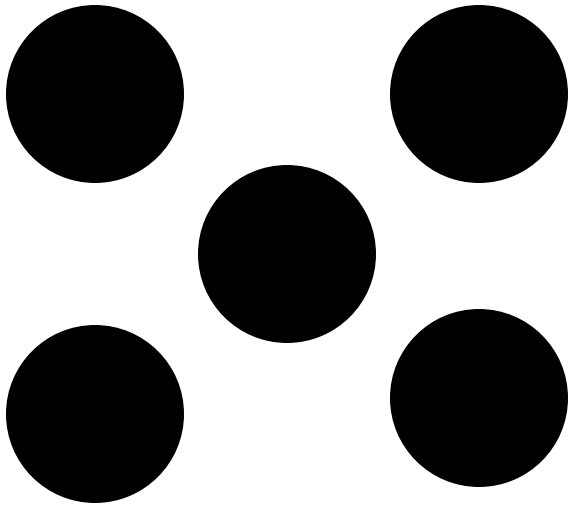


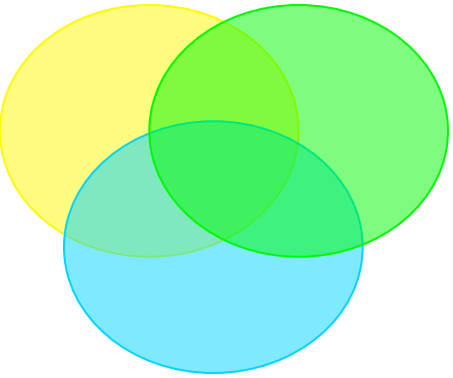








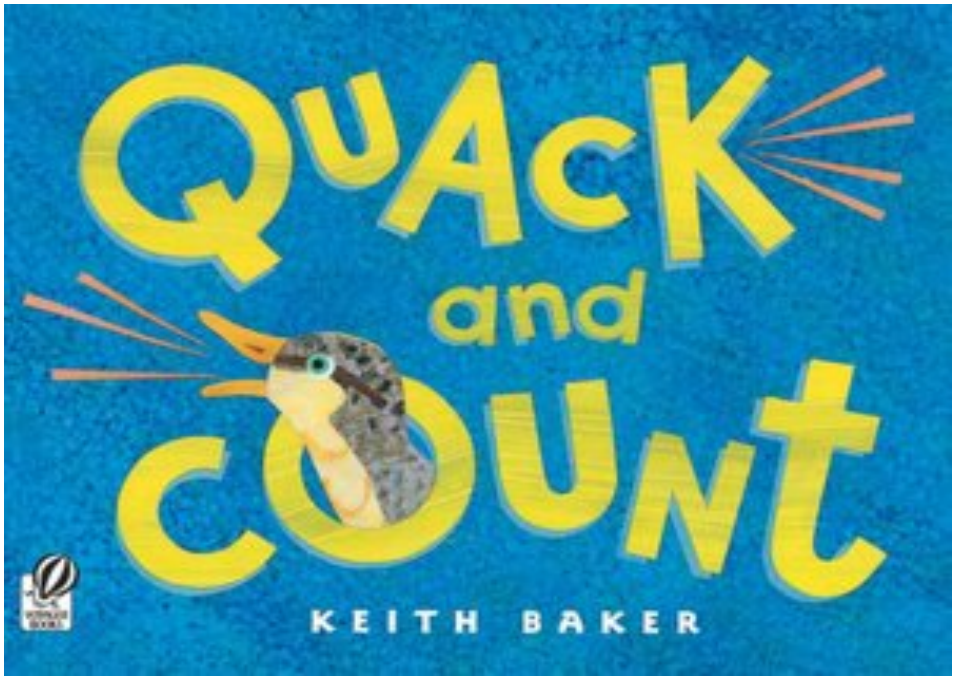


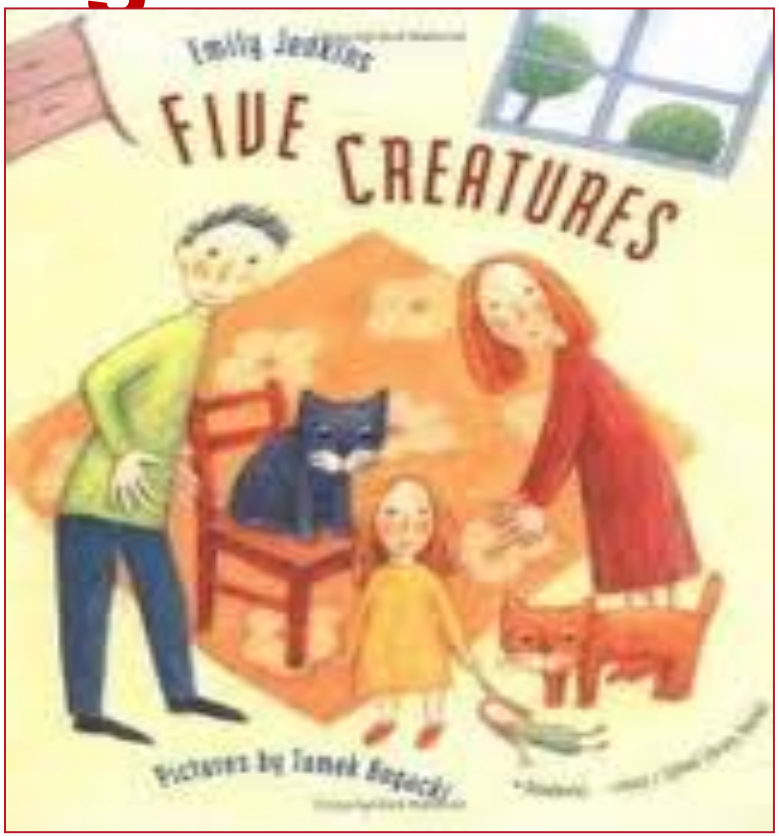


A Big Idea

A given quantity can be **composed** and **decomposed** in a variety of ways.

Acting Out Number Arrangements





Big Ideas and Key Skills in Numerosity and Number Sense

Big Ideas	Key Skills
• Quantity is an attribute of a set of objects & we use numbers to name specific quantities. • Small collections can be intuitively perceived without counting.	• **Naming** the quantity of sets • **Conceptual subitizing**
• A given quantity can be composed and decomposed in a variety of ways.	• **Fluency** in composing and decomposing numbers

Video Analysis

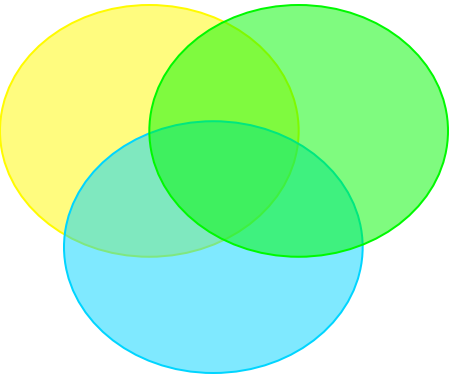
Focus on the Child: Visual Number Sense

- What do you notice about how children perform this task?

Video Analysis

Research Lesson: Number Arrangements

- What is the mathematical learning for these children?
- What did the teacher do and say to support children's learning?



Try and Apply

Research Lesson

Number Arrangements

How might this work in <u>your</u> classroom?