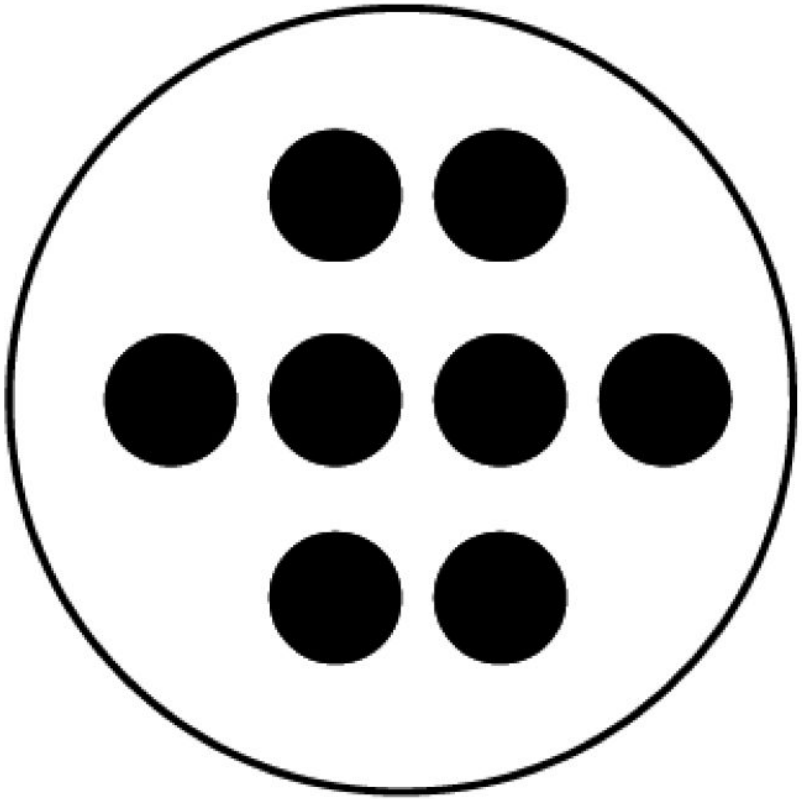
Bridging the Gap from Counting to Operations: Numeracy in Young Learners

WMC 48th Annual Conference
Friday, May 6 11:30-12:30

Presenters: Nicole Hawkins, Meg Kinateder, Robin Swartz
Greendale School District



How many dots did you see?
How did you see it?

Learning intentions

We are learning to:

- Identify the 4 Number Relationships
- Understand how the Number Relationships assist students in the transition from counting to addition and subtraction
- Connect the relationship between the Number Relationships and fluency

Initial thoughts on fluency

What does it mean for a student to be a fluent mathematician?

Developing accuracy, flexibility, and efficiency.

FLUENCY

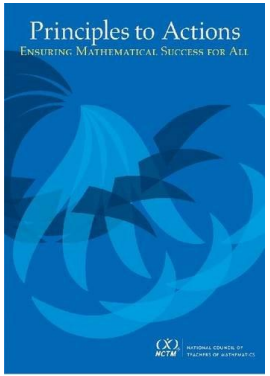
“Fluency in each grade involves a mixture of just knowing some answers, knowing some answers from patterns, and knowing some answers from the use of strategies.”

OA Progressions Document, pg.18

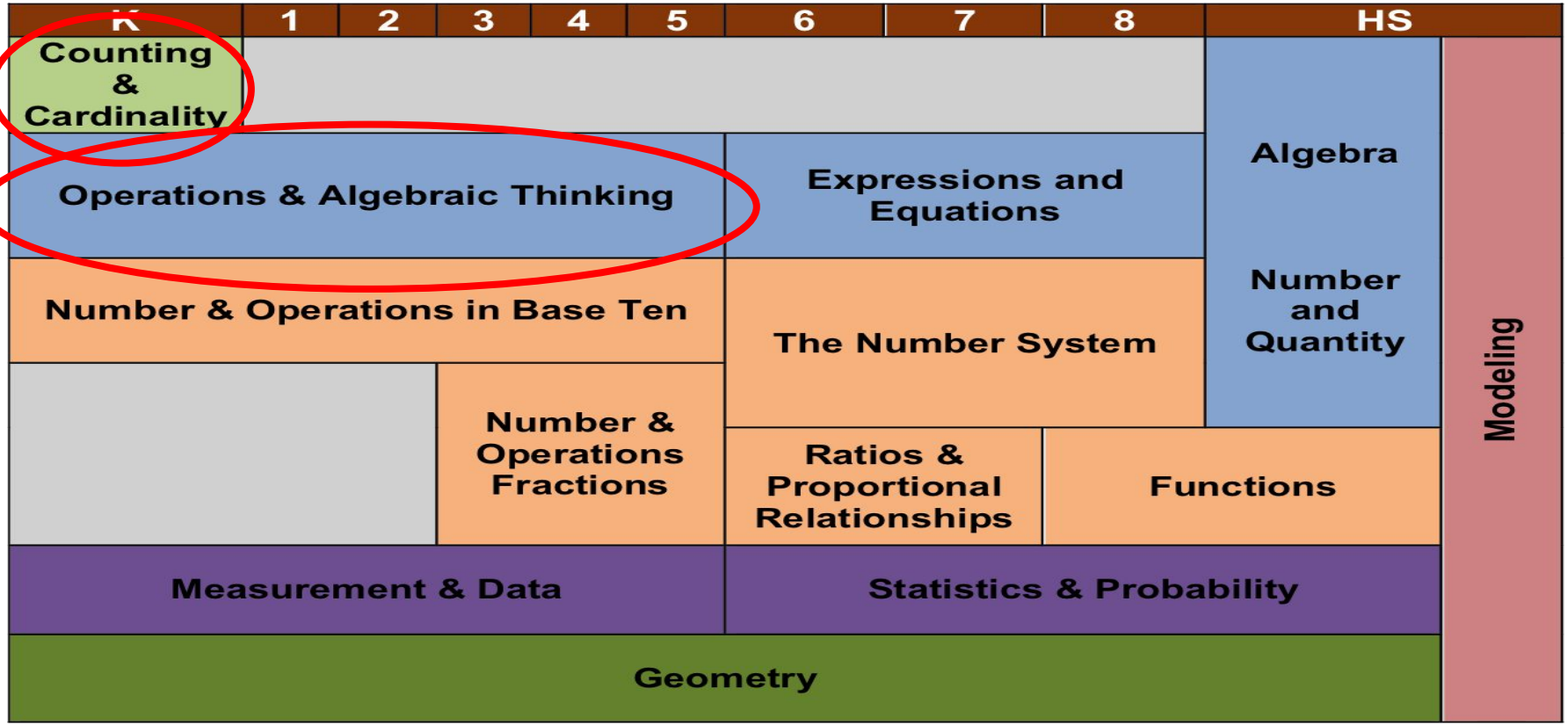
Connection to Math Teaching Practice Standards

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Taken from *Principles to Actions: Ensuring Mathematical Success for All*



K-8 domains and Hs Categories



Connection to early Content Standards

K.OA.3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

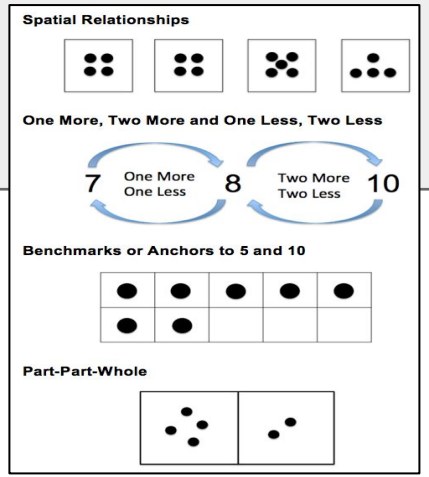
K.OA.4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

Leads to Content Standards

Early Counting

1. Subitizing
2. Rote counting
3. One-to-One Correspondence
4. Cardinality

Four Number Relationships



Addition and Subtraction

Fluency Expectations
K.OA.5 – up to 5
1.OA.6 – up to 10
2.OA.2 – up to 20

The power of number sense

…”the ability to work flexibly with numbers, decomposing and regrouping them with confidence, is so critical to young children that it is known to separate high achievers from low achievers in mathematics.”

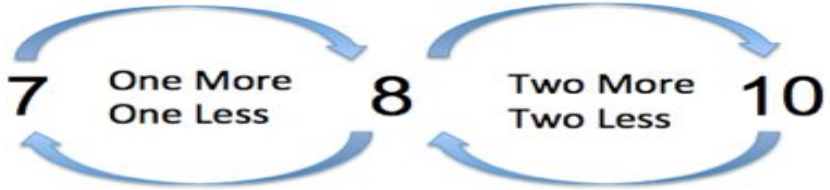
--Jo Boaler (2012). Timed testing and the development of math anxiety.

Number Relationships: The Foundation of Number Sense

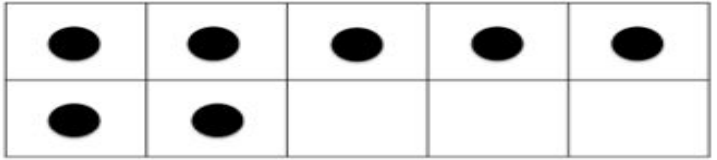
Four Types of Number Relationships

Spatial Relationships

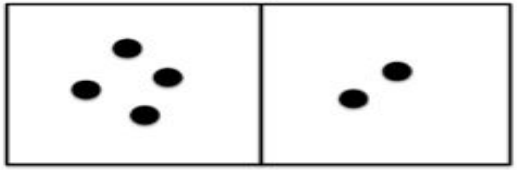
One More, Two More and One Less, Two Less



Benchmarks or Anchors to 5 and 10

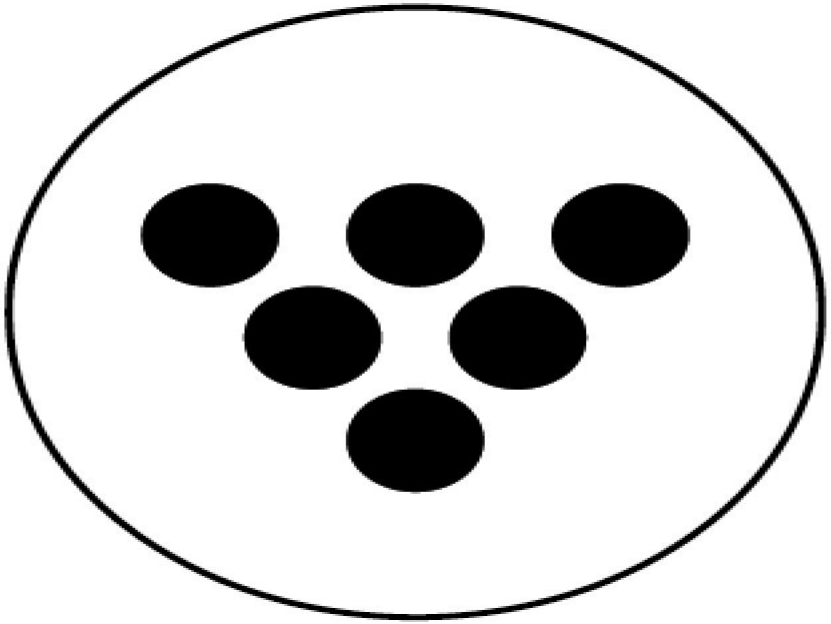


Part-Part-Whole



Spatial Relationships

- Recognizing how many without counting by seeing a visual pattern.
- Subitizing: being able to instantly recognize how many are in a set
- Dot Patterns, Ten Frames, fingers



How many dots?
How did you see it?

One and Two More, one and two Less

- Knowing which numbers are one and two less or more than any given number (NOT the ability to count on two or count back two)

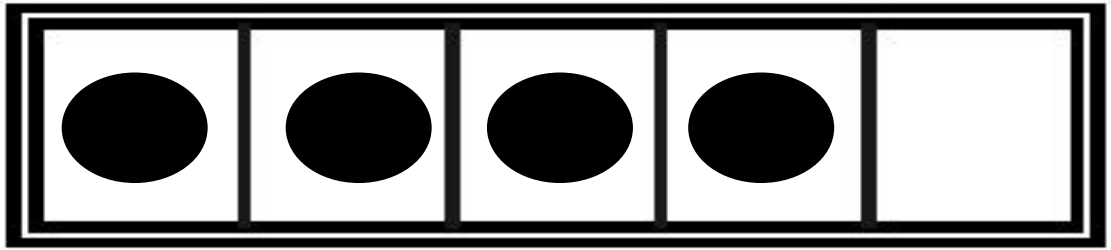
- Mental Computation

- Example: 9 + 5...If a child understands that 9 is one less than 10, when they see 9+5 they can think to themselves “That is like 10+5, which is 15, so it is just one less.”

Benchmarks of 5 and 10

- Being able to relate numbers to 5 and 10 and use this skill for computation

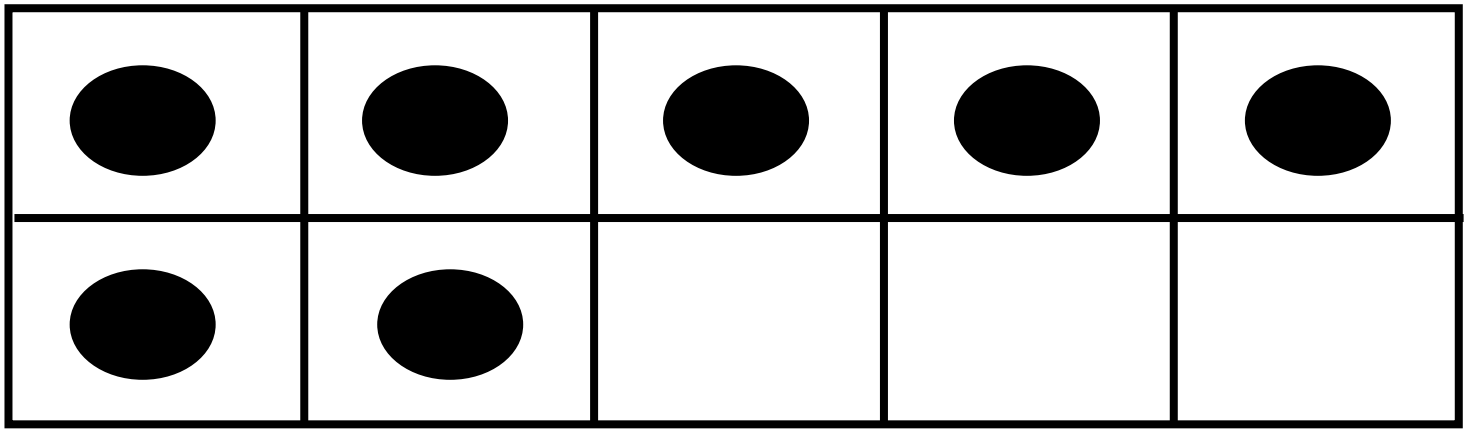
How many dots do you see? How do you see them?



How many more to make 5?

Extending up to 10

How many dots do you see? How do you see them? How many more to make 10?



https://www.youtube.com/watch?v=jOOJLSpeXVY

Part-Part-Whole

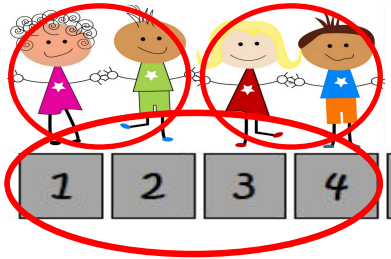
- Being able to decompose numbers into parts to assist with computation

The Importance of Part-Part-Whole Understanding:

“It is not unusual to find children in second grade who have not developed firm part-whole understanding for numbers 7 through 12 even though by that time they should be adding up to 100.”

---Van de Walle, Lovin, Karp, & Bay-Williams, p. 113, 2014

Representing Part-Part-Whole on a number path



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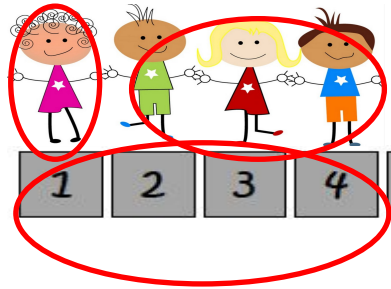

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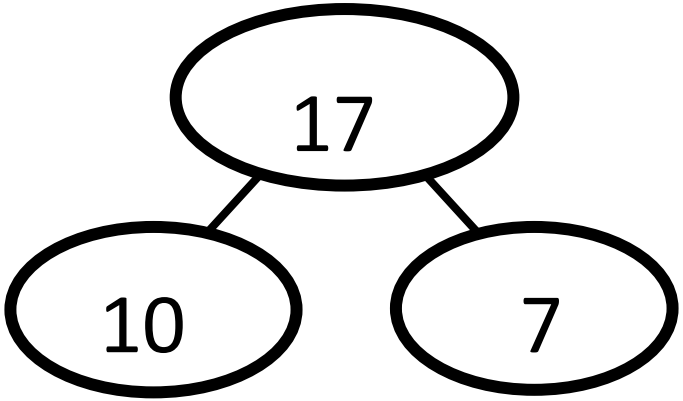
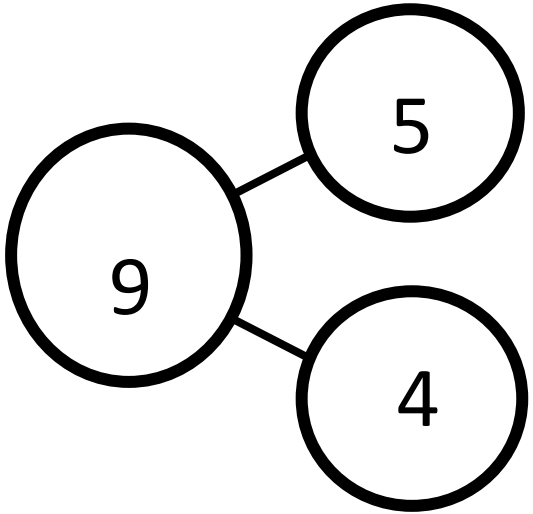
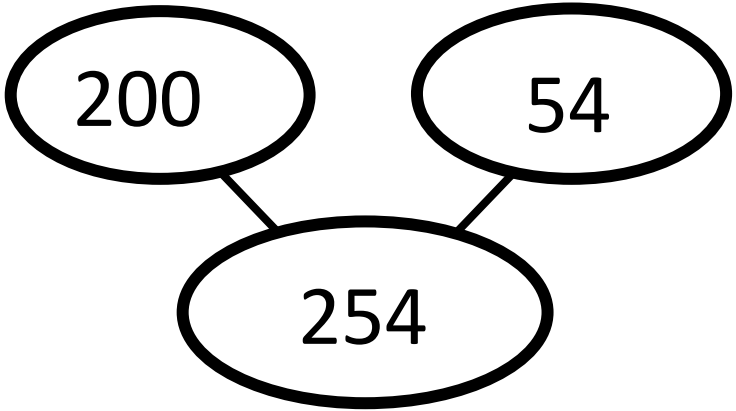


Number Bonds

- Useful for decomposing and recomposing quantity
- Name strengths and challenges of this model.





Building Skills with Students

- Dot Pattern Cards
- Slap it (One/Two More, One/Two Less)
- Go Fish (Benchmarks of 5 and 10)
- Salute!(Part-Part-Whole)
- Number Sandwiches (Part-Part-Whole)

Activity: Slap It! (One/Two More & Less)

In a group of 3, two are “slappers” one is the “speaker.”

1. Lay out number cards 0-20 face up in order.
2. In round 1, the “speaker” says a number out loud and the “slappers” have to slap the card that is “one more than” that number. The first slapper to touch the card gets to keep the card.
3. In round 2, they have to slap the card that is “one less than”, Round 3 is “two more than” and Round 4 is “two less than”.

Activity: Go Fish (Benchmarks of 5 and 10)

Directions:

1. Each player is dealt 5 cards, and the remaining cards are placed in a pile in the middle of the group.
2. If players have any pairs that have a sum of 10, they can place those pairs to the side.
3. Players take turns asking for a pair to make a sum of 10.
4. If the player being asked has the card to make 10, they will give that card to the first player. If not, the first player will “Go Fish” and take a card from the pile.
5. The game is over when there are no more cards in the center pile and the players have no remaining cards.

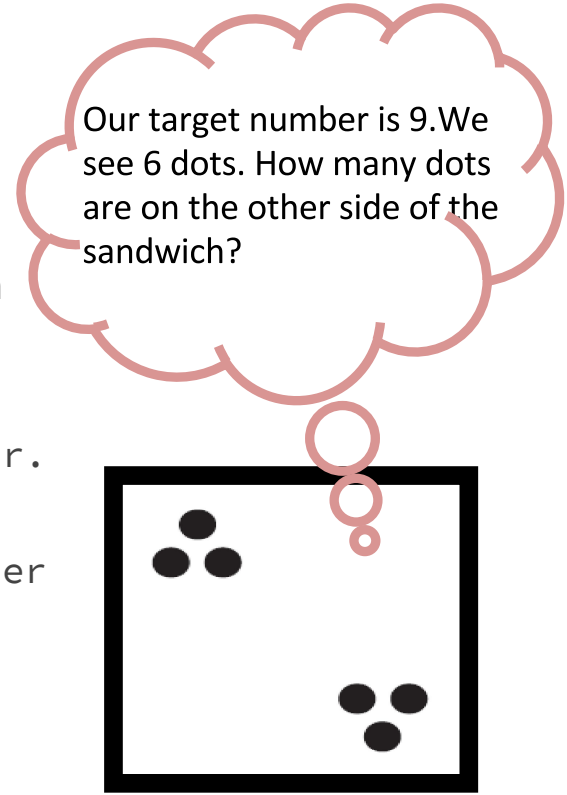
Activity: Salute! (Part-Part-Whole)

Directions:

1. Stack the deck in the middle.
2. Determine who is the “judge” and who are the two “players” for the first round.
3. The “players” will each take a card from the deck, without looking at it, and hold it up to their forehead (like a salute) with the number facing outward.
4. The judge will tell the players their total, or whole.
5. The players will work to determine their part of the whole.
6. Take turns, rotating players and judge, until the entire deck has been used.

Activity: Number Sandwiches (Part-Part-Whole)

1. Together decide on a target number between 7 and 12.
2. Lay all the dot cards in front of you face up.
3. Together find two dot cards totaling your target number.
4. Make a “sandwich” with the two cards by placing them back-to-back with the dots sides out. Place each sandwich in front of you.
5. Find at least ten pairs that total your target number. Make a sandwich for each pair.
6. Look at each dot card that is face up. Name the number on the other side.
7. Turn your sandwich over to check!



Developing Number Sense by Building Number Relationships

Number sense is a set of skills that grow and develops over time. Number sense is described as a “good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms” (Howden, 1978, p.11).

Learning intentions - Revisited

We are learning to:

- Identify the 4 Number Relationships
- Understand how the Number Relationships assist students in the transition from counting to addition and subtraction
- Connect the relationship between the Number Relationships and fluency

Questions?

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