Making High Yield Routines Work in Pre-K - Grade 2

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#NCTMAnnual

The
Nur

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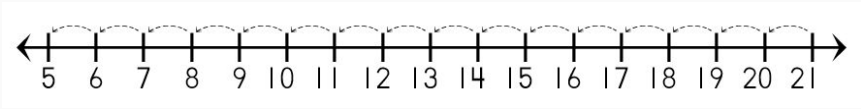
Number Sense: “A good intuition about numbers” (Howden, 1989)

High Achievers

21 - 16 = 20 - 15

Low Achievers



What can be done with 10 minutes to build the number sense of our youngest student mathematicians?

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Routine:

noun

1. a customary or regular course of procedure.

2. commonplace tasks, chores, or duties as must be done regularly or at specified intervals; typical or everyday activity:
   the routine of an office.

3. regular, unvarying, habitual, unimaginative, or rote procedure.

4. an unvarying and constantly repeated formula, as of speech or action; convenient or predictable response:
   Don't give me that brotherly-love routine!

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What constitutes an instructional routine?

- ➔ Gives structure to time and interactions for the purpose of learning academic content
- ➔ Opens up conversations and thinking about mathematics that might not otherwise happen
- ➔ Provides a framework for moving students toward a goal with a structured sequence of events

McCallum, 2018

What is a high yield routine?

- Short: 5-10 minutes
- Flexible
- Scalable
- Merges content with practice
- Opportunity for informal assessment

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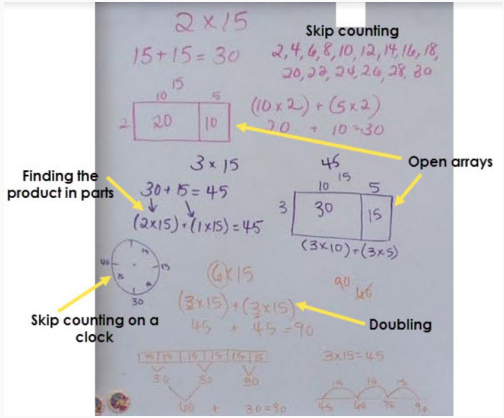
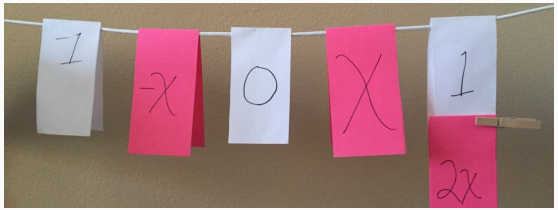
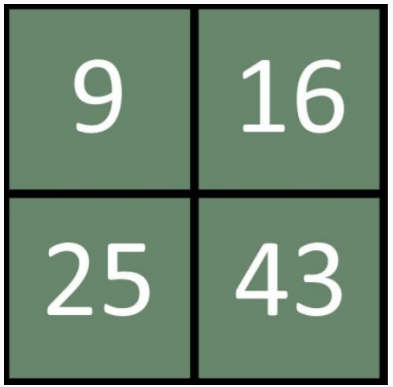
Favorites from Grades 3-5 Become Favorites for Pre-K - Grade 2

Number Talks Quick Images	Clothesline Math	Which One Doesn't Belong
		

Guiding Principles for Making Routines Work

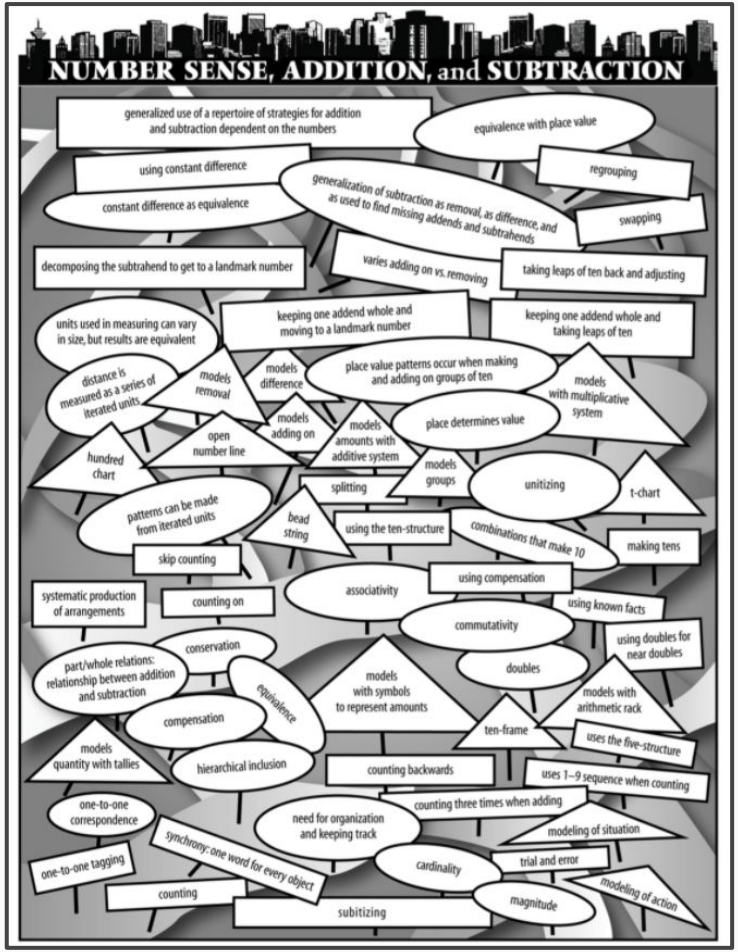
1. Select content for routines with learning trajectories in mind.

2. Make it visual.

3. Anticipate student thinking. Plan next steps responsively.

Learning Trajectories: Understanding on the Horizon

It's a little bit messier than moving from page to page in the textbook...



(Fosnot, 2001)

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Unpacking Early Numeracy

Primary Concepts: Early Number and Counting

- Verbal Counting
- Object Counting
- Cardinality
- Subitizing

Secondary Concepts: Number Relationships

- Spatial Relationships
- 1 and 2 more, less
- Benchmarks of 5 and 10
- Part-whole relationships

(Van de Walle, 2014)

Zooming In: Perceptual vs. Conceptual Subitizing

Perceptual Subitizing		Conceptual Subitizing		Part/Whole Relationships
Ability to perceive small quantities without counting (4 or less)		Ability to perceptually subitize 2 or more amounts, automatically and instantly combine to find a total in a set (e.g., 6 as 3 and 3)		Ability to consider parts of a number (e.g., 6 is made up of 5 and 1 or 4 and 2) Precursor to addition

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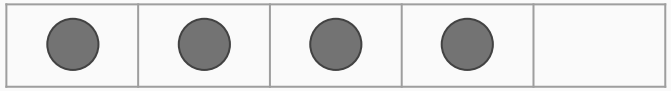
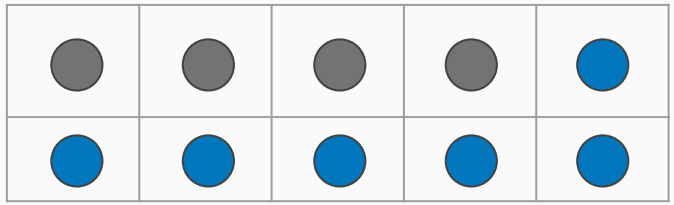
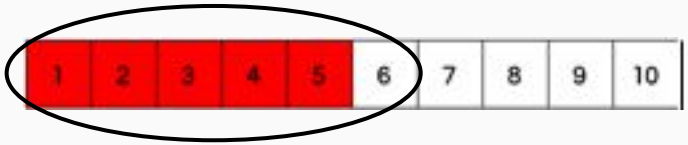
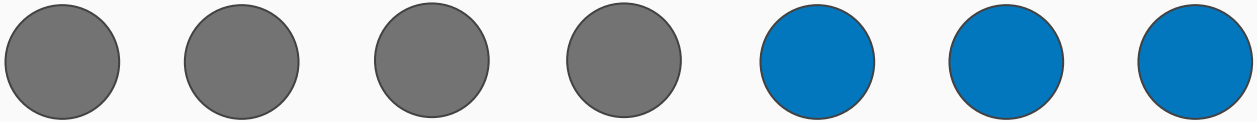
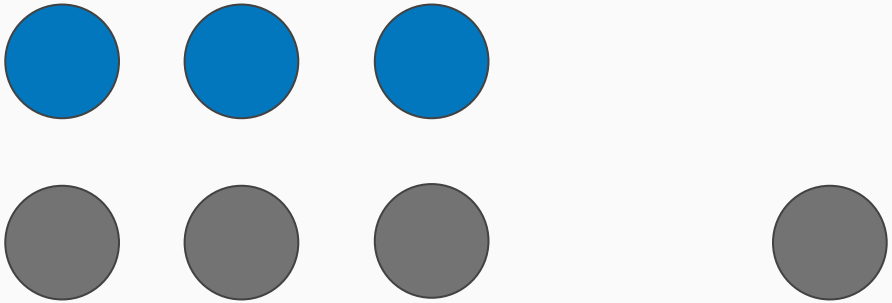
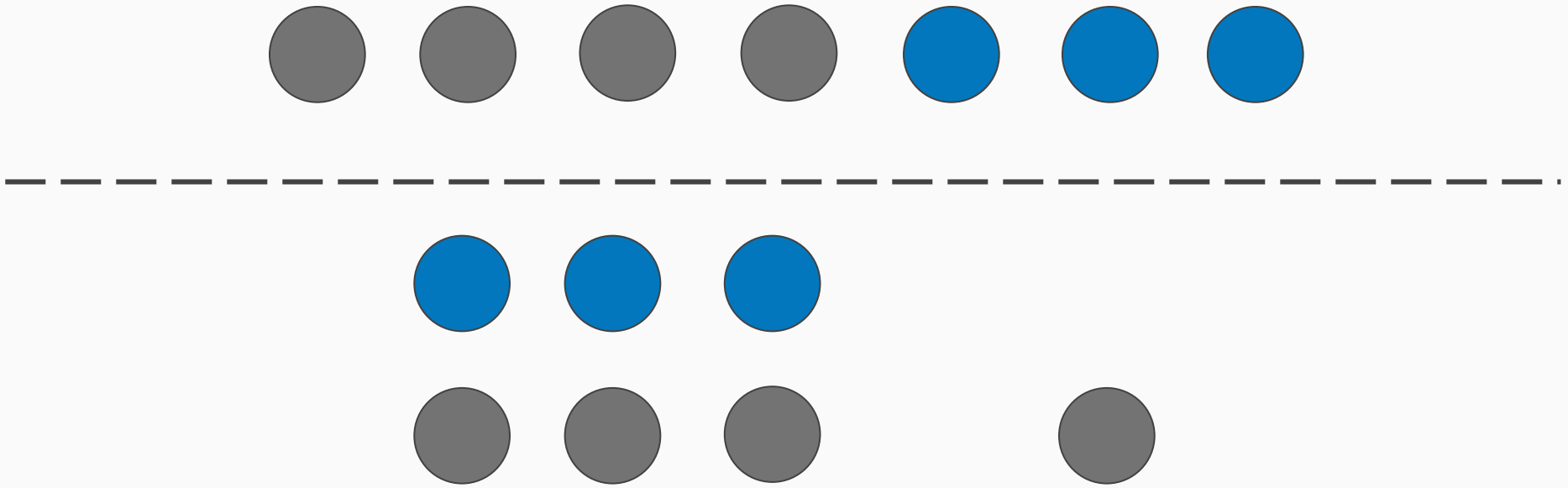
Making Maths Visual: Seeing as Understanding (Boaler et al., 2016)

This	Not That
	4
	4 + 6 = 10
	6





Same-Different Math



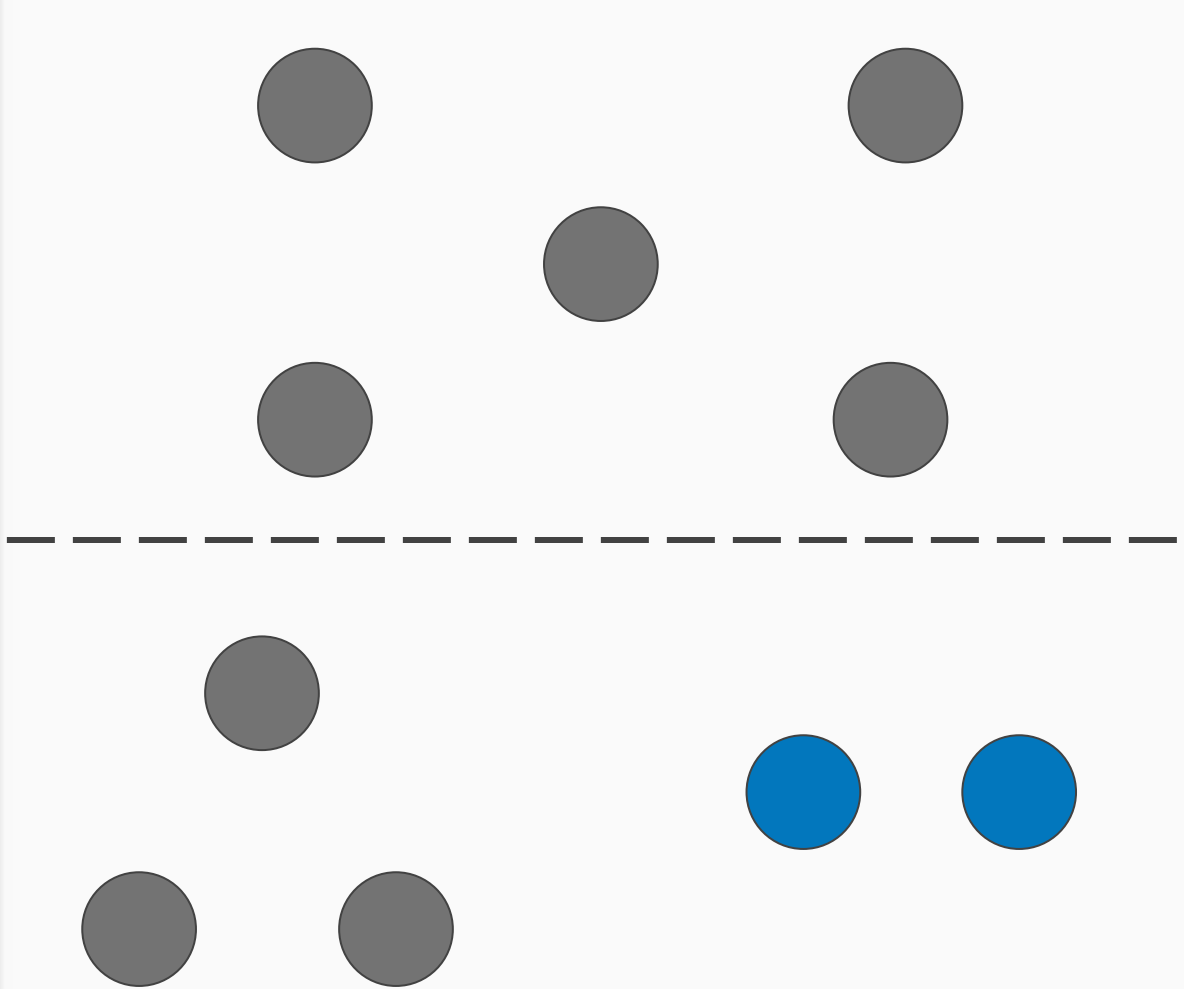
Dimensions of Variation

- Groups
- Space
- Color
- Shape
- Structure
- Orientation

Choosing Images with Intentionality

You have a group of students who are struggling to see smaller groups within the larger one. While they are exceptional perceptual subitizers, they do not see small groups within larger wholes.

Turn and talk to your neighbor: Which one of these images would you choose to move their thinking forward? Why?



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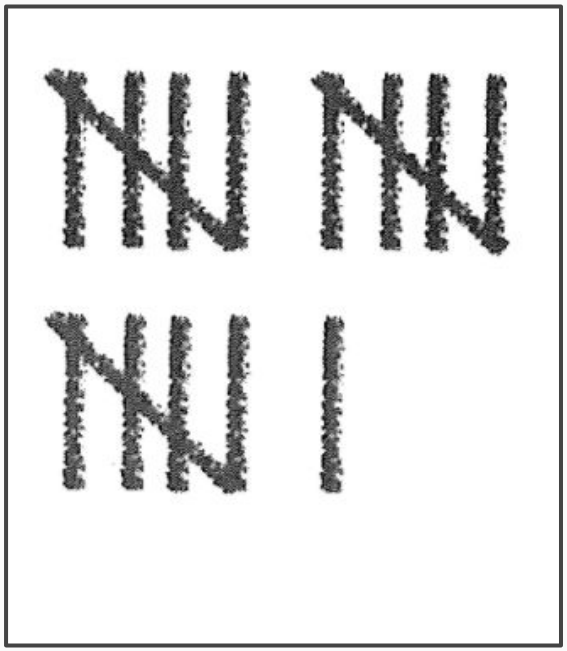
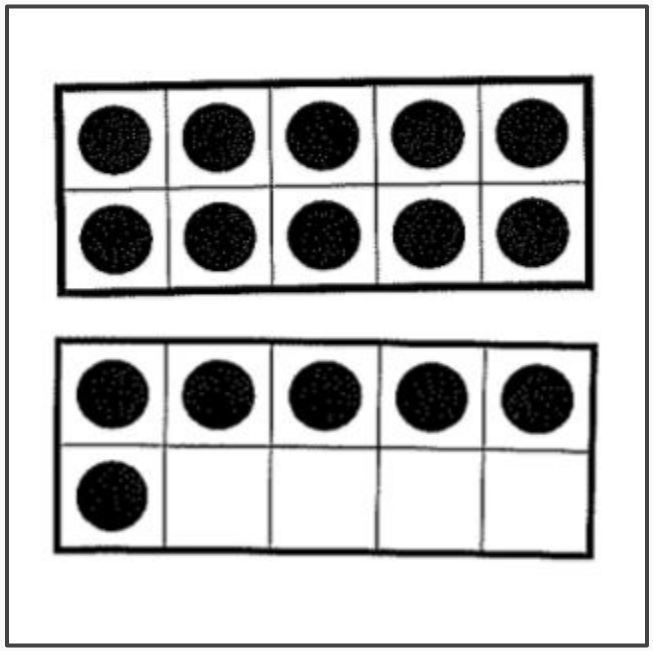
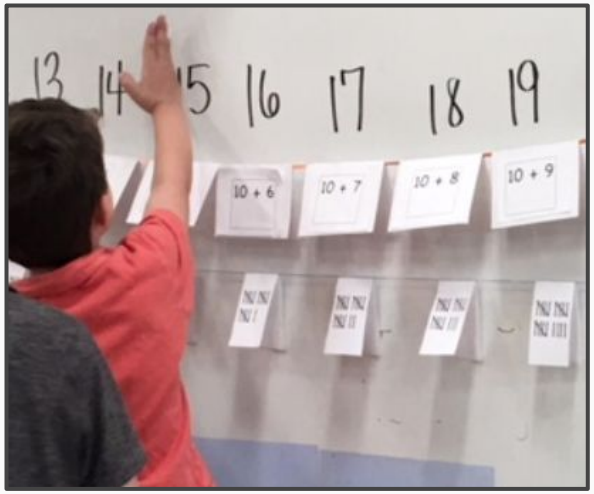
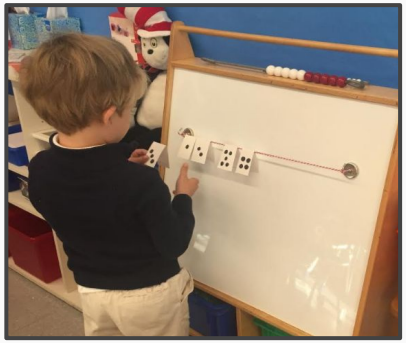




10 + 6

Clothesline Math: The Master Number Sense Maker (Chris Shore)





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Clothesline Math: What does it look like with students?

Turn and talk to you neighbor:
What early numeracy concepts are at play in this 3 minute interaction?

Number Talks and Quick Images

Consider the Standards for Mathematical Practice or NCTM Process Standards of Problem Solving, Reasoning and Proof, Communication, Representation, and Connections (NCTM; 2000).

Which of these are being exercised in the course of this routine?

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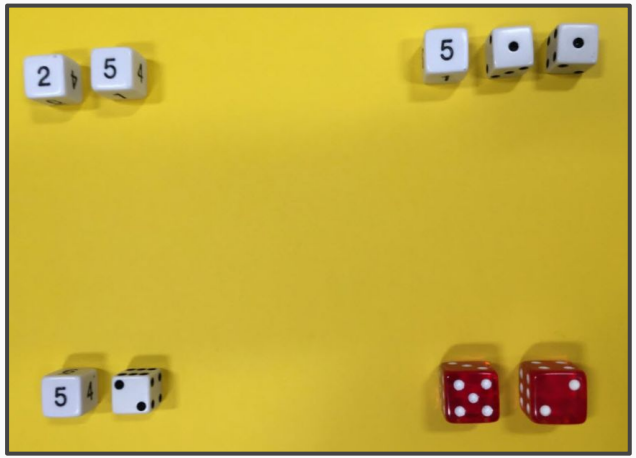
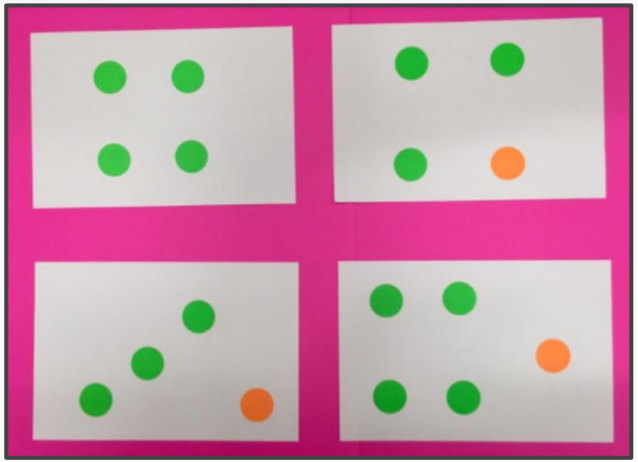
WODB: Which One Doesn't Belong?





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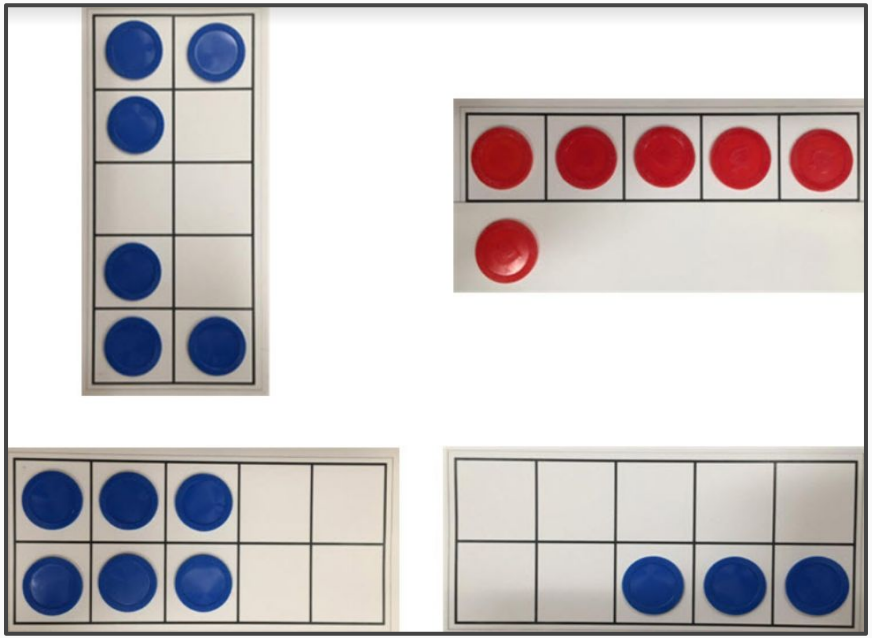
Which one doesn’t belong?



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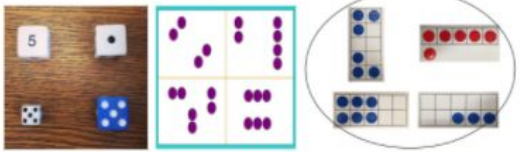
Facilitating: Anticipating Student Thinking, Making the Next Move

A Community of Discourse:

"As a member of the community..., the teacher facilitates, monitors, and at times provides counterexamples and/or highlights connections to ensure that this dialogue supports genuine mathematical learning."

(Fosnot, 26)

High Yield Routine Planning Guide

Mathematical Goal What is the math? Where are our students?	Subitizing Recognizing numerals, matching to a representation Part-part-whole, seeing smaller groups within the large group More than/less than, comparing quantities Bigger, smaller (sizes of the dice) Object counting (counting dots) Conservation (seeing same quantity in different ways) Using benchmark values (5) Exposure to both 5 and 10-frames Variety of subitizing activities (dot images) Vocalize their thinking, listen to the thinking of others Work with quantities to 10 Many need reminders to count on instead of count all - most can do this with a reminder Wide range of abilities - some (very few) still counting one by one even within 5 ***Almost all are successful with subitizing with fading prompt*** ***Few are able to see parts within the whole*** Verbal counting is strong (counting up and back) Object counting, cardinality, conservation are all strong
WODB Prompt What problem will I pose?	 Dice image feels like the quantity is too small but might be good earlier in the year The second image does not incorporate attributes (color, orientation, size) - might not have an point of entry for all Include a turn and talk opportunity to bring in new voices, take advantage of other adults in the room
Recording What is important about my recording?	Poster paper with velcro to attach images to the four regions. Do not label the 4 images with letters or numbers to identify them. Require students to use positional language to help identify which one they're talking about. Do not mark up the images or record student ideas - This may be
	confusing for students, difficult to capture different ways of seeing quantities on the models on a single image without being able to erase Circle groups as they see them - this was difficult for some kids to see on their own Use numerals to record. Avoid using words and equations
Anticipating What will they come up with?	Upper left is vertical Upper right has red tokens Upper right is a 5-frame Bottom right only has 3 Upper left is grouped 3 and 3 Upper right is the only one that has a group of 5, filled in like a 10-frame Upper left has tokens in triangles Upper right looks like it could be the number 7 Bottom right shows 8, 9, 10 Bottom right has dots missing The dot out of the frame does not count The red has all of the boxes filled, the blue has missing ones 4 missing in three but not the others Noticing the lighting on different images Thinking about "what wasn't in boxes" as opposed to what was there
Questioning What questions will be important to ask?	How did you see that? Where do you see that? Can you explain that another way? Can you describe how you see that? Can you use different words to explain which one? Some kids see or think something that's a little off track - Can you think about the 4 separate images or frames? Can you think about the 4 images are the same? Different? Which ones doesn't belong? Can you tell me why that doesn't belong? Can we look again? Is this the only that's like that or that has that? I wonder what might happen if we count the tokens? *Reserve this for an unstuck strategy In response to they are all 6 - Do you see the 6 in the same way for all of them? Do you see smaller groups in the frames? Encouraging questioning around positional language How do we take an interesting noticing and ask questions to get others to take the same path

Source: Kristin Gray (https://kgmathminds.com/)

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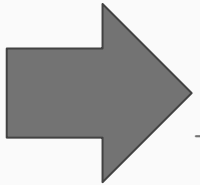
There is not time in my day for one more thing!

Characteristics of a High Yield Routine:

- **Short: 5-10 minutes**
- **Flexible**
- Scalable
- Merges content with practice
- Opportunity for informal assessment



Math lesson:

- Beginning, end, within
- Station/center time
- Workshop: Small group

Transitional time:

- Cafeteria, playground line-up
- Waiting for a specialist or classroom visitor

Unstructured time:

- Early morning
- Dismissal

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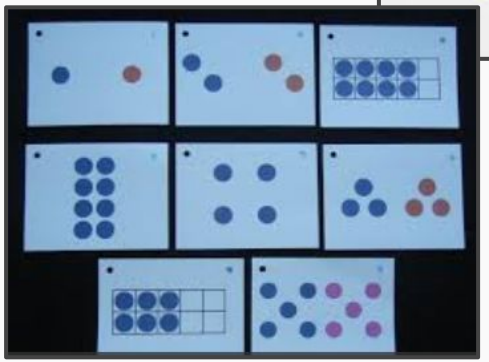
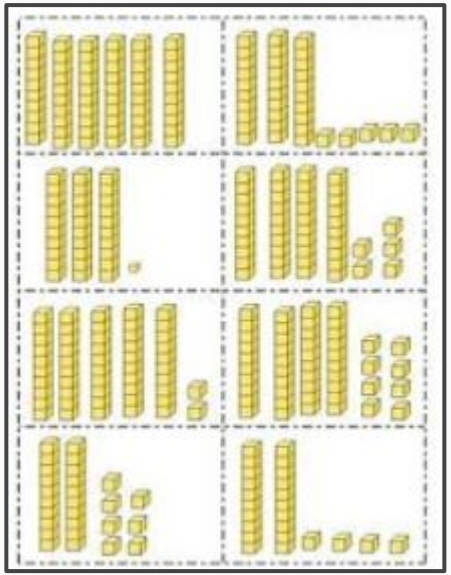
What's on your ring?





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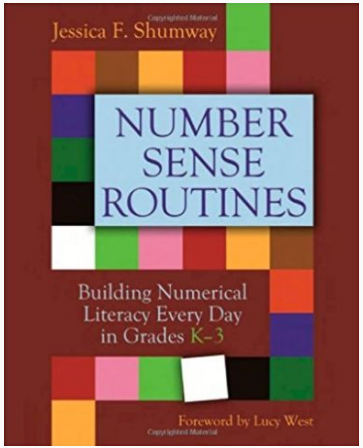
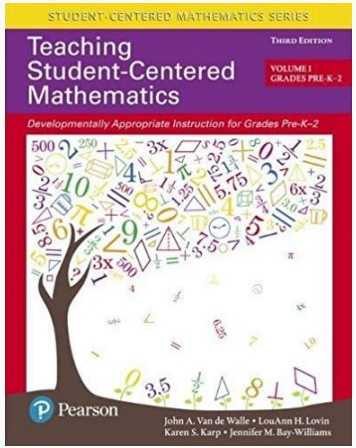
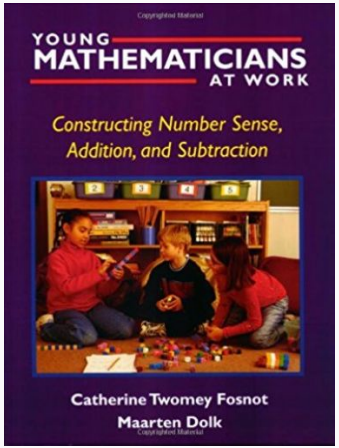
Resources: Learning More

Clothesline Math: https://clotheslinemath.com/; @MathProjects; #clotheslinemath

Which One Doesn't Belong: http://wodb.ca/; #wodb







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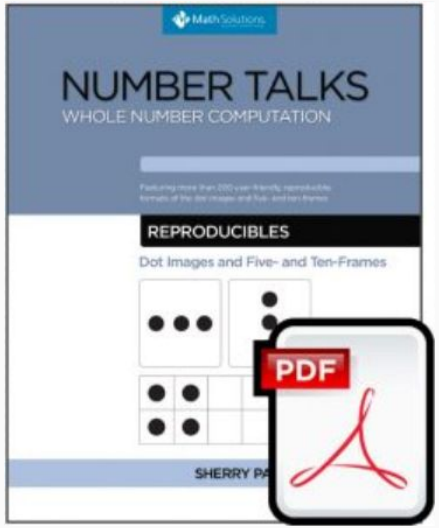
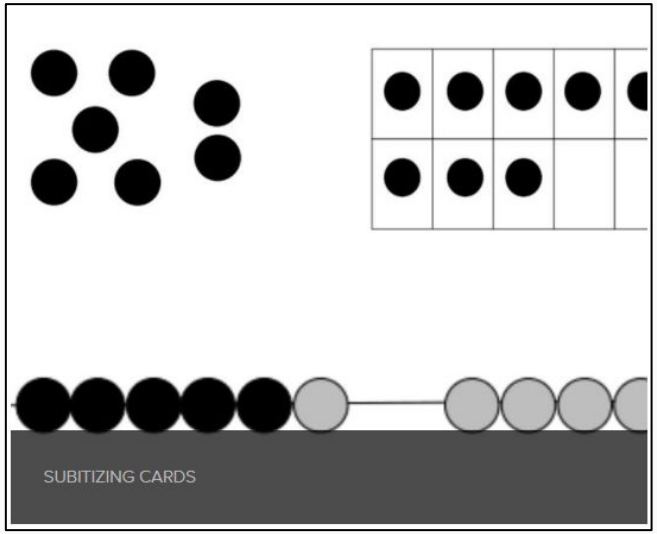
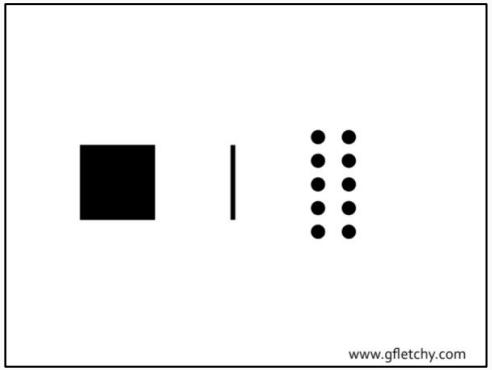
Resources: Images Ready to GO!



Number Talks Reproducibles
Sherry Parrish



Free Number Sense Downloads
Christina Tondevold
http://www.mathematicallyminded.com/



Subitizing Cards
Graham Fletcher
https://gfletchy.com/

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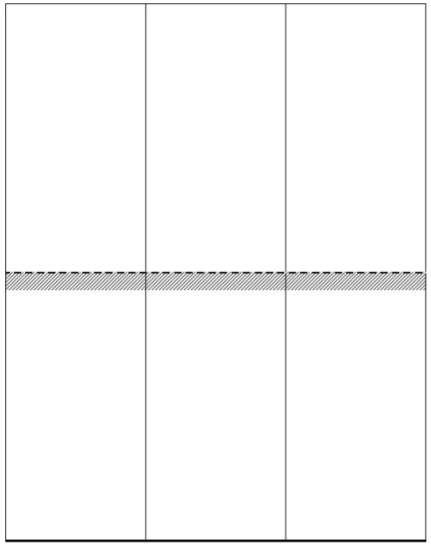
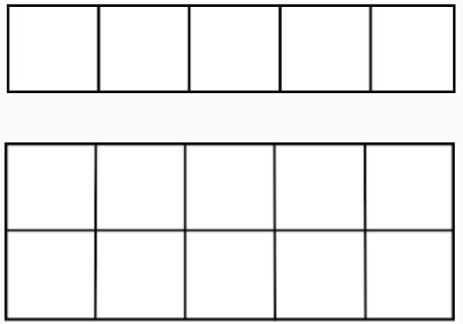
Resources: Making Your Own



Chris Shore: Clothesline Math



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What can be done with 10 minutes to build the number sense of our youngest student mathematicians?

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Call to Action

- ➔ Pick one routine to put in front of your students next week.
- ➔ Consider the guiding principles for these high-yield routines:
  - ◆ Be mindful of the landmarks along the landscape for early number sense and operation. Allowing these to inform your navigation
  - ◆ Be thoughtful in your planning but ready to respond to “bad weather”
  - ◆ Make it visual

Commit to just one thing. How will that commitment elevate your practice?


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Making High Yield Routines Work in Pre-K - Grade 2

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Resources: http://bit.ly/2gVdpJc

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References

routine. (n.d.). *Dictionary.com Unabridged*. Retrieved April 25, 2018 from Dictionary.com website http://www.dictionary.com/browse/routine

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