

Preschool Math and the Common Core

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Let's start by looking at
some preschool math
teaching...

What kinds of “math
thinking” can you spot?

Why are the Standards Needed?

- Previously, U.S. standards differed from state-to-state
- U.S. publishers wanted to meet all standards with a single curriculum
- Math curricula “mile-wide, inch-deep”

What do the Standards Address?

- Content Standards: focus, coherence, and rigor
- Practice Standards: reasoning and sense-making

Challenges: Lack of Common Standards Prior to Kindergarten

- Means that early childhood curricula may not benefit from whatever advantages the standards bring
- Reinforces the idea that math is not relevant before the age of 5

School Readiness and Later Achievement

Kindergarten entry

3rd to 8th grades

Early **reading** skills

Later **reading** achievement



Early **math** skills

Later **math** achievement

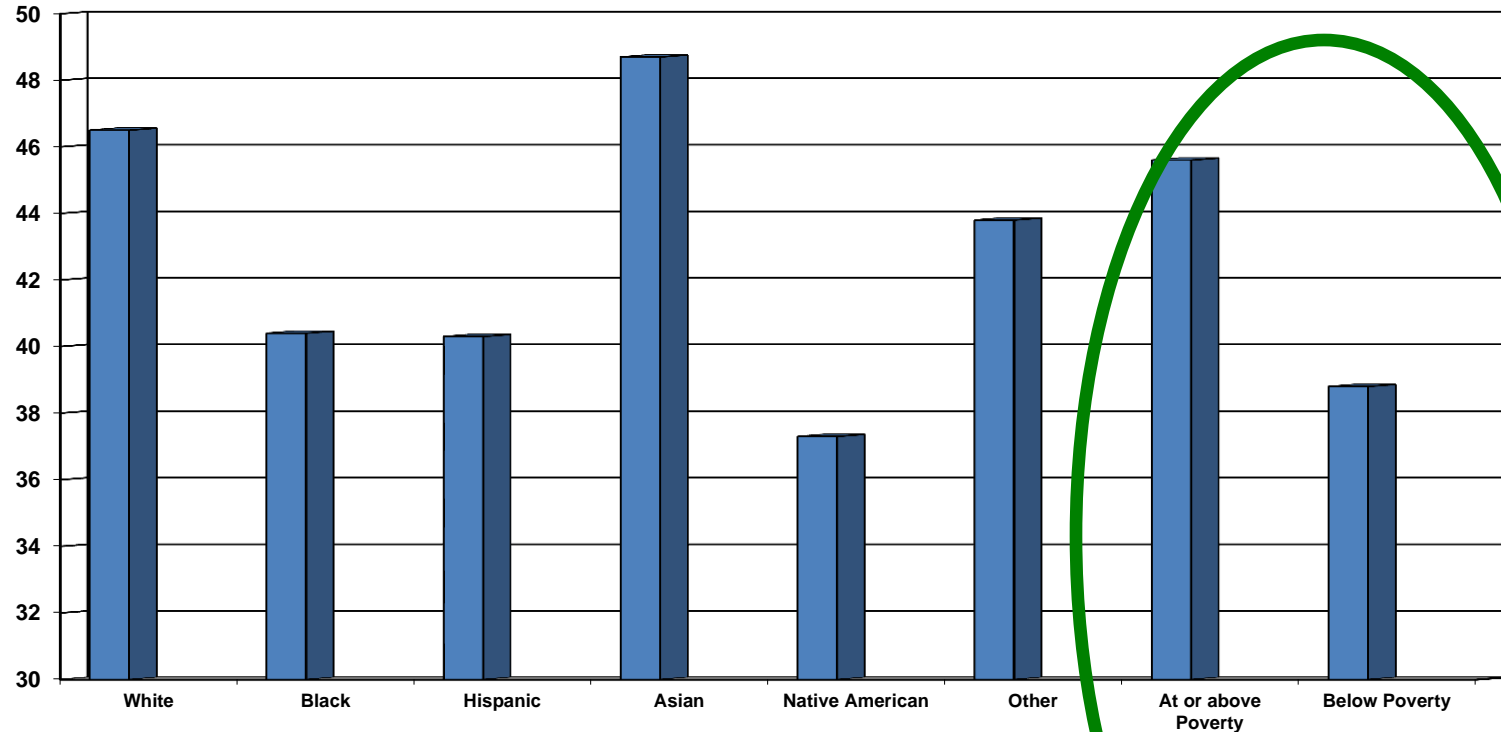


Early **math** skills

Later **reading** achievement



Average Math Scores at Kindergarten Entry (ECLS-B)



Practice Standards

- Goal: Ensure that the way math is taught emphasizes reasoning and sense-making
- They describe what proficient math LEARNERS are DOING as they learn
- By implication, they set a standard for HOW teachers should teach

Common Core Practice Standards

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Key Practice Standards for Today

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Attend to precision.

Let's Look at that Video Again

What did the TEACHER do to make sure children had opportunities to “practice” mathematics?

- Make notes of “teacher moves” as you watch
- Turn to a partner and talk about what you noticed: which teaching choices were most important? Which most difficult to make?

Key Practice Standards for Today

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Attend to precision.

Turn and Talk with a Partner

Share the “teacher moves” you noticed, and discuss:

- Which teaching choices were most important?
- Which teaching choices do you think might be the most difficult to make?

Content Standards

- Focus: Certain strands limited to early grades, others don't begin until later grades, 2 to 4 focal points at each grade level
- Coherence: Domains (such as “Number and Operations in Base 10”) progress across grade levels
- Rigor: Require both conceptual understanding and procedural fluency

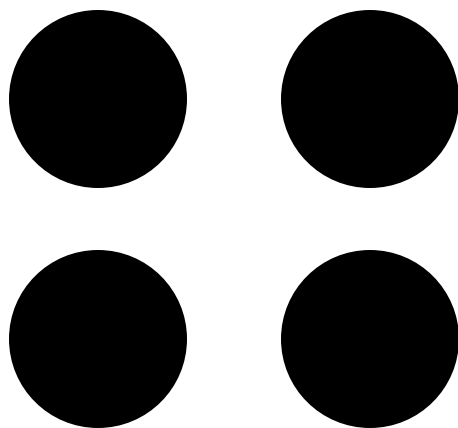
Content Standards K-5

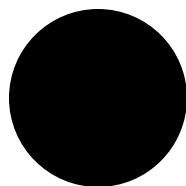
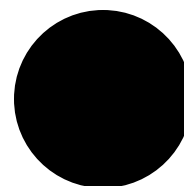
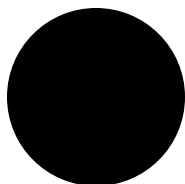
- Emphasis on a *solid foundation in whole numbers, addition, subtraction, multiplication, division, fractions, and decimals*
- Kindergarten focus on the *number core*:
 - How numbers correspond to quantities
 - How to put numbers together and take them apart

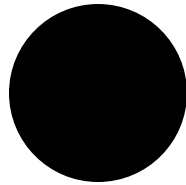
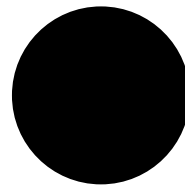
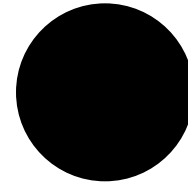
Number Core Overview (Kdgn)

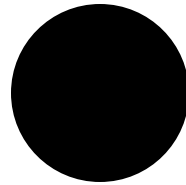
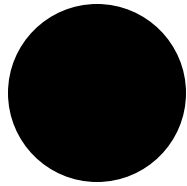
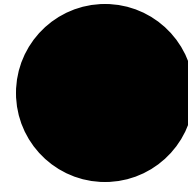
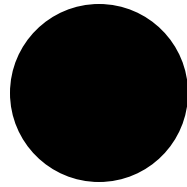
- Counting and Cardinality
 - Know number names and the count sequence
 - Count to tell number of objects
 - Compare numbers
- Operations and Algebraic Thinking
 - Understand addition as putting together and adding to; understand subtraction as taking apart and taking from
- Number and Operations in Base 10
 - Work with numbers 11 to 19 to gain foundations for place value

What can you see quickly?



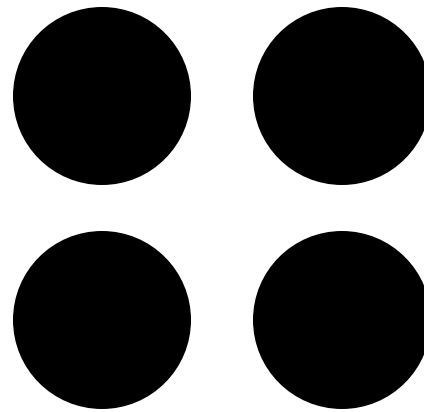
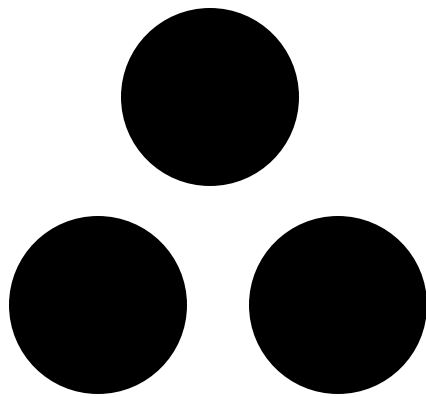


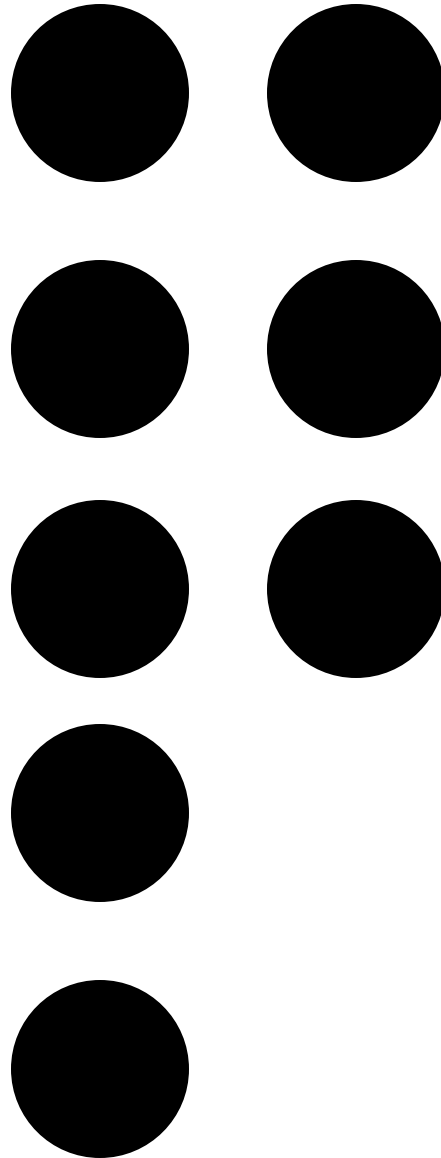


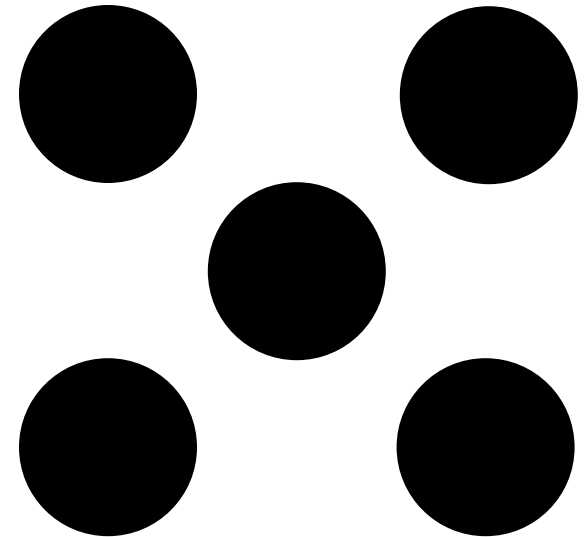
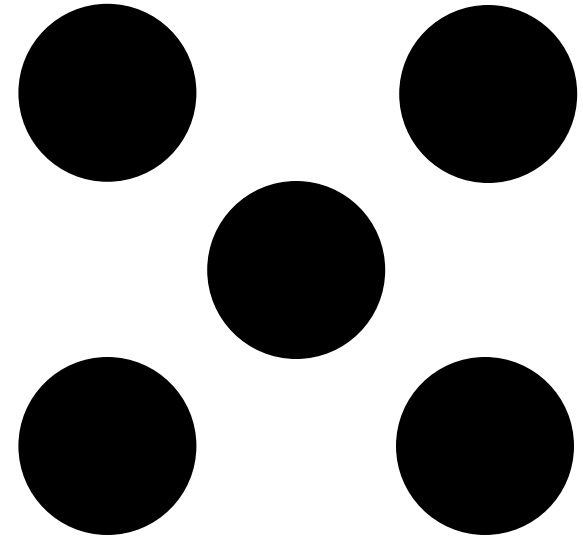
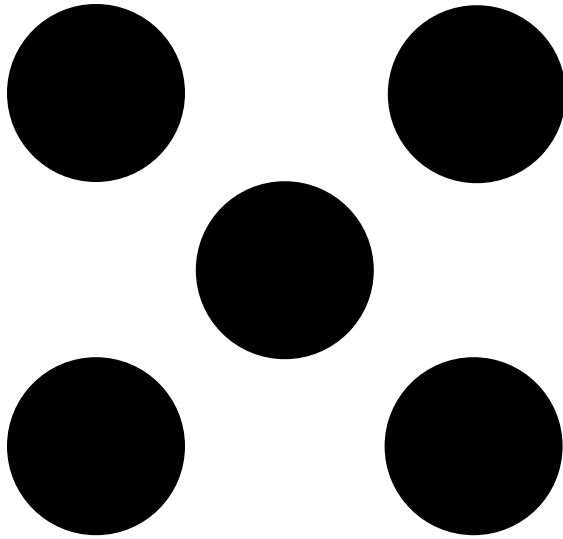


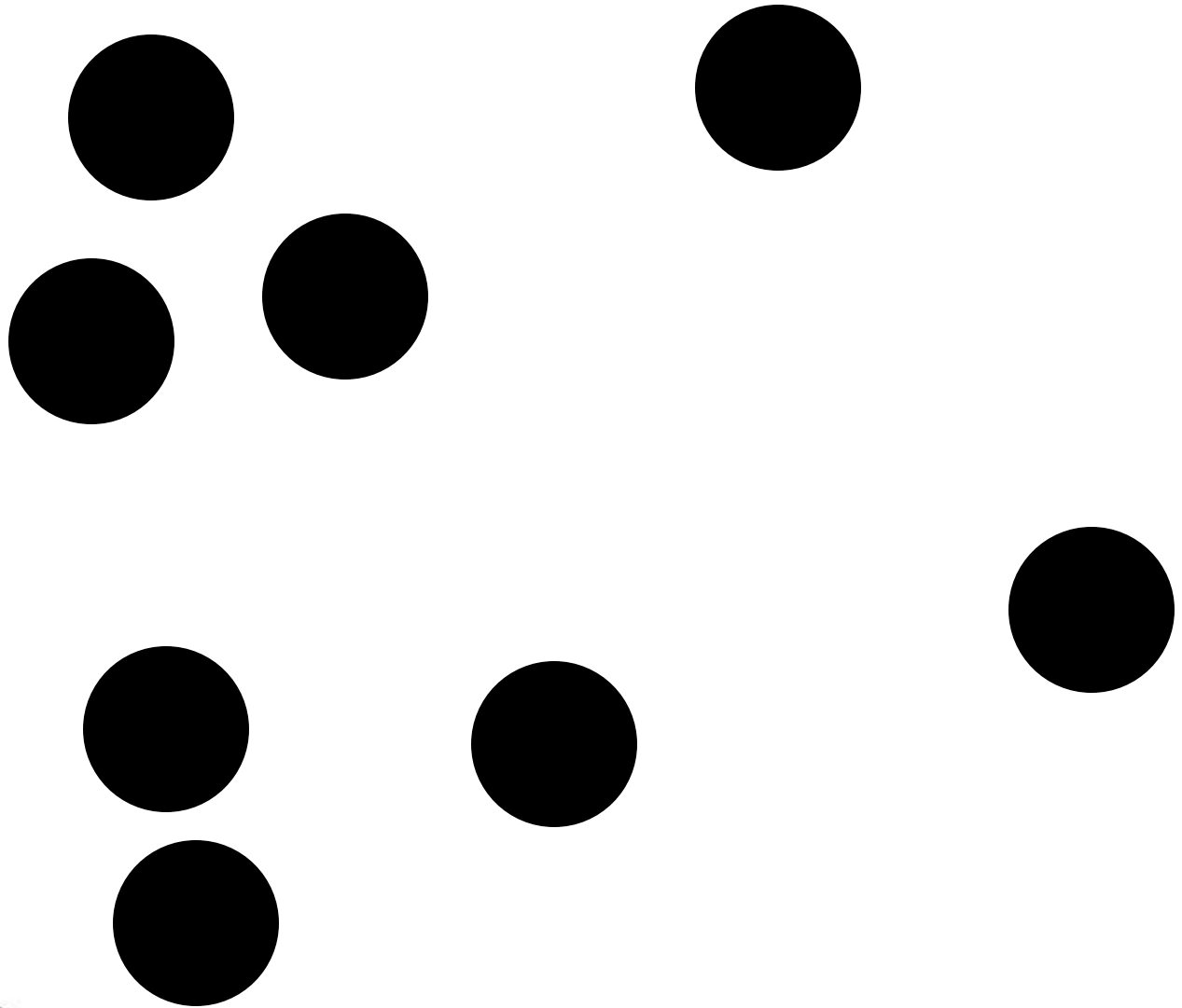
Perceptual Subitizing

- You perceive the three or four dots intuitively & simultaneously.
- You “just know.”
- Let’s try some more “quick looks” ...









Conceptual Subitizing

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

Video Analysis: Focus on the Child

- Let's watch a preschooler doing some “quick looks.”

A Big Idea

The **quantity** of a small collection
can be intuitively perceived
without counting.

Implications for Teaching & Learning

- Subitizing is foundational.
 - Subitizing relies on visual patterns.
 - Not all arrangements of a number are equally easy to “see.”
 - How is subitizing different than counting?
 - Label small sets with number, without enumerating.
 - How does subitizing support counting?
 - Authentic reasons to count small sets.
 - When counting, restate the last count word to emphasize cardinality: “1, 2, 3, ... 3 cups.”
 - Subitizing & counting build understanding of cardinality.
 - Expect children to subitize small sets; avoid “counting to be sure.”

Another *Big Idea*

**Quantity is an attribute
of a set of objects.**

A Big Idea:

Quantity is an **attribute** of a set of objects

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.

A Big Idea:

Quantity is an **attribute** of a set of objects.

A Collection Can Have Many Attributes

Consider this bunch of roses:

- Red color is an attribute.
- Sweet smell is an attribute.
- Quantity is another attribute: there are **THREE** roses in this bunch.

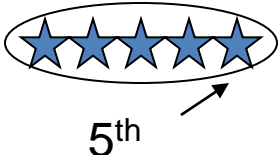



A Big Idea

Quantity is an **attribute** of a set of objects.

- We call this ***numerosity*** - the “threeness” of 3.
- Numerosity exists apart from number words and written symbols. Words and symbols vary from language to language - numerosity does not.
- Humans seem to be biologically programmed to automatically perceive the numerosity of small sets.

Big Ideas of Number Sense

Topic	Big Ideas	Examples
<p>Uses of Number</p> 	<ul style="list-style-type: none"> • Numbers are used many ways, some more mathematical than others. 	<ul style="list-style-type: none"> • <i>Tommy has 5 books.</i> (cardinal) • <i>Ava is fifth in line today.</i> (ordinal) • Numbers on basketball jerseys, home addresses, telephone numbers (nominal) • <i>Let's meet at 5 pm on December 5.</i> (referential)
<p>Numerosity</p> 	<ul style="list-style-type: none"> • Quantity is an attribute of a set of objects and we use numbers to name specific quantities. • The quantity of a small collection can be intuitively perceived without counting. 	<ul style="list-style-type: none"> • 5 mice and 5 elephants are alike in quantity, though different in other ways. • Children just “see” three objects and know it's 3.

How do children **develop the idea** of **quantity** as an attribute?

- Older infants often learn signs/words for “more” and “all gone” before other ideas.
- One-year-old can tell that a pile of 5 is more than a pile of 2, but does not know any number names.
- In 2nd half of 2nd year (18-24 mos), toddlers can “take one” or “give two,” but do not have words for 3 and bigger.
- Preschoolers are building a firm sense of the numerosity of 3, 4 & 5.

Implications for Teaching & Learning

- Children learn about quantity even without exact numbers.
 - “Which pile has more?”
 - “Put one napkin on each plate.”
- Smaller numbers are easier than larger.
 - With infants and toddlers, talk about “1” and “2” and “1 more” and “2 more”
 - With preschoolers, spend a lot of time exploring “3” and “4” and “5”
- Fingers are great tools for understanding small numbers, then building to 5 & 10.
- Children need repeated exposure to amounts in order to associate number name and quantity.
- Strong visual number sense supports flexibility & fluency in arithmetic.

Video Analysis: Kdg Dot Cards

- The teacher has carefully chosen what cards to use and in what order. What ideas is she trying to help the children discover?

Video Analysis: Kdg Dot Cards

- The teacher has carefully chosen what cards to use and in what order. What ideas is she trying to help the children discover?
- What kinds of experiences in preschool will be helpful to prepare children for this kind of kindergarten activity?

Routines and Activities that Build Visual Number Sense

- During clean-up and meal times, talk about sets of 1, 2 and 3.
- Finger-plays that show 1 to 5.
- Quick Look games using dots or fingers.
- Activities with dice or dominoes.

Turn and Talk with a Partner

What are some routines you have in your classroom that provide an opportunity for children to develop number sense?

Take-Away Messages

- Find opportunities to build visual number sense, pairing number words with visible sets of things
- Help children see that a “number” can be represented in many ways: words, fingers, dots, objects in a set
- Give children opportunities to count in useful and meaningful ways—not just rote counting
- Remember the practice standards: Be sure to let CHILDREN do the math!

THANKS FOR THE TERRIFIC
WORK YOU DO, AND ENJOY
THE CONFERENCE!

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