

Building Strong Number Sense

Kindergarten, Grade 1 & Grade 2

In the primary grades (K-2), students need to develop strong number sense through hands-on manipulation and exploration. Through opportunities that encourage the use of various **concrete objects**, students make sense of abstract number concepts--a critical skill for all children in all grade levels.

As Marilyn Burns, respected math educator and published author writes, "Having mastered arithmetic procedures is not a sufficient indicator that children truly understand the concepts that symbolic manipulations represent. It does not guarantee that they will be able to use those concepts to solve problems. Learning mathematics requires that children create and re-create mathematical relationships in their own minds... **Children need direct and concrete interaction with mathematical ideas. Continual interaction between a child's mind and concrete experiences with mathematics in the real world is necessary.**" (from *About Teaching Mathematics*, 2007)

The following excerpts are from the [*Progressions for the Common Core State Standards in Mathematics*](#).

Counting and Cardinality

This domain begins with early counting and identifying how many are in one group of objects. Addition, subtraction, multiplication, and division grow from these early roots. *These ideas need to be taught, in ways that are interesting and engaging to young students.*

Numbers and Operations in Base-Ten

Students' work in the base-ten system is intertwined with their work on counting and cardinality, and with the meanings and properties of addition, subtraction, multiplication, and division. Work in the base-ten system relies on these meanings and properties, but also contributes to deepening students' understanding of them.

Operations and Algebraic Thinking


Students develop meanings for addition and subtraction as they encounter problem situations in Kindergarten, and they extend these meanings as they encounter increasingly difficult problem situations in Grade 1. They represent these problems in increasingly sophisticated ways. And they learn and use increasingly sophisticated computation methods to find answers. In each grade, the situations, representations, and methods are calibrated to be coherent and to foster growth from one grade to the next.

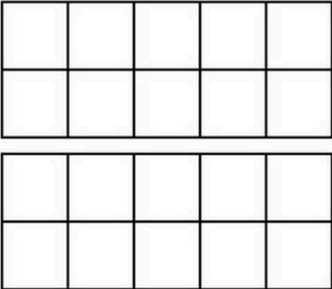
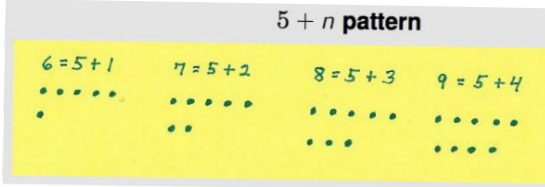
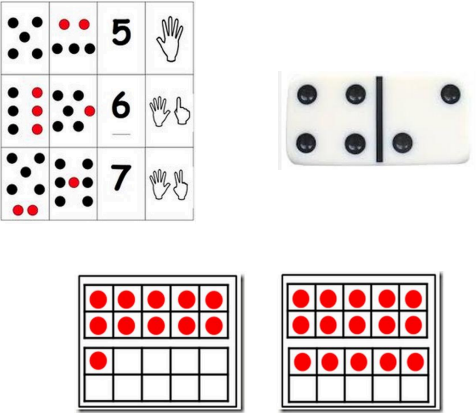
A Word on "Fluency"


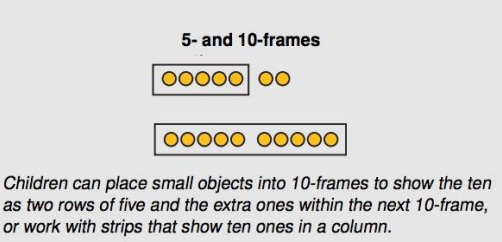


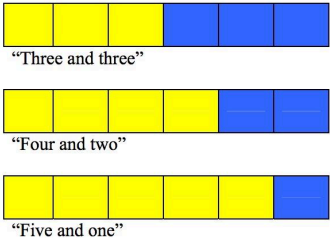
The word fluent is used in the Standards to mean "fast and accurate". Fluency in each grade involves a mixture of just knowing some answers, knowing some answers from patterns (e.g., "adding 0 yields the same number"), and knowing some answers from the use of strategies. It is important to push sensitively and encouragingly toward fluency of the designated numbers at each grade level, recognizing that fluency will be a mixture of these kinds of thinking which may differ across students.

Created by the Curriculum Department,
Bozeman School District



Grade & Concepts	Manipulatives to Use	Why and How?
<p>Kindergarten: Counting 1-20</p> <ul style="list-style-type: none"> - Count to 100 by ones and by tens. - One-to-one correspondence as they count. - Answer to the question “how many?” - <u>Fluently add and subtract within 5.</u> 	<p>Bears, Linking Cubes & Other Objects</p> 	<p>Kinders need to...</p> <ul style="list-style-type: none"> - count as many as 20 things arranged in a line, a rectangular array, or a circle; - count as many as 10 things in a scattered configuration; - be given a number from 1–20, and count out that many objects. And then we ask... “How many are there?” <p>Use these manipulatives with...</p> <ul style="list-style-type: none"> • Deck of cards, dice, dominoes, etc.—anything that produces a single digit • Spinners • Dot cards to match to numeral cards

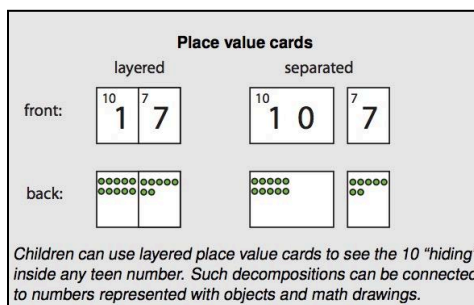
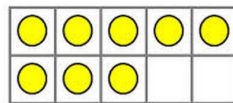
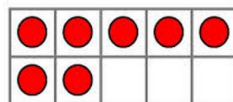
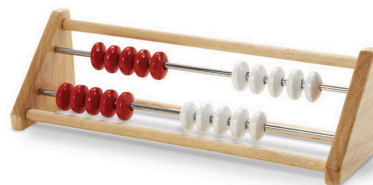
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<p>Kindergarten: Counting “One Larger” Understand that each successive number name refers to a quantity that is one larger.</p>	<p>Ten Frames, Cubes, etc.</p> <p style="text-align: center;">TEN FRAMES</p>  <p>Play doh, counters, bears, etc. → all good to use with 5- and 10-frames</p>	<p>Have students roll a die or flip a numeral card. Then have them build the number on a ten-frame. Have them continue to build numbers that are “one more” on the ten-frame. Kinders should also see the equations that match, as in the picture below.</p> 
<p>K, 1, 2: Subitizing Students come to quickly recognize the cardinalities of small groups without having to count the objects; they look at a pattern of dots or pictures and come to know the amount by the arrangement.</p>	<p>Dot Cards, Dominoes, Ten Frames</p> 	<p>There are lots of ways to incorporate quick subitizing games and engagers.</p> <p><u>Quick Images</u>: Briefly (1 – 2 seconds) show child a card with a pattern of dots on it (domino patterns, ten-frame patterns, dice patterns, etc. can be drawn on index cards). Ask child to tell you how many dots. If s/he isn’t sure, quickly flash the card again and have child draw the pattern that s/he remembers.</p> <p><u>Matching</u>: Match dot cards with numeral card and another picture card (similar to image to left).</p>

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<p>K, 1: Composing & Decomposing Compose and decompose numbers by using objects or drawings, and record each composition/decomposition with drawings and equations.</p>	<p>Unifix Cubes, Bears, Buttons, Pom Poms, Anything!</p>   	<p>Students need to have <u>many</u> opportunities to build numbers in various ways. In Kindergarten, students must build their understanding of what single digit even means. A “3” is a squiggly line until a child has many opportunities to see it, build it, and manipulate it.</p>  <p>Students do this by decomposing numbers in many ways. For example, here are three ways to build 6:</p> <p>$6 = 3 + 3$, $6 = 4 + 2$, $6 = 5 + 1$</p>  <p>K and 1 students should also match or write number sentences to match their representations.</p>

K, 1, 2: Compose & Decompose

- (K) Compose and decompose numbers 1 - 10 and from 11 to 19; numbers from 11 through 19, are ten ones and some more ones. By working with teen numbers in this way in Kindergarten, students gain a foundation for viewing 10 ones as a new unit called a ten in Grade 1.
- (Grade 1) Students take the important step of viewing ten ones as a unit called a “ten.” They need to understand that the two digits of a two-digit number represent amounts of tens and ones.
 - 10 can be thought of as a bundle of ten ones—called a “ten.”
 - The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
 - The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).
- (Grade 1) Students compare two two-digit numbers, using the symbols $>$, $<$ and $=$.

Rekenreks, Unifix Cubes, Five and Ten-Frames, Place Value Cards



Many manipulatives allow students to compose (build) and decompose (break into parts) numbers. A few examples are provided on the left.

The Rekenrek is a great tool. It combines features of the number line, counters, and base-10 models. It is comprised of two strings of ten beads each, strategically broken into two groups: five red beads, and five white beads. The rekenrek encourages children to think in groups of five and ten. (If your school doesn't have rekenreks, there are lots of DIY tutorials showing how to make these. Here's [one](#).) For activity ideas, click [HERE](#) for an amazing resource!

As students explore the “teen” numbers, children need to understand that the 1 in 16 has a value of 10. The tools on the left offer lots of options. Another tool to use is “place value cards;” students build the number by layering the cards.