

MATHEMATICALLY POWERFUL STUDENTS KNOW NUMBERS AND RECOGNIZE RELATIONSHIPS. DO YOURS?

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CCSS- Kindergarten

Students

- choose, combine, and apply effective strategies for answering quantitative questions
- quickly recognize the cardinalities of small sets of objects
- count and produce sets of given sizes
- count the number of objects in combined sets, or
- count the number of objects that remain in a set after some are taken away
- find the number that makes 10 when added to the given number (1-9, using objects, drawings, or equations)
- fluently add and subtract within 5

CCSS- First Grade

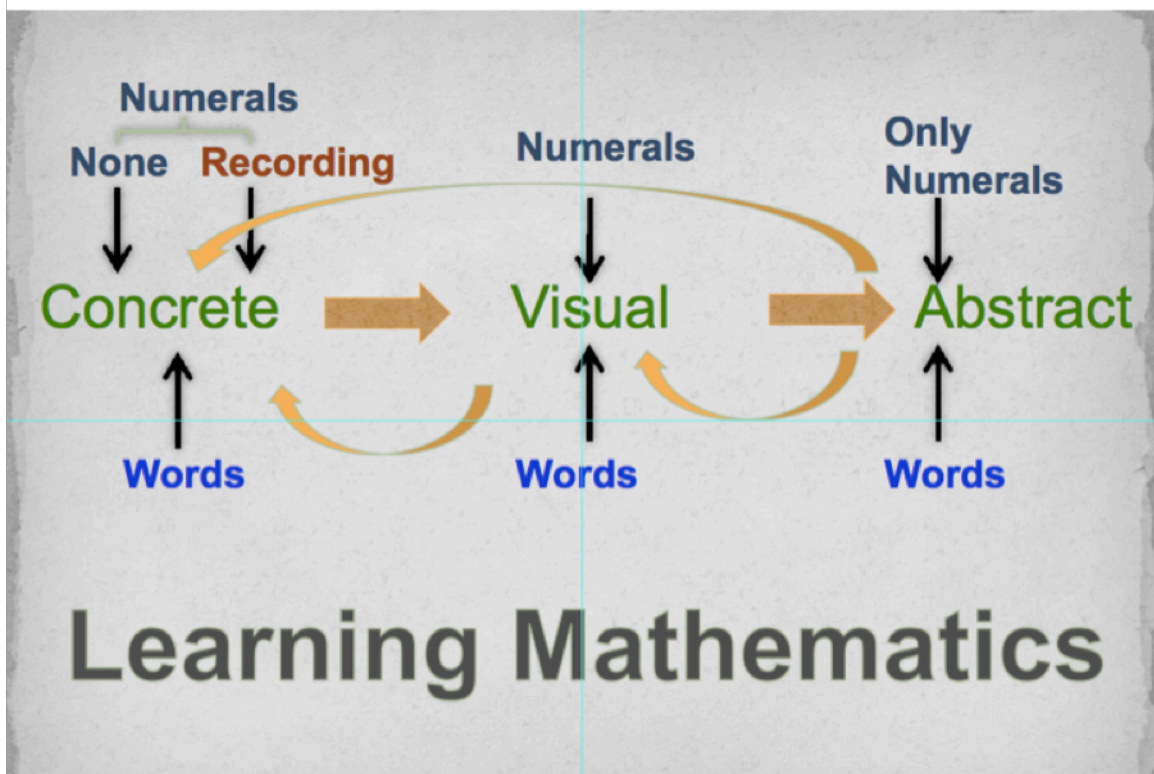
Students

- develop strategies for adding and subtracting whole numbers based on their prior work with small numbers
- use a variety of models, including discrete objects and length-based models
- understand connections between counting and addition and subtraction
- use increasingly sophisticated strategies based on properties (e.g., "making tens") to solve addition and subtraction problems within 20
- develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10

CCSS- Second Grade

Students

- develop fluency with addition and subtraction within 100
- develop, discuss, and use efficient, accurate, and generalizable methods to solve problems that require computation of sums and differences of whole numbers
- use their understanding of place value and the properties of operations
- select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.



Types of Word Problems

Kinder

Table 2: Addition and subtraction situations by grade level.

	Result Unknown	Change Unknown	Start Unknown
Put Together / Take Apart	<p>A bunnies sat on the grass. B more bunnies hopped there. How many bunnies are on the grass now?</p> $A + B = \square$	<p>A bunnies were sitting on the grass. Some more bunnies hopped there. Then there were C bunnies. How many bunnies hopped over to the first A bunnies?</p> $A + \square = C$	<p>Some bunnies were sitting on the grass. B more bunnies hopped there. Then there were C bunnies. How many bunnies were on the grass before?</p> $\square + B = C$
	<p>C apples were on the table. I ate B apples. How many apples are on the table now?</p> $C - B = \square$	<p>C apples were on the table. I ate some apples. Then there were A apples. How many apples did I eat?</p> $C - \square = A$	<p>Some apples were on the table. I ate B apples. Then there were A apples. How many apples were on the table before?</p> $\square - B = A$
Compare	<p>A red apples and B green apples are on the table. How many apples are on the table?</p> $A + B = \square$	<p>Grandma has C flowers. How many red ones put in her red vase and how many in her blue vase?</p> $C = \square + \square$	<p>C apples are on the table. A are red and the rest are green. How many apples are green?</p> $A + \square = C$ $C - A = \square$
	<p>"How many more?" version. Lucy has A apples. Julie has C apples. How many more apples does Julie have than Lucy?</p> $A + \square = C$ $C - A = \square$	<p>"More" version suggests operation. Julie has B more apples than Lucy. Lucy has A apples. How many apples does Julie have?</p> $A + B = \square$	<p>"Fewer" version suggests operation. Lucy has B fewer apples than Julie. Julie has C apples. How many apples does Lucy have?</p> $C - B = \square$ $\square + B = C$

Dark shading indicates the four kindergarten problem subtypes. Grade 1 and 2 students work with all subtypes and variants. Unshaded (white) problems are the four difficult subtypes or variants that students should work with in Grade 1 but need not master until Grade 2. Adapted from CCGO, p. 86, which is based on Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity, National Research Council, 2008, pp. 32-33.

¹ This can be used to show all decompositions of a given number, especially important for numbers within 10. Equations with totals on the left help children understand that = does not always mean "makes" or "results in" but always means "is the same number as." Such problems are not a problem subtype with one unknown, as is the Addend Unknown subtype to the right. These problems are a productive variation with two unknowns that give experience with finding all of the decompositions of a number and reflecting on the patterns involved.

² Either addend can be unknown, both variations should be included.

url: 5/29/2011, comment of commoncoretools.wordpress.com.

Mastered in 2nd

Counting Collections

Count, count and count some more

Children need lots of experience with counting to learn which number comes next, how this number sequence is related to the objects in front of them, and how to keep track of which ones have been counted and which still need to be counted (Fuson 1988).

Experience with counting provides a solid foundation for future experience with addition, subtraction, multiplication, and division (National Research Council 2001).

Schwerdtfeger, J.K and A. Chan (2007, March) Counting collections. *Teaching Children Mathematics*.

Counting Collections

Count, count and count some more

Kinder – cadence, number names, one more concept, last name is total, keep track of tracking, teens as 10 ones plus some more, one-to-one correspondence

First – learn one more and ten more, count different units (ones and tens), teens (1 ten plus more), grouping to count

Second – count different units (1s, 10s, 100s), attend to place value

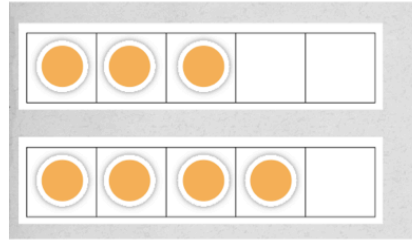
There is more to subitizing!

Using 2 Five-Frames

Perceptual → **Conceptual**

Instantly seeing how many

Seeing a composite of parts



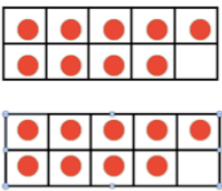
$$7 = \underline{\quad}$$

$$\begin{aligned} 3 + 4 &= 5 + 2 \\ 3 + 4 &= 3 + 3 + 1 \\ 3 + 4 &= 6 + 1 \end{aligned}$$

Clements, Doug (1999, March). Subitizing: What it is. Why teach it. *Teaching Children Mathematics*

1.OA.7 Understand the meaning of the equal sign . . .

Jae had 9 cards. Then his friend, Sara, gave him 9 more cards. How many cards does he have now?



$9 + 9$ is almost $10 + 10$. $10 + 10 = 20$ but since it really is suppose to be $9 + 9$, I subtracted 2 from 20 and got 18.

Resources

Schwerdtfeger, J.K and A. Chan (2007, March) Counting collections. *Teaching Children Mathematics*.

Clements, Doug (1999, March). Subitizing: What it is. Why teach it. *Teaching Children Mathematics*

<http://illuminations.nctm.org>

K-2 activities using 5 and 10 frames

Ten Frame Train by Didax

Book: It Makes Sense: Using Ten-Frames to Build Number Sense