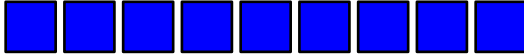


The Importance of Counting and Place Value

info@RightStartMath.com

Counting

- Most people think of counting as the foundation of math.
- So we have our children memorize a long string of 100 counting words.
- Then we teach one-to-one correspondence.

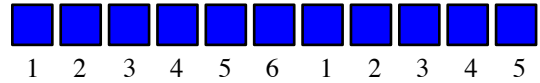


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Counting

- After counting, the child must be ready to answer “how many” by saying the last number.
- To add, they count each number then count all.

$$6 + 5$$

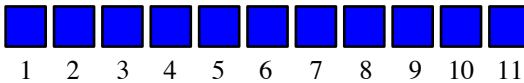


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Counting

- After counting, the child must be ready to answer “how many” by saying the last number.
- To add, they count each number then count all.

$$6 + 5$$



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Counting

Because we're so familiar with 1, 2, 3,
we'll use letters.

A = 1
B = 2
C = 3
D = 4
E = 5, and so forth

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Counting

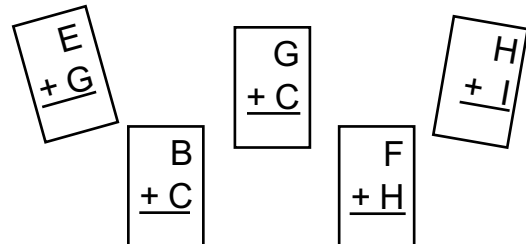
$$G + H = \underline{\quad O \quad}$$



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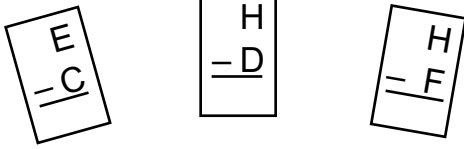
Counting

Now Memorize the Facts!!



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Counting



Now try subtraction by
“taking away.”

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Flashcards

- Don’t work for one out of seven children.
- Especially for those with learning challenges.
- Memorized results are short-lived.
- Memorized results need frequent review.
- Flash cards are often the root cause for disliking math and failure to thrive in math.

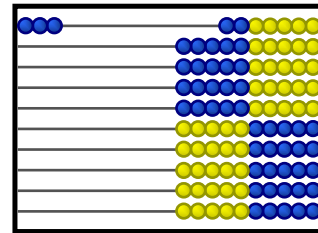
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Subitizing

- Subitizing is quick recognition of quantity without counting.
- Subitizing, unlike counting, allows the child to simultaneously see the whole and the individual parts.

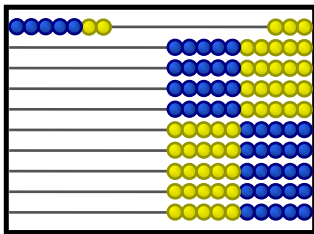
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Subitizing



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Subitizing



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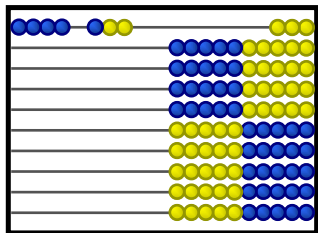
Subitizing

- Numbers 1 to 10 need to be grouped in fives.
- Important part of math is visualizing – seeing it in your mind.
- Brains need grouping to “see” it.
- What can be subitized can be visualized.

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Adding

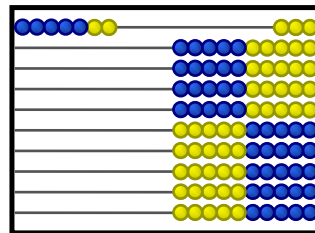
$$4 + 3 = \underline{\quad}$$



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Adding

$$4 + 3 = \underline{7}$$



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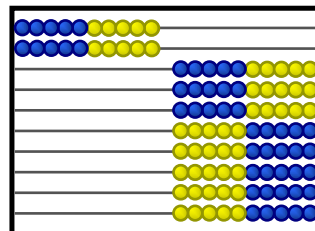
Subitizing

- What about numbers more than 10?
- Subitizing beyond 10 is done by grouping in tens.

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Conceptual Subitizing

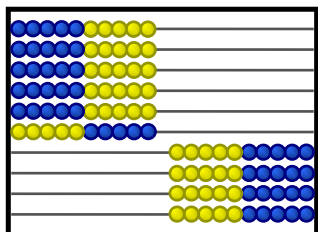
2-ten



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Conceptual Subitizing

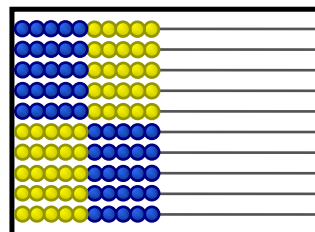
6-ten



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Conceptual Subitizing

10-ten



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Place Value

- When counting, place value is a burden that often gets ignored.
- Yet, it is the very foundation of arithmetic.
- It must be taught, not left for discovery.
- It is critical for understanding algorithms.
- Children need the big picture, not tiny snapshots.

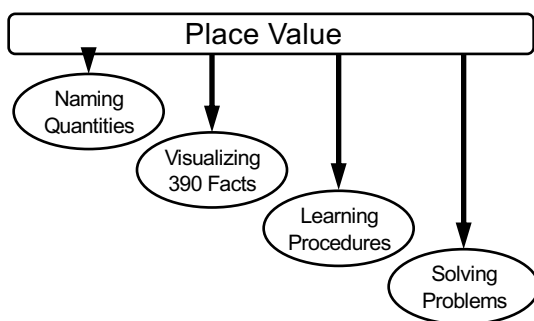
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Place Value

- In *Treviso Arithmetic of 1478*, the world's first printed arithmetic book, the author states there are five fundamental operations in arithmetic:
 - Numeration (place value up to millions)
 - Addition
 - Subtraction
 - Multiplication
 - Division

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Place Value in Its Proper Place



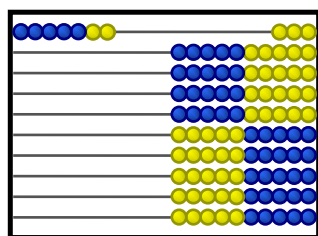
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Teaching Place Value

- Place value, not counting, is the key to understanding numbers beyond ten.
- Place value is best learned by:
 - Subitizing quantities 1–10,
 - Initially using transparent number naming,
 - Composing numbers with place-value cards,
 - Mastering facts with base-ten strategies,
 - Trading with four-digit numbers.

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Subitizing Quantities



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Transparent Number Naming

- Asian children have no trouble learning place value because their languages are transparent in number naming.
- Their languages are completely “ten-based.”
- Whereas English teen numbers are reversed and the word for ten is “teen.”
- Then, another word for ten is “ty,” as in forty.
- Very confusing!

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Transparent Number Naming

11 = ten 1	20 = 2-ten
12 = ten 2	21 = 2-ten 1
13 = ten 3	22 = 2-ten 2
14 = ten 4	23 = 2-ten 3
....
19 = ten 9
	99 = 9-ten 9

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Transparent Number Naming

137 = 1 hundred 3-ten 7
or
137 = 1 hundred and 3-ten 7

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Transparent Number Naming

- Just as reciting the alphabet doesn't teach reading, counting doesn't teach arithmetic.
- Just as we first teach the sound of the letters, we must first teach the transparent name of the quantity.

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Transparent Number Naming

- Only 11 words are needed to count to 100 using transparent number naming, 28 in English.
- Asian children learn mathematics using transparent number naming.
- They understand place value in first grade; only half of U.S. children understand place value at the end of fourth grade.
- Mathematics is the science of patterns. The patterned transparent number naming greatly helps children learn number sense.

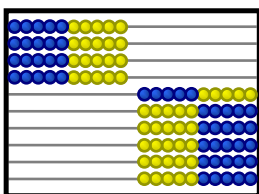
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Transparent Number Naming

Transition to regular names

4-ten = forty

The "ty"
means tens.

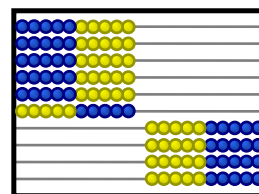


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Transparent Number Naming

Transition to regular names

6-ten = sixty



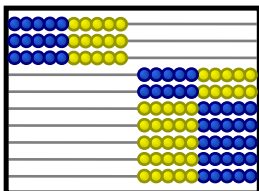
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Transparent Number Naming

Transition to regular names

3-ten = thirty

“Thir” also
used in 1/3,
13 and 30.



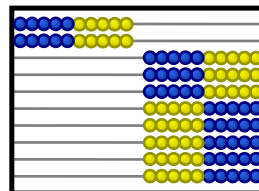
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Transparent Number Naming

Transition to regular names

2-ten = twenty

Two used to be
pronounced
“twoo.”



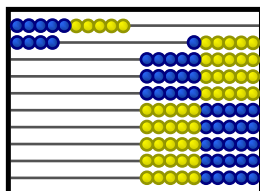
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Transparent Number Naming

Transition to regular names

ten 4 → teen 4 → fourteen

Prefix *-teen*
means ten.

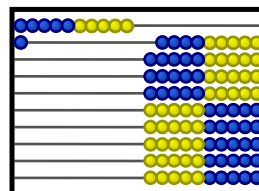


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Transparent Number Naming

Transition to regular names

a one left → a left-one → eleven



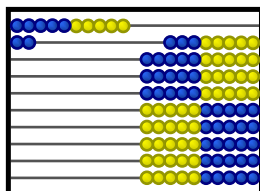
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Transparent Number Naming

Transition to regular names

two left → twelve

Two said
as “twoo.”

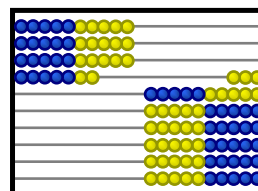


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Composing Numbers

3-ten 7

30
7

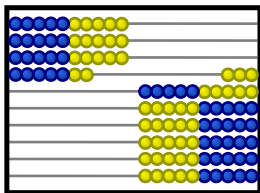


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Composing Numbers

3-ten 7

37



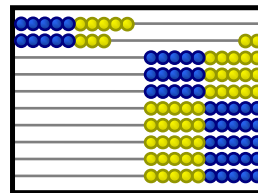
Note the congruence in the way we say the number, represent the number, and write the number.

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Composing Numbers

1-ten 8

108



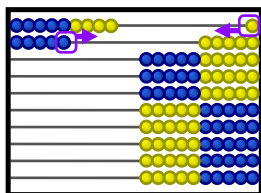
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Fact Strategies

Complete the Ten

$$9 + 5 = \underline{\quad}$$

Take 1 from the 5
and give it to the 9.



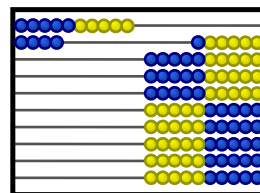
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Fact Strategies

Complete the Ten

$$9 + 5 = \underline{14}$$

Take 1 from the 5
and give it to the 9.



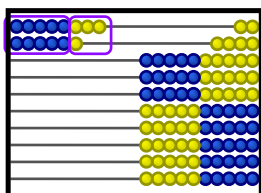
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Fact Strategies

Two Fives

$$8 + 6 =$$

$$10 + 4 = 14$$



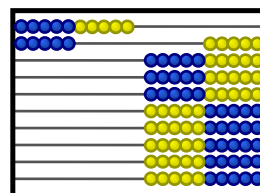
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Fact Strategies

Subtracting Part from Ten

$$15 - 9 = \underline{\quad}$$

Subtract 5 from 5
and 4 from 10.



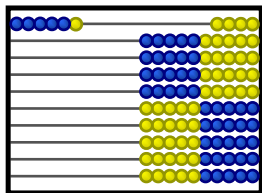
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Fact Strategies

Subtracting Part from Ten

$$15 - 9 = \underline{6}$$

Subtract 5 from 5
and 4 from 10.



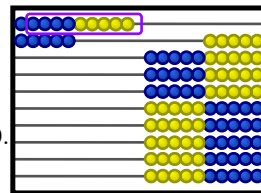
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Fact Strategies

Subtracting All from 10

$$15 - 9 = \underline{\quad}$$

Subtract 9 from 10.



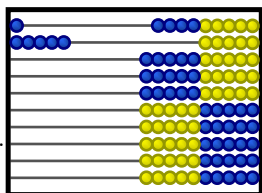
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Fact Strategies

Subtracting All from 10

$$15 - 9 = \underline{6}$$

Subtract 9 from 10.



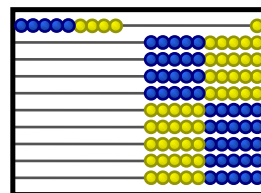
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Fact Strategies

Going Up

$$15 - 9 =$$

Start with 9;
go up to 15.



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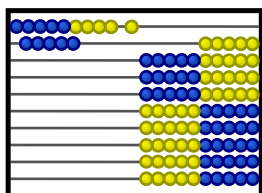
Fact Strategies

Going Up

$$15 - 9 =$$

$$1 + 5 = 6$$

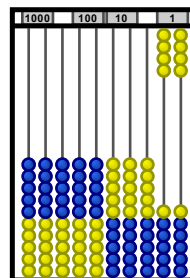
Start with 9;
go up to 15.



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Trading

Adding



$$\begin{array}{r} 8 \\ + 6 \\ \hline \end{array}$$

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Trading

Adding

$$\begin{array}{r} 8 \\ + 6 \\ \hline \end{array}$$

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Trading

Adding

$$\begin{array}{r} 8 \\ + 6 \\ \hline 14 \end{array}$$

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Trading

Adding

$$\begin{array}{r} 8 \\ + 6 \\ \hline 14 \end{array}$$

Too many ones; trade 10 ones for 1 ten.

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Trading

Adding

$$\begin{array}{r} 8 \\ + 6 \\ \hline 14 \end{array}$$

Same answer before and after trading.

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Trading

Bead Trading activity

Object: To reach 1000 by adding numbers on the cards.

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Trading

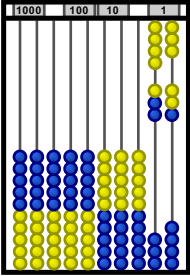
Bead Trading activity

7

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Trading

Bead Trading activity

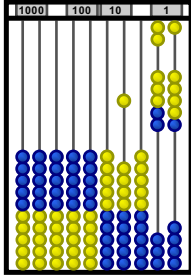


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Trading

Bead Trading activity



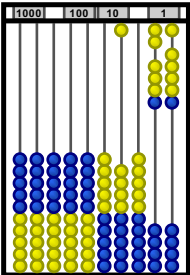
6

Trade 10 ones for 1 ten.

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Trading

Bead Trading activity



9

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Trading

- In the Bead Trading activity, trading
 - 10 ones for 1 ten occurs frequently;
 - 10 tens for 1 hundred, less often;
 - 10 hundreds for 1 thousand, rarely.
- Bead trading helps the child experience the greater value of each column from left to right.
- To detect a pattern, there must be at least three examples in the sequence. To experience place value as a pattern, the thousands are needed.

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Place Value

- Place value is a wonderful gift.
- Allows us to neatly package our numbers.
- Provides a pattern in numbers.
- Our brains look for patterns!
- Place value with transparent number naming helps the child work with numbers efficiently.

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Conclusion

If a child can't learn the way we teach,
maybe we should teach the way they learn.

– Ignacio Estrada,
Gordon and Betty Moore Foundation

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