

Pre Number and Number Concepts for the Young Child

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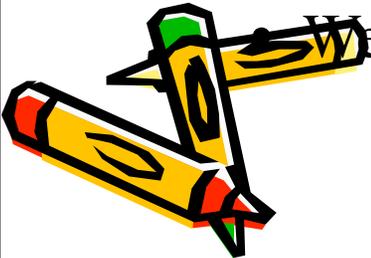
**Co-authors of DMA (Developmental
Math Assessment)**



Why is Early Numeracy So Important?

- Helping young children develop Number Sense lays a critical foundation for later success in mathematics.
- Early learning in mathematics is as vital to a student's mathematical success as early literacy involvement is to a student's success in reading and writing.
- Children enter school with significant differences in their knowledge of early number concepts.
- There can be as much as a three year gap when children enter kindergarten.

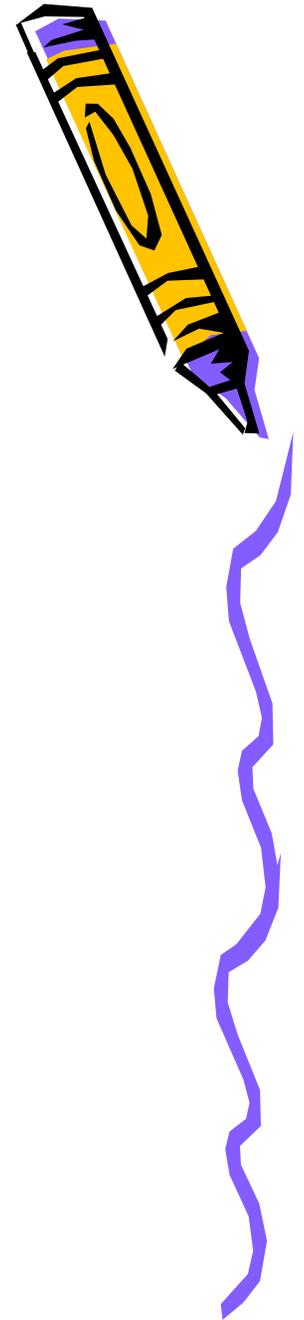
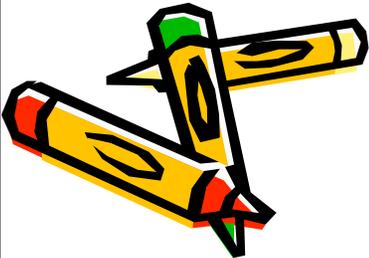
We usually put all children in the same program.



What is Number Sense?

Number sense is sometimes defined as having good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms.

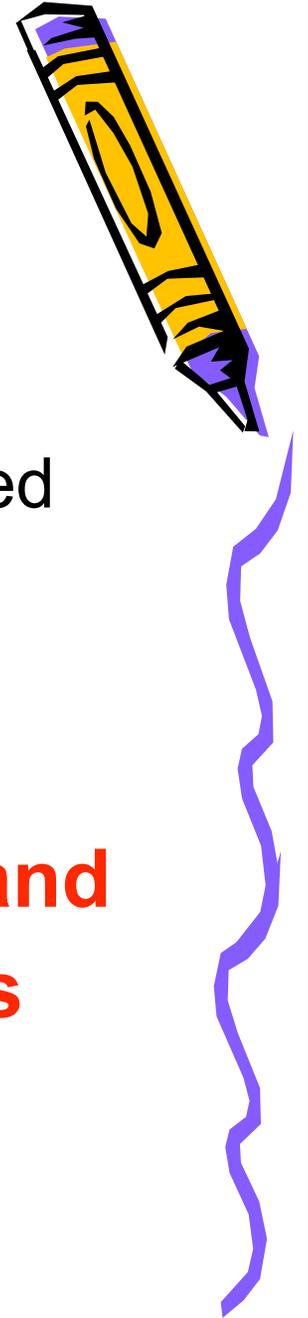
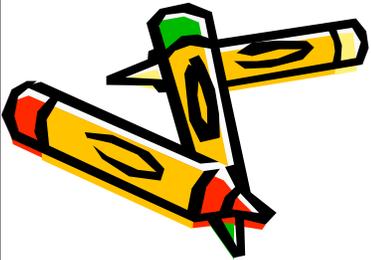
(Howden, 1989)



Questions To Be Asked

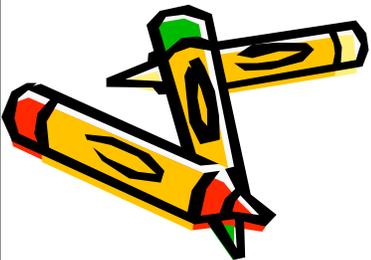
1. What are the essential pre-number and early number concepts?
2. How will teachers know if children have learned the concepts?
3. What will teachers do if students have not developed the concepts?

- **The essential pre-number and early number concepts**
- **Assessment**
- **Activities**



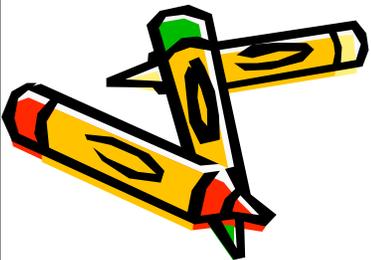
The Essential Pre-number Concepts

- Matching
- Sorting
- Comparing
- Ordering
- Subitizing



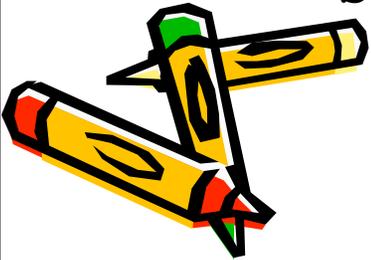
SAME

- Before a child begins to match, the child needs to know how to determine when items are “the same”.
- Hold up an item and have the child find one that is the same.



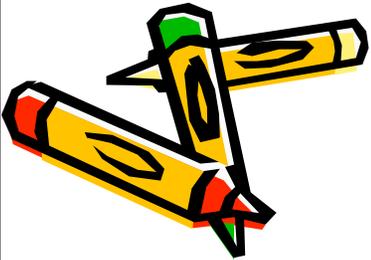
MATCHING

- Matching leads to understanding the concept of one-to-one correspondence. When a child passes out cookies, each child in the room gets one cookie. Maybe there are just the right amount of cookies or maybe there are extra cookies.
- Matching forms the basis for our number system. When a child can create "the same", it then becomes possible to match two sets. This becomes a prerequisite skill for the more difficult tasks of conservation



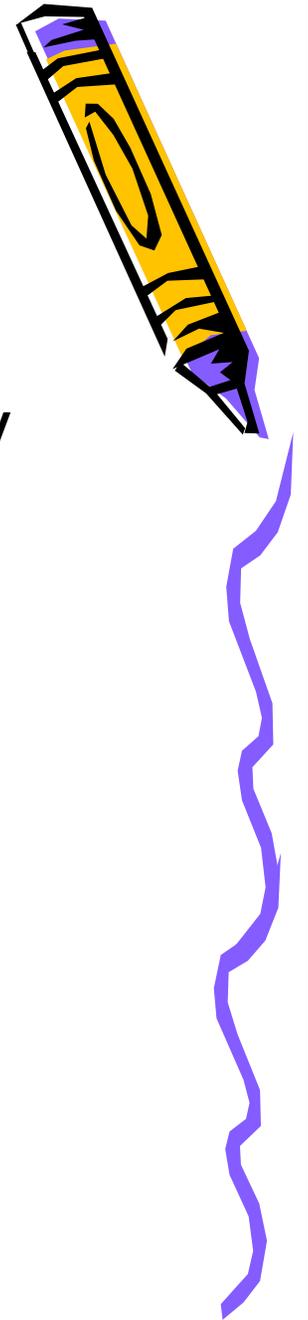
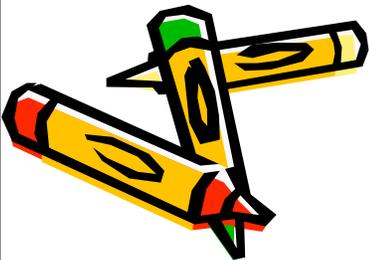
SORTING

- Children need to look at the characteristics of different items and find characteristics that are the same.
- Young children usually begin sorting by color before sorting by other attributes.



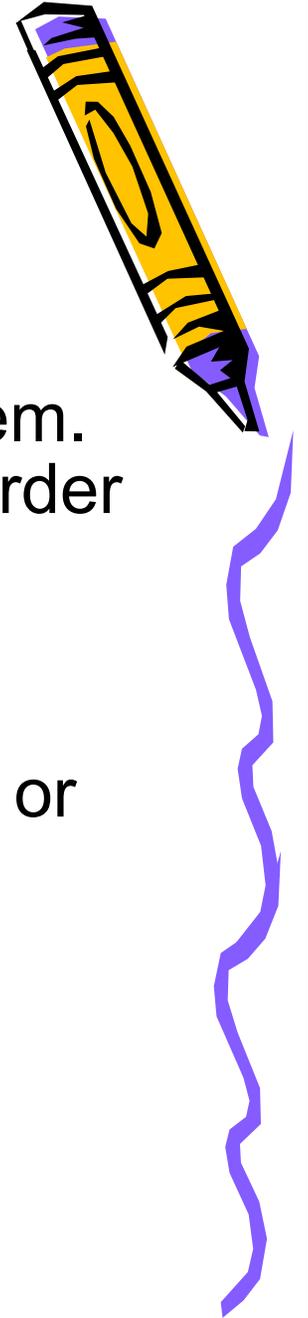
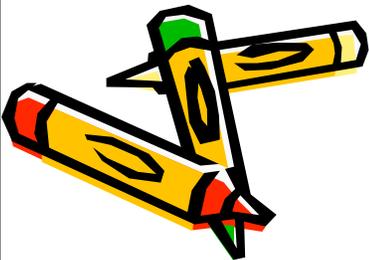
Comparing

- Children look at items and compare by understanding difference.
- big/little, hot/cold, smooth/rough, tall/short, heavy/light
- At the preschool level children should make comparisons of more, less and same by making visual comparisons.



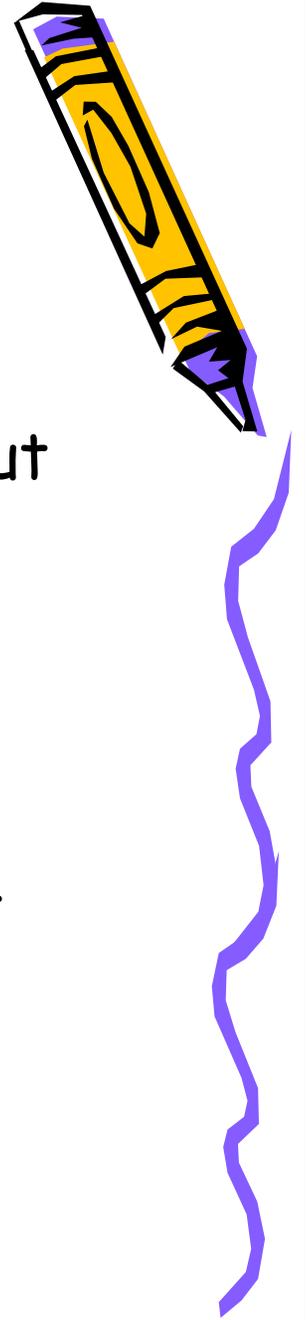
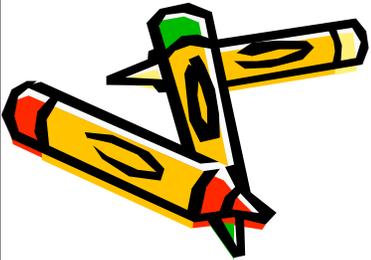
ORDERING

- Ordering is foundational to our number system. Children have to be able to put items in an order so they are counted once and only once.
- Putting items in order is a prerequisite to ordering numbers.
- Seriation is ordering objects by size, length, or height.
- When giving a child directions use ordinal words (first, next, last)



Subitizing

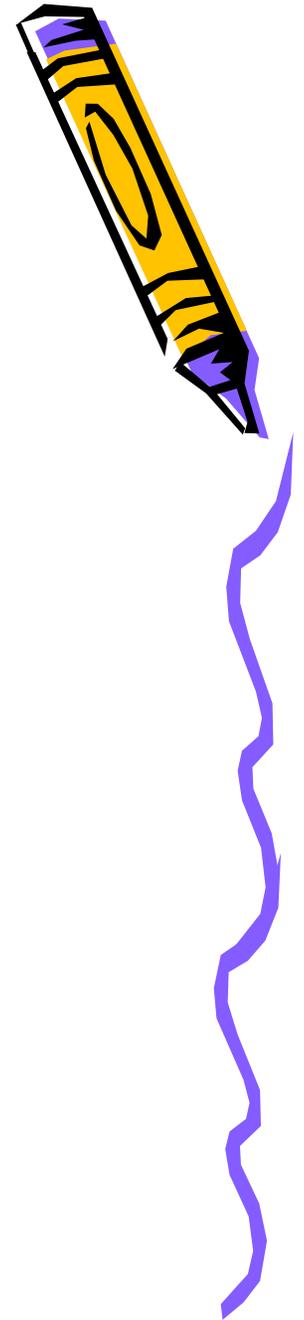
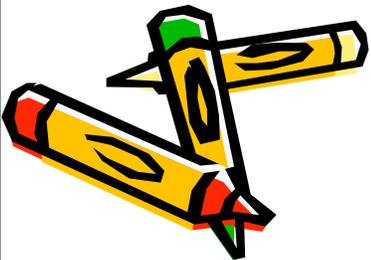
- Instant recognition of a number pattern without counting is the definition of subitizing. The pattern can be reconstructed without knowing the amount. Subitizing helps the children see small collections as one unit. This provides an early perceptual basis for number, but it is not yet "number knowledge".



Subitizing

- • **Finger Patterns**
- • **Dot Patterns**
- • **Domino Patterns**

To 6



Number Concepts

1

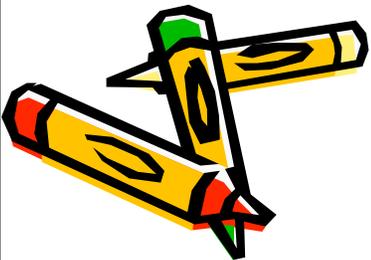
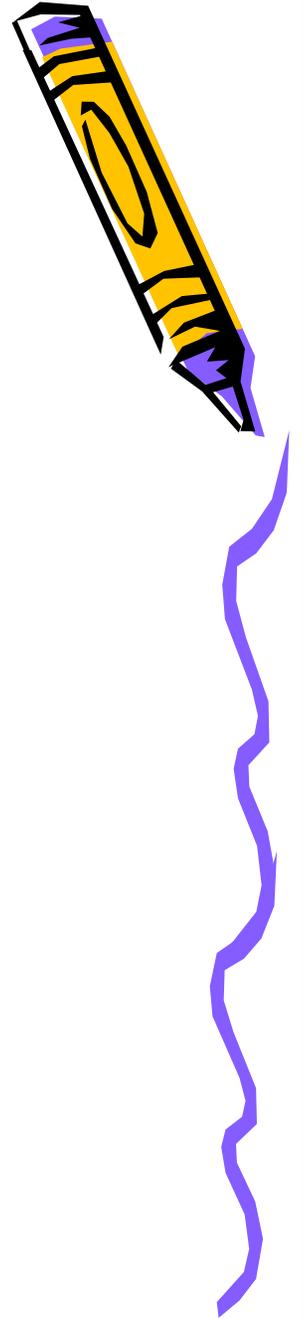
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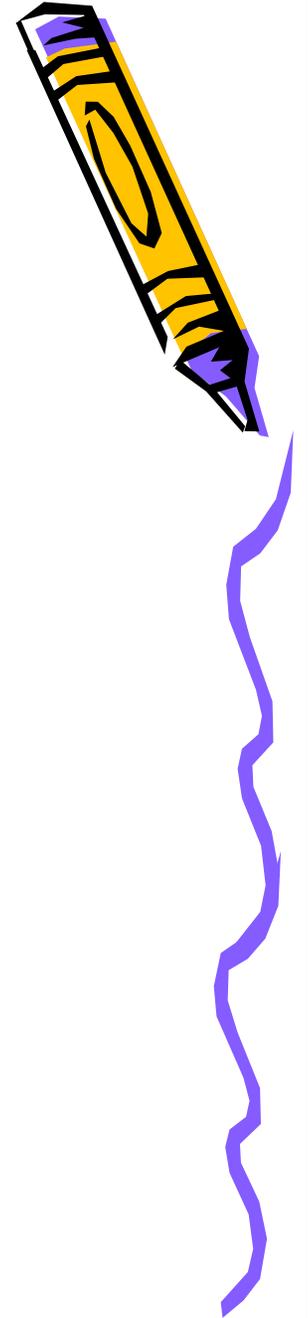
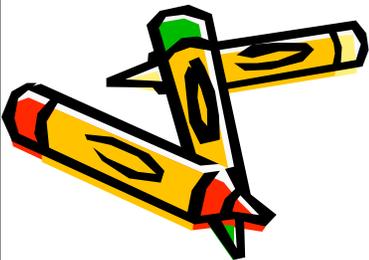
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- **Words**
- **Symbols**
- **Quantity**



Counting Patterns

- Know single digit sequence 1 to 9
- Transitions are signaled by a 9
- Transition terms for the new series (29 SIGNALS 30)
- Rules for generating the new series
- Exceptions to the rules (11, 12, teens)



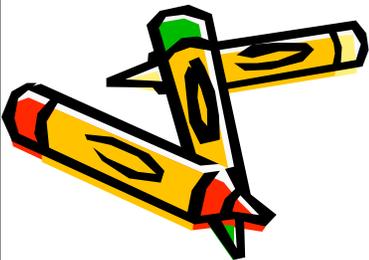
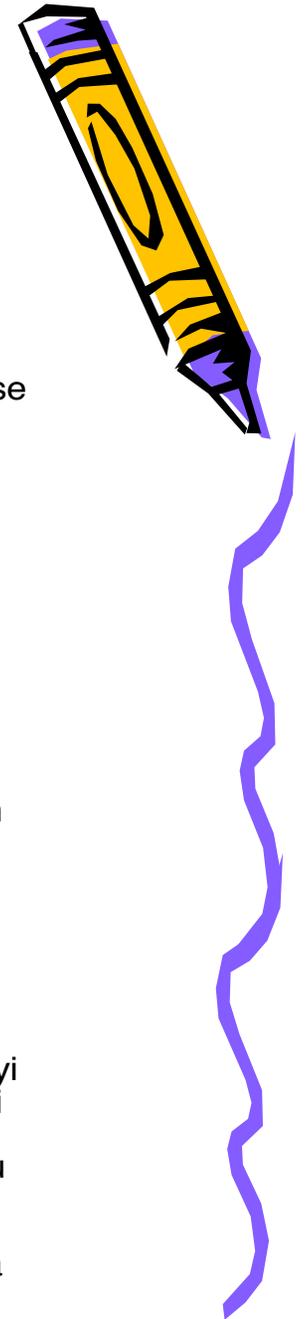
Chinese Perspective

- The highly regular nature of the Chinese counting sequence no doubt helps to account for the fact that Chinese children have significantly less difficulty learning to count than do U.S. children.

(Miller and Stigler, 1987)

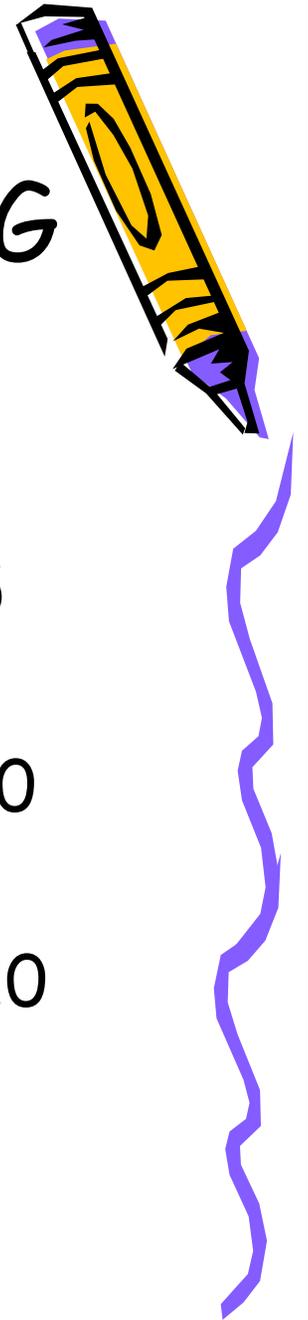
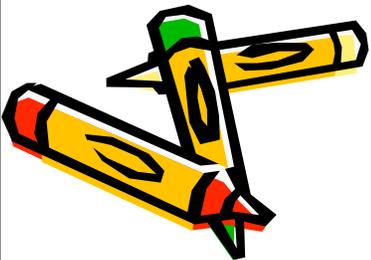
Verbal Counting Sequence

Numeral	English	Chinese
1	one	yi
2	two	er
3	three	san
4	four	si
5	five	wu
6	six	liu
7	seven	qi
8	eight	ba
9	nine	jiu
10	ten	shi
11	eleven	shi-yi
12	twelve	shi-er
13	thirteen	shi-san
14	fourteen	shi-si
15	fifteen	shi-wu
16	sixteen	shi-liu
17	seventeen	shi-qi
18	eighteen	shi-ba
19	nineteen	shi-jiu
20	twenty	er-shi
21	twenty-one	er-shi-yi
30	thirty	san-shi
40	forty	san-si
50	fifty	san-wu
60	sixty	san-liu
70	seventy	san-qi
80	eighty	san-ba
90	ninety	san-jui



BENCHMARKS FOR COUNTING

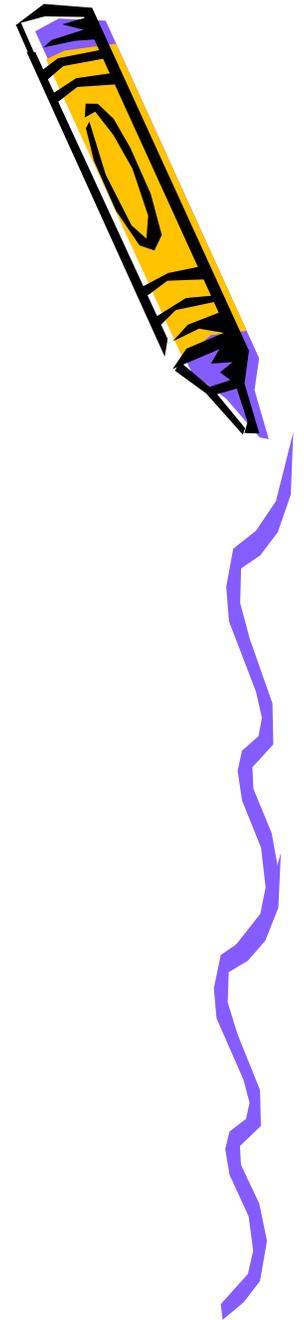
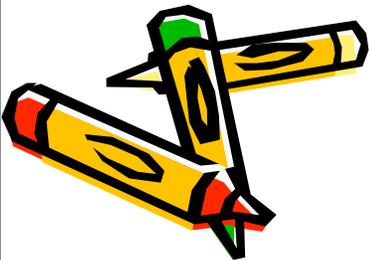
- | | | |
|----------------|-------|--------------|
| • Ages 2 and 3 | 1-3 | N/A |
| • Age 4 | 1-10 | Back from 5 |
| • Age 5 | 1-20 | Back from 10 |
| • Age 6 | 1-100 | Back from 20 |



Counting Objects in a Set

To enumerate sets of objects correctly a child must know:

- The number-word sequence
- That each object in a set is labeled with one counting word
- How to keep track of counted and uncounted objects so that each object is counted once and only once
- When counting out a smaller set from a larger set when to stop the count

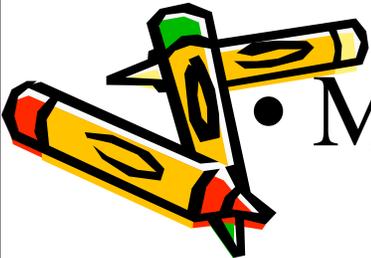


SYMBOLS

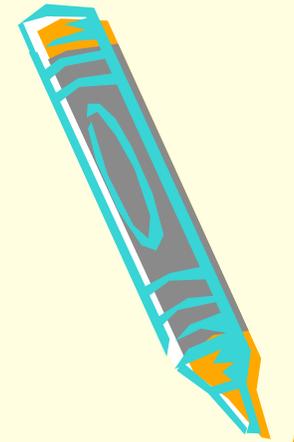
- BE ABLE TO BOTH RECOGNIZE AND CONSTRUCT
- Distinguish among symbols
- Construct a mental image
- Look for relationships

(2, 5 and 6, 9)

- Motor Plan



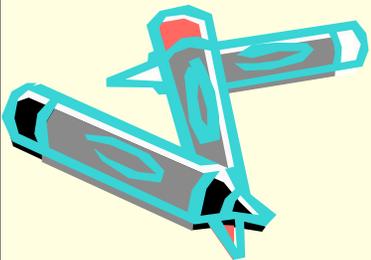
Word



Relationships

Quantity

Symbol

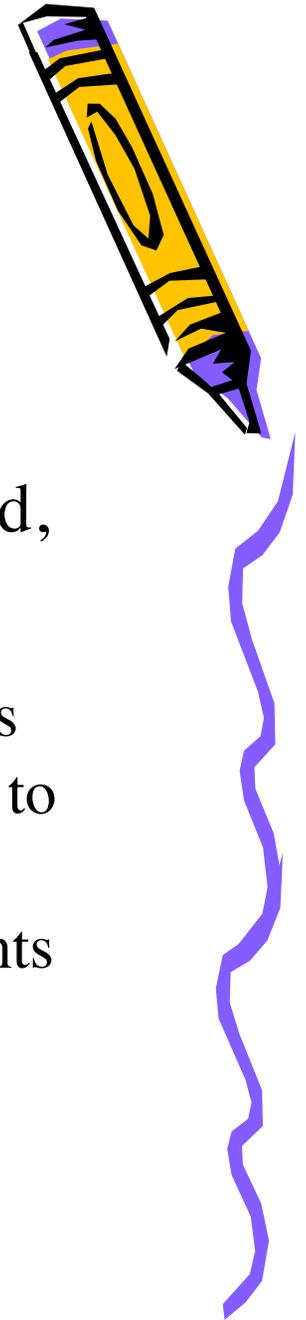
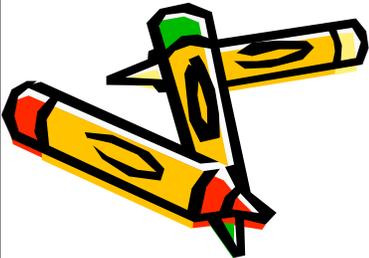


RELATIONSHIPS

Typically math programs move to addition and subtraction after children have had work with word, quantity and symbol.

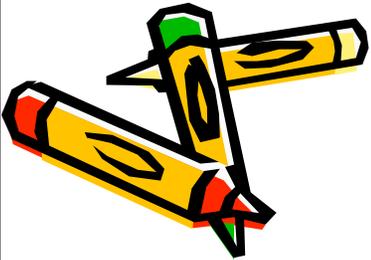
This leads to rote memory and finger counting. Students need to develop the following relationships which leads to the development of number sense.

Taking time to build numerical relationships with students helps them develop a flexible understanding of how our number system works.



Comparisons

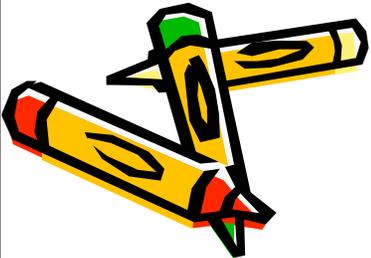
- Comparisons can be made to determine more than, bigger than, greater than, less than, smaller than, fewer than, or the same as. Using comparison terms like these is important when children are looking for a relationship between two or more quantities. To determine more/less/same comparisons, children initially need to construct and compare sets of concrete objects.



1 or 2 More and Less

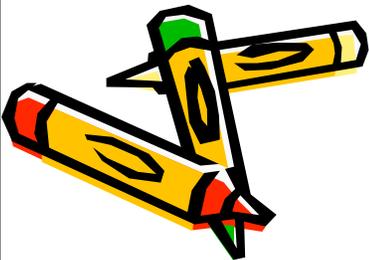


- Students should be able to do all three of the following and see the relationship among the three concepts:
 - Say the number after and the number before when given a number
 - Count on from a given number and count back from a given number
 - State the number that is one or two more than and one or two less than a given number
- These concepts give children strategies for basic facts when adding one or two onto a number or subtracting one or two from a number. Not including 0 as an addend, students would have a strategy for 32 of the 100 basic addition facts.

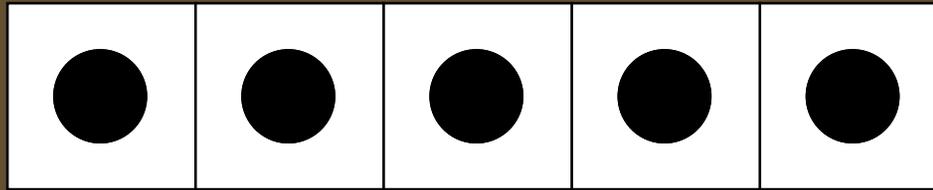


Visual Patterns

- When we refer to visual patterns, we mean we want students to automatically recognize a dot or finger pattern for a given quantity. Mathematicians call this subitizing. It is a fundamental skill in the development of children's understanding of number.
- When a child recognizes number patterns as both a whole (as a unit itself) and a composite of parts (individual units) a child is capable of viewing number and number patterns as a unit composed of units (Steffe, Richards & Cobb, 1983). They are able to UNITIZE.

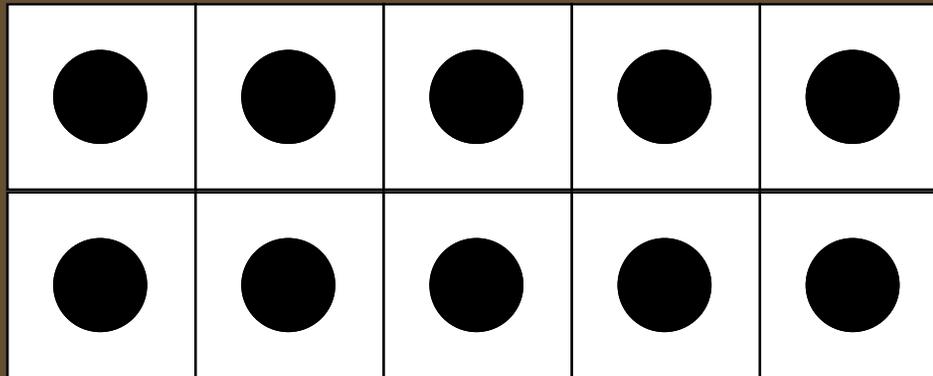


Anchor to 5



5 frame

Anchor to 10

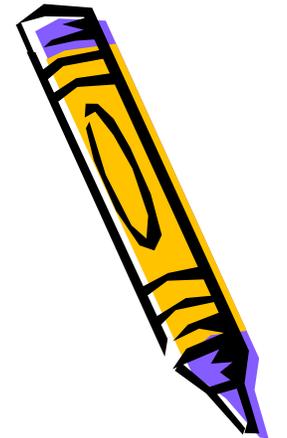
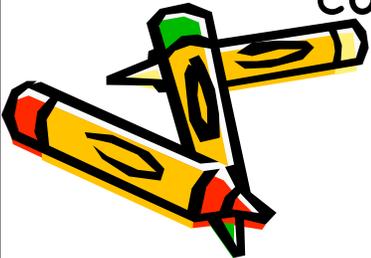


10 frame



Part/Part/Whole and Place & Value

- The ability to think about a number in terms of parts is a major achievement in the development of a child's thinking about number. (VanDeWalle 2006). Focusing on a quantity in terms of its parts has important implications for developing number sense. When children are able to think of numbers as being composed of other numbers they are able to problem solve and develop strategies for computation and other mathematical concepts.



dma

Developmental Math Assessment

- Observation of essential concepts
- Anecdotal Records
- Framework
- Longitudinal Record of Development
- Record of Early Numeracy (RENs)
- DMA (Developmental Math Assessment)

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