



Number Sense: Big Ideas





COUNTING



- Rote counting
- Rational Counting
- Counting as it relates to understanding quantity, place value & the operations

Key Concepts

1. Stable order
2. Order irrelevance
3. Conservation
4. Abstraction
5. One-to-One Correspondence
6. Cardinality
7. Movement is Magnitude
8. Unitizing

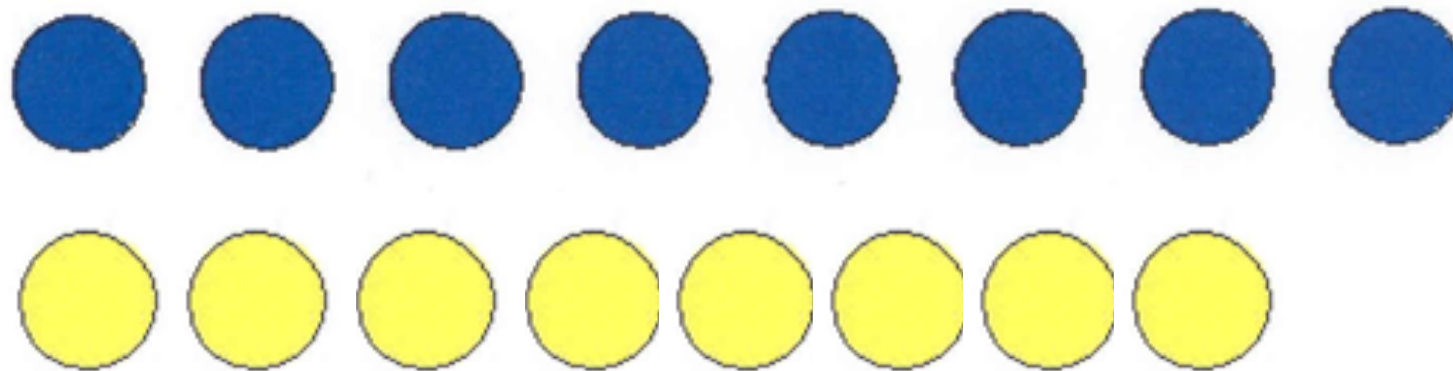


One-to-One Correspondence





NUMBER CONSERVATION



: Fifth edition. NJ: John Wiley & Sons, Inc

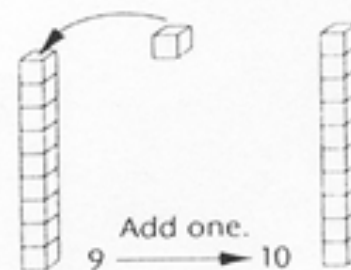
Hatfield, Mary M., Edwards, Nancy, Bitter, Gary, Morrow, Jean. (2005). Mathematics methods for elementary & middle school teachers: Fifth edition. NJ: John Wiley & Sons, Inc.



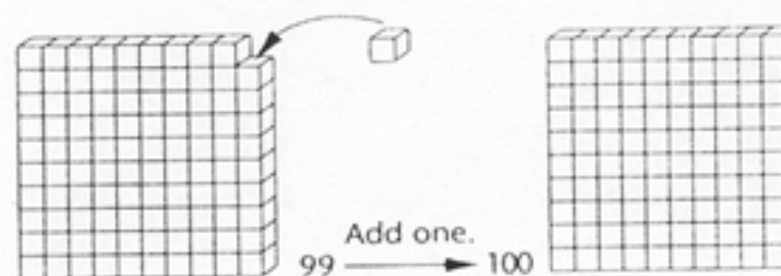
Regrouping & Place Value

Base-10 Blocks

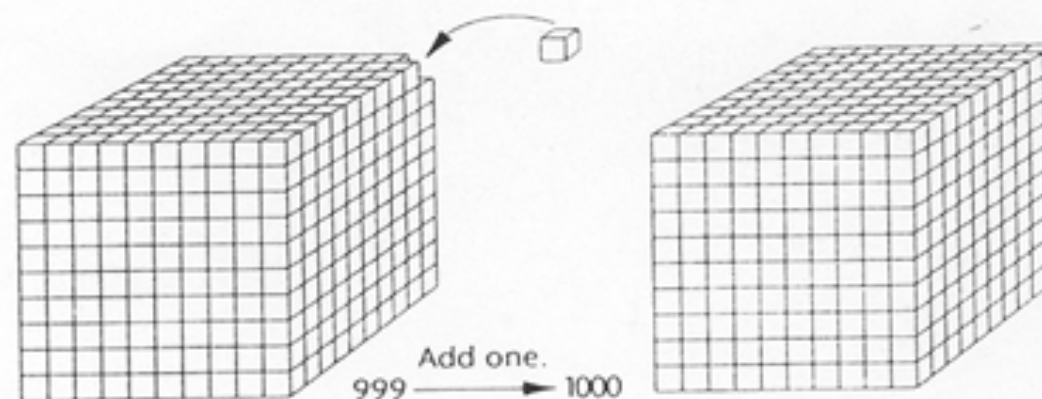
The largest one-digit number:



The largest two-digit number:

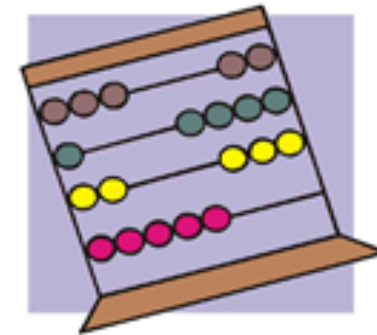


The largest three-digit number:





Quantity



- “Howmuchness”
- Understanding operations, place value & fractions in meaningful contexts
- Estimating, reasoning with numbers, magnitude of numbers, *proportional reasoning (4-6)* and rational numbers

Key Concepts:

1. Conservation
2. Cardinality
3. Subitizing
4. Magnitude
5. Proportions
6. Part-part Whole
7. Anchors of 5 & 10
8. Decomposition & Composition of Numbers
9. Estimation Skills
10. Rational Numbers



Magnitude of Numbers

What Year was it One Million Seconds Ago?

- one million seconds ~ 11 1/2 days - 2013

One Billion Seconds Ago?

- $11.5 \times 1,000 = 11,500$ divided by 365 ... just under 32 years
1981

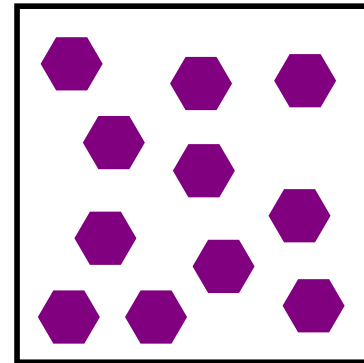
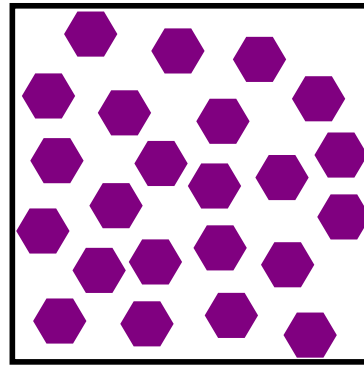
One Trillion Seconds Ago?

32,000 years ago
one trillion is a thousand billion!
1,000,000,000,000



Don't Count!

A. Look and decide:



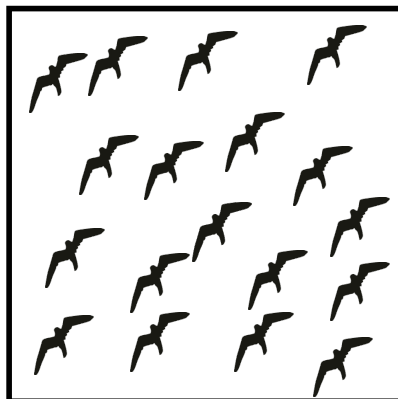
More than 20 _____

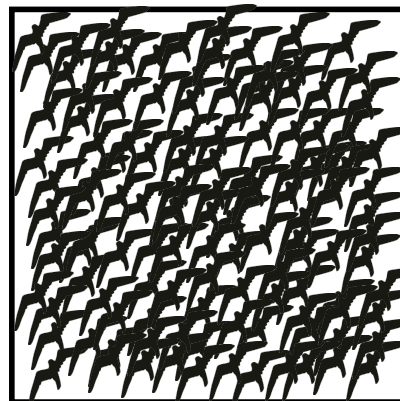
More than 20 _____

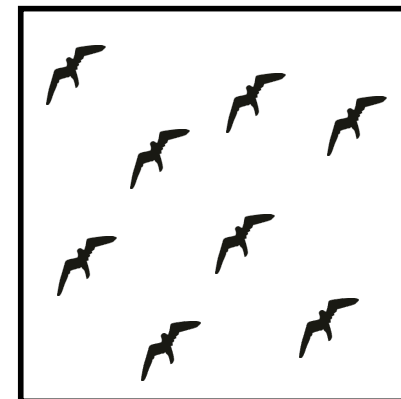
Less than 20 _____

Less than 20 _____

B. Decide which picture has about 10, 20, or 100 birds.









Estimation Skills

The diagram illustrates an estimation activity. At the top, three rectangular boxes are labeled "Too Long", "About Right", and "Too Short". Below each box are vertical lines of varying lengths. The "Too Long" box has five lines, the "About Right" box has two lines, and the "Too Short" box has five lines. Below these boxes is a drawing of a pumpkin with a stem. A horizontal dashed line is drawn across the middle of the pumpkin, and a label "String" with a pointer indicates this line. The entire activity is presented on a light-colored background with a subtle grid pattern.

Relationships



Kindergarten – Grade 3:

- Number patterns
- Understanding & performing operations
- Relationships to anchors of 5 & 10

(K-3/4-6)

How numbers are related to each other for ordering/comparing

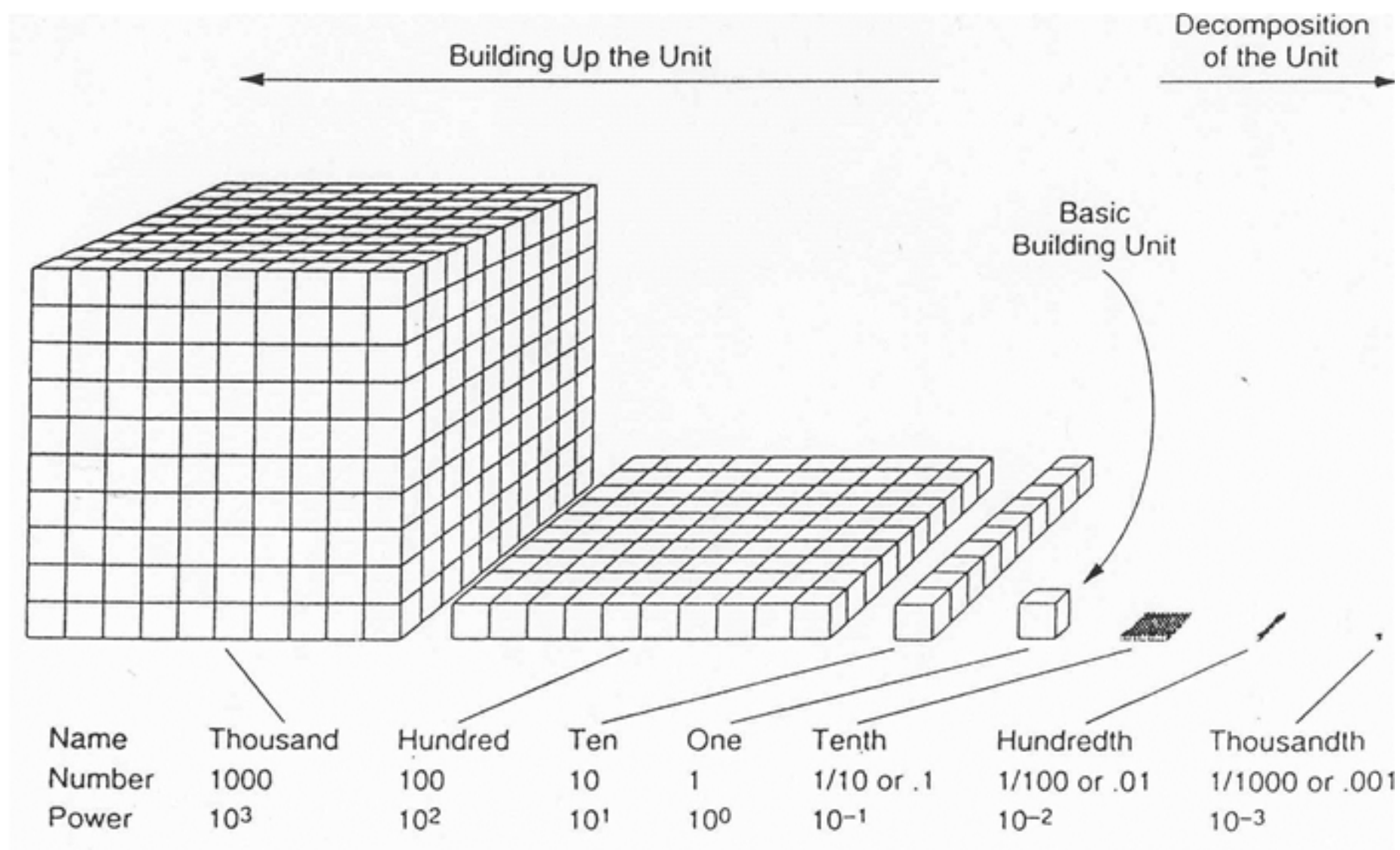
Grades 4 – 6:

- Understanding our number system
- Understanding relationships between the operations
- Understanding relationships between fractions, decimals, percents



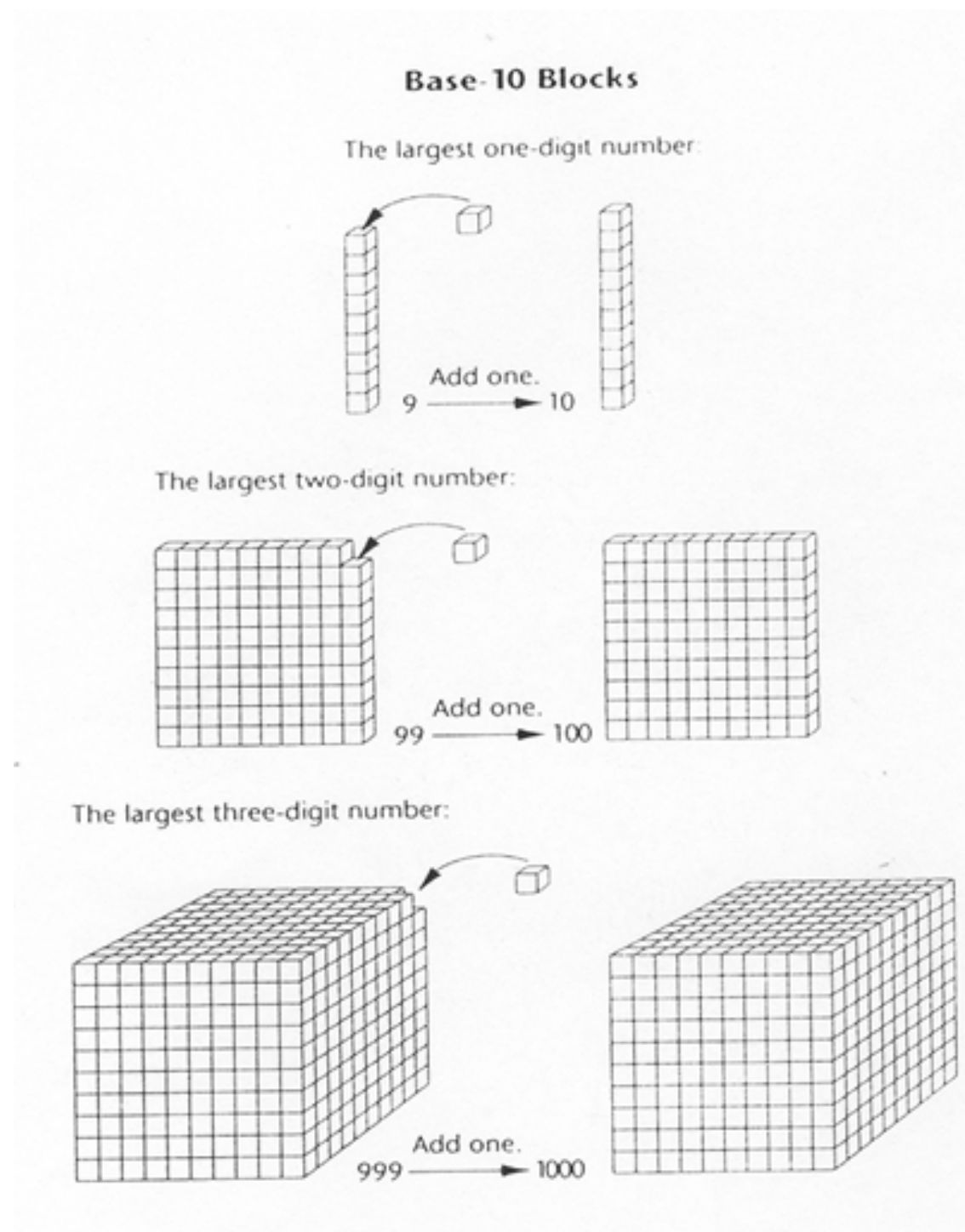
Reys, Robert E., Suydam, Marilyn N., Lindquist, Mary M. & Smith, Nancy L. (1999). *Helping children learn mathematics: Fifth edition*. New York: John Wiley & Sons

Base Ten System







Regrouping & Place Value



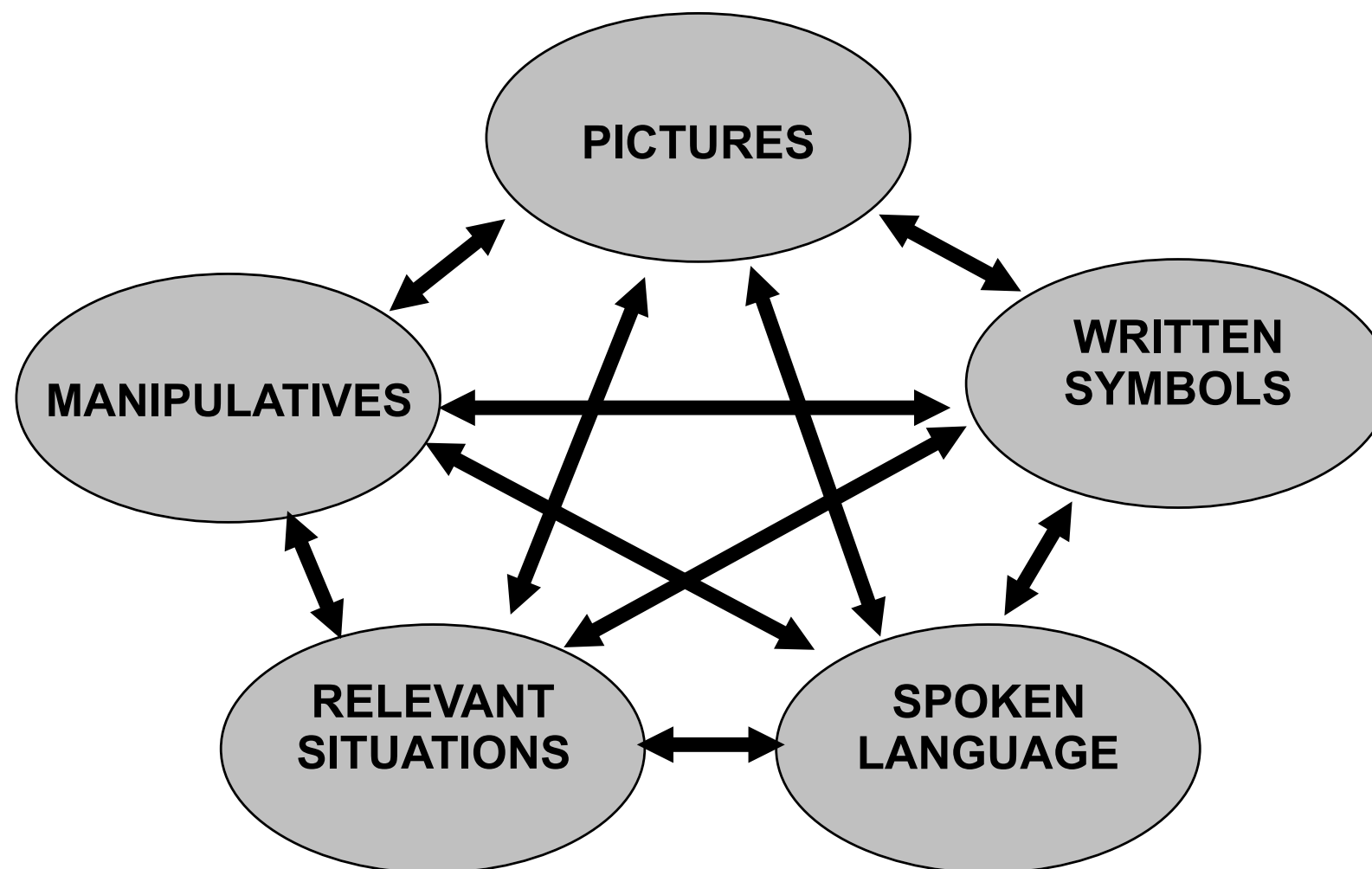


PLACE VALUE

- Modelling is critical
- Concrete  Pictorial  Abstract
- Provide TIME and MANY VARIED EXPERIENCES
- Always represent a quantity with the least number of pieces for a particular model

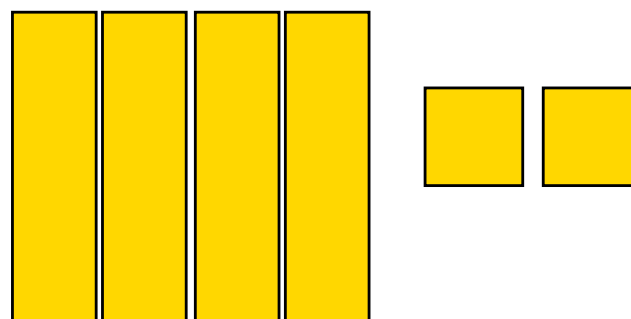


Representations

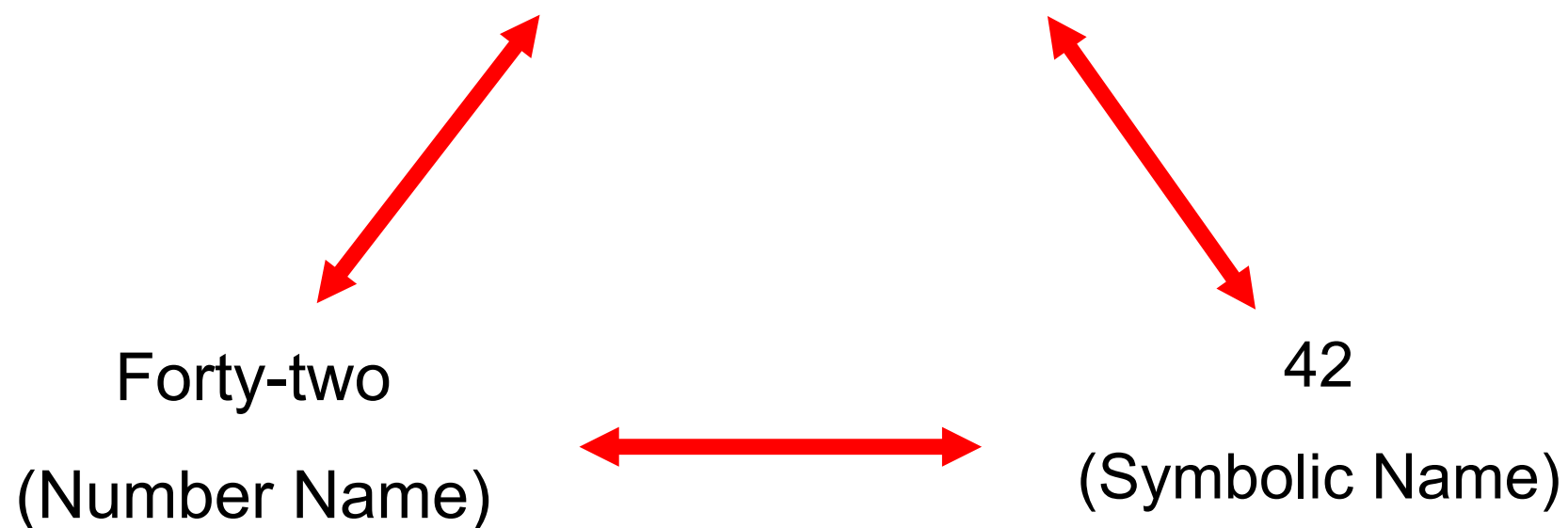




Components of Place Value Understanding



CONCEPTUAL MODEL





Visual Representations

$$\begin{array}{c} 5 \\ \circ \circ \circ \\ \circ \circ \end{array} \times \begin{array}{c} 3 \\ \circ \circ \circ \end{array} = \begin{array}{c} 15 \\ \circ \circ \circ \circ \circ \\ \circ \circ \circ \circ \circ \\ \circ \circ \circ \circ \circ \end{array}$$

$$\begin{array}{c} 3 \\ \circ \circ \circ \end{array} \div \begin{array}{c} 5 \\ \circ \circ \circ \\ \circ \circ \end{array} = \begin{array}{c} 5 \\ \circ \circ \circ \\ \circ \circ \end{array}$$

$$15 \div \begin{array}{c} 5 \\ \circ \circ \circ \\ \circ \circ \end{array} = \begin{array}{c} 3 \\ \circ \circ \circ \end{array}$$



Written Representations

twenty-five percent **25%**

0.25 **twenty-five hundredths**

one quarter **$\frac{1}{4}$**



BASIC FACTS

- **discover answers for themselves**
- **recognize relationships that exist:**
 - **patterns/properties**
- **commit the facts to memory**



Strategies: Addition



- Counting on: one more than/two more than/3 more than
(e.g. $8 + 3$ “8...9, 10, 11”)
- Facts with zero (e.g. $5 + 0$)
- Double facts (e.g. $6 + 6$)
- Commutative Property (e.g. $5 + 7 = 7 + 5$)
- Make a 10 (e.g. $8+7$ “ $8 + 2 = 10$ and $10 + 5 = 15$ ”)
- Other: doubles plus one (e.g. $4 + 5$ “ $4 + 4 = 8$ and add 1...9”)
- adding “9” – add 10 less 1 (e.g. $9 + 4$ “ $10 + 4 = 14$ and $14 - 1 = 13$ ”)

Strategies: Subtraction



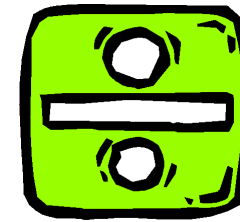
- **Counting back (e.g. $8 - 2$ “8...7,6”)**
- **Subtraction as think addition (e.g. $14 - 6$... “ $? + 6 = 14$ ”)**
- **Subtracting zero (e.g. $6 - 0 = 6$)**
- **Subtracting a number from itself (e.g. $5 - 5 = 0$)**

Strategies: Multiplication



- **Commutative Property (e.g. $3 \times 4 = 4 \times 3$)**
- **Multiplying by zero (e.g. $7 \times 0 = 0$)**
- **Multiplying by one (e.g. $4 \times 1 = 4$)**
- **Doubles (e.g. $5 \times 5 = 25$)**

Strategies: Division



- **Division as think multiplication**
(e.g. $15 \div 3 \dots$ “? X 3 =15”)



Worksheets With Purpose

$2 + 2 = \underline{\quad}$	$3 + 3 = \underline{\quad}$	$9 + 9 = \underline{\quad}$
$8 + 8 = \underline{\quad}$	$7 + 7 = \underline{\quad}$	$2 + 2 = \underline{\quad}$
$6 + 6 = \underline{\quad}$	$5 + 5 = \underline{\quad}$	$4 + 4 = \underline{\quad}$
$1 + 1 = \underline{\quad}$	$2 + 2 = \underline{\quad}$	$5 + 5 = \underline{\quad}$
$7 + 7 = \underline{\quad}$	$4 + 4 = \underline{\quad}$	$6 + 6 = \underline{\quad}$
$8 + 8 = \underline{\quad}$	$3 + 3 = \underline{\quad}$	$1 + 1 = \underline{\quad}$
$9 + 9 = \underline{\quad}$	$5 + 5 = \underline{\quad}$	$7 + 7 = \underline{\quad}$
$4 + 4 = \underline{\quad}$	$1 + 1 = \underline{\quad}$	$2 + 2 = \underline{\quad}$
$5 + 5 = \underline{\quad}$	$6 + 6 = \underline{\quad}$	$3 + 3 = \underline{\quad}$
Just the Facts 5a60	Strategy: _____	Ontario Ministry of Education, Early Math Strategy Binder



Using Doubles

$2 + 3 = \underline{\quad}$	$3 + 4 = \underline{\quad}$	$9 + 8 = \underline{\quad}$
$8 + 7 = \underline{\quad}$	$7 + 8 = \underline{\quad}$	$7 + 6 = \underline{\quad}$
$6 + 7 = \underline{\quad}$	$6 + 5 = \underline{\quad}$	$4 + 3 = \underline{\quad}$
How do Doubles help you solve these questions?		
Just the Facts 5a.61	Strategy: _____	Ontario Ministry of Education, Early Math Strategy Binder