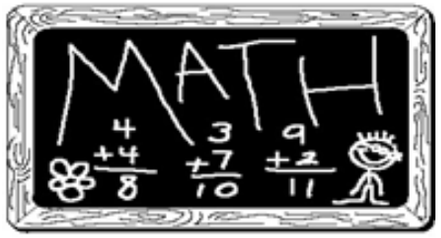
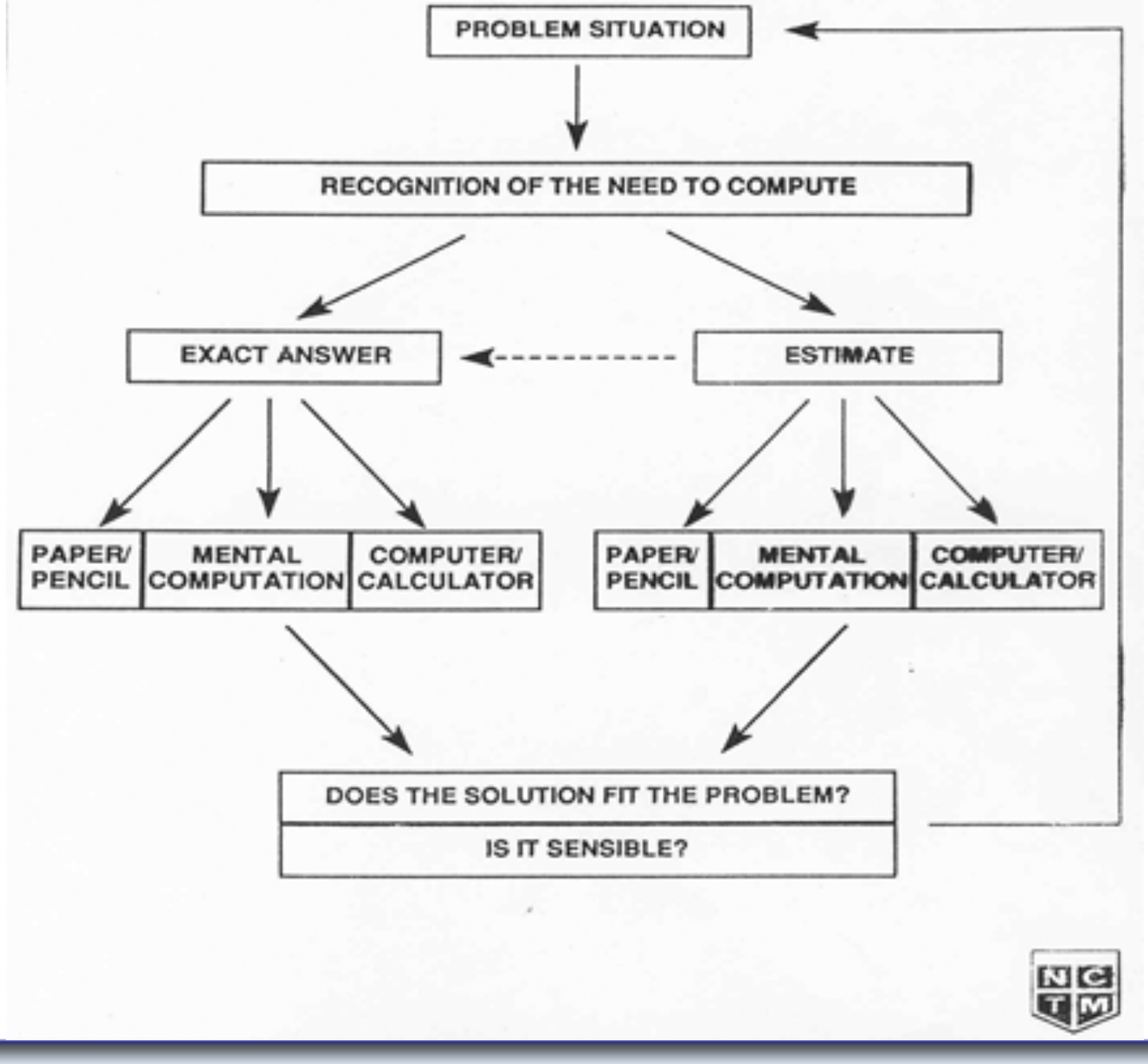


P/J Mathematics

Addition & Subtraction

AGENDA
Relationships Between the Operations
Properties of the Operations
Basic Problem Interpretations
Computation

COMPUTATION MODEL



OPERATIONAL SENSE "MUSTS"

MODELLING WITH ...*PHYSICAL MATERIALS*
(CONCRETE → PICTORIAL → ABSTRACT)

WITHIN A ...*PROBLEM SOLVING CONTEXT*

INCLUDE...
DEVELOPMENT OF THINKING STRATEGIES
(basic facts, estimation, reasonableness of results)

DISCOURSE

Mathematical Properties

Property	Mathematical Language	Child's Language	How It Helps
Commutative	For all numbers a and b: a + b = b + a and a x b = b x a	If 4 + 7 = 11, then 7 + 4 must equal 11, too. If I know 4 x 7, I also know 7 x 4	The number of addition or multiplication facts to be memorized is reduced from 100 to 55.
Associative	For all numbers a, b, and c: (a + b) + c = a + (b + c) and (ab)c = a(bc)	When I'm adding (or multiplying) three or more numbers, it doesn't matter where I start.	When more than two numbers are being added (or multiplied), combinations that make the task easier can be chosen. For example, 37 x 5 x 2 can be done as 37 x (5 x 2) or 37 x 10 Rather than (37 x 5) x 2.
Distributive	For all numbers a, b, and c: a(b + c) = ab + ac	(6 x 15) is the same as (6 x 10) + (6 x 5) 96 ÷ 3 is the same as (90 ÷ 3) + (6 ÷ 3)	Some of the more difficult basic facts can be split into smaller, easier-to-remember parts. For example, 6 x 15 is the same as (6 x 10) + (6 x 5) or 60 + 30 The 19 addition facts involving 0 and the 19 multiplication facts involving 1 can be easily remembered once this property is understood and established.
Identity	For any whole number a a + 0 + a & a x 1 = a	*0 added to any number is easy - it's just that number. *1 times any number is just that number	The 19 addition facts involving 0 and the 19 multiplication facts involving 1 can be easily remembered once this property is understood and established.
Role of Zero in (x)	For any inside number a: 0 x a = 0 or a x 0 = 0	0 multiplied by any number is 0. Any number multiplied by 0 is 0	The 19 multiplication facts involving zero can be generalized.

Cathcart, W. George, Pothier, Yvonne M., & Vance, James H (1997). Learning mathematics in elementary and middle schools: Second Edition. Scarborough, ON: Prentice Hall Allyn and Bacon Canada

Defining an "Algorithm"

Algorithms:

- are a structured series of procedures that can be used across problems regardless of the numbers

Important qualities of algorithms include:

- accuracy (*or reliability*);
- generality;
- efficiency (*or complexity*);
- ease of accurate use (*versus error proneness*);
- transparency (*versus opacity*);

Exploring the Traditional Algorithm Using Base 10 Manipulatives

Pine Hill Problem

The Pine Hill School community is raising money for a charity organization. They decide to sell tickets to a school play. At the end of the fundraising, the primary division students raise $348 and the junior division raises $583. How much did they raise altogether?

TEACHING CONVENTIONAL ALGORITHMS

- ***Let them see what it looks like***
- ***De-emphasize rote rules***
- ***Emphasize big ideas***
- ***Let the written algorithm simply be a recording***
- ***Watch our language***

Tucker, Benny F., Singleton, Ann H., Weaver, Terry L. (2002)*Teaching Mathematics to All Children: Designing and Adapting Instruction to Meet the Needs of Diverse Learners. New Jersey: Merrill Prentice Hall.*

November 30, 2016

BIG IDEA

ADDITION

- always add like units
- when there are too many to write, make a trade

Pine Hill Problem

The Pine Hill School community is raising money for a charity organization. They decide to sell tickets to a school play. At the end of the fundraising, the primary division students raise $348 and the junior division raises $583. How much did they raise altogether?

November 30, 2016

BIG IDEA

SUBTRACTION

- always subtract like units
- when there are not enough, make a trade

Exploring the Traditional Algorithm Using Base 10 Manipulatives

Muffin Problem

The organizing committee purchased 509 muffins for a tournament. Only 326 were eaten. How many muffins were left?

Inverse Operations

Addition

joining
active
George had 2 cars. Sandra gave him 4 more. How many cars does George have now?

part-part whole
static
Sami had a cube-a-link tower. (3) of them are white and (6) of them are red. How many cubes does Sami have?

repeated addition/ equal groups or sets
Pui Loo put 2 candles on each cupcake. She had 4 cupcakes. How many candles in all?

Subtraction

comparison
Peggy had 7 balloons. Richard had 4 balloons. How many more balloons did Peggy have than Richard?

missing addend//part whole
Peggy had 7 balloons. Four of them were red and dthe rest were blue.

take away/ separation
Peggy had 7 balloons. She gave 4 away to other children. How many balloons did she have left?

repeated subtraction/ measurement
Marisa baked 24 cookies and wants to put them into tins containing 5 cookies each. How many tins does Marisa need?

partitive
Marisa has 4 friends and 8 pieces of candy. She wants to give her candy away to her friends so everyone has an equal amount. How many pieces will each friend get?

Multiplication

area/array
Mrs. Graham asked the children to sit in rows with 3 in each row. How many children would this be?

combinations
Monique is packing for a trip. She has 4 tops to go with a skirt, a pair of shorts, and a pair of pants. How many different outfits can she make?

missing factor
The area of a rectangle is 12 square units. The length of the rectangle is 4 units. What is the

rate/comparison
Mia has 4 pencils. Poli has 3 times as many pencils as Mia. How many pencils does Poli have?

Division

Inverse Operations

Effective Numeracy

TEACHERS ...

start with a problem and then facilitate:

- share strategies
- explain reasoning
- listen to the thinking of others
- adapt their thoughts
- search for meaning
- identify and discuss patterns and a range of solutions