MULTIPLICATIVE REASONING

Examples

- Proportion
- Ratio
- Rates
- Fractions and decimals
- Percentages
- Indices

Multiplicative strategies

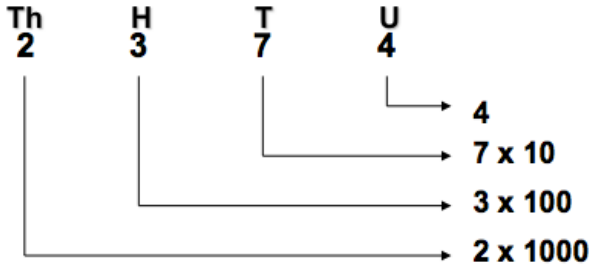
- Direct counting – uses addition
- Repeated addition – starts to recognise equal groups, rhythmic counting
- Multiplicative operation – knows multiplication

Conceptual development research

- Young children have simple x and / ideas before formal schooling through modeling and representing
- Students + - x / without meaning

Hindu-Arabic place value system

Structure



Expanded form

$2374 = 2 \times 10^3 + 3 \times 10^2 + 7 \times 10^1 + 4 \times 10^0$

Possible reasons for poor understanding of place value

- Limitations of Dienes blocks
- Numeration system structure not taught well and its purpose
- Too many written calculations

Partitive division – give the total number of items and number of groups. Easier, teachers are more comfortable

Quotitive division – give the total number of items and number in each group (NOT the number of groups). More difficult

TEACHING AND LEARNING MULTIPLICATION AND DIVISION CONCEPTS AND PROCESSES

Conceptual development

- Maths is reliant on strong understanding of x and / e.g. base 10 no system, fractions, decimals, ratio, functions, probability, length, area, volume, time, data analysis, graphing, coordinate geometry, algebraic reasoning, number patterns
- Understanding equal groups structure
- Pattern and structure

- Making connections between multiplication and division
- X and / as commutative and inverse relationships

Making connections between additive and multiplicative concepts

Multiple (skip counting) 3, 6, 9, 12 etc

Repeated addition

3 + 3 + 3 + 3 = 12 lll lll lll lll

4 + 4 + 4 = 12 llll llll llll

Array model '3 by 4' llll

llll

llll

Row and column structure

Commutitivity 3 x 4 = 12 4 x 3 = 12

Inverse relations 12 ÷ 4 = 3 12 ÷ 3 = 4

Sharing by dealing (one by one)

Division by grouping (estimate the number in each group)

Division by repeated subtraction (12 – 3 = 9; 9 – 3= 6; 3 – 3 = 0)

Use double counting (often with fingers to record the count)

1, 2, 3 (1 group)

4, 5, 6 (2 groups)

7, 8, 9 (3 groups)

10, 11, 12 (4 groups)

Research so far…

- Children understand X and / before school through modeling, counting and representation
- Students often + - x / without meaning
- Children can recall X tables without understanding concepts
- Misconceptions that multiplication always makes bigger (X 0.5?!) and division is always smaller (/0.25)