



Supporting students with anxiety and learning difficulties

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2020

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Anxiety – Brain Under Stress Condition

- Blood flows to the reptilian brain - heart beats faster - blood pressure rises
- Problem solving, creativity, flexibility functions are displaced
- Thinking skills are replaced by survival skills
- Peripheral vision lost -Focus-source of anxiety - Behaviour learnt in childhood returns
- The emotional part of the brain is the catalyst for learning as it opens the gateway to the Neo-cortex so learning can take place.

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Cognitive load theory

- The implications of working memory limitations on instructional design can hardly be overestimated ...
- Anything beyond the simplest cognitive activities appear to overwhelm working memory.
- Any instructional design that flouts or ignores working memory limitations is deficient.
- (Sweller, van Merriënboer & Paas 1998, pp. 252-253)

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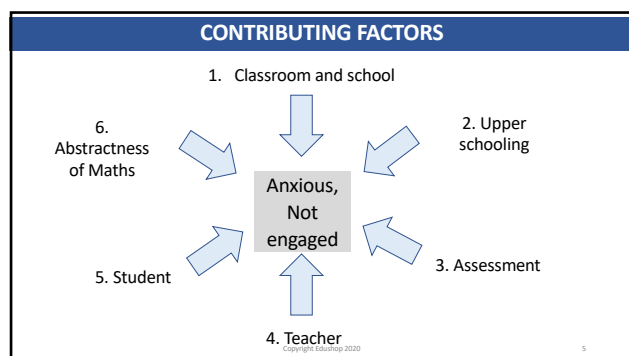
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Some key factors influencing mathematical learning

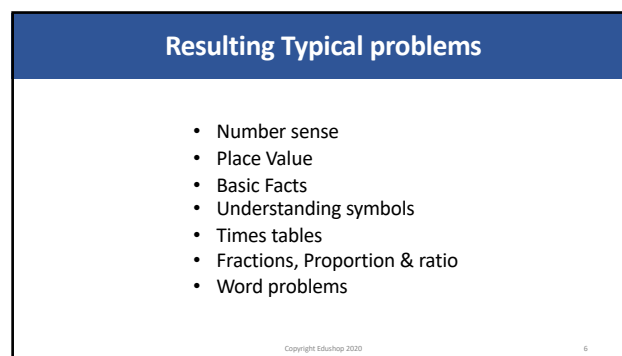
- ability to sequence
- working memory/auditory, visual
- processing/auditory, visual
- language skills
- motor skills
- attitude
- teaching approach

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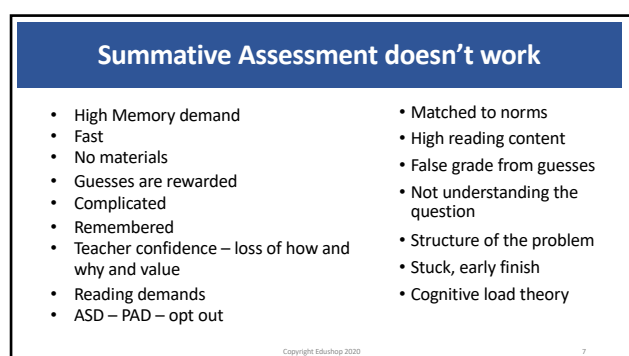
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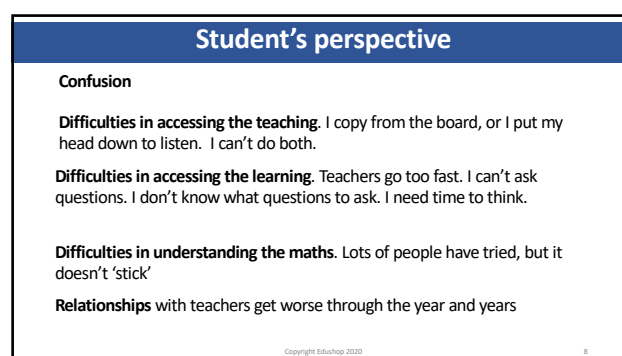
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Steve Chinn

-Research and learning maths



- Early experiences – play
- Subitising




Maths Explained.co.uk Judy Hornigold

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Dyscalculia

<p>Pictures representing numbers, counting, number line</p>  <p>Manipulating symbols</p> $2 + 3 = 5$ $5 = 3 + 2$ <p>What do maths words mean?</p> <p>'How many?'</p>	<p>Word problems – oral and written</p> <p>Using strategies, performing operations</p> $23 - 19 =$ <p>Mental calculations.</p> <p>I have 4 and you have 3.</p> <p>How many altogether?</p> <p>Number line?</p> <p>Memorizing</p> <p>Longer to develop brain pathways</p>
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Counting difficulties

Finger counting:

- Slow
- Inaccurate
- Trouble recognising finger configurations
- Memorisation ≠ understanding





Object counting:

- Slow
- Inaccurate
- Memory and coordination – words, sequence, materials and action of counting

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Consequences in adults

- Blocked from certain professions (lower salary)
- Managing money and time
- Understanding statistics/numbers (influence on decision making)
- Low self-esteem, anxiety, avoidance

"I have always had difficulty with simple addition and subtraction since young, always still have to 'count on my fingers quickly' e.g. '5+7' without anyone knowing. Sometimes I feel very embarrassed! Especially under pressure I just panic."

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Consequences in teachers, both as strugglers and in treatment of those who struggle

- Insecurity about maths concepts
- Reliance on drill
- Over-emphasis of strategies
- Compartmentalize strands
- Over-test
- Isolate maths from the whole curriculum
- Don't know the real learning steps of concepts
- Reliance on text books and worksheets



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Psychological support

- Draw on beliefs
- Change negative self talk
- Deep breathing to eliminate fear
- Growth mindset
- Meditation
- Memorizing quotes

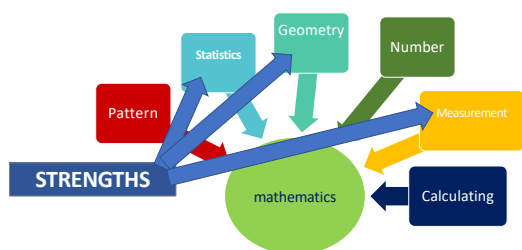


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Inter-connectedness with Maths

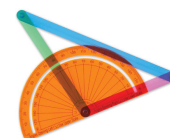


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Linking Strands Digital curriculum comes out of Maths

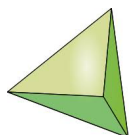


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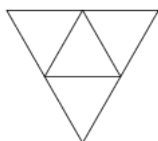
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Multi-faceted experiences – RICH TASKS



Number
Number
Number
Number...



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Assessment – Formative

Look and listen for: what they do and what they say

- Respectful
- Personal achievement
- Show an understanding of the words and terms for communicating in what they say and do
- Use structured and non-structured materials to communicate their ideas
- Over time
- Supported memory
- Persistence

Dylan Williams

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Different Teaching Approach - Explicit Instruction

- The **teacher decides** the learning intentions and success criteria,
- **makes them transparent** to the students,
- **demonstrates** them by modelling,
- **evaluates** if they understand what they have been told by checking for understanding,
- and **retelling** them what they have been told by **tying it all together** with closure.

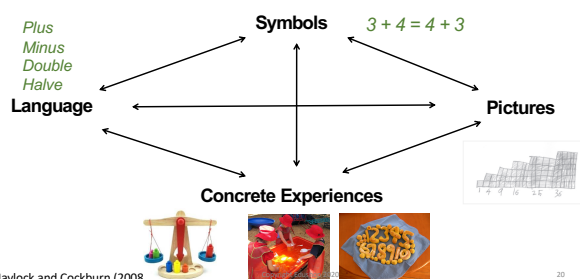
(Hattie 2009, p. 206)

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Children make connections and learn language

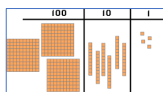


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Better Approaches - Learn from the experts

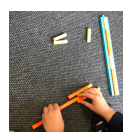
- Jerome Bruner – CPA Approach
- Vygotsky and Piaget
- Steve Chinn - Maths Explained
- Judy Hornigold – Making Maths Tactile
- Brian Butterworth and Jane Emerson
- Dr Tony Wing - Numicon
- Ronit Bird
- Dr Anna Wilson – Dyscalculia.org.nz



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Better Teaching Approaches

- Conversation - teach the language of maths
- Use structured materials
- Learning Through Play
- Inter-Connections with all strands



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Better Teaching Approaches

- Tracey Zager – connections in conversations
- Jo Boaler – connections in maths
- Tony Wing, Gattegno, Vygotsky, Bruner, Piaget
- Bobbie and Jodie Hunter - collaboration
- Learning Through Play - connections



What's in
common?

Structured materials
and experiences,
language

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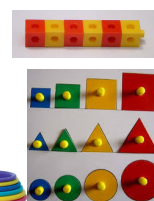
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Why?

Mathematics is the exploration and use
of **patterns** and **relationships** in
quantities, space, and time.

Statistics is the exploration and use of
patterns and relationships in data.



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NC Curriculum Level 1 Number and Algebra (Years 1, 2 & 3)

Number strategies

451 Use the number line and count sharing objects with whole numbers and factors.
 This strategy involves counting on using objects including counting by tens, doubling and counting by ones. This strategy is used to solve problems involving addition and subtraction. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones.

Number knowledge

452 Know the forward and backward counting sequences of numbers up to 100.
 This strategy involves counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving addition and subtraction. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones.

453 Place numbers in groups, within and without sets

This strategy involves counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving addition and subtraction. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones.

Equations and expressions

This strategy involves counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving addition and subtraction. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones.

Patterns and relationships

454 Describe and explain the relationship between the number of objects and the number of groups.
 This strategy involves counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving addition and subtraction. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones. It is used to solve problems involving multiplication (e.g. 1×4 , 4×1 , 4×4) and sharing and counting on using objects including counting by tens, doubling and counting by ones.

455 Create and explain mathematical patterns

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- Finger counting is OK, link with patterns
- Grouping – link with patterns
- Equal sharing – link with patterns

Link with patterns

- Counting, then abstract, then abstract
- Number sentences – make with words first, then take the words off
- Three and seven makes ten
- Three add seven makes ten
- Three plus seven equals ten
- $3 + 7 = 10$
- Multiply with equipment if recall is slow or child is non-verbal

• Add and count

- Make counting groups in patterns, make counting groups and place for generalising – the count is always the same result – see over

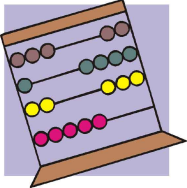
• Start here

- Make patterns – see over

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Galileo, Montessori, Stern, Gattegno

Counting as the foundation? NO!




Better:

- Pattern
- Relationships with structured apparatus


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Patterns




We were in the top four countries when these materials were widely used with meaningful teaching.



6, 5, 6, 5, 6...



1, 4, 4, 1, 4, 4...



6, 4, 6, 4, 6...

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Number line, Before/After, Odds and Evens



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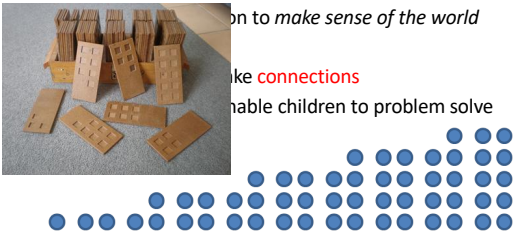
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Exploring Groups in Patterns & Relationships

on to *make sense of the world*

ake **connections**

nable children to problem solve

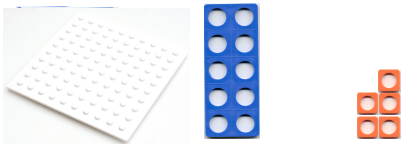


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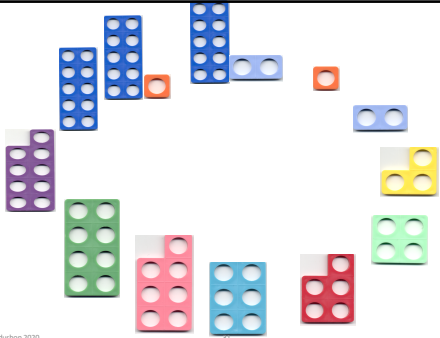
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Place value



Hundreds Tens Ones

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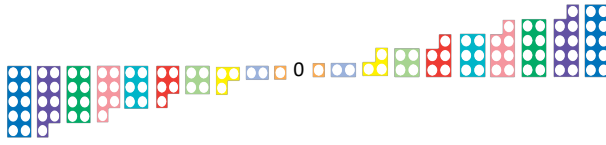


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Positive and negative numbers



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X y axis, Coordinates, Digital Curriculum



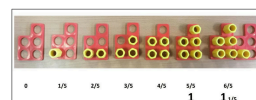
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Fractions

Division structure ÷



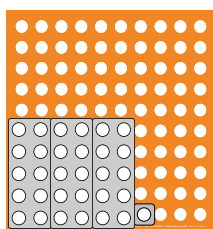
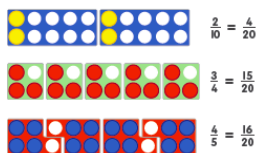
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Fractions

Division and Multiplication Linked

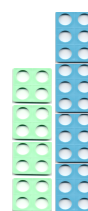


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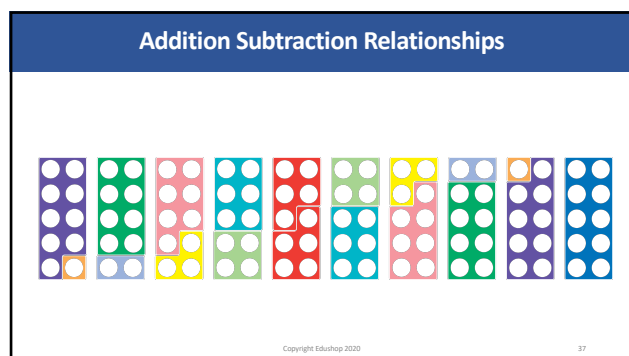
Proportion and ratio



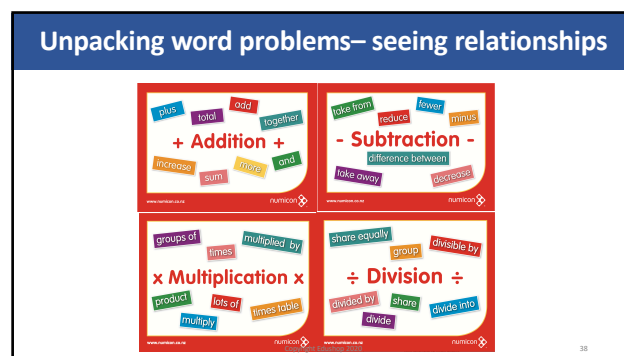
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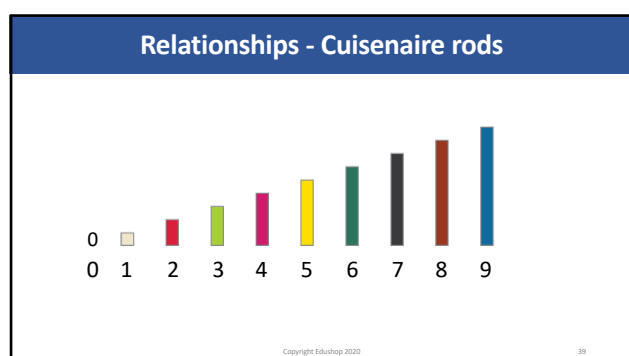
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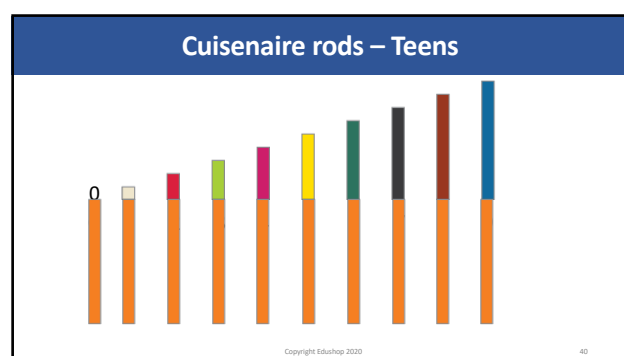
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Caleb Gattegno									
1	2	3	4	5	6	7	8	9	10
10	20	30	40	50	60	70	80	90	100
100	200	300	400	500	600	700	800	900	1000
1000	2000	3000	4000	5000	6000	7000	8000	9000	10000

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Bar Modelling/Reasoning/Problem solving

Problem: Nina has 5 more apples than Allison. They have 29 apples together. How many apples does Allison have? Use **bar modeling**.

Nina: ? 5
Allison: ?

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$29 - 5 = 24$
 $24 / 2 = 12$ Allison has 12 apples.

How many ways can I make 14?

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Looking at difference and equal

balance
equal
 $7 + 5 = 12$

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NZ Maths Cuisenaire Rods

Number Strategies units of work
The Cross strand units are a selection of units from other strands with links to Number achievement objectives and stages of the Number Framework, Number Framework Addition & subtraction Multiplication & division Fractions Level 1

A Balancing Act
Solve problems using a combination of addition, subtraction, multiplication and division mental strategies.

- Numeracy activities
- Number and Algebra
- Level Three

Covering Up
This is a level 4 measurement activity from the Figure It Out series. A PDF of the student activity is included.

- Figure It Out activities
- Geometry and Measurement
- Level Four

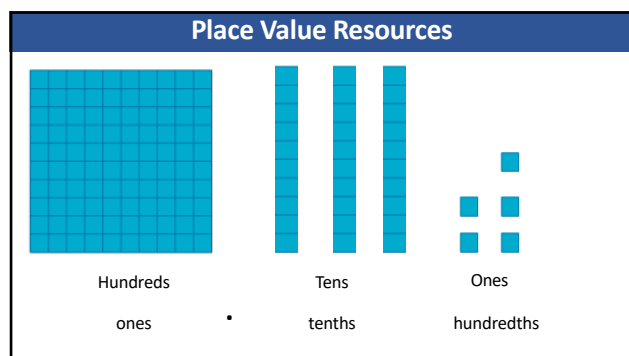
Pythagoras' Theorem
This unit is an introduction to Pythagoras' Theorem, including history, proofs, and practise in application of the theorem.

- Units of Work
- Geometry and Measurement
- Level Five

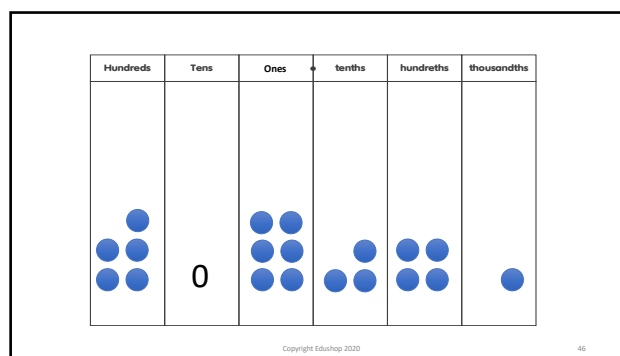
Trains
Compare two lengths (either directly or by calculation) Devise and use problem solving strategies to explore situations mathematically

- Problem solving activities
- Geometry and Measurement
- Level One

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NZ Maths Place Value Blocks

Place Value Blocks

The Place Value Blocks learning object allows the user to make numbers using place value equipment. They can add or remove 1s, 10s, 100s or 1000s from their number and the learning object will automatically keep a running total of the number of blocks in each column, the total value of each column, and the total value of the whole number. Arrows between the columns allow the user to combine 10 of one type of block, or to break a block into ten smaller sized blocks.

Students and Teachers Notes for Place Value Blocks provides information for students and teachers on using this Learning Object.

Level Two Number

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Solutions

- Different Teaching approach
- Classroom adjustment – mixed ability
- Student support
- Assessment
- Parental participation
- Structured, Multi-sensory

**Making
Maths
Real**

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