

# Supporting Maths in ECE with Numicon



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## New Zealand wide

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Change your  
perception of  
teaching maths  
forever...



[www.numicon.co.nz](http://www.numicon.co.nz)

Introduction

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[www.edushop.nz](http://www.edushop.nz)

# What is Maths?

**Mathematics helps children to think logically, strategically, creatively, and critically** – skills and knowledge which are particularly valuable in today's information and digital age.

*Te Whāriki* positions mathematics as one of the many forms of expression that children need in order to **communicate successfully and widely**.

This view of **mathematics as a language** is embedded in the learning outcome, *he kōrero pāngarau: recognising mathematical symbols and concepts and using them with enjoyment, meaning, and purpose*.

Te Whariki

“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.

These two disciplines are related, but different ways of thinking and of solving problems. Both equip students with effective means for investigating, interpreting, explaining, and making sense of the world in which they live”. *NZ Curriculum*

## How does Numicon help?

- It makes numbers real
- It provides a structured learning process that follows the CPA sequence, using appropriate manipulatives.
- Children enjoy learning about maths which has a direct purpose and real-life context
- Reduces anxiety
- Supports all types of learners, AVK, as well as those with learning difficulties
- Reduces auditory processing and working memory load
- The teacher is supported with on-line and face to face support by a Numicon trained NZ teacher.
- Focuses on key aspects of mathematics: Communicating, Generalizing, Exploring Relationships

Numicon is an approach to teaching mathematics that uses manipulatives to explore patterns and relationships in mathematics.

Uses the Concrete- Pictorial-Abstract Approach which supports understanding, memory and application when solving problems.

Numicon meets the needs of *all* learners therefore providing a truly inclusive programme.

### What does this mean for our students?

Visual prompts

Hands-on activities

One small step at a time, repeated

Working alongside others

Opportunity to say what they want to learn

Connections with real life experience

### What does this mean for our teaching?

Open ended tasks and challenges

Effective questioning strategies

*Making Skills and Capabilities explicit*

Opportunities to work collaboratively

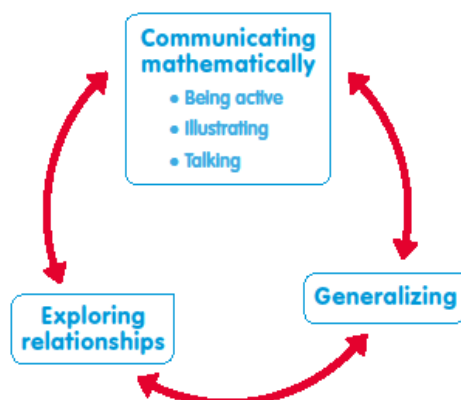
More self-directed learning

Making connections

Numicon is a distinctive approach to children's mathematical learning that emphasises three key aspects of doing mathematics:

This demands children to:

- Think and communicate with and about abstract objects
- Look for patterns in abstract objects
- Generalise and use these patterns

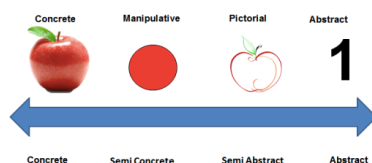


All aspects work together when 'doing' mathematics

*But it's hard to **generalise** in the abstract at first...*

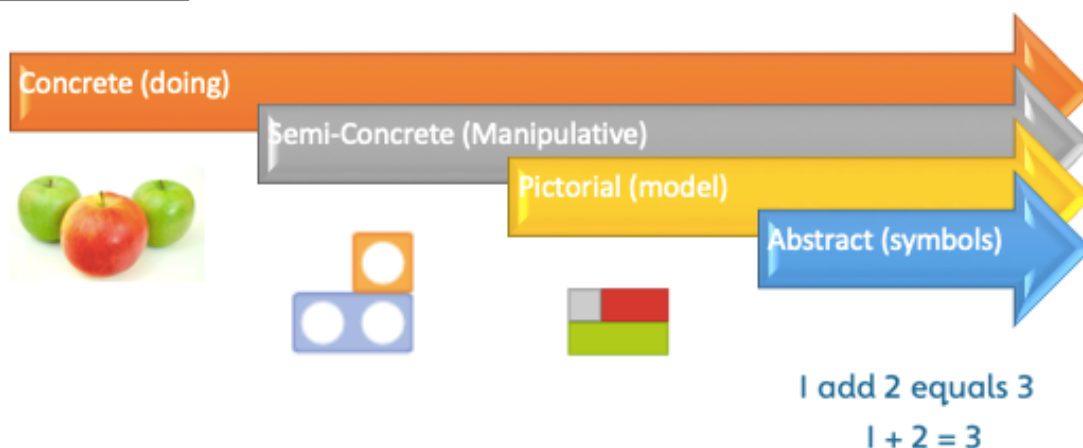
*Which is why Numicon is founded on the CPA approach:*

*Concrete - Pictorial - Abstract*



Numicon acknowledges the difficulties and teaches how to generalise to solve problems

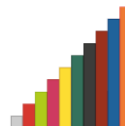
Action and imagery activities to give experience to understand symbols, necessary for communicating a generalisation. To aid this, a strong focus is placed upon the use of structured materials that will lead children into *doing* mathematics.



# Numicon Manipulatives

Numicon is essentially a whole school approach to mathematics that uses manipulatives to explore patterns and relationships in mathematics.

It uses number shapes and number rods, Along with other manipulatives.



## The Shapes

Learning to count successfully is a vital early skill.

Calculating successfully and fluently depends on children being able to think of numbers as whole entities.

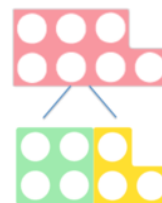
The Numicon shapes are designed to help children think and communicate about numbers as whole entities.

**Not counting** – seeing numbers as whole objects.

Numicon Pattern



Part - Whole

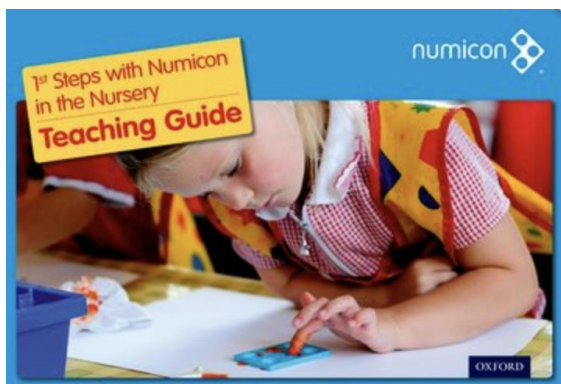


Bar Model



## Resources to support ECE

### Numicon in the Nursery.



## Firm Foundations.



### Key Features

- adult-led and child-initiated learning
- variety of learning areas (sand, water, construction, small world...)
- learning outside
- stories, themes and opportunities from other parts of the curriculum in maths learning

### Using the activity groups.

Groups A and B, provide ideas you can use everyday.

Groups 1-19 provide a progressive programme.

Each activity group focuses on a Numbers theme and an aspect of Shape, Space and Measures.

Because Pattern is so important there is at least one pattern activity in each group.

### Counting.

In 1978, Rochel Gelman and C. R. Gallistel described how anyone counting correctly has to follow five distinct principles.<sup>1</sup> The first three principles are together known as the 'how to count' principles, since these govern the actual procedure of counting:

- One-one principle:** the use of this principle involves ticking off the items in a collection with distinct tags (usually, such tags are our conventional number names, 'one', 'two' etc.) in such a way that one and only one tag is used for each item in the collection.
- Stable order principle:** the tags used to correspond to items in a collection must be arranged or chosen in a stable – that is, a repeatable – order.
- Cardinal principle:** the tag applied to the final item in the collection represents the number of items in the collection.

Two further principles refer to the application of the first three:

- iv Abstraction principle:** the first three principles (above) can be applied to any array or collection of entities.
- v Order-irrelevance principle:** the order in which items are tagged, and hence which item receives which tag, is irrelevant; the same cardinal number results, regardless of the order of enumeration.



## Exploring maths all around us

### Outdoor maths and physical play

- Ask children to run, skip or hop, then, when you give a signal and hold up a Large Foam Numicon Shape, stop and arrange themselves into groups with the number of children matching the Shape. Begin with, e.g. the 2- and 3-shapes, and move on to larger numbers over time.

Increased challenge: children arrange themselves into the Numicon Shape pattern for the number.

- Provide ribbons and scarves of different colours, lengths and patterns for children to play with creatively.

Model and invite children to 'draw' 2D shapes in the air with dance ribbons.

Can you make big circles?  
Can you make straight lines?  
What shapes can you make?

Encourage children to talk about the different patterns, lengths and widths of the ribbons and scarves. They can select several and order them from shortest to longest or longest to shortest.

- Provide skipping ropes of different lengths.
- Play 'snake hide and seek': hide soft-toy snakes or laminated snake pictures (see Expressive arts and design) for children to find and then order by length. **3**

Encourage children to describe where they find the snakes using positional language, e.g. behind, in front of, above, below, on top, under, inside, and to talk about length when ordering the snakes.

- Set out objects, e.g. cones, shapes, toys, in repeating patterns of, e.g. type, colour, encourage children to describe and continue the patterns, and create their own. **4**

Variation: ask children to sort objects into sets by, e.g. colour, shape.

### Sand, water and messy play

- Bury collections of small objects of different types, e.g. plastic lids, shells, pebbles, in wet sand for children to find and sort, then find how many in each set by grouping them into Numicon Shape patterns. Encourage them to think about different criteria for sorting, e.g. type, size, colour. **5**
- Push straws of different colours and lengths into wet sand so that the length left above the sand is the same. Ask children to pull out two straws and say how they compare, e.g. 'The yellow straw is longer than the pink one.'
- Increased challenge: children pull out a third straw and compare it to the first two, or pull out three or more at a time.
- Invite children to make modelling dough snakes, and compare and order them by length.

Can you make three snakes, all of different lengths?  
Can you make two snakes of the same length?

Children may also like to decorate their snakes with repeating patterns by scoring them with different marks or making impressions with different objects, e.g. pen lids, paper clips. **6**

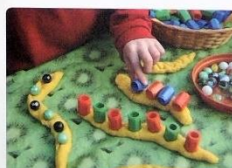
- Make Numicon number line head bands: children cut out Printable Numicon Shapes (available on the Oxford Owl website) and stick them on a strip of paper or card to show a number line, then join the ends to make a head band to wear and keep.

### Expressive arts and design

- Set up an area with, e.g. a piece of garden netting or a bicycle wheel into which children can weave different-length strips of interesting materials, e.g. fabric, ribbon, plastic from plastic bags, gift string. Encourage children to talk about what they are doing and how the design is developing, describing and comparing lengths, shapes and materials.

Why did you choose that ribbon?  
What shapes can you weave in?  
Could we weave that in again, but make it bigger this time? How?

- Provide outline pictures of snakes of different lengths for children to decorate with repeating patterns. They might create patterns of, e.g. thick and thin lines, large and small marks, different 2D shapes, different colours. Cut out and laminate the pictures for children to use in 'snake hide and seek' (see Outdoor maths and physical play).



## Stories, songs and rhymes

- Share and talk about stories that refer to length.
- Sing songs involving different lengths or add new verses to songs. Discuss these with children, encouraging them to describe and compare them, e.g. how a song is getting longer and longer.
- Recite new number rhymes with children, including numbers beyond 10.

## Other curriculum links

### Understanding the world – People and communities

- Role playing being at the vet's surgery.

### Understanding the world – The world

- Thinking about animals at the vet.
- Sorting and ordering objects, including natural objects.

### Understanding the world – Technology

- Grouping on-screen pictures into Numicon Shape patterns.

Provides information and ideas for intentional learning through play.

## Role play, small world and construction

- Work with children to devise ways of ordering and arranging equipment when it is set out at the start of the day or session. Encourage them to leave it the same way at the end.
- Provide several dressing-up items of the same type, e.g. aprons, scarves, shirts, skirts, in different lengths or sizes, for children to use and discuss. As children explore how the clothes fit, they will be discussing size and length.

## Numicon overview chart

	NURSERY	FOUNDATION	AGE 5-6	AGE 6-7	AGE 7-8	AGE 8-9	AGE 9-10	AGE 10-11		
TEACHING SUPPORT	1ST STEPS WITH NUMICON IN THE NURSERY KIT	NUMICON FIRM FOUNDATIONS KIT	<div>Teaching Resource Handbook and Implementation Guide</div> <div>(Number, Pattern, Calculating, and Geometry, Measurement and Statistics teaching packs available separately)</div> <div></div>						<div>NEW</div> <div>NUMICON ONLINE</div> <div>ONLINE PLANNING AND ASSESSMENT SUPPORT</div>	<div>ALSO AVAILABLE</div> <div>Investigations with Numicon:</div> <div>a supplementary teaching manual and apparatus pack to stretch able children in Key Stage 2.</div> <div></div>
APPARATUS			STARTER APPARATUS PACK A		STARTER APPARATUS PACK B		STARTER APPARATUS PACK C			
ASSESSMENT			<div>(Three Explorer Progress Books for</div> <div></div>		<div>Explorer Progress Books</div> <div>(Number, Pattern and Calculating, one for Geometry, Measurement and Statistics)</div> <div></div>		<div></div> <div>NEW</div> <div></div>			
ACTIVITIES FOR HOME	1ST STEPS WITH NUMICON AT HOME KIT		<div>Explore More Copymasters</div> <div></div>		<div>Explore More Copymasters</div> <div></div>		<div></div> <div>NEW</div>		<div>ALSO AVAILABLE</div> <div>Breaking Barriers</div> <div>designed specifically for pupils with SEND or those experiencing learning difficulties with maths.</div>	

- First Steps with Numicon in the Nursery
- First Steps with Numicon at Home
- Firm Foundations
- Numicon at the Seaside

### Teaching Resources Numicon 1- 6:

1. Teaching Resource Handbook
2. Implementation Guide
3. Explore More – extra activities or for home work
4. Pupil Books – Problem-solving for deeper learning and investigations (Numicon 3 – 6)
5. Explorer Progress Books – formative assessment

- Investigations with Numicon
- Breaking Barriers
- Big Ideas
- Numicon Intervention Programme

### Apparatus Packs

- Apparatus Packs – Starter Class and Starter 1:1
- Apparatus Pack A – Supports Numicon 1 and 2
- Apparatus Pack B – Supports Numicon 3 and 4
- Apparatus Pack C – Supports Numicon 5 and 6
- Breaking Barriers – Supports Breaking Barriers Teaching Pack
- Firm Foundations Apparatus Packs

### Starter Apparatus Pack A



### Starter Apparatus Pack B



### Starter Apparatus Pack C





# Numicon- Apparatus & Resources



Box of 80 Shapes



Grey Shapes and pegs



Pegs and baseboard



Little Box of shapes



Numerous number lines



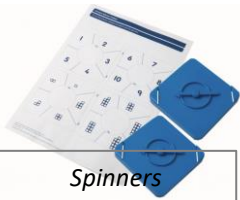
Intervention CD



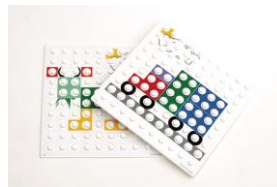
Pan Balance



Training DVD



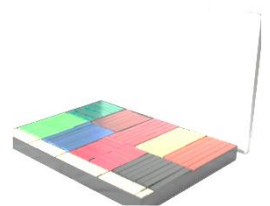
Spinners



Picture Overlays



Number overlays



Cuisenaire Rods



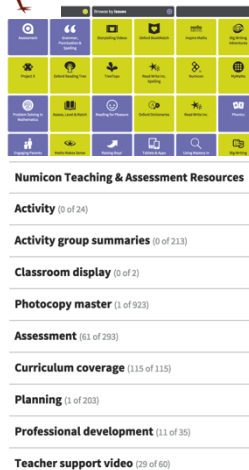
Large Foam Shapes



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