Numicon - all learners in NZC Levels 1-4

- Representational
- Can ‘see’ relationships
- Multi-sensory
- All strands
- Cross-curricular
- Intervention
- High Learning Needs/Gifted
- Evidence based
- Teaching Handbook & Implementation Guide
- Built in Assessment
- Homework support

Characteristics of the teaching activities

- Meaningful contexts
- Conversations and inquiry
- Exploring relationships and patterns
- Activities making connections with their real world, generalizing
- Sequential, explicit lessons with step-by-step illustrations
We often underestimate the difficulties children have understanding abstract ideas without pictures to help them. It's comparable to teaching children reading without any pictures in the books.

The Numicon shapes and patterns provide children with pictures of numbers that show the nature of numbers as well as their relationships. Numicon enables children to really 'see' how numbers and number system works.

The Numicon Approach – Communicating Mathematically, Exploring Relationships, Generalising

Explicit and progressive activities helps teachers provide a comprehensive programme of learning for all children. They teach with confidence.

It has been proven by research that by adopting the Numicon approach to maths and following the teaching programme, children are helped in securing the essential building blocks of maths understanding, giving them the best chance to be successful in maths all their lives.

What does it mean for children?
• Children enjoy the visual, practical open-ended activities
• Recognise the maths found in everyday situations
• Conversation enabling children of all abilities to achieve more.
• Confidence in themselves as mathematicians and persist in finding solutions.

What does it mean for teachers?
• Confidence and consistent teaching
• Seeing children understanding and enjoying maths!
• Assessment becomes very obvious- they can see what a child is thinking
• Sequenced approach and planning provided across the school and incorporating other curriculum areas
• Ongoing PD through the use of the Teaching Resources

www.numicon.co.nz
Numicon fits well with the NZ Curriculum and National Standards.

From preschool, the Numicon teaching activities develop **number and algebra together**. Children explore the **pattern, order, position and size of numbers** and understand them in relation to other numbers. They are introduced to the **language and actions of number operations** as equations and expressions. They explore all the strands’ concepts in the context of real life activities.

- Activities in all the strands interweave building confidence for strategies to be easily understood and applied in the context of everyday life
- Activities teach the application of a **range of different strategies** to solve problems and understand the connections between them.
- The same apparatus is used from early childhood through to illustrating mathematical concepts at Year 10!
- Language of maths is explicitly taught
- The activities build on previously learned concepts in a structured and inter-connected way.
- They **apply their number and algebra skills** to conduct investigations, solve problems, communicate their reasoning and apply them in all the strands of the mathematics curriculum.

<table>
<thead>
<tr>
<th>NUMICON</th>
<th>Firm Foundations</th>
<th>Numicon 1</th>
<th>Numicon 2</th>
<th>Numicon 3</th>
<th>Numicon 4</th>
<th>Numicon 5</th>
<th>Numicon 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Breaking Barriers</td>
<td>Breaking Barriers</td>
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<td>Breaking Barriers</td>
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<tr>
<td>Similar to NF Stages</td>
<td>0-3</td>
<td>0-4</td>
<td>Early 5</td>
<td>Late 5</td>
<td>6</td>
<td>7</td>
<td>8+</td>
</tr>
<tr>
<td>NZ Curriculum Levels</td>
<td>Early 1</td>
<td>1</td>
<td>2</td>
<td>2/3</td>
<td>3</td>
<td>4</td>
<td>4+</td>
</tr>
<tr>
<td>National Standards</td>
<td>By the end of Year 2</td>
<td>By the end of Year 3</td>
<td>By the end of Year 5</td>
<td>By the end of Year 6</td>
<td>By the end of Year 7</td>
<td>By the end of Year 8</td>
<td></td>
</tr>
<tr>
<td>Typical year level</td>
<td>Early Childhood New Entrants</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
<td>Year 5</td>
<td>Year 6</td>
</tr>
</tbody>
</table>
### Key Mathematical ideas in Numicon 1 - 4

Teaching Progressions can be found under Supporting Resources on [www.numicon.co.nz](http://www.numicon.co.nz). These show when to connect NPC and GMS into your programme during the year.

<table>
<thead>
<tr>
<th>Numicon 1</th>
<th>Number, Pattern and Calculating</th>
<th>Geometry, Measure and Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Counting objects to at least 30</td>
<td>• Making tiling, repeating and growing patterns</td>
<td></td>
</tr>
<tr>
<td>• Ordering numbers to 20</td>
<td>• Making, naming and sorting 2D and 3D shapes</td>
<td></td>
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<tr>
<td>• Counting in two’s, five’s, and ten’s</td>
<td>• Exploring properties of 2D and 3D shapes</td>
<td></td>
</tr>
<tr>
<td>• Understanding place value of 2-digit numbers</td>
<td>• Giving directions, describing, turns and rotations</td>
<td></td>
</tr>
<tr>
<td>• Reading, writing and understanding +, −, &lt;, &gt;</td>
<td>• Comparing and ordering mass, capacity and length</td>
<td></td>
</tr>
<tr>
<td>• Adding and subtracting facts to 10</td>
<td>• Understanding time duration</td>
<td></td>
</tr>
<tr>
<td>• Recognising halves and quarters of wholes</td>
<td>• Telling the time to the hour and half hour</td>
<td></td>
</tr>
<tr>
<td>• Patterns and sequences of 2s, 5s, and 10s</td>
<td>• Understanding money</td>
<td></td>
</tr>
<tr>
<td>• Counting to 100 and beyond</td>
<td>• Making and classifying polygons</td>
<td></td>
</tr>
<tr>
<td>• Comparing and ordering numbers to 100</td>
<td>• Identifying/descending faces, edges, vertices of 3D</td>
<td></td>
</tr>
<tr>
<td>• Recognise the place value of 2-digit number</td>
<td>• Symmetrical patterns, identifying lines of symmetry</td>
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<tr>
<td>• When/how to add/subtract to solve problems</td>
<td>• Identifying and naming prisms</td>
<td></td>
</tr>
<tr>
<td>• Adding and subtracting facts to 20</td>
<td>• Exploring fractions of rotations</td>
<td></td>
</tr>
<tr>
<td>• Working with multiplying and dividing</td>
<td>• Creating block graphs and bar graphs</td>
<td></td>
</tr>
<tr>
<td>• Recognising halves, quarters and thirds of wholes</td>
<td>• Telling the time to five minutes, including quarter past/to the hour</td>
<td></td>
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<tr>
<td>• Understanding fractions as numbers</td>
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</table>

<table>
<thead>
<tr>
<th>Numicon 2</th>
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<tbody>
<tr>
<td>• Developing fluency - + - in 2- and 3-digit numbers</td>
<td></td>
<td></td>
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<tr>
<td>• Exploring multiplying and dividing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Partitioning 2- and 3-digit numbers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Comparing and ordering numbers to 1000</td>
<td></td>
<td></td>
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<tr>
<td>• Using apparatus and imagery in + - x ÷</td>
<td></td>
<td></td>
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<tr>
<td>• Understanding fractions of a wholes &amp; numbers</td>
<td></td>
<td></td>
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<tr>
<td>• Using fraction notation</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Numicon 3</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>• Understanding place value in 4-digit numbers</td>
<td></td>
<td></td>
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<tr>
<td>• Ordering and comparing numbers to 1000+</td>
<td></td>
<td></td>
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<tr>
<td>• Developing fluency with mental and written methods for adding and subtracting</td>
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<td></td>
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<tr>
<td>• Developing fluency with multiplying and dividing facts to 12 x 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Developing fluency with mental and written methods for multiplying and dividing</td>
<td></td>
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<tr>
<td>• Exploring negative numbers</td>
<td></td>
<td></td>
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<tr>
<td>• Exploring decimal fractions</td>
<td></td>
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<tr>
<td>• Exploring equivalent fractions</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Numicon 4</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>• Sorting/classifying triangles and quadrilaterals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Making/identifying symmetrical figures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Making/identifying types of angles in polygons</td>
<td></td>
<td></td>
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<tr>
<td>• Plotting /reading co-ordinates in the first quadrant</td>
<td></td>
<td></td>
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<tr>
<td>• Describing/drawings translations on a co-ordinate grid</td>
<td></td>
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<tr>
<td>• Measuring mass, capacity and length using decimals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Calculating area and perimeter of rectilinear shapes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Collating, comparing, presenting monetary data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Reading/creating tables and graphs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Telling the time (analogue/digital 24-hour clocks)</td>
<td></td>
<td></td>
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<tr>
<td>• Time duration</td>
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</tbody>
</table>

**Breaking Barriers** covers a summary of the concepts in Numicon 1, 2 and 3 at a pace to enable students with high Learning Needs to participate in the same class environment as their peers. Numicon supports inclusive education practice.

**Numicon Intervention Programme** covers the key mathematical ideas in Numicon 1, 2, and 3 in a 12-15 week intervention either as part of the classroom environment or in a separate environment. A Diagnostic Assessment in mathematics determines the starting point and teaching programme for each student to close the gap between the students who are struggling and their average-achieving peers.

‘**Investigations with Numicon’** teaching book contains ten open-ended investigations with a low threshold and high ceiling, with the potential to stretch children to Level 3 and beyond of the NZ Curriculum. Suitable for bright children in maths, including bright children who are not succeeding in mathematics known as ‘twice exceptional’.
Key Mathematical ideas in Numicon 5 and 6

Teaching Progressions can be found under Supporting Resources on www.numicon.co.nz. These show when to connect NPC and GMS into your programme during the year.

<table>
<thead>
<tr>
<th>Numicon 5</th>
<th>Numicon 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reading/working -digits &amp; multiples to seven places</td>
<td></td>
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<tr>
<td>- Interpreting negative numbers in context</td>
<td></td>
</tr>
<tr>
<td>- Recognise/describe linear number sequences, rules</td>
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<tr>
<td>- + And - numbers 4 plus digits, algorithms reasoning</td>
<td></td>
</tr>
<tr>
<td>- Square numbers (2) and cubed (3)</td>
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<tr>
<td>- Scaling by simple fractions and simple rates</td>
<td></td>
</tr>
<tr>
<td>- Fractions –multiples, equivalent, tenths and hundredths, mixed, improper fractions</td>
<td></td>
</tr>
<tr>
<td>- + And – fractions, x proper fractions/mixed numbers</td>
<td></td>
</tr>
<tr>
<td>- Decimal -fractions, hundredths, tenths &amp; decimal equivalents, rounding</td>
<td></td>
</tr>
<tr>
<td>- Per cent %, fraction and as a decimal</td>
<td></td>
</tr>
<tr>
<td>- Percentage &amp; decimal equivalents of 1/10, 1/100, with a multiple of 10 or 25</td>
<td></td>
</tr>
<tr>
<td>- Convert between different units of metric measure and solve problems involving converting between units of time</td>
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<tr>
<td>- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres</td>
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<tr>
<td>- Calculate and compare the area of rectangles</td>
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<tr>
<td>- Estimate volume</td>
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<tr>
<td>- Use all four operations to solve problems involving measures using decimal notation, including scaling.</td>
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<tr>
<td>- Angles -drawn, measured in degrees</td>
<td></td>
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<tr>
<td>- Line graphs, complete, read and interpret information in tables, including timetables</td>
<td></td>
</tr>
<tr>
<td>- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to 3 decimal places where appropriate</td>
<td></td>
</tr>
<tr>
<td>- Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3 decimal places</td>
<td></td>
</tr>
<tr>
<td>- Convert between miles and kilometres</td>
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<tr>
<td>- Recognize that shapes with the same areas can have different perimeters and vice versa</td>
<td></td>
</tr>
<tr>
<td>- Recognize when it is possible to use formulae for area and volume of shapes</td>
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</tr>
<tr>
<td>- Calculate the area of parallelograms and triangles</td>
<td></td>
</tr>
<tr>
<td>- Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm³) and cubic metres (m³), and extending to other units [for example, mm³ and km³]</td>
<td></td>
</tr>
<tr>
<td>- Draw 2-D shapes using given dimensions and angles</td>
<td></td>
</tr>
<tr>
<td>- Recognize, describe and build simple 3-D shapes, including making nets</td>
<td></td>
</tr>
<tr>
<td>- Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons</td>
<td></td>
</tr>
<tr>
<td>- Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius</td>
<td></td>
</tr>
<tr>
<td>- Recognize angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles</td>
<td></td>
</tr>
<tr>
<td>- Describe positions on the full coordinate grid (all 4 quadrants)</td>
<td></td>
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<tr>
<td>- Draw and translate simple shapes on the coordinate plane, and reflect them in the axes</td>
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<tr>
<td>- Interpret and construct pie charts and line graphs and use these to solve problems</td>
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<tr>
<td>- Calculate and interpret the mean as an average</td>
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</tbody>
</table>
GMS is integrated logically to link in with the learning in NPC.

Numicon covers all the strands in a meaningful and logical way that helps children make the connections between the strands and to an everyday life context.
Numicon – Printed resources

Implementation Guide
Teaching Handbook: Long, medium and weekly plans

Milestones to achieve throughout the year & linked to assessment booklets - Explorer Progress

Educational context
Assessment opportunities
Explorer Progress link
Learning opportunities
Words and terms for use in conversation

www.numicon.co.nz
Focus activities

Activity 1: Creating a timetable for today

Home ready: A sheet of paper to draw images of events on.

Step 1
Ask children what are you going to do today? (Encourage them to describe activities or pets they will do.) Each child will draw a simple representation of each one of the events on a separate piece of paper. e.g. Fig. 1.

Step 2
Discuss with the children that there are so many different things happening during the day that it can be hard to remember them all. Ask how they could use the pictures of events to help remind them. Look and listen for children who suggested rearranging the pictures in the order they happen, to create a timetable. Encourage children to arrange the events into the correct order and to describe the activities they are making. Look and listen for children who use language such as before, after, and next.

Step 3
Ask children if they can put their days of the week in order and discuss what they are doing with that partner, look and listen for children using language such as better, after, and next.

Step 4
Ask children what happens when it gets to bedtime. Talk about how they could show that the days continue. Look and listen for children who arranged their photo booklets to illustrate the children’s weekly routine. Ask children what day they think should be at the top of the circle. Then, demonstrate a clock face. Ask each child to show their partner which day they think is next, and why. Encourage children to read the days of the week can say what their partner does on that day.

Activity 2: Days of the week and weekends

Home ready: A sheet of paper recording days of the week.

Step 1
Ask children if they know the days of the week, encouraging them to discuss and give their answers. Talk about how babies have names for the days of the week. Ask children who suggested that we label the days so that we know what order they come in and can talk about when things happen. Make a list of the days of the week on a piece of paper and cut them out. Ask children to separate them into five days and cut them out. Ask children if they know which days are the first and last days of the week. Ask children if they can separate their pictures into the correct days of the week.

Step 2
Ask children to put their pictures in order and discuss what they are doing with that partner. Look and listen for children using language such as better, after, and next.

Activity 3: Sequencing months and birthdays

Home ready: Twelve photo boxes with a hole in each. Red, yellow, and blue paper.

Step 1
Ask children how many seasons they have, and if they know the names of them. Discuss what they know about the weather, e.g. type of weather or particular landmarks. Ask children to separate them into seasons. Ask children if they know which months are the first and last days of the week.

Step 2
Ask children to put it in a box when they know their birthday. Ask children if they can separate their pictures into the correct days of the week. Ask children if they can separate their pictures into the correct days of the week.
Enhance teachers’ subject knowledge, pedagogy and therefore their confidence

Progression, support and challenge for children of all abilities

Skills children in mathematics for ‘secondary readiness’ and beyond

Sense of achievement and confidence for child by ‘actively’ doing maths

Numicon does make a difference!

Easy Buy Packs
• Number Pattern Calculating
• Geometry Measurement Statistics

Apparatus Starter Packs

All products can be purchased separately

Budget for PLD to get the most from NUMICON

www.numicon.co.nz
Assessment – Assessment Opportunities, Gathering Evidence, Tracking

Within the Teaching Handbook, on the introductory page, in every Activity Group, there are details of what to look and listen for.

Assessment opportunities

Look and listen for children who:
• Use the words and terms for use in conversation effectively.
• Name common 3D shapes, irrespective of size and orientation, e.g. cube, cuboid, pyramid, sphere, cylinder, cone.
• Name common 2D shapes, e.g. square, oblong, triangle, pyramid, circle.
• Use the names of 3D shapes to describe real-life objects.
• Distinguish between 2D and 3D shapes.
• Describe the differences between a cube and a cuboid, e.g. a cube has all square surfaces.

Assessment activities in the Explorer Progress Books allow a student to demonstrate their understanding in a new context, provide an independent record and evidence of their learning.

After every four or five Activity groups a summary of what has been covered and tracked for each student at a Milestone.

A record to track the learning at each Milestone is included in the Teaching Handbook

• Track key concepts and skills
• Gives you confidence in tracking over time
• Integrated into medium-term planning

Intervention – 12-15 weeks

The Numicon Intervention Programme provides training and resources for effective maths intervention with students from Years 3 - 11.

• diagnostic assessment
• qualitative assessment
• targeted activities
• guidance on planning
• assessing and reflecting on progress
• next steps beyond intervention

Resources required:
NIP Online Resources, NIP Guide Book and training Apparatus Pack A Intervention CD 1 Maths Bag per student

A school or RTLB cluster can only provide this programme after training has been received by a certified Numicon Consultant

Diagnostic Assessment
Standardized Testing

Analysis for the
starting point

Meeting with carers/
parents

Review of
Understanding

Intervention
Activities

Familiarization
Activities

Options of delivery:
• RTLB
• SENCO or Learning Support staff
• Classroom teacher
• Teacher Aide with teacher support

Familiarization for the starting point
Meeting with carers/parents
Diagnostic Assessment
Standardized Testing
Numicon Intervention Programme

Designed specifically for using with students with delay in Years 3-11, covering Level 1 and Level 2 of the NZ Curriculum in Number, Pattern & Algebra, Early Measurement. 12-15 week intervention.

NIP:
- Introduction to school and families
- Diagnostic Assessment
- Planning and Activity Guidance
- Familiarization Lessons
- Intervention Lessons
- Record of Progress
- Homework Resources Guide
- Photocopy Masters

Resources:
- Numicon Intervention Programme Guide
- Numicon Intervention Programme On line support
- Apparatus Starter Pack A Class
- Apparatus Starter Pack A 1:1
- Maths Bag
- NIP Intervention CD

Maths Concepts Link with Numicon 1, 2 and 3

Concepts covered:

Counting Skills to 1000

Pattern & Algebra
- Patterns
- Equivalence
- Odds and evens
- Reasoning
- Greater and less than, < and >
- = sign

Number and the Number System
- Exploring shapes
- Ordering shapes
- Numbers and ordering to 10
- Numbers and ordering to 20, 100
- Grouping in 10’s to 100
- Place value to 100
- Skip counting in 2’s 5, 10’s
- Money, and using money

Calculating
- Addition and subtraction to 10, 20
- + and – symbols
- Money- coin equivalence
- Fractions
- Multiplying and dividing
- X and ÷ symbols

Numicon Starter Apparatus Pack A, Group

Maths Bag and NIP CD
Designed specifically for using with students with High Learning Needs covering Level 1 and early Level 2 of the NZ Curriculum in Number, Pattern & Algebra, Measurement. Links with NPC & GMS 1, 2 and 3 for a complete programme.

Breaking Barriers covers:

**Counting Skills**

**Pattern & Algebra**
- Patterns
- Equivalence
- Odds and evens
- Reasoning
- Greater and less than, < and >
- = sign

**Number and the Number System**
- Exploring shapes
- Ordering shapes
- Numbers and ordering to 10
- Numbers and ordering to 20
- Grouping in 10’s to 100
- Place value to 100
- Skip counting in 2’s, 5’s, 10’s

**Calculating**
- Addition and subtraction to 10
- + and – symbols
- Money- coin equivalence
- Simple Fractions
- Practical Multiplying and dividing
- X and ÷ symbols

Resources:
Breaking Barriers Teaching Pack $200
Breaking Barriers Class Apparatus Pack $400
Breaking Barriers 1:1 Apparatus Pack $240

 Prices are subject to change
Early Childhood and New Entrants

Firm Foundations
- Learning through play
- Learning the patterns and gaining “number sense”
- Using the patterns in applied arithmetic
- Addition and Subtraction

Breaking Barriers equivalent to Numicon 1 and 2, but differentiated for greater inclusion and support for intervention and students with learning/high learning needs at NZC Levels 1-2 - for any age

School Years: Numicon 1 – 6
Teaching Packs

Assessment Booklets

Extra activities of support for home and school

Apparatus Packs A, B, C

Investigations with Numicon
- Gifted & Talented Programme
- Dyslexic students love this!
- Encourages mathematical thinking
- Open investigations with mathematical concepts, ideal for G & T exploration days

Further Information
- Replacement books and apparatus are available
- Many schools purchase class sets of little boxes and add them to the student stationery list along with the Assessment booklets
- Use the little boxes of shapes with your class while using the interactive whiteboard software
- Numicon pieces are weighted allowing use of a pan balance and a natural link to understanding equivalence
- The training DVD is a great resource for ongoing PD
- In-school PD is available
- Further support at our website and Oxford Owl

Testimonials
- “We were really floundering until we began working with Numicon”
- “My student has made more progress in these five weeks than he did with five weeks on a regular programme”
- “It is the highlight of my student’s day!”
- “Planning is so easy now.”
- “What I have learned in teaching my student using Numicon, has carried over into other subject areas- the small steps.”
- “We were amazed at the success of Numicon in our remedial programme. The knowledge stayed with the children and they were able to take it back into their regular programme with confidence!”
- “The training course really helped me gain better understanding of the programme and the decision to implement it as our school Maths curriculum.”
- “We are very impressed that our Year 1 students are well through the equivalent of Stage 4 NPD and onto Stage 5!”

www.Numicon.co.nz
0800 678 581