

Online Numicon Firm Foundations Sample





Firm Foundations Revised Edition



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OXFORD

Numicon Firm Foundations: Using this Teaching Folder

Numicon Firm Foundations is a comprehensive teaching programme providing children with engaging activities through which they explore mathematical ideas every day, indoors and outdoors. It is based on a proven approach to teaching and learning mathematics that builds deep understanding for every child, firmly placing the teacher as an exemplar mathematical communicator.

Section 1: Teaching Guide

What's special about the Numicon Approach Key mathematical ideas What's in the Numicon Firm Foundations Starter Apparatus Pack? Glossary of mathematical terms Using the Numicon Online planning and assessment support

Section 2: Putting Numicon into Practice

Your Numicon classroom Daily routines with Numicon How to use the Activity Cards

Section 3: Activity Cards

Index to Activity Cards (serves as Long term planning) Everyday counting with Numicon Activity Cards 1–18

Section 4: Planning and Assessing

Medium-term planning Assessing children's mathematical communicating Record of progress

Section 5: Photocopy Masters

Supporting teachers



Inverse relationships – doing and undoing

Actions that have an opposite effect to each other are said to have an inverse relationship to each other. For example, **adding** and **subtracting** have an opposite effect to each other in the sense that we can always 'undo' adding by subtracting the same amount, and vice versa.

Inverse relationships become increasingly important as children progress in mathematics; they allow us to retrace our steps, and they also allow us to confirm that actions and calculations have been carried out correctly. Very importantly for young children following the Numicon approach, the grouping activities that we encourage (see **Grouping and place value** on page 16) can later easily be 'undone' to *partition* numbers, for example into tens and ones, to help children with their calculating methods.

Order, sequences and direction

Two kinds of ordering are important in our mathematical communicating: ordering that depends on **comparing** and ordering that is simply a matter of convention. When we ask children if they can put number rods in order, we are hoping that they will do this by comparing rods with each other physically, and then order them according to the lengths of the rods, or their sizes.

When children are learning the order of number names – one, two, three and so on – they are learning a purely conventional sequence of words that has no rhyme or reason to it, in just the same way as they learn the sequence that we call the alphabet. Learning a conventional sequence of words or letters is simply a blind memory task, whereas ordering that depends on comparisons involves some thought and important **reasoning**.

Key words that children learn to use in relation to ordering either kind of sequence, are 'next', 'after' and 'before'. Generally speaking, the kinds of ordering and sequences that are most important for children's mathematics in the future are sequences that have some kind of regular pattern to them, for example, red, blue, red, blue. The important point is that children can **generalize** about a regular sequence; they can spot a rule that means they can predict what will come next and continue the sequence for as long as they want.

This kind of generalizing about sequences will be of vital importance to children as they work out the rules of our **place value** number naming system and learn that, for example, the name of the next number after 34 must be 35, if we follow the rules. It is only by generating number names according to a consistent set of rules that we are able to go on inventing our sequence of number names, in order, forever.

Importantly, things lined up in order are ordered in two directions: forwards and backwards. So, when ordering things, children are experiencing direction too, and it is almost always important for children to experience a particular order in both directions, such as **counting** forwards and backwards.

Your Numicon classroom

Showing that we use numbers every day

You can do this by providing Numicon Shapes, Numicon Coloured Pegs, number rods and numerals alongside a wide range of other resources: in sand, in water, with modelling dough, in creative activities, with construction equipment, in the larger playground, with wheeled toys, alongside small-world apparatus, in role-play, on displays and to illustrate numbers in songs, rhymes and stories.

Numicon Number lines



Have these close by for whole-class discussion and within children's easy reach.



Have Numicon Large Format Tabletop Number Lines available for children as they work and play.

Numicon signs



Make these to show how many children may use each area.

Storage labels

Label storage trays with numerals as well as words, and arrange them in numerical order.



Number storage pots to show how many pencils, crayons, pairs of scissors they should contain.

Objects featuring numerals

Frequently refer to calendars, clocks, timetables, the register, pages in books, etc.



In role-play, e.g. computer keyboards, cash tills, a telephone, etc.

Display charts





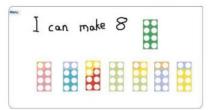
Display attendance and birthday charts at children's own height and talk about them regularly.

Outdoor play



Provide number lines and number resources, e.g. Numicon buckets, pocket dice and objects for making Numicon Shape patterns outdoors.

Numicon IWB software



Make good use of the <u>Numicon IWB</u>, tablets and computers.

Assessing children's mathematical communicating

Learning about number patterns and relationships continued

Activity Cards 7–18 introduce practical adding and subtracting to help children develop the depth of understanding needed for future learning and required for the Early Learning Goals. Listen for children saying full number sentences and recalling numbers facts in activities around the setting.



Can you spin a number and make the pattern?

Can you see how many you have from looking at the pattern without counting?

If you took 4 counters away, how many would you have?

If you make the 4-pattern, how many more would you need to make the 8-pattern?



What number are you making? Which Shapes have you used for each layer? Can you remember the Shapes you have used to make 8?



How could you show '7 take away 3' with Numicon Shapes? Can you say the subtracting sentence?

If 7 frogs were in the pond and 2 hopped away, how many would be left?

What take away story can you show and say?



Can you show double 2 with the Shapes?' What other doubles could you show?' What doubles can you remember?



Can you choose two Shapes, put them together and say the adding sentence? Which number are you going to make next? Which two Shapes will you choose to make it?

Which other Shapes could you use?



Have you got the right number of legs? What could you do to put that right? Good thinking! You had 7 legs and added 1 more to make 8.

Teaching progressions for the year Each Activity Card is two weeks of learning

Activity Card	Focus
Activity Card 1:	Introducing Numicon Shapes
Activity Card 2:	Ordering Numicon Shapes
Activity Card 3:	Introducing Numicon Shape patterns and number rods
Activity Card 4:	Linking Numicon Shapes with number ideas and numerals
Activity Card 5:	Linking numerals with Numicon Shapes, and ordering number rods
PLE Card 6:	Finding how many by grouping, and teen numbers
Activity Card 7:	Adding with Numicon Shapes
Activity Card 8:	Adding 1 more
Activity Card 9:	Subtracting – finding the difference
Activity Card 10:	Subtracting – taking away
Activity Card 11:	Doubling and halving
Activity Card 12:	Subtracting 1, connecting increase and decrease
Activity Card 13:	Halving and sharing
Activity Card 14:	How many more, how many fewer?
Activity Card 15:	Adding parts and wholes
Activity Card 16:	Subtracting – parts and wholes
Activity Card 17:	Connecting adding, subtracting and number lines
Activity Card 18:	More teen numbers, adding and subtracting facts

Medium-term planning

Activity Cards

Activity Card 4 Linking Numicon Shapes with num SSM focus. Exploring capacity of various container	
 Activities with Numicon structured manipulatives 1. Counting the holes in Numicon Shapes 2. Building towers with Numicon Shapes and Pegs 3. Matching Numicon Shapes with numerals 	 Learning opportunities To count up to 10 objects accurately. To join in counting to find 'how many?' To begin to compare outcomes of counts, saying which represents more and which fewer. To give number names to Numicon Shapes. To label Numicon Shapes with numerals. To recognize that the number idea 3 can be represented in many different ways. To begin to compare and order number rods by length. To compare the capacities of different containers. To use ordering and sorting to organize classroom play resources.
Activity Card 5 Linking numerals with Numicon S SSM focus. 2D and 3D geometric shapes	ihapes, and ordering number rods
 Activities with Numicon structured manipulatives 1. Read the numeral, find the Shape 2. Visualizing Numicon Shape patterns 3. Finding 'how many?' with Numicon Shape patterns 4. Building Numicon Shape patterns 5. Exploring rods 	 Learning opportunities To make links between Numicon Shapes, Numicon Shape patterns, numerals and numbers. To find how many objects there are by counting accurately and by making and/or recognizing Numicon Shape patterns. To recognize that the number idea 4 can be represented in many different ways. To compare and order rods by height. To use informal positional language, e.g. next to, between. To describe parts and properties of cuboids and cylinders.
Activity Card 6 Finding how many by grouping, a SSM focus. Length	nd teen numbers
Activities with Numicon structured manipulatives 1. Checking estimates with Numicon Shape patterns 2. Finding how many pictures on gift wrap 3. Comparing and ordering rods	 Learning opportunities To use Numicon Shapes, Numicon Shape patterns, numerals and number names confidently to represent number ideas. To begin to group objects into Numicon Shape patterns as an efficient way of finding out how many there are. To begin to represent numbers greater than 10 with Numicon Shapes and Numicon Shape patterns. To recognize that the number idea 5 can be represented in many different ways. To put number rods in order of size. To compare lengths in a range of different situations. To sort objects into sets. To create repeating patterns.

Finding how many by grouping, and teen numbers



Encourage children, through these activities, to extend their counting range from 10 up to 20 and, as they are ready, beyond.

Pointing to the Numicon Display Number Line while counting aloud helps children connect the patterns they hear with those they see.

Children estimate the number of Numicon Coloured Peas shown on a Baseboard in Activity 1. which provides a further opportunity to check their subitizing of quantities up to 5.

They apply their ability to make 1–10 Numicon Shape patterns in order to group larger quantities into Shape patterns to find 'how many' for quantities greater than 10.

While exploring the Numicon Number Rod Trays, children put 10 number rods in order, describing the position, relationships and patterns in the ordered set of rods.

Children also compare, order and begin to measure length in a variety of contexts. The important term 'equal' is introduced as a natural part of conversation about this work.

Children explore representations of number 5 their counting and number ideas book,

> ow up on the Home learning activity for Card 6: Five Dancing Starfish (available in at the Seaside - At Home).

Watchpoints

fe

Encourage pronunciation of the '-teen' part of the number name, to avoid later confusion with '-ty' (e.g. the confusion of 'thirteen' with 'thirty').

Some children put a 1-shape at the top right of a 10-shape to show 11, continuing the 'staircase' pattern. This shows them the 'quantity value'. But when they are grouping objects to find 'how many' they put the Numicon Shape patterns side by side, which shows the place value of each digit. Give children opportunities to show numbers to 20 in both ways.

Key mathematical ideas (Teaching Guide, page 8)

The focus is on:

Counting, not-counting - seeing numbers as whole objects, one-to-one correspondence, grouping and place value - naming whole numbers

Children will also encounter:

Contrasting, order, seque relationship, shape and st

Key Mathematical Ideas provide a summary of the important concepts covered this week

Communicating

Model these words and terms, and listen for children using them in the same ways as you use them:

- · Words for counting, e.g. number names (one, two, three, ...), teen numbers, how many?
- · Words for comparing length and quantity, e.g. longer, longest, shorter, shortest, between, equal, the same
- Words for action, e.g. group, arrange, order, estimate, guess, fill, build a pattern

Learning opportunities

- To use Numicon Shapes, Numicon Shape patterns, numerals and number names confidently to represent number ideas.
- To begin to group objects into Numicon Shape patterns as an efficient way of finding out how many there are.
- To begin to represent numbers greater than 10 with Numicon Shapes and Numicon Shape patterns.
- To recognize that the number idea 5 can be represented in many different ways.
- To put num Learning Opportunities are linked
- To compare
- with the Assessment opportunities, To sort object
- detailing the range of Focus Activities To create r

Assessing

Look and listen for children who:

- Recite the count sequence to 20 with correct pronunciation.
- Begin to represent numbers greater than 10 with Numicon Shapes and Numicon Shape patterns.
- Compare the length/width/height of different objects.
- Describe two objects that are the same length as being of equal length.
- Devise simple repeating patterns.
- Order number rods 1–10.
- Arrange and organize equipment in a logical way.

Assessment is recorded to provide a record of learning that is stored in the Assessment Tracker

All doing maths together with Numicon

Select activities from:

- Daily routines with Numicon
- Everyday counting with Numicon

Also:

- Count with children along the Numicon Display Number Line.
 Discuss that the Numicon Shapes 1–9 repeat to show 11–19.
- Emphasize clear pronunciation of '-teen' to avoid later confusion with '-ty', e.g. between 'thirteen' and 'thirty'.
- Involve children in ordering a row of Numicon Shapes on the <u>Numicon Interactive Whiteboard</u> <u>Software</u> to show numbers 1–20. Start by ordering Numicon Shapes 1–10.



What will the next number be?

How could we show 11 with Numicon Shapes?

Some children may suggest putting the 1-shape at the top of the 10-shape to show 11, continuing the staircase pattern of Numicon Shapes.



Others may suggest the image they have seen on the Numicon Display Number Line, where the Shapes are side by side.

What do you notice about 11 on the Display Number Line?

• Agree to build the staircase pattern to 20, showing how the numbers grow.

What patterns can you see?

 At different times, invite children to look carefully at the Display Number Line.

What patterns do you notice?

Point to the numeral 1 in 14 and ask:

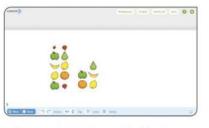
I wonder what this '1' means?

- Repeat these activities often, asking children to help you show different numbers to 20 with Numicon Shapes.
- Show collections of objects or display items on the <u>Numicon IWB</u>. Start with fewer than 10 objects. Ask children to think carefully about how many there are.

How could we check our estimate?

Could we check our estimate without counting one by one?

 Over future sessions repeat and extend to 11–20 objects, making 10-shape patterns first and then arranging the remaining objects.



• Use number rods on the <u>Numicon</u> <u>IWB</u> or a magnetic board and involve the children in helping to put the rods in order of size.

Learning about number patterns and relationships

Activities with Numicon structured manipulatives

Activity 1 Checking estimates with Numicon Shape patterns

Have ready: Numicon Shapes, Numicon Baseboards, Numicon Coloured Pegs, <u>Numeral Cards 1–10</u> (cut from photocopy master 2), Numicon Large Format Tabletop Number Line

Put 10 or fewer Pegs on the Baseboard, at random. Children estimate how many there are and then find out by grouping them into Numicon Shape patterns (without counting). They check by fitting Shapes over the Pegs and matching them to a Number Line.





Can we use Numicon Shape patterns to find how many there are?

Repeat with different numbers of Pegs.

Activity 2 Finding how many pictures on gift wrap

Have ready: Numicon Shapes, Numicon Coloured Pegs, Numicon Baseboards, Numicon Display Number Line, gift wrap with repeating pictures

Provide gift wrap illustrated with between 10 and 20 pictures.

Children estimate the number of pictures and then check by 'tagging' each picture with a Numicon Peg or counter, arranging them in Numicon patterns to show the total. They say the number and find it on the Number Line.





Increased challenge: use paper with more than 20 pictures

Activity 3 Comparing and ordering rods

Have ready: number rods, Numicon Number Rod Trays

A child starts by putting the smallest rod into the orange Number Rod Tray and passing the Tray to the next child, who puts in the next size rod. Continue to pass the Tray around the group, with children adding the next size rod until the rod staircase is complete.



Which rods are shorter than the yellow rod? Which rod is the shortest? Which is the longest?

Children choose a different Number Rod Tray and experiment to find which rods to put in order in their Tray. **Increased challenge:** can children put a set of 1–10 rods in order, on the table, without the Number Rod Tray?



Maths games and puzzles

- Children practise Activities 1 and 2 independently. Vary by providing different counters.
- Using the <u>Numicon IWB</u> or computers, group pictures into Numicon Shape patterns.
- Invite children to make repeating patterns threading beads onto laces.

Which lace are you going to use?

Can you tell us about your pattern?

- Provide a selection of jigsaws and games that show numbers 1–10 and 1–20.
- Provide the number rods and Number Rod Trays for children to continue exploring putting rods in order, making patterns and filling the Trays completely.

Counting and number ideas book

Have ready: children's starfish pictures (see 'Expressive arts and design'), prepared page for exploring number 5, Numicon Shapes, pencils, coloured pencils/felt-tip pens/crayons in the Numicon colours, pipe cleaners, a small amount of modelling dough, glue stick, selection of small natural objects, small play people and Numicon Coloured Pegs

How will you use a pipe cleaner to make numeral 5?

What Numicon Shapes can you put together to make 5?



Exploring maths all around us

Stories, songs and rhymes

- Share and talk about stories that refer to length. Where appropriate, have a basket with the book and objects of different lengths from the story for children to handle, talk about and compare the different lengths, e.g. a collection of ribbons, ties or scarves.
- 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.
- Read stories and information books about pets and vets; use this learning to set up a vet roleplay. Introduce and then listen for children using new vocabulary as they play.

Healthy food activity

 Snack-time challenge: give the children a plate of apple pieces, (vary from 3–6 pieces). Ask children to sit with a friend and compare the amounts on the two plates.

Do you have fewer, more or an equal number of pieces of apple?

How many more/fewer pieces would you need to have an equal amount?

 Have a plate of extra pieces and serving tongs so children can make their shares equal.

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 in 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.

· Set up a role-play vet's surgery or toy hospital with different-sized toy animals and bandages for children to play with and talk about.

Which bandage will you use for this teddy? Why?

• Include a cash register, coins and blank 'forms' for children to use to pay for treatment, write invoices and receipts and so on.

How much will it cost to treat my horse?

 At the beginning or end of a session or day, set out objects, e.g. natural objects or toy cars, in lines of different lengths. Talk about the lines with children.

Which line is the longest?

Are there any lines of equal length?

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 and then find how many in each set by grouping them into Numicon Shape patterns.



 Push straws of different lengths into wet sand so that the lengths still showing above the sand are the same. Children pull out two straws and compare them.

Increased challenge: children compare three or more straws.

 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.



 Make Numicon number line head bands: children cut out Printable Numicon Shapes (photocopy master on Oxford Owl) and stick them on a strip of paper or card to show a number line. They join the ends to make a head band to wear.

Expressive arts and design

 Explore drawing shapes and making patterns with fine felt-tip pens. Then provide a cut-out Starfish Template for children to decorate creatively for the pumpo

5 page in thei number ideas

 Set up an area garden nettin can weave dif of interesting children to de lengths.

Activity Card 6: Starfish Cut out a starfish shape in caloured paper for each chile their starfish with fine fait tip pens ready to stick onto it



Why did you choose that ribbon? What shapes can you see?

 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 for use in outdoor play.

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, they 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?

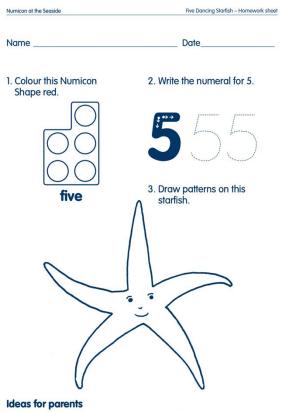
What shapes can you make?

- 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.
- 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.
- 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 to create their own.



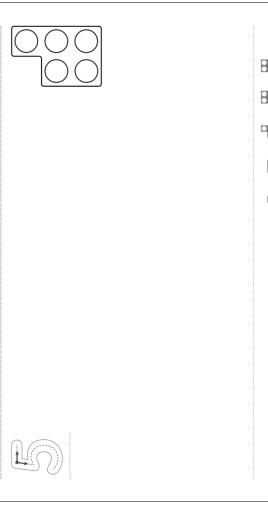
Understanding the world

Thinking about animals, learn about how to look after pets and explore the role of the vet.

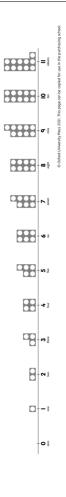


- Count the five points on the starfish, then count five points on stars, count five fingers, five toes, etc.
- Encourage your child to put small objects like pebbles, shells or toys into the Numicon pattern for 5 (copy the pattern in the Shape above).
- Demonstrate first, and then encourage your child to practise writing the numeral 5.

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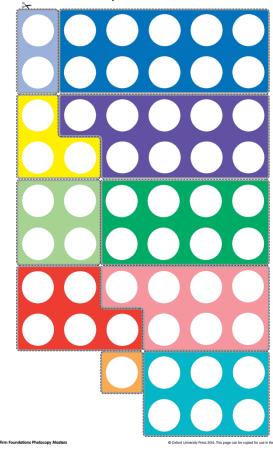


Numeral Cards 0–10

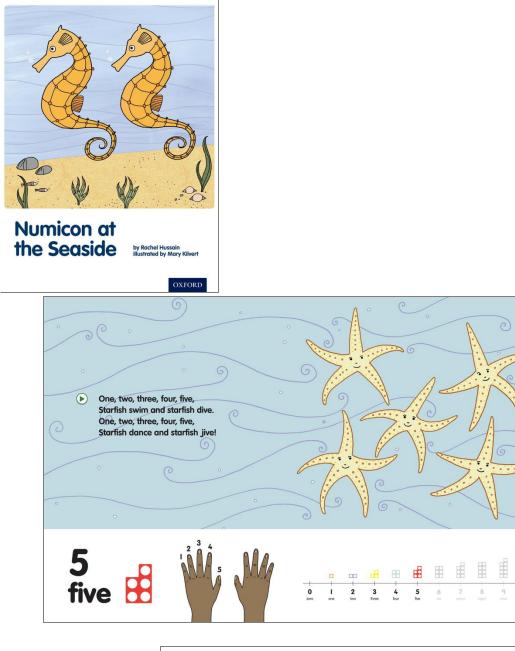
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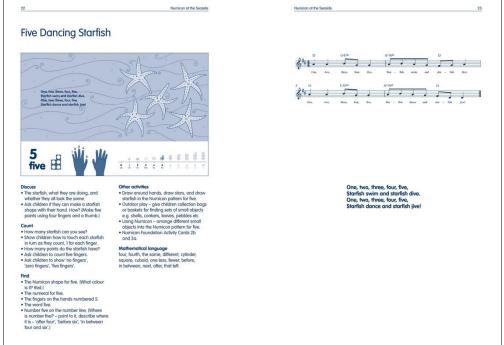
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3	4	5
6	7	8
٩	10	

Printable Numicon Shapes



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The Firm Foundations Tracker as a print file

Name/sTeacher/s	Class		
Record of progress	Notes:		
Child is able to:	Autumn	Spring	Summer
Recognize quantities of up to 20 objects arranged in Numicon Shape patterns (note range).			
Read numerals to (note range).			
Order numerals to (note range).			
Write numerals to (note range).			
Find the last number counted on the Numicon Display Number Line or 0–100 cm Number Line.			
Verbally count beyond 20, recognizing the pattern of the counting system.			
Beginning to calculate			
Respond to numbers and mathematical ideas in rhymes and stories, e.g. selects the right number of ducks when singing a number song.			
Show awareness that numbers can be put together to make a larger one when using Numicon Shapes.			
Use language for adding and subtracting informally as they play, (and, more, take away, makes, etc.).			
When using Numicon, show awareness that subtracting from a number results in a smaller number.			

In order to have a deep understanding of numbers to 10, including the composition of each number, children will need to achieve all the statements in practical adding, subtracting and sharing sections below.

Practical adding within 10 without counting	
Combine any two numbers totalling within 10, without counting, using Numicon Shapes and explain what they have done, e.g. says, 'I put 5 and 3 together and they make/equal 8'.	
Use Numicon Shapes for adding, in response to questions, e.g. How can you make 7? Can you add 4 and 5?	
Respond to an adding story, e.g. 'Two ducks are on the pond and two more come along' by showing the adding with Numicon Shapes and say, '2 and/add 2 equals 4'.	
Use Numicon Shapes when making up a story; e.g. combines a 2-shape and 3-shape and says, 'There were 2 children playing and 3 more came so there were 5 altogether'.	
Show and explain patterns within numbers up to and including 10, as they build Numicon Patterns with Pegs or counters, e.g. says, 'I've made the 4-shape pattern; I need 2 more to make 6'.	

3

The Firm Foundations Tracker as an xl file

Numicon Firm Foundations Record of Progress				
Class/Group				
name:				
Activity Card	Assessment Statement (Steps towards Early Learning Goals)		Notes	
7 and on	Predict what will come next to continue the repeating patterns.			
	Ordering			
	Child is able to:			
2	Apply comparisons to put alike things in order, e.g. order parcels by weight or toy bears by height.			
2	Put larger collections in order, e.g. nesting toys.			
2 and on	Order Numicon Shapes to (note range).			
2 and on	• Describe the position of objects in order, including Numicon Shapes and number rods, e.g. says, 'The 5-shape is in between the 4-shape and the 6-shape'; 'The 3-shape is next to the 2-shape'; 'The 3-shape is before the 4-shape'; 'The 4-shape is after the 3-shape'.			
6 and on	Order number rods to (note range).			
	Number			



Your next steps...

Find out how Numicon can make a difference in your school and discover Numicon's potential, arrange an appointment, or **Professional Development with us:**

Web: <u>www.numicon.co.nz</u> and <u>www.edushop.nz</u> Email: <u>info@numicon.co.nz</u> Phone: 0800 678 581

