numicon

Revised edition

An overview of Firm Foundations

Firm Foundations
Revised Edition

Includes updates for latest ELGs in England

OXFORD

About Numicon Firm Foundations

Numicon Firm Foundations is a comprehensive and varied programme of Maths activities for children aged 3–5. 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. The programme:

- Provides a balance of structured and explorative activities for all areas of the setting, indoors and outdoors
- Uses stories, songs and rhymes as well as cross-curricular links as a springboard for Maths learning
- Includes assessment opportunities throughout that guide the observation of children's developing mathematical understanding
- Covers the new Early Learning Goals as well as Shape, Space and Measure
- Includes 18 Activity Cards covering the Foundation Stage mathematics curriculum in England and support all other early years settings. Plus, support on putting Numicon into practice in the classroom, planning and assessing, and daily routine suggestions

Firm Foundations is a great addition to any Early Years setting looking to prepare children for Primary School.

Contents

Teaching Guide and Photocopy Masters

Dividing – sharing

The sharing situations that every child will experience as part of everyday life from their earliest days offer the beginning of work on dividing amounts and collections into equal parts. This is clearly related to **part-whole relationships** and to **fractions**, as in contexts of sharing we are almost always concerned with sharing equally between people. In other words, a given whole (called the 'dividend' in mathematics) is to be shared into two or more *equal* parts.

During the Foundation Stage we focus almost entirely upon halving, or sharing a whole into two equal parts, although sometimes children are asked to share amounts into more than two equal parts (see also **Fractions** on page 13 and **One-to-one correspondence** on page 12).

Preparing for multiplying

Early foundations for multiplying are laid in doubling activities, and in **counting** in twos, fives and tens. The key idea here is really that of equal repetition: an amount (such as a number of things, a length of time, a distance) is repeated exactly in some way, a number of times.

Repeating something exactly, several times, connects directly with the equal repetition that is involved in **dividing**; sharing a whole into several equal parts corresponds closely with situations in which repeated equal amounts 'add up' to make a larger whole. Dividing and multiplying are therefore **inverses** of each other; putting lots of equal amounts together to make up a whole is the inverse of dividing a whole into lots of equal amounts.

Later, children will learn that there is more to multiplying than repeated **adding**, but experiences of multiplying are limited to this at Foundation Stage.

Non-computational thinking – adjusting

In some activities, children will be invited to 'balance' calculating in ways that will be important for later non-computational thinking. For instance, if class birthdays are being monitored as two related and changing sets (for example, a set of 4-year-olds and a set of 5-year-olds), each time a child has a birthday, the number of 4-year-olds becomes '1 fewer' and the number of 5-year-olds becomes '1 more'. However, the total number of children in the class remains the same.

Actively adjusting two parts of a total requires **adding** an amount to one part and compensating by **subtracting** the same amount from the other part, in order to keep the whole total the same. The idea of compensating for an action and **equivalence** in sustaining a 'balance' in calculating is extremely important for later work.

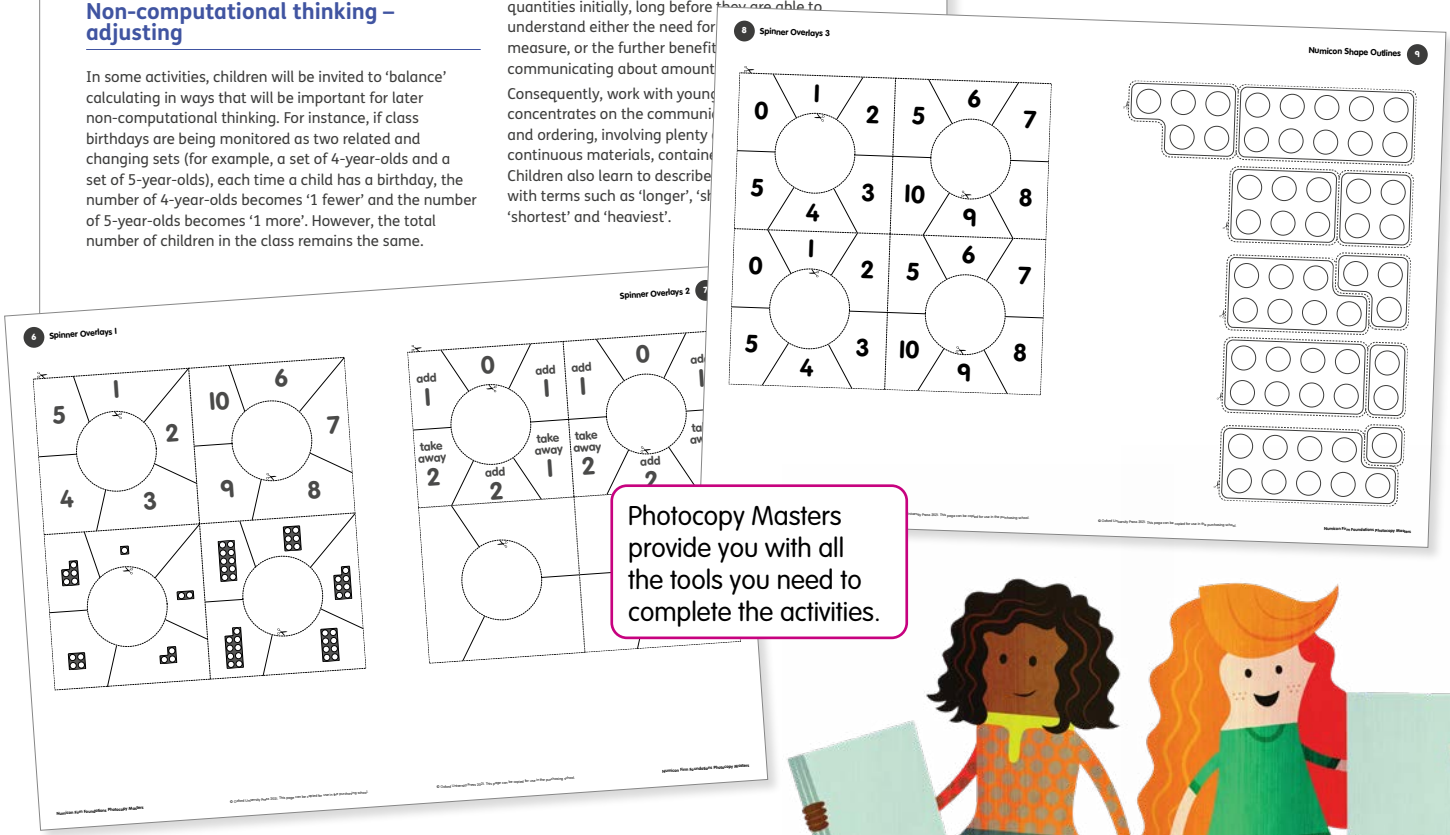
Measuring

Measuring involves working with materials that we call 'continuous': liquids, distances, times, weights, volumes, areas and so on. In order to judge 'how much' of a continuous liquid, distance or time we have, ultimately we need to invent *units* that we can count, for example, spoonfuls, metres, hours.

For young children, the roots of measuring activities lie in the relationships of both **comparing** and **ordering** quantities initially, long before they are able to understand either the need for measure, or the further benefit communicating about amount

Consequently, work with young concentrates on the communi and ordering, involving plenty continuous materials, contain Children also learn to describe with terms such as 'longer', 'sh 'shortest' and 'heaviest'.

The Teaching Guide provides information on the Numicon approach, key mathematical ideas, a glossary of mathematical terms, how to use Numicon Online planning and assessment, and what's in the apparatus pack.



Photocopy Masters provide you with all the tools you need to complete the activities.

Teaching Folder – Activity Card

The maths topic that children will be learning about.

Subtracting – finding the difference

Activity Card 9

A short summary of the ideas children will learn, plus helpful teaching points. Home learning activities have been included to reinforce the ideas children learn in this activity.

Children will already be familiar with using the word 'different' as they contrast objects and describe their similarities and differences. They now learn to describe the difference in size by comparing Numicon Shapes, which lays the foundation for later understanding the 'difference' structure of subtracting: e.g. the difference between the 7-shape and the 4-shape is the 3-shape or, more generally, the difference between 7 and 4 is 3. They also make simple comparisons between number rods and now give rods number names.

Children compile a class pictogram about favourite fruits and describe comparisons about the data.

In shop role-play, children contrast, compare and sort coins and begin to experience shopping as an exchange transaction where they give money and receive something in return.

Children will be exploring representations of number 8 in their counting and number ideas books. Give children the Home learning activity for Activity Card 9: Eight Little Octopi (available in *Numicon at the Seaside – At Home*).

Watchpoints

When comparing two Numicon Shapes, encourage children to think carefully about placing the smaller Shape on top of the larger one and to make sure the 'difference in size' is seen as a whole Numicon Shape pattern.

Children often comment on the 'sticking-up bit' of odd Shapes. They will not yet use 'odd' and 'even', although they will in time. At this stage, do not expect children to refer to numbers as odd or even just from looking at numerals without the Numicon Shapes.

'Watchpoints' provide detailed guidance on how teachers and teaching assistants should communicate the activity to children.

Key mathematical ideas (Teaching Guide, page 8)

Ideas that children are meeting are explained in the Teaching Guide.

The main focus is on:

Subtracting, contrasting, comparing and combining, part-whole relationships

Children will also encounter:

Equivalence, order, sequences and direction, one-to-one correspondence, fractions – equal parts of a whole, measuring, shape and space, reasoning and logic

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, ...)
- **Words for comparing quantities and subtracting**, e.g. how many more?, how many fewer?, fewer, the difference between, how much larger?, how much smaller?, odd, even
- **Words for money and shopping**, e.g. money, coin, pence, pay, change
- **Words for sorting**, e.g. set, sort, odd, even

Model the mathematical vocabulary listen for children using it to explain their thinking.

Learning opportunities

- To find the difference between whole numbers, without counting, using Numicon Shapes.
- To find the differences in size between collections of objects.
- To compare everyday quantities and begin to find differences between them.
- To begin to use the terms 'odd' and 'even' using Numicon Shapes.
- To recognize that the number idea 8 can be represented in many different ways.
- To begin to give number names to rods.
- To recognize coins and sort them in different ways.
- To use everyday language to talk about money.
- To begin to appreciate that shopping involves exchange.

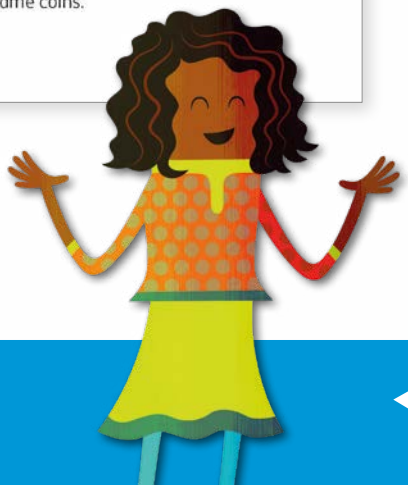
To support your planning, key ideas are broken into small steps.

Assessing

Look and listen for children who:

- Discuss similarities and differences between everyday objects.
- Sort objects according to similarities.
- Describe Shapes as odd or even.
- Find numerical differences between two Numicon Shapes, including when the difference is 0.
- Find numerical differences between small collections of everyday objects.
- Use number names for rods.
- Recognize and name coins.

Actions and vocabulary that will show you what children have understood and where further support is needed.



Teaching Folder – Activity Card

These activities form the core of the Numicon teaching programme and are directly relevant to both revised Maths Early Learning Goals in England.

All doing maths together with Numicon

Select activities from:

- Daily routines with Numicon
- Everyday counting with Numicon

Also:

- Discuss pairs of objects that are different in size, colour or design.
- Compare two Numicon Shapes. Talk about the similarities and differences, e.g. both have a 'sticking-up bit', which one is bigger or smaller, their colours. Model showing the difference by placing Shapes one on top of the other to reveal a whole Numicon Shape pattern. Repeat with other Shapes, including two identical Shapes to show a difference of 0.
- Compare two rods. Talk about the similarities and differences, e.g. they are both cuboids, one is longer, one is shorter, one is blue, one is yellow. Repeat with other rods.
- Provide two bags containing different amounts of the same objects (up to 10). Talk about and explore how to find the difference between the two collections. Some children may see the difference between the objects when they are arranged in Numicon Shape patterns; some may need to find the corresponding Shapes and compare them, or may prefer to match the objects one-to-one or along a number line.
- Discuss favourite fruits. Ask each child to draw their favourite on a small square of paper. Use them to make a class pictogram.

> Which is the most popular fruit?
>
> How many children like apples best?
>
> Which fruit is the least popular?

- Sort coins with children, e.g. on the Numicon Interactive Whiteboard Software. Together, make up a story with different amounts of money. Compare two rows of pennies on the Numicon IWB to find the difference between the rows.

> Who has more pennies? Who has fewer?

Learning about number patterns and relationships

Activities with Numicon structured manipulatives

Activity 1 See the difference between Numicon Shapes

Have ready: Numicon Shapes

Children take two Shapes, put the smaller Shape on top of the larger one, and say the numerical difference by looking at the Numicon Shape pattern not covered. They find the matching Shape to check.

> Which Shape matches the difference?

Model saying, e.g. 'We say the difference between 6 and 2 is 4'; 'The difference between 2 and 6 is 4.' Repeat often, comparing different Shapes.

Increased challenge: can children say what the difference between two Shapes is just by looking?

Activity 2 Comparing numbers using Spinners

Have ready: Numicon Shapes, Numicon Spinners with 1–5 and 6–10 Spinner Overlays (cut from photocopy master 6)

Children take turns to spin two numbers, pick up and compare the corresponding Shapes, and describe the difference, e.g. 'The difference between 5 and 7 is 2'; 'The difference between 7 and 5 is 2.' Children find the Shape to check. Repeat often. If they spin the same number twice, talk about there being no difference, so the answer is 0.

Increased challenge: ask children to name two Shapes that would show a difference of 1.

Activity 3 Making trains with white rods

Have ready: number rods

Children experiment to find how many white rods will equal the length of the other rods.

> How many white rods did you use to equal the yellow rod?

Activity 4 Combining two or more rods to fit another rod

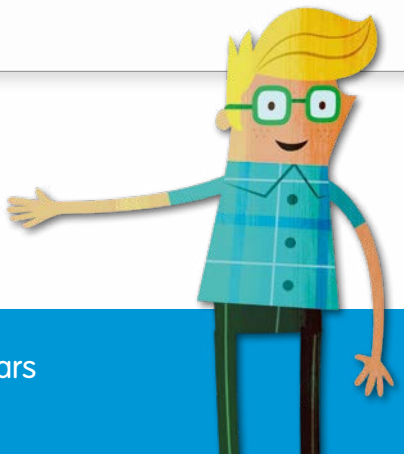
Have ready: Numicon Spinners with Number Rod Colour Spinner Overlays (cut from photocopy master on *Oxford Owl*), number rods

Children spin a colour and find the matching rod. They find two or more rods to equal its length when placed end to end and explain what they have done, e.g. 'A red rod and a pink rod equal a dark green rod'.

Numicon structured manipulatives give children insight into number ideas that they cannot see just in numerals or collections of counters.

There are regular opportunities for increased challenge and variation.

These questions set the tone and culture in the classroom, other supporting adults learn to imitate and adopt same communication with children.



Teaching Folder – Activity Card

The learning focus of the Activity Card and aspects of Shape, Space and Measures are continued indoors and out so children can experience that we all use maths every day in many aspects of our lives.

Set up these activities for children to practice independently and repeat often with their friends.

Children's individual counting and number ideas books are a key feature of the Numicon Firm Foundations teaching programme.

Stories, rhymes and songs are a fun and natural way for children to learn mathematical language.

Activities involve counting, comparing and sharing. They also support children in making good food choices and understanding the importance of a healthy lifestyle.

Increased challenge: can children make a rod train that is not longer than the orange rod?

Maths games and puzzles

- Provide a Numicon Feely Bag with Shapes 1–10. Children take turns to take two Shapes from the Feely Bag, compare them and explain using the language 'the difference between'.
- Provide Numicon Spinners with 1–5 and 6–10 Spinner Overlays (cut from photocopy master 6) or Numicon Dice (0–5 and 5–10 if available) and Numicon Shapes. Children spin both spinners or roll both dice and then pick up and compare the matching Shapes to find the difference. If they get two 5s, talk about there being no difference, so the answer is 0.
- Provide Numeral Cards 0–10 (in a pile face down). Children turn over two Cards, pick up the corresponding Shapes and compare them to find the difference.
- Using interlocking cubes or identical building blocks, children can build towers and compare them to find the difference in height.

- Provide Rod Outlines (photocopy master 12) and number rods for children to practise Activity 4.
- Give children collections of mixed coins. Encourage them to find the numerals on the coins, and to sort them into sets of copper and silver, and then into sets of coins that are the same.
- Provide large card coins for children to recognize, name and match with small coins.

What coins can you name?

- Children explore sorting coins and comparing rows of pennies using the Numicon IWB on a computer or tablet.

- Invite children to make rubbings of different coins using crayons or pencils.

Counting and number ideas book

Have ready: children's spider pictures (see 'Expressive arts and design'), prepared page for exploring number 8, Numicon Shapes, pencils, coloured pencils/felt-tip pens/crayons in the Numicon colours, a small tray of dry sand, a selection of small natural objects and Numicon Pegs

Can you draw a numeral 8 in sand?

How will you make the Shape pattern for 8?

Where does number 8 go on your number line?

Can you remember a way of making 8 with two Numicon Shapes?

How can you check if you were correct?

Increased challenge: Can children take an 8-shape and choose other smaller Shapes to compare to it and find the differences?

Exploring maths all around us

Stories, non-fiction, songs and rhymes

- Act out number rhymes involving decrease, illustrating with Numicon Shapes and pointing out the difference of one for each verse. Refer to the Numicon Display Number Line. Include rhymes where at the end there is nothing left and say, e.g. 'the difference between 1 and 1 is zero'; and ask children to find 0 on the Numicon number line.
- Share number rhymes involving amounts of money in pence. Encourage children to link buying 1 more with adding 1, reinforcing this by illustrating with Numicon Shapes and a number line.
- Read stories, poems, songs and rhymes about spiders.
- Have available a selection of non-fiction texts from books or websites to learn about different spiders and their webs. Listen out for children using new vocabulary.

Healthy food activity

- Make a simple meal with the children. Cook pasta (penne or spaghetti), a simple tomato sauce (chopped onion, tinned tomatoes and a few basil leaves) and then sprinkle a little grated cheese on it. Discuss how the food is changed by cooking. Encourage children to set the table for their group, making sure everyone has a plate, spoon or fork, and drink of water.

Teaching Folder – Activity Card

Each Activity Card provides a range of activities children will enjoy while developing their gross and fine motor skills alongside applying their maths understanding.

Role-play, small world and construction

- Set up role-play shops (e.g. a garage, a market stall, a shoe or clothes shop, a sports shop), with real coins for children to use. Encourage children to swap roles – customer and shopkeeper – so they experience playing at paying and giving change.
- You could set up a games shop with, e.g. balls, bats, hoops and skipping ropes in different sizes for children to 'buy' and then play with, giving them opportunities to use the language of size.

Which size of hoop would you like to buy?

Sand, water and messy play

- Hide Numicon Shapes in dry sand for children to find two. Support them to put the smaller Shape on top of the larger, find the difference and say the number sentence. Alternatively, put Shapes in a water tray and give children little nets to fish out two and find the difference.
- Have a range of different types and sizes of dinosaurs or minibeasts in sand, or sea creatures in water.

How many more turtles than whales are in the water?

Invite children to select two and say how they are the same and how they are different, then to sort them into sets and compare the different quantities. Some children may use Numicon Shapes to help them, while others may make the comparison by arranging the two types of creature in rows to find the difference.

What is the difference between the number of spiders and the number of grasshoppers?

What is the difference between the number of tigers and the number of giraffes?

- Roll out some modelling dough and push a Numicon Shape into it, then remove it and put a smaller Shape on top of the impression. Encourage children to identify the difference between the impressed Shape and the smaller one chosen, and to say the difference in a number sentence.

The difference between 7 and 5 is 2.

Expressive arts and design

- Children make a 'spider' for number 8 in their counting and ideas book. After looking closely at a real spider's web, or using a good photograph or book illustration, provide fine black pens and paper for them to draw one. They make a spider to put on the web by printing a body from a suitable sponge/potato shape and cutting 8 legs from a strip of black paper to stick on; add eyes.
- Provide a wide variety of instruments for children to explore. Encourage them to share the instruments fairly between groups of different sizes.
- Give children a range of percussion instruments so they can explore, create and combine different sounds to represent sounds in the environment, or animal movements, or accompany songs. Discuss their sounds, emphasizing the word 'different'.

Outdoor maths and physical play

- Play simple running games. On an agreed signal, children stop and get into groups according to eye or hair colour, or favourite colour or animal. They then count and compare the different groups.
- Compare amounts of different types of equipment, e.g. tricycles, bats, balls, coloured hoops. Count the number of objects in each set and find the differences between the amounts. (They could compare two sets of equipment by matching them one-to-one and seeing the difference.)

How can we find out if we have enough balls to go with each bat?

- Encourage children to collect objects, e.g. stones, leaves, feathers, and compare the sizes of their collections to find the difference between them (by arranging them into Numicon Shape patterns and comparing them).

- Provide ribbons for children to 'write' numerals in the air.

Understanding the world

Look carefully around the outdoor learning environment to find spiders and their webs, and other minibeasts in different habitats.

On all the Activity Card there are suggestions for exploring maths activities in contexts that connect with aspects of People Culture and Communities or The Natural World.

Gentle questioning encourages reticent children, as well as more confident speakers, to talk about their ideas, which helps you recognize when children are ready to move on from simple everyday language to using more sophisticated and specific words and terms.

Children have a strong sense of pattern. Learning to recognize patterns and predict from them is fundamental to maths. Children are highly motivated to engage in the creative activities suggested on the Activity Card.

Numicon Online Firm Foundations subscription

The digital subscription of Numicon Firm Foundations brings together all your planning and classroom resources in one place. Having the print and digital version provides flexibility and supports you whichever way you teach maths in your Early Years setting. Use this subscription to prepare resources in advance or use the resources on the spot in the classroom setting. Here's what's included:

- eBook version of the teaching handbook with direct links to extra resources
- Numicon Interactive Whiteboard Software access
- eBook of Numicon at the Seaside Big Book and further activity sheets for home learning
- bank of songs, stories and videos
- visual references demonstrating exemplar classroom set-ups
- professional development videos
- extra printable photocopy masters.

Ideas for how to use the Numicon Interactive Whiteboard Software are provided. Click on the link to open it directly.

You will find further ideas on how to use songs, stories and poems with your children on Numicon Online Firm Foundations.
You will also be able to open and use front of class the Numicon at the Seaside Big Book.

You will find further recipes and healthy food activities on Numicon Online Firm Foundations.

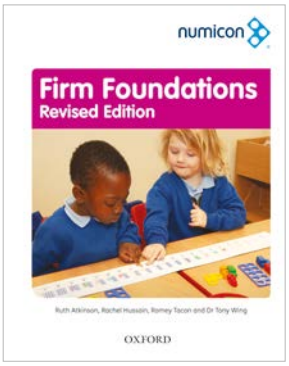
Helpful photocopiable masters, such as Spinner Overlays, are provided. This saves you time in your lesson preparation.

A printable Counting and numbers ideas book can be distributed to all your children for them to create.

Numicon Early Years Resources

Teaching Resources

HANDBOOKS



Firm Foundations Teaching Manual
9780198375227
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Firm Foundations Online
9781382019514
Price £150 + VAT

Coming soon

Apparatus

Numicon Firm Foundations

Starter Apparatus Pack*
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- Numicon Baseboard x 6
- Numicon Number Bond Baseboard Overlay x 6
- Numicon Picture Baseboard Overlay x 6
- Numicon Spinner x 6
- Large Format Table-top Number Line x 1
- Numicon Feely Bag x 3
- Number Rod Set Large x 1
- Number Rod Trays (1–10 and 20) x 1
- Set of 20 Numicon 1–Shapes x 1
- Magnetic Strip x 3
- 0–100cm scale Number Lines x 3

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- 80 Numicon Coloured Pegs
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- Numicon Feely Bag x 1
- Number Rod Set Small x 1
- Number Rod Trays (1–10 and 20) x 1
- Set of 20 Numicon 1–Shapes x 1

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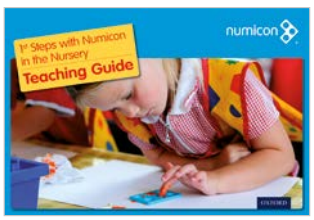
£130.00+VAT

More apparatus - Nursery

KITS	CONTENTS, ISBN/PRICE		TEACHING RESOURCES
1st Steps with Numicon in the Nursery 	**1st Steps with Numicon in the Nursery Kit*** • Nursery – Teaching Guide x 1 • 115 Numicon Shapes • 80 Numicon Coloured Pegs • Numicon Feely Bag x 1 • Numicon Threading Lace x 3 • Numicon Baseboard x 2 • Numicon Picture Baseboard Overlay x 6 • Numicon Display Number Line x 1 978 0 19 848690 9 **£125.00+VAT**	**Numicon at the Seaside Big Book Pack (KS1/P1–3)** 978 0 19 848703 6 **£59.00+VAT** 	**1st Steps with Numicon in the Nursery Teaching Guide** 978 0 95 539499 7 **£36.00** 

Numicon Early Years Resources cont.

Numicon at home

KITS

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- Activity book x 1
- 32 Numicon Shapes
- 52 Numicon Coloured Pegs
- Numicon Feely Bag x 1
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- Numicon Baseboard x 1
- Numicon Picture Baseboard x 2

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- 32 Numicon Shapes
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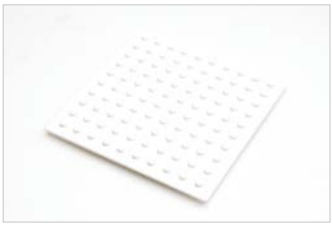
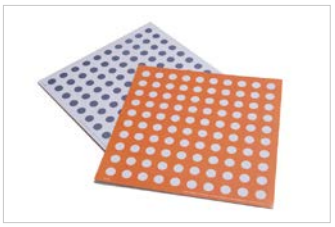
Top up

RESOURCES	ISBN/PRICE	RESOURCES	ISBN/PRICE
	**Numicon Baseboard** 978 0 19 848725 8 **£5.25+VAT**		**Numicon 80 Coloured Pegs*** 978 0 19 848723 4 **£10.25+VAT**
	**Numicon Threading Lace – Set of 3*** 978 0 19 848721 0 **£2.00+VAT**		**Numicon Double sided Baseboard – Set of 3** 978 0 19 848940 5 **£9.25+VAT**
	**Numicon 80 Black and White Pegs*** 978 0 19 848724 1 **£10.25+VAT**		**Numicon Feely Bag** 978 0 19 848722 7 **£7.25+VAT**
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