

Getting Started with Numicon Kit 2

The Numicon Kit 2 teaching materials in this binder are divided into 4 sections as detailed below. The best results are achieved where the suggested Order for Teaching Activities is followed, to ensure skills and understanding are built step by step. However where children are progressing appropriately for their age, teachers may decide to use Numicon to illustrate current teaching, you can find relevant activities by referring to the Activity Card Summary.

Research suggests that the most effective teachers of numeracy are those who help children make connections. Therefore in the Teaching Guide we explain the key mathematical ideas met in Kit 2 and explain how to help children make connections and solve problems.

The key components of Numicon Kit 2

Teaching Materials

Supplied in a binder divided into 4 sections.

Numicon Shapes

The Shapes give children a tactile and visual representation of number ideas. There are two boxes of Shapes in the Kit 2 each containing 80 Shapes.

Feely Bag

This is a key component! By feeling for Shapes in the Bag, children are encouraged to visual the properties of the Shapes, this helps them to develop their own mental imagery of number.

Spinners

These are used in games and activities explained on the Activity Cards.

Display Number Line

A key image for children that helps them to connect Numicon with the number line and understand the value and order of numbers.

Numicon 10s Number Line

Shows Numicon 10 Shapes end-to-end marked with multiples of 10.



Card 1-100 Number Track

The ten decade sections can be arranged horizontally as a Number Line or as an array to help pupils to see the connection between patterns on the 1-100 line and 1-100 number square.

0-100 Table-Top Number Line

Centimetre scale, decade sections shown in red and blue. Laminated. May also be used with Number Rods which are centimetre scale. Measures 102 cm.

Numicon Post Box

Designed to be used by two children taking it in turns to 'post' questions and 'post back' answers.

Number Cards

Pack of 0-100 playing cards

Trays for Number Rods

Each 1-10 Tray is coloured to connect with its matching Rod. The 1-10 Trays stack in two sets, for odd and even numbers. Useful for building number bonds.

Number Rod Track

Useful for teaching about place value, partitioning, multiplication and division. Each section of this clicks together into a metre track. Designed to take Number Rods it can be separated easily into decade sections and arranged as an array.

Kit 2 Teaching Materials

Section 1: Kit 2 Teaching Guide

This explains key mathematical ideas introduced in Kit 2; gives suggestions for organisation of teaching; notes on setting up maths displays etc.

Section 2: Kit 2 Activity Cards

Key to the Kit 2 Activity Cards

Where to find Key questions, ideas for Using and applying and Independent practice.

Activity Card Summary

List of the title and teaching objectives of each activity card.

Order for Teaching Kit 2 Activity Cards

The recommended order for teaching the Activities to build children's understanding step by step.

Kit 2 Activity Cards

The Numicon Teaching Programme. The Cards are in three strands, Using Pattern, Numbers and The Number System and Calculating, each strand is numbered in order.

Section 3: Assessment Tools

Numicon Assessment Signposts

To assess children's readiness for the ideas they will meet in Kit 2 and where to start children on the Numicon teaching programme.

Individual Record of Progress

This gives very small steps for tracking progress through the teaching programme.

Section 4: Photocopy Masters

Resources to be copied and used in teaching the activities, the activity cards are referenced to relevant photocopy masters.

Familiarisation

Children of any age, meeting Numicon for the first time, need to explore and build with Numicon Shapes and Number Rods before these are used for specific teaching activities.

Differentiation

By the time children are working on Kit 2 there is likely to be a clear indication of their potential and ability. For children who are moving on quickly it is important to be selective and to decide which parts of the activities are important for them. For those moving more slowly teachers will need to decide whether to teach an activity in one session or over several sessions.

Where children have misconceptions or learning difficulties the Assessment Signposts can be used to assess their readiness for Kit 2. Some children will need to work through Foundation and Kit 1 activities first. Older children who are working at the Foundation Stage level will need daily counting practice and very frequent work on repeating patterns, following the steps shown on the Record of Progress.

The teaching activities are easily adapted for one-to-one and small group teaching. Children who take longer to understand new ideas will benefit from the individual steps of each activity being taken as a separate teaching session, and having opportunities to practise before learning the next step. Some children will need yet smaller steps and are likely to rely heavily on Numicon apparatus and to need plenty of practical work before they begin to record.

Training and Support

In the Building Understanding section of our training DVD 'Working with Numicon' there are examples of Numicon in use in three different Key Stage 1 settings. The teaching materials are designed to be easy to follow with step by step illustrated instructions. For further information, advice and support visit our website or contact Numicon.



Contents

Introduction	4
The Numicon Kit 2 Programme	6
Imagery	8
Teaching the activities	14
Key mathematical ideas	18
Planning and Assessment and Training	22

Teaching the activities

A visually rich mathematics environment gives children opportunities to learn about numbers and how useful they are in daily life. Just as they learn by noticing what is going on around them when they are playing on the beach, in the park or garden. Children make connections between new things they see and what they already understand.

Creating a working environment to support effective teaching and learning of mathematics

A classroom rich in images for number supports children in their day to day maths work, for instance they can glance at the imagery and number lines to confirm their thinking, check how a numeral is correctly written etc. The teacher can draw attention to the different images for number to help children make connections and develop rich concept images for number. It is particularly important that children with special educational needs have the support of Numicon Number Lines wherever they are working.

Wall number lines should be prominently displayed at the children's eye level, including the Numicon Display Number Line, a large 0-100 line which is 'open' at both ends and continuous (leaving equal spaces between whole numbers for fractions and decimals to be accommodated later) and a 1 – 100 number square.

Children will see how useful and important numbers are when the labelling and signs around the classroom use number purposefully, for example drawers can be numbered as well as labelled, as can storage pots for pencils and crayons. Signs can show how many children may work at a time on a given activity. It is helpful to use number in everyday situations by referring to calendars, clocks, timetables, numbered lists, lunch money etc.

As well as being the focal point for storage of maths equipment, the maths area within the classroom provides a useful place to mount displays to stimulate thinking about mathematical ideas. Where displays are interactive, children can have a go at a choice of activities planned by the teacher to reinforce the current teaching focus. A mathematics display can also gather ideas around a theme to stimulate discussion for example: odd and even numbers; triangles; ordering; counting; etc. (see figure 9).



Key mathematical ideas

Underlying the activities of this pack are several key mathematical ideas that children will be developing and extending, as well as some they will be meeting for the first time. In order to teach these ideas effectively, those who are working on activities with children will need to be clear themselves about both the mathematical ideas and about which activities address which ideas.

To aid this, we include here a brief outline of each key mathematical idea, and on the Activity Cards we list which 'Key ideas' are associated with each activity. As you prepare for your teaching you may find it helpful to remind yourself about the key ideas behind each activity by referring to the outlines below.



Fig 7, Above left: Finding out 'how many' by grouping in the Numicon pattern for 10.

Fig 8, Above right: The structure of teen numbers is clear on the Numicon Number Line.

New ideas in Kit 2

The two principle new ideas introduced in Year 2 are multiplication and division, although of course foundations for both of these ideas occur much earlier in children's experiences. It is important for teachers to understand the respective natures of these ideas and their connections before addressing their development with children.

Building on Kit 1

Principally, the rest of the work in Kit 2 consists of building on the big ideas and facts of Foundation and Kit 1 to extend and develop children's understanding of number and calculation skills. The ideas of addition, subtraction and place value, together with basic addition and subtraction facts of number up to ten, are all built upon and exploited to develop children's mastery of these operations and ideas with ever larger and more complicated numbers. Working with larger and more varied numbers brings in the need for new calculation strategies, as well as using number patterns to extend the application of strategies already learned.

Mathematical thinking

As the UK National Curriculum has always recognised, learning mathematics is about more than learning some facts and calculation techniques; it is about learning how mathematics is practised, i.e. about mathematics as activity. So just as children learn about numbers and calculations, they need to learn also how to go about doing mathematics. There are several elements involved in thinking mathematically, most of them stemming directly from the essentially abstract character of most mathematical ideas. Probably the most fundamental aspect of mathematical thinking arises from the need to be logical when dealing with abstract ideas; if we are not

logical then we have no way of relying on the outcomes of our thinking, and we do need to be able to rely on our conclusions.

Piaget's work taught us long ago however, that young children do not think logically in the way that most adults are able to; their gradual progress toward adult logical thinking is partly experiential, partly maturational. So we cannot expect young children to think like adults, but we can discuss their thinking with them and help them to reflect on their reasoning as they do it.

Children's developing reasoning in mathematics should always be shared, explored, and reflected upon openly from their earliest experiences. We are not expecting clear, logical arguments from young children, but we do want them to notice that the way they think is important to us, and that thinking is worth thinking about. For children to feel willing, and increasingly able to share and develop their mathematical thinking of course, they need to feel that their thoughts are welcomed, respected, and important. If their thoughts are treated as simply 'wrong', low-level, or even worse if they are ridiculed, then children will quickly close up and lose faith in their own brains. Central to the Numicon approach is the self-confidence that children can learn to feel in their own mathematical thinking and reasoning – teachers should take every opportunity to nurture this in a highly supportive atmosphere.

Key to Kit 2 Activity Cards

Card title
The title of the card signals the key mathematical ideas and arithmetic structures and properties underlying the activities. These are explained under key mathematical ideas in Teaching Guide.

Aims
Detail the learning objectives of the teaching activity.

Language
Details the mathematical language which can be developed in the context of the teaching activity.

The Activity
Each activity is described step by step, with illustrations. Some activities will be taught in one session, others over several lessons. This will depend on the teacher's knowledge of the pupils' prior achievement, ability and confidence as well as the nature of the activity itself.

Card number
Cards numbered in sequence within strand.

Colour and label
Indicates strand: Calculating, Numbers and The Number System, Using Pattern.

Independent practice
Once children have been taught the main activity independent practice will enable them eventually to develop unconscious competence.

Key question
The key question is closely linked to the aim of the activity to inform assessment. Children's ability to answer the extent to which the teaching objective has been achieved. Sometimes the key question is for the teacher to ask of the children and sometimes it is a prompt for the teacher's own reflection on the children's responses.

Activity Card Summary

The Activity Cards are arranged in three parallel and connected strands, the title of the Cards within each strand are shown below.

Using Pattern

Using Pattern 1

Card title
Inverse relation between addition and subtraction

Key mathematical idea
Inverse

Aims

- To understand the inverse nature of addition and subtraction.
- To encourage children to use mental imagery.

Using Pattern 2

Card title
Patterns in addition or subtraction of 10

Key mathematical idea
Pattern

Aims

- To understand the structure and value of numbers when ten is added or subtracted.
- To understand the patterns of numbers on the 100 square.

Using Pattern 3

Card title
'=' as a sign of equality

Key mathematical idea
Equivalence

Aims

- To understand the sign '=' as a sign of equivalence.
- To understand that in addition the total can be on the left or right of the '=' sign.

Using Pattern 4

Card title
Recognising that symbols can stand for unknown numbers

Key mathematical idea
Equivalence

Aim
To recognize the use of a symbol such as \square or \triangle to stand for an unknown number.

Using Pattern 5

Card title
Patterns in addition and subtraction of numbers to 20

Key mathematical idea
Pattern

Aims

- To learn addition and subtraction facts of teen numbers.
- To use facts of 10 in addition to 20.
- To begin to add three single digit numbers.

Using Pattern 6

Card title
Odd and even patterns

Key mathematical ideas
Pattern, Generalising

Aims

- To extend the sequence of odd and even numbers.
- To understand the 'rule' that when we write even numbers they always end in 0, 2, 4, 6, or 8.
- To understand the 'rule' that when we write odd numbers they always end in 1, 3, 5, 7, or 9.

Using Pattern 7

Card title
Patterns/sequences of other numbers

Key mathematical idea
Pattern

Aim
To describe and extend number sequences.

Using Pattern 8

Card title
Addition and subtraction of single digits and full tens

Key mathematical idea
Pattern

Aim 1

- To generalise basic addition and subtraction facts.

Aim 2

- To know how to use facts of ten to add or subtract a single digit to or from any 2-digit number, without crossing a multiple of 10.

Aim 2
To understand how to add or subtract full tens within two-place numbers.

Using Pattern 9

Card title
Using known addition and subtraction facts to solve new problems

Key mathematical ideas
Pattern, Place value

Aims

- To use addition and subtraction bonds to solve new problems.
- To use patterns of similar calculations
- To use knowledge of partitioning to add and subtract tens and units.

Inverse relation between addition and subtraction

Aims

- To understand the inverse relation of addition and subtraction.
- To encourage children to use mental imagery.

Language

put together, take apart, add, subtract, equals, inverse

Activity 1

Step 1

Teacher makes facts of 11 using two Numicon Shapes for each number.



Step 2

Children close their eyes. Teacher hides a pair of Shapes totalling 11 (e.g. 3 and 8) behind her/his back.

Step 3

- Teacher says "I have 11 behind my back, so 11 take away 8 equals ...?" while showing children the 8-shape.
- Teacher reminds children to visualise the Shapes 'in their mind's eye' to help them answer mentally. When children have answered show 3-shape to check.



Step 4

Repeat the game and record as $11 - 8 = 3$.



Step 5

Now show the inverse. Using the 3 and 8 Shapes teacher says "I'm putting them together" while joining the Shapes together to show $3 + 8 = 11$ and $8 + 3 = 11$, and shows the children how to record both inverse facts.

Step 6

Teacher now "takes them apart" to show $11 - 3 = 8$ (some children find it easier when the teacher continues to hide the Shapes).

Aims

- To understand the inverse relation of addition and subtraction.
- To encourage children to use mental imagery.

Language

put together, take apart, add, subtract, equals, inverse

Independent practice

Game for 2 players

- To prepare for the game children work together to build addition facts of 11 using Numicon Shapes.
- Player 1 closes eyes.
- Player 2 takes one pair of Shapes totalling 11 and hides them.
- Player 1 opens eyes.
- Player 2 shows player 1 one of the Shapes from the pair.
- Player 1 says what the other Shape is.
- Player 2 reveals the Shape.
- Repeat the game, changing roles and using other pairs of Shapes.

Game for 2 players

- Have ready 1 Numicon Post Box, Numicon Shapes or Number Rods.
- Children sit with the Post Box between them.
- Player 1 posts two Shapes (or Rods) saying "I'm putting them together, $2 + 9 = 11$ ".
- Player 2 posts one of the Shapes (or Rods) back saying "I'm taking them apart, $11 - 2 = 9$ ".
- Repeat the game, this time recording the facts as the game is played.



Individual work

Children build 11 using Numicon Shapes or Number Rods. Record both addition facts and then take the Shapes or Rods apart and record both subtractions (e.g. $3 + 8 = 11$; $8 + 3 = 11$; $11 - 3 = 8$; $11 - 8 = 3$).

Key question

When shown two Shapes (or Rods) can children say all four related addition and subtraction facts?

Assessment Signposts

1. Can pupil match Shapes and copy the pattern of a Shape with Pegs on the Baseboard?

How to find out

- Show pupil a 7-shape and ask him/her to make the corresponding pattern with Pegs on the Baseboard.
- Make a 9-pattern with Pegs on the Baseboard and ask pupil to find the corresponding Shape.

Yes? Move on to next question

No? Go to the activity from the relevant Numicon kit:

Firm Foundations: 2a, 2b, 3a, 5a, 6a
Closing the Gap: 1, 2a, 5
Old Foundation Cards: 1-2

2. Can pupil copy a repeating pattern?

How to find out

- Make yellow red yellow red (at least five repeats) repeating pattern with Pegs on the Numicon Baseboard.
- Ask pupil to copy the pattern on the Baseboard.

Yes? Move on to next question

No? Go to the activity from the relevant Numicon kit:

Firm Foundations: 5b
Closing the Gap: Pattern Card
Old Foundation Cards: 2a Making Connections

3. Can pupil continue a repeating pattern?

How to find out

- Make a blue green blue green repeating pattern (three repeats) with the Pegs on the Numicon Baseboard.
- Ask pupil to continue the pattern.

Yes? Move on to next question

No? Go to the activity from the relevant Numicon kit:

Firm Foundations: 5b
Closing the Gap: Pattern Card
Old Foundation Cards: 2a Making Connections

4. Can pupil order Shapes and give them number names?

How to find out

- Give pupil a set of jumbled 1-10 Shapes. Ask pupil to put them in order starting with the 1-shape.
- Point to a 6-shape ask pupil to say its number name. Continue to ask him/her to name each Shape (not in order).

Yes? Move on to next question

No? Go to the activity from the relevant Numicon kit:

Firm Foundations: 3b, 4a, 4b, 6b, 7a
Closing the Gap: 2b, 3a, 3b, 4a, 4b, 6
Old Foundation Cards: 3, 4

Name: _____

Date of Birth: _____

Numbers and the Number System

Recognition of Shapes, Counting and Place value

Pupil is able to	Comments
1. Recite numbers to...	
2. Match Numicon Shapes by colour.	
3. Recognise Numicon Shapes by colour.	
4. Find Numicon Shape to match Numicon pattern built with Pegs on Base Board 1 2 3 4 5 6 7 8 9 10. (do not use number names with the pupil yet, see later steps.)	
5. Build Numicon pattern with Pegs on Base Board in response to seeing the Numicon Shape 1 2 3 4 5 6 7 8 9 10 (do not use number names with the pupil yet, see later steps).	
6. Count objects to... (note pupil's one-to-one counting range)	
7. Recognise numbers within stories and rhymes.	
8. Compare two Shapes and say which has more holes and which has fewer/less holes.	
9. Find position of Numicon Shape on Numicon Number Line by matching.	
10. Find Numicon Shape in response to hearing the number name 1 2 3 4 5 6 7 8 9 10.	
11. Name Numicon Shapes 1 2 3 4 5 6 7 8 9 10 (pupil says number name in response to seeing Shape).	
12. Recognise numerals (pupil points to numeral in response to hearing the number name) 1 2 3 4 5 6 7 8 9 10.	
13. Name numerals (pupil says number name when shown numerals – out of order) 1 2 3 4 5 6 7 8 9 10.	
14. Remove 2 objects from a set of 10.	

Index

The following 28 pages contain photocopy masters used in the Numicon teaching programme.

1. Spinner Overlays 2
0-5
6-10
+ -
÷ x
2. Spinner Overlays 2
+1, -1, +10, -10, + -
1p, 2p, 5p, 10p, 20p, 50p
1/2, 1/3, 1/4, 1/5, 1/6, 1/10,
stop go
3. Numeral Cards (0-20)
4. Numeral Cards (multiples of 10)
5. 1-100 Square
6. Empty 100 Square
7. Empty Number Squares for 9, 16, 25, 36
8. Tens and Units Frame
9. Hundreds, Tens and Units Frame
10. Number generator for addition and subtraction of whole tens
11. Additions for learning facts up to 10
12. Addition and subtractions for learning facts up to 10
13. Subtractions for learning facts up to 10
14. Subtractions for learning facts up to 10
15. Additions for learning whole tens facts up to 100
16. Additions and subtractions for learning whole tens facts up to 100
17. Subtractions for learning whole tens facts up to 100
18. Subtractions for learning whole tens facts up to 100
19. Number generators for partitioning calculations
20. Multiplications (without =) for 2, 3, and 4 times tables
21. Multiplications (without =) for 5 and 10 times tables
22. Multiplications (with =) for 2, 3, and 4 times tables
23. Multiplications (with =) for 5 and 10 times tables
24. 'Climb the ladder' multiplication race game
25. Divisions for 2, 3, and 4 times tables
26. Divisions for 5 and 10 times tables
27. Place value cards
28. Finding half of small numbers

1-100 Square

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100