Focus on place value

Place value can be a real stumbling block for children. Not only is it notoriously difficult for them to grasp it also underpins other ideas that they will come across later in their learning. Here are some tips and activities from the teaching cards to help children meet this concept in ways which will help them build a picture of how our number system works.

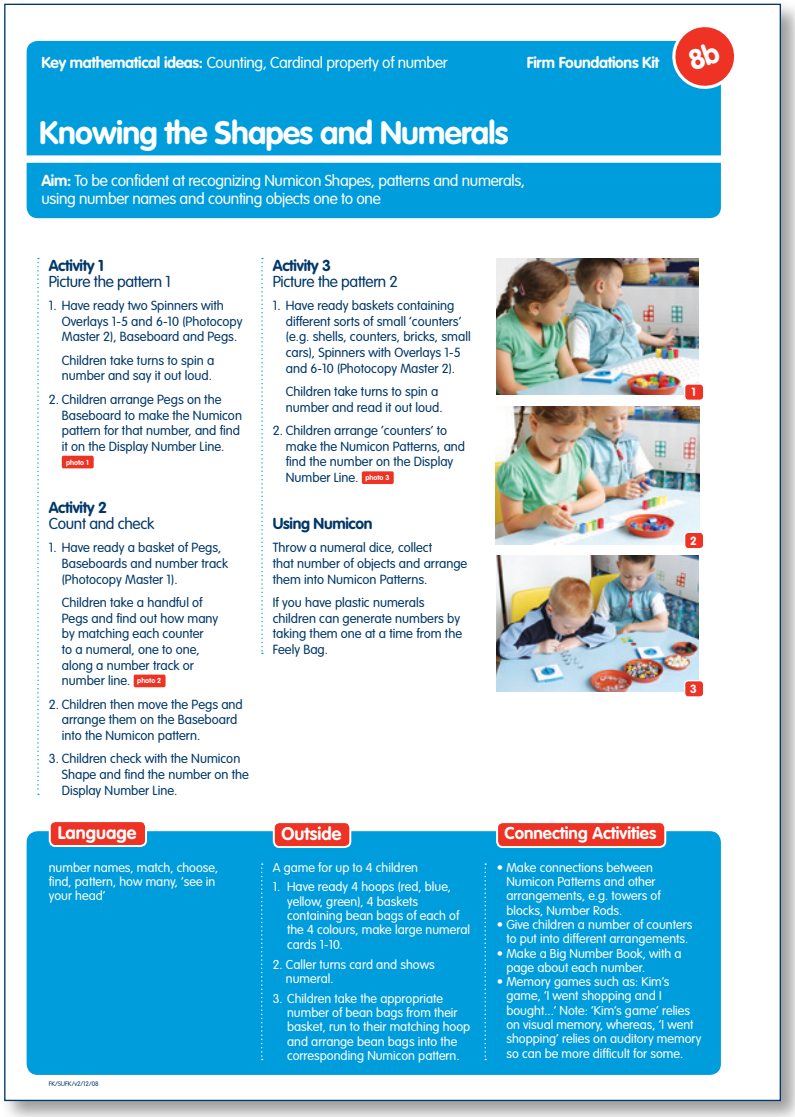
Learning about place value involves children connecting two complicated ideas. The first idea is grouping and the most important group in our naming system is 'ten'. This is because when we are counting collections, as soon as we have ten of something we call them one of something else. So ten 'ones' are called 'ten', ten 'tens' are called one hundred, ten 'hundreds' are called one 'thousand' etc. The second idea is that there is a symbolic system for recording numbers where the place of the digit signifies its value. Children need to realise that we have a symbolic language for naming and reading number names and that they have to learn either to crack this code or to reinvent the code for themselves. (See Section 1: Teaching Guides)

Children need lots of practise of making the Numicon patterns without counting; using any small objects like counters, or buttons etc, they need to build up each pattern from the bottom up, in pairs, matching it with the shapes or numerals as shown in the picture below.

The teaching materials from the Numicon core kits contain a number of challenging and engaging activities that cover place value. For your reference we have included images of the cards on the next few pages.

Firm Foundations Kit

Card 8a: Counting, Cardinal property of number



Key mathematical ideas: Counting, Cardinal property of number — **Firm Foundations Kit** — 8b

Knowing the Shapes and Numerals

Aim: To be confident at recognizing Numicon Shapes, patterns and numerals, using number names and counting objects one to one

Activity 1
Picture the pattern 1

1. Have ready two Spinners with Overlays 1-5 and 6-10 (Photocopy Master 2), Baseboard and Pegs.

   Children take turns to spin a number and say it out loud.
2. Children arrange Pegs on the Baseboard to make the Numicon pattern for that number, and find it on the Display Number Line. photo 1

Activity 2
Count and check

1. Have ready a basket of Pegs, Baseboards and number track (Photocopy Master 1).

   Children take a handful of Pegs and find out how many by matching each counter to a numeral, one to one, along a number track or number line. photo 2
2. Children then move the Pegs and arrange them on the Baseboard into the Numicon pattern.
3. Children check with the Numicon Shape and find the number on the Display Number Line.

Activity 3
Picture the pattern 2

1. Have ready baskets containing different sorts of small 'counters' (e.g. shells, counters, bricks, small cars), Spinners with Overlays 1-5 and 6-10 (Photocopy Master 2).

   Children take turns to spin a number and read it out loud.
2. Children arrange 'counters' to make the Numicon Patterns, and find the number on the Display Number Line. photo 3

Using Numicon

Throw a numeral dice, collect that number of objects and arrange them into Numicon Patterns.

If you have plastic numerals children can generate numbers by taking them one at a time from the Feely Bag.

1

2

3

Language

number names, match, choose, find, pattern, how many, 'see in your head'

Outside

A game for up to 4 children

1. Have ready 4 hoops (red, blue, yellow, green), 4 baskets containing bean bags of each of the 4 colours, make large numeral cards 1-10.
2. Caller turns card and shows numeral.
3. Children take the appropriate number of bean bags from their basket, run to their matching hoop and arrange bean bags into the corresponding Numicon pattern.

Connecting Activities

- Make connections between Numicon Patterns and other arrangements, e.g. towers of blocks, Number Rods.
- Give children a number of counters to put into different arrangements.
- Make a Big Number Book, with a page about each number.
- Memory games such as: Kim's game, 'I went shopping and I bought...' Note: 'Kim's game' relies on visual memory, whereas, 'I went shopping' relies on auditory memory so can be more difficult for some.

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Kit 1, Numbers and the Number System
Card 3A: Find how many without counting

Key mathematical idea Counting, Place value, Pattern — Kit 1 **Numbers and The Number System 3A**

Finding how many without counting

Aims
- → To reinforce understanding that arranging counters into patterns and groups is an efficient way to find out 'how many' without counting.
- → To extend counting range.
- → To introduce place value.

Language
count, how many, number names, arrange, pattern, check, estimate

Activity 1
Step 1
- Teacher puts out Numicon Shapes 1-10 in order, a basket with 20 Pegs and a Baseboard.
- Teacher asks children to close their eyes and puts some Pegs from the basket over the Baseboard.

Step 2
- Children open their eyes and teacher asks them to rearrange the Pegs into the 10-pattern and the pattern for 'whatever is left' without counting.
- Children say how many Pegs there are from looking at the patterns.

Step 3
- Children check the answer is correct by fixing the equivalent Shapes on top of the Pegs.
- Teacher asks children to find the number on a number line (matching the Shapes to the Display Number Line if necessary).

Activity 2
Step 1
Teacher shows children a collection of up to 20 Pegs and asks them to think how many Pegs there are.

Step 2
Teacher asks children to find the Numicon Shapes that show their estimation.

Step 3
Teacher puts the Pegs into two 10-shapes, asks children to say how many and check their estimate.

Use it!
Mental arithmetic
Ask children to estimate how many Pegs on the Baseboard before arranging into patterns.

Independent practice
For children working in pairs – Have ready a basket with up to 30 Pegs, Baseboard, Numicon Shapes.
- Children practise the above activity.

For children working in pairs – Have ready baskets of 20 objects.
- Children take out a handful of objects and find out how many there are without counting, by arranging them into Numicon patterns on the table.

Key questions for assessment
- Can children arrange objects into Numicon patterns without using the Baseboard?
- From looking at the patterns can children say how many tens there are in the number they have made?

Kit 1, Numbers and the Number System
Card 3B: Counting by grouping in tens

Key mathematical idea Counting and place value, Pattern — Kit 1 **Numbers and The Number System 3B**

Counting by grouping in tens

Aims
- → To reinforce understanding that arranging counters into patterns and groups is an efficient way to find out 'how many' without counting.
- → To extend counting range.
- → To begin to understand place value.

Language
count, how many, number names, check, estimate, tens, units

Activity 1
Step 1
- Teacher puts out a sheet of wrapping paper, basket of Pegs or other objects, 0-100 Number Line, tens Number Cards from 0-100 Pack.
- Teacher shows children the wrapping paper and asks them how many pictures they think there are.

Step 2
Teacher with children put one Peg on each picture.

Step 3
- Children remove Pegs and arrange them into patterns of 10.
- When one pattern of 10 is complete, teacher asks children to put the '10' Card and below the pattern. Children find 10 on the Number Line.

Step 4
- Teacher continues to guide the children through each 10, each time putting down the next tens Number Card and finding its place on the Number Line.
- When all the tens have been counted, arrange the last few Pegs into a Numicon pattern. Children can now see how many have been counted altogether.
- Children find the last number in the count on the number line.

Activity 2
Repeat Activity 1 using 1p coins as counters. Children exchange each 10 pattern for a 10p coin and then find the total.

Use it!
- Give children frequent opportunities to count by arranging objects into patterns.
- Give opportunities for children to estimate how many in counting situations.
- Use the patterns in data handling situations.

Key questions for assessment
- Having arranged the counters, can children say how many tens there are from looking at the patterns?
- Can the children make a sensible estimate?

Kit 2, Numbers and the Number System

Card 7: Visualising – developing mental imagery

Key mathematical idea Ordinal property of numbers, Place value — Kit 2 **Numbers and The Number System 7**

Visualising – developing mental imagery

Aims
- ➔ To recall by visualisation the structure and value of numbers.
- ➔ To compare and order numbers from 1-100.
- ➔ To understand 'between' in the context of multiples of 10.

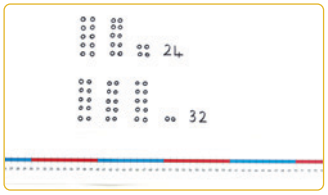
Language
tens, units, more, less, between, smaller, greater, before, after, forwards, backwards, adding one, subtracting/taking away one, multiple of ten

Activity 1

Step 1
Teacher says a number between 1-100.

Step 2
Children (using white boards or paper) write the numeral and from memory, draw the appropriate tens and units patterns of Numicon Shapes.

Step 3
Teacher picks another number. Children draw the pattern and compare with the previous number to see which is greater or smaller.



Step 4
- Children choose a number in between and draw the pattern.
- Find all three numbers on the 0-100 Number Line.

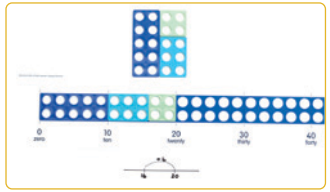
Activity 2

Step 1
Teacher says a number e.g. 16, holds up an imaginary 10-shape and 6-shape, and asks children to visualise them in their mind's eye.

Step 2
Teacher asks children how to make the number with Numicon Shapes and puts out the 10-shape and 6-shape. Teacher now asks children which multiple of ten comes after 16 and then asks them how many more are needed to reach 20. The teacher adds the 4-shape to the 16 to check.

Step 3
Lay the Shapes along the Numicon Tens Number Line.

Step 4
Record steps on an empty number line.



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Key mathematical idea Ordinal property of numbers, Place value — Kit 2 **Numbers and The Number System 7**

Aims
- ➔ To recall by visualisation the structure and value of numbers.
- ➔ To compare and order numbers from 1-100.
- ➔ To understand 'between' in the context of multiples of 10.

Language
tens, units, more, less, between, smaller, greater, before, after, forwards, backwards, adding one, subtracting/taking away one, multiple of ten

Activity 3

Step 1
- Make 16 again and find out which multiple of 10 comes before by removing the 6.
- Check by laying Shapes along the Numicon Tens Number Line.

Step 2
Record steps on an empty number line.

Independent practice

Individual work
Child repeats Activity 3 generating numbers from the 0-100 Number Cards.

Game for 2 players
- Have ready Feely Bag containing nine 10-shapes and one of each of the other Shapes.
- Player 1 chooses some Shapes from the Feely Bag to make a 2-digit number and places them on the table.
- Player 2 says what has been made, draws an empty number line and records the number.
- Player 1 now adds the correct Shape to make the next multiple of 10 and records this by jotting on the empty number line.

Key questions

- Can you put these numbers in order from the smallest to the largest?
- Do you know the multiple of ten that comes between 34 and 42?

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Kit 2, Numbers and the Number System

Card 8: Visualising – developing mental imagery

Key mathematical idea Place value — Kit 2 **Numbers and The Number System 8**

Partitioning 2-digit numbers into a multiple of 10 and 1s

Aim

→ To partition 2-digit numbers into a multiple of 10 and 1s.

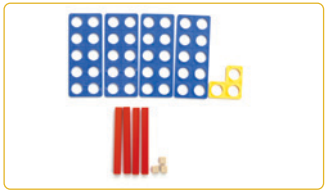
Language

partition, tens, units, add, equals, arrange, 2-digit number, multiple of 10

Activity 1

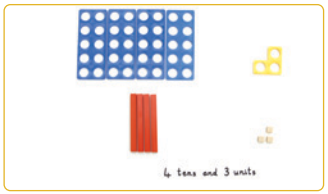
Step 1

- Teacher builds a two digit number e.g. 43 with four 10-shapes and a 3-shape (or with four 10-rods and three 1-rods arranged into Numicon '3-shape pattern'). Children say the number.
- Teacher reminds children how to 'partition' the number showing how the number can be separated into tens and units and saying '4 tens and 3 units'.



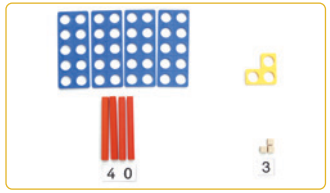
Step 2

Children then say '4 tens and 3 units' and write it on a piece of paper, placing it below the apparatus.



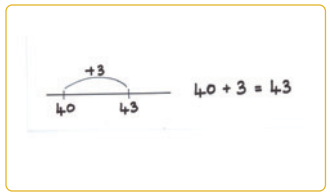
Step 3

Teacher discusses with children how '4 tens and 3 units' is written in numerals and using cards, place '40' under the tens and '3' under the units.



Step 4

- Teacher points to apparatus and says "40 add 3 equals 43" and "43 equals 40 + 3" and asks children how to write the whole number sentence. Teacher writes 40 + 3 = 43 and 43 = 40 + 3.
- Teacher gives children an empty number line and asks children to record the addition with jottings.



Independent practice

Individual

Using 0-100 Cards and a Tens and Units Frame (photocopy master 8) children take a Card and build the number with either Numicon Shapes or Number Rods. Record partitioning as an addition.

Game for two players

- Have ready Numicon Shapes or Number Rods.
- Player 1 makes a number from apparatus.
- Player 2 says how many tens and how many units.
- Both players record the addition facts e.g. 40 + 3 = 43 and 43 = 40 + 3.

Key question

Can you partition this number into tens and units?