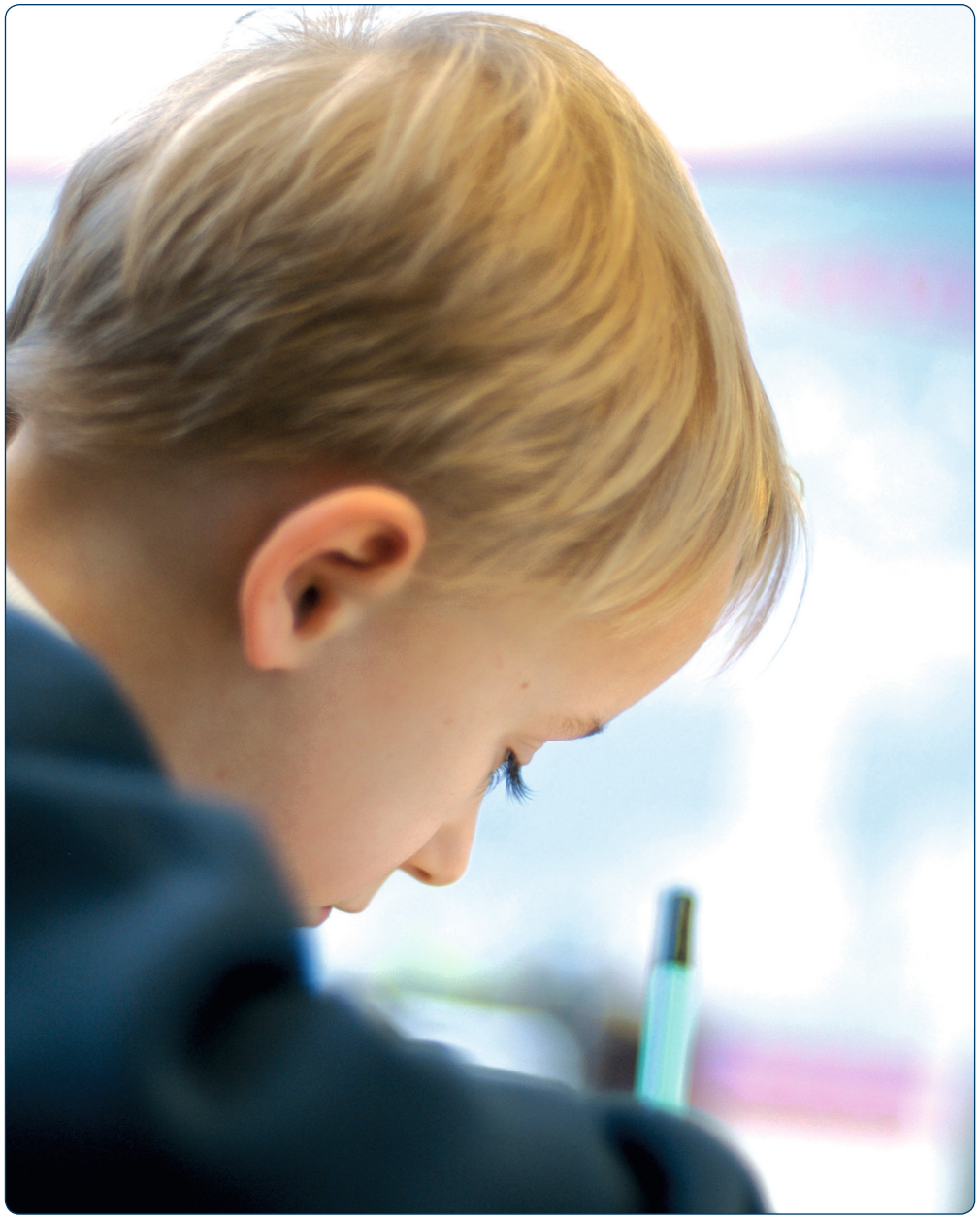
Introducing Numicon into Year 2

Before using Numicon Shapes in your teaching, give children time to explore Numicon Shapes for themselves. To help you get started we have suggested a sequence of activities for all children. These activities refer to the teaching materials in our three core kits: Firm Foundations, Kit 1 and Kit 2.

Assessing children's progress and knowing when to move them on is always a concern, but watching what they do and listening to what they say as they work with these activities will help you to assess their understanding. For example when they first meet Numicon, children may not call the Numicon Shapes by number names, or connect them with numerals, so watching out for when children do this will help your assessment of their number understanding.

Even if children have learnt to read and write the +, –, =, symbols before you introduce Numicon, it is worthwhile revising these through the multi-sensory activities suggested below. In doing so you will be able to assess whether children understand the ideas of addition, subtraction and equivalence represented by these symbols, or whether they are simply following a rote procedure.

Most children in Year 2 will complete these activities in about three weeks, and will be ready to move on to the work in Kit 2, if some children need longer then it is important to give them more time. We find that all children they enjoy revisiting earlier activities independently, even when they are working on later ideas in their maths lessons.



Getting to know the Numicon Shapes

Shape Detectives

Working with the whole class together give each child a set of Numicon Shapes 1-10. Ask them to consider with a partner 'What they could use these Shapes for?' As a whole class feedback and discuss their ideas.

Assessing children's understanding

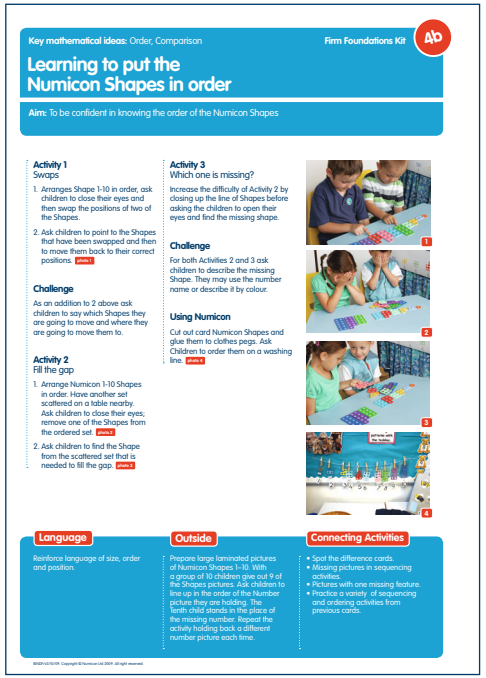
Watch and listen for children who can see relationships between the Shapes and those who notice properties like odd, even, one more/less. Some children may also refer to the Shapes by their number names.

Extending the task

Give each pair of children a Feely bag and two sets of Shapes 1-10. Have one set of Shapes spread out on the table and the other set in a pile at the side. One child puts a Shape from the pile in the bag and the other feels inside and points to the matching piece.

Challenge the children to see if they can make find different ways of sorting the Shapes into sets?

Ordering


Key mathematical ideas: Order, Comparison

Firm Foundations Kit 4b

Learning to put the Numicon Shapes in order

Aim: To be confident in knowing the order of the Numicon Shapes

Activity 1
Swaps

1. Arranges Shape 1-10 in order, ask children to close their eyes and then swap the positions of two of the Shapes.
2. Ask children to point to the Shapes that have been swapped and then to move them back to their correct positions. photo 1

Challenge

As an addition to 2 above ask children to say which Shapes they are going to move and where they are going to move them to.

Activity 2
Fill the gap

1. Arrange Numicon 1-10 Shapes in order. Have another set scattered on a table nearby. Ask children to close their eyes, remove one of the Shapes from the ordered set. photo 2
2. Ask children to find the Shape from the scattered set that is needed to fill the gap. photo 3

Activity 3
Which one is missing?

Increase the difficulty of Activity 2 by closing up the line of Shapes before asking the children to open their eyes and find the missing shape.

Challenge

For both Activities 2 and 3 ask children to describe the missing Shape. They may use the number name or describe it by colour.

Using Numicon

Cut out card Numicon Shapes and glue them to clothes pegs. Ask Children to order them on a washing line. photo 4

Language

Reinforce language of size, order and position.

Outside

Prepare large laminated pictures of Numicon Shapes 1–10. With a group of 10 children give out 9 of the Shapes pictures. Ask children to line up in the order of the Number picture they are holding. The tenth child stands in the place of the missing number. Repeat the activity holding back a different number picture each time.

Connecting Activities

- Spot the difference cards.
- Missing pictures in sequencing activities.
- Pictures with one missing feature.
- Practice a variety of sequencing and ordering activities from previous cards.

Refer to: Firm Foundations Kit card 4b, Activity 1, Swaps

Before moving on to the above activity try the following whole class activity, which can be played with the whole class using Numicon Shapes on a magnet board, or on the Numicon Whiteboard Software.

First ask the children for suggestions about how the Shapes might be put in order of size then ask them to help decide which is the smallest, which is the largest, which Shape might come 'next', 'after', 'before' or 'between', which are 'bigger' or 'smaller'. Ask children how they know the answers to these questions and what they notice that helps them decide how to put the Shapes in order of size?

Assessing children's understanding

- Watch for children who are able to order the Shapes independently, and which way round they place the Shapes.
- Listen for the language they use to describe the position of the Shapes, and what has happened in the Swaps Game.
- Listen out for children using the word 'pattern'.

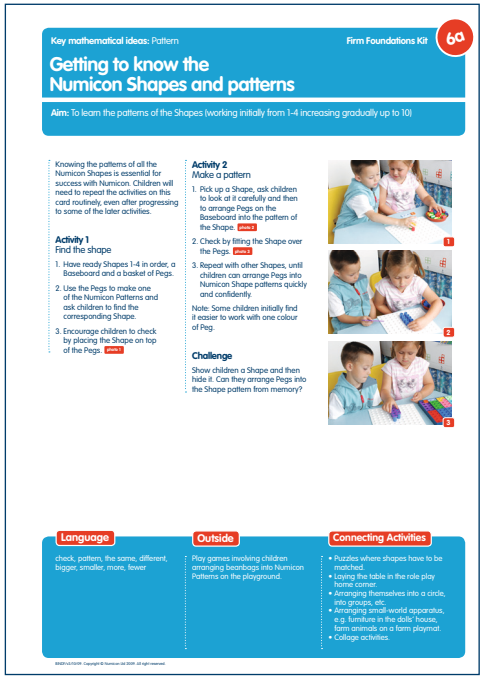
Moving on

When children are ordering the Shapes confidently, play the Swaps games as a whole class. Children can then work in pairs to play Swaps and the other games on this card.

Extending the task

Children can work in pairs to put a set of Shapes 1-5 into the Feely Bag and a second set in order on their table. One child removes a Shape from the ordered row, leaving a gap, another child feels in the bag to find the missing Shape. This can be repeated with a set of five higher value Shapes, e.g. 4-8 or a larger set of Shapes, e.g. 1-10. The gap can also be closed to present a greater challenge to children's understanding of order.

Patterns



Refer to: Firm Foundations Kit card 6a, Activity 2, Make a pattern

This activity can be completed by children working alone or played as a game, with up to 6 children working in pairs.

Assessing children's understanding

- Watch for children matching a Numicon Shape to a Numicon Pattern confidently without counting.
- Vary colours used for building the Patterns to assess whether children are just matching by colour, or whether they have moved on to looking at the Pattern.

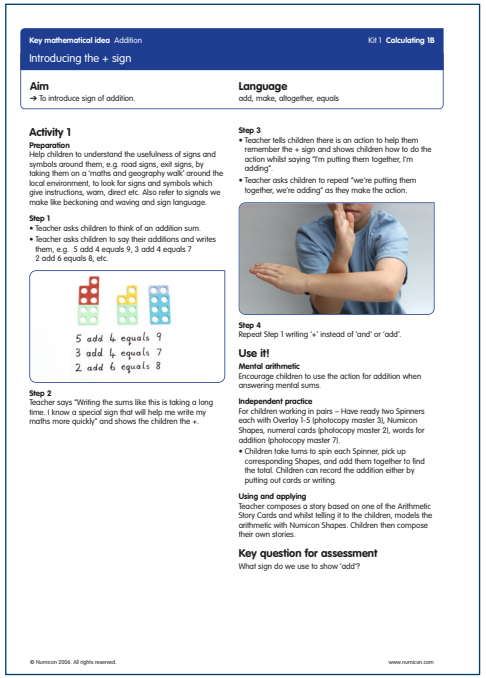
Moving on

Building Numicon Patterns helps children to know the cardinal value of each number and to visualise Numicon Shapes. The better a child's ability to build and identify Numicon Patterns the more readily they will learn to calculate. So keep revisiting these Pattern activities almost daily until children are able to build all the Numicon Patterns without counting. Use opportunities that arise during the day as well as alongside other activities in maths lessons. For more ideas look at Foundation Kit Cards 6b, 8b, 9a and 9b.

Extending the task

Use the Spinner with the Pattern Overlay (see photocopy masters) to select and build the Patterns. Put one Shape in the Feely Bag, identify the Pattern purely by touch and make it with the Pegs.

Addition



Refer to: Numicon Kit 1, Calculating 1b, Activity 1

Follow Activity 1 to check that children understand the operation of addition and the mathematical language. Introduce the action for the addition symbol.

Make up an addition story with the children and hold up Numicon Shapes to illustrate the story, e.g. three children are listening to a story, another child joins them. Illustrate the story by combining the 3-shape and 1-shape and use the addition vocabulary to go with the action '3 add 1 equals 4'. Children will be able to solve these problems without counting.

Assessing children's understanding

- Watch for children confidently matching the addition story to the action and imagery.
- Listen for them using the language of addition in their stories (altogether, more, makes, add, put together).

Moving on

Children work independently to make up and record their own addition stories.

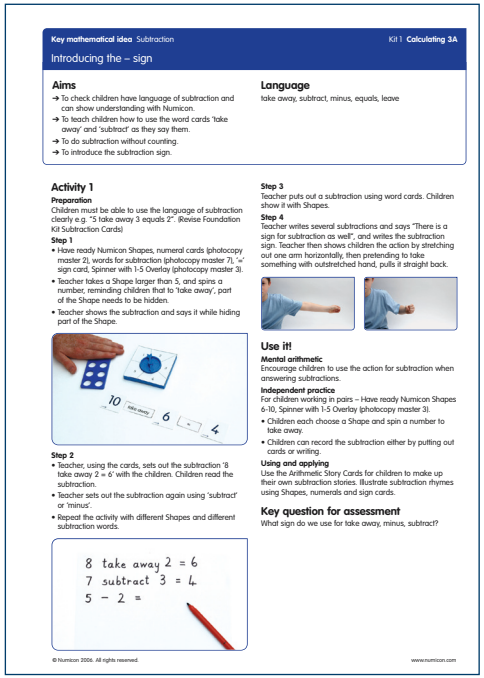
Extending the task

Challenge children to find all the ways to make 10 (and other numbers to 10) using two Shapes, record their work and to think about how they know they have found all the possible ways?

Kit 1, Calculating Card 7b – Independent practice.

Kit 1, Calculating 8b – All activities to practise Addition Facts to 10

Subtraction 1


Key mathematical idea Subtraction — Kit 1 Calculating 3A

Introducing the – sign

Aims
- To check children have language of subtraction and can show understanding with Numicon.
- To teach children how to use the word cards 'take away' and 'subtract' as they say them.
- To do subtraction without counting.
- To introduce the subtraction sign.

Language
take away, subtract, minus, equals, leave

Activity 1

Preparation
Children must be able to use the language of subtraction clearly e.g. "5 take away 3 equals 2". (Revise Foundation Kit Subtraction Cards)

Step 1
- Have ready Numicon Shapes, numeral cards (photocopy master 2), words for subtraction (photocopy master 7), '=' sign card, Spinner with 1-5 Overlay (photocopy master 3).
- Teacher takes a Shape larger than 5, and spins a number, reminding children that to 'take away', part of the Shape needs to be hidden.
- Teacher shows the subtraction and says it while hiding part of the Shape.

Step 2
- Teacher, using the cards, sets out the subtraction '8 take away 2 = 6' with the children. Children read the subtraction.
- Teacher sets out the subtraction again using 'subtract' or 'minus'.
- Repeat the activity with different Shapes and different subtraction words.

Step 3
Teacher puts out a subtraction using word cards. Children show it with Shapes.

Step 4
Teacher writes several subtractions and says "There is a sign for subtraction as well", and writes the subtraction sign. Teacher then shows children the action by stretching out one arm horizontally, then pretending to take something with outstretched hand, pulls it straight back.

Use it!

Mental arithmetic
Encourage children to use the action for subtraction when answering subtractions.

Independent practice
For children working in pairs – Have ready Numicon Shapes 6-10, Spinner with 1-5 Overlay (photocopy master 3).
- Children each choose a Shape and spin a number to take away.
- Children can record the subtraction either by putting out cards or writing.

Using and applying
Use the Arithmetic Story Cards for children to make up their own subtraction stories. Illustrate subtraction rhymes using Shapes, numerals and sign cards.

Key question for assessment
What sign do we use for take away, minus, subtract?

8 take away 2 = 6
7 subtract 3 = 4
5 – 2 =

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Refer to: Numicon Kit 1, Calculating 3a, Activity 1

Follow this activity to check children understand take-away structure of subtraction and the mathematical language. Introduce the action for the subtraction symbol.

Make up an subtraction story with the children, hold up Numicon Shapes to illustrate the story e.g. hold up a 7-shape and say 'If 7 children were playing in the park, and 3 had to go home, how could we find out how many were left?' Invite the children to suggest different ways of showing this with Numicon. Ask children to think about how they could record this take away subtraction story.

Assessing children's understanding

- Watch for children confidently matching the take away subtraction story to the action and imagery.
- Look at the ways in which children show 'take away' by hiding a number of holes in the Shape they are starting with.
- Have they learnt that it is easier to leave a recognisable pattern?
- Listen for them using the language of subtraction (take away, leaves, start with, fewer, less).

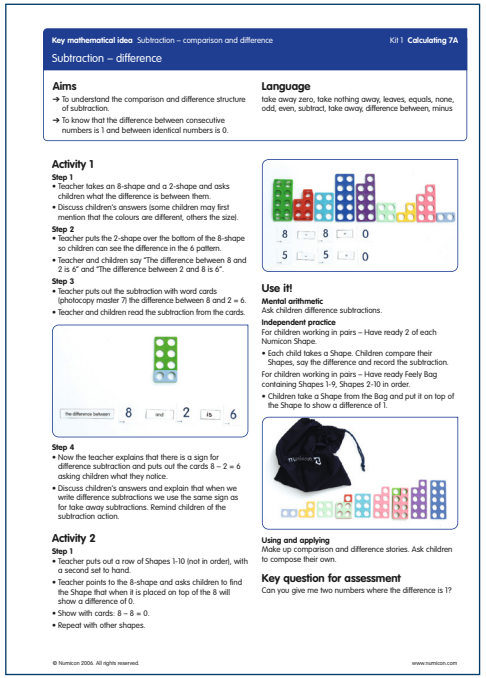
Moving on

Children can work independently to make up and record their own take away subtraction stories.

Extending the task

Follow the Independent practice and Using and Applying suggestions on the Activity Card.

Subtraction 2


Key mathematical idea Subtraction – comparison and difference — Kit 1 Calculating 7A

Subtraction – difference

Aims
- To understand the comparison and difference structure of subtraction.
- To know that the difference between consecutive numbers is 1 and between identical numbers is 0.

Language
take away zero, take nothing away, leaves, equals, none, odd, even, subtract, take away, difference between, minus

Activity 1

Step 1
- Teacher takes an 8-shape and a 2-shape and asks children what the difference is between them.
- Discuss children's answers (some children may first mention that the colours are different, others the size).

Step 2
- Teacher puts the 2-shape over the bottom of the 8-shape so children can see the difference in the 6 pattern.
- Teacher and children say "The difference between 8 and 2 is 6" and "The difference between 2 and 8 is 6".

Step 3
- Teacher puts out the subtraction with word cards (photocopy master 7) the difference between 8 and 2 = 6.
- Teacher and children read the subtraction from the cards.

The difference between 8 and 2 is 6

Step 4
- Now the teacher explains that there is a sign for difference subtraction and puts out the cards 8 – 2 = 6 asking children what they notice.
- Discuss children's answers and explain that when we write difference subtractions we use the same sign as for take away subtractions. Remind children of the subtraction action.

Activity 2

Step 1
- Teacher puts out a row of Shapes 1-10 (not in order), with a second set to hand.
- Teacher points to the 8-shape and asks children to find the Shape that when it is placed on top of the 8 will show a difference of 0.
- Show with cards: 8 – 8 = 0.
- Repeat with other shapes.

8 – 8 = 0
5 – 5 = 0

Use it!

Mental arithmetic
Ask children difference subtractions.

Independent practice
For children working in pairs – Have ready 2 of each Numicon Shape.
- Each child takes a Shape. Children compare their Shapes, say the difference and record the subtraction.

For children working in pairs – Have ready Feely Bag containing Shapes 1-9, Shapes 2-10 in order.
- Children take a Shape from the Bag and put it on top of the Shape to show a difference of 1.

Using and applying
Make up comparison and difference stories. Ask children to compose their own.

Key question for assessment
Can you give me two numbers where the difference is 1?

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Refer to: Numicon Kit 1, card 7a

Read the Key mathematical ideas section of the Kit 2 Teaching Guide in particular the section that focuses on subtraction structures and associated mathematical language. Now follow Activity 1 with the children to introduce the idea of 'difference' in discussion. Talk about the idea of comparing things; choose pictures of two animals and talk about similarities and differences. Then show the children two Shapes and identify differences in colour and size. Draw children's attention to the difference in size that can be seen when a smaller Numicon Shape is put on top of a larger one.

Assessing children's understanding

- Watch for children confidently comparing two Shapes and expressing the difference as a number without counting the holes.
- Listen for them describing what they see using language of difference subtraction (compare, say, difference, fewer, difference between).
- Can they express what they see as a whole subtraction sentence? e.g. the difference between seven and three is four.

Moving on

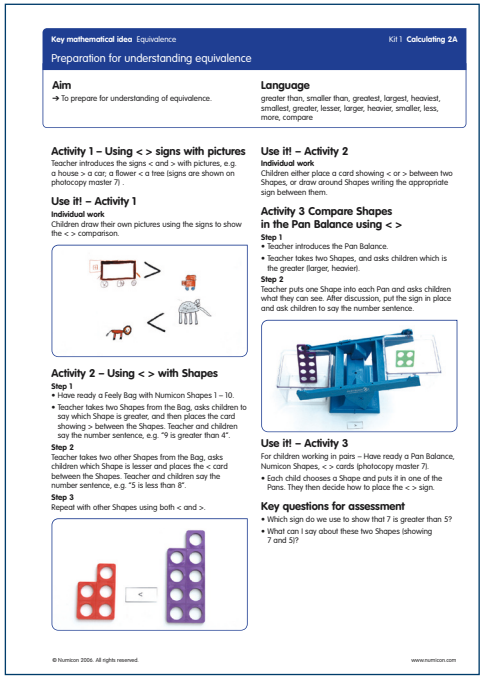
Ask children to choose two shapes and make up their own stories using take away and difference.

Make and use a class pictogram or bar chart, explore and compare different categories using language of comparison and difference.

Extending the task

Follow Activity 2 and challenge the children to find two Shapes with a difference of 1 and then to find more ways to show this. How do they know that they have found all the ways?

Equivalence


Key mathematical idea Equivalence — Kit 1 Calculating 2A

Preparation for understanding equivalence

Aim
→ To prepare for understanding of equivalence.

Language
greater than, smaller than, greatest, largest, heaviest, smallest, greater, lesser, larger, heavier, smaller, less, more, compare

Activity 1 – Using < > signs with pictures
Teacher introduces the signs < and > with pictures, e.g. a house > a car, a flower < a tree (signs are shown on photocopy master 7) .

Use it! – Activity 1
Individual work
Children draw their own pictures using the signs to show the < > comparison.

Activity 2 – Using < > with Shapes
Step 1
- Have ready a Feely Bag with Numicon Shapes 1 – 10.
- Teacher takes two Shapes from the Bag, asks children to say which Shape is greater, and then places the card showing > between the Shapes. Teacher and children say the number sentence, e.g. "9 is greater than 4".

Step 2
Teacher takes two other Shapes from the Bag, asks children which Shape is lesser and places the < card between the Shapes. Teacher and children say the number sentence, e.g. "5 is less than 8".

Step 3
Repeat with other Shapes using both < and >.

Use it! – Activity 2
Individual work
Children either place a card showing < or > between two Shapes, or draw around Shapes writing the appropriate sign between them.

Activity 3 Compare Shapes in the Pan Balance using < >
Step 1
- Teacher introduces the Pan Balance.
- Teacher takes two Shapes, and asks children which is the greater (larger, heavier).

Step 2
Teacher puts one Shape into each Pan and asks children what they can see. After discussion, put the sign in place and ask children to say the number sentence.

Use it! – Activity 3
For children working in pairs – Have ready a Pan Balance, Numicon Shapes, < > cards (photocopy master 7).
- Each child chooses a Shape and puts it in one of the Pans. They then decide how to place the < > sign.

Key questions for assessment
- Which sign do we use to show that 7 is greater than 5?
- What can I say about these two Shapes (showing 7 and 5)?

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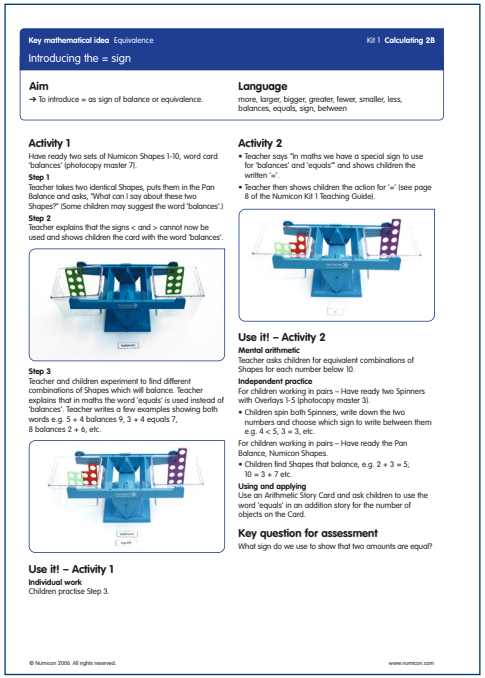
Key mathematical idea Equivalence — Kit 1 Calculating 2B

Introducing the = sign

Aim
→ To introduce = as sign of balance or equivalence.

Language
more, larger, bigger, greater, fewer, smaller, less, balances, equals, sign, between

Activity 1
Have ready two sets of Numicon Shapes 1-10, word card "balances" (photocopy master 7).

Step 1
Teacher takes two identical Shapes, puts them in the Pan Balance and asks, "What can I say about these two Shapes?" (Some children may suggest the word 'balances'.)

Step 2
Teacher explains that the signs < and > cannot now be used and shows children the card with the word 'balances'.

Step 3
Teacher and children experiment to find different combinations of Shapes which will balance. Teacher explains that in maths the word 'equals' is used instead of 'balances'. Teacher writes a few examples showing both words e.g. 5 + 4 balances 9, 3 + 4 equals 7, 8 balances 2 + 6, etc.

Use it! – Activity 1
Individual work
Children practise Step 3.

Activity 2
- Teacher says "In maths we have a special sign to use for 'balances' and 'equals'" and shows children the written '='.
- Teacher then shows children the action for '=' (see page 8 of the Numicon Kit 1 Teaching Guide).

Use it! – Activity 2
Mental arithmetic
Teacher asks children for equivalent combinations of Shapes for each number below 10.

Independent practice
For children working in pairs – Have ready two Spinners with Overlays 1-5 (photocopy master 3).
- Children spin both Spinners, write down the two numbers and choose which sign to write between them e.g. 4 < 5, 3 = 3, etc.

For children working in pairs – Have ready the Pan Balance, Numicon Shapes.
- Children find Shapes that balance, e.g. 2 + 3 = 5; 10 = 3 + 7 etc.

Using and applying
Use an Arithmetic Story Card and ask children to use the word 'equals' in an addition story for the number of objects on the Card.

Key question for assessment
What sign do we use to show that two amounts are equal?

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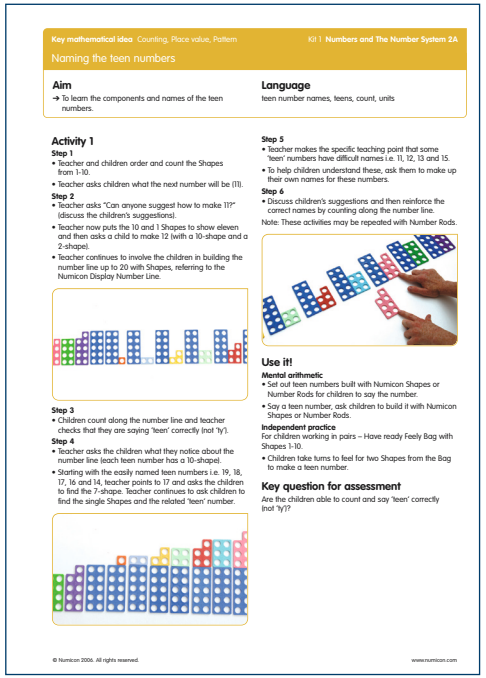
Place value


Key mathematical idea Counting, Place value, Pattern — Kit 1 Numbers and The Number System 2A

Naming the teen numbers

Aim
→ To learn the components and names of the teen numbers.

Language
teen number names, teens, count, units

Activity 1
Step 1
- Teacher and children order and count the Shapes from 1-10.
- Teacher asks children what the next number will be (11).

Step 2
- Teacher asks "Can anyone suggest how to make 11?" (discuss the children's suggestions).
- Teacher now puts the 10 and 1 Shapes to show eleven and then asks a child to make 12 (with a 10-shape and a 2-shape).
- Teacher continues to involve the children in building the number line up to 20 with Shapes, referring to the Numicon Display Number Line.

Step 3
- Children count along the number line and teacher checks that they are saying 'teen' correctly (not 'ty').

Step 4
- Teacher asks the children what they notice about the number line (each teen number has a 10-shape).
- Starting with the easily named teen numbers i.e. 19, 18, 17, 16 and 14, teacher points to 17 and asks the children to find the 7-shape. Teacher continues to ask children to find the single Shapes and the related 'teen' number.

Step 5
- Teacher makes the specific teaching point that some 'teen' numbers have difficult names i.e. 11, 12, 13 and 15.
- To help children understand these, ask them to make up their own names for these numbers.

Step 6
- Discuss children's suggestions and then reinforce the correct names by counting along the number line.

Note: These activities may be repeated with Number Rods.

Use it!
Mental arithmetic
- Set out teen numbers built with Numicon Shapes or Number Rods for children to say the number.
- Say a teen number, ask children to build it with Numicon Shapes or Number Rods.

Independent practice
For children working in pairs – Have ready Feely Bag with Shapes 1-10.
- Children take turns to feel for two Shapes from the Bag to make a teen number.

Key question for assessment
Are the children able to count and say 'teen' correctly (not 'ty')?

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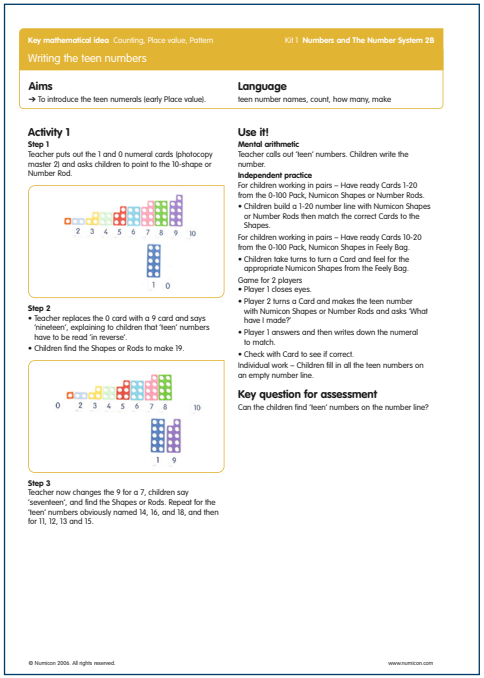
Key mathematical idea Counting, Place value, Pattern — Kit 1 Numbers and The Number System 2B

Writing the teen numbers

Aims
→ To introduce the teen numerals (early Place value).

Language
teen number names, count, how many, make

Activity 1
Step 1
Teacher puts out the 1 and 0 numeral cards (photocopy master 2) and asks children to point to the 10-shape or Number Rod.

Step 2
- Teacher replaces the 0 card with a 9 card and says 'nineteen', explaining to children that 'teen' numbers have to be read 'in reverse'.
- Children find the Shapes or Rods to make 19.

Step 3
Teacher now changes the 9 for a 7, children say 'seventeen', and find the Shapes or Rods. Repeat for the 'teen' numbers obviously named 14, 16, and 18, and then for 11, 12, 13 and 15.

Use it!
Mental arithmetic
Teacher calls out 'teen' numbers. Children write the number.

Independent practice
For children working in pairs – Have ready Cards 1-20 from the 0-100 Pack, Numicon Shapes or Number Rods.
- Children build a 1-20 number line with Numicon Shapes or Number Rods then match the correct Cards to the Shapes.

For children working in pairs – Have ready Cards 10-20 from the 0-100 Pack, Numicon Shapes in Feely Bag.
- Children take turns to turn a Card and feel for the appropriate Numicon Shapes from the Feely Bag.

Game for 2 players
- Player 1 closes eyes.
- Player 2 turns a Card and makes the teen number with Numicon Shapes or Number Rods and asks 'What have I made?'
- Player 1 answers and then writes down the numeral to match.
- Check with Card to see if correct.

Individual work – Children fill in all the teen numbers on an empty number line.

Key question for assessment
Can the children find 'teen' numbers on the number line?

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Numicon Kit 1, Calculating 2a & 2b

Follow the Activities on the cards in which children first use the greater than and less than symbols to compare Numicon Shapes and then use Shapes in a pan balance to explore equivalence

Assessing children's understanding

Watch and listen for children comparing different combinations of Shapes that are equivalent and using the language 'is equal to' in their explanations

Moving on

Follow the Independent practice on card 2b

Extending the task

- Challenge children to be able to make up their own addition and subtraction stories and to record them with number sentences that include the = symbol.
- Develop further with suggestions from the Kit 2 card Using Pattern 3

Numicon Kit 1, Numbers and the Number System 2a & 2b

Read the Key mathematical ideas section of the Kit 2 Teaching Guide in particular the section that focuses on place value, which will help you to anticipate where children may have difficulty. Follow Activity 1 on card 2a to check if children can recognise the teen numerals and build them with Numicon Shapes. Develop this Activity to revise writing the teen numerals (refer to card 2b). Give children an opportunity to play the two Feely Bag games described in the Independent Practice sections both cards

Assessing children's understanding

- Watch for children who can read the numerals and build the number and children who can build the number and write the numerals.
- Listen to the children's explanation of a teen number like 13 as a 10-shape and a 3-shape. Also the connections they are making between the place of the digits and their value.

Moving on

To reinforce place value ideas follow Activity 1 on Card 3a. Give children plenty of practise of 'finding how many' by

Place value, continued

grouping objects in the 10s Pattern and 'whatever is left' as an efficient way to find out 'how many' without counting.

Extending the task

- To extend their counting range give children frequent opportunities to find 'how many' by arranging large groups of objects into patterns.
- Ask children to estimate 'how many' in counting situations like the wrapping paper task, Activity 1 on card 3B. Encourage children to use their understanding of higher numbers when they meet them in situations like measuring, data handling, shopping problems etc.