



Introduction

The booklet is devoted to suggestions for a wide variety of engaging activities, through which to encourage children's mathematical development throughout the Nursery setting. Alongside suggestions for activities we have given examples of questions for you to ask as you play alongside children. These questions will encourage conversations that will help children develop in all aspects of their mathematical understanding and provide a firm foundation for the number ideas they will meet in school.

Using this booklet

Background to the Numicon approach

Numicon is an important part of children's wider experience with mathematics and number ideas. It helps them eventually to see important connections between numbers, for example, that each number is 'one more' than the last, and 'one fewer' than the next. Numicon uses a multi-sensory approach so children learn about number ideas through seeing and feeling how Numicon Patterns connect with each other. As adults we can quickly make connections between Numicon Shapes and number ideas because we already understand numbers. However these connections are not obvious to children and it is really important to give them time to make their own discoveries and to avoid jumping in to tell them the number names for the Shapes. As children meet Numicon in play in different areas of the setting they get to know the colours, sizes and patterns of the Numicon Shapes. They will put their

fingers into the holes of the Shapes and count them, and gradually start to make connections with numbers. In time they will notice that the ten Shapes together form a regularly patterned set that can be arranged in order of size. The activities are suitable for children of all abilities they aim to help children develop the understanding that will provide a firm foundation for the number ideas they will meet in school.

How to use this booklet for planning

You will see that the suggestions for activities in this booklet are arranged under headings of the different areas of the setting. As you plan the activities for the children week by week, refer to the booklet and identify the areas of the setting where an adult will be working alongside the children, then note the ideas that will be explored and the questions that will be included in the conversations. Not all the questions would be used in one session – there is so much potential in these activities that they will be revisited often and the conversations and questions will vary from session to session and child to child. The main activities are for all children, the extension ideas suggested will help you to plan for the later stages of children's development. We recommend



including activities with Numicon once or twice a week for children to use independently as well as periodically planning some adult-led games.

Assessing children's progress and responding to children's answers

The most important evidence of children's understanding is what they do and say while they play on the various activities that you have planned for them. Whenever possible, play alongside the children and talk with them using the mathematics words and questions that we have suggested. Children will learn the meaning of words through hearing you use them and in time they will start to use these words themselves. The questions will encourage you to notice what the children can do and help you to avoid focusing on what they can't. Noting children's responses and watching what they do as they play will give you evidence of their level of understanding.

We need to speak to children thoughtfully and ask questions encouragingly. You will find that many of the suggested questions are open, asking children what they think, rather than asking them for a one word 'right or wrong' answer. Whatever they answer we need to value their replies, which will tell us something about their understanding. Where children's understanding and explanations are uncertain, model back the mathematical words you have been using during the activity. Always show children how much you value their thinking and encourage them by saying, for example, "I can see you have really thought about that" or "I can see why you think that" or "that's a good try". As an example, if a child is not yet able to make a repeating pattern and has made a random one

Key mathematical ideas

instead, you might say, "You've worked really hard on your pattern. I like the way you have chosen lots of different colours, to make it really colourful". You would make a note that the child was not yet making a repeating pattern, and plan to encourage understanding over the next few weeks by drawing attention to and talking about repeating patterns in other areas of the setting.

Moving children on to do the extension activities

In each section of the booklet you will find extension ideas. The majority of children will be ready for these towards the end of their time in the Nursery. It is important not to rush on to these until you notice by listening and watching that children are confident with the earlier activities and that they are responding to questions in ways that show that they understand.

Counting

It is easy for us, as adults, to underestimate the difficulties involved in learning to count. First of all children have to learn to say the number names in order, which is difficult because there is no pattern. We notice that when children start to count they may say, "one, two, three, seven, four, eight ...". Most children do learn eventually to recite the sequence of number names correctly but at this stage they do not yet know why they are counting. As children see adults pointing to objects as they count they begin to mimic this, and in time they learn to say one number name as they point to each object in the collection they are counting. This is sometimes called 'one to one' counting. Later, children learn that the last number they say when they are counting a group of objects tells them how many objects there are. Then children learn that in whatever order they count the same group of objects, the number in the group remains the same. All this is a lot for little children to learn. In the Nursery most of them will be getting to grips with learning the number names and learning to count small numbers of objects. You will notice that we suggest you ask children questions such as, "How could we find out how many there are?" to encourage their understanding that we count to find out how many.

Finding 'how many' by using the Numicon Patterns

As children become familiar with the Numicon Shapes they begin to learn their Patterns. They will put Pegs into the holes in each of the Shapes, and also build the Patterns of the Shapes by arranging Pegs on the Baseboard. Some children will start to

do this for the lower numbered Shapes towards the end of their time in the Nursery. They may also group other objects into Numicon Patterns to see how many objects there are from looking at the Patterns rather than counting. Making the Numicon Patterns encourages children to see numbers as 'wholes', which is an important step towards calculating.

Patterns

When we recognise a pattern we are able to predict, and it is pattern that underlies mathematics. Most children have a strong sense of pattern; they enjoy familiar stories and rhymes and feel secure when they understand the routines of their day because they can predict what is going to happen next. It is through recognising patterns in language that they learn to talk. Numicon is designed to appeal to this sense of pattern and we can also encourage children to recognise patterns from the beginning of their time in Nursery. Draw their attention to patterns on fabric, in bricks, in sounds and stories and in movement. It will take some time for children to confidently copy, continue, and create their own simple repeating patterns, but lots of opportunities to thread beads, use Pegs on Baseboards, and copy patterns with percussion instruments and body sounds will help.

Putting things in order

As children put things into size order they are comparing them to find the smallest, and then which comes next, and so on. Making comparisons like this is an important part of children's mathematical development and is the basis for learning about measurement later on at school.

Learning to put Numicon Shapes in order of size will also help children to see how numbers are connected with one another, for example, that each Shape is 'one more' than the previous one.

Beginning calculating

Beginning to understand and use the language of 'one more' and 'one fewer' is an important foundation for children's calculating. As they put together groups of objects in their play they find they have made a larger group. In their play they may also notice that when they put two or more Numicon Shapes together they make the pattern of a larger Shape. In the activities there are also suggestions for helping children to notice that when objects are taken away from a group, fewer objects are left. Through such activities children are beginning to learn about addition and subtraction.

Shape and space

As children engage in movement, dance and outside play, and play with the variety of resources in the Nursery including Numicon, they are all the time seeing and exploring spatial relationships. As they play with jigsaws and Numicon Shapes they experiment by turning the pieces over, turning them round and moving them together, they also notice and talk about changes in position. As they build with blocks, with Numicon Shapes and other apparatus, they explore the shape properties of different resources. By giving children lots of opportunities to experiment and by talking to them as they do so, you can encourage children to begin to learn some essential geometric ideas.

Raising the profile of mathematics in the Nursery

Children take in their surroundings and as they begin to recognise patterns, similarities and differences they begin to make sense of the world around them. Use numerals around the setting, for example, on labels near the sand, water, or role play area that show how many children may work at a time on these activities. Provide objects that use number in everyday situations such as calendars and clocks and refer to them in your conversations with children. On your storage trays, as well as showing the name of the equipment you can also number them, this will help children to notice that we can use numerals to help us find things, as we do in an index in a book. Display the Numicon Number Line at children's eye level – children will notice this and will begin to make important connections between their counting, the numerals and the Numicon Shapes.

Resourcing

Young children enjoy exploring early number and mathematical ideas through lots of different media alongside their play with Numicon. Resourcing doesn't need to be expensive. Collections of 'found' objects such as plastic bottle tops of different sorts and sizes are useful in all sorts of ways. For instance, bottle tops are useful for measuring or for pouring, in sand and water play. Make collections of straws, bottle tops, empty plastic bottles, socks (for comparing sizes and patterns), stones, flower pots, shells, nuts, autumn collections, butter beans, pasta, ribbons of different widths and lengths, boxes (chocolate boxes with spaces, egg boxes, little boxes for making collections) and so on. At car boot sales, jumble sales and charity shops you can find toy cars of different sizes, plastic boats of different sizes, dolls, and more ...



2 Mathematics in Water Play

Most children love playing and experimenting with water, watching how it splashes and flows. Providing a wide range of inexpensive resources at different times in the water tray will help children to experiment with water in different ways. Playing alongside children and engaging in conversation with them about what is happening will extend children's thinking. Over a period of time, put out different resources for children to play with in the water.

Ideas for small world toys in water

You will need

A large container for the water such as a water tray or bucket. A selection of various small world toys such as: twelve squirty fish in different colours, ducks of different sizes, sea creatures of different types, boats of different colours, types and sizes, shells or pebbles in a range of colours, types and sizes, and a net or small bucket for each child in the group.

- 1 Talk to the children about the different objects as they play and collect fish or shells in their nets and buckets.

For the fish, use the different colour words and adjectives like small, large, round, flat, stripy, spotty, etc. Ask questions such as:

- "What is your favourite coloured fish?"
- "How can we find out how many fish are in the water?"
- "How many fish of that colour can you find?"
- "How could we sort the fish out?"
- "Which is your favourite group of fish?"

Extension

Ask the children:

- "Which is the largest and the smallest group of fish?"
- "Can you find the Numicon Shape for the number of fish in this group?"
- "Can you find it on the Number Line?"

Children who are calling Numicon Shapes by their number names and can make the Numicon Patterns with Pegs on the Baseboard may like to find out how many objects there are by arranging them into Numicon Patterns. Ask questions such as:

- "Can you arrange the fish into the Numicon Pattern?"
- "How many fish would you have if you caught one more?"
- "Why not catch one more and find out?"
- "How many would you have if one jumped back in?"

- 2 Talk to the children about the different shaped shells using adjectives such as pointed, curved, curly, spiral, round, long, straight, etc.

Encourage children to describe the shells they have collected by asking:

- "What different shaped shells have you found?"
- "Can you find some shells that look different?"
- "How many shells did you collect?"
- "Can you count them?"

Extension

Ask:

- "Do you think your friend collected more than you or fewer than you?"

Children could find out by counting or comparing the number of shells they have by arranging them into lines, circles or Numicon Patterns.



"What different shaped shells have you found?"



"How many fish of that colour can you find?"

3 Talk to the children about the different sized ducks in the water, encouraging the children to use the words 'bigger' and 'smaller' by saying things such as "I think the smaller duck is the baby". Ask questions such as:

- "Are all the ducks the same size?"
- "What sized ducks have you collected?"
- "Which is the biggest duck?"
- "Which is the smallest?"
- "Can you find two that are the same?"
- "Could you put the ducks in a row with the biggest at the front?"
- "Could you start with the smallest?"
- "Can you catch two different sized ducks?"
- "What can you tell me that you notice about them?"



*"Which bucket do you like best?"
"Have you filled it up?"*

Extension

Put several of each Numicon Shapes 1-6 in the water and talk to the children about the Numicon Shapes they can see in the water, describing their colours and other features that the children notice about them. Play alongside the children – fish out some Numicon Shapes yourself and, without saying anything, put them in order. Leave the children to play independently then go back and talk to them about what they are doing. Suggest, "Let's put the Shapes in order starting with the smallest?"

Put Numicon Shapes and pebbles into the water. Ask the children to catch a Shape in their net and then collect enough pebbles to fill the holes. Some children who are calling Numicon Shapes by their number names and can make the Numicon Patterns with Pegs on the Baseboard may like to arrange their pebbles into Numicon Patterns and check how many they have by comparing their Pattern with the Shape.

try this!

Instead of water use snow or make ice*



If weather allows, hide Numicon Shapes and collections of small objects in snow for children to find. Use similar questions as those suggested for water play.

Freeze Numicon Shapes and up to six other small objects like shells, buttons or small toys in different blocks of ice by putting them in plastic containers of different shapes, filling the containers with water and freezing them. Set up a table in the Nursery where the children can watch the blocks of ice melting during the session. Talk about what they can see happening and what they can see emerging from the ice as it melts.

*Be aware that ice can burn so children should not touch it for long periods.

Ideas using buckets, containers and bottles

You will need

A large container for the water such as a water tray or bucket, A selection of different sized buckets, bottles, plastic containers and cups. Over a period of time, put different resources for children to play with in the water.

4 As children fill and empty various bottles and containers in their imaginative play, engage in conversations with them and take opportunities to compare various containers.

Try to include words such as more, fewer, full, empty, half full, half empty, most, least, etc. Ask questions such as:

- "Which bucket do you like best?"
- "Why do you like it best?"
- "Have you filled it up?"
- "What did you use to fill it?"
- "What happens when you tip the water out?"
- "How many buckets (or other containers) are there in the water tray today?"
- Make sure that there are three distinct sizes of similar containers for children to play with before asking the following questions:
- "Are all the bottles (or other containers) the same size?"
- "Would you like to play with a big one or a small one?"

Suggest:

"Let's put the bottles in order of size."

Extension

Ask:

- "Which bottle do you think will hold the most water?"
- "Which bottle do you think will hold the least water?"
- "How could we find out how many small bottles full of water will fill up the big bottle?"



"Which bottle do you think will hold the most water?"



"How could we find out how many small bottles full of water will fill up the big bottle?"