

Foundation Stage

Progression in mathematics

The learner

Children in the Foundation Stage are beginning to build mathematical concepts, skills and knowledge. They are curious about their world, and are motivated, enthusiastic and engaged by the mathematical experiences they are offered and those they initiate for themselves. Home –school mathematics links are an important part of Foundation Stage children’s experiences.

Opportunities to link mathematics to practical experiences and play, and to their everyday lives, help children to see mathematics in the real world. Children’s mathematical experience is a combination of child-initiated activity and systematic adult-directed mathematics teaching, which they receive every day.

Children’s mathematics is developed through stories, songs, games and imaginative play. Children become involved in planned experiences that are mostly based on real-life situations. They have time for sustained concentration. They learn mathematics in a context that promotes their personal, social, emotional, physical and intellectual development.

Discussing mathematics, describing shapes and talking about solutions to problems all contribute to the development of speaking and listening skills. Key aspects of learning identified in *Excellence and Joyment: learning and teaching in the primary years* (Ref: 0518-2004G) are developed through mathematical explorations.

Using and applying mathematics

Children in the Foundation Stage develop their use and understanding of mathematical vocabulary to count, describe and compare shapes and numbers. They talk about the patterns and features they observe in numbers and shapes, and use these to recreate and generate their own patterns and shapes. They know that a number name such as ‘four’ identifies how many objects there are in a group (for example ‘This horse has four legs’) and is used to label items (for example ‘This peg is peg number four’). They use ordinal numbers to describe the position of an item in an ordered group (for example ‘My fourth birthday was in January’ or ‘This block is fourth in the tower’).

Children are surrounded by a learning environment that provides stimulating practical opportunities for mathematical development through indoor and outdoor play. Children become familiar with numbers when they use a toy telephone or a calculator during role-play, with shapes when they play on the climbing frame or with construction materials, and with measures when they fill containers with sand or compare heights and lengths of toys. They solve practical problems involving mathematical thinking, for example when they explore the shapes of bricks to use to build a bridge that a toy truck can go under, or when they count out beakers so that each child in a group can have a drink. They select objects that belong and do not belong to a group, explaining their choices by describing the relevant property, such as ‘This hat has two pompoms so it belongs in this group’, or ‘This shape has no corners and does not belong in this group’. They use computer programs, for example to sort, match and order objects by size, colour or type.

Children develop a sense of pattern and order through rhymes and rhythms, stories, actions, dance, art and craft. They observe the sequence of numbers on a board game and describe the order of events in their day. They begin to recognise and talk about the patterns they see in the indoor and outdoor environment and those they make as they play. They copy symmetrical patterns using construction materials or paints. They demonstrate that they recognise and recreate the pattern, for

instance when they add the next beads to a necklace or place shapes into a design on an interactive whiteboard.

Counting and understanding number

Children count small sets of objects and know that the last number in the count represents how many objects there are altogether in the set; for example, in the classroom shop they find five pennies to pay for an item costing 5p. They also begin to appreciate that numbers are used as labels. For instance, they find tricycle number 3 in the outside area or they match numbered toy cars to car parking spaces in a garage. They recite the number names in order up to and beyond 20 and begin to recognise patterns in the number system, using stories and rhymes to reinforce their understanding. They recognise the numerals 1 to 9 and begin to recognise other numbers, including familiar two-digit numbers such as their house number, bus number or older sibling's age. They recognise and use numbers in games and play activities, such as dice games or role-play involving a shop till, calculator or toy telephone. They compare two familiar numbers. For example, they know that 4 comes before 5 from saying rhymes such as:

*One, two, three, four, five,
Once I caught a fish alive,*

and that 12 is bigger than 8 as a row of 12 cars is longer than a row of 8 cars. They are familiar with numbers in the environment through number tracks, number grids such as a 'Snakes and Ladders' board and numbers pegged on a washing line. They identify missing numbers on a number track to 20, and organise numbers that are in the wrong order on the washing line. They order a small set of consecutive numbers, for example placing number cards in the correct order on a number line.

Knowing and using number facts

Children count aloud in ones, fives and tens, using fingers and hands to illustrate each step. They count in twos to count, say, pairs of socks on a washing line or the number of children when they line up in twos. They use this pattern when joining in rhymes such as:

*Two, four, six, eight,
Mary at the garden gate.*

When children count in ones, they know the number before and after a given number in the range 1 to 10 and begin to relate this to a number that is one more or one less. They jump on the number one more or one less on a play mat and say the number one more or one less when playing a game on a number board. Children use the number patterns and relationships they observe to derive facts. For example, they see two houses each with three windows and say that three windows and three windows make six windows altogether, counting the windows to confirm the answer. They know some number pairs, for example making five fingers by showing two on one hand and three on the other, or choosing a domino with six spots by selecting the domino with four spots and two spots.

Children organise toy animals into groups of the same size, and share out objects equally. For example, when they share ten stickers among five children, they recognise how many stickers each child gets and say: 'I've got two stickers like everyone else'. They recognise some doubles, for example that two rows of three eggs in an egg box is six eggs, or that five fingers on one hand and five on the other hand is a total of ten fingers.

Calculating

Children are introduced to addition both as combining two groups of objects then counting the total and as counting on. For example, children each select a group of toys and count how many each of them has. Pairs then pool the toys to see how many toys they have altogether. In board games,

children roll dice and move along a number grid or track by counting on. They experience subtraction as taking objects away from a group and counting how many objects are left. For example, children count out grapes on a plate, select some to eat and count out how many grapes remain on the plate. They create a number track or refer to a calendar to identify the days they have to wait until a special event, crossing off each day as it passes and counting how many are left. They also meet subtraction in the context of counting back along a number track, for example when they jump backwards three jumps along a playground track or when they use a programmable toy.

Understanding shape

Children develop their sense of shape and space as they play. They begin to know the names of familiar 2-D shapes such as 'circle', 'square' and 'triangle'. They use computer programs to sort and match shapes and to create patterns. They count and talk about the shapes they have used. Children explore properties of 3-D shapes; for example, they describe and name the shapes that they can make when they dip different sponges in paint to create prints. They sort shapes by using their properties, for example those that roll, those that are good for stacking, or the ones they could use to make a model. They know the names of some 3-D shapes, such as 'cone', 'cube' or 'sphere', and talk about these shapes using words such as 'corner', 'edge', 'side', 'flat', 'straight' and 'round'. For example, children use this vocabulary to describe the features of a box or ball hidden in a drawstring bag to help other children to identify the shape. They recognise and name common shapes in the indoor or outdoor environment, describing books, windows, tables, doors or fences as 'square' or 'a rectangle shape'.

Children use familiar objects and common shapes to build models. For example, using empty containers or building blocks that include cubes, cuboids and cylinders, they build models such as houses, animals or trains. They explain why they used a particular object or shape and what it represents. They create and recreate patterns using familiar objects or shapes, and recognise how some objects fit together exactly and why.

Children describe positions of objects or people using words such as 'underneath', 'on top', 'next to' and 'between'. They participate in action games such as 'Looby Loo', where they turn to the left, right or right round. They visualise how to get from one place to another and can lead another person there. They use a programmable toy and move it about the room and work their way through a maze on the computer, clicking on symbols for 'up', 'down', 'right' and 'left'.

Measuring

Through play and guided experiences, children respond to and use the language of size, and demonstrate and confirm their statements using the available resources. They find three differently sized bowls that they place before each of the three bears when retelling the Goldilocks story. They steer a remote-control car along the shortest side of the playground. They engage in activities such as packing, filling and emptying a bag and other containers, and talk about what the bags and containers can hold. They recognise when something is too big or too small; for example, they cut a long piece of ribbon for a makeshift belt when they dress up. They describe the size of flat shapes when piecing them together to create pictures, identifying whether they are too big or too small to fit in a space. They compare the size and scale of real objects with the replicas and models they arrange and organise. They talk about relative sizes using words such as 'bigger' and 'smaller'. They begin to recognise how a certain shape can be used to make a bigger version of itself or another shape and count out the number of smaller shapes they used.

Children compare sizes and quantities, such as finding the longest zip in a collection or the play-farm pen with the most animals in it. They describe their choice using language such as 'more' or 'most', or 'less' or 'least'. They are asked to decide whether objects fit into containers or under bridges, and use language such as 'too wide', 'too long' or 'too tall' when they test or compare the

width, length or height of objects. They discuss who has made the longest necklace or whose bucket holds the most sand. They notice that much more sand can be held by a scoop than a spoon and that more cakes will fit, for example, on the blue plate than the white plate. They use strips of paper that just touch when placed around their heads to compare their hat sizes. They compare two masses by holding them in their hands or by placing them on a balance. They develop comparative language such as 'too heavy to carry', or 'a box big enough for my teddy'.

Children learn about the order of routine events. They note the passage of time, becoming familiar with changes from day to night and from morning to afternoon. They understand that bedtime is later than home time and that on Saturday and Sunday they don't come to school or nursery. They begin to measure time using sand timers. They use these to see if they can tidy things away before the sand runs out, or to time their turn to play with a toy or on a swing. Children use the language of time ('earlier', 'later', 'afternoon', 'today', 'tomorrow') to talk about what they have done or will do. They take digital photographs of their activities at different times in the day and put them in order to show their parents or carers. They become familiar with the idea of dates, days, months and seasons, and can talk about times of the year that are significant to them such as birthdays or religious festivals. They understand that clocks are significant in the structure of their day and that adults refer to them to know, for instance, when it is lunchtime. They recognise some familiar times on a clock face of the type they see in the classroom or at home, such as 3 o'clock on an analogue clock or 3:00 on a digital clock, and know that this means that, for example, it is home time.

Handling data

Children process data as they count and organise objects such as toys in a line or match pairs of shoes or socks. They begin to use pictures to represent shapes that they see or tally marks to record the number of items. They make number tracks and relate the numbers on the track to position and movement up and down as they hop or jump along it. Children sort objects to decide whether they meet a criterion such as 'it floats': they count the number of objects that do float and those that sink and present their results using drawings, marks or name or number labels.

Children's natural curiosity leads to questions. They are encouraged to ask questions about the indoor and outdoor environment and to gather data that help them to make decisions. For example, they look for the biggest leaf on a twig or the twig with the most leaves, and measure or count to help them to decide. Children look for similarities and differences between objects and sort them accordingly into two or more groups. They use practical resources or ICT images to record their results and return to these later to add to them or to interpret their results for others. For example, children describe the weather each day and record this on a chart using pictures, images or tally marks. They interpret their record to compare days or weeks or different times of the year, and talk about what clothing it would be suitable to wear.

Embedding key aspects of learning

During the Foundation Stage, children's thinking, communication and social skills develop through all areas of learning, including learning in mathematics.

In mathematics, for example, children learn to reason when they demonstrate that they recognise and recreate the patterns they see. This might involve them in deciding the next bead to add to replicate or complete the pattern on a necklace, or where to place shapes into a design on an interactive whiteboard. Creative thinking is encouraged when children see relationships and make connections. For example, they know that the number 'six' represents how many items there are in a given group of six items and that the number of items does not change irrespective of how these items are arranged. They listen to six stones being dropped in a container and, even though they cannot see the stones, expect to find six stones in there when they look.

Communication skills develop as children understand and use the names of some 3 -D shapes, such as 'cone', 'cube' or 'sphere', and talk about these shapes using words such as 'corner', 'edge', 'side', 'flat', 'straight' and 'round'. They extend their communication skills by making charts, for example weather charts. When they work collaboratively, for example to build or sort shapes or to share out some crayons equally among a group of four children, this helps to develop their social skills as well as their mathematical thinking.