



## Enriching maths in outdoor play

Developing mathematical thinking and learning mathematical skills can be part of a child's everyday outdoor play experiences. They can count and measure and explore shapes, and develop their imagination and creativity through mathematical ideas on a large scale. In fact, all the mathematical learning children do indoors they can also do outdoors, but with vigour, freedom, and scale.

This Playnotes looks at:

- unlocking the potential of your setting to support mathematical learning
- valuable everyday play experiences that involve mathematical learning
- activities for mathematical learning
- your role as a practitioner
- great resources.

### Unlocking the potential of your setting

You can enhance the mathematical provision of your outdoor area by providing rich and exciting environments to engage children's curiosity and challenge their thinking.



### Using the sand area

- Make footprints to count and to compare shapes.
- Put a wooden plank across the sand pit for children to balance on and to see their constructions from a different perspective.
- Have patches of damp sand as well as dry sand.

- Talk about why some containers fit inside others and some do not, how sand slithers down the side of a funnel and forms a cone shape, and whether the size of the hole means the bucket empties faster.
- At times, add natural materials – twigs, shells, stones – and include magnifying glasses and binoculars.

### Using the growing area

- Use hanging baskets at child height and involve children in planting and watering.
- Draw up together a rota for watering and deadheading the plants, written as a chart so that children can see who did it last and work out who is next.
- Set up a potting table resourced with compost, bulbs, small bedding plants and plastic pots. Decide how many pots will be needed to pot up all the plants, how far up the pots the compost will come, and how deep the seeds and bulbs should be planted.
- Agree how much water each plant will need, and how often.
- Measure growth against things that are familiar. For example, it's exciting to compare tall-growing plants with your own height by standing beside them. Sunflowers are ideal for this.
- Create habitats for mini-beasts with piles of old logs.
- Record and display on a large sheet of paper how many beetles, spiders and ants are seen each day. Draw a map of where each species can be seen.



### Using the digging area

- Change this from mud to sawdust to gravel to leaf mould or to forest bark to develop children's ideas of capacity.
- Provide a range of digging implements and containers. A digging scenario can easily turn into a problem-solving one when the hole has to be deep enough to bury three rocks in or a post for the washing line. Children can explore, for example, just how many stones can fit into a newly dug hole.



### Using water play

Ideally your outdoors will have a tap with running water so that children can play with hoses. If you do not have this, is there an indoor tap that you can run a hose from?

- Create fountains, waterfalls, lakes and streams.
- Use pond liners and bricks of different shapes and sizes to make sections within the water area, and change these regularly.
- Use large and small containers of water for comparison of volume and weight.
- Provide a range of things to experiment with the mathematical concepts of number, shape, space and measure. For example, balsa wood rafts can be sent across a 'lake'. How many could you fit on your lake? How much weight could your raft carry?
- Drop in cooked spaghetti for children to retrieve with tongs and forks, to count and compare lengths.
- Add some large porridge oats and provide whisks. Ask the children to predict what might happen.
- Make your own puddles by building a very low wall of sand and then filling with water. Get the children involved in deciding how big to make the puddle. Ask questions like how much water will we need? How much sand will we need? Children can look at the reflections in the puddles and make circles in them with a stick.

### Using the sensory area

- Set up large pots with plants that are interesting to touch and smell, including herbs and scented flowers.
- Install a range of wind chimes made by the children as well as soft drums and rain shakers.
- Put out bowls containing a variety of small smooth pebbles and shells to handle, count and make patterns with.
- Set up a reflection site and involve the children in noticing how things look through mirrors. Use distorting mirrors, and ask children to observe what they see, and how their size and shape changes.

### The active area

- Build an obstacle course together that allows for zigzag running, touch the stone and three hops, walk sideways for five steps etc.
- Do lots of physical, boisterous, noisy activities, such as manoeuvring between lines of plastic cones or pedaling round a numbered obstacle course in the right order and direction.
- Make target areas for throwing beanbags.

### Valuable everyday play

Young children learn a lot about maths through their senses and through movement, and play gives opportunities to repeat the same activities and

movements. Here are some repeated activities that most children engage in during play that support their mathematical experiences.

- **Collecting** Young children are especially interested in making collections of natural materials such as conkers, acorns leaves and sticks. Encourage this by providing baskets and boxes in which children can put their collections.
- **Mark making** Children begin to develop an understanding that a symbol can stand for something, and they create their own symbols. Provide a chalk board or easel near games for scoring; lay some flagstones for children to chalk or paint on; encourage children to use fences and walls to display their drawn maps and writing; paint a wall with magnetic paint and use large magnets to fix drawings, directions and notices to it; paint a wall with blackboard paint for large-scale chalking.
- **Patterning** Children explore pattern in different ways, from the casual arranging of shapes, toys and artifacts to making large complicated patterns. There is often a sense of symmetry about their pattern making, which you can encourage by providing balanced sets of materials. Young children also often make patterns of long, continuous lines of objects. Provide natural objects with which children can make trails.
- **Hiding** Children develop a sense of shape and space by hiding objects and finding them again. Encourage this by hiding objects in the sand area or under stones or behind logs; organise a scavenger hunt; play games such as hunt the thimble. Provide lots of paper bags, handbags and large and small boxes for children to hide toys, collectables and themselves in. Provide a selection of wheelbarrows, carts and trucks for children to play at packing up and moving to a different area. Provide bags, cases and rucksacks of different sizes, from the very small to the very large.
- **Reasoning** Children need opportunities to develop reasoning skills through problem solving. Set up situations that require children to puzzle things out, such as how to build a bridge over the sand pit; how to sail the boat from this end of the tank to that; how to make a den with some blankets under the picnic table.
- **Building** Children need access to a large supply of building materials so that they can experiment and gain knowledge about construction, solving problems such as how to build a tall tower, or how to make a window in the wall of their house. Discuss how wide the arch needs to be for the truck

to drive though, whether that block will fit between the doorposts, how heavy that brick is, and whether there are enough bricks to finish the wall.

- **Using the whole body** Young children often need to experience things with their whole body to get a true sense of it. They curl in a ball to show a small shape, they jump three times to get a sense of the number, they run round and round to get the feeling of a circle. Playing outside gives children the opportunity to develop meaning through physical feeling.

## Your role

To help children benefit from outdoor mathematical experiences, you need to:

- talk to children about the activities in the different areas
- plan and use mathematical language with the children
- encourage children to solve problems themselves by prompting them with questions such as, 'I wonder if all these stones will fill that hole?'
- value children's ideas and allow them to explain what they think before you intervene
- give children time to review and reflect upon what has happened as the activity finishes.

## Activities for learning

Capitalise on children's love of games with these challenging activities designed to support mathematical learning.

### Numbers for labels and counting

Play these games when children begin to use the names for numbers accurately.

- **Number hunt** Prepare laminate photographs of features that can be 'hunted for and counted. For example, 1 door, 2 gates, 3 fence posts, 4 airbricks. Hunt for examples of a specific number outdoors, such as 3 drainpipes, 3 windows, 3 manhole covers. Give children a way of recording their discoveries – for example, using cameras, or clipboards and pencils.
- **Number match** Prepare collections of interesting things found outdoors that children can sort, order, count and label. Provide number cards or large wooden numbers that children can use to match their items to when counting objects outdoors (for example, four pebbles are put on the number card with the number '4' drawn on it).

### Calculating

Use this activity to help demonstrate the use of language, such as 'same', 'fewer', 'less'. Show an interest in how children solve problems and value their different solutions and make sure they are secure



about the order of numbers before asking what comes after or before each number.

- **Comparing and problem solving** Collect together items that can be used for counting, comparing and problem solving – such as pebbles, acorns, sticks, fir cones. Provide children with wooden numbers and containers. Encourage children to record what they have done – for example, by drawing, tallying or with photographs. **Good ideas** Enrich



the activity by using seasonal materials such as conkers or chestnuts. Or why not spray dry beans with gold paint and bury in the sand as pieces of treasure or gold nuggets for the children to find and record?

### Shape, space and measures

Use these activities to discuss similarities and differences.

- **Sorting materials** Use whatever you can find outdoors in your setting

– for example, twigs, stones, leaves, flowers, gravel. Supplement everyday materials such as pebbles, leaves, pine cones, shells with seasonal items – such as conkers, acorns, sycamore seeds – to add variety and interest. Provide containers and large trays so the children can sort them into separate items. Discuss different ways of sorting the same items and value the children's arrangements of objects by displaying them or taking photographs.

**Good idea** Set up a 'collection corner' outdoors where children can explore collections of different objects.

- **Shape search** Plan opportunities for children to describe and compare shapes and provide ways for them to record the shape they find and identify – for example, by providing cameras and making books about the shapes that are in the outdoor environment. **Good idea** Create laminated pictures of the shaped objects and encourage children to search for them.
- **Making trails** Lay a trail using everyday resources and materials, such as twigs, pebbles, flowers, conkers, acorns. Items like twigs could be used for making arrows, which the children follow. Introduce key words including positional and directional language to describe the route of the trails and encourage children to create their own trails. Can the same place be reached by a different route? Where else could the trail lead to? **Good ideas** Share stories such as *Rosie's walk* and *We're going on a bear hunt* to stimulate further discussion or reinforce children's understanding. Lay a trail that leads to something exciting.



## Great resources

**Natural** Gravel, pebbles, earth, sticks, logs, leaves, pine cones, sycamore seeds, acorns, flowers, grass, chestnuts, conkers, water/puddles

**Made** Fences, manhole covers, windows, doors, brick walls, drainpipes, paving slabs, painted markings, seating

**Additional** Large wooden numbers, large dice with spots and numbers, balance scales, selection of containers for collecting and sorting, scoops and tongs, recording equipment (paper and pencils, cameras, tape recorder), tallying equipment (lollipop sticks, counters, pencils and paper)

## What's in your setting?

Leaves are free and available all year. You could:

- use matching leaves to make a lotto game
- sort leaves by colour, species, number of tips, size
- collect up handfuls of leaves and count them
- order different leaves by size
- measure how many leaves you need to join A to B
- share leaves – how many do you need so every one has two?

Bricks are used for buildings all around us. You could:

- sort by colour, size and texture
- count how many bricks high you are
- estimate and count how many bricks in a given area.

[www.beam.co.uk](http://www.beam.co.uk).

- Mindstretchers online catalogue of multi-sensory resources for outdoor play. Includes many of the items suggested in this Playnotes. Call 01764 664409 and/or visit [www.mindstretchers.co.uk](http://www.mindstretchers.co.uk).

## Books

- *Maths Outdoors* by Carole Skinner (BEAM, 2005) ISBN 1-903142-36-9. Call 01242 267945 and/or visit [www.beam.co.uk](http://www.beam.co.uk).
- *Mathematics Through Play in the Early Years* by Kate Tucker (Paul Chapman, 2005) ISBN 1 4129 03947
- *Children's Mathematics* by Elizabeth Carruthers and Maulfry Worthington (Sage Publications, 2006) ISBN 1 4129 2283 6
- *A Place to Learn: developing a stimulating learning environment* by Lewisham Early Years Advice & Resource Network. Includes a section on 'developing mathematics in the outdoor area'. Email [eyes.advisor@lewisham.gov.uk](mailto:eyes.advisor@lewisham.gov.uk) or call 020 8695 9806.
- *Supporting mathematical development in the Early Years* by Linda Pound, (OUP, 1999) ISBN 0335-19887-2. Focuses on children's mathematical thinking and successful learning. Visit [www.openup.co.uk](http://www.openup.co.uk) or good bookshops.
- *More than numbers* by Carole Skinner

(BAECE) ISBN 0 904187 23 3.

Visit [www.early-education.org.uk](http://www.early-education.org.uk)

## About the authors

This Playnotes was written by Sheila Ebbutt and Carole Skinner, both experienced early years teachers and founder members of the Early Childhood Mathematics Group.

## Further resources

- *Big Outdoor Maths Box* A collection of large-scale, colourful mathematical equipment for active maths outdoors and inside, plus notes suggesting ideas for enjoyable games and activities using all of the resources. £225 plus VAT from BEAM (BE A Mathematician) Education (an organisation offering consultancy, training and resources for mathematics education, including Early Years). Call 01242 267945; email [beamorders@nelsonthornes.com](mailto:beamorders@nelsonthornes.com) or view and buy online at

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