

## Building Towers

Exploring 3D shapes



**Children often** enjoy playing with blocks.

**Adults could** encourage children who show an interest in building towers to explore further in order to develop an awareness of the properties of 3D shapes.

### The Activity

Provide children with a selection of wooden blocks of various shapes. Talk about experiences of building and stacking. (Children may do all sorts of things with blocks, building towers is just one example you might choose to develop mathematically.)

### Encouraging mathematical thinking and reasoning:

#### Describing

Which block are you going to put on top of your tower?  
Which is the tallest block in your tower?

#### Reasoning

How could you make your tower taller?  
I wonder if we could stack two shapes like this on top of each other?  
Which blocks would you use to make a very big castle?  
What would happen if we turned that block the other way up, would it make the tower any different?  
If you do that, will it fall down? Can you do that without it falling down?

#### Opening Out

Encourage children to feel the surfaces of the blocks, finding and selecting flat surfaces on which to stand the blocks.  
Can you balance this flat block on these three cones? What if they're in a straight line? What if you squash them together?  
Could you build with only cylinders?

#### Recording

Let's make a picture of your tower.  
You could print a picture with blocks dipped in paint.

## The Mathematical Journey

### Properties of shapes:

- selecting appropriate blocks to represent something else or to fit into a structure, analysing properties such as flat, curved etc.
- using informal language - soft, smooth, sharp, slopey, pointy, like a brick, arch, box, roof etc.
- using mathematical language - corner, side, flat, curved, rectangular, cylinder etc.

### Position and spatial properties:

- positional language - on top of, next to, underneath, in front of, behind, between, left, right etc.
- using symmetry for placing blocks, creating patterns and complex structures e.g. castles
- connecting ideas about balance to the choice of blocks

### Development and Variation

Other activities that complement this:

- Stacking box-modelling materials and other containers
- Stacking shoe boxes in a role-play shoe shop
- Stacking cuboid boxes or cylinders as tins in a role play grocery shop
- Making large-scale constructions using crates, large boxes and cylinders
- Stacking stones or sticks in a forest school environment
- Making a pile of real bricks
- Tackling group challenges such as building a castle for a mouse, a house for a teddy or a giant's castle.

### Story, rhyme and song links

London Bridge is Falling Down  
Humpty Dumpty  
Build a House with Five Bricks  
Titch by Pat Hutchins  
Rapunzel and Jack and the Beanstalk (traditional tales)  
How Big is a Pig? by Clare Beaton  
All Shapes and Sizes by Shirley Hughes



### Resources

All the blocks, both hollow and solid, that you can find, including regular and irregular shapes



## Collecting

Exploring the characteristics of everyday objects and shapes and using mathematical language to describe them.

Creating and describing patterns.

Counting and comparing numbers.



**Children often** enjoy making collections of objects like leaves, pebbles or buttons, which they arrange in patterns or put into containers.

**Adults could** take children on collecting trips outdoors, providing containers and labels to display arrangements.

### The Activity

Take the children on an autumn walk with collecting bags and invite them to choose something to collect, such as twigs, conkers, ash-keys etc. (of course, observing the usual health and safety precautions). On their return, children can make a display to talk to everyone about.

### Encouraging mathematical thinking and reasoning:

#### Describing

Tell me about your pine cones/leaves/ash keys...

Have you seen shapes like these before? What have you seen that is similar? ... different?

Tell me about your display. Why have you chosen to arrange them like this?

Tell me about your pattern... How does it go?

#### Reasoning

Why do you think they are like . . . ? What is different .../the same about these?

Can you make your pattern longer/bigger? What would come next? Why?

#### Opening Out

Is that tray big enough? (Can you find one that is?)

I wonder how many little fir cones you could fit in your bag?

Can you make a different pattern using two sorts of things?

#### Recording

Can you find / make a label for your collection to show how many there are?

Can your friend tell how many you have in your collection without counting to check?

Can you find a way to record your pattern?

## The Mathematical Journey

### Shape:

- developing language to compare and contrast shapes, using informal vocabulary such as pointy, and more mathematical terms like straight or round

### Number:

- noticing numbers increase as more are collected
- counting and cardinality - progressing from knowing some number words to saying one number for each object, then knowing the number of the whole group
- relative number size - comparing numbers
- part-whole numbers - noticing numbers within numbers, with subgroups in collections

### Measures:

- developing language from e.g. bigger, fatter, to more specific terms like longer, wider, heavier, holds more than

### Patterns:

- continuing the pattern in ones, then in complete units; ABAB progressing to ABC, ABB, ABBC
- identifying the rule of the pattern: 'It goes red, blue, blue.'

### Development and Variation

**Outings** - If you note what children are interested in, you can supplement collections back in your setting. NB You may need to deter children from picking flowers, eating berries or collecting unsavoury objects like litter (or ensure they wear gloves)!

### Making provision to stimulate collections

- Hide collections in the sand around the setting/outdoor area-or in water to be caught & fished out.
- Display collections in compartments with labels
- Provide containers of different sizes and shapes, especially with compartments, like printing trays, chocolate boxes, bun or plant trays and number cards to match or write on.
- Use light boxes to look at shapes of silhouettes or place between hinged mirrors - collections put between them will appear much bigger!
- Provide purposes for sorting and arranging e.g. resources for tidying and checking, for creative work or for a role-play area such as a shop.

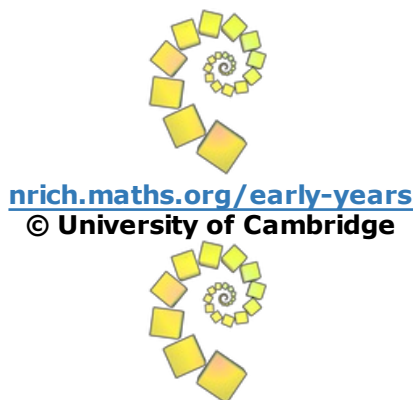


### Resources

You will already have lots of collections of things in your setting. Those with several of one item provide more potential for counting. You might provide assortments which are:

- miniature objects, such as cars, small people or animals
- connected with parents' jobs or activities, e.g. nuts and bolts, tickets, packaging
- part of a role play area e.g. treasure, hats, shoes, tools, boxes
- specifically mathematical e.g. numerals in different forms, block-play shapes available cheaply, at scrap schemes, pound shops or car boot sales

Acknowledgement: Helen J. Williams



**Teachers: Early Years**

## Exploring 2D Shapes

Describing and comparing 2D shapes.  
Understanding the characteristics of 2D shapes



**Children often** enjoy playing with long strings and ribbons and making and describing shapes.

**Adults could** build on this by providing long loops of string or elastic to stimulate conversations about 2D shapes.

### The Activity

Provide loops made from string or elastic at least 3m long. For the task, these can be put on the ground or held in the air by children working in groups of three or four. Ask the children to make shapes with their loops and talk about what they see.

### Encouraging mathematical thinking and reasoning:

#### Describing

Have you seen a shape like this before? Where?

Can you see another shape like yours that someone else has made?

Put your shape near/inside/outside/under another one. What do you notice? See what you can make. Tell me about what you have made.

#### Reasoning

What if something was different?

What if you had another one the same?

#### Opening Out

I like your shape. I wonder how you could change it? What would you like to do next?

How about working with some more string?

Can you fit inside the shape?

Can you fit more/fewer children in the shape when you change it?

#### Recording

Trace your shape with chalk on the playground or with felt tip pens on a big sheet of paper.

Make a small drawing of your shape on paper.

## The Mathematical Journey

### Same and different:

- developing the use of language to compare, contrast and describe. Examples: straight, wiggly, curved, rounded, pointy, bigger, smaller, longer, shorter, corner, like, different, side, curve

### Recognising & labelling common shapes:

- making connections with shapes in their own environment and beginning to use names such as triangle, rectangle, square, corner, side . . .
- counting the sides and corners of the shapes they make

### Describing position:

- using words such as on, inside, outside, under, left, right, above, below to describe the position

### Comparing sizes:

- beginning to use language such as bigger, smaller, longer, shorter, to introduce ideas about measuring

### Development and Variation

This is presented here as a teacher-led activity. It might also be possible to model the activity and then let children play freely with the string or elastic but they would need careful supervision to avoid the health and safety issues associated with the resources.

Other activities that complement this:

- Drawing.
- Shape searches in a series of photos or in books and drawings.
- I-spy shapes games.
- Using educational games that involve shape sorting or matching.
- Building pictures from precut shapes or cutting shapes from coloured paper or magazines.
- Painting on the ground or wall with big wallpaper brushes and water.
- Using natural materials to make shapes: leaves, twigs, daisy chains. Printing with potato or sponge shapes.
- Drawing shapes in the sand tray, with paints, through cornflour gloop, with a finger.
- Riding wheeled toys through puddles and looking at the tracks.



### Story, rhyme and song links

My Mum and Dad Make Me Laugh by Nick Sherratt

Washing line by Jez Alborough

Aliens Love Underpants by Claire Freedman,

Kipper's Book of Opposites by Nick Butterworth

Opposites by Eric Carle.

Opposites pop up book Robert Crowther

### Resources

String or elastic at least 3m long



## Making a Picture

Using everyday language to talk about shape and position

Other objectives that it offers



**Children often** enjoy creating pictures from a variety of coloured shapes.

**Adults could** offer them a picture frame and shapes, and encourage them to build a picture, talking about the shapes and patterns that they make.

### The Activity

The adult works with a group of children around him/her. Using a variety of card shapes s/he chats with the children to find out where on the A3 sheet to place the shapes in order to create a picture. Once the pieces have been agreed they can be pasted in position along with the frame.

### Encouraging mathematical thinking and reasoning:

#### Describing

Which shape would you like to use?

What can you see in the picture? How is it similar to/different from ...?

Is the picture finished? Are you ready to put the frame round it?

Tell me about the shape/pattern.

How many triangles/circles/squares/rectangles are there in your picture?

#### Reasoning

Why do you want it to go here?

#### Opening Out

What if we made another ... here?

What will happen if you take away that shape? Can you make another one like it here?

What could you add to your picture to make ...?

#### Recording

Where should we put it? What are you making?



## The Mathematical Journey

### Relationship between shapes

- making connections between the mathematical shapes they are offered and the world around them as they create the picture
- developing mathematical language to describe the shapes rather than describing them only by colour which is often the most obvious attribute to children

### Properties of shapes

- using everyday language such as curved, pointy, straight, wiggly then progressing to using the mathematical names of the shapes such as circle, square rectangle, triangle, oblong ....

### Position and spatial properties

- using positional language such as above, below, beside, on top of, underneath, left, right, in front, behind ...

### Development and Variation

Making pictures as an independent activity with A4 sized frames

Creating junk models from packaging to explore 3D shapes and the language associated with them

Painting and drawing shapes

Creating specific images from sets of shapes such as a house, a cat, a dog, a boat ...

Playing with tangram pieces to create pictures Feeling shapes in a bag and trying to identify them

The Imagination Tree blog

[http:// www.theimaginationtree.com/2012/08/matisse-art-in- bath-tub.html](http://www.theimaginationtree.com/2012/08/matisse-art-in-bath-tub.html)

has some open-ended art activities for small children.



### Resources

- Thin card or foam shapes (a selection of triangles, rectangles, semicircles etc.)
- A3 sheet of coloured thin card
- A (narrow) card frame that will go around the A3 sheet to create a 'picture frame'

Optional:

- Printed sheet of shapes and frames in different sizes • A camera to take photos of children's creations.

Photo acknowledgements

[http:// www.theimaginationtree.com/2012/08/matisse-art-in- bath-tub.html](http://www.theimaginationtree.com/2012/08/matisse-art-in-bath-tub.html)



## Making Footprints

Exploring 3D shapes



**Children often** enjoy making footprints in soft materials.

**Adults could** use this idea to encourage children to develop an awareness of the faces of 3D shapes.

### The Activity

Provide children with soft dough and a selection of small wooden blocks of various shapes. Talk about experiences of making footprints in sand or snow. Encourage children to select a block and press it into the dough making a 'footprint'. Show how to run a finger around the edge of the impression to feel the perimeter.

### Encouraging mathematical thinking and reasoning:

#### Describing

Tell me about what you've made.

Can you see other blocks that might make the same footprint?

Look at the block and the footprint it has made side by side. What's the same and what's different?

#### Reasoning

What will happen if we stand the shape back in its footprint?

How do you think this shape made this footprint?

#### Opening Out

What will happen if we turn the shape over and make a new footprint?

How many different footprints do you think you can make with this shape?

Which shapes might have made this footprint?

#### Recording

Draw around a block. Look at the shape you have made.

Is it the same shape as the footprint?

## The Mathematical Journey

### Properties of shapes:

- Using everyday language to describe the shape of each block and the impressions it makes e.g. flat, sharp, slopey, pointy, like a brick, ball, box, roof etc.
- Using mathematical language to talk about the attributes of each block and the impressions it makes e.g. curve, side, corner, flat, rectangular ...
- Connecting the shape of a face of the block to the shape of the impression made by it

### Same and different:

- Developing language to describe similarities and differences e.g. bigger, smaller, longer, shorter, like a ..., same as ..., straighter, more curved, rounder, more pointy ...

### Development and Variation

- Printing with cut vegetables and paint
- Solving old-fashioned picture cube puzzles
- Shadow play
- Pressing natural materials such as pebbles, twigs, cones and flowers into soft earth
- Making handprints in salt dough that can be baked to keep
- Dipping feet in baby talc to make prints on black paper
- Balloon printing – dip a partially-blown balloon into paint to print
- Playing with shape sorter toys in which blocks are fitted into shaped slots
- Using cutters to make gingerbread or pastry shapes.

### Story, rhyme and song links

- The Blue Balloon by Mick Inkpen
- Changes by Anthony Browne
- The Six Blind Men and the Elephant by Clare Boucher and Rachel Merriman
- Jack and Jill (good for slopes and rolling)



### Resources

- Soft dough
- Selection of wooden blocks of various shapes
- Rolling pin to "re-flatten" the dough
- Camera or video camera for recording results.

Optional: Encourage children to explore making "footprints" using everyday objects such as hands and feet, spoons of different sizes, dice, lolly sticks, leaves, shells, small world play equipment or pieces of other construction kits.



## Packing

Sorting and describing, using mathematical properties such as size, shape, weight, capacity and pattern  
Counting and comparing numbers



**Children often** enjoy putting “like” things together, when putting things away and gathering them together.

**Adults could** have lots of boxes (or trays), perhaps “shoe-box” style available for children to use as well as large groups of small items like zoo/farm animals, train set carriages or any similarly shaped items.

### The Activity

You could provoke the children by saying something like, “These have all got muddled up” as you present them with an assortment of small items.

### Encouraging mathematical thinking and reasoning:

#### Describing

Tell me about your box and the . . . you are putting away.  
How many will fit? Will they all fit?

#### Reasoning

Looking at all the boxes we’ve got here, who has the most . . . in their box.  
How do you know?  
Could we fit more/fewer in . . . ’s box?

#### Opening Out

Which boxes/trays would be best for keeping which things in?  
Are some things better to be kept in something other than a box or tray? If so what?

#### Recording

Do you want to make a new label for the box showing how many are inside?

## The Mathematical Journey

### Properties of shapes

- choosing particular trays/boxes for particular objects having analysed the properties of the shapes involved

### Same and different

- grouping according to a rule, e.g. "these are good for our artwork when we need to stick bits onto card"

### Counting and cardinality

- noticing amounts increase as more are gathered together
- counting and cardinality - progressing from knowing some number words to saying one number for each object, then knowing the number of the whole group
- relative number size - comparing numbers
- part-whole numbers - noticing numbers within numbers, for subgroups within collections

### Development and Variation

Many settings use songs associated with different parts of the day. Using such songs can help children focus on packing things away.

Similar aspects of learning and development are highlighted in the activity "[Collecting](#)" found in the NRICH EYFS collection. "[Tidying](#)" is also linked to this activity but has more of a numerical focus.



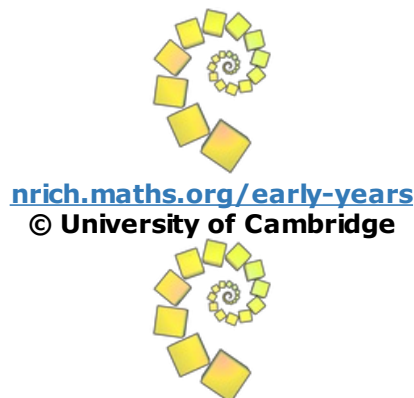
### Resources

Any objects and resources that need to be 'put away'

A range of containers, for example, trays, boxes, baskets etc.

Photo acknowledgement

<http://nurturestore.co.uk/sorting-games-for-children>



## Paths

Talking about positions and shape properties



**Children often** enjoy putting objects in lines wiggling all over the place.

**Adults could** build on this by providing an environment that will give good opportunities for language work and discoveries.

### The Activity

Gather together a selection of different shapes, colours and sizes of flat shapes, with sufficient room to create paths in and around the surroundings. This could be indoors or outdoors using man-made or natural shapes. The children are asked to 'make paths!'.

### Encouraging mathematical thinking and reasoning:

#### Describing

Tell me about your paths.  
Let's look at what everyone has made.  
I wonder where this path is going.  
I wonder who/what could be going along your path. How do you know what to put next?  
Who used more shapes, you or . . . ?

#### Reasoning

Why did you put . . . next to the . . . ?  
Is there a pattern to your path? What could you put after the . . . ?  
Can you make your paths go (under the . . . , round the . . . , by the . . . )?

#### Opening Out

How many teddies/lorries can use your path?  
Can you put more lorries on your path?

#### Recording

Would you like to show your path on paper?

## The Mathematical Journey

### Comparing and describing:

- using everyday language to describe geometric ideas
- using mathematical language to describe shape, moving from informal such as wiggly, to more specific such as straight or curved

### Number:

- counting and knowing that the last number in the path tells the total

### Adding and subtracting:

- increasing or decreasing the number of shapes in the path

### Properties of shapes:

- selecting shapes to add to the path by analysing their properties
- using shapes to solve problems about the route of the path

### Development and Variation

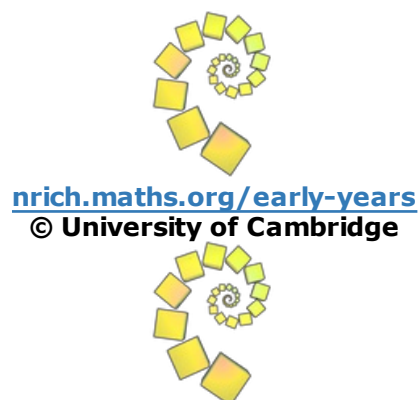
- Collecting all kinds of objects both natural and man-made and stacking them up into towers
- Fitting different objects into big boxes or drawers
- Choosing things to build with outside



### Resources

Small flat shapes that could be used as stepping stones or put together to make a continuous path  
Outside, look for larger flat shapes that are able to be carried safely, both man-made and natural

Photo acknowledgements:  
<http://progressiveearlychildhoodeducation.blogspot.co.uk>





## Pattern Making

Making and describing patterns



**Children often** enjoy spotting patterns and making patterns with lots of different things, including themselves.

**Adults could** provide a 'pattern of the day' with objects for children to copy, extend and create their own. They could make deliberate mistakes for children to spot. Parents and carers could join in.

### The Activity

Children copy and continue an AB repeating pattern with blocks, then do it in other colours and with other materials such as small toys, leaves and twigs or by printing and sticking shapes on long pieces of paper. They can progress to more complex ABB or ABC repeating patterns and to make growing patterns.

### Encouraging mathematical thinking and reasoning:

#### Describing

What do you notice about the pattern?  
Can you say the colours - red, blue . . . ?  
Tell me about your pattern.

#### Reasoning

What is the same and what is different about this one and your copy?  
I wonder which one goes next? I think the next one is blue - oh, don't you agree?  
Can you explain how the pattern should go?  
What is wrong with this pattern?  
Is that something you know or did you guess?

#### Opening Out

Can you make your own pattern along this strip?  
What is the pattern called?  
What is the rule for your pattern?  
How is your pattern like this pattern? How is it different?  
Can you continue this staircase pattern? What do you notice?

#### Recording

Can you record your pattern with stamps?  
Can you make a staircase pattern with stickers?



## The Mathematical Journey

### Patterns

- copying the pattern by matching cubes one at a time
- copying by complete units e.g. picking up a red and a blue cube together
- continuing the pattern in ones; in complete units
- correcting an error e.g. spotting a missing cube or reversed colours
- identifying the rule of the pattern: 'It should go red, blue, blue'
- noticing a growing pattern: 'It's like a staircase'

### Counting and cardinality

- counting the number of items in the unit of repeat, or the towers in a staircase pattern

### Adding and Subtracting

- generalising about a staircase pattern: 'It's one more each time!'

### Position and spatial properties

- using the vocabulary of position: 'The red comes next', 'it's blue between the red and the yellow'.
- reversing units to make reflecting patterns e.g. ABC CBA

### Development and Variation

- provide more complex repeating patterns: ABC, ABB, ABCD
- vary the materials and media, indoors and out
- make action or sound patterns and record them with invented symbols
- make growing patterns, eg. going up in ones
- make reflecting patterns with peg boards, mirrors and constructions
- discuss patterns in stories & rhymes e.g. Goldilocks, Gingerbread man.



### Resources

- Coloured cubes, beads, small toys, leaves and twigs; printing and sticking shapes
- Pegboards, mirrors, construction materials. Long strips of paper for making patterns
- Books & rhymes e.g. John Burningham -The Shopping Basket; There was an old woman who swallowed a fly
- See [Erikson Early Math Collective](http://erikson-early-math-collective.org) website for more about patterns, including activity



Acknowledgements: Helen Thouless and the pattern group. Wandsworth

## Position with Wellies

Describing relative position



**Children often** enjoy going outside to play, discover and build, whatever the weather, so wellies might be needed!

**Adults could** provide suitable shelving for children's wellies (see picture overleaf).

### The Activity

Ask children to fetch a particular pair of wellies from the shelf, using just positional language. You can also ask children to put them away afterwards. There will be other contexts in your setting in which you could focus on positional language in a similar way.

### Encouraging mathematical thinking and reasoning:

#### Describing

Where are your wellies? (Encourage children to use positional language, not simply point!)  
Where do your wellies 'live'?

#### Reasoning

Encourage children to follow instructions which use positional language e.g.:  
Please can you put your wellies on the top shelf.  
I think your wellies are on the shelf below the basket of dice.

#### Opening Out

Provide situations where there are two prepositions to describe the wellies' locations (or location of other objects in the setting), for example, "My wellies go on the middle shelf. They go next to Anya's, below the plant."

#### Recording

Will you tell me where the wellies are so that I can write it down to go with the picture we've got?

## The Mathematical Journey

### Geometric Skills:

- Being able to say where something is, relative to something else
- Getting used to positional language including words such as up, down, over, under, into, out of, beside, next to, away from, across, between, behind, in front of, at the back, through, top, bottom, inside, outside and upside down
- Being able to follow instructions for putting a tray, box, basket ... away on a particular shelf.

### Development and Variation

Try to use every available opportunity to help children respond to, and use, prepositions. In the course of a day, some situations arise naturally, such as when children line up or tidy up. Listen out for children who describe the location of objects clearly without resorting to gesticulation!

You could include the children in creating name labels for the shelves which may make it easier to recognise which space is theirs.

Other NRICH Early Years activities offering opportunities to develop positional language include:

[Tidying](#), [Incey Wincey Spider](#),  
[Building Towers](#), [Packing](#), [Long Creatures](#).



### Resources

Storage units

Items to store! (in this case, wellies)

We recommend you read the article entitled 'Getting into Position' written by Debbie Chalmers, which was published in the July 2014 edition of the Early Years Educator

[nrich.maths.org/early-years](http://nrich.maths.org/early-years)  
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## Scooters, Bikes and Trikes

Using everyday language to talk about position, direction and time



**Children often** enjoy riding scooters, bikes and trikes along interesting pathways around and between objects.

**Adults could** discuss routes and provide sign-up lists and timers for children to use when they have to take turns.

### The Activity

Children make their own way round the routes on offer. Children waiting for a turn can write their name or put their name card on a board to mark their position in the queue. They can use a digital timer to measure 10 minutes turns and watch the digits count down.

### Encouraging mathematical thinking and reasoning:

#### Describing

Tell me about your route. What did you go between? Behind? Where will you go next? How many people are waiting in front of you? What number are you in in the queue? What numbers can you see on the timer? What does that 5 mean, do you think?

#### Reasoning

Why will you need to go that way? Is there another way of getting there? Do you think you will have to wait a long or a short time? How long? Why do you think that? What number do you think will come next? What do you notice about the numbers? Why do you think the numbers are going backwards?

#### Opening Out

There are a lot of people today: should we allow 5 minutes or 10 minutes for each turn? Shall we time how long your friend takes to go round the circuit? How shall we do that?

#### Recording

How could we record how long people took to do a circuit? Let's take a look at the recording board. Tell us what has been going on.

## The Mathematical Journey

### Shape and space

- using positional language eg 'behind', 'between' ... or directions like 'left' and 'right'.
- describing shape properties of a route e.g. 'straight', 'corner', 'bend'

### Numbers

- remembering the word sequence and saying one number for each object e.g. when counting people waiting
- cardinality i.e. that the last number gives the total eg. number of wheels
- using the language of 'more' and 'less' or 'fewer' to compare e.g. number of minutes
- using ordinal language: 'first', 'second' or 'number 3' in the queue

### Measures

- language to compare duration: 'a longer / shorter time', and speed: 'slower/faster'
- explaining that a smaller number of minutes is a shorter time

### Development and Variation

Trikes and bikes can be numbered and parked in matching bays. Children can decide which one they are queuing for.

You could introduce the idea of a map by creating a simple map, marking 'landmarks' in the area. Children could use laminated maps in their outdoor play.

Ask children to draw a picture of their journey so someone else could follow their route.



### Resources

An outdoor area with interesting paths and landmarks.

A whiteboard and pens, or sticky name cards, for the waiting list.

Digital timers, which can be set to ring after a specific number of minutes. These provoke more discussion of decreasing numbers than sand-timers.

Acknowledgements: Helen J Williams

Photo acknowledgements (left to right) [www.storytimepreschooltoddlers.com](http://www.storytimepreschooltoddlers.com),  
[www.womenridersnow.com](http://www.womenridersnow.com), [www.toysabout.com](http://www.toysabout.com)

[nrich.maths.org/early-years](http://nrich.maths.org/early-years)  
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## Shapes in the Bag

Sorting and describing, using mathematical properties such as size and shape  
Understanding the characteristics of 2D and 3D shapes



**Children often** enjoy puzzling and guessing games.

**Adults could** provide a bag containing assorted shapes and, when a suitable opportunity arises, encourage the children to play a kind of game.

### The Activity

Children put their hand(s) in a bag to choose one of the shapes inside. By exploring the shape with their hands while it is still in the bag, they try to reason what shape it is, then bring it out to see their choice.

**Encouraging mathematical thinking and reasoning:**

### Describing

(While hands are still in the bag)  
Tell me about the shape you have found.

### Reasoning

Why do you think it could be a ...?  
Is there another shape it could be?

### Opening Out

Put many examples of shapes with the same name into the bag.  
Can you find others in the bag that have the same name?  
How many are there that have the same name?

### Recording

How could you remember what you all found in the bag today?  
Do you want to make a label for your collection and show how many there are?

## The Mathematical Journey

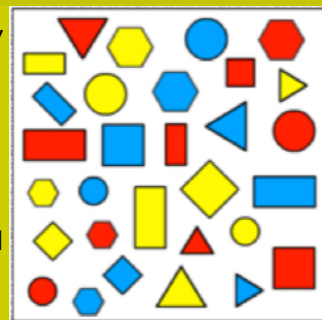
### Properties of shapes:

- using everyday language such as curved, pointy, straight, wiggly to describe shapes
- progressing to using mathematical language such as corner, side, circle, square, rectangle, triangle, oblong ....., having analysed the properties of the shapes involved
- counting the sides and corners of the shapes they choose

### Development and Variation

Encourage children to notice shapes around them - both in the setting and beyond. If they walk around with an example of a particular shape, they may find it easier to discover more of that shape in the environment. This offers opportunities for developing language associated with comparing and contrasting (i.e. 'what is the same and what is different?').

You may like to ask them to take photographs of the shapes they see. If printed, the photographs could become a sorting game back in your setting. You could adapt this game for all sorts of purposes. For example, why not fill a bag with numbers for the children to identify without looking?



### Resources

A collection of shapes - try to include a range of different types and, if possible, a range of different materials from which they are made (ideally the shapes should contain examples that children might have already come across in the setting as well as those which are likely to be new to them)

An attractive bag that is deep enough to contain all the shapes without the children being able to take a peek

A camera might be useful for taking pictures.

With thanks to Kirsty Lombardi at Ludwick Nursery School who was the inspiration for this activity.



[nrich.maths.org/early-years](http://nrich.maths.org/early-years)  
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## Small World Play

Using everyday language to talk about position and size, to compare quantities and objects and to solve problems



**Children often** enjoy playing in an imaginary small world environment, for example, the zoo, jungle, farm, town map, with animals, cars, people ...

**Adults could** provide small world play figures and an area with separate compartments or boxes, fences, sand, etc.

### The Activity

Present the animals or characters and materials to make an environment for them. Below we use the farm as an example. Invite the children to make up a story about where the animals go. Then they might be rearranged or decide to go elsewhere.

### Encouraging mathematical thinking and reasoning:

#### Describing

Tell us about where you have put the animals. What's happening - where are they going now? What a lot of cows you've got! How many animals do you think the farmer has altogether? Which animals do you think you have most/least of? How do you know?

#### Reasoning

Why have you decided to put the cows here? Why is the pig-pen smaller than the sheep-pen? What size field do you think the horses should have? Why do you think that? Roughly how many pigs do you think will fit in that field you are building/have built? How could the cows get to the milking parlour without going through the horses' field?

#### Opening Out

Rina wants to have a farm as well, how could she share some of your animals? Do you think the field for the cows could be any better - if so, how? What if another 5 horses arrive? Might there be space in your farm for them? How will the farmer know if any of the animals are lost?

#### Recording

Let's make a picture of your farm. Can we show where the farmer should put all the animals? Shall we have an animal stock-take? Can you make a list or a tally of all the different animals on your farm today, so we can check they are all there tomorrow?

## The Mathematical Journey

### Shape and space:

- positional language e.g. next to, opposite, between, behind, underneath, inside, outside. . .

### Measures

- developing language to compare and contrast e.g. bigger, taller, much bigger, a little smaller . . .
- explaining that you can fit more sheep in a field because they are smaller.

### Number:

- counting and cardinality - progressing from knowing some number words, to saying one number for each object, then knowing the number of the whole group

comparing numbers, estimating

### Development and Variation

A visit to a farm or zoo can stimulate children's small world play. Observing the different enclosures and space that each type of animal requires provides an opportunity for children to discuss ideas about size and area.

Dinosaur caves, the zoo, the jungle, the sea-side, or a town map can enable similar mathematical talk.

Children's own collections of objects can provide similar opportunities. (See the NRICH activity [Collecting.](#))

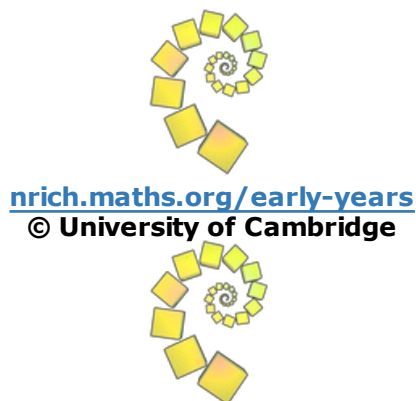


### Resources

A range of materials for the children to make fences, compartments and environments e.g. recyclable boxes, material scraps, lolly sticks, sand etc.

Paper, card, pens and scissors for making labels, maps and plans

Acknowledgement: Helen J Williams



## Tubes and Tunnels

Using everyday language to talk about size, length, position and distance  
Understanding the characteristics of 3D shapes



**Children often** enjoy playing with tubes, rolling them, putting things in them and rolling things down them.

**Adults could** provide an assortment of all kinds of tubes, for example from the insides of wrapping paper, new tubes for hamster/guinea pigs, straws, large ones from carpets etc.

### The Activity

This is very much a child-initiated activity with the children freely playing with the tubes, perhaps making a telescope, perhaps blowing through them, perhaps rolling things down them, perhaps laying them on their side and forming a stack, etc.

### Encouraging mathematical thinking and reasoning:

#### Describing

Tell me about the tubes you are using.  
What are you using the tube(s) for?

#### Reasoning

How could you use another tube?  
I like what you have done. How would you do it again?

#### Opening Out

Can you explain to..... what you have done?  
What could you do with your tube next?

#### Recording

[At the conclusion]  
How can you show what you've done/made/discovered?

## The Mathematical Journey

### Size and measures

- using language to compare the sizes of the tubes, for example, wider, narrower, longer, shorter, fatter, thinner etc.
- developing language to describe the sizes of things going through the tubes

### Properties of shape

- understanding and appreciating the properties of the tubes (of any cross-section) which make them good for ....
- knowing what rolls well

### Position and spatial properties

- learning where to place the tubes to achieve what you want
- talking about where the tubes are in relation to things around them and other tubes

### Development and Variation

There may be tubes that will slide inside each other, producing a telescope effect, which can lead to other discussions about length. You could use gutters to channel water, sand or small pebbles. Further activities that help children experience the properties of other shapes may be appropriate to lead on to from this one. You could look at "[Building Towers](#)" and "[Making Caterpillars](#)" which are found on the NRICH EYFS page.



### Resources

An assortment of cardboard tubes e.g. carpet tubes, kitchen roll tubes, music rain sticks ...  
Play tunnel (the collapsible kind)  
Various food containers with different cross-sections

Photo acknowledgements

