



# Early Years Mathematics Toolkit

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# Section 1: Introduction

## Aims

This toolkit has been produced to support all early years' practitioners with teaching mathematics. It aims to provide information and guidance about how to help young children develop some of the key mathematical ideas and skills that they will use throughout their lives. The toolkit has a strong focus on 'Number', particularly counting, and developing an understanding of number patterns. This is in line with current research which suggests that a key focus for early mathematics should be developing 'Number Sense'. The toolkit also highlights the five recommendations of the Education Endowment Foundation 'Improving Mathematics in the Early Years and Key Stage 1'.

The emphasis throughout the toolkit is on stimulating and engaging children's interest and enjoyment in learning about mathematics in a way that is relevant and meaningful to their lives. The toolkit will be updated, when required, with relevant changes at a national and local level.

## Why is early maths important?

*'Mathematics plays a key role in a child's development. Very young children are naturally curious, noticing differences in quantity and the shape of objects, and using early mathematical concepts when they play. Mathematical understanding helps children make sense of the world around them, interpret situations, and solve problems in everyday life, whether that's understanding time, sharing amounts with their peers, or counting in play. Developing a sound understanding of mathematics when we are young is essential. Children's early mathematical understanding is strongly associated with their later school achievement. It has, therefore, a major impact on young people's educational progress and life outcomes'*  
(Francis, B 2020)

## Mastery in mathematics

The principles of maths mastery for early years should be applied within the context of high quality provision. Practitioners are crucial within this environment in introducing, modelling, extending and assessing mathematics for young children. It is important for mathematics in early years' educational settings to focus upon deepening not accelerating learning. In teaching for mastery, educational settings need to provide time and opportunities for children to make connections in their mathematical understanding. Children should therefore be provided with many opportunities, throughout the indoor and outdoor environments, to develop and deepen their understanding as well as through discrete teaching sessions led by a practitioner.

Practitioners should provide different contexts for children to explore the same mathematical ideas and multiple representations of this idea (including pictorial, informal jottings and mathematical equipment). For mastery in early years, children should be encouraged to communicate their mathematical thinking in a wide variety of ways including through talk, gesture, pointing, body language, manipulation of resources and mark-making.

## Opportunities for reflection

### Key features in maths mastery in Early Years are:

- The characteristics of effective teaching and learning are essential to learning and development within mathematics
- Practitioners enact the belief that all children are effective, competent and secure mathematicians
- Quality play is essential within a mastery approach in early years
- In addition to mathematics throughout all areas of provision, all children experience mathematics teaching in short daily focussed sessions
- Differentiation is achieved by emphasising deep knowledge and through individual support and intervention
- Communication (verbal and nonverbal) is modelled and encouraged in a variety of ways including the careful and precise use of mathematical vocabulary

- Mathematical reasoning is modelled, planned for and assessed within the child's holistic mathematical development
- Mathematical thinking and talking is highly valued, with an emphasis upon the child's process within activities
- Concrete, practical experiences underpin mathematical learning
- Engagement with a range of resources and representations support children to think flexibly and to see multiple ways to approach and solve problems
- Mastery is achieved through quality time, repetition and extended periods on an aspect of mathematics to enable deeper and more connected thinking (both provided by the practitioners and self-selected by the children)
- Children are provided with carefully chosen examples and problems that help them to see connections and relationships
- Children are encouraged to approach mathematical challenges with positivity and confidence

**Find out more** - Mastery in Mathematics in the Early Years: Maths Hubs – East Midlands West  
[www.emwest.co.uk/early-years/](http://www.emwest.co.uk/early-years/)

### Key current guidelines

The Education Endowment Foundation recommend five key areas for 'Improving mathematics in early years and key stage 1':

1. Develop practitioners' understanding of how children learn mathematics
2. Dedicate time for children to learn mathematics and integrate mathematics throughout the day
3. Use manipulatives and representations to develop understanding
4. Ensure that teaching builds on what children already know
5. Use high quality targeted support to help all children learn mathematics

**Find out more** - Education Endowment Foundation - Improving mathematics in early years and key stage 1  
[educationendowmentfoundation.org.uk/tools/guidance-reports/early-maths/](http://educationendowmentfoundation.org.uk/tools/guidance-reports/early-maths/)

### Opportunities for reflection

#### Mathematics Audit Tool

An early years maths audit tool will help practitioners evaluate their own practice and provision in mathematics. The audit tool includes sections on staff knowledge and attitudes, observation, assessment and planning and the enabling environment. This is available at: [www.cumbria.gov.uk/childrensservices/childrenandfamilies/cfis/earlyyearsandchildcare/supportforearlyyearsandchildcareprovision.asp](http://www.cumbria.gov.uk/childrensservices/childrenandfamilies/cfis/earlyyearsandchildcare/supportforearlyyearsandchildcareprovision.asp)

### The revised early years mathematical educational programme 2021 – Why the focus on number?

We know from research that a key focus for early mathematics is developing number sense, e.g. 'the fiveness' of 5. Other early predictors of success are:

- Recognising numbers from dice and dominoes patterns
- Comparing numbers like 5 and 7, saying which is more
- Predicting the result of adding or taking away one

After this, research tells us that, children need to develop an understanding of numbers as made up of other numbers, and number combinations (Geary, 2011; Gifford, 2014).

Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically. Children should be able to count confidently, develop a deep conceptual understanding of the numbers to 10, the relationships between them and the patterns therein.

By providing frequent and varied opportunities to build and apply this understanding – such as using manipulatives – children will develop a secure base of knowledge from which mathematical mastery is built.

In addition, children’s curiosity about number, shape, space and measure should be encouraged and furthered through opportunities to apply their growing understanding of the mathematical world to the world around them.

### Find out more

Early Years Mathematics: How to Create a Nation of Mathematics Lovers? - Sue Gifford  
[nrich.maths.org/11441](http://nrich.maths.org/11441)

Revised educational programmes and early learning goals:  
Early years foundation stage (EYFS) statutory framework - GOV.UK ([www.gov.uk](http://www.gov.uk))  
Birth To 5 Matters – Guidance by the sector, for the sector  
Development Matters - GOV.UK ([www.gov.uk](http://www.gov.uk)) (educational programmes only)



## Section 2: Developmental progression in mathematics

### Learning and development: How do children typically learn mathematics?

In order to lay the foundations for learning, settings should embed practices that support and extend children's mathematical development. This includes promoting a culture that supports children's curiosity, thinking and problem-solving. It also involves planning and providing appropriate, cognitively challenging activities which will develop children's early mathematical skills and understanding. The focus within curriculum design should be upon exploring key mathematical content in considerable depth, particularly at the earliest stages. Teaching and learning in the EYFS must also be informed by the Characteristics of Effective Teaching and Learning:

- **Playing and exploring** - children investigate and experience things, and 'have a go'
- **Active learning** - children concentrate and keep on trying if they encounter difficulties, and enjoy achievements
- **Creating and thinking critically** - children have and develop their own ideas, make links between ideas, and develop strategies for doing things

### Developmental Progression: Babies

Mathematics is just one of the ways in which young children learn to make sense of their world. From the moment of birth, babies are using their senses and developing awareness of everything that is going on around them in an effort to understand. They are born curious, born problem-solvers and born communicators and these characteristics will help them to become mathematical thinkers and explorers. Babies are born with mathematical brains and within the first year of life it is clear that babies have many mathematical skills. These include:

- Being able to recognise differences between groups of one, two or three objects, actions or sounds.
- Making connections between a number of sounds heard and looking at a set of objects with the same number.
- Discriminating between simple 2D shapes such as circles and triangles.
- Enjoying tasks that require them to figure something out or solve a problem.
- Investigating cause and effect.
- Looking for patterns. In common with all human minds, babies' developing brains seek out pattern, a vital aspect of mathematical understanding.

Babies learn first about the space they are in. Then they learn about the order of events and begin to predict what will happen next. They also start to hear number names and associate them with small groups of objects. Babies' early awareness of shape, space and measure grows from their sensory awareness and opportunities to observe objects and their movements, and to play and explore.

### Practical ideas:

#### How to support babies' mathematical development:

- It is important for practitioners to use mathematical language with babies and young children such as top, bottom, big, little, next to, round, square, up, down etc.
- They also need lots of exposure to adults engaging them in songs and finger rhymes which involve counting.
- Let babies hear you counting in a range of everyday situations; when building a tower, when placing finger foods on their plate, when you are sharing books and looking at the pictures. Pointing to each item and counting aloud helps babies learn the pattern of the numbers and importantly helps them learn one-to-one correspondence.
- Introduce the idea of 'One More?' and 'All gone!' at meal times as this is an important starting point for later addition and subtraction.

- Playing peekaboo type games helps babies develop a sense of 'object permanence'.
- The use of treasure baskets help babies to explore collections of different objects and begin to make comparisons; which feel hard or soft, which are shiny or dull, textured or smooth etc. Carefully select objects for treasure baskets to include lots of different shapes and sizes. In this way you are giving babies the opportunity to learn about sizes and dimensions as they play.
- Using water and other messy play resources is important for allowing babies to begin to explore capacity and volume. Provide different sized and shaped jugs and pots. Show babies how to fill and empty and talk about what is happening, introducing mathematical vocabulary, such as 'empty, full, more'.
- Talk to babies about the sequence of routine times, such as nappy changing or feeding time so that they can begin to recognise repeated patterns of activity.

## Developmental Progression: Toddlers

From 18 months onwards:

- Most toddlers will be learning to say some number names although they will mix up the order of the numbers.
- Toddlers will learn how to match and complete simple inset jigsaw puzzles. They will begin to understand about sorting and will group together similar objects.
- They will begin to build towers with bricks and also line toys up along the floor
- Toddlers will know the order of events that happen every day, such as having a lunch or getting dressed.
- They will make connections in everyday events, such as seeing their cup and understanding that it is snack time.

## Practical ideas:

### How to support toddlers' mathematical development:

- Practitioners need to maximise opportunities for toddlers to hear them counting, during play and everyday routines. For example, count buttons as you fasten them up, counting stairs as you go up and down.
- Toddlers need to hear lots of number songs and rhymes and be encouraged to join in repetitive actions
- Draw children's attention to groups of objects during personal care routines, for example 'This little piggy went to market'.
- Create situations where toddlers can find the 'odd one out', for example a cuddly toy hidden in the box of bricks.
- Play games whereby you pass objects to toddlers one by one so they can see a growing number.
- Sensory and messy play provide opportunities for toddlers to explore comparatives such as capacity and weight. Adults should start to model mathematical vocabulary such as full / empty, big / small heavy / light etc.
- Continue to provide lots of opportunities for sorting and matching as these are key mathematical skills which will support a child's later development with counting. Heuristic play is a really positive way to support this. The structured materials of heuristic play give children an opportunity to experience different shapes and sizes, to find out about putting things in and taking them out, and at the end of the session there is an opportunity to sort materials as they tidy up and put everything back into the correct bags.

## Developmental progression: 2-3 Year olds

- Most children will be able to say some of the number names in order.
- They will begin to give you the correct amount of objects from a collection (up to 3).
- They will show an understanding of 'more' in their play and at snack and mealtimes.
- Children will begin to use the word 'more' and 'a lot' to describe amounts of objects.
- They will begin to understand that if they add something to a collection, they have more and that if they take something away, they do not have as much.
- Children will be able to make marks to represent numbers and quantities.
- Children will show an increased interest in shape and patterns.
- They will sort collections into groups that are the same colour, shape and size.



- They will use words like 'big' and 'little' to describe objects and pictures.
- They will know the order of regular things that happen every day.

### Practical ideas:

#### How to support 2-3 year olds' mathematical development:

- Maximise everyday opportunities for children to hear you count, for example counting the number of children in a group at snacktime, the number of plates and pieces of fruit etc.
- Continue to provide lots of opportunities for grouping and sorting objects e.g. farm animals, toy vehicles etc. Start to introduce sorting by, not just type, but also colour, shape and size.
- Sing counting songs and rhymes and use props so that children have real objects to count.
- Draw children's attention to quantity by talking about 'more' and 'less'.
- Use every day routines such as meal times to help children learn about quantities increasing and reducing.
- Provide a range of containers of different sizes, for example large cardboard boxes, plastic bottles, beakers and hessian bags, so that children can put things in and out of them.
- Provide sand, water and other sensory play where children can use containers and scoops, etc.
- Draw children's attention to objects of different sizes, for example 'Which spoon would you like – the large one or the smaller one?'
- Provide jigsaw puzzles so that children begin to learn about shape and spaces.

#### Developmental progression: 3-4 year olds

- Children will use number names and comparative words such as 'more than' and 'fewer than' in their play.
- They will be able to say the numbers in order from 1-10.
- They will know that numbers tell them how many things there are altogether.
- Children will use their fingers, pictures or marks to show how many things there are.
- They begin to appropriately match some numerals to groups of objects.
- They are interested in talking and asking questions about numbers.
- They know when there are the same number of objects in groups.
- They begin to share objects out into different groups.
- Children know that they can count sounds and actions as well as objects.
- They can identify shapes in the environment.
- They like to explore and talk about shapes in their play activities.
- They are beginning to use positional language.

#### Developmental progression: 4-5 year olds

- Children count aloud, using the number words in sequence, to at least 10.
- They recognise the numerals to 10 and beyond.
- They count groups of objects using 1:1 correspondence.
- They match the correct numeral to a group of objects that they have counted.
- Children begin to give realistic estimates.
- They can make comparisons about which group has 'more' or 'fewer'.
- They combine two groups of objects to say how many altogether.
- Children can say what 'one more' and 'one less' is.
- They use mathematical vocabulary such as 'more' 'add' 'less' 'take away'.
- They use an understanding of number to solve problems.
- Children use 2 and 3D shape names.
- They develop an understanding of the properties of shapes and use shapes appropriately in their play.
- They make comparisons and use vocabulary such as 'longer / shorter' 'heavier / lighter'.
- They begin to develop an understanding of money in their role play.
- They begin to develop an understanding of time and sequencing.

## Practical ideas:

### How to support 3-5 year olds' mathematical development:

- Create opportunities in the daily routine for counting to take place, for example counting out chairs or snacks.
- Create mathematical problems for children to solve, for example 'Tom wants to share these grapes between his three friends'.
- Use role-play situations to encourage counting and recognition of numbers, for example at the shops, at the petrol station, at the takeaway.
- Draw children's attention to numbers by counting and writing numbers in front of them.
- Use materials from 'real life' such as birthday cards, raffle tickets and takeaway menus for children to see and play with numbers.
- Look out for opportunities for children to one-to-one match, such as laying the table.
- Identify opportunities for children to see subtraction and addition, such as making sandcastles and then knocking them down one by one or two by two.
- Use language to draw children's attention to changes, such as how many less or how many more.
- Play games that encourage children to be active in using their emerging skills, for example roll-a-dice games.
- Use counting songs and accompany these with props.
- Play physical games to encourage children to develop a concept of number, for example hopscotch and 'What's the time Mr Wolf?'
- Provide objects for children to sort and classify. Talk about the size of the different groupings.
- Draw children's attention to the names and shapes of objects.
- Provide opportunities for children to measure and compare quantities.
- Look for opportunities to incorporate shapes, measuring and making things in play opportunities, for example making dens with fabric and boxes outdoors.
- Use stories such as Goldilocks that focus on size or quantity, for example large, medium and small.
- Use the language of measurement with children, for example long, longest, small, smallest.

## The Early Learning Goals for Mathematics: The current expected level of learning by the end of Reception

### Number

- Have a deep understanding of number to 10, including composition of each number
- Subitise (recognize quantities without counting) up to 5
- Automatically recall (without reference to rhymes, counting or other aids) number bonds to 5 (including subtraction facts) and some number bonds to 10, including double facts

### Numerical patterns

- Verbally count beyond 20, recognising the pattern of the counting system
- Compare quantities up to 10 in different contexts, recognizing when one quantity is greater than, less than or the same as the other quantity
- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally

**For practical ideas of how to support mathematics within your provision, including what adults might do and what adults might provide, linked to the 2021 mathematics educational programme please explore:**

Birth To 5 Matters – Guidance by the sector, for the sector  
Development Matters - GOV.UK ([www.gov.uk](http://www.gov.uk))  
<https://help-for-early-years-providers.education.gov.uk/>

## An example of developmental progression

### Counting: Progression in play for babies and children - Fingers and Toes

Adapted from: Baby & Beyond, Counting – progression in play for babies and children (2008) A&C Black Publishers Limited  
Fingers and toes are the ultimate, one minute anywhere, anytime resource for counting. Ideal for finger play and number rhymes, for tapping, pointing, clapping and stamping and of course counting to ten and back again. Books, CDs and the internet all offer endless finger rhymes.



Development Matters 2021	Birth to 5 Matters 2021	
Birth to three	Range 1 / 2	<p>Even tiny babies enjoy having their fingers and toes gently massaged and tickled. Trail different fabrics gently across fingers and toes. By around three months babies press their palms together and enjoy watching and playing with their fingers. By six months they will begin to use a palmar grasp to hold small toys in two hands.</p> <p>Draw their attention to their hands and toes by placing brightly coloured soft bangles and rings around their wrists and feet.</p>
Birth to three	Range 2 / 3	<p>This is the perfect stage for finger play games, and rhymes of all sorts. Try individual sessions with the baby on your knee, and at different times hold them facing you, sideways on your knee, or facing away from you towards another adult and baby. This is also a good time for 'One, Two, Three, Go!' games. Build brick towers, say 'One, Two, Three, Go!' – then knock them over together.</p>
Birth to three	Range 2 / 3 / 4	<p>Imitating and turn taking are essential parts of the play children around this age. Try clapping and counting 'One, Two, Three' then lift and swing children gently, with a 'One, Two, Three, wheeee!' or do the same thing when walking with a child between two adults. Make numbers a part of the everyday language as the children imitate simple pretend play, such as picking up or setting out plates, cups, etc. with 'One, Two, Three'.</p>
Birth to three  3 and 4-year-olds	Range 4 / 5	<p>Children now begin to know some number words but need to move on to matching one object to one count. Make time every day for counting finger rhymes, such as 'Five Fat Peas' or 'One Potato, Two Potato'. Use simple finger puppets, smiley faces or star stickers on each finger. Play, 'Show me three stars', and so on. Count to five or ten with older children. Begin to use the language of number, such as 'more', 'less', 'lots', 'a few', as well as number words.</p>
3 and 4-year-olds  Children in Reception	Range 4 / 5 / 6	<p>By this stage children should be able to glance at a small group of objects and know that there are say three or five objects. Put a group of three cars on the mat and ask children to show you the same number of fingers. Talk about how many more to make five cars, how many will there be if two cars drive away. Take off shoes and socks and use fingers and toes for counting to ten, and of course, back again to</p>

<p><b>ELG</b> (The expected level of learning by the end of Reception)</p>	<p>Use finger rhymes, songs and stories involving counting on and counting back in ones, twos, fives and tens. Ask a child to show you double two or half of six with their fingers. Use fingers and toes for counting to twenty and back again to zero.</p>
<p><b>NC Yr1</b></p>	<p>Use fingers to:</p> <ul style="list-style-type: none"> <li>• Practise counting (1, 2, 3...) and ordering (first finger, second finger, third finger...)</li> <li>• Support counting in groups of five or ten</li> <li>• Explore number bonds to 10 (<math>6+4=10</math>; <math>10-6=4</math>; <math>6=10-4</math>)</li> </ul>
<p><b>NC Yr2</b></p>	<p>Use fingers to:</p> <ul style="list-style-type: none"> <li>• Practise addition and subtraction to become increasingly fluent in deriving facts such as using <math>6+4=10</math>; <math>10-6=4</math>; <math>6=10-4</math> to calculate <math>60+40=100</math>; <math>100-60=40</math>; <math>60=100-40</math></li> <li>• Practise the 5 and 10 multiplication tables</li> </ul>

**BBC Teach** provide an A to Z list of over 100+ videos of traditional nursery rhymes and songs. All videos include the words on screen and a lyric sheet to print out:

[www.bbc.co.uk/teach/school-radio/nursery-rhymes-a-to-z-index/z4ddgwx](http://www.bbc.co.uk/teach/school-radio/nursery-rhymes-a-to-z-index/z4ddgwx)



## Section 3: Developing practitioners' understanding of how children learn mathematics

It is important that all practitioners feel confident in their knowledge and understanding of how to teach mathematics to young children. The following sub-sections provide information about the key elements of teaching 'Sorting' and 'Number'.

### Sorting and Classifying

It is vital that young children have lots of experience of handling, sorting and classifying a range of different objects within the environment. By sorting, children understand that things are alike and different as well as that they can be organised into certain groups. Getting practice with sorting at an early age is important for the development of numerical concepts when children are older. Learning about identifying and describing attributes, matching, sorting, comparing and ordering start children on the path to developing mathematical understanding. Studies have shown that children who are used to comparing and contrasting do better in mathematics later on.

Mathematical learning for young children begins naturally as they engage with the world around them and children have a natural desire to make sense of and create order in their world. Children learn best by investigating and manipulating concrete materials, discussing ideas and developing problem solving skills. Classifying and sorting activities help children to develop a range of thinking skills and build the foundations for later problem solving. The visual memory and the ability to identify patterns, relationships, similarities and differences, assists children in learning about early number representation and problem solving.

### Progression in sorting and classifying

1. When identifying and describing attributes, children start by noticing the properties of a particular object. Gradually they are able to notice the details and recognise similarities and differences. As they develop language, they begin to talk about what they have noticed and explain their thinking.
2. With matching children are focusing on the sameness of an attribute. Children gradually learn to express why they are matching something. Matching is important as it nurtures children's reasoning skills.
3. Sorting is a step further than matching, as children group different objects with one or more attributes. Sorting involves making a variety of different decisions. The ability to sort using two or more attributes embodies higher order thinking.
4. In comparing children make a decision based on the amount of an attribute two objects hold. Here children are engaged with determining which object possesses more or less of an attribute. Children develop their vocabulary of comparative description. They also develop an understanding that comparing is relative to the situation and that an object's description can change depending on what it is being compared with. Children begin using "er" words for example 'bigger, darker' etc.
5. Children can only order when they are able to identify and describe attributes, notice differences and make comparisons. Ordering involves arranging objects according to increasing or decreasing amounts of an attribute. Children use "est" words for example 'biggest, darkest'.

### Opportunities for reflection

#### The role of the adult in teaching sorting and classifying:

When planning sorting activities it is important to ensure that children are sufficiently challenged. Plastic sorting toys provide very limited opportunities for sorting, with the only options often being colour and size. Using collections of open-ended, natural resources give limitless ways for children to sort and often children's ideas are much more creative than adults.

A key aspect of sorting activities has to be encouraging children to think mathematically and express their ideas. As they sort we want children to seek patterns, make connections and recognise relationships, solve problems and generate questions. Engaging children in collaborative discussions in which practitioners scaffold children's thinking helps them go beyond what they already understand and can do.

## Practical ideas:

### Ideas for sorting and classifying activities

#### Identifying and describing attributes

1. Ask the children to collect a few small things from around the environment that are different. Use outdoors as well as indoors so that the children can engage with natural resources. Start with collecting just two objects each and increase the number as the children begin to understand the game. Talk to the children about what makes the items different. Encourage conversation about colour, shape, size, what they are made of and function. Remember to encourage the children to explain their thinking.
2. Try this activity again, this time talking about what makes the two objects the same or almost the same.
3. Encourage the children to find items that are similar and talk about the differences and similarities.
4. Listen to children's explanations for their reasoning. Accept their explanations and take the time to offer different ones. Different interpretations will broaden children's thinking. For example, if a child only ever talks about colour, try talking about size or shape.



#### Matching

1. This time collect a variety of items, two of each kind of item that has at least one attribute the same - for example, colour, purpose etc. Start by giving children an attribute and ask them to match the items according to the attribute.
2. Using lots of different collections, then move on to encouraging the children to match the items according to their own chosen attribute. Remember that the development of language skills here is very important. Practitioners need to engage children in sustained shared thinking; wondering aloud, making suggestions, modelling ideas and vocabulary and asking open ended questions.

#### Sorting

1. Provide a wide range of open ended collections such as buttons, squares of fabric, pebbles, sticks, tubes, lids, balls - the range is endless. Encourage children to sort them according to the attribute they choose. Talk about why they chose that attribute, asking them to explain their thinking. Provide opportunities for children to work in pairs with their sorting. Encourage each child to shut their eyes and pick out one object from the collection. They can then talk about what is the same and what is different to their partner's object. Encourage collaboration and negotiation as children work in groups to sort their collections. Groups can then look at how others have sorted their collections and can talk about whether they have used the same sorting criteria or something different.
2. Plan problem solving challenges linked to the collections. For example, practitioners could ask, "I wonder how many balls fit in a box" – this engages the children in really thinking about what sized box / balls they will explore with.
3. Be creative in thinking about providing sorting opportunities within the continuous provision. For example, when planning role play, consider having a fruit and veg shop, a shoe shop or a post office with authentic resources which the children can naturally sort as they play. In the sand and water areas, provide toys which can be sorted by size, colour etc. In the mark making area have individual colour pots for crayons and felt tip pens. Collections of natural objects, such as pebbles, cones and twigs, whilst inspiring imaginative play in small world, can also provide further opportunities for sorting. Use play animals, figures and vehicles to practise sorting with children in small world play. For example, challenge them with different ways for sorting a collection of animals – type, colour, body patterns, where they live, the number of legs etc.
4. For older and more able children start to introduce the '1 difference' game. From a collection of objects, children take turns to select one that is the same in all respects except for one difference to that of the previous child.
5. Use books and stories as a start point for sorting activities. 'The button box' by Margarett Reid and 'You choose' by Nick Sharratt and Pippa Goodhard are examples of useful books to support sorting activities.
6. Maximise opportunities for sorting within daily routines. Tidying up is a really good time to practise sorting. It is important to see this as a teaching opportunity and ensure sufficient time and adult support is afforded to this activity. Snack time is another great time for children to practise sorting as they help to chop and plate up fruit and other foods.

**Find out more** - For creative ideas for matching and sorting activities see [theimaginationtree.com/?s=sorting](https://www.theimaginationtree.com/?s=sorting)

Further ideas to practice classification - [inspirationlaboratories.com/ideas-to-practice-classification-for-kids/](https://www.inspirationlaboratories.com/ideas-to-practice-classification-for-kids/)

Using multi-sensory, tactile resources and following the Reggio Emilia approach to children learning about sorting and classifying through free investigations see [www.pinterest.co.uk/PlaytheDay/reggio-math-concepts/](https://www.pinterest.co.uk/PlaytheDay/reggio-math-concepts/)

## Number: Cardinality and Counting

The cardinal value of a number refers to the quantity of things it represents, e.g. the numerosity, 'howmanyness', or 'threeness' of three. When children understand the cardinality of numbers, they know what the numbers mean in terms of knowing how many things they refer to. Counting is one way of establishing how many things are in a group, because the last number you say tells you how many there are. Children enjoy learning the sequence of counting numbers long before they understand the cardinal values of the numbers. Subitising is another way of recognising how many there are, without counting.

Typical progression of key ideas in this concept:

- Saying number names in sequence.
- Tagging each object with one number word.
- Knowing the last number counted gives the total so far.
- Recognising small quantities without needing to count them all (subitising).
- Understanding the meaning of numerals.
- Knowing that the number does not change if objects are rearranged, provided no more have been added or taken away (conservation).

**Find out more** - For the 'Early Years Typical Progression Chart with additional guidance for practitioners' go to **Cardinality and Counting | NCETM**

Information on common errors and assessment points are also available on the above website.

## The five counting principles (Gelman, R. & Gallistel, C. (1978))

It is important to consider each of the following principles when planning a counting curriculum:

**1. The one-one principle** This involves the assigning of one, and only one, distinct counting word to each of the items to be counted. To follow this principle, a child has to be able to partition and re-partition the collection of objects to be counted into two categories: those that have been allocated a number name and those that have not. If an item is not assigned a number name or is assigned more than one number name, the resulting count will be incorrect.

**2. The stable-order principle** To be able to count also means knowing that the list of words used must be in a repeatable order. This principle calls for the use of a stable list that is at least as long as the number of items to be counted; if you only know the number names up to 'six', then you obviously are not able to count seven items. So, a child who counts 1, 2, 3 for one particular collection of three objects and 2, 1, 3 for a different collection cannot be said to have an understanding of the stable-order principle – although such a child would appear to have an understanding of the one-one principle. However, a child who repeatedly counts a three-item collection as 2, 1, 3 does appear to have grasped the stable-order principle – although, in this case, has not yet learned the conventional sequence of number names.

### 3. The cardinal principle

This principle says that, on condition that the one-one and stable-order principles have been followed, the number name allocated to the final object in a collection represents the number of items in that collection. To be considered to have grasped this principle, a child needs to appreciate that the final number name is different from the earlier ones in that it not only 'names' the final object, signalling the end of the count, but also tells you how many objects have been counted: it indicates what we call the numerosity of the collection. If a child recounts a collection when asked how many objects there are, then they have not yet grasped this principle. Until recently, it was generally assumed that a child understood the cardinal principle if, after counting a collection and being asked how many objects there were, they immediately repeated the last number name spoken. However, in 2004 Bermejo et al. showed that when children were asked to count a collection of five objects starting the count with the word 'three' many gave the answer 'seven', i.e. the last number name they had said. These three principles are considered by Gelman and Gallistel to be the 'how-to-count' principles as they specify the way in which children must execute a count. The remaining two are 'what-to-count' principles, as they define what can actually be counted.

### 4. The abstraction principle

This states that the preceding principles can be applied to any collection of objects, whether tangible or not. Obviously, for young children learning to count it is easier if the objects are tangible and, where possible, moveable, in order to help them to distinguish the 'already counted' from the 'yet to be counted' group. To understand this principle, children need to appreciate that they can count non-physical things such as sounds, imaginary objects or even the counting words – as is the case when 'counting on'.

### 5. The order-irrelevance principle

This principle refers to the knowledge that the order in which items are counted is irrelevant. It does not really matter whether the counting procedure is carried out from left to right, from right to left or from somewhere else, so long as every item in the collection is counted once and only once.

#### Find out more

There is further information about the counting principles at the beginning of each of the Reception Schemes of learning in the White Rose Maths: [www.whiterosemaths.com](http://www.whiterosemaths.com)

#### Opportunities for reflection

##### The role of the adult in teaching counting:

- When counting always use real objects to start with.
- Encourage children to use fingers for counting so they gradually learn to immediately show you any number to 10 on their fingers.
- Maximise opportunities for counting within continuous provision. Support children's counting in a range of everyday situations and remember to consider the counting principles at all times. It is important to practise counting in as many different ways as possible – this is maths mastery.
- Introduce 5 frames (and later 10 frames) when children are counting out groups of objects as this will help them to line up objects and will also help them to subitise. Practitioners should start to talk about how many empty spaces there are on the frame as this supports children's developing awareness of number bonds.
- Introduce comparison, starting with groups of identical objects and then move on to non-identical (e.g. different colour or size within the same type). Teach children to line up the groups to compare which has more / fewer.
- A key role of the adult is to encourage children to begin to talk about their mathematical thinking – "How do you know? ...What strategies did you use?"
- Closely observe children in order to identify any common errors in their understanding of the counting principles and use these as teaching points in planning.





### Practical ideas: Ideas for counting activities:

- Deliberately make mistakes in counting, using a puppet to motivate the children.
- Use songs and rhymes to explore counting and addition and subtraction. Number songs often involve '1 less' e.g. '10 green bottles'. Include '1 more' songs too such as '1 elephant came out to play'.
- Use story books to further develop an understanding of number.
- There are lots of stories which support the concept of adding and subtracting e.g. 'The gingerbread man' and 'The enormous turnip'. Story maps are also useful as they involve creating visual representations of numbers.
- Play simple track games where children move a toy or themselves along a number track using 1:1 correspondence. Also skittles and other games, such as throwing beanbags into numbered containers, will help children to be active in their learning of number.
- Dominoes are a great resource for teaching number, including subitising and comparison. Start by matching dot patterns and talking about how many spots on each half of the domino. Then challenge children further by starting to consider the total number of spots on each domino through a variety of games. See [www.teachwire.net/news/using-dominoes-to-teach-early-years-maths](http://www.teachwire.net/news/using-dominoes-to-teach-early-years-maths) for more ideas.
- Exploit problem solving through challenges based on children interests and fascinations. Try presenting a beginning and an ending to a simple number story and ask what could have happened in the middle. Encourage children to explain their ideas and represent them through acting out the story, telling it and drawing it.
- Blank games boards, together with a selection of dice, spinners and small world toys / pebbles / shells etc. will encourage children to invent and play their own maths games.

### Subitising

Subitising is a skill we all use but are unlikely to remember learning. Now 'subitising to 5' is explicitly specified in the pilot Early Learning Goals (ELG) for Mathematics. Subitising is the ability to quickly recognise how many objects are in a group without actually counting them. As adults, most people can subitise up to five objects – this is called **perceptual subitising**. We also subitise larger numbers of objects by 'seeing' them in groups of five or less and combining these – this is called **conceptual subitising**. The ability to subitise develops instinctively. The development of this skill in young children is fascinating: from the two-year old who can distinguish between one and two objects, to the three-year old who can build a group of objects of the same number as the group s/he has seen briefly, to the four-year old who starts to recognise and use number names for groups up to four. Perceptual subitising to five, doesn't usually occur until a child is five years old, and conceptual subitising develops gradually from there on.

### Practical ideas:

#### Ideas for subitising activities:

- Games that involve hiding a small number of objects in a box or under a cloth, and getting children to take a peek and say how many there are.
- Throwing a number (up to 5) of two-sided beanbags. Children then say what they can see "I can see 2 patterned and 1 plain beanbag – there are 3 beanbags altogether". A more complex version of this would be to hide some of a known number of beanbags. "I have 3 beanbags altogether. I can see 2, so there must be 1 in the box".
- Using 5 seeds, plant them in 2 flowerpots, talking about how many seeds are planted in each pot and making a total, for example, "2 seeds are planted in my pot and 3 seeds are planted in your pot. There are 5 seeds altogether".
- Play dice games, such as rolling a dice and counting out that number of teddies, cups, saucers etc. for a picnic. For further ideas see: <https://nrich.maths.org/content/id/9888/Dice.pdf>

**Find out more** - Other activities are suggested in the 'Number Sense Series: Developing Early Number Sense' from NRICH, by Jenni Way: [nrich.maths.org/10737](http://nrich.maths.org/10737)

The CBeebies Numberblocks series introduces subitising. The NCETM have produced 'Numberblocks Support Materials' and Series 1, Episode 11 addresses subitising to 5. **Numberblocks Support Materials | NCETM**

## Section 4: Dedicated time for children to learn mathematics and integrate mathematics throughout the day

### The organisation of time for teaching maths

In the early years and Key Stage 1, there are opportunities throughout the day to learn about mathematics through the environment and through routines, as well as in dedicated teaching time. Throughout the day children should be exposed to mathematical language, both formal and informal, and practitioners should discuss mathematical ideas with children in order to extend their thinking.

#### Opportunities for reflection

##### Plan daily activities targeting specific maths concepts and skills:

- Focus on supporting children to develop specific mathematical ideas and skills, taking into account developmental progressions.
- Use whole-class, large and small groups to tailor instruction for children who need support on different aspects of content.
- Explore maths through different contexts, including books, puzzles, songs, rhymes, puppet play and games. Use these to teach specific concepts which match the children's next mathematical steps in learning

##### Reinforce mathematical vocabulary and create opportunities for discussion of mathematics

- Seize chances to reinforce mathematical vocabulary—for example by making a comment about which child is standing 'first', 'second', or 'fourth' in line, which child has 'more than' or 'fewer' objects than another child, or helping children rephrase statements that use ambiguous, non-mathematical language, such as refining 'big' when the child means 'tall'.
- Once children are comfortable with using informal language, practitioners can begin to introduce more formal mathematical vocabulary.
- Create opportunities for extended discussion of mathematical ideas with individuals or small groups of children in order to extend their thinking, e.g. sustained shared thinking.
- Tune into the child's behaviour and motivations, responding to what children are saying and using a variety of techniques to help develop and extend children's thinking, e.g. asking open-ended questions.

##### Highlight mathematics across the day

- Everyday routines such as registration time, snack time, and tidying up provide opportunities for counting and comparison as well as addition, subtraction, sharing, and time problems. Provide daily opportunities to vote for activities, such as choosing a favourite book to read at story time, as this is a good way to explore counting and the comparison of number.
- Provide a variety of tools to allow children to explore all areas of mathematics, both indoors and out, e.g. manipulatives, measuring items, scales, construction materials, puzzles, sorting and pattern materials.
- Identify 'teachable moments' during play. Ensure that practitioners have the time and availability to engage with children in their self-directed play in order to maximise these 'teaching moments'.

**Find out more** - For further information see: Improving Mathematics in the Early Years and Key Stage 1 – Education Endowment Foundation [educationendowmentfoundation.org.uk/public/files/Publications/Maths/EEF\\_Maths\\_EY\\_KS1\\_Guidance\\_Report.pdf](https://www.educationendowmentfoundation.org.uk/public/files/Publications/Maths/EEF_Maths_EY_KS1_Guidance_Report.pdf)

East Midlands West Maths Hub: Mathematical snack time in the Early Years provides lots of ideas for developing mathematical thinking as part of this daily routine. See [www.emwest.co.uk/eyfs-resources/](http://www.emwest.co.uk/eyfs-resources/)

NRICH have freely downloadable activities around routines such as 'The Voting Station'. There are also useful articles such as 'Developing number through tidying up'. See [www.nrich.maths.org](http://www.nrich.maths.org)

For further information see Appendix 1: Mathematical routines in the early years.

## Enabling Environments to support mathematical development

Children learn and develop well in enabling environments and a key role of the early years practitioner is to plan an environment that is engaging and interesting and that supports children's individual and group learning needs.

Some settings choose to have a specific maths area whilst others put mathematical resources into every area of provision. Others may have a central maths store which children can access and take resources to where they need them. There is no right or wrong approach to take, however the key consideration should be to maximise mathematical possibilities everywhere. Children need to be able to extend, apply and revisit their mathematical learning through real life experiences, using resources that will interest, inspire and motivate them. Practitioners should ask themselves whether their environment is **irresistibly exciting and challenging**. If it is, then children will naturally become curious, confident and resilient learners. A captivating environment combined with the active intervention, guidance and support of a skilled adult, ensures that children will develop into enthusiastic, independent and able mathematicians who enjoy solving problems.

## Resources

Children's interests are powerful catalysts for mathematical enquiry and should provide a strong starting point when planning provision that will support and extend mathematical thinking. Observe children and tune into their interests whilst also discussing and sharing insights with parents about children's interests and play at home and in the setting. Use this information to help plan resources to support mathematical development within the environment.

## Practical ideas:

Mathematics does not depend on specific mathematical resources and often more open-ended resources, such as those in 'Loose parts play' will provide richer opportunities for mathematical enquiry and exploration where children can engage at their own level of understanding. Children are also far more likely to use authentic real-life resources for real purposes and as such, these resources will enable children to apply their own knowledge and utilise their own home experiences as part of their learning. These could include the following items:

- Measuring tapes and rulers
- Real coins with wallets, purses and money boxes
- Kitchen balances and scales and bathroom scales (digital and/or mechanical)
- Sand timers, kitchen timers and stopwatches
- Clocks and watches (both digital and analogue)
- Large calculators
- Measuring jugs, spoons and other types of kitchen equipment
- Spirit levels and plumb lines
- Address books, calendars, diaries, recipe books and phones
- Tinned foods, empty food cartons and real vegetables (to help children explore the concepts of 'heavy' and 'light')
- Natural objects such as shells, pebbles, conkers, cones
- Different sized containers such as boxes, gift bags, cake tins
- Collections of everyday objects such as buttons, pieces of fabric, tubes, balls
- Dice, spinners, playing cards, counters
- Clipboards, squared paper, marker pens, chalk and white boards



## Outdoors

The great outdoors is filled with rich opportunities for mathematical learning that can interest and engage children in real-life problem solving. Children need to spend long periods playing outside so that they have time to become absorbed in mathematical exploration and discovery.

As with the indoor environment, the outdoors needs thoughtful planning to really maximise the rich and varied opportunities for mathematical learning.

Think about maths on a bigger scale, with opportunities for large construction and messy maths outside where children can explore their own mathematical ideas. Mud kitchens and outdoor sand and water areas are all good ways to challenge children's mathematical thinking in an open-ended way.

Getting hands-on and learning in the natural environment is growing in popularity in schools and nurseries, with many following what is called a 'Forest Schools' approach. This is a child and environment-led approach which can present lots of opportunities for mathematical problem solving.



## Practical ideas:

### Resources for outdoors

- Natural materials such as gravel, pebbles, sticks, logs, leaves, pine cones, acorns, flowers, grass
- Crates, tyres, ropes, planks, carpet tubes, drain pipes, large pieces of fabric for large construction play
- Pulleys
- Balance scales
- Tape measure, metre ruler, measuring wheel
- Scoops, tongs, large pans and bowls, colanders and sieves, plant pots
- 'Tuff spot' builder's tray
- Large wooden numbers
- Large dice with spots and numerals
- Recording equipment such as clipboards, marker pens, chunky chalk, large pieces of paper, camera

### Find out more - Useful Websites

'Numbers and patterns: laying foundations in mathematics' has an Enabling Environment section containing 12 cards, each designed to illustrate potential opportunities for enhancing provision for mathematical development through the use of everyday contexts and resources. See: [www.foundationyears.org.uk/wp-content/uploads/2011/10/Numbers\\_and\\_Patterns.pdf](http://www.foundationyears.org.uk/wp-content/uploads/2011/10/Numbers_and_Patterns.pdf)

For more information on 'Loose Parts Play' see [www.playscotland.org/parents-families/loose-parts-play/](http://www.playscotland.org/parents-families/loose-parts-play/)

'Open Up to Outdoor Mathematics!' a freely downloadable booklet from 'Learning Through Landscapes' [www.ltl.org.uk/publications/](http://www.ltl.org.uk/publications/) This booklet contains a wealth of practical ideas and information about ways to support children's mathematical skills through good use of natural and manmade materials in the outdoor environment.

The 'Teach Early Years' website has a useful article by Judith Dancer which suggests some creative ways to get children using their mathematical skills outdoors. See: [www.teachearlyyears.com/learning-and-development/view/taking-maths-outdoors](http://www.teachearlyyears.com/learning-and-development/view/taking-maths-outdoors)

For information on creating a mathematical environment see: [www.philippahinesconsultancy.co.uk/creating-a-mathematical-environment/](http://www.philippahinesconsultancy.co.uk/creating-a-mathematical-environment/)

For more information about Forest Schools including details of case studies from nurseries who successfully use this approach see: [www.nurseryworld.co.uk/features/article/eyfs-best-practice-all-about-forest-schools](http://www.nurseryworld.co.uk/features/article/eyfs-best-practice-all-about-forest-schools)

## The Role of the Adult

**Positive relationships** - Children learn to be strong and independent through positive relationships. It is vital that practitioners support children's emotional security and enable mathematical risk taking and resilience.

**Practitioners' Attitudes** - The attitude of practitioners towards mathematics has a significant impact on children's learning. We need to show them that maths is important and fun and that everyone can be successful mathematicians. We can influence children's enthusiasm for mathematics by following their interests and planning activities which are relevant and interesting.

### Opportunities for reflection

#### Creating a culture of mathematical enquiry

It is important to create a culture of mathematical enquiry where mathematics is woven throughout the day. Problem solving is at the heart of mathematics and needs to be linked to children's own enquiries that arise out of their interests and everyday happenings. It is important to ensure a balance between direct teaching and supporting children's own ideas and enquiries within continuous provision.

- The adults need to rigorously identify and promote mathematical opportunities outdoors and indoors, exploiting real and everyday situations.
- Practitioners should enter into the children's self-chosen play and identify and maximise opportunities for mathematical teaching and learning 'in the moment'.
- They should model mathematical concepts and vocabulary in a fun, interesting and stimulating way.
- They should exploit opportunities to find out what the children already know and understand through the use of sensitive questioning and commenting.
- It is important to spot errors in children's mathematical understanding and see these as teaching opportunities. It is important that children begin to understand that we all make mistakes but that these can often help us with our learning. Adults should deliberately make mistakes themselves through the use of a puppet and encourage children to identify and correct them. Adults should also engage children in situations where neither the child nor the adult knows the outcome. This is a good opportunity to model thinking aloud and posing 'I wonder ..' type questions.
- Practitioners should identify next steps to children's learning and teach within children's self-chosen activities as well as plan future activities and provision to support children's individual next steps.
- They should also provide opportunities for children to consolidate and move forward in their learning.

### Mathematical Conversations

Mathematical conversations, with adults listening and responding to children's ideas are key to children's mathematical learning. 'Talking mathematics' clarifies and refines children's thinking and is crucial to the development of their strategies in tackling and solving mathematical problems. Children need to learn how to talk about their ideas, explain their strategies and decisions. A vital role of the adult is therefore to develop children's use of language alongside teaching mathematical concepts. Practitioners need to maximise opportunities for dialogue among children and between children and adults. Children will be most stimulated to talk about mathematics when they are interested and engaged in the materials and context.

#### Practical ideas:

##### Language

- **Talking to children as you play alongside them:** Use appropriate language as you 'think aloud' when interacting with children. Use a running commentary of what is happening and what you are doing. As you talk, explain your thinking and reasoning.
- **Modelling:** Children need adults to model mathematical ideas and language so that they can rehearse and use it for themselves. Modelling is a useful way of correcting mistakes rather than telling children they are wrong.
- **Questioning:** Use a range of questions, focusing predominantly on open-ended questioning, prompting, probing and promoting. Excessive use of closed questions can narrow and limit learning. It can also deter children who are worried about giving the 'wrong' answer

- Prompting questions help children engage with and use language e.g. 'This shape is a square. Can you pick another shape and tell me if it has a square face or not?'
- Probing questions are intended to test a child's understanding and learning e.g. 'How did you decide there are fewer animals in this field than that field?'
- Promoting questions are aimed at expanding children's thinking e.g. 'This shoe belonged to a giant. How can we decide how big his foot was?'
- **Sustained shared thinking:** This is an in-depth conversation between adult and child where they both share ideas and thoughts and come to conclusions together. Children learn to be more curious and find their own solutions whilst the adult learns more about the child's understanding and knowledge.
- **Recasting or remodelling:** Here adults re-phrase children's words when they make errors. This helps children develop an improved understanding of mathematical concepts and language. For example if a child says 'Six comes behind seven' the adult could say 'Yes that right, six comes before seven'.
- **Repetition:** It is important to reinforce and confirm children's own attempts at explaining their thinking. By repeating and adding to a child's words you will be scaffolding their language development and consolidating and adding to their knowledge.
- **Time:** Children need time to think, reflect and process language. When asking questions give them time to respond and, if necessary, repeat the question in exactly the same way.
- **Introducing vocabulary:** Plan the introduction of new words, using visual images and tactile resources so that children can see what the mathematical language means in a variety of contexts. Children need to encounter and use the new words frequently in order to embed their understanding and use of them.

### Find out more

This material from New Zealand is intended to support practitioners to use opportunities that arise in everyday interactions with children to foster the development of mathematical thinking:

[nzmaths.co.nz/supporting-rich-mathematical-interactions-ece](http://nzmaths.co.nz/supporting-rich-mathematical-interactions-ece)



## Section 5: Using manipulatives and representations to develop understanding

### Using manipulatives

Manipulatives are items that you can handle and move. These range from everyday objects such as buttons and shells, to resources designed specifically for teaching arithmetic, such as tens and units sticks or coloured number rods.

Rearranging objects helps children to try out new ideas. They can use a range of strategies alongside each other, including using manipulatives, talking, drawing and writing, and gradually moving towards a confident use of more abstract ways of working.

Manipulatives work because they:

- Help children make sense of arithmetic.
- Help teachers see what children understand.
- Increase children's engagement and enjoyment.
- Develop visual images and understanding.
- Help children to work together and share ideas.
- Are tools to help children solve problems; investigate patterns and relationships; demonstrate and explain results and reasoning.
- Provide a bridge to abstract thinking.

There are several things that can make children's use of manipulatives more effective. These include careful matching of both manipulatives and activities to the mathematical focus, and thinking about children's prerequisite knowledge.

#### Find out more:

##### **Using manipulatives in the foundations of arithmetic - Rose Griffiths, Jenni Back and Sue Gifford**

A short booklet that illustrate approaches to exploring numbers in a creative way

[www.nuffieldfoundation.org/sites/default/files/files/Examples%20for%20teachersNuffield\(2\).pdf](http://www.nuffieldfoundation.org/sites/default/files/files/Examples%20for%20teachersNuffield(2).pdf)

Oxford University Press' free website for teachers, Oxford Owl, hosts four short Making Numbers films giving further advice for teachers and four lively animations for use in the classroom with children: Five Friends Counting, Ten Fishes in the Sea, Half a Hundred Hedgehogs, and Ten Tens and a Dragon

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

### Mathematical models and images: Number Lines

Number lines are an essential starting point for children in developing their understanding of the ordinal and cardinal value of number. These help children to see how mathematics works and provide opportunities to explore and investigate the number system. It is really important to always have interactive number line activities as part of the enabling environment, both indoors and outdoors.

Children should not only see the numerals but also have opportunities to interact with them, touching, moving and playing with them as they practice the skills of number recognition, ordering and counting. It is also important to provide opportunities to link groups of objects to numerals through the use of number lines. In addition to numbered cards or objects to put in order, there should be numbered boxes, bags, socks, flower pots etc. into which children can place the corresponding number of objects to match the numeral. Use objects based on children's interests or on current themes in order to motivate involvement. Provide empty number lines so the children can be encouraged to start at different places and also challenge the children to make their own number lines.



In addition, exploit the use of number labels in areas of provision, both indoors and outdoors e.g. numbering the painting apron hooks and the bike parking spaces etc.

**For more information and practical examples of how to develop and use mathematical washing lines – see Appendix 2.**

## Children's Mathematical Mark Making

*'Children's mathematical graphics begin in play and support their developing understanding of the standard abstract written symbolism of mathematics'* (Carruthers and Worthington, 2007)

It is important that young children are encouraged to represent their mathematical thinking through drawing and mark making. This enables them to process and communicate their emerging mathematical findings for themselves. It is also an important developmental stage as children move towards more formal mathematical recording.

Practitioners need to understand that children's mathematical mark making often arises spontaneously through a need to communicate in a meaningful context. Through their marks, children's thinking becomes visible and practitioners can gain valuable insights into children's developing understanding of complex concepts. When children are asked to record, after they may have finished a practical mathematical activity, motivation and meaning are often lost. Children's mathematical mark making is most beneficial when it

is an integral part of a child's activity as it is their own personal response as they try to make meaning of their thoughts. When children are encouraged to represent their mathematical thinking as they go along, in contexts that are meaningful to them, they are able to use higher level thinking skills.

## Opportunities for reflection

### Considerations for practitioners in supporting mathematical graphics

- How does the environment support children's mathematical graphics? Are there a good range of appropriate resources, available in all areas, to enable children's written recordings?
- Do practitioners plan opportunities to ensure that mark making takes place outdoors as well as indoors?
- To what extent do adults understand and value children's marks? Is there an understanding that children's graphics can often become a starting point for shared mathematical talk?
- Do adults support children's learning by modelling mathematical graphics in simple ways? Remember it is important not to introduce children to formal mathematical notation, when they are not developmentally ready for this.
- Is there an awareness of the difficulty of 'over-correcting' for fear of giving the impression that 'teacher's method is better'?
- How are children's mathematical marks used to inform the next steps for learning?

## Practical ideas:

### Experiences to support mathematical mark making

- Registers – self-registration
- Voting systems – using pictures or tallying to record the most popular choice
- Snack time – recording numbers of children, plates and cups, ways of cutting up and sharing fruit and other food
- Domestic role play - diaries and calendars, telephone books, shopping lists
- Themed role play – booking in forms, tickets, menus, order forms, labelling resources e.g. price labels, till
- Outdoor garage area – filling in slips, petrol receipts, bills
- Baking / Dough area – writing recipes, providing scales, timers and clocks to take and record measurements
- Sensory trays – making marks in wet sand, shaving foam, mud etc.
- Construction area – drawing plans and noting down measurements, writing lists of quantities of materials
- Small world area – drawing maps, signs, directions
- Outdoor physical play – making up games and keeping scores, measuring distances, making movement patterns with large wheeled toys
- Forest area – making collections of natural objects, exploring similarities and differences, measuring twigs and sticks, examining patterns on flowers and leaves



## Resources and equipment to support mathematical graphics

- Paper, including squared paper – assorted sizes, colours, textures and types
- Large rolls of paper
- Notepads, envelopes, stamps
- Sticky notes and labels
- Address books, diaries, registers, order forms
- Clipboards
- Cardboard – assorted sizes and thickness
- Mark making tools – pens, pencils, felt tips, marker pens, chalk
- Rulers
- Hole punchers
- Staplers
- Paints – range including poster paint, water colours, palettes
- Brushes – different sizes, rollers, sponges
- Fastening materials – sticky tape, glue, paper clips, treasury tags, masking tape, string
- Range of natural materials – lolly sticks, feathers, twigs
- Examples of environmental mathematical print
- Number cards and number lines

### Find out more:

See article on 'Children's Mathematical Graphics: Understanding the Key Concept' [nrich.maths.org/6894](http://nrich.maths.org/6894)

To download 'Mark Making Matters' see: [https://www.foundationyears.org.uk/wp-content/uploads/2011/10/Mark\\_Marking\\_Matters.pdf](https://www.foundationyears.org.uk/wp-content/uploads/2011/10/Mark_Marking_Matters.pdf)

'Number and patterns: laying foundations in mathematics' has a section on children's mathematical mark making. See: [www.foundationyears.org.uk/wp-content/uploads/2011/10/Numbers\\_and\\_Patterns.pdf](http://www.foundationyears.org.uk/wp-content/uploads/2011/10/Numbers_and_Patterns.pdf)



## Section 6: Ensuring that teaching builds on what children already know

*'Assessment plays an important part in helping parents, carers and practitioners to recognise children's progress, understand their needs, and to plan activities and support. Ongoing assessment (also known as formative assessment) is an integral part of the learning and development process. It involves practitioners knowing children's level of achievement and interests, and then shaping teaching and learning experiences for each child reflecting that knowledge. In their interactions with children, practitioners should respond to their own day-to-day observations about children's progress and observations that parents and carers share.'* (The Statutory Framework for the Early Years Foundation Stage (2021) 2.1)

The EYFS Framework (2021) highlights the importance of assessing what children understand, know and can do in a variety of contexts. This assessment process is best done through observation and discussion. Practitioners can only see the true depth of children's mathematical enquiries and learning through close observation. This is especially true where the attainment demonstrated is not dependent on adult support. Sustained shared thinking is a positive means of assessing children and by listening carefully to their responses and considering the right questions to ask, it helps to reveal children's understanding.

Information gained through observing children and talking to them, should be used to inform next steps for teaching. This needs to build on what children already know and can do. Practitioners should consider developmental progression, using tools such as the revised Development Matters (2020) and Birth to 5 Matters (2021) as these will be useful in informing decisions about what children should learn next.

The focus should be on supporting children to develop a deep rather than a superficial understanding of mathematical concepts. Because of this, it is important to provide children with lots of opportunities to practise and consolidate their learning in different contexts.

### Opportunities for reflection

#### Remember

- The starting point for assessment is the child, not a list of skills against which a child is marked.
- Judgements about children's learning and development must be based on skills, knowledge, understanding and behaviour that are demonstrated consistently and independently. Assessments are not reliable or accurate if they are based on one-off activities.
- Assessment should not entail prolonged breaks from interaction with children, nor require excessive paperwork.
- Practitioners should use their knowledge of typical mathematical progression to help them assess whether an individual child is at the expected level of development.
- Assessment supports practitioners in planning 'what next' for children's mathematical development.

### Find out more

#### Birth To 5 Matters – Guidance by the sector, for the sector

Learning and Development - Observation, assessment and planning:

- Formative assessment is an integral part of teaching young children
- Summative assessment involves stepping back to gain an overview of children's development and progress

### How children learn: The Characteristics of Effective Learning

The characteristics of effective teaching and learning and the prime and specific areas of learning and development are all interconnected. The ways in which the child engages with other people and their environment – playing and exploring, active learning, and creating and thinking critically – underpin learning and development across all areas and support the child to remain an effective and motivated learner. The unique child reaches out to relate to people and things through the characteristics of effective teaching and learning.

The characteristics of effective teaching and learning, particularly creating and thinking critically, are intrinsically linked to children's mathematical learning. Thinking of mathematical mastery as a process forming part of a child's 'learning journey' then, **playing and exploring** is children's research, as they engage in child-led play; which through their **active learning** engages brain and body in deep and meaningful ways; which will lead to **creating and thinking critically**, where they come to truly understand and master concepts, skills and knowledge in meaningful ways.

The ability to think critically and problem solve is inherently what children need to become successful mathematicians. Using trial and error, experimenting, repeating and practising are all life-long learning skills and the more of this approach that children do whilst they are young, the better their long term educational outcomes. It is important to provide lots of open-ended opportunities for problem solving within a rich, enabling environment and practitioners should look for children using these thinking and problem solving skills as they carry out their close observations.

### Find out more

Information about how adults and your environment can support a child's developing characteristics of effective teaching and learning can be found here:

**Birth To 5 Matters – Guidance by the sector, for the sector  
Development Matters - GOV.UK ([www.gov.uk](http://www.gov.uk))**

### Exploiting the characteristics of effective learning

Children have the **skill** in playing and exploring, the **will** and the **thrill** of doing and thinking – recognising their own power as learners. It is the **thrill** that gives them the **will** to want to engage. What early years practitioners need to do is, together with parents, exploit the characteristics of effective learning in order to fully develop children's mathematical **skills**.

Characteristics of Effective Teaching and Learning	Prompts for discussions with parents	
<p><b>Playing and Exploring – engagement / the skill to get engaged</b></p> <p>Children seek out and engage in first-hand and imaginative experiences, gathering the material to feed their learning and being prepared to take a risk in new experiences – they are ready to learn.</p>	<p><b>Finding out and exploring</b></p> <ul style="list-style-type: none"> <li>Showing curiosity about everything around them and using their senses to explore</li> <li>Showing particular interests</li> </ul>	<p>How does your child explore? Do they use their senses to explore and investigate – sight, sound, smell, taste and/or touch?</p> <p>Does she/he have particular mathematical play interests, e.g. exploring capacity by emptying and filling containers?</p>
	<p><b>Playing with what they know</b></p> <ul style="list-style-type: none"> <li>Pretending and representing their day to day experiences in their play</li> <li>Role play</li> </ul>	<p>Is your child getting involved in pretend play and role play? Do they use open-ended resources? Do you hear your child using number and quantity words during play?</p>
	<p><b>Being willing to ‘have a go’</b></p> <ul style="list-style-type: none"> <li>Being prepared to try things out, taking a risk, engaging in new experiences, and learning by trial and error</li> <li>Initiating new activities</li> </ul>	<p>In what situations is your child confident to try something out which may involve challenging her/himself, e.g. counting on or back from different start numbers?</p>
<p><b>Active Learning – motivation / the will to keep going</b></p> <p>Children invest concentration and energy in following their interests, seek the satisfaction of meeting their goals and show perseverance in the face of difficulty – they are willing to learn.</p>	<p><b>Being involved and concentrating</b></p> <ul style="list-style-type: none"> <li>Maintaining focus on their own chosen activity for a period of time</li> <li>Showing high levels of fascination</li> <li>Not easily distracted</li> </ul>	<p>In what kind of activities do you find your child concentrating in this way, e.g. would they persist in dividing and recombining groups of objects, describing the total number and understanding the number stays the same when a group is rearranged?</p>
	<p><b>Keeping on trying</b></p> <ul style="list-style-type: none"> <li>Persisting with their chosen activity when challenges occur</li> <li>Showing a belief that more effort or a different approach will pay off</li> <li>Bouncing back after difficulties</li> </ul>	<p>In what situations do you see your child persisting through challenges in an activity she/he has chosen to do?</p> <p>Does your child use their knowledge of patterns in number to explore and experiment with larger numbers and number patterns?</p>
	<p><b>Enjoying achieving what they set out to do</b></p> <ul style="list-style-type: none"> <li>Being proud of how they accomplished something – not just the end result</li> <li>Enjoying meeting challenges for their own sake rather than external rewards or praise</li> </ul>	<p>Does your child show satisfaction at the challenge of meeting her/his own goals (rather than because they were rewarded or given praise)?</p> <p>Does your child show enjoyment of and interest in playing with numbers and patterns through music, movement, songs, etc.?</p>

Characteristics of Effective Teaching and Learning		Prompts for discussions with parents
<p><b>Creating and thinking critically – thinking / the thrill of discovery</b></p> <p>Children have their own ideas of how to do things, they make sense of their experiences by linking ideas, and they choose how to do things including about their goals and strategies and monitoring their success – they are able to learn.</p>	<p><b>Having their own ideas</b></p> <ul style="list-style-type: none"> <li>• Having their own ideas and finding their own ways to solve problems</li> <li>• Finding new ways to do things</li> </ul>	<p>Do they record their thinking? Can they explain their thinking, e.g. their recordings?</p>
	<p><b>Making links</b></p> <ul style="list-style-type: none"> <li>• Making links between what they already know and new things they are finding out</li> <li>• Making predictions and testing out their ideas</li> </ul>	<p>Does your child make connections, e.g. do they sort, match and compare quantities in their play?</p> <p>Do they refer to numbers that are meaningful to them and interpret numbers in different contexts?</p>
	<p><b>Working with ideas</b></p> <ul style="list-style-type: none"> <li>• Making decisions about how to approach a task or solve a problem</li> <li>• Changing strategy as needed and reviewing how well the approach worked</li> </ul>	<p>Does your child use mathematical skills and ideas during play and when solving simple problems, e.g. do they count to find out 'how many' there are? Do they demonstrate understanding of one-to-one correspondence, e.g. matching cups and saucers?</p>



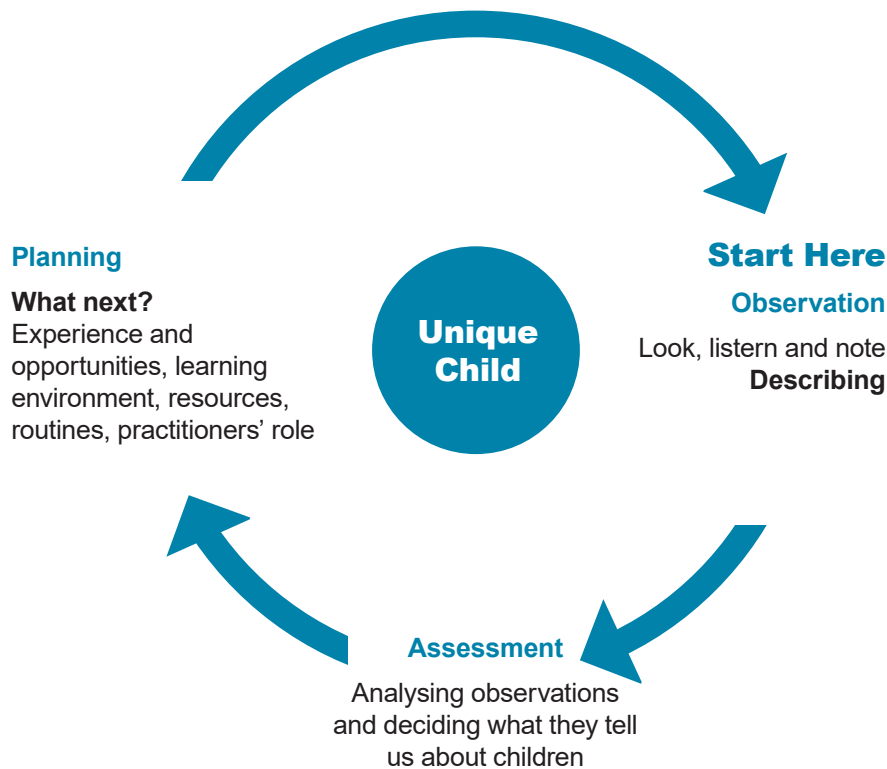
# Section 7: Using high quality targeted support to help all children learn mathematics

Accurate observations enable practitioners to assess children’s levels of attainment. It is vital that practitioners are knowledgeable about children’s typical stages of mathematical development so that they can plan high quality targeted support to help all children learn mathematics.

See Appendix 3: Curriculum mapping – ELGs 2021 and National Curriculum 2014 (Key Stage 1)

## Planning (what next?)

All planning starts with observing children in order to understand and consider their current interests, stage of development and next steps in learning.



When thinking about learning and development opportunities for children it is important to base decision making and planning on the EYFS curriculum. Planning should also be based on the needs and interests of the children.

The statutory framework for the EYFS (2021) does not prescribe a particular teaching approach (1.14). In planning and guiding what children learn, practitioners must reflect on the different rates at which children are developing and adjust their practice accordingly (1.15).

You may find it helpful to consider Ofsted’s school guidance when evaluating the teaching of early years education (2021):

*“Teaching should not be taken to imply a ‘top down’ or formal way of working. It is a broad term that covers the many different ways in which adults help young children learn. It includes: their interactions with children during planned and child-initiated play and activities, communicating and modelling language, showing, explaining, demonstrating, exploring ideas, encouraging, questioning, recalling, providing a narrative for what they are doing, facilitating and setting challenges. It takes account of the equipment that adults provide and the attention given to the physical environment, as well as the structure and routines of the day that establish*

*expectations. Integral to teaching is how practitioners assess what children know, understand and can do, as well as taking account of their interests and dispositions to learn (characteristics of effective teaching and learning), and how practitioners use this information to plan children's next steps in learning and to monitor their progress."*

Remember, children learn from everyone and everything around them, even the things you haven't specifically planned for!

## Opportunities for reflection

### Planning targeted interventions

The key principles to consider when planning effective high quality targeted support are:

- Small-group support is more likely to be effective when children with the greatest needs are supported by the most experienced staff.
- Training, support and resources are provided for staff using targeted activities.
- Sessions are brief and regular and explicit connections are made between targeted support and everyday activities or teaching.
- Using an approach or programme that is evidence-based and has been independently evaluated is a good starting point.

### Find out more: Useful websites to support planning

**White Rose Maths** has produced free guidance for early years with a 'Reception Scheme of Learning'. This includes information on the counting principles, key language, useful websites and free interactive whiteboard resources.

[whiterosemaths.com/resources/schemes-of-learning/reception-sol/](http://whiterosemaths.com/resources/schemes-of-learning/reception-sol/)

The **BBC Cbeebies** website provides access to all the Numberblocks programmes. There are also lots of games and songs which can be played at home or in a setting. Useful videos and information support parents.

[www.bbc.co.uk/cbeebies/shows/numberblocks](http://www.bbc.co.uk/cbeebies/shows/numberblocks)

**Learning & Teaching with Learning Trajectories** is a web-based tool for early childhood educators to learn about how children think and learn about mathematics and how to teach mathematics to young children (birth to age 8). The website provides teachers with access to information about Learning Trajectories for maths. Teachers can also review short video clips of children's thinking along the maths Learning Trajectories. Users can access hundreds of classroom activity ideas to support children's development along the maths trajectories.

[www.learningtrajectories.org/](http://www.learningtrajectories.org/)

## Section 8: Supporting home learning

### Home Learning in mathematics

Parents are the first and most important influence on their child's development and future outcomes. The interactions that take place in the home environment have the most influence on a child's future achievement, above innate ability, parental education, family income and the quality of the child's early years setting. Research has shown that if young children get the right learning experiences at home they are likely to do better at school.

Early years settings should develop effective partnerships with parents so that they can offer appropriate support to help enhance the learning and development of children at home. This means all staff being aware of the importance of working with parents and providing the practical support they need. This may include allocating time to talk to parents on an individual basis, sharing resources, organising 'stay and play' activities and holding group learning sessions. One way to do this is to take a family learning approach where parents work in a group, together with a practitioner on an area, such as early mathematics. They explore current thinking about how children become mathematical thinkers and doers from birth onwards, they discuss how the setting supports children's mathematical development and what the parents do, or could do, at home. Together practitioners and parents carry out activities with the children, both in the setting and at home and come back again at a later date to share their findings.

A good way to extend children's learning is to have resources that can be shared at home. These may include games, jigsaws, story books and other resources which can be used for mathematical exploration and problem solving. It is also important to promote to parents the idea of exploiting everyday opportunities for mathematical learning through simple routines and activities at home. There are a wealth of websites which aim to support parents with children's learning at home and it is important that settings signpost parents to high quality information which promotes early mathematical learning through play and through real life experiences.

**See Appendix 4 for a set of useful home learning maths challenges which can be shared with families.**

#### Find out more: Useful websites to support home learning in mathematics

'Making maths real – Working with parents to support children's early mathematical development. This is a report for practitioners about the NCB Early Childhood Unit's (ECU) project '**Making Maths Real**' which provides ideas about how to support home learning in mathematics. [www.ncb.org.uk/sites/default/files/field/attachment/NO20%20-%20ncb\\_making\\_maths\\_real\\_august\\_2014.pdf](http://www.ncb.org.uk/sites/default/files/field/attachment/NO20%20-%20ncb_making_maths_real_august_2014.pdf)

**National Numeracy** is an organisation providing news, research and resources all about mathematics. They have created the National Numeracy Family Maths Toolkit to help families with children aged 4 and above to enjoy learning maths together. There is also a free online tool to help parents improve their own maths. See: [www.nationalnumeracy.org.uk/your-childs-maths](http://www.nationalnumeracy.org.uk/your-childs-maths)

The **BBC's CBeebies** website has lots of information for parents on supporting children's early mathematical development. This includes a handy guide for parents, with mini-videos explaining how children's maths skills develop and suggestions for fun activities parents can do with their children. There are also lots of interactive games for children to play and videos and songs to support early counting, sorting, shape recognition and problem solving. See: [www.bbc.co.uk/cbeebies/grownups/help-your-child-with-maths](http://www.bbc.co.uk/cbeebies/grownups/help-your-child-with-maths).

'**Count with me**' booklets have been produced by Surrey County Council. There are individual booklets for different ages of children from birth to 4+ which contain practical ideas and tips for parents in supporting their child's early numeracy skills See [www.surreycc.gov.uk/people-and-community/families/publications/count-with-me-maths-tips-for-parents](http://www.surreycc.gov.uk/people-and-community/families/publications/count-with-me-maths-tips-for-parents)



Early Education have produced a booklet for parents to help support children's mathematical development. **'Maths is everywhere'** can be found at: [www.early-education.org.uk/sites/default/files/Maths%20is%20Everywhere.pdf](http://www.early-education.org.uk/sites/default/files/Maths%20is%20Everywhere.pdf)

**'Time Together at Home'** is an online resource for parents. Divided into 3 age groups from birth to 5, it contains ideas of activities to support children's learning and development at home. The 'Play' section has a range of fun activities to help develop early mathematical skills. [www.cumbria.gov.uk/childrensservices/childrenandfamilies/cfis/homelearning/homelearningandtimetogetherhomepage/homelearningandtimetogetherhomepage.asp](http://www.cumbria.gov.uk/childrensservices/childrenandfamilies/cfis/homelearning/homelearningandtimetogetherhomepage/homelearningandtimetogetherhomepage.asp)

**Pacey** produce parental magazines, 'Building Bright Futures' which provide professional early learning and development advice for families. The issue below has an article called 'Early Years Maths Made Easy' <https://cloud.3dissue.com/176015/176404/205852/BuildingBrightFuturesWinterSpring2020/index.html>

**'Every day's a learning day'** is a booklet for parents to support their child's learning in the early years through everyday activities. Included in this booklet is a section on early numeracy. <https://education.gov.scot/parentzone/Documents/EveryDaysaLearningDay3to6.pdf>

**Oxford Owl** have produced parental information aimed at helping parents overcome any of their own anxieties about mathematics: <https://home.oxfordowl.co.uk/blog/overcoming-maths-anxiety-and-being-positive-about-numbers/>

**More to Maths than counting** is a guide for parents to support their child's mathematical development and thinking at home [www.towerhamlets.gov.uk/Documents/Children-and-families-services/Early-Years/More\\_to\\_Maths\\_the\\_counting\\_booklet.pdf](http://www.towerhamlets.gov.uk/Documents/Children-and-families-services/Early-Years/More_to_Maths_the_counting_booklet.pdf)

### Further reading to support practitioners with home learning

#### Early Home Learning Matters: A good practice guide – Kim Roberts

This book brings together key messages from research, practice and parents themselves to provide a practical guide that will help with understanding the evidence about brain development and the vital role of parents, both fathers and mothers; plan services to support early learning and development at home; reach and include vulnerable families; and enable parents to gain the understanding, skills and confidence they need to help their children flourish.



## Section 9: Additional web links and further reading

### Additional web links

#### **Closing the attainment gap in maths: a study of good practice in early years and primary settings – Fair Education Alliance**

Available to download from:

[mathsreports.files.wordpress.com/2013/01/c716b-feanumeracyreport\\_fv.pdf#:~:text=Closing%20the%20numeracy%20attainment%20gap%20is%20an%20ambitious,their%20own%20primary%20school%20or%20early%20years%20setting.](https://mathsreports.files.wordpress.com/2013/01/c716b-feanumeracyreport_fv.pdf#:~:text=Closing%20the%20numeracy%20attainment%20gap%20is%20an%20ambitious,their%20own%20primary%20school%20or%20early%20years%20setting.)

#### **Children thinking mathematically: PSRN essential knowledge for EY practitioners – DCSF**

Available to download from:

[www.childrens-mathematics.net/childrenthinkingmathematically\\_psrn.pdf](http://www.childrens-mathematics.net/childrenthinkingmathematically_psrn.pdf)

The Erikson Institute **Early Math Collaborative** is striving to transform the understanding, teaching and learning of early mathematics [earlymath.erikson.edu/](http://earlymath.erikson.edu/)

#### **Foundation Years: Mathematics in the early years – Top ten lists of mathematical resources for children up to the age of 5**

- Websites and online resources
- Picture books for maths
- Number and counting books
- Number rhymes
- Authentic resources
- Collections
- General resources
- Games
- Ideas for babies and toddlers
- Professional resources and books

Available to download from:

[www.foundationyears.org.uk/mathematical-resources/](http://www.foundationyears.org.uk/mathematical-resources/)

(This document can also be accessed via NRICH [nrich.maths.org/early-years-old](http://nrich.maths.org/early-years-old))

**NCETM** for early years aims to help practitioners to have a clear understanding of how children build early number sense, and to provide tips on how best to support children's learning. <https://nrich.maths.org/10737>

**NRICH** early years' resources aim to further develop young children's natural problem solving abilities in the context of mathematics [nrich.maths.org/early-years](http://nrich.maths.org/early-years)

**Numberblocks** is a pre-school BBC television series aimed at introducing children to early number. It introduces children to the concepts of number to support early mathematical understanding [www.bbc.co.uk/cbeebies/shows/numberblocks?fbclid=IwAR3shsrgiWSSho1hhEkk2JQ6tVXuWAhv0mmcuumj7YpooKX8KG4sh07ZEfs](http://www.bbc.co.uk/cbeebies/shows/numberblocks?fbclid=IwAR3shsrgiWSSho1hhEkk2JQ6tVXuWAhv0mmcuumj7YpooKX8KG4sh07ZEfs)

#### **Numbers and patterns: Laying foundations in mathematics – DCSF**

Available to download from:

[www.foundationyears.org.uk/wp-content/uploads/2011/10/Numbers\\_and\\_Patterns.pdf](http://www.foundationyears.org.uk/wp-content/uploads/2011/10/Numbers_and_Patterns.pdf)

#### **Open Mathematics, open minds: Children's thinking and mathematics - Elizabeth Carruthers**

A very useful research article which highlights the importance of creating a culture of mathematical enquiry through children's play where problem-solving is at the heart of mathematics.

[www.communityplaythings.co.uk/learning-library/articles/open-mathematics-open-minds](http://www.communityplaythings.co.uk/learning-library/articles/open-mathematics-open-minds)

**REAM: An example of a project focused on Raising Early Achievement in Maths – Alison Marron and Donna Thorpe**

[www.real-online.group.shef.ac.uk/wordpress/wp-content/uploads/REAM.pdf](http://www.real-online.group.shef.ac.uk/wordpress/wp-content/uploads/REAM.pdf)

The **STEM** website includes links to mathematical materials for the early years  
[thestemlaboratory.com/preschool-stem-activities](http://thestemlaboratory.com/preschool-stem-activities)

### Further reading

Below are suggested books which early years' practitioners may find useful in supporting mathematical teaching and learning:

**A Place to Learn: Developing a stimulating learning environment – Lewisham Early Years Advice and Resource Network**

This book helps practitioners to explore their learning environment from a range of areas of learning including mathematics

**Big Ideas of Early Mathematics: What Teachers of Young Children Need to Know – The Early Math Collaborative Erikson Institute**

In this book, readers will explore and understand the Big Ideas that underlie early maths content and learn how to make these foundational ideas clear to young children. These ideas are developmental, building on children's own thinking to support understanding.

**Developing Young Children's Mathematical Learning Outdoors: Linking Pedagogy and Practice – Lynda Keith**

This book will help you to realise the mathematical learning happening in your provision all day and every day through the familiar resources and experiences routinely offered to your children. It will help you to think more reflectively about what you are providing for children and suggest ways of making provision richer and more exciting.

**Everyday Maths through Everyday Provision: Developing opportunities for mathematics in the early years – Elaine Bennett and Jenny Weidner**

This book will help you to realise the mathematical learning happening in your provision all day and every day through the familiar resources and experiences routinely offered to your children. It will help you to think more reflectively about what you are providing for children and suggest ways of making provision richer and more exciting.

**How Children Learn Mathematics: A guide for Parents and Teachers – Pamela Liebeck**

This book explores the stages children need to progress through to attain mathematical understanding and competence from infancy through the Primary school years.

**Making Numbers: A definitive guide to using manipulatives to teach arithmetic - Rose Griffiths, Jenni Back and Sue Gifford**

This book shares examples of good practice in the use of manipulatives to help children develop mastery of counting, place value and calculation.

**Messy Maths: A Playful, Outdoor Approach for Early Years – Juliet Robertson**

This book offers a rich resource of ideas that will inspire you to tap into the endless supply of patterns, textures, colours and quantities of the outdoors and deepen children's understanding of maths through hands-on experience. Juliet believes being outside makes maths real. In the classroom environment, maths can seem disconnected from everyday reality but real maths is really messy. Lots of outdoor play and engaging activity along the way is a must, as being outside enables connections to be made between the hands, heart and head, and lays the foundations for more complex work as children grow, develop and learn.

**More than numbers: Children developing mathematical thinking – Carole Skinner and Elaine Bennett**

The aim of this booklet is to provide information and support for everyone who has a responsibility for, or interest in young children learning maths. It recognises that children use play as a valuable tool to rehearse their mathematical skills. It also emphasises the crucial role that discussion has, as children share their learning with adults.

**Stories Can Be Counted On: Ideas for Developing Mathematics Through Story! – Neil Griffiths**

The aim of the book is to provide practitioners with ideas for developing mathematics using quality picture books and well-known rhymes. The book is intended for use with young children in early years' settings and at home.

**Supporting Mathematical Development in the Early Years – Linda Pound**

This book provides practical guidance about children's early mathematical development, focusing in particular on children's mathematical thinking.

**Looking Closely at Learning and Teaching ... a journey of development – Liz Marsden and Jenny Woodbridge with Mary Jane Drummond and Lesley Hill**

This book which provides a framework for reflective practice, focuses on a classroom enquiry project about children inventing, designing and playing their own mathematical games.

**Books for practical ideas and activities**

**A number of things: Practical and creative ideas for the development of number skills with children from four to seven – Kathie Barrs and Sue Logan**

This book contains many practical and creative ideas for the development of number skills with children from four to seven years – and display ideas to reinforce the learning experience.

**Baby and Beyond series, Progression in play for babies and children: Counting - Clare Beswick**

This book gives ideas for introducing and extending role play activities and experiences for babies and young children. Each page contains a range of experiences and a selection of ideas for each of the developmental stages of the EYFS.

**Maths Displays – Therese Finlay and Jacquie Finlay**

This book shows you how you can create interactive displays that promote learning across the early years for three- to five-year-olds.

The **Little Books** series are packed with advice and ideas for all those working with children in the early years. Some of the more mathematical titles you may wish to explore include:

- Bricks and boxes
- Colour, shape and number
- Counting
- Maths activities
- Maths from stories
- Maths songs and games
- Time and place

**What Learning Looks like: Mathematical Development – Caroline Jones**

This book looks at the first steps in developing the concepts of mathematical language, shapes and numeracy. It considers mathematics in relation to all other areas of learning and the importance of play. It explains how activities can be adapted for children at different stages of their development – covering from three years to rising six year olds.

# Appendix 1: Mathematical Routines in the Early Years

Daily routines are an important part of life within early years and provide a range of learning opportunities. They can provide real-life, meaningful and purposeful contexts to explore problem solving, number, calculation, shape, pattern, etc. By taking the time to tune in to how children operate at these key times of the day and carefully leading learning through modelling and open-ended questions, you can gain extensive information about where children are mathematically, whilst helping them to be aware of the maths that surrounds them.

## Self-registration

Children could self-register by adding their name to a number line making it easier to work out the number of children present.

Could be used to pose a simple question (using a mixture of pictures and/or words) for all the children to consider and answer with their self-registration card. The question can be changed daily and be linked to favourite programmes, books, characters, food or anything else staff (or the children) can think of. Have two laminated pieces of paper – one with 'yes' and a smiley face or tick, and one with 'no' and a sad face or cross. Ensure they are at child height and ask children to use their self-registration card to vote. Once everyone has arrived, the vote can be explored – How many people liked...? How many didn't? Which group had more?

Can the children estimate how many of their class are present? How can we check? What would happen if 2 children came in late? What would happen if 3 went to the dentist?

## Visual timetables

Don't change your visual timetable when the children have gone home! Take time with the children to talk about what happened yesterday, what is different today and what is going to happen tomorrow whilst changing the visuals. You can also explore what day it is and talk about the passing of time, as well as patterns over time.

## Lining up

Although young children should not spend a lot of time lining up, there are occasions where children are required to do this. Such spare minutes can be used to encourage mathematical learning:

- Ask the children to count themselves by counting out loud as you touch them on the head as you move down the line. When you get to the end of the line begin a backwards count, i.e. they simply have to repeat the same number. For older children this could be extended to counting in 2s, e.g. the first child whispers 1, the second shouts 2, the third whispers 3, the fourth shouts 4, etc.
- Can the children line up in twos (or threes) if space allows?
- Can you ask the children to organise themselves into small groups rather than lining up? When they are in groups, a group at a time can begin to move off when needed.
- Can the children make people patterns, e.g. a girl, boy, girl, boy pattern in the line?
- Can the children make an active pattern, e.g. clap, stamp, clap, stamp, etc. This could be extended to more complicated patterns of 3 or 4 repeating actions. Try stopping the pattern mid-flow – what will the next person do? What about the person after that?
- When the children are on the move from A to B, can you give them a simple task – counting doors travelled through, looking for the number 2, find a pattern, etc.

## Making a circle

When asking the children to come together in a circle there are many resources which could be used to support this, e.g. a rope on the ground outside, a circular carpet indoors, etc. Talk about who is in-between Tom and Jack, who is opposite Ava, etc.

## Tidy up time

- Do you have the right containers for your resources? Have you considered what items fit best into what containers?
- Could you review the way you sort and group your resources?
- Do you help your children to tidy up, i.e. are containers labelled so that children know where to return resources to and, where appropriate, how many? Do you have shadowing on shelving? Depending upon your room organisation, you could be helping the children to use real-life opportunities to use (and develop) their number recognition, counting skills, one to one correspondence, etc.
- Do you have wooden blocks that are meant to fit into a specific trolley or box? Do you see this as a real-life opportunity for children to explore shape and space? Challenge the children to fit all the blocks in the trolley or box. Can they devise a plan to follow in the future for others to successfully put the blocks back? A photo could be attached to the trolley/box of what success looks like.

## Getting dressed/undressed

- Talk about sequencing, matching and position.
- Questions to ask – ‘What are you going to put on first? Second? Third?’ (ordinal number language) and ‘Can you find the other sock/shoe/glove/wellie to match this one?’
- ‘One-to-one correspondence: one hat goes on one head.
- One-to-two correspondence: one pair of trousers/tights needs two legs.
- Can the children follow a list of pictorial instructions, e.g. when getting ready for a Forest School session? This could include both numerals and pictures illustrating the order and displayed for children to follow at change times. Children could create their own pictorial list for changing and sequencing these.

## The messy coat area

Do you see this as a practical data-handling challenge? Ask questions such as...

- How will you sort it – size, colour or some other way?
- How will you reorganise it? What could hats and gloves be kept in? What can we do if there are not enough pegs for everyone?

Remember to take before and after photos. If the new system works, well done! If it doesn't, what else can be done? Keep taking photos along the way.

## Choosing activities and exploring their favourites

- Do you have signs within your continuous provision areas indicating how many children can play in each area? This can work well where areas have been refreshed or enhanced and are therefore often popular. Do you involve the children in deciding the rules, i.e. how many children can comfortably play in an area at any one time?
- Again, in popular areas, can sand timers, cooking timers or alarm clocks be used to give children a real experience of time and/or feeling what 5, 10 or 15 minutes is like? Once children know how to set the timers they can then be responsible for setting and resetting as agreed.
- Can the children vote as to which was their favourite activity during a session? Place a container in each of your areas and ask the children to put their photo into the container of their favourite activity. Results could be discussed, counted and/or displayed as sets.

## Snack time

- Could the children help to prepare snack? This would allow for an opportunity to explore and discuss quantities, size, counting and measuring.
- When pouring their own drinks – have they poured enough? Too much? Not enough? How could the same be poured into each cup? How many cups can one jug fill before it is empty?
- When offering food items – can you explore food shapes? Can you make patterns with toppings on crackers?
- Make the children ‘pay’ for their snack with coins. As their money handling skills develop you could develop your pricing – a banana may cost two pence, milk five pence, five raisins cost one penny, etc.
- Do you encourage alternative solutions to problems to be solved, e.g. when laying a table, a child could either get plates one at a time (one-to-one correspondence), or they could count the chairs and the plates (counting and cardinality), or they could just make sure they have more plates than chairs and tell everyone to help themselves (estimation and number comparison)! Reviewing and discussing alternative solutions will support children learn about mathematics and problem solving.

## The weather

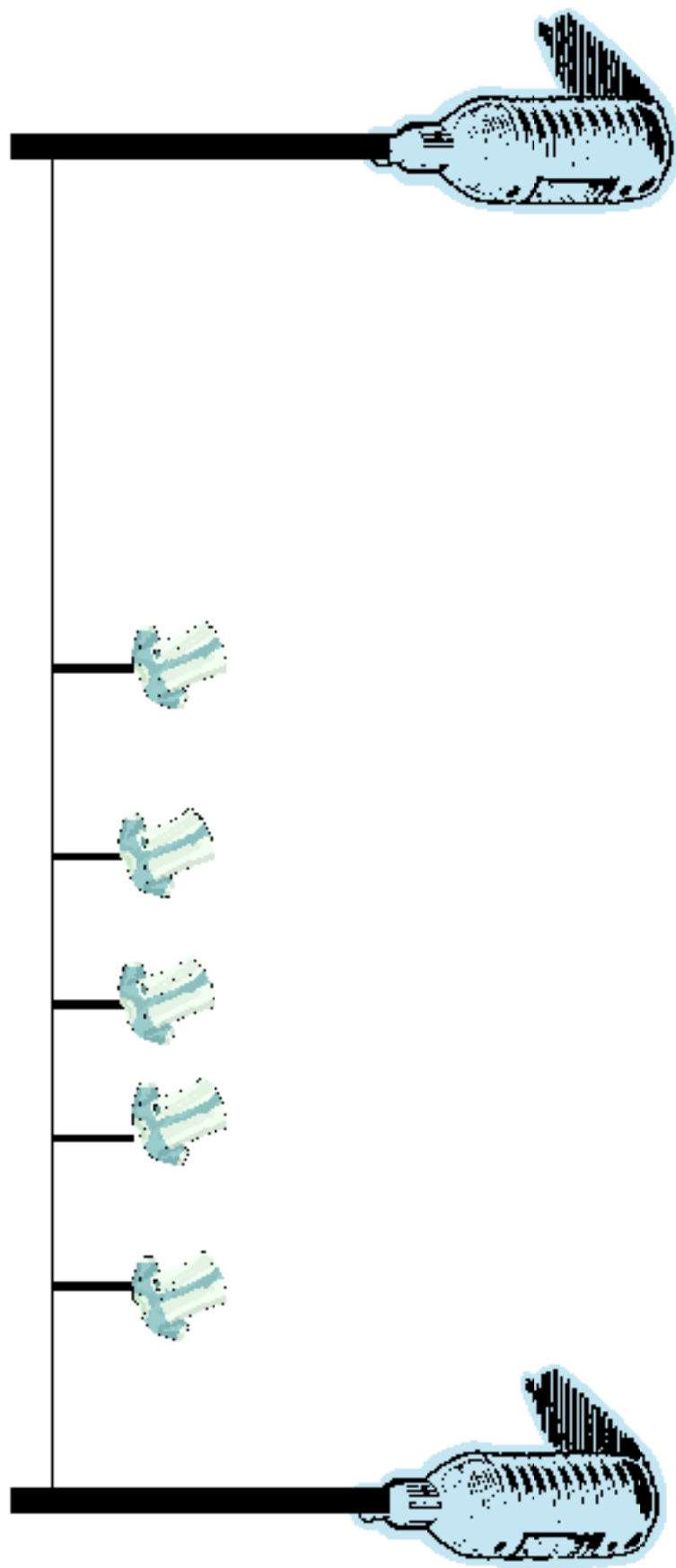
Rather than sitting inside talking about the weather can you create a weather station with simple rain gauges, wind vanes, etc. Can the children share/record this information for other children? A simple pictorial weather chart could begin with sun, rain, wind and clouds.

Adapted from:

Everyday maths through everyday provision (Bennett and Weider, 2012) Messy Maths: A Playful, Outdoor Approach for Early Years (Robertson, 2017)

NRICH - Mathematical Problem Solving in the Early Years: Developing Opportunities, Strategies and Confidence (Gifford, 2016)

## Appendix 2: Making a Washing Line



If you have not got fencing outside to suspend a washing line you may need to use an alternative idea. Fill large pop bottles with sand and pop a thick sturdy cane inside each bottle. Attach a cord from one cane to another.

Or

Fill a bucket with quick cement and stick a broom handle in it. This will provide a base and post for a line to be suspended from.

Or

If you are in a school and have access to a rounders post this will make a sturdy base.

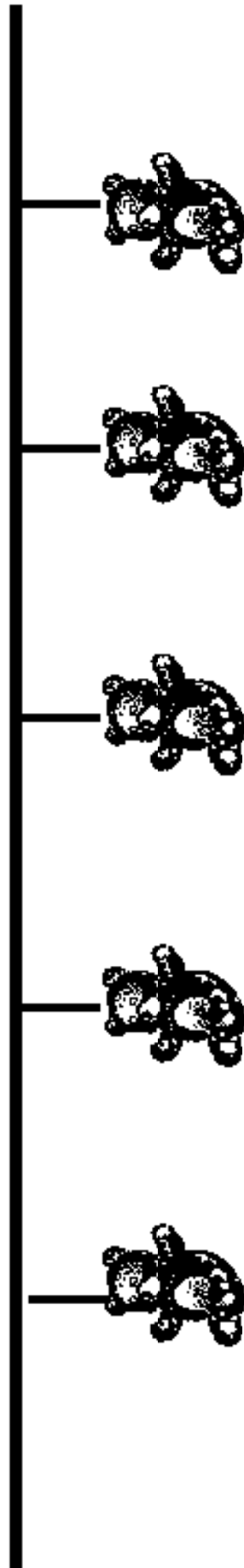


**Possible Resources**  
 shells, pebbles, old cds, pine cones, twigs, baubles, flags, soft toys, socks, scarves, gloves, toy soldiers, gift bags, dolls clothes, plant pots, key rings, old keys, hair bobbles, rollers—for hair, caps, t-shirts

The objects can be numbered or un-numbered dependent upon the stage of development of the child or the intended learning outcome.



## Washing Line Opportunities

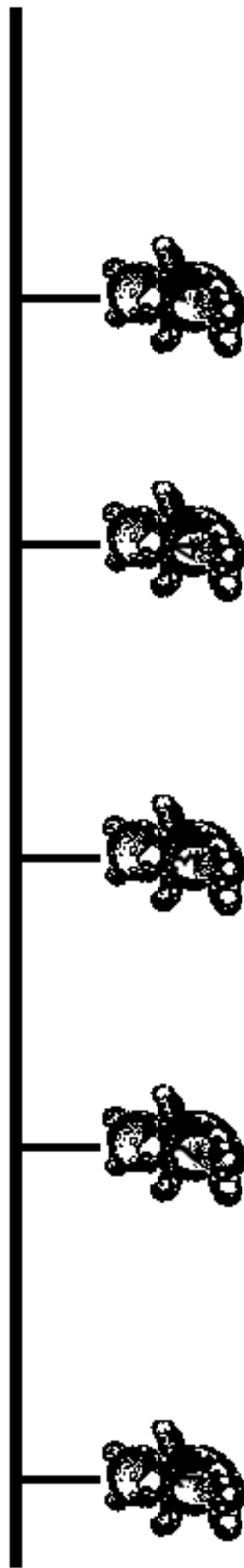


### Learning Opportunities

Provide opportunities for children to hang objects onto a line, the amount of objects made available to the children will vary dependent upon their stage of development.

1. Encourage the children to **count the objects pointing to them one at a time, (starting from left to right )** once they are on the line support them by modelling, listening and noting any errors and providing the correct sequence at the end.
2. **Count the objects as they are being put onto the line.** This requires the child to hold the last number in their head whilst attaching the next object.
3. Establish with the children how many objects are on the line, then **count backwards pointing to each object one at a time (start right to left).**
4. **Count backwards as the objects are being taken off the line.** This requires the child to hold the last number in their head as they are removing the next one.

## Washing Line Opportunities – numbered objects



### Learning Opportunities

Attach or mark the objects with numbers. With some objects it may be possible to attach numbers temporarily which provides flexibility as to how the resource may be used. The number of objects to be used will vary dependent upon the stage of development of the child.

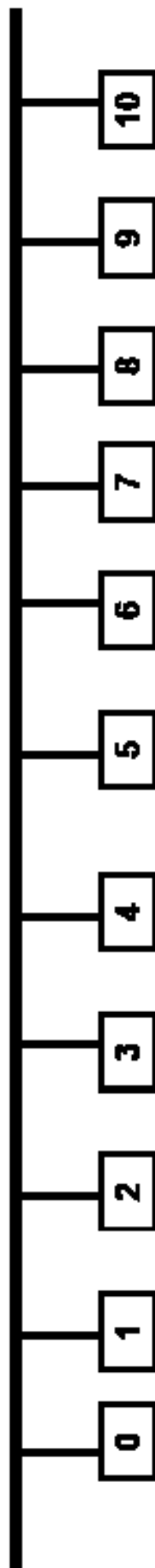
1. Children hang the objects up in the correct order. Adult can support and extend the learning by posing questions such as "What number comes after 2?", "What number comes before 4?", etc.
2. Child/children close their eyes and remove a number (adult or child), children to work out which number has been removed.
3. Adult or child mixes the numbered objects up and the child has to re-arrange the objects in the correct order.
4. Encourage the children to count forwards and backwards pointing/touching the objects one at a time.

## **Washing Line Opportunities– numbered objects**

### **Learning Opportunities– continued**

- 5. Place the set of numbered objects on the floor for the children to see. Place one number on the line and then ask them to find the number which comes before and/or after that number. This activity is challenging and is only appropriate when children are able to confidently recognise and order numbers . This activity needs to be built up gradually. Begin with numbers 1– 3, then 1-5, then 1-10 etc.**
- 6. Mix all the numbered objects up. An adult selects an object and puts it onto the line roughly where it should be i.e. from a selection of 10 objects, number 5 would be placed in the middle of the line. Children can take an object one at a time and place it where they think it will be. The adult can support the children by encouraging them to think about which number comes before and /or after.**

## Washing Line Opportunities– number cards



### Learning Opportunities

These can be handmade, commercially bought or downloaded off educational websites. Ensure 0 is included.

To support the use of this resource refer to the previous suggestions on pages 2 and 3.

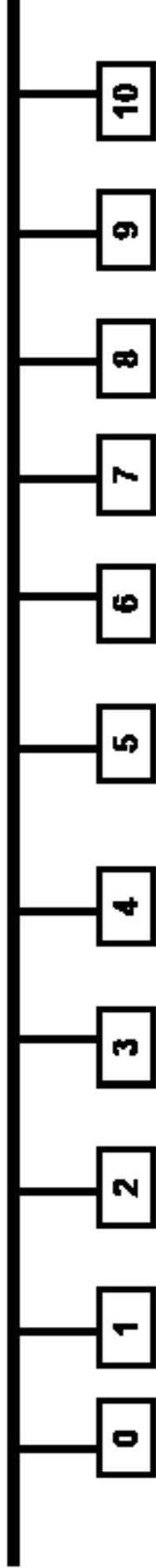
### Additional Suggestions-

1. Provide number cards which have dots, shapes etc. under the number or on the back of the card. These dots, shapes etc. could be textured i.e. made from felt, sandpaper etc. This will provide a multi-sensory learning opportunity.



2. Attach a plastic bag/pocket to the bottom of each card and provide objects for the children to post the right number of objects into.

## Washing Line Opportunities— counting in 2s



### Learning Opportunities

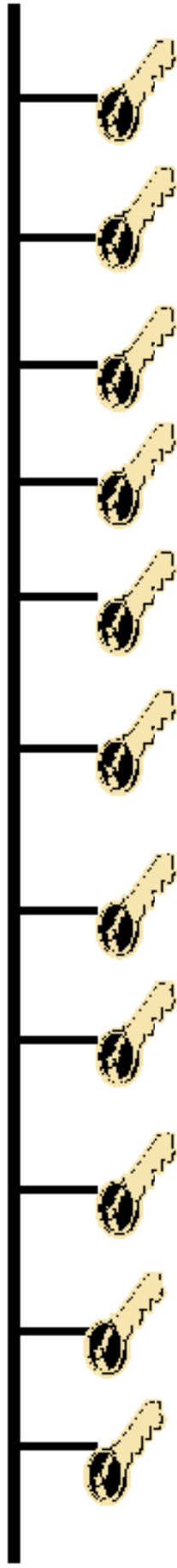
Using number cards as above jump along the line, starting at 0 in hops of two using a soft toy or puppet.



### Learning Opportunities

Encourage the children to group real objects into 2s and count along the line saying 2,4,6,8,10.

## Washing Line Songs



Using the tune of “Ten green bottles” use real objects on the washing line to sing/act out new versions of the song based around the objects used.

### Examples

- Ten rusty keys blowing in the wind..... and if one nasty pirate took one away.
- Ten sparkly baubles glittering in a line.. and if one glittery bauble rolled onto the floor.
- Ten tired teddies trying to go to sleep.....and if one tired teddy ran off to his bed.
- Ten brown plant pots sitting in a line..... and if one busy gardener took one to his shed.
- Ten flapping flags, floating in the breeze.... and if one cheeky monkey took one to his tree
- Ten smelly socks hanging on the line..... And if one busy mummy took one to be washed.

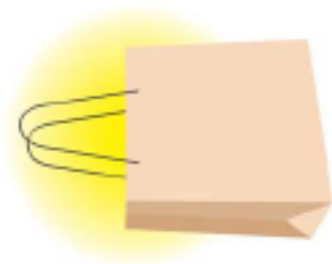
## Washing Line Collections



### **Storing Collections**

Keep your real object collections in shoe boxes or gift bags.

Take a photograph of the contents and label the box or bag.



## Parental Contributions



Involve your parents by asking them for objects you are collecting and containers to put your resources into.

Display photographs of the children using the resources and washing lines. Accompany the photographs with ideas and suggestions for them to try at home.

Ask parents for any objects that the children have enjoyed using at home.



## Appendix 3: Curriculum mapping: What children learn and by when

ELGs 2021 to National Curriculum 2014 (Key Stage1) – progression for practitioners

### Mathematics: Number and Numerical Patterns

Early Years Mathematical Educational Programme (2021)	National Curriculum (December 2014)
<p>Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically. Children should be able to count confidently, develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers.</p> <p>By providing frequent and varied opportunities to build and apply this understanding - such as using manipulatives, including small pebbles and tens frames for organising counting - children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built.</p> <p>In addition, it is important that the curriculum includes rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures. It is important that children develop positive attitudes and interests in mathematics, look for patterns and relationships, spot connections, 'have a go', talk to adults and peers about what they notice and not be afraid to make mistakes.</p> <p>Although the 2021 ELGs do not exactly link to the NC regarding fractions, measurement, geometry and statistics, it is important that children have experiences of these early mathematics concepts within the wider early years curriculum.</p>	<p>The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources [for example, concrete objects and measuring tools].</p> <p>At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money.</p> <p>By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.</p> <p>Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.</p>

ELG Children at the expected level of development will:	Year 1	Year 1
By the end of the key stage, pupils are expected to know, apply and understand the matters, skills and processes specified below:		
<b>Number and Place Value</b>		
<p><b>ELG: Number</b>  <b>Subitise (recognise quantities without counting) up to 5</b></p> <p>Subitising is the ability to recognise how many objects are in a small set without the need to count them:</p> <ul style="list-style-type: none"> <li>Perceptual subitising - recognising small quantities without counting (typically up to 5 objects)</li> <li>Conceptual subitising – recognition of small groups (without counting) within a larger whole (e.g. recognising 3 and 4 within 7)</li> </ul> <p><b>ELG: Number</b>  <b>Have a deep understanding of number to 10, including the composition of each number</b></p> <p><b>Composition</b></p> <ul style="list-style-type: none"> <li>Knowing how numbers are made of other numbers – numbers within numbers, odd/even patterns</li> <li>Part-whole relationship – 2 or more parts that make a whole, equal parts</li> <li>Partitioning – separating into 2 or more groups, patterns of number composition (e.g. pairs of numbers which make 10), partitioning using 5 or 10 (5 and some more, 10 and some more)</li> </ul> <p><b>ELG: Numerical Patterns</b>  <b>Verbally count beyond 20, recognising the pattern of the counting system</b>            (see subject knowledge overview for pattern <a href="http://www.emwest.co.uk/wp-content/uploads/2020/02/EMWest-pattern-project-subject-knowledge-overview.pdf">www.emwest.co.uk/wp-content/uploads/2020/02/EMWest-pattern-project-subject-knowledge-overview.pdf</a>)</p>	<p>Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number.</p> <p>Count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens</p>	<p>Count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward</p>
<p><b>ELG: Numerical Patterns</b>  <b>Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity</b></p> <p><b>Comparison</b></p> <ul style="list-style-type: none"> <li>Comparing size – comparing the size of quantities, same/bigger/smaller</li> <li>More/less – more/less when comparing quantities, how many more/less</li> <li>Ordering – order numbers, larger/smaller/equal, number patterns</li> </ul>	<p>Given a number, identify one more and one less</p> <p>Identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least</p> <p>Read and write numbers from 1 to 20 in numerals and words</p>	<p>Identify, represent and estimate numbers using different representations, including the number line</p> <p>Compare and order numbers from 0 up to 100; use &lt;, &gt; and = signs</p> <p>Read and write numbers to at least 100 in numerals and in words</p> <p>Recognise the place value of each digit in a two-digit number (tens, ones)</p> <p>Use place value and number facts to solve problems</p>

Addition and Subtraction		
<p><b>ELG: Number</b> Automatically recall (without reference to rhymes, counting or other aides) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including doubling facts</p> <p>Number bonds - being able to quickly recall the total of any two numbers</p> <ul style="list-style-type: none"> <li>up to 5, e.g. <math>2 + 3 = 5</math>, rather than having to count to find out the answer (including subtraction facts, e.g. <math>5 - 2 = 3</math>)</li> <li>doubling facts, e.g. <math>0 + 0 = 0</math>, <math>1 + 1 = 2</math>, <math>2 + 2 = 4</math>, <math>3 + 3 = 6</math>, etc.</li> </ul> <p><b>ELG: Numerical Patterns</b> Compare sets of objects up to 10 in different contexts, considering size and difference</p> <p><b>Comparison</b></p> <ul style="list-style-type: none"> <li>Equivalence and difference – equal and not equal, numerical difference (addition and subtraction)</li> </ul>	<p>Represent and use number bonds and related subtraction facts within 20.</p>	<p>Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100.</p>
	<p>Add and subtract one-digit and two-digit numbers to 20, including zero</p>	<p>Add and subtract numbers using concrete objects, pictorial representations, and mentally, including:</p> <ul style="list-style-type: none"> <li>A two-digit number and ones</li> <li>A two-digit number and tens</li> <li>Two two-digit numbers</li> <li>Adding three one-digit numbers</li> </ul>
	<p>Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs</p>	<p>Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot</p>
	<p>Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as <math>7 = 0 - 9</math></p>	<p>Solve problems with addition and subtraction:</p> <ul style="list-style-type: none"> <li>Using concrete objects and pictorial representations, including those involving numbers, quantities and measures</li> <li>Applying their increasing knowledge of mental and written methods</li> </ul>
		<p>Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems</p>
Multiplication and Division		
<p><b>ELG: Numerical Patterns</b> Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally</p>	<p>Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher</p>	<p>Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts</p>
		<p>Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers</p>
		<p>Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs</p>
		<p>Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot</p>
Fractions (including decimals and percentages)		
<p>Help children to understand that one thing can be shared by number of pieces, e.g. a pizza.</p>	<p>Recognise, find and name a half as one of two equal parts of an object, shape or quantity</p>	<p>Recognise, find, name and write fractions <math>\frac{1}{2}</math>, <math>\frac{1}{4}</math>, <math>\frac{2}{4}</math> and <math>\frac{3}{4}</math> of a length, shape, set of objects or quantity</p>
<p>Encourage children to talk about the shapes they see and use and how they are arranged and used constructions.</p>	<p>Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity</p>	<p>Write simple fractions e.g. <math>\frac{1}{2}</math> of <math>6 = 3</math> and recognise the equivalence of two quarters and one half</p>

Measurement		
<p>Provide different sizes and shapes of containers in play, so that children can experiment with quantities and measures.</p> <p>Provide opportunities for children to measure time (sand timer), weight (balances) and length (standard and non-standard units).</p> <p>Use the language for shape, position and measurement during play, e.g. sphere, shape, box, in, on, inside, under, long, longer, longest, short, shorter, shortest, heavy, light, full and empty.</p>	<p>Compare, describe and solve practical problems for:</p> <ul style="list-style-type: none"> <li>Lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]</li> <li>Mass/weight [for example, heavy/light, heavier than, lighter than]</li> <li>Capacity and volume [for example, full/empty, more than, less than, half, half full, quarter]</li> <li>Time [for example, quicker, slower, earlier, later]</li> </ul>	<p>Compare and order lengths, mass, volume/capacity and record the results using &gt;, &lt; and =</p>
	<p>Sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]</p>	<p>Compare and sequence intervals of time</p>
	<p>Measure and begin to record the following:</p> <ul style="list-style-type: none"> <li>Lengths and heights</li> <li>Mass/weight</li> <li>Capacity and volume</li> <li>Time (hours, minutes, seconds)</li> </ul>	<p>Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels</p>
	<p>Recognise and know the value of different denominations of coins and notes</p>	<p>Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value</p>
		<p>Find different combinations of coins that equal the same amounts of money</p>
		<p>Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change</p>
	<p>Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times</p>	<p>Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times</p>
<p>Recognise and use language relating to dates, including days of the week, weeks, months and years</p>	<p>Know the number of minutes in an hour and the number of hours in a day</p>	
Geometry - position and direction		
<p>Offer a range of puzzles with large pieces and knobs or handles to support success in fitting shapes into spaces</p> <p>Be a robot and ask children to give you instructions to get to somewhere. Let them have a turn at being the robot for you to instruct.</p> <p>Encourage children to use everyday words to describe position, e.g. when following pathways.</p>	<p>Describe position, direction and movement, including whole, half, quarter and three-quarter turns</p>	<p>Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise)</p>
		<p>Order and arrange combinations of mathematical objects in patterns and sequences</p>

Statistics		
Encourage children to explore ways in which to record their mathematical thinking, e.g. by drawing or tallying.		Interpret and construct simple pictograms, tally charts, block diagrams and simple tables
Use mathematical vocabulary and demonstrate methods of recording, using standard notation where appropriate.		Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity
Talk with children about strategies they are using, e.g. to work out a solution to a simple problem by using their fingers or counting aloud.		Ask and answer questions about totalling and comparing categorical data

### Information sources:

**Early years foundation stage (EYFS) statutory framework - GOV.UK ([www.gov.uk](http://www.gov.uk))**

**Birth To 5 Matters – Guidance by the sector, for the sector**

**Development Matters - GOV.UK ([www.gov.uk](http://www.gov.uk))**

Maths Hubs East Midlands West: Early years resources

<http://emwest.co.uk/early-years/>

National Curriculum in England: Mathematics programmes of study

**National curriculum in England: mathematics programmes of study - GOV.UK ([www.gov.uk](http://www.gov.uk))**

## Appendix 4: Home learning mathematical challenges

### Maths Challenge

Can you sort the cutlery in your house into different sets?

How did you do it?



1

### Maths Challenge

Can you add up the numbers on a car registration plate?

Try again with a different car. Is that number bigger or smaller?

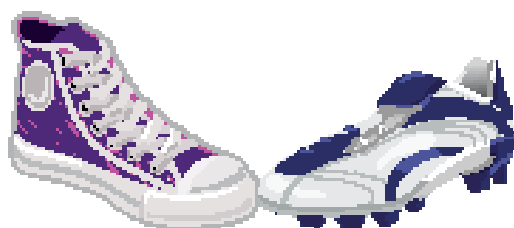


2

### Maths Challenge

Can you find 4 different sized shoes in your house and put them in order of size?

What else can you find to order by length?



3

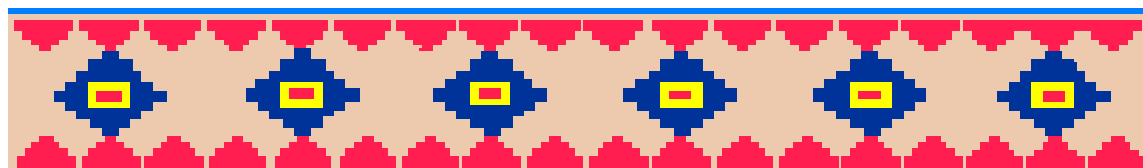
### Maths Challenge

Find a pattern in your house, e.g. wallpaper, tiles, on the duvet.

Can you describe it?

(It could be squares/circles...)

See if you can draw your own pattern.



4

### Maths Challenge

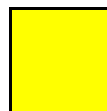
Can you make a repeating pattern using forks and spoons?



5

### Maths Challenge

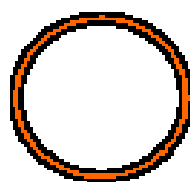
Can you find something that is a square shape in your house?



Can you find something that is a rectangular shape in your house?



Can you find something that is a circular shape in your house?



6



### Maths Challenge

How long does it take to have a bath?

How did you work it out?



7

### Maths Challenge

Are you taller or shorter than a door?

Are you taller or shorter than an armchair?

Are you taller or shorter than a window sill?

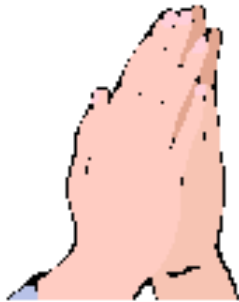


8

### Maths Challenge

Who has the biggest hands in your family?

How can you tell?



9

### Maths Challenge

How wide is your bed?

How long is your bed?

What did you use to measure?



10

### Maths Challenge

Who is the tallest person in your house?

Who is the shortest person in your house?

How did you measure them?



11

### Maths Challenge

Do 10 jumps in each room of your house. Count each jump to make sure you do 10.

Can you count in 10s up to 100 instead as you jump?



12

### Maths Challenge

Ask your grown up if you can sort and count the coins they have got?

How many of each coin you found?



13

### Maths Challenge

What numbers can you see on around your home?

Which is the smallest number? Which is the largest number?



14

### Maths Challenge

Do you have a clock in your house?

What is the biggest number you can read on the clock? What would be the next number?

What time did you get up? What time did you go to bed?



15

### Maths Challenge

Can you find any numbers on the houses near where you live?

What is the biggest number?



16

### Maths Challenge

Count how many drawers there are in each room.

How many are in the whole house?



17

### Maths Challenge

How many windows are in your house?

How many are upstairs?

How many are downstairs?

Are there more upstairs or downstairs?



18

### Maths Challenge

How many footsteps from:  
Your house to the bottom of your garden?  
Your front door to your bedroom?  
Your kitchen to your bathroom?

What happens to the number if you take bigger steps?



19

### Maths Challenge

What is your house number?

Can you think of a smaller number than this?  
What number are the numbers of the houses  
next door?



20

### Maths Challenge

What numbers are in your phone number?

Which is the biggest number?

Can you put them in order from smallest to biggest?



21

### Maths Challenge

How many stairs are in your house?

Show how many by writing the number or drawing a picture.



22



### Maths Challenge

How many different shaped lids can you find in your house?

Can you talk about the shapes?

Can you draw the shapes?



23

### Maths Challenge

Who are the oldest and youngest people in your family?

How old are they?

How old will they be on their next birthday?



24

### Maths Challenge

How many chairs are in your house?

How many televisions are in your house?

Can you add the two numbers together?



25

### Maths Challenge

Ask your grown up for their keys. Count the keys on the key ring.

How many would there be if you lost 1 key?

What if you added 1 more, how many would there be then?



26

### Maths Challenge

Find a pair of socks for everyone in your house?

How many socks do you have altogether?

Practice counting in 2s.



27

### Maths Challenge

Can you collect some sticks?

Which is the longest?

Which is the shortest?

Can you put them in order of their length?



28

### Maths Challenge

Look at one of your books. Can you find and read the numbers in order on each page?

Which is the biggest number?

Which is the smallest number?



29

### Maths Challenge

Hide your teddy. Use words to describe where teddy is hidden, e.g. behind, on top, underneath, in between.



30

### Maths Challenge

Ask your grown up to blind fold you. Listen to their instructions and see where you end up!



31

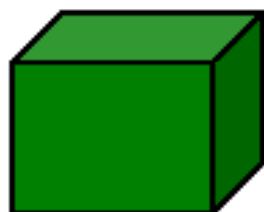
### Maths Challenge

Walk around your house. How many shapes can you see?

Can you find a cube?

Can you find a cuboid?

Can you find a cylinder?



32

### Maths Challenge

Look in your food cupboard. What is the heaviest food? Which is the lightest? How do you know?



33

### Maths Challenge

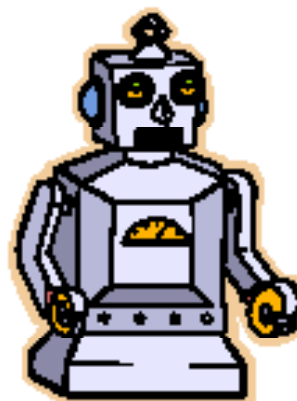
Can you cut a banana in half? How many pieces have you got now?  
What happens if you cut each of those pieces in half? How many pieces are there now?



34

Maths Challenge

Can you find a small toy that is heavier than a big toy?



35

Maths Challenge

Count how many trees are on your street.  
Count how many cars are on your street.

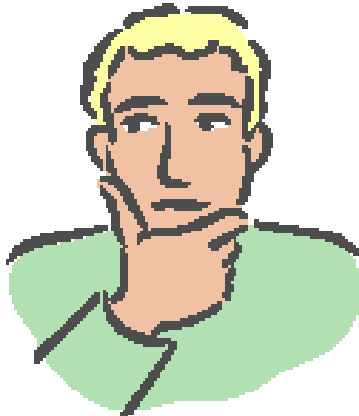
Are there more cars or more trees?



36

### Maths Challenge

What is the biggest number you can think of?  
What is the smallest number you can think of?



37

### Maths Challenge

When you get undressed for bed, what do you  
take off first?  
What do you take off second?  
What do you take off third?



38



### Maths Challenge

Can you find 1 box in your house that will fit inside another box?

Can you find an even bigger box that they will both fit into?



### Maths Challenge

Can you share a piece of fruit equally between 2 people in your house?



40

### Maths Challenge

Can you share the contents of 1 packet of crisps equally between everyone in your house?  
Are they any left over? How many has each person got each?



41

### Maths Challenge

Can you find?  
1 toothbrush  
2 spoons  
3 pegs  
4 socks  
5 shoes

How many things altogether?



42

### Maths Challenge

Can you get dressed before your grown up counts to 20?

Can you do your coat up before your grown up counts to 10?



43

### Maths Challenge Cards

The maths challenge cards are short activity ideas that can fit into your day and will help your child see maths as fun. They will also help them learn that maths is all around them and it is in many of the everyday activities we do.

You can repeat each activity as many times as your child wants to. Feel free to change the ideas to suit your child's interests, what you have in your house and their current level of development. If your child wants to represent their thinking on paper let them do so in their own way. For example, they might not want to write numbers but they might want to draw to communicate their mathematical thinking.

We encourage you to share any ideas you have for maths challenges so that our collection of cards can grow and we can learn from one another.

