



Calculation in the Early Years Foundation Stage

Spring 2016

Early Maths

Research on children's learning in the first six years of life demonstrates the importance of early experiences in mathematics. An engaging and encouraging climate for children's early encounters with mathematics develops their confidence in their ability to understand and use mathematics. These positive experiences help children to develop dispositions such as curiosity, imagination, flexibility, inventiveness, and persistence, which contribute to their future success in and out of school (Clements & Conference Working Group, 2004).

The NCETM (National Council of Teachers of Mathematics) states

“Young learners’ future understanding of mathematics requires an early foundation based on a high-quality, challenging, and accessible mathematics education. Young children in every setting should experience mathematics through effective, research-based curricula and teaching practices. Such practices in turn require that teachers have the support of policies and resources that enable them to succeed in this challenging and important work.”

They go on to highlight how early maths can support the aims of the new Curriculum 2014:

“Early childhood educators should actively introduce mathematical concepts, methods, and language through a variety of appropriate experiences. Teachers should guide children in seeing connections of ideas within mathematics as well as with other subjects, developing their mathematical knowledge throughout the day and across the curriculum. They must encourage children to communicate, explaining their thinking as they interact with important mathematics in deep and sustained ways.”




THE EARLY YEARS FOUNDATION STAGE

Mathematics involves providing children with opportunities to develop and improve their skills in counting, understanding and using numbers, calculating simple addition and subtraction problems; and to describe shapes, spaces, and measures.

(Statutory Framework for the Early Years Foundation Stage, DfE: 2012)



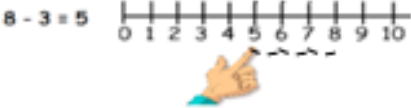
Addition

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

GUIDANCE / MODELS AND IMAGES	KEY VOCABULARY
<p>If available, Numicon shapes are introduced straight away and can be used to:</p> <ul style="list-style-type: none"> • identify 1 more/less • combine pieces to add. • find number bonds. • add without counting. <p>Children can record this by printing or drawing around Numicon pieces.</p> <p>Children begin to combine groups of objects using concrete apparatus</p> <p></p> <p>Construct number sentences verbally or using cards to go with practical activities.</p> <p>Children are encouraged to read number sentences aloud in different ways "Three add two equals 5" "5 is equal to three and two"</p> <p>Children make a record in pictures, words or symbols of addition activities already carried out.</p> <p>Solve simple problems using fingers</p> <p> $5 + 1 = 6$</p> <p>Numberlines can be introduced to count back and to find one less</p> <p>What is 1 more than 4? 1 more than 13?</p> <p>Number lines can then be used alongside number tracks and practical apparatus to solve addition calculations and word problems.</p> <p>$5 + 3 = 8$ </p> <p>Children will need opportunities to look at and talk about different models and images as they move between representations.</p>	<p>Games and songs can be a useful way to begin using vocabulary involved in addition e.g. Alice the Camel</p> <p>add</p> <p>more</p> <p>and</p> <p>make</p> <p>sum</p> <p>total</p> <p>altogether</p> <p>score</p> <p>double</p> <p>one more, two more, ten more...</p> <p>how many more to make...?</p> <p>how many more is... than...?</p>






Subtraction

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

GUIDANCE / MODELS AND IMAGES	KEY VOCABULARY
<p>Children begin with mostly pictorial representations</p> <p>  </p> <p>Concrete apparatus is used to relate subtraction to taking away and counting how many objects are left.</p> <p>Concrete apparatus models the subtraction of 2 objects from a set of 5.</p> <p>Construct number sentences verbally or using cards to go with practical activities.</p> <p>Children are encouraged to read number sentences aloud in different ways "five subtract one leaves four" "four is equal to five subtract one"</p> <p>Children make a record in pictures, words or symbols of subtraction activities already carried out.</p> <p>Solve simple problems using fingers</p> <p>  $5 - 1 = 4$ </p> <p>Numberlines can be introduced to count back and to find one less</p> <p>What is 1 less than 9? 1 less than 20?</p> <p>Number lines can then be used alongside number tracks and practical apparatus to solve subtraction calculations and word problems. Children count back under the number line.</p> <p>  $8 - 3 = 5$ </p> <p>Children will need opportunities to look at and talk about different models and images as they move between representations.</p>	<p>Games and songs can be a useful way to begin using vocabulary involved in subtraction</p> <p>e.g. Five little men in a flying saucer</p> <p>take (away)</p> <p>leave</p> <p>how many are left/left over?</p> <p>how many have gone?</p> <p>one less, two less... ten less...</p> <p>how many fewer is... than...?</p> <p>difference between</p> <p>is the same as</p>



Multiplication

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.


GUIDANCE / MODELS AND IMAGES	KEY VOCABULARY
<p>The link between addition and multiplication can be introduced through doubling.</p> <p>If available, Numicon is used to visualise the repeated adding of the same number. These can then be drawn around or printed as a way of recording.</p> <p>Children begin with mostly pictorial representations:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>How many groups of 2 are there?</p> </div> <div style="text-align: center;">  </div> </div> <p>Real life contexts and use of practical equipment to <u>count in repeated groups of the same size</u>:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>How many wheels are there altogether?</p> </div> <div style="text-align: center;">  <p>How much money do I have?</p> </div> </div> <div style="text-align: center; margin-top: 20px;">  <p>objects</p> </div> <p>Count in twos; fives; tens both aloud and with</p> <p>Children are <u>given multiplication problems set in a real life context</u>. Children are encouraged to visualise the problem.</p> <p>How many fingers on two hands? How many sides on three triangles? How many legs on four ducks?</p> <p>Children are encouraged to read number sentences aloud in different ways "five times two makes ten" "ten is equal to five multiplied by two"</p>	<p>lots of</p> <p>groups of</p> <p>times</p> <p>multiply</p> <p>multiplied by</p> <p>multiple of</p> <p>once, twice, three</p> <p>times... ten times...</p> <p>...times as (big, long, wide... and so on)</p> <p>repeated addition</p> <p>double</p>

Division and fractions

Maths for young children should be meaningful. Where possible, concepts should be taught in the context of real life.

GUIDANCE / MODELS AND IMAGES	KEY VOCABULARY
<p>The ELG states that children solve problems, including doubling, halving and sharing.</p> <p>Children need to see and hear representations of division as both grouping and sharing.</p> <p>Division can be introduced through halving.</p> <p>Children begin with mostly pictorial representations linked to real life contexts:</p> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;">  <p>Grouping model Mum has 6 socks. She grouped them into pairs – how many pairs did she make?</p> </div> <div>  <p>Sharing model I have 10 sweets. I want to share them equally with my friends.</p> </div> </div> <p>Children have a go at recording the calculation that has been carried out.</p>	<p>halve</p> <p>share, share equally</p> <p>one each, two each, three each...</p> <p>group in pairs, threes...</p> <p>tens</p> <p>equal groups of</p> <p>divide</p> <p>divided by</p> <p>divided into</p> <p>left, left over</p>

FRACTIONS



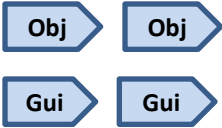

GUIDANCE / MODELS AND IMAGES	KEY VOCABULARY
<p>Although not explicit in the Development Matters document, the sharing model is a useful way of introducing young children to fractions and calculating with fractions.</p> <p>Setting the problems in real life context and solving them with <u>concrete apparatus</u> will support children's understanding.</p> <p>"I have got 5 bones to share between my two dogs. How many bones will they get each?"</p> <div style="display: flex; align-items: center; justify-content: center; margin: 10px 0;">  </div> <p>Children have a go at recording the calculation that has been carried out.</p> $2\frac{1}{2} + 2\frac{1}{2} = 5$	<p>As division vocabulary</p> <p>plus:</p> <p>fraction</p> <p>half</p> <p>halves</p> <p>third</p> <p>thirds</p>

Development Matters in the Early Years Foundation Stage (EYFS)

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Links to calculation:

<p><u>22 – 36 months</u></p>  <p>Creates and experiments with symbols and marks representing ideas of number. Begins to make comparisons between quantities. Uses some language of quantities, such as 'more' and 'a lot'. Knows that a group of things changes in quantity when something is added or taken away.</p>	<p><u>30 – 50 months</u></p>  <p>Beginning to represent numbers using fingers, marks on paper or pictures. Compares two groups of objects, saying when they have the same number. Separates a group of three or four objects in different ways, beginning to recognise that the total is still the same.</p>	<p><u>40 – 60 months</u></p>  <p>Says the number that is one more than a given number. Finds one more or one less from a group of up to five objects, then ten objects. In practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting. Records, using marks that they can interpret and explain.</p>	<p><u>Early Learning Goal for Numbers</u></p>  <p>Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.</p>
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Mathematics: Numbers			
	A Unique Child: observing what a child is learning	Positive Relationships: what adults could do	Enabling Environments: what adults could provide
 Birth - 11 months	<ul style="list-style-type: none"> Notices changes in number of objects/images or sounds in group of up to 3. 	<ul style="list-style-type: none"> Sing number rhymes as you dress or change babies, e.g. 'One, Two, Buckle My Shoe'. Move with babies to the rhythm patterns in familiar songs and rhymes. Encourage babies to join in tapping and clapping along to simple rhythms. 	<ul style="list-style-type: none"> Display favourite things so that a young baby can see them. Provide a small group of the same objects in treasure baskets, as well as single items, e.g. two fir cones or three shells. Create a mobile, occasionally changing the number of items you hang on it. Collect number rhymes which are repetitive and are related to children's actions and experiences, for example, 'Peter Hammers with One Hammer'. Use song and rhymes during personal routines, e.g. 'Two Little Eyes to Look Around', pointing to their eyes, one by one. Collect number and counting rhymes from a range of cultures and in other languages. This will benefit all children and will give additional support for children learning English as an additional language.
 8-20 months	<ul style="list-style-type: none"> Develops an awareness of number names through their enjoyment of action rhymes and songs that relate to their experience of numbers. Has some understanding that things exist, even when out of sight. 		
 16-26 months	<ul style="list-style-type: none"> Knows that things exist, even when out of sight. Beginning to organise and categorise objects, e.g. putting all the teddy bears together or teddies and cars in separate piles. Says some counting words randomly. 	<ul style="list-style-type: none"> Use number words in meaningful contexts, e.g. 'Here is your other mitten. Now we have two'. Talk to young children about 'lots' and 'few' as they play. Talk about young children's choices and, where appropriate, demonstrate how counting helps us to find out how many. Talk about the maths in everyday situations, e.g. doing up a coat, one hole for each button. Tell parents about all the ways children learn about numbers in your setting. Have interpreter support or translated materials to support children and families learning English as an additional language 	<ul style="list-style-type: none"> Provide varied opportunities to explore 'lots' and 'few' in play. Equip the role-play area with things that can be sorted in different ways. Provide collections of objects that can be sorted and matched in various ways. Provide resources that support children in making one-to-one correspondences, e.g. giving each dolly a cup.
 22-36 months	<ul style="list-style-type: none"> Selects a small number of objects from a group when asked, for example, 'please give me one', 'please give me two'. Recites some number names in sequence. Creates and experiments with symbols and marks representing ideas of number. Begins to make comparisons between quantities. Uses some language of quantities, such as 'more' and 'a lot'. Knows that a group of things changes in quantity when something is added or taken away. 	<ul style="list-style-type: none"> Encourage parents of children learning English as an additional language to talk in their home language about quantities and numbers. Sing counting songs and rhymes which help to develop children's understanding of number, such as 'Two Little Dickie Birds'. Play games which relate to number order, addition and subtraction, such as hopscotch and skittles and target games. 	<ul style="list-style-type: none"> Make a display with the children about their favourite things. Talk about how many like apples, or which of them watches a particular TV programme at home. Provide props for children to act out counting songs and rhymes. Provide games and equipment that offer opportunities for counting, such as skittles. Plan to incorporate a mathematical component in areas such as the sand, water or other play areas.

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Mathematics: Numbers			
	A Unique Child: observing what a child is learning	Positive Relationships: what adults could do	Enabling Environments: what adults could provide
 30-50 months	<ul style="list-style-type: none"> • Uses some number names and number language spontaneously. • Uses some number names accurately in play. • Recites numbers in order to 10. • Knows that numbers identify how many objects are in a set. • Beginning to represent numbers using fingers, marks on paper or pictures. • Sometimes matches numeral and quantity correctly. • Shows curiosity about numbers by offering comments or asking questions. • Compares two groups of objects, saying when they have the same number. • Shows an interest in number problems. • Separates a group of three or four objects in different ways, beginning to recognise that the total is still the same. • Shows an interest in numerals in the environment. • Shows an interest in representing numbers. • Realises not only objects, but anything can be counted, including steps, claps or jumps. 	<ul style="list-style-type: none"> • Use number language, e.g. 'one', 'two', 'three', 'lots', 'fewer', 'hundreds', 'how many?' and 'count' in a variety of situations. • Support children's developing understanding of abstraction by counting things that are not objects, such as hops, jumps, clicks or claps. • Model counting of objects in a random layout, showing the result is always the same as long as each object is only counted once. • Model and encourage use of mathematical language e.g. asking questions such as 'How many saucepans will fit on the shelf?' • Help children to understand that one thing can be shared by number of pieces, e.g. a pizza. • As you read number stories or rhymes, ask e.g. 'When one more frog jumps in, how many will there be in the pool altogether?' • Use pictures and objects to illustrate counting songs, rhymes and number stories. • Encourage children to use mark-making to support their thinking about numbers and simple problems. • Talk with children about the strategies they are using, e.g. to work out a solution to a simple problem by using fingers or counting aloud. 	<ul style="list-style-type: none"> • Give children a reason to count, e.g. by asking them to select enough wrist bands for three friends to play with the puppets. • Enable children to note the 'missing set', e.g. 'There are none left' when sharing things out. • Provide number labels for children to use, e.g. by putting a number label on each bike and a corresponding number on each parking space. • Include counting money and change in role-play games. • Create opportunities for children to separate objects into unequal groups as well as equal groups. • Provide story props that children can use in their play, e.g. varieties of fruit and several baskets like Handa's in the story <i>Handa's Surprise</i> by Eileen Browne.
 40-60+ months	<ul style="list-style-type: none"> • Recognise some numerals of personal significance. • Recognises numerals 1 to 5. • Counts up to three or four objects by saying one number name for each item. • Counts actions or objects which cannot be moved. • Counts objects to 10, and beginning to count beyond 10. • Counts out up to six objects from a larger group. 	<ul style="list-style-type: none"> • Encourage estimation, e.g. estimate how many sandwiches to make for the picnic. • Encourage use of mathematical language, e.g. number names to ten: 'Have you got enough to give me three?' • Ensure that children are involved in making displays, e.g. making their own pictograms of lunch choices. Develop this as a 3D representation using bricks and discuss the most popular choices. • Add numerals to all areas of learning and development, e.g. to a display of a favourite story, such as 'The Three Billy Goats Gruff'. 	<ul style="list-style-type: none"> • Provide collections of interesting things for children to sort, order, count and label in their play. • Display numerals in purposeful contexts, e.g. a sign showing how many children can play on a number track. • Use tactile numeral cards made from sandpaper, velvet or string. • Create opportunities for children to experiment with a number of objects, the written numeral and the written number word. Develop this through matching activities with a range of numbers, numerals and a selection of objects.

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Mathematics: Numbers

	A Unique Child: observing what a child is learning	Positive Relationships: what adults could do	Enabling Environments: what adults could provide
	<ul style="list-style-type: none"> • Selects the correct numeral to represent 1 to 5, then 1 to 10 objects. • Counts an irregular arrangement of up to ten objects. • Estimates how many objects they can see and checks by counting them. • Uses the language of 'more' and 'fewer' to compare two sets of objects. • Finds the total number of items in two groups by counting all of them. • Says the number that is one more than a given number. • Finds one more or one less from a group of up to five objects, then ten objects. • In practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting. • Records, using marks that they can interpret and explain. • Begins to identify own mathematical problems based on own interests and fascinations. <p>Early Learning Goal Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.</p>	<ul style="list-style-type: none"> • Make books about numbers that have meaning for the child such as favourite numbers, birth dates or telephone numbers. • Use rhymes, songs and stories involving counting on and counting back in ones, twos, fives and tens. • Emphasise the empty set and introduce the concept of nothing or zero. • Show interest in how children solve problems and value their different solutions. • Make sure children are secure about the order of numbers before asking what comes after or before each number. • Discuss with children how problems relate to others they have met, and their different solutions. • Talk about the methods children use to answer a problem they have posed, e.g. 'Get one more, and then we will both have two.' • Encourage children to make up their own story problems for other children to solve. • Encourage children to extend problems, e.g. 'Suppose there were three people to share the bricks between instead of two'. • Use mathematical vocabulary and demonstrate methods of recording, using standard notation where appropriate. • Give children learning English as additional language opportunities to work in their home language to ensure accurate understanding of concepts. 	<ul style="list-style-type: none"> • Use a 100 square to show number patterns. • Encourage children to count the things they see and talk about and use numbers beyond ten • Make number games readily available and teach children how to use them. • Display interesting books about number. • Play games such as hide and seek that involve counting. • Encourage children to record what they have done, e.g. by drawing or tallying. • Use number staircases to show a starting point and how you arrive at another point when something is added or taken away. • Provide a wide range of number resources and encourage children to be creative in identifying and devising problems and solutions in all areas of learning. • Make number lines available for reference and encourage children to use them in their own play. • Big number lines may be more appropriate than counters for children with physical impairments. • Help children to understand that five fingers on each hand make a total of ten fingers altogether, or that two rows of three eggs in the box make six eggs altogether.

Additional information for the 'exceeding' judgement

taken from the 2014 Early Years Foundation Stage Handbook

Numbers: Children estimate a number of objects and check quantities by counting up to 20. They solve practical problems that involve combining groups of 2, 5, or 10, or sharing into equal groups.

(This descriptor has been amended to reflect the increased level of challenge applied to the expected descriptor following the Tickell review.)