




## Early Years Foundation Stage consultation: Response from the Children's Mathematics Network

### Recommended new section:



#### Problem Solving, Reasoning and Numeracy

#### Children's Mathematical Graphics

	Development matters	Look, listen and note	Effective practice	Planning and resourcing
	<ul style="list-style-type: none"> <li>Uses gesture and sounds to make meanings</li> </ul>	<ul style="list-style-type: none"> <li>The meanings children assign to gestures and sounds</li> </ul>	<ul style="list-style-type: none"> <li>Respond to different gestures and sounds babies use</li> </ul>	<ul style="list-style-type: none"> <li>Create a positive learning environment in which babies' and children's 'voices' are heard</li> </ul>
	<ul style="list-style-type: none"> <li>Begins to assign meanings to objects (e.g. uses a wooden block as a telephone)</li> <li>Begins to make and explore marks with a variety of media</li> </ul>	<ul style="list-style-type: none"> <li>Babies patterns of behaviour</li> <li>The range of meanings babies make</li> <li>The range of marks they make and the different media they choose and enjoy using</li> </ul>	<ul style="list-style-type: none"> <li>Observe babies' behaviours and personal interests</li> <li>Value the alternative meanings babies and children assign to objects within their play</li> <li>Show an interest in the marks they make</li> </ul>	<ul style="list-style-type: none"> <li>Provide open-ended resources for multi-modal play and exploration</li> <li>Encourage mark-making indoors and out</li> <li>Provide a wide range of mark-making materials and tools, indoors and out</li> </ul>
	<ul style="list-style-type: none"> <li>Uses an increasing range of own marks and symbols</li> </ul>	<ul style="list-style-type: none"> <li>How babies are aware of the marks around them and those that others make</li> <li>The range and types of marks they use</li> </ul>	<ul style="list-style-type: none"> <li>Recognize and develop awareness of the range of <i>forms</i> of mathematical graphics that children choose to use (dynamic, pictographic, iconic, written and symbolic)</li> </ul>	<ul style="list-style-type: none"> <li>Provide materials which reflect children's cultural contexts, so that they see symbols and numerals with which they are familiar</li> <li>Encourage independent and shared mark-making through the use of I.C.T.</li> </ul>


## Problem Solving, Reasoning and Numeracy

## Children's Mathematical Graphics

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	<ul style="list-style-type: none"> <li>Explores and creates meanings in multi-modal ways within their play</li> <li>Begins to differentiate between marks that are 'drawings', marks that carry a written message and those that carry mathematical meanings</li> <li>Ascribes meanings to their marks</li> </ul>	<ul style="list-style-type: none"> <li>Children's different actions and self-initiated play</li> <li>The different meanings they assign to objects and contexts in their play</li> <li>When children ascribe mathematical meanings to their marks</li> <li>What some children sometimes say about their marks</li> <li>The context in which their marks were made</li> </ul>	<ul style="list-style-type: none"> <li>Recognize the ways in which they explore meanings (e.g. actions, dens, role play, cutting out, junk modeling and drawing)</li> <li>Discuss the children's marks with them</li> <li>Use a range of forms when modeling mathematics for real purposes</li> <li>Encourage children to use their mathematical graphics for real purposes and for real people and to communicate their mathematical thinking</li> <li>Talk about children's thinking, meanings, ideas and understanding</li> </ul>	<ul style="list-style-type: none"> <li>Observe children's multi-modal explorations and use observations to plan opportunities to extend their learning</li> <li>Provide a rich environment that children can freely use</li> <li>Develop a graphics area with mark-making and mathematical resources</li> </ul>
	<ul style="list-style-type: none"> <li>Begin to differentiate marks they make</li> <li>Sometimes represents numerals in personal ways</li> <li>Chooses to use their own written numerals as labels</li> <li>Represents quantities that are not counted</li> <li>Counts the marks or items they have represented and represent items they have counted</li> <li>Uses a range of <i>forms</i> to represent meanings (i.e. dynamic, pictographic, iconic, written and symbolic)</li> </ul>	<ul style="list-style-type: none"> <li>The play contexts in which children choose to use mathematical graphics</li> <li>The different ways in which children represent numerals</li> <li>When some children use numerals as labels for a purpose</li> <li>How children represent quantities</li> <li>The range of <i>forms</i> they choose to use</li> </ul>	<ul style="list-style-type: none"> <li>Draw attention to marks, signs and symbols in the environment and talk about what they represent</li> <li>Encourage children to display their own marks and mathematical graphics</li> <li>Discuss the different ways that children have represented numerals or quantities</li> <li>Show that you value their personal ways of thinking and representing</li> <li>In adult-led group contexts, show children's different ways of representing their mathematical thinking on paper and discuss their strengths</li> </ul>	<ul style="list-style-type: none"> <li>Create displays of children's mathematical graphics with a shared focus (e.g. the outcome of an adult-led group session)</li> <li>Display children's own mathematical graphics on paper or printed from their use of I.C.T.</li> <li>Add explanations about the context and range of the children's graphics to support parents' understanding</li> <li>Plan adult-led group activities for children to explore their mathematical graphics using an interactive whiteboard or tablet P.C.s</li> </ul>

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## Children's Mathematical Graphics

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All	<b>Other aspects of mathematics (data handling, shape and space, measurement):</b>	<ul style="list-style-type: none"> <li>The ways in which children represent and explore different aspects of mathematics, in play and occasionally in adult-led groups</li> </ul>	<ul style="list-style-type: none"> <li>Encourage children to explore the breadth of mathematics within their play and occasionally within adult-led small groups</li> </ul>	<ul style="list-style-type: none"> <li>Provide appropriate real resources (e.g. real coins, analogue and digital clocks, balance scales)</li> <li>Plan activities to extend their thinking, based on your observations</li> </ul>
	<b>Calculations:</b> <ul style="list-style-type: none"> <li>Continues to use a range of forms to represent their thinking</li> <li>Explores layout in personal ways</li> <li>Represents two sets of items to be added as a continuous line of items</li> <li>Separates two sets of items to be added or subtracted</li> <li>Begins to explore personal and implicit symbols in creative ways</li> <li>Sometimes uses standard (abstract) signs within own written method</li> <li>May begin to use standard symbolic operations (horizontal) with small numbers</li> </ul>	<ul style="list-style-type: none"> <li>Note the range of individual responses and children's own written methods</li> <li>Observe different responses to solving problems</li> <li>Note when children choose to self-check what they have represented</li> </ul>	<ul style="list-style-type: none"> <li>Encourage children to 'read' other children's mathematical graphics, to interpret and understand what they have shown</li> <li>Discuss the different symbols children have chosen to use (including personal and implicit symbols)</li> <li>Encourage children to discuss their different strategies and to explain what their thinking</li> <li>Focus on children's meanings, thinking, ideas and understanding</li> </ul>	<ul style="list-style-type: none"> <li>In adult-led group sessions, encourage children to 'put something down to show...' (e.g. their thinking, or to help them think about how they might work something out or solve a problem)</li> <li>Use I.C.T (e.g. interactive whiteboard or tablet P.C.s to sometimes explore children's different ways of exploring problems and calculations)</li> <li>Create displays of children's own written methods (e.g. showing the different strategies they use for subtraction or to solve a problem)</li> </ul>

### References to research:

Carruthers, E. and Worthington, M. 'Making sense of mathematical graphics: the development of understanding abstract symbolism'. *European Early Childhood Education Research Association Journal*, Volume 13, No. 1. 2005.

Worthington, M. and Carruthers, E. (2003) *Children's Mathematics: Making Marks, Making Meaning*. London: Paul Chapman, (second edition, Carruthers and Worthington, 2006).

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