Calculation Policy

Lead committee: Performance Committee
Last reviewed and approved: Summer 2 - 2017
Next review date: Summer 2019
Calculation at Bedgrove Infant School

Written methods of calculation are based on mental strategies. Each of the four operations (addition, subtraction, multiplication and division) builds on mental skills such number bonds which provide the foundations for jottings and informal written methods of recording.

Calculation concepts need to be supported and therefore strategies progress from the use of concrete resources such as cubes through to pictorial or visual representations and jottings and finally to the use of the abstract or number sentences. Building the children's experience of calculation in this way helps to develop their understanding of the different mathematical concepts and how they relate to each other rather than them just being able to apply a strategy to calculate an answer.

Within the new curriculum mental maths skills and the knowledge of number facts are important skills and need to be taught, practised and reviewed constantly in order to support children with their calculations regardless of format.

When learning a new strategy it is important that children start with numbers they can easily manipulate so that they can understand the concept. It is also important to teach the new method alongside the one the child is already familiar with so that they may see the link between the two methods.

The transition between the strategies detailed in this policy is a guideline and dependent on the development of individual children since not all will be ready to move on to the next stage at the same time.

Useful Maths Websites:

http://www.mathszone.co.uk/
http://www.primarygames.co.uk/
http://www.ictgames.com/resources.html
http://www.oxfordowl.co.uk/maths/
http://www.multiplication.com/
<table>
<thead>
<tr>
<th>Reception</th>
<th>Addition</th>
<th>Subtraction</th>
<th>Multiplication</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objects</strong>&lt;br&gt;Using quantities and objects, they add two single-digit numbers within 20</td>
<td><strong>Objects</strong>&lt;br&gt;Using quantities and objects, they subtract two single-digit numbers within 20</td>
<td><strong>Grouping and counting</strong>&lt;br&gt;Children will use practical resources to make equal groups then count to find the total in role-play and problem solving activities</td>
<td><strong>Halving and Sharing</strong>&lt;br&gt;Children will use practical resources to make equal groups and share items out in role-play and problem solving activities</td>
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<tr>
<td><strong>Bead Strings</strong> (or similar)&lt;br&gt;Bead strings can be used to illustrate the concept of addition. Further explore the idea of commutativity i.e, numbers can be added in any order.</td>
<td><strong>Bead Strings</strong> (or similar)&lt;br&gt;Bead strings can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2.</td>
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<tr>
<td><img src="image" alt="8+2=10" /></td>
<td><img src="image" alt="6-2=4" /></td>
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<tr>
<td><strong>Number-lines/tracks</strong>&lt;br&gt;Teachers <em>demonstrate</em> the use of the number-line. They use number tracks and practical resources to support calculation and count on to find the answer.</td>
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<tr>
<td><strong>Recording</strong>&lt;br&gt;Records, using marks that they can interpret and explain.</td>
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<tr>
<td>Y1</td>
<td>Addition</td>
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<td>Multiplication</td>
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<td>Ensure children are secure with apparatus eg. using cubes then moving onto methods such as: <strong>Numbered Number Lines</strong> Teachers initially demonstrate the use of the number-line, and then children can use 0-20 and 0-30 number-lines and practical resources to support their own calculation when counting forwards in ones.</td>
<td>Ensure children are secure with apparatus eg. using cubes then moving onto methods such as: <strong>Numbered Number Lines</strong> Teachers initially demonstrate the use of the number-line, and then children can use 0-20 and 0-30 number-lines and practical resources to support their own calculation when counting back in ones. <strong>Bead strings</strong> (or similar) Used to illustrate subtraction including <strong>bridging through ten</strong> (crossing 10) <em>eg.</em> to calculate 13 – 5 = __ counting back 3 to 10, before counting back another 2. <strong>100 trails</strong> Demonstrate working out the answer to number sentences that involve larger numbers using 100 trails to model counting backwards. Children use this to support their own calculations by circling the start number and counting back. <strong>Difference</strong> Use concrete apparatus eg. cubes so children can see difference between 2 numbers.</td>
<td>Introduce children to concept by using methods such as: <strong>Counting</strong> They will count in 1s, 2s, 5s and 10s. Children are introduced to the concept that by doing this, they are adding 1, 2, 5 and 10 each time. Children begin to count real objects or pictures of objects using the language of groups of, lots of and sets of. <em>eg.</em> 3 lots of crayons, 10 in each lot or 3 groups of crayons, 10 in each group. <strong>Grouping and sharing</strong> Children will understand how to make equal groups and share items out in role play and problem solving.</td>
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<td><strong>Bead strings</strong> (or similar) Used to illustrate addition including <strong>bridging through ten</strong> (crossing 10). <em>eg.</em> to calculate 8+5= __ counting on 2 to 10 and before counting on another 3. <strong>100 trails</strong> Demonstrate working out the answer to number sentences that involve larger numbers using 100 trails to model counting forwards. Children use this to support their own calculations by circling the start number and counting on. <strong>Number Bonds</strong> Practise rapid recall of number bonds within 5, 10 and 20 to support calculation methods.</td>
<td>The difference between our weights is 8kg. The term difference should be used practically, in the context of measuring. <strong>The difference between 11 and 14 is 3.</strong></td>
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<td>9 and 1 more is 10 9 add 1 equals 10 9 + 1 = 10</td>
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<td><img src="image1.png" alt="Image" /> <img src="image2.png" alt="Image" /></td>
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<td><img src="image5.png" alt="Image" /> <img src="image6.png" alt="Image" /></td>
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<td><strong>Y2</strong> Continue to ensure children are secure with Year 1 methods continuing to use some such as number trails then:</td>
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<td><strong>Numbered Number Lines</strong></td>
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<td>Children should continue to become secure with using 0-20 and 0-30 number lines to support mental methods of addition. Children should understand that addition can be done in any order although it is more efficient to start with the largest number.</td>
<td>Children should continue to become secure with using 0-20 and 0-30 number lines to support mental methods of subtraction.</td>
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<tr>
<td><strong>100 Squares</strong></td>
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<td>Children use 100 squares to help with the addition of 10 and multiples of 10 to any number in order to see the pattern in the numbers, i.e. the tens digit changes but the ones (units) do not.</td>
<td>Children use 100 squares to help with the subtraction of 10 and multiples of 10 from any number in order to see patterns in how the number changes.</td>
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<td><strong>Concrete resources such as Numicon and Diennes:</strong></td>
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<td>Children use concrete resources to illustrate place value and the addition of tens to any number and when beginning to add two 2 digit numbers.</td>
<td>Children may use concrete resources to illustrate the subtraction of tens from any number and when beginning to subtract one two 2 digit number from another.</td>
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<tr>
<td><img src="image1.png" alt="Image" /></td>
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</tbody>
</table>

**Concrete resources such as Numicon and Diennes:**

Children use 100 squares to help with the subtraction of 10 and multiples of 10 from any number in order to see patterns in how the number changes.

**Concrete resources such as Numicon and Diennes:**

Children may use concrete resources to illustrate the subtraction of tens from any number and when beginning to subtract one two 2 digit number from another.

$$36 - 25 = 21$$

![Image](image3.png)
## Addition

**Empty Number Lines**
Children will begin to use empty number lines to support their own calculations. First adding a single digit number:

*eg. 22 + 2 = 24*

![Addition Example](image)

Then moving to add two 2 digit numbers by partitioning the second number and adding the tens and then the ones (units). Place value will need to be secure for partitioning.

*eg. 34 + 23 = 57*

Later becoming more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).

*34 + 23 = 57*

![Addition Example](image)

## Subtraction

**Empty Number Lines**
Children will then begin to use empty number lines to support their own calculations.

*eg. 24 - 22 = 2*

Then moving to subtract a 2 digit number from another 2 digit number by partitioning the second number then subtracting the tens and then the ones (units). Place value will need to be secure for partitioning.

*47 - 23 = 24*

![Subtraction Example](image)

Then becoming more efficient by subtracting the ones (units) in one jump by using the known fact 7 - 3 = 4.

*34 - 23 = 57*

![Subtraction Example](image)

## Multiplication

**Continue to ensure children are secure with concept through counting then:**

### Counting

They will continue to count in 1s, 2s, 5s, and 10s moving on to counting in 3s.

**Repeated addition**

3 times 5 is 5 + 5 + 5 = 15

*ie. 3 lots of 5, or three 5’s.
Repeated addition can be shown easily on a number line or bead string:*

*3 X 5 = 5 + 5 + 5 = 15*

![Multiplication Example](image)

**Arrays**

Children should be able to model a multiplication calculation using an array. Initially this is modelled as the 1st number indicating the number of rows (or groups) and the 2nd number the number of objects in each row (the number in each group).

*so 4 X 2 = 4 rows with 2 objects in each row*

![Multiplication Example](image)

but 2 X 4 = 2 rows, 4 objects each row.

**Division on a number line**

15 + 5 = 3

Children should understand this number sentence as ‘How many groups of 5 make 15?’

And on a bead string:

![Division Example](image)

By relating division to groups/grouping children can see the relationship between division and grouping:

15 ÷ 5 = 3 so 3 X 5 = 15 and both would look the same on a number line.
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Y2</strong></td>
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<tr>
<td>Eventually adding the tens in one jump and the ones (units) in one jump.</td>
<td>Eventually subtracting the tens in one jump and the ones (units) in one jump.</td>
<td><strong>Commutativity</strong></td>
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<tr>
<td>34 + 23 = 57</td>
<td>47 - 23 = 24</td>
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<tr>
<td>bridging through ten (breaking single number into smaller amounts to jump to next ten) can help children become more efficient.</td>
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<tr>
<td>37 + 15 = 52</td>
<td>42 - 25 = 17</td>
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<tr>
<td>Number facts:</td>
<td>Difference</td>
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<tr>
<td>All these methods can be accessed and applied more readily if children are able to rapidly recall number facts to at least 10. In addition if children know: eg. 2 + 3 = 5 then they can also easily work out: 20 + 30 = 50 22 + 33 = 55 32 + 23 = 55 etc.</td>
<td>The vocabulary of difference should continue to be used in a practical context and then shown that it is the same as subtraction. Number lines can be used to show subtraction and difference are the same and can be done by counting up or back between 2 numbers on a number line.</td>
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<td>All these methods can be accessed and applied more readily if children are able to rapidly recall number facts to at least 10. In subtraction if children know: eg. 3 - 2 = 1 then they can also easily work out: 30 - 20 = 10 33 - 22 = 11 32 - 20 = 12 etc.</td>
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</table>
**Addition**

During the summer term and if children have sufficient understanding they will be introduced to the idea of partitioning and to add which leads into the initial stages of column addition ready for transition to Yr3.

**Partitioning**
Children will also learn to partition 2 digit numbers into tens and ones before adding.

\[
\begin{align*}
37 + 12 &= 30 + 10 + 7 + 2 = 40 + 9 = 49 \\
&
\end{align*}
\]

If they have the depth of understanding:

\[
\begin{align*}
30 + 7 \\
10 + 2 \\
40 + 9 &= 49 \\
&
\end{align*}
\]

They need to understand that if the ones add to more than 10 they need to take that into account in the last step.

\[
\begin{align*}
37 + 15 &= \\
30 + 7 \\
10 + 5 \\
40 + 12 &= 40 + 10 + 2 = 52 \\
&
\end{align*}
\]

**Subtraction**

During the summer term and if children have sufficient understanding they will be introduced to the idea of partitioning and to add which leads into the initial stages of column subtraction ready for transition to Yr3.

**Partitioning**
Children may also learn to partition 2 digit numbers into tens and ones before subtracting but this only works if the ones in the first number are larger than in the number being subtracted to avoid bridging ten.

\[
\begin{align*}
37 - 15 &= 30 - 10 = 20 \\
7 - 5 &= 2 \\
&
\end{align*}
\]

If they have the depth of understanding:

\[
\begin{align*}
30 + 7 \\
- 10 + 5 \\
20 + 2 &= 22 \\
&
\end{align*}
\]

This method becomes much more complex if the start number has fewer ones than the number being subtracted therefore using a number line is more straightforward.

**Multiplication**

**Division**