Types of questioning

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Reception follows the ‘Development Matters’ EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Age related expectations
The calculation policy is organised according to age related expectations as set out in the National Curriculum 2014. It is vital that interventions and appropriate scaffolding is in place to ensure all children can reach age related expectation. Children who are behind will receive immediate support to keep on track.

Providing a context for calculation
It is important that any type of calculation is given a real life context or problem solving approach to help build children’s understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with reasoning problems. This must be a priority within calculation lessons. Choosing a calculation method: Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation; to ensure they select the most appropriate method for the numbers involved. Children use RUCSAC as a strategy to work through problems in a systematic, logical way.
Meeting Expectations in Foundation

<table>
<thead>
<tr>
<th>Addition</th>
<th>Subtraction</th>
<th>Multiplication</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial experiences should involve physical counting with a range of objects.</td>
<td>Initial experiences should involve physical and oral counting backwards with a range of objects and real life situations.</td>
<td>Begin to lay the foundations for multiplying by maximising opportunities when counting.</td>
<td>Sharing: Requires secure counting skills Develops importance of one-to-one correspondence</td>
</tr>
<tr>
<td>E.g.</td>
<td>E.g. fingers, Numicon, pegs, coins, moveable objects</td>
<td>Counting forwards and backwards in 2s</td>
<td>Practical activities involving sharing, distributing cards when playing a game, putting objects onto plates, into cups, hoops etc.</td>
</tr>
<tr>
<td>When children are confident at counting 2 groups of objects, they can begin counting on from a number to find the total. This can be supported by putting objects in a container E.g. pennies in a purse or sweets in a bag.</td>
<td>Use tins and counters. E.g. If we had 8 biscuits and we ate one, how many would be left?</td>
<td>Count back when sausages go bang &amp; pop</td>
<td>Number rhymes counting in 2s,</td>
</tr>
<tr>
<td>Children may also count on using a physical number line.</td>
<td>Use Numicon. E.g. You have a five. Take away one. What do you have left?</td>
<td>Counting in pairs</td>
<td>Grouping Sorting objects into 2’s / 3’s/ 4’s etc. How many pairs of socks are there?</td>
</tr>
<tr>
<td>Combining two groups to make a whole.</td>
<td>Use washing line and spotty cards. E.g. Find a card with one spot and peg it on the line. Find a card with one more spot etc.</td>
<td>How many wheels do we need to make three cars?</td>
<td>There are 10 flower seeds. Plant 2 in each pot. How many pots are needed? Link to table facts: 2, 4, 6, 8, 10.</td>
</tr>
<tr>
<td>Children can fluently recall number bonds to 10.</td>
<td>Use physical number lines E.g. give children a number from 1-10 and ask them to line up in order.</td>
<td>How many wheels to make 6 bikes.</td>
<td>Tim has 12 Lego wheels. How many cars can she make?</td>
</tr>
<tr>
<td>E.g. Sue has 6p. Her Mum gives her 4p. How much does she have altogether? or Sue has 10p she spends 6p, how much does she have left? or Sue has 6p how much more does she need to make 10p altogether?</td>
<td>Use song and rhyme to count back. e.g. 10 speckled frogs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number bonds can be shown as simple number sentences e.g. 10p = 6p + 4p</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20p = 15p + 5p</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use the partitioning diagram as shown above to move into the abstract.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 + 3 = 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 = 6 + 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children can add two single digits where the answer is upto 18.</td>
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</tr>
</tbody>
</table>

- **Division**

Sharing: Requires secure counting skills
Develops importance of one-to-one correspondence

- **Grouping**

Sorting objects into 2’s / 3’s/ 4’s etc. How many pairs of socks are there?

- **Multiplication**

Begin to lay the foundations for multiplying by maximising opportunities when counting.

- **Subtraction**

Counting forwards and backwards in 2s
Number rhymes such as two, four, six, eight, ten fat sausages sizzling in a pan. Count up in 2s to put sausages in pan.

Count back when sausages go bang & pop

Counting in pairs
pairs of children, socks, animal legs, eggs in an egg box.

How many wheels do we need to make three cars?

How many wheels to make 6 bikes.

- **Addition**

Initial experiences should involve physical counting with a range of objects.

E.g.
- Fingers
- Numicon
- Pegs
- Claps or drum beats
- Moveable objects

- **Subtraction as taking away**

Knowledge of 1 more and 1 less.

Use tins and counters. E.g. If we had 8 biscuits and we ate one, how many would be left?

- **Understanding of the difference**

Use washing line or number track to count on, e.g. from 6 to 8

To find the difference between 4 and 7, make lines of each number and count on from the smaller number. What’s the difference between 7 and 4?

Start on a number and find one more and one less.
## Meeting Expectations in Year 1

<table>
<thead>
<tr>
<th><strong>Addition</strong></th>
<th><strong>Subtraction</strong></th>
<th><strong>Multiplication</strong></th>
<th><strong>Division</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue mental strategies using SUMMS.</td>
<td>Continue mental strategies using SUMMS.</td>
<td>Multiplication is related to doubling and counting groups of the same size.</td>
<td>Once children are confident at sharing objects practically they can be encouraged to make simple jottings.</td>
</tr>
<tr>
<td>Children should continue to use physical objects for counting and combining initially.</td>
<td>Number sentences and missing number</td>
<td>From the above pictorial representation:</td>
<td>Initially this could be using physical objects but requiring children to draw the correct number of circles to share between.</td>
</tr>
<tr>
<td>Children need to understand the concept of equality before using the ‘=’ sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as ‘the answer’.</td>
<td>7 - 3 = 4 = 7 - 3</td>
<td>Looking at columns</td>
<td>Next children should be encouraged to make simple drawings to help solve their problems.</td>
</tr>
<tr>
<td></td>
<td>7 - □ = 4</td>
<td>Looking at rows</td>
<td>Checking by counting that all groups are the same.</td>
</tr>
<tr>
<td></td>
<td>□ + □ = 7</td>
<td>2 + 2 + 2 = 4 + 4</td>
<td>E.g.</td>
</tr>
<tr>
<td></td>
<td>□ + □ = 7</td>
<td>4 groups of 2</td>
<td>Sharing – 6 sweets are shared between 2 people. How many do they have each?</td>
</tr>
<tr>
<td>Missing numbers need to be placed in all possible places.</td>
<td>□ = □</td>
<td>2 groups of 4</td>
<td>12 pound coins are shared between 4 people. How many do they have each?</td>
</tr>
<tr>
<td>3 + 4 = □</td>
<td>□ = □</td>
<td>Counting using a variety of practical resources</td>
<td>The number sentence can be modelled alongside. E.g. 12 ÷ 4 = 3</td>
</tr>
<tr>
<td>3 + □ = 7</td>
<td>□ = □</td>
<td>Counting in 2s</td>
<td>Children use physical objects &gt; simple drawings &gt; circle objects</td>
</tr>
<tr>
<td>□ + □ + □ = 7</td>
<td>□ + □ = □</td>
<td>e.g. counting socks, shoes, animal legs...</td>
<td>Counting in 5s</td>
</tr>
<tr>
<td>□ + □ = 7</td>
<td>□ = □</td>
<td>e.g. counting fingers, fingers in gloves, toes...</td>
<td></td>
</tr>
<tr>
<td>□ = □</td>
<td>□ = □</td>
<td>Counting in 10s</td>
<td>Pictures / mark making</td>
</tr>
<tr>
<td></td>
<td>□ = □</td>
<td>e.g. fingers, toes...</td>
<td>There are 5 sweets in one bag. How many sweets are there in 3 bags?</td>
</tr>
<tr>
<td>Draw jumps on numbered number lines to support understanding of the mental method</td>
<td>Find a ‘difference’ by counting up; I have saved 5p. The socks that I want to buy cost 11p. How much more do I need in order to buy the socks?</td>
<td>Use practical and informal written methods to support the subtraction</td>
<td></td>
</tr>
<tr>
<td>Children can create their own jumps using rulers, fingers, pens, bodies etc.</td>
<td>I have 11 toy cars. There are 5 cars too many to fit in the garage. How many cars fit in the garage?</td>
<td>I have 11 pound coins. There are 5 coins too many to fit in the garage. How many coins fit in the garage?</td>
<td></td>
</tr>
<tr>
<td>Use the vocabulary related to addition and symbols to describe and record addition number sentences Recording by - drawing jumps on prepared lines - constructing own lines - Using a 100 square</td>
<td>Use the vocabulary related to subtraction and symbols to describe and record subtraction number sentences Recording by - drawing jumps on prepared lines - constructing own lines - Using a 100 square</td>
<td>Use the vocabulary related to subtraction and symbols to describe and record subtraction number sentences Recording by - drawing jumps on prepared lines - constructing own lines - Using a 100 square</td>
<td></td>
</tr>
</tbody>
</table>
### Meeting Expectations in Year 2

<table>
<thead>
<tr>
<th>Addition</th>
<th>Subtraction</th>
<th>Multiplication</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Continue mental strategies using SUMMS.</strong></td>
<td><strong>Continue mental strategies using SUMMS.</strong></td>
<td><strong>Missing numbers need to be placed in all possible places.</strong></td>
<td><strong>Use multiplication facts to solve missing number problems.</strong></td>
</tr>
<tr>
<td><strong>Continue using a range of equations but with appropriate, larger numbers. E.g.</strong> $13 + 4 = \text{\checkmark}$</td>
<td><strong>Continue using a range of equations as at year 1 but with appropriate numbers. E.g.</strong> $14 + 5 = 20 - \text{\checkmark}$</td>
<td><strong>Find a small difference by counting up</strong> $42 - 39 = 3$</td>
<td><strong>$6 \div 2 = \text{\checkmark}$</strong> $= 6 \div 2$</td>
</tr>
<tr>
<td><strong>Children also need to be confident in bridging through 10.</strong></td>
<td><strong>Children also need to be confident in bridging through 10.</strong></td>
<td><strong>Subtract 9 or 11 by adding 10 and adjusting. Begin to subtract 19 or 21.</strong> $35 - 9 = 26$</td>
<td><strong>$6 \div 3 = \text{\checkmark}$</strong> $= 6 \div 3$</td>
</tr>
<tr>
<td><strong>Partition into tens and ones and recombine as a mental strategy. E.g.</strong> $15 + 13 = 10 + 10 = 20$ $5 + 3 = 8$ $20 + 8 = 28$</td>
<td><strong>Subtract 9 or 11 by adding 10 and adjusting. Begin to subtract 19 or 21.</strong> $35 - 9 = 26$</td>
<td><strong>Double the multiples of 5 up to 50</strong> $15 \times 2 = 30$</td>
<td><strong>There are 20 sweets and 4 friends share them between themselves. How many do they get each?</strong></td>
</tr>
<tr>
<td><strong>Children should be able to partition the 7 to relate adding the 2 and then the 5. Look for practical use of number bonds.</strong> $8 + 7 = \text{\checkmark}$</td>
<td><strong>Use known number facts and place value to subtract</strong></td>
<td><strong>Doubling multiples of 5 up to 50</strong> $15 \times 2 = 30$</td>
<td><strong>Children also need to be taught that if they are not all equal the extra ones must be left as a remainder. E.g.</strong> $21 \div 5 = 4 \text{\checkmark}$ $1$</td>
</tr>
<tr>
<td>Number lines are a good visual model of this.</td>
<td><strong>Use a number line to count up from the smallest number to find the difference.</strong> $32 - 17 = 15$</td>
<td><strong>Partition two digit numbers into tens and ones to multiply.</strong> $13 \times 3 = 10 \times 3 = 30$ $3 \times 3 = 9$ $30 + 9 = 39$</td>
<td><strong>Children begin to use blank number lines</strong></td>
</tr>
<tr>
<td><strong>Add 9 or 11 by adding 10 and adjusting. Begin to add 19 or 21.</strong> $7 + 9 = \text{\checkmark}$</td>
<td><strong>Bridge through 10 where necessary. E.g.</strong> $32 - 17 = 15$</td>
<td><strong>Use doubling to multiply by 2.</strong> $15 \times 2 = 30$</td>
<td><strong>Children begin to use blank number lines</strong></td>
</tr>
<tr>
<td><strong>Children begin to use blank number lines</strong></td>
<td>$3 + 10 + 2 = 15$</td>
<td>$10 + 5$</td>
<td>**21 \div 5 = 4 \text{\checkmark} 1$</td>
</tr>
<tr>
<td><strong>Column addition can be taught when place value is secure. Children are not required to carry using this method yet.</strong> $\begin{array}{c} 2 \quad 3 \ + \quad 1 \quad 4 \ \hline 3 \quad 7 \end{array}$ $\begin{array}{c} 3 \quad 2 \ + \quad 2 \quad 4 \ \hline 5 \quad 6 \end{array}$</td>
<td>$\begin{array}{c} 17 \ + \quad 10 \ + \quad 2 \ \hline 32 \end{array}$</td>
<td>$\text{\checkmark} \downarrow$ <strong>15 \times 2 = 30</strong></td>
<td>[21 \div 5 = 4 \text{\checkmark} 1]</td>
</tr>
</tbody>
</table>
Meeting Expectations in Year 3

**Addition**
- Continue mental strategies using SUMMS.
- Add 9, 19, 29 or 11, 21, 31 by adding 10s and adjusting. E.g.
  \[25 + 19 = 44\]

**Subtraction**
- Continue mental strategies using SUMMS.
- Use counting on to find the difference for most subtractions using number lines.
  \[103 - 87 = 16\]

**Multiplication**
- Arrays and repeated addition
  - An array
    \[
    \begin{array}{c}
    \text{\( \text{\(2 \times 4\)}\)}
    \\
    \text{\( \text{\(4 + 4\)}\)}
    \end{array}
    \]
  - Repeated addition
    \[
    \begin{array}{c}
    \text{\( \text{\(2 + 2 + 2 + 2\)}\)}
    \\
    \text{\( \text{\(8\)}\)}
    \end{array}
    \]

**Division**
- Count in groups.
  - How many 5s in 15?
    \[
    \begin{array}{c|c}
    1 \times 5 & 5 \\
    2 \times 5 & 10 \\
    3 \times 5 & 15 \\
    \hline
    15 \div 5 & 3 \\
    \hline
    \end{array}
    \]
- Ensure children are secure with grouping. Children also need to be taught that if groups are not all equal the extra ones must be left as a remainder. E.g.
  \[21 \div 5 = 4 \text{ r} 1\]
- Use short division to divide TU by U with remainders.
  \[52 \div 4 = 13\]
### Meeting Expectations in Year 4

#### Addition

- **Continue mental strategies using SUMMS.**
- **Expanded Addition**
  
  \[
  \begin{array}{c}
  625 + 48 \\
  600 + 20 + 5 \\
  600 + 60 + 13 = 673
  \end{array}
  \]
  
  Add in context of money to 2 decimal places. £2.50 + £1.75
  
  \[
  \begin{array}{c}
  £2 + 50 \\
  £1 + 70 + 5 \\
  £3 + £1.20 + 5 = £4.25
  \end{array}
  \]
  
  **Formal column addition with numbers to 1000.**
  
  \[
  \begin{array}{c}
  7187 \\
  + 635 \\
  7122
  \end{array}
  \]
  
  Add numbers up to 2 decimal places in context of measures.
  
  \[
  \begin{array}{c}
  23.42 \\
  + 3.78 \\
  27.20
  \end{array}
  \]
  
  Continue to use number line when working with time & temperature. E.g. A TV show starts at 9:35 and lasts 1 hour 35 minutes. What time does it end?

#### Subtraction

- **Continue mental strategies using SUMMS.**
- **Number lines to support ‘counting on’ method to larger numbers.** E.g. 705 - 287 = 418
  
  \[
  \begin{array}{c}
  13 + 400 + 5 = 418
  \end{array}
  \]
  
  **Extend to decimals to 1 decimal place.** E.g. 4.3 - 2.8 = 1.5
  
  \[
  \begin{array}{c}
  0.2 + 1 + 0.3 = 1.5
  \end{array}
  \]
  
  **Subtract decimals in context of money.** See Year 3 example.
  
  **Formal column subtraction**
  
  Begin without decomposition.
  
  \[
  \begin{array}{c}
  487 \\
  - 234 \\
  253
  \end{array}
  \]
  
  Continue to use number line when working with time.

#### Multiplication

- **Extend grid method to include HTU x U and TU x TU.** E.g. 246 x 8 and 72 x 38
  
  \[\text{Extend grid method to include HTU x U and TU x TU.}
  \]
  
  **Multiply decimals to 1 decimal place using grid method.**
  
  \[
  \begin{array}{c|c|c}
  32 & 23 \\
  \hline
  3 & 1 & 1 \\
  \end{array}
  \]
  
  Extend to decomposition where appropriate.
  
  \[
  \begin{array}{c}
  432 \text{'2} \\
  - 214 \\
  218
  \end{array}
  \]
  
  **Formal short multiplication**
  
  \[
  \begin{array}{c|c|c}
  32 & 23 \\
  \hline
  3 \times 7 & 161 \\
  \end{array}
  \]
  
  **Keep internal remainders lower than 10 because this is a short division method for what should be a long division.**

#### Division

- **Short Division**
  
  \[
  \begin{array}{c}
  69 \div 3 = 23 \\
  \end{array}
  \]
  
  **Short Division with end remainders**
  
  \[
  \begin{array}{c|c|c}
  94 & 31 \text{ r1} \\
  \hline
  3 \text{ r1} \\
  \end{array}
  \]
  
  **Short Division with internal remainders**
  
  \[
  \begin{array}{c|c|c}
  73 & 24 \text{ r1} \\
  \hline
  241 \text{ r1} \\
  \end{array}
  \]
  
  **Extend to ThHTU ÷ TU**
  
  \[
  \begin{array}{c|c}
  3665 & 1511 \\
  \hline
  1576615 \\
  \end{array}
  \]
  
  Children may write out the multiplication tables of the divisor.

  **Keep internal remainders lower than 10 because this is a short division method for what should be a long division.**
### Meeting Expectations in Year 5

<table>
<thead>
<tr>
<th>Addition</th>
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<th>Multiplication</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue mental strategies using SUMMS.</td>
<td>Use mental methods where possible to add.</td>
<td>Continue mental strategies using SUMMS.</td>
<td>Short Division with internal remainders</td>
</tr>
<tr>
<td>Use mental methods where possible to add. Continue to use column addition up to ThHTU. Add several numbers with different numbers of digits. E.g. Find the total of 442, 1786, 25</td>
<td>Formal column subtraction with decomposition.</td>
<td>Multiply two multiples of 10 fluently. E.g. 30 (\times) 60 = 18000 20 (\times) 60 = 1200</td>
<td>Divide decimal numbers where some questions are in a worded context. E.g. 5 cleaners earn £350.50 in one day. How much does one cleaner earn in one day? 350.50 ÷ 5</td>
</tr>
<tr>
<td>Add several numbers with different numbers of digits. E.g. Find the total of 442, 1786, 25</td>
<td>Add decimals with different numbers of digits with either 1 or 2 decimal places. Decimals must line up. E.g. 14.75 + 12.8 = 27.55</td>
<td>Multiply whole numbers and decimals by 10, 100 and 1000 fluently. E.g. 23 (\times) 100 = 45 (\times) 10 = 3.6 (\times) 100 = 3.87 (\times) 1000 =</td>
<td>E.g. We have 7.59kg of cookies. A small bag of cookies weighs 0.36kg. How many bags of cookies can we fill? 7.59 ÷ 0.36 =</td>
</tr>
<tr>
<td>1 (\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quadr...</td>
<td></td>
<td>Always make the divisor into a whole number by using a multiple of 10 e.g. 10, 100, 1000. Whole numbers are easier to divide by. 0.36 (\times) 100 = 36 Adjust the numerator by multiplying using the same multiple of 10. 7.59 (\times) 100 = 759 Now calculate 759 (\div) 36 = 21 r3</td>
<td></td>
</tr>
<tr>
<td>Add decimals with different numbers of digits with either 1 or 2 decimal places.</td>
<td>Number line to support counting on with decimals with different numbers of digits with either 1 or 2 decimal places. E.g. 14.24 – 8.7 = 5.54</td>
<td>Move to formal column subtraction E.g. 14.24 – 8.7 = 5.54</td>
<td>We can only fill 21 bags.</td>
</tr>
<tr>
<td>Continue to use number line when working with time &amp; temperature. E.g. The average temperature in March is 5°C and in July it is 27°C. What is the difference between the two? 27 - 5 = 22</td>
<td>Use formal methods to subtract ThHTU from ThHTU.</td>
<td>Use formal methods to subtract decimals from decimals with up to 2 decimal places.</td>
<td></td>
</tr>
<tr>
<td>Continue to use number line when working with time &amp; temperature. E.g. The average temperature in March is 5°C and in July it is 27°C. What is the difference between the two? 27 - 5 = 22</td>
<td>Use formal methods to subtract ThHTU from ThHTU.</td>
<td>Use formal methods where numbers include multiple zeros. E.g. 2000 - 1542 = £20.00 - £12.65=</td>
<td></td>
</tr>
<tr>
<td>Continue to use number line when working with time &amp; temperature. See Year 4 for example of time.</td>
<td>Use formal methods to subtract decimals from decimals with up to 2 decimal places.</td>
<td>Continue to use number line when working with time &amp; temperature.</td>
<td>Use rounding remainders appropriately. We can only fill 21 bags.</td>
</tr>
</tbody>
</table>
### Meeting Expectations in Year 6

#### Addition
- Continue mental strategies using SUMMS developing fluency and speed.
- Add numbers up to 10,000,000 and decimals with different numbers of digits with up to three decimal places. E.g. 564,765 + 265,876 = 830,641 and 212.765 - 126.4 = 86.365
- Begin to add numbers including negatives, always in context. E.g. -5°C + 9°C = 4°C and -9°C + 15°C = 6°C
- Reason with formal written method using missing numbers.

<table>
<thead>
<tr>
<th>7</th>
<th>1</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Including decimals.

<table>
<thead>
<tr>
<th>1</th>
<th>4.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>1.8</td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

Continue to use number line when working with time & temperature. See Years 3 and 4 for examples.

#### Subtraction
- Continue mental strategies using SUMMS developing fluency and speed.
- Subtract numbers up to 10,000,000 and decimals with different numbers of digits with up to three decimal places. E.g. 564,765 - 265,876 = 298,889 and 212.765 - 126.4 = 86.365
- Begin to subtract numbers including negatives, always in context. E.g. 5°C - 9°C = -4°C and 9°C - 15°C = -6°C
- Reason with formal written method using missing numbers.

<table>
<thead>
<tr>
<th>4</th>
<th>8</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Including decimals.

<table>
<thead>
<tr>
<th>1</th>
<th>4.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>0.7</td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Multiplication
- Formal short multiplication
  - 32 x 3 = 96
  - 23 x 7 = 161

#### Division
- Formal short division with remainders represented as fractions and decimals.
  - 946 ÷ 7 = 135.142857
  - 946 ÷ 8 = 118.25

- Formal long multiplication
  - 72 x 38 = 2736

- Formal long division with remainders represented as fractions and decimals.
  - 168712 ÷ 16 = 10544.8
  - 8712 ÷ 16 = 544 r8 or 544 ½ or 544.5

- Multiplying Decimals
  - Multiply decimals by decimals and whole numbers.

- Children can cross out numbers they have used to avoid confusion. When multiplying, carry at the top but when adding, carry at the bottom.

- Continue to use number line when working with time & temperature.
### Fractions Years 2 - 5

<table>
<thead>
<tr>
<th>Meeting Expectation in Year 2</th>
<th>Meeting Expectation in Year 3</th>
<th>Meeting Expectation in Year 4</th>
<th>Meeting Expectation in Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify one half of a shape given in a range of pictorial representations.</td>
<td>Adding fractions with common denominators</td>
<td>Adding fractions with common denominators</td>
<td>Adding and subtracting fractions with common denominators</td>
</tr>
<tr>
<td>[Image of fractions]</td>
<td>Identify what must be added to a fraction to make 1 whole one. E.g. (\frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1)</td>
<td>Continue to practice addition of fractions with the same denominator.</td>
<td>See Year 4 to add and subtract fractions with common denominators. Give answers as mixed numbers. E.g. (\frac{4}{6} + \frac{5}{6} = \frac{9}{6} = 1\frac{3}{6})</td>
</tr>
<tr>
<td>(\frac{1}{2}) means one out of every 2.</td>
<td>[Image of fractions]</td>
<td>Subtracting fractions with the same denominator.</td>
<td>Extend to add and subtract fractions with different denominators, including simplification.</td>
</tr>
<tr>
<td>Identify one quarter of a shape given in a range of pictorial representations.</td>
<td>One whole on is where the numerator and denominator are the same.</td>
<td>Adding fractions when the whole is bridged, (\frac{4}{6} + \frac{5}{6} = \frac{9}{6})</td>
<td>(\frac{2}{3} + \frac{5}{9} =)</td>
</tr>
<tr>
<td>[Image of fractions]</td>
<td>Extend to the addition of fractions with the same denominator. Not bridging the whole.</td>
<td></td>
<td>(\frac{6}{9} + \frac{5}{9} = \frac{11}{9} = 1\frac{2}{9})</td>
</tr>
<tr>
<td>Halve a set of objects or amount of money by sharing.</td>
<td>(\frac{1}{7} + \frac{5}{7} = \frac{6}{7})</td>
<td>Finding fractions of quantities. E.g. (\frac{2}{5}) of 10 = 4</td>
<td>Multiply a single fraction by a whole number</td>
</tr>
<tr>
<td>[Image of candies]</td>
<td>When denominators are the same, we can simply add the numerators.</td>
<td></td>
<td>(5 \times \frac{1}{4} = \frac{5}{4} = 1\frac{1}{4})</td>
</tr>
<tr>
<td>Share this money between 2 children. How much do they get each?</td>
<td>[Image of fractions]</td>
<td>When denominators are the same, we can simply add the numerators.</td>
<td>Multiply a mixed number by a whole number. Begin with a pictorial method.</td>
</tr>
<tr>
<td>[Image of candies]</td>
<td>(10 \div 5 = 2)</td>
<td>Rule: Divide by the denominator then multiply by the numerator. Divide by the bottom then times by the top.</td>
<td>(3 \times 2\frac{2}{3} = 6\frac{6}{3} = 8)</td>
</tr>
<tr>
<td></td>
<td>(2 \times 2 = 4)</td>
<td>Use models and images to support. Use concrete objects to begin then move to pictorial and abstract.</td>
<td>Extend to a formal written method.</td>
</tr>
</tbody>
</table>
### Fractions Year 6

#### Addition

Formal written methods for addition. Find common denominators using table facts and common multiples.

Here, 28 is a common multiple of 4 and 7.

\[
\frac{3}{4}x^7 + \frac{2}{7}x^4 = \frac{21}{28} + \frac{8}{28} = \frac{29}{28} = 1\frac{1}{28}
\]

Extend to the addition of mixed numbers. Convert mixed numbers to improper fractions before addition.

\[
1\frac{1}{4} + \frac{2}{7} = \frac{5}{4}x^7 + \frac{2}{7}x^4 = \frac{35}{28} + \frac{8}{28} = \frac{43}{28} = 1\frac{15}{28}
\]

Always give answers in their lowest form by finding common factors of numerator and denominators.

\[
\frac{4}{12} = \frac{2}{6} = \frac{1}{3}
\]

Numerator and denominator can be halved.

#### Subtraction


\[
\frac{3}{4}x^7 - \frac{2}{7}x^4 = \frac{21}{28} - \frac{8}{28} = \frac{13}{28}
\]

Notice here, 13 is a prime number and so this fraction cannot be simplified.

Extend to the addition of mixed numbers. Convert mixed numbers to improper fractions before subtraction.

\[
1\frac{1}{4} - \frac{2}{7} = \frac{5}{4}x^7 - \frac{2}{7}x^4 = \frac{35}{28} - \frac{8}{28} = \frac{27}{28}
\]

Always give answers in their lowest form by finding common factors of numerator and denominators.

\[
\frac{4}{12} = \frac{2}{6} = \frac{1}{3}
\]

Numerator and denominator can be halved.

#### Multiplication

Multiplying single fraction by whole number.

Multiply two proper fractions. Begin with a pictorial method.

E.g.

\[
\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}
\]

Once the pupils are confident, extend to a formal written method.

\[
\frac{2}{5} \times \frac{1}{4} = \frac{2 \times 1}{5 \times 4} = \frac{2}{20} = \frac{1}{10}
\]

E.g.

\[
\frac{1}{3} \times \frac{1}{2} = \frac{1}{3 \times 2} = \frac{1}{6}
\]

#### Division

Dividing proper fractions by whole numbers

E.g.

\[
\frac{1}{3} \div 2 = \frac{1}{6}
\]

Children must understand that dividing by a whole number is the same as multiplying by the reciprocal.

E.g.

\[
\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}
\]
### BIG question starters for reasoning opportunities

<table>
<thead>
<tr>
<th>What’s in the empty box?</th>
<th>Give me an example of . . . and another . . .</th>
<th>The answer is . . . , what is the question?</th>
<th>What do you notice about . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ x □ x 6 = 72</td>
<td>A common factor of 66 and 24</td>
<td>Write an addition calculation.</td>
<td>3 + □ = 10 3 + □ = 20 3 + □ = 11</td>
</tr>
<tr>
<td>□ ÷ □ = 3 r 1</td>
<td>A multiple of 3 over 200 (using the rule that multiples of 3 have digits that add to 3, 6 or 9)</td>
<td>Write a mixed number addition calculation.</td>
<td>7 + □ = 10 7 + □ = 20 7 + □ = 11</td>
</tr>
<tr>
<td>6 r 3 □ ÷ 4</td>
<td>A multiple of 6 over 1000 (using the rule that multiples of 6 must be even multiples of 3)</td>
<td>Write a subtraction calculation.</td>
<td>30 + □ = 100 30 + □ = 200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write a mixed number subtraction calculation.</td>
<td>70 + □ = 100 70 + □ = 200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write a calculation with different denominators.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write a multiplication calculation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write a worded problem involving pizza.</td>
<td></td>
</tr>
</tbody>
</table>

**BIG question starters to create reasoning opportunities . . .**

- What is the same / different about . . .
- Which of these numbers/calculations are trickier? Why?
- Do you agree or disagree that . . .
- Is it always/sometimes/never true that . . .
- What do you notice about . . .
- Give me an example of . . . and another . . .
- Spot the mistake . . . explain the mistake
- What couldn’t it be? What could it be?
- Give me a silly suggestion for . . .
- Convince me that . . .
- Prove by drawing/using dienes/using algebra that . . .
- What comes next . . . What came before?
- The answer is . . ., what’s the question?
- What’s in the empty box?
- If we know . . . what else do we know?
- Spot the pattern, explain the pattern.
- Find an equivalent for . . .
- Can I change the order I do this in?
- Can you make up a story/real situation for this maths?

**Question to check understanding . . .**

- Can you explain how you know that?
- Why must that be the correct answer?
- How do you know that?
- Are you sure you’re correct?

---

If there’s anything better than one empty box, it’s two! This opens up children to multiple possibilities so that there’s not just one right answer.

36 is a multiple of 3 because 3+6=9. So, 360 is a multiple of 3. Why? What about 213?

Use what you know to write a multiple of 6 greater than 1000 ending in a 2. e.g. 4302

Children are able to challenge themselves to create complex calculations or more comfortable ones.

Add parameters e.g. Your questions must contain . . .

Focus this on an area of maths you have been teaching such as: number bonds, fractions, decimals, percentages, multiplication, division . . .

For example, when probed to say, ‘If you know 3 + 7 = 10, what else do you know?’ They should reply with answers, such as 13 + 7 = 20 or 4 + 7 = 11. I know that 3 + 7 = 10 and 4 is one more than 3. The answer must be 11.

Children make connections by using what they do know and applying it to a problem to find what they don't.
### Types of questioning

<table>
<thead>
<tr>
<th>Starter questions</th>
<th>Questions to stimulate mathematical thinking</th>
<th>Assessment questions</th>
<th>Final discussion questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>These take the form of open-ended questions which focus the children’s thinking in a general direction and give them a starting point.</td>
<td>These questions assist children to focus on particular strategies and help them to see patterns and relationships. The questions can serve as a prompt when children become ‘stuck’. (Teachers are often tempted to turn these questions into instructions, which is far less likely to stimulate thinking and removes responsibility for the investigation from the child).</td>
<td>Questions such as these ask children to explain what they are doing or how they arrived at a solution. They allow the teacher to see how the children are thinking, what they understand and what level they are operating at. Obviously they are best asked after the children have had time to make progress with the problem, to record some findings and perhaps achieved at least one solution.</td>
<td>These questions draw together the efforts of the class and prompt sharing and comparison of strategies and solutions. This is a vital phase in the mathematical thinking processes. It provides further opportunity for reflection and realisation of mathematical ideas and relationships. It encourages children to evaluate their work.</td>
</tr>
<tr>
<td><strong>Examples:</strong></td>
<td><strong>Examples:</strong></td>
<td><strong>Examples:</strong></td>
<td><strong>Examples:</strong></td>
</tr>
<tr>
<td>How could you sort these......?</td>
<td>What is the same?</td>
<td>What have you discovered?</td>
<td>Who has the same answer/ pattern/ grouping as this?</td>
</tr>
<tr>
<td>How many ways can you find to ......?</td>
<td>What is different?</td>
<td>How did you find that out?</td>
<td>Who has a different solution?</td>
</tr>
<tr>
<td>What happens when we ......... ?</td>
<td>Can you group these .... in some way?</td>
<td>Why do you think that?</td>
<td>Are everybody’s results the same?</td>
</tr>
<tr>
<td>What can be made from....?</td>
<td>Can you see a pattern?</td>
<td>What made you decide to do it that way?</td>
<td>Why/why not?</td>
</tr>
<tr>
<td>How many different ...... can be found?</td>
<td>How can this pattern help you find an answer?</td>
<td>What else do you know now?</td>
<td>Have we found all the possibilities?</td>
</tr>
<tr>
<td></td>
<td>What do think comes next? Why?</td>
<td>How do you know that?</td>
<td>How do we know?</td>
</tr>
<tr>
<td></td>
<td>Is there a way to record what you’ve found that might help us see more patterns?</td>
<td></td>
<td>Have you thought of another way this could be done?</td>
</tr>
<tr>
<td></td>
<td>What would happen if....?</td>
<td></td>
<td>Do you think we have found the best solution?</td>
</tr>
</tbody>
</table>