Garlinge Primary School and Nursery

Progression towards a Standard Method of Calculation
(Articles 2, 28, 29)

This policy is based on national expectations as outlined in the 2014 National Curriculum

Garlinge Primary School and Nursery is a Rights Respecting School. As part of our commitment to the UN Convention on the Rights of a Child, please find links to the *Articles* throughout this policy. Details of the *Articles* can be found on the school website.

Introduction

The 2014 National Curriculum provides a structured and systematic approach to the teaching of calculation. The aim is for mental calculations and written procedures to be performed efficiently, fluently and accurately with understanding. Procedures and understanding are to be developed within each year group. End of key stage expectations are explicit in the programme of study.

At Garlinge Primary School and Nursery we have a consistent approach to the teaching of written calculation methods in order to ensure continuity and progression across the school.

Age Related Expectations

This calculation policy is organised according to age appropriate expectations as set out in the National Curriculum 2014. At times, some pupils may require consolidation of skills from earlier year groups. If pupils are exceeding, enrichment and further development opportunities will be taught.

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. It is also important for children to be confident to use mental and written strategies to explain their thinking**.** This must be a priority within calculation lessons**.** Written methods need to be viewed as tools to enable children to solve problems and record their thinking in an organised way.

Aims

Children should be able to use an efficient method, mental or written appropriate to the given task, with understanding. By the end of year 6, children will have been taught, and be secure with, a compact standard method for each operation.

To develop efficient written calculation strategies children need:

- Secure mental methods which are developed from early years
- A solid understanding of the number system
- Practical hands on experience including a range of manipulatives
- Visual models and images including number lines and arrays
- Experience of expanded methods to develop understanding and avoid rote learning
- Secure understanding of each stage before moving onto the next.

Before carrying out a calculation, children will be encouraged to consider:

- Can I do it in my head? (using rounding, adjustment)
- The size of an approximate answer (estimation)
- Could I use jottings to keep track of the calculation?
- Do I need to use an expanded or compact written method?

Pre -requisite Skills for Written Calculations

Addition (Appendix 1) and Subtraction (Appendix 2):

- Do they know all the addition and subtraction facts for all numbers to 20?
- Do they understand place value and can they partition and then re-partition numbers?
- Can they add three single digit numbers mentally?
- Can they add and subtract any pair of two digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?

Multiplication (Appendix 3) and Division (Appendix 4):

- Do they know the 2, 5 and 10 times tables and corresponding division facts?
- Do they know the result of multiplying by 1 and 0?
- Do they understand 0 as a place holder?
- Can they multiply two and three digit numbers by 10 and 100?
- Can they double and halve two digit numbers mentally?
- Can they use multiplication and division facts they know to derive mentally other multiplication and division facts that they do not know?
- Can they explain their mental strategies orally and record them using informal jottings?

Fractions (Appendix 5):

- Do they understand a fraction as being part of a whole?
- Can they recognise, find name and write fractions?
- Can they compare and order fractions?
- Can they recognise and show, using diagrams, families of common equivalent fractions?

It is vitally important that children's mental methods of calculation continue to be practised and secured alongside their learning and use of an efficient written method for each operation.

A Pathway to Teaching Calculation Methods

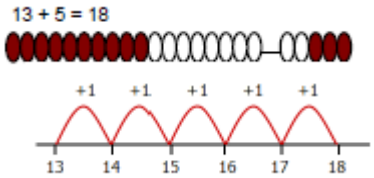
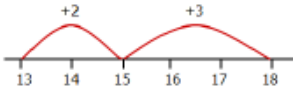
Expanded methods should be viewed as steps towards a standard method and not as methods in themselves. Before beginning to record in a more refined written format children must have had significant practical work reinforced with appropriate manipulative, models and images.
Teachers will guide pupils to refine their written methods of recording by modelling and asking questions such as "What is the same? What's different?"
Learning will be planned to ensure pupils are encouraged to use and apply what they have learnt to problem solving tasks.

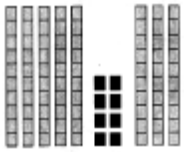
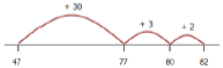
Point to note: *Teachers should refer to the programme of study for key vocabulary for each year group.*

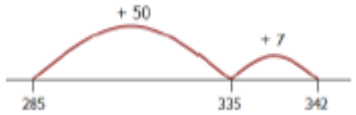
CALCULATION POLICY APPENDICES

Addition (Appendix 1)

<table>
<tr><td>Statutory Expectations</td><td colspan="5"><u>Year R</u></td><td>Rapid Recall/Mental Calculations</td><td>Non-Statutory Guidance</td></tr>
<tr><td>Count … from 1-20 …
and say which no. is
1 more than a given no. Using quantities objects, + two O nos and count on to find the answer.
[Expected] Estimate no. of objects; check quantities by counting up to 20.
[Exceeding]</td><td colspan="2">Pictures/Objects Might be recorded:
I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether?
  </td><td colspan="2">Symbolic
8 people are on the bus. 5 more get on at the next stop.
How many people are on the bus now
[Might be recorded as: 8 + 5 = 13]
  </td><td>Practical or recorded using ICT.
Hannah … listed how many girls and how many boys were outside. [She] was able to say that “There are 5 girls and 4 boys. That’s 9 altogether”.
When playing in the shop Christopher used his shopping list to add 2 amounts. He said “the beans are 5 pence and the bananas are 3 pence, altogether that is 8 pence.”

[EYFS Profile exemplifications, STA]</td><td>Rapid recall of numerals.
Recall numbers to 20.
Counting on.
Rote counting.</td><td></td></tr>
<tr><td>Statutory Expectations</td><td colspan="5"><u>Year 1</u></td><td>Rapid Recall/Mental Calculations</td><td>Non-Statutory Guidance</td></tr>
<tr><td>Add (and subtract) one-digit and two-digit numbers to 20 (9 + 9, 18 - 9), including zero
Read/write/interpret statements involving addition (+), subtraction (-) and equals (=) signs.</td><td>Pupils use concrete objects and pictorial representations (e.g. place value counters, Dienes)
Problems should include terms: put together, add, altogether, total, take away, distance between, more than and less than, so pupils develop concept of +/- and use operations flexibly.</td><td>Practical/recorded using ICT
Pictures/Symbolic (see above)</td><td>Visual
(modelled using bead strings)
  </td><td>Visual (efficient jumps)
13 + 5 = 18
[jumps may be in 1s]
  </td><td>Use known facts/partitioning
8 + 5 = 13
8 + 2 = 10
10 + 3 = 13</td><td>Represent/use number bonds (and related subtraction facts) within 20.
Missing number problems (e.g. 16 = ? + 9)</td><td>Memorise/reason with bonds to 10/20 in several forms (e.g. 9 + 7 = 16; 16 - 7 = 9; 7 = 16 - 9).
Pupils should realise the effect of adding or subtracting zero - establishes +/- as related operations.
Pupils combine and increase numbers, counting forwards and backwards.</td></tr>
</table>

Statutory Expectations	**Year 2**						***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
TO + O **TO + tens** **TO + TO** **O + O + O** [Show addition of two numbers can be done in any order.]	Recognise/use inverse relationship between +/- and use to check calculation and missing number problems. Pupils use concrete objects, pictorial representations and mental strategies. (e.g. place value counters, Dienes)	Practical/visual images 58 + 30 = 88 	Visual (efficient jumps) Counting On 35 + 47= 82  Also jumps can be in tens and ones.	No number line 35 + 47 = 82 47 + 30 = 77 77 + 3 = 80 80 + 2 = 82	Partitioning 35 + 47 = 82 40 + 30 = 70 7 + 5 = 12	Recording addition in columns supports place value and prepares for formal written methods with larger numbers. 47 + 35 = 82 40 + 7 30 + 5 70 + 12	Recall and use addition facts to 20 fluently. Derive and use related facts up to 100. Solve problems by applying increasing knowledge of mental methods.	Pupils extend understanding of the language of + to include sum. Practise + to 20 to derive facts such as using 3 + 7 = 10 to calculate 30 + 70 = 100, 100 - 70 = 30 and 70 = 100 - 30. Check calculation, including by adding numbers in a different order to check +. Establishes commutativity and associativity of addition.

Statutory Expectations	**Year 3**				***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Use **formal** written methods of **columnar addition**. **TO + TO** **HTO + TO** **HTO + HTO**	Number line 57 + 285 = 342 	No number line 57 + 285 = 342 285 + 50 = 335 335 + 7 = 342	Compact vertical 374 + 248 622	Estimate answers and use inverse to check.	HTO + O; HTO + tens HTO + hundreds Use number facts and place value to solve problems. *For mental calculation with TO nos, answers could be >100.*	

Statutory Expectations	**Year 4**				***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Use formal written methods of columnar addition. **HTO + HTO** **ThHTO + HTO** **ThHTO + ThHTO**	Estimate and use inverse operations to check answers to a calculation. Estimate, compare and calculate different measures, including money in pounds and pence.	789 + 642 = 1431 7 8 9 + 6 4 2 1 4 3 1 1 1	5735 + 562 = 6297 5735 + 562 6297 1	Solve addition two-step problems in contexts, deciding which operations and methods to use & why. Solve simple measure and money problems involving fractions and decimals to 2dp	Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.	Pupils build on their understanding of place value and decimal notation to record metric measures, including money.
Statutory Expectations	**Year 5**				***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Add whole numbers >4 digits, including using formal written methods (columnar addition). Decimals up to 2dp (e.g. 72.5 + 45.7)	Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.	Solve problems involving number up to 3dp. Solve problems involving converting between units of time. *[Measurement]* Use all four operations to solve problems involving measure [e.g. length, mass, volume, money] using decimal notation including scaling. *[Measurement]*	Compact vertical 23.70 + 48.56 72.26 1 1	Pupils practise adding decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1.	Add numbers mentally with increasingly large numbers (e.g. 12462 + 2300 = 14762). *Pupils mentally add tenths, and one-digit whole numbers and tenths.*	They extend their knowledge of fractions to thousandths and connect to decimals and measures. Pupils should go beyond the measurement and money models of decimals (e.g. by solving puzzles.

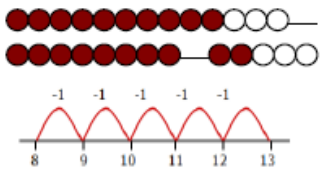
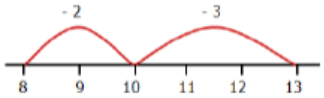
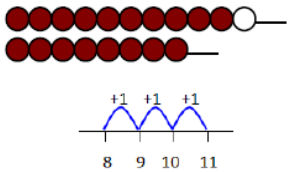
Statutory Expectations	**Year 6**					***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3dp (Context: Measures)	Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.	Use knowledge of the order of operations to carry out calculations involving subtraction.	Solve problems which require answers to be rounded to specified degrees of accuracy. [*Fractions*] Solve problems involving the calculation and conversion of units of measure, using decimal notation to 3dp where appropriate. [*Measurement*]	Expanded vertical 3.243 + 18.070 = 21.313 3.243 + 18.070 0.003 0.110 0.200 21.000	Compact vertical 3.243 + 18.070 21.313 1 1	Perform mental calculations, including with mixed operations and large numbers. Using the number line, pupils add positive and negative integers for measures such as temperature.	Pupils develop skills of rounding/estimating to predict/check order of magnitude of answers to decimal calculation. Includes rounding answers to a degree of accuracy & checking reasonableness.

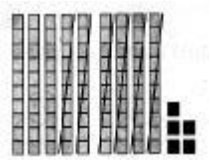
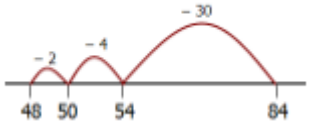
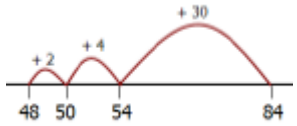
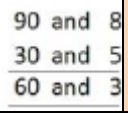
Subtraction (Appendix 2)

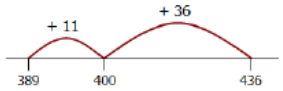
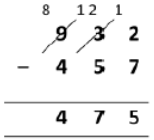
Year R

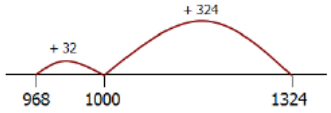
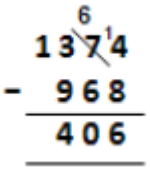
Statutory Expectations	Practical or recorded using ICT.	Pictures/Objects	Symbolic	*Rapid Recall/Mental Calculations*	*Non-Statutory Guidance*
Count … from 1-20 … and say which no. is 1 less than a given no. Using quantities objects, subtract two O nos and count back to find the answer. [Expected] Estimate no. of objects; check quantities by counting up to 20. [Exceeding]	Chloe was playing in the maths area. "I need three more" she said as she added some cubes to the circle. She then realised she had more than her friend. "Oh, I have too many". She removed one. "Now we have the same". During a game of skittles outdoors Joseph knocked three numbered skittles down. He was able to calculate his score in his head. [EYFS Profile exemplifications, STA]	I have five cakes. I eat two of them. How many do I have left? [Might be recorded as: 5 – 2 = 3] 	Mum baked 9 biscuits. I ate 5. How many were left? [Might be recorded as: 9 – 5 = 4] 	Rapid recall of numerals. Recall numbers to 20. Counting back Rote counting backwards.	

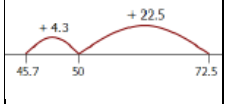
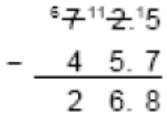
Year 1

Statutory Expectations	Practical or recorded using ICT.	Taking away – jumps of 1	Taking away (efficient jumps)	Counting on – jumps of 1	Counting on	*Rapid Recall/Mental Calculations*	*Non-Statutory Guidance*
Subtract (and add) one-digit and two-digit numbers to 20 (9 + 9, 18 - 9), including zero Read/write/interpret statements involving addition (+), subtraction (-) and equals (=) signs	Pupils use concrete objects and pictorial representations (e.g. place value counters, Dienes)	(modelled using bead strings) 13 – 5 =8 	13 – 5 = 8 No number line:  13 – 3 = 10 10 – 2 = 8	(modelled using bead strings) 11 – 8 = 3 	(efficient jumps) With, or without, number line 8 + 2 = 10 10 + 1 = 11	Represent/use number bonds and related subtraction facts within 20. Problems should include terms: put together, add, altogether, total, take away, distance between, more than and less than, so pupils develop concept of +/- and use operations flexibly. Missing number problems (e.g. 7 = ? – 9)	Memorise/reason with bonds to 10/20 in several forms (e.g. 9 + 7 = 16; 16 - 7 = 9; 7 = 16 - 9). Pupils should realise the effect of adding or subtracting zero - establishes +/- as related operations. Pupils combine and increase numbers, counting forwards and backwards.

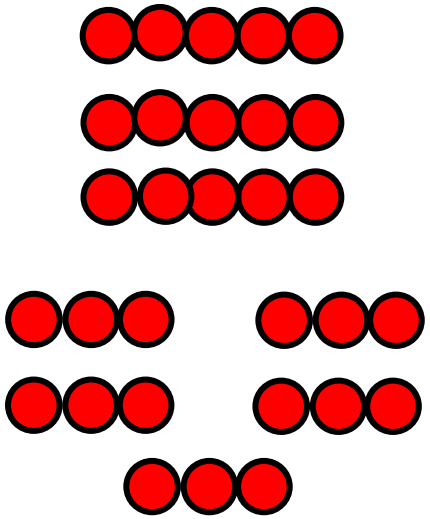
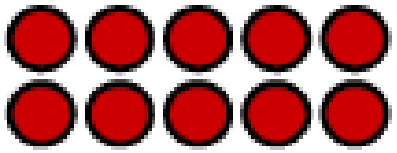
Statutory Expectations	**Year 2**						***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
TO - O **TO - tens** **TO - TO** [Show subtraction of two numbers cannot be done in any order.]	Recognise/use relationship between+/- to check calculations and missing number problems. Pupils use concrete objects and pictorial representations and mental strategies (e.g. place value counters, Dienes)	Practical/visual images 95 - 60 = 35 	Taking away Counting Back 84 - 36 = 48  Also jumps can be in 10s and 1s	Taking away (no number line) 84 - 36 = 48 84 - 30 = 54 54 - 4 = 50 50 - 2 = 48	Counting on 84 - 48 = 36  Also jumps can be in 10s and 1s	Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers. 98 - 35 = 63 	Recall and use subtraction facts to 20 fluently. Derive and use related facts up to 100. Solve problems by applying increasing knowledge of mental methods.	Pupils extend understanding of the language of subtraction to include difference. Practise subtraction to 20 to derive facts such as using 3 + 7 = 10, 10 - 7 = 3 and 7 = 10 - 3 to calculate 30 + 70 = 100, 100 - 70 = 30 and 70 = 100 - 30. Check calculations, including by adding to check subtraction.

Statutory Expectations	**Year 3**					***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Use formal written methods of columnar subtraction. **TO - TO** **HTO - TO** **HTO - HTO**	Counting on 436 - 389 = 47 	Taking away (no number line) 326 - 178 = 148 326 - 100 = 226 226 - 70 = 156 156 - 6 = 150 150 - 2 = 148	874 - 523 = 351 (no decomposition) 	Decomposition 932 - 457 = 475 	Estimate answers and use inverse to check.	HTO - O HTO - tens HTO – hundreds Use number facts and place value to solve problems.	

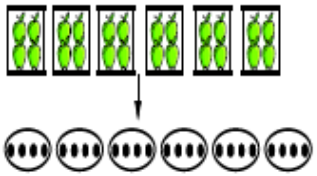
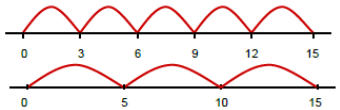
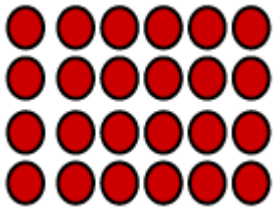
Statutory Expectations	**Year 4**				***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Use formal written methods of columnar subtraction. **HTO - HTO** **ThHTO - TO** **ThHTO - HTO** **ThHTO - ThHTO**	Counting on 1324 - 968 = 356  	Decomposition 1374 - 968 = 406  	Solve subtraction two-step problems in contexts, deciding which operations and methods to use and why. Solve simple measure and money problems involving fractions and decimals to 2dp.	Estimate and use inverse operations to check. Estimate, compare and calculate different measures, including money in pounds and pence.	Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.	Pupils build on their understanding of place value and decimal notation to record metric measures, including money.

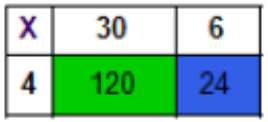
Statutory Expectations	**Year 5**						***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Subtract whole numbers >4 digits, including using formal methods (columnar subtraction). Decimals up to 2dp (e.g. 72.5 - 45.7)	Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. Solve multi-step problems in contexts, deciding which operations/methods to use and why.	Solve problems involving number up to 3dp. [*Fractions*] Solve problems involving converting between units of time. [Measurement] Solve problems involving measure [e.g. length, mass, volume, money] using decimal notation including scaling. [Measurement]	Counting on 72.5 – 45.7 = 26.8  	Taking away (no number line) 72.5 – 45.7 72.5 – 40 = 32.5 32.5 – 5 = 27.5 27.5 – 0.7 = 26.8	Decomposition 72.5 - 45.7 = 26.8  	Pupils practise subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1.	Subtract numbers mentally with increasingly large numbers (e.g. 12462 - 2300 = 10162). Pupils mentally subtract tenths, and one-digit whole numbers and tenths.	They extend their knowledge of fractions to thousandths and connect to decimals and measures. Pupils should go beyond the measurement and money models of decimals (e.g. by solving puzzles.

Statutory Expectations	**Year 6**			***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3dp (Context: Measures)	Use knowledge of the order of operations to carry out calculations involving subtraction. Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.	Solve problems which require answers to be rounded to specified degrees of accuracy. [*Fractions*] Solve problems involving the calculation and conversion of units of measure, using decimal notation to 3dp where appropriate. [*Measurement*]	□ There were 2.5 litres in the jug. Stuart drank 385 ml. How much was left? □ 18.07 km - 3.243 km □ Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.	Perform mental calculations, incl. with mixed operations and large numbers. Using the no. line, pupils subtract positive/negative integers for measures such as temperature.	Pupils develop skills of rounding and estimating to predict/check order of magnitude of answers to decimal calculations. Includes rounding answers to a degree of accuracy & checking reasonableness.

Multiplication (Appendix 3)					
Statutory Expectations	**Year R**			***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Children … solve problems, including doubling, halving and sharing. [Expected] Solve practical problems that involve combining groups of 2/5/10. [Exceeding]	Pictures/Objects How many socks in three pairs? 	Symbolic 3 pairs, 2 socks in each pair: 	<u>Practical/ recorded using ICT (e.g. digital photos / pictures on IWB)</u> How many 10p coins are here? How much money is that? This domino is a double 4. How many spots does it have?	Counting on in 2s, 5s or10s. Double 1 2 3 4 5. Rote counting on and back in 2s, 5s and 10s.	
Statutory Expectations	**Year 1**			***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Solve one-step problems using concrete objects, pictorial representations and arrays *(with the support of the teacher)*	<u>Practical/recorded using ICT</u> <u>Pictures/Symbolic</u> There are five cakes in each bag. How many cakes are there in three bags? 	Visual (e.g. modelled using bead strings) **5** x 3 **or** 3 x **5** [two, three times] or [three groups of two] 	Arrays 5 x 2 or 2 x 5 	Count in multiples of twos, fives and tens . Recognise, find and name a half as one of two equal parts of an object, shape or quantity. 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.	Doubling numbers/quantities Count on/back in 2s, 5s and 10s

<table>
<tr><th>***Statutory Expectations***</th><th colspan="4">**Year 2**</th><th>***Rapid Recall/Mental Calculations***</th><th>***Non-Statutory Guidance***</th></tr>
<tr><td>Calculate statements for multiplication within the multiplication tables and write them using the multiplication and equals signs.

[Show multiplication of two numbers can be done in any order.]</td><td>Pictures/Symbolic
There are four apples in each box.
How many apples in six boxes
  </td><td>Pupils use a variety of language to describe multiplication.</td><td>Repeated addition
5 x 3 or 3 x 5
0 3 6 9 12 15
0 5 10 15
  </td><td>Arrays
6 x 4 or 4 x 6
  </td><td>Recall and use multiplication facts for the 2, 5 and 10 multiplication tables, (including recognising odd and even numbers).

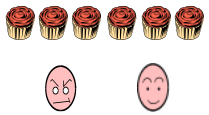
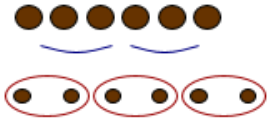
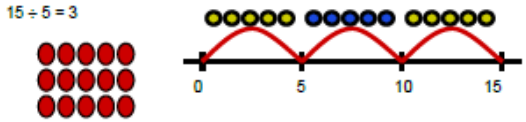
Use commutativity/inverse relations to develop multiplicative reasoning (e.g. 4 × 5 = 20 and 20 ÷ 5 = 4).</td><td>Pupils … practise to become fluent in the 2/5/10 multiplication tables and connect them to each other. They connect the 10x table to place value, and the 5x table to divisions on the clock face. They begin to use other multiplication tables and recall facts, including using related division facts to perform written and mental calculations.</td></tr>
<tr><th>***Statutory Expectations***</th><th colspan="5">**Year 3**</th><th>***Rapid Recall/Mental Calculations***</th><th>***Non-Statutory Guidance***</th></tr>
<tr><td>Write/calculate statements using the multiplication tables that they know (progressing to **formal** written methods).
TO x O
(multiplier is 2/3/4/5/8/10)</td><td>36 x 4 = 144
  </td><td>36 x 4 = 144
30 x 4 = 120
6 x 4 = 24</td><td>36 x 4 = 144
36
x 4
(6 x 4) 24
(30 x 4) 120
144</td><td>36 x 4 = 144
36
x 4
144</td><td>Pupils develop reliable written methods for multiplication, starting with calculations of TO by O (progressing to formal written methods of short multiplication).</td><td>Recall and use multiplication facts for the 3, 4 and 8 multiplication tables.</td><td>Through doubling, they connect the 2/4/8 multiplication tables. Pupils develop efficient mental methods, using commutativity (e.g. 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 & 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, 60 ÷ 3 = 20 & 20 = 60 ÷ 3).</td></tr>
</table>

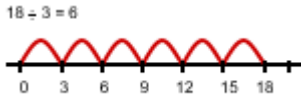
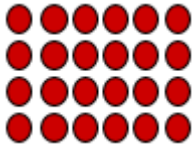
Statutory Expectations	**Year 4**						***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Use **formal** written layout: **TO x O** **HTO x O** Convert between different units of measure [e.g. km to m; hr. to mi]	43 x 6 = 258 (estimate: 40 x 6 = 240) 40 x 6 = 240 3 x 6 = 18	43 x 6 43 x 6 18 (3 x 6) 240 (40 x 6) 258	24 x 6 = 144 2 4 × 6 1 4 4 2	342 x 7 = 2394 x 300 40 2 7 2100 280 14	237 × 4 (estimate: 250 × 4 = 1000) 237 × 4 28 120 800 948	342 x 7 = 2394 3 4 2 × 7 2 3 9 4 2 1	Recall multiplication facts to 12 × 12. Use place value, known & derived facts to multiply mentally, including x by 0/1; x 3 numbers. Recognise/use factor pairs and commutativity in mental calculations. Pupils use multiplication to convert from larger to smaller units.	Practise mental methods and extend this to HTO numbers to derive facts, for example 200 × 3 = 600 into 600 ÷ 3 = 200. Write statements about equality of expressions [e.g. 39 × 7 = 30 × 7 + 9 × 7 and (2 × 3) × 4 = 2 × (3 × 4)]. Combine knowledge of facts and arithmetic rules to solve mental/written calculations (e.g. 2 x 6 x 5 = 10 x 6 = 60).

Statutory Expectations	**Year 5**					***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Use a **formal** written method (including long x for TU nos) **TO x TO** **HTO x O / HTO x TO** **ThHTO x O** Convert between units of measure (e.g. km/m; m/cm; cm/mm; kg/g; litre and ml)	47 x 36 = 1692 (estimate 50 x 40 = 2000)	2741 x 6 = 16446 (estimate 3000 x 6 = 18000	24 x 16 = 384 (estimate 25 x 15 = 375) 24 x16 144 240 384	124 x 26 = 3224 124 X 26 744 2480 3224 11	Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division. This relates to scaling by simple fractions, including those > 1. Find fractions of numbers and quantities, writing remainders as a fraction.	Identify multiples/factors; including finding all factor pairs of a number, & common factors of two numbers. Know/use vocabulary of prime numbers, prime factors and composite (non-prime) nos. Establish if a number up to 100 is prime; recall prime numbers to 19.	Pupils … apply all the x tables frequently, commit them to memory and use them to make larger calculations. They understand the terms factor, multiple/prime, square/cube numbers & use to construct equiv. statements (e.g. 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 9^2 x 10).

						x nos mentally using known facts. Multiply whole numbers and those involving decimals by 10/100/1000.	
Statutory Expectations	**Year 6**					***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Multi-digit numbers (up to 4 digits) x TO whole number using the **formal** method of **long multiplication**. Multiply one-digit numbers with up to two decimal places by whole numbers	124 x 26 = 3224 124 X 26 744 2480 3224 11	4.7 x 8 = 37.6 (estimate 5 x 8 = 40) [Or 47 x 8 then divide the solution by 10.] 4.7 x 8 37.6 5	5.65 x 9 = 50.85 (estimate 6 x 9 = 54) Compute 565 x 9, then divide the solution by 100.	Use a variety of images to support understanding of x with fractions. Use understanding of relationship between unit fractions and ÷ to work backwards by x a quantity that represents a unit fraction to find the whole quantity (e.g. if ¼ of a length is 36cm, whole length 36 × 4 = 144cm). x numbers with up to 2dp by O/TO whole nos (starting with simplest cases e.g. 0.4 × 2 = 0.8, and in practical contexts).		Perform mental calculations, including with mixed operations/large numbers. Identify common factors/multiples and prime numbers. Use knowledge of order of operations to carry out calculations. Use estimation to check answers to calculations and determine an appropriate degree of accuracy. Identify value of each digit to 3dp and x nos by 10/100/1000 (answers to 3dp)	Undertake mental calculation with increasingly large numbers and more complex calculations. Continue to use all x tables to calculate statements in order to maintain their fluency. Explore the order of operations using brackets. Common factors can be related to finding equivalent fractions.

Division (Appendix 4)

<table>
<tr><td>Statutory Expectations</td><td colspan="3"><u>Year R</u></td><td>Rapid Recall/Mental Calculations</td><td>Non-Statutory Guidance</td></tr>
<tr><td>Children … solve problems, including doubling, halving and sharing. [Expected]
They solve practical problems that involve sharing into equal groups. [Exceeding]</td><td>Practical / recorded using ICT (e.g. digital photos/pictures on IWB)</td><td>Pictures/Objects
6 cakes shared between 2
 
6 cakes put into groups of 2
  </td><td>Symbolic
6 cakes shared between 2
 
There are 8 raisins.
Take half of them.
How many do you have?
Share the 10 grapes between 2 people.</td><td>Name half 2 4 6 10</td><td></td></tr>
<tr><td>Statutory Expectations</td><td colspan="3"><u>Year 1</u></td><td>Rapid Recall/Mental Calculations</td><td>Non-Statutory Guidance</td></tr>
<tr><td>Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)</td><td>Practical/recorded using ICT
There are 14 people on the bus. Half of them get off.
How many remain on the bus?
There are 20 people in the class. One quarter are boys. How many boys are there?</td><td>Pictures/Symbolic
How many apples in each bowl if I share 12 apples between 3 bowls?
  </td><td>Visual (modelled using bead strings)
  </td><td>Recognise/find/name ½ as one of two equal parts of an object, shape or quantity.
Recognise/find/name ¼ as one of four equal parts of an object, shape or quantity.</td><td>Find simple fractions of objects, numbers and quantities
Count on/back in 2s, 5s and 10s</td></tr>
</table>

Statutory Expectations	**Year 2**					***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Calculate statements within the multiplication tables and write them using the division and equals signs. [Show division of two numbers cannot be done in any order.] Find ⅓, ¼, ²⁄₄, ¾ of a length/objects/quantity. Write simple fractions e.g. ½ of 6 = 3	Pictures/Symbolic Four eggs fit in a box. How many boxes would you need to pack 20 eggs? 	Pupils use a variety of language to describe division.	Visual (modelled using bead strings) 	Arrays Find ¼ of 24 24 ÷ 4 = 6 	Partitioning 32 ÷ 2 = 16 20 ÷ 2 = 10 12 ÷ 2 = 6	Pictures/Symbolic Four eggs fit in a box. How many boxes would you need to pack 20 eggs?	Pupils use a variety of language to describe division.
Statutory Expectations	**Year 3**					***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Write/calculate statements using the tables that they know (progressing to **formal** written methods). **TU ÷ O** (divisor is 2/3/4/5/8/10)	96 ÷ 4 = 24 20 x 4	Multiples of the divisor) 85 ÷ 5 = 17 10 x 5 = 50 7 x 5 = 35	51 ÷ 3 =17 51 30 (3 x **10**) 21 21 (3 x **7**) 0	51 ÷ 3 = 17 17 3 | 51	Pupils develop reliable written methods for division, starting with calculations of TO by O numbers (progressing to formal written methods of short division).	Recall and use division facts for the 3, 4 and 8 multiplication tables.	Pupils develop efficient mental methods, using commutativity (e.g. 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 & 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, 60 ÷ 3 = 20 & 20 = 60 ÷ 3).

Statutory Expectations	**Year 4**					***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Pupils practise to become fluent in the **formal** written method of **short division** with exact answers [NS] **TO ÷ O; HTO ÷ O**	Multiples of the divisor 98 ÷ 7 = 14 10 x 7 = 70 4 x 7 = 28	98 ÷ 7 = 14 1 4 7 | 9 8 2	252 ÷ 7 = 36 30 x 7 = 210 6 x 7 = 42	252 ÷ 7 = 36 252 210 (7 x 30) 42 42 (7 x 6) 0	252 ÷ 7 = 36 36 7 | 252 2 4	Recall division facts to 12 × 12. Use place value, known/derived facts to ÷ mentally, including ÷ by 1. Find effect of dividing O/TO by 10/100, identifying the value of the digits in the answer as units/tenths/hundredths.	Practise mental methods and extend this to HTO numbers to derive facts, for example 200 × 3 = 600 into 600 ÷ 3 = 200. Relates decimal notation to division of whole number by 10 and later 100.

Statutory Expectations	**Year 5**			***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Use the **formal** written method of **short division** (interpret remainders appropriately for the context). **HTU ÷ O** **ThHTO ÷ O** Convert between units of measure (e.g. km/m; m/cm; cm/mm; kg/g; litre and ml)	432 ÷ 5 = 86 r2 (estimate: 400 ÷ 5 = 80) 8 6 r 2 5 | 4 3 2 3	8520 ÷ 6 = 1420 1420 6 | 8520 2 1	Pupils connect x by a fraction to using fractions as operators (fractions of), and to ÷. This relates to scaling by simple fractions, incl. those > 1. Find fractions of numbers and quantities, writing remainders as a fraction.	Identify multiples/factors, including finding all factor pairs of a number, & common factors of two numbers. Know/use vocabulary of prime numbers, prime factors and composite (non-prime) nos. Establish if a number up to 100 is prime; recall prime numbers to 19. ÷ nos mentally using known facts. Divide whole numbers and those involving decimals by 10/100/1000.	Pupils … apply all the ÷ facts frequently, commit them to memory and use them to make larger calculations. They understand the terms factor, multiple/prime, square/cube numbers & use to construct equivalent statements [e.g. 120 ÷15 = (30 x 4) ÷ 15 = 2 x 4 = 8]

Statutory Expectations	**Year 6**			***Rapid Recall/Mental Calculations***	***Non-Statutory Guidance***
Divide numbers (up to 4 digits) by TO whole number using the **formal** method of **short/long division** (interpret as apron. for the context). Use written division methods in cases where the answer has up to 2dp. [Divide numbers up to 2dp by O/TO whole numbers.]	43.4 ÷ 7 = 6.2 (estimate 42 ÷ 7 = 6) 6 x 7 = 42 0.2 x 7 = 1.4	43.68 ÷ 7 = 6.24 (estimate: 42 ÷ 7 = 6) [Or compute 4368 ÷ 7, then divide the solution by 100.] 6.24 7) 43.68	496 ÷ 11 - (estimate 500 ÷ 10 = 50) Express remainder in different forms. 4 5 r 1 1 1) 4 9 6 5 Answer: $45\frac{1}{11}$ Encourage pupils to record the jottings at the side as an aid e.g. 1x 11 = 11 2 x 11 = 22 3 x 11 = 33 4 x 11 = 44 5 x 11 = 55 However, teachers may use their judgement to decide whether chunking is needed, using multiples of 10 and adjust. Extend to positioning of additional 0's after the decimal point and continue to divide.	Perform mental calculations, including with mixed operations/large numbers. Identify common factors/multiples and prime numbers. Use knowledge of order of operations to carry out calculations. Use estimation to check answers to calculations and determine an appropriate degree of accuracy. Identify value of each digit to 3dp and ÷ nos by 10/100/1000 (answer to 3dp)	Undertake mental calculations with increasingly large numbers and more complex calculations. Continue to use all table facts to calculate statements in order to maintain their fluency. Explore the order of operations using brackets. Common factors can be related to finding equivalent fractions.

Fractions (Appendix 5)

Years 3 and 4

Statutory Expectations

Year 3 - Add and subtract fractions with the same denominator within one whole [for example, 5/7 + 1/7 = 6/7]

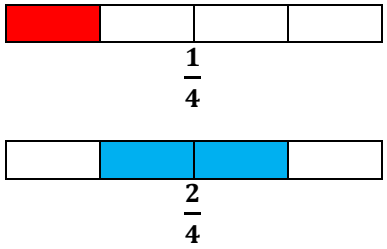
Compare and order unit fractions, and fractions with the same denominators

Solve problems that involve all of the above

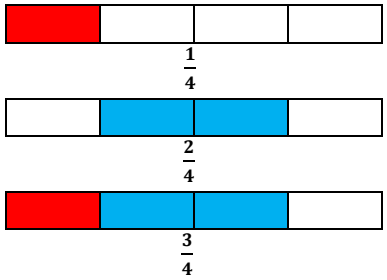
Year 4 - Add and subtract fractions with the same denominator

<u>Adding Fractions</u> - e.g. What is $\frac{1}{4} + \frac{2}{4}$?

1. Visualise the fractions



2. Add the fractions together. The denominators stay the same so just add the numerator



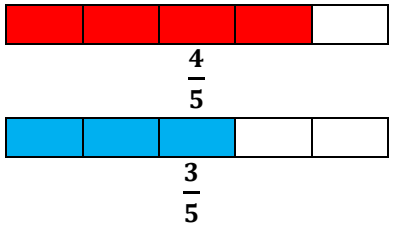
3. Add fractions as numbers

1+2 = 3 so $\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$

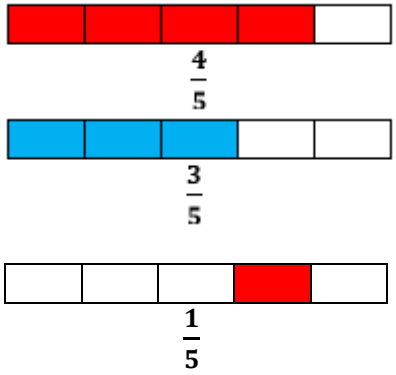
$$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

<u>Subtracting Fractions</u> - e.g. What is $\frac{4}{5} - \frac{3}{5}$?

1. Visualise the fractions



2. Subtract the lowest value from the highest value. The denominator stays the same so just subtract the numerator



3. Subtract fractions as numbers

4 - 3 = 1 so $\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$

$$\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$$

Non-Statutory Guidance

Year 3 *- Pupils practise adding and subtracting fractions with the same denominator through a variety of increasingly complex problems to improve fluency.*

Year 4 *- Pupils continue to practise adding and subtracting fractions with the same denominator, to become fluent through a variety of increasingly complex problems beyond one whole.*

Year 5

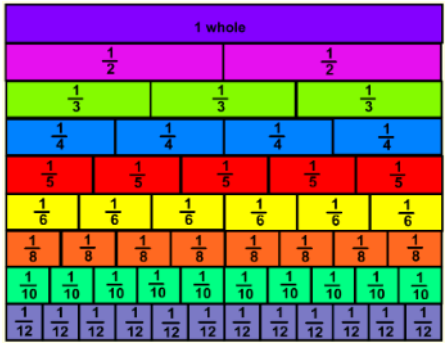
Statutory Expectations

Add and subtract fractions with the same denominator, and denominators that are multiples of the same number

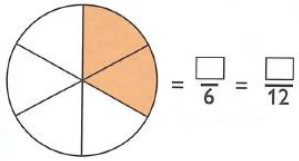
Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
•read and write decimal numbers as fractions [for example, 0.71 = 71/100]

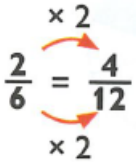
Equivalent Fractions - e.g. $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$

1. Use a fraction wall to find and compare equivalent fractions

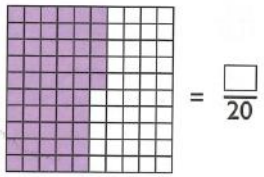


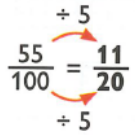
2. Multiply the numerator and denominator by the same common factor to find areas of shaded shapes





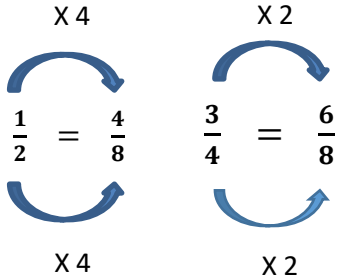
3. Divide the numerator and the denominator by the same common factor to find equivalent fractions





Ordering Fractions - e.g. Order $\frac{7}{8}$ $\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$

1.Find equivalent fractions with common denominators of 8



2. Order the equivalent fractions

$\frac{4}{8}$ $\frac{5}{8}$ $\frac{6}{8}$ $\frac{7}{8}$

3. Return fractions to their original state

$\frac{1}{2}$ $\frac{5}{8}$ $\frac{3}{4}$ $\frac{7}{8}$

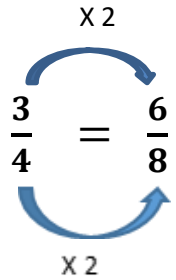
?Non-Statutory Guidance

Pupils practise adding and subtracting fractions to become fluent through a variety of increasingly complex problems. They extend their understanding of adding and subtracting fractions to calculations that exceed 1 as a mixed number.

Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division, building on work from previous years. This relates to scaling by simple fractions, including fractions > 1.

They practise adding and subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1 (for example, 0.83 + 0.17 = 1).

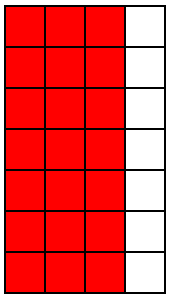
Adding Fractions - e.g. What is $\frac{3}{4} + \frac{5}{8}$?

1. Find a common denominator	2. Add the fractions together	3. Convert to a mixed number
	$\frac{6}{8} + \frac{5}{8} = \frac{11}{8}$	$\frac{11}{8} = 1\frac{3}{8}$

Subtracting Fractions - e.g. What is $4\ \frac{2}{10} - \frac{3}{10}$?

1. Convert mixed number to a fraction	2. Subtract the lower value from the higher value	3. Convert to a mixed number
4 x 10 = 40 + 2 = 42 $4\ \frac{2}{10} = \frac{42}{10}$	$\frac{42}{10} - \frac{3}{10} = \frac{39}{10}$	39 ÷ 10 = $\frac{39}{10} = 3\frac{9}{10}$ $\frac{39}{10} = 3\ \frac{9}{10}$

Multiplying by Fractions - e.g. What is $\frac{3}{4}$ x 7 ?

	1. Multiply the numerator by the whole number. The denominator stays the same.  $\frac{3}{4}$ x 7	2. Multiply the numerator by the whole number 3 x 7 $\frac{3}{4}$ x 7 = $\frac{21}{4}$	3. Convert to a mixed number 21 ÷ 4 = $5\frac{1}{4}$ $\frac{21}{4}$ = $5\frac{1}{4}$	

Year 6

Statutory Expectations

Use common factors to simplify fractions; use common multiples to express fractions in the same denomination

Compare and order fractions, including fractions >1

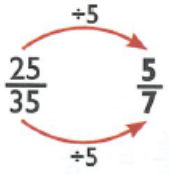
Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, 1/4 × 1/2 = 1/8]

Divide proper fractions by whole numbers [for example, 1/3 ÷ 2 = 1/6]

<u>Simplifying Fractions</u> - e.g. $\frac{25}{35}$

Divide the top and bottom by the biggest number which goes into both (the highest common factor)



<u>Ordering Fractions</u> - e.g. Order $\frac{9}{5}$ $\frac{17}{10}$ $1\frac{1}{5}$

1. Convert any mixed numbers into improper fractions

$1\frac{1}{5} = \frac{5}{5} + \frac{1}{5} = \frac{6}{5}$

2. Find equivalent fractions with the common denominator

$\frac{9}{5} = \frac{18}{10}$

$\frac{6}{5} = \frac{12}{10}$

3. Compare and order

$\frac{12}{10}$ $\frac{17}{10}$ $\frac{18}{10}$

So the order is this:

$1\frac{1}{5}$ $\frac{17}{10}$ $\frac{9}{5}$

<u>Adding Fractions</u> - e.g. What is $\frac{3}{5} + \frac{3}{4}$?

1. Find a common denominator

$\frac{3}{5} = \frac{12}{20}$ *and* $\frac{3}{4} = \frac{15}{20}$

2. Add the fractions together

$\frac{12}{20} + \frac{15}{20} = \frac{27}{20}$

3. Convert to a mixed number

$27 \div 20 = \frac{27}{20}$

$\frac{27}{20} = 1\frac{7}{20}$

<u>Adding Mixed Numbers</u> - e.g. What is $3\frac{1}{3} + \frac{7}{6}$?

Non-Statutory Guidance

Pupils should practise, use and understand the addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other (for example, 1/2 + 1/8 = 5/8] and progress to varied and increasingly complex problems.

Pupils should use a variety of images to support their understanding of multiplication with fractions. This follows earlier work about fractions as operators (fractions of), as numbers, and as equal parts of

	1. Write the mixed number fraction as an improper fraction (3 x 3) + 1 = 10 $3\frac{1}{3} = \frac{10}{3}$	2. Find a common denominator then add $\frac{10}{3} = \frac{20}{6}$ $\frac{20}{6} + \frac{7}{6} = \frac{27}{6}$	3. Write as a mixed number and simplify 27 ÷ 6 = $4\frac{3}{6}$ $\frac{27}{6} = 4\frac{3}{6} = 4\frac{1}{2}$	objects, for example as parts of a rectangle. Pupils use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example, if quarter of a length is 36cm, then the whole length is 36 × 4 = 144cm). They practise calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators.
	<u>Adding Two Mixed Fraction Numbers</u> - e.g. What is $4\frac{1}{6} + 3\frac{2}{3}$?			
	1. Add the whole numbers $4\frac{1}{6} + 3\frac{2}{3}$ $4 + 3 = 7$	2. Find a common denominator and then add the fractions $\frac{1}{6} + \frac{2}{3}$ $\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$	3. Record number as a mixed number and simplify if needed $7 + \frac{5}{6} = 7\frac{5}{6}$	
	<u>Subtracting Fractions</u> - e.g. What is $\frac{10}{16} - \frac{1}{4}$?			
	1. Find the common denominator $\frac{1}{4} = \frac{4}{16}$	2. Subtract the lower value fraction from the higher value fraction $\frac{10}{16} - \frac{4}{16} = \frac{6}{16}$	3. Simplify the answer if possible $\frac{6}{16} = \frac{3}{8}$	
	<u>Subtracting Mixed Numbers</u> - e.g. What is $2\frac{1}{4} - \frac{4}{8}$?			

	1. Write the mixed number as an improper fraction (2 x 4) + 1 = $\frac{9}{4}$ $2\ \frac{1}{4} = \frac{9}{4}$	2. Find the common denominator then subtract the lower value from the higher value $\frac{9}{4} = \frac{18}{8}$ $\quad \frac{18}{8} - \frac{4}{8} = \frac{12}{8}$	3. Convert to mixed number and simplify 12 ÷ 8 = $1\frac{4}{8}$ $\frac{12}{8} = 1\frac{4}{8} = 1\frac{1}{2}$	
	<u>Multiplying Fractions</u> - e.g. What is $\frac{1}{2}$ x $\frac{3}{5}$?			
	1. Multiply the numerator $\frac{1}{2}$ x $\frac{3}{5}$ **1 x 3 = 3**	2. Multiply the denominator $\frac{1}{2}$ x $\frac{3}{5}$ **2 x 5 = 10**	3. Simplify if possible $\frac{1}{2}$ x $\frac{3}{5}$ = $\frac{3}{10}$ 	
	<u>Dividing Fractions</u> - e.g. What is $\frac{3}{4}$ ÷ 3 ?			
	1. The numerator stays the same $\frac{3}{4} \div 3 = \frac{3}{12}$	2. Multiply the denominator by the whole number $\frac{3}{4} \div 3 = \frac{3}{12}$ **4 x 3**	3. Simplify if possible $\frac{3}{4} \div 3 = \frac{3}{12} = \frac{1}{4}$ **4 x 3**	