

# Calculation Policy



Created: February 2015

Agreed by Governing Body:

Reviewed: February 2016

Next review: Spring 2018

## Values Statement

At Deal Parochial Primary School the curriculum is firmly rooted in its Christian foundation: enabling every child to grow spiritually and emotionally; fostering imagination and a deep sense of personal identity and self-worth; providing guidance through the loving example of Jesus Christ.

## Mission Statement

Our hope is that each child at Deal Parochial Primary School will develop an appetite for learning that will endure throughout their lives. To achieve this, the curriculum will need to motivate and excite children so that they engage fully in learning, cultivate positive attitudes and relationships, make good progress and fulfil their true potential – being “**The best that I can be**”.

## Purpose

*Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history’s most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.*

*(Primary Framework Mathematics Sept 2013)*

At Deal Parochial we believe in the importance of developing mathematical skills in our children so that they are efficient and confident in their approach to mathematics in a wide range of contexts. A good knowledge and understanding of mathematics provides a way of viewing and making sense of the world. It is a very powerful means of communicating information and as such, plays an important part in all areas of the curriculum. We strive to deliver quality teaching of mathematics enabling pupils to reach their true potential.

## Aims

The national curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

We aim as a school to:

- teach children to be numerate by learning key addition and multiplication facts known as 'Learn Its'
- use their addition and multiplication facts in a given context e.g. if a child knows  $30+40$ , then they can understand  $30p + 40p$  or  $30 \text{ mins} + 40 \text{ mins}$ .
- make learning mathematics fun
- build on prior knowledge and calculation methods
- share calculation methods with the children and parents
- teach the 4 different aspects of numeracy: Counting, Learn Its', It's Nothing New, Calculation.

Pupils should make connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems.

Children will be taught calculation methods for the four operations: addition, subtraction, multiplication and division see Appendix A and Appendix B.

For each operation children needs to experience all of these steps to completely conquer it.

- 1) using objects
- 2) using pictures
- 3) using a numberline
- 4) using an expanded method
- 5) using a compact written method

Children should always be encouraged to consider if a mental calculation would be appropriate before using written methods. Children need to do written calculations to:

- represent work that has been done practically;
- support, record and explain mental calculation;
- keep track of steps in a longer task;
- work out calculations that are too difficult to do mentally.

Children should be taught when it is appropriate to do an approximate or estimate first and should check with the inverse operation at the end. By upper Key Stage 2, children should be confident in choosing and using a strategy that they know will get them to the correct answer as efficiently as possible.

### **Parental Involvement**

Parents can help their child by:

- Counting with their child;
- Playing number games;
- Involving their child when taking measurements or weighing items;
- Taking note of numbers in real life e.g. telephone numbers, bus numbers, lottery numbers etc;
- Giving their child opportunities to use money to shop, check change etc;
- Talking about the mathematics in real-life situations e.g. football - 'How many points does your favourite team need to catch the next team in the league?';
- Helping their children calculate using the method that they have been taught;
- Teaching their child that to multiply by 10 you 'move the digits to the left and add a zero as a place holder' (not that you 'just add a zero')
- Teaching them that you cannot move the decimal point. – You can only move the digits to the left or to the right
- Teaching them that they are doing 'calculations' (not 'sums' – 'sum' is a mathematical word that means 'addition').

### **Links to other policies**

Mathematics Policy

Assessment Policy

Curriculum Policy

Equal Opportunity Policy

Homework Policy

Marking for Improvement Booklet

### **Appendices**

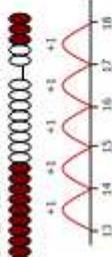
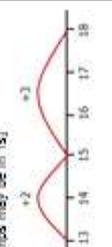
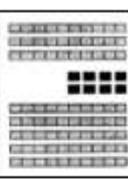
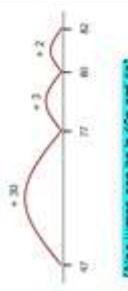
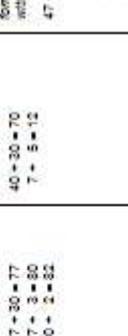
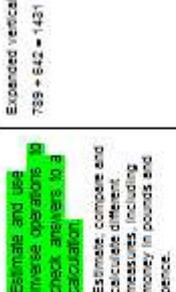
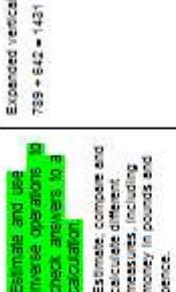
Appendix A – Progression of Calculations

Appendix B – Examples of formal written methods for addition, subtraction, multiplication and division taken from the Primary National curriculum – Mathematics September 2013

Appendix C – Glossary

## Appendix Ai

## ADDITION

STATUTORY EXPECTATIONS		Rapid Recall/Mental Calculations		Non-statutory guidance		
YR	Count... from 1-20... and say which no. is 1 more than a given no. Using quantities objects. + two U nos and count on to find the answer. (Expected) Estimate no. of objects; check quantities by counting up to 20. (Exceeding)	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 bananas are 5 pence and the bananas are 3 pence, altogether that is 8 pence'. (EVERY Profile extension blocks, BTA)	Pictures/Objects I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether? 	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)	(Memorise/reason with bonds to 10/20 in several forms eg 9 + 7 = 16, 16 - 7 = 9, 7 = 16 - 9). Pupils should realise the effect of adding or subtracting zero - establishing + as related operations. Pupils combine and increase numbers, counting forwards and backwards.
Y1	Add (and subtract) one-digit and two-digit numbers to 20 (9 + 5, 18 - 5), including zero. Read/write/interpret statements involving subtraction (+), addition (-) and equals (=) signs.	Practical/recorded using ICT. Pictures Symbolic (see above). Pupils use concrete objects and pictorial representations (eg place value counters, Dienes). Problems should include terms put together, add, altogether, total, like, away, distance between, more than and less than, so pupils develop concept of +, - and use operators, verbally.	Visual (modelled using bead strings) 13 + 5 = 18 (Jumps may be in 1s) 	Visual (efficient jumps) 13 + 5 = 18 	Use known facts/partitioning 8 + 5 = 13 8 + 2 = 10 10 + 3 = 13	Represent use number bonds (and related subtraction facts) within 20. Missing number problems (eg 16 = 7 + 9)
Y2	TU + U TU + TU U + U + U (Show addition of two numbers can be done in any order.)	Practical/visual images 58 + 30 = 88 	Visual (efficient jumps) 35 + 47 = 82 	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 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.
Y3	Use formal written methods of columnar addition. HTU + TU HTU + TU HTU + HTU	Number line 97 + 285 = 342 	Expanded vertical 374 + 248 110 500 622	Compact vertical 374 + 248 622	HTU + U, HTU + tens, HTU + hundreds. Use number facts and place value to solve problems. For mental calcs with TU nos, answers could be >100.	
Y4	Use formal written methods of columnar addition. HTU + HTU ThTU + HTU ThTU + ThTU	Expanded vertical 789 + 642 = 1431 	Expanded vertical 789 + 642 11 120 1300 1431	Expanded vertical 789 + 642 = 1431 789 + 642 11 120 1300 1431	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.
Y5	Add whole numbers >4 digits, including using formal written methods (columnar addition). Decimals up to 2dp (eg 72.3 + 45.7)	Use estimation 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.	Expanded vertical 789 + 642 = 1431 	Expanded vertical 789 + 642 = 1431 789 + 642 11 120 1300 1431	Solve addition two-step problems in context, deciding which operations and methods to use & why. Solve simple measure and money problems involving additions and decimals to 2dp.	They extend their knowledge of factors to decimals and connect to percentages and measures. Pupils should go beyond the measurement and money models of decimals (eg by solving puzzles).
Y6	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.	Expanded vertical 3243 + 18070 = 21313 3243 + 18070 0003 0110 21313	Expanded vertical 3243 + 18070 = 21313 3243 + 18070 0003 0110 21313	Add numbers mentally with increasingly large numbers (eg 14.62 + 2300 = 14752). Pupils mentally add tenths, and one-digit whole numbers and decimals to 2dp.	Pupils develop skills of rounding/estimating to predict/order of magnitude of ans to decimal calcs. Includes rounding answers to a degree of reasonableness.
Y8	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.	Expanded vertical 3243 + 18070 = 21313 3243 + 18070 0003 0110 21313	Expanded vertical 3243 + 18070 = 21313 3243 + 18070 0003 0110 21313	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.	

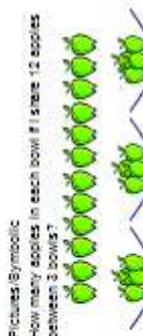
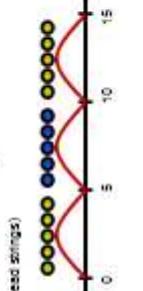
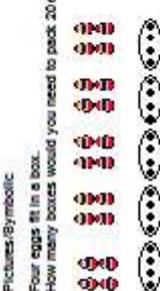
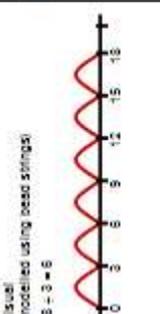
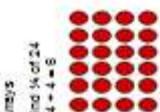
**SUBTRACTION**

STATUTORY EXPECTATIONS		Rapid Recall/Mental Calculations		Non-tabulary guidelines		
YR	<p>Count... from 1-20 and say which is 5's 1 less than's given no. Using objects</p> <p>Objects: A basket with 10 items, 5 crossed out.</p> <p>Use objects to find the answer.</p> <p>[Expected] Estimate no. of objects, check quantities by counting up to 20. [Exceeding]</p>	<p>Practical or recorded using ICT.</p> <p>Choice 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'.</p> <p>During a game of skittles outdoors Joseph knocked three numbered skittles down. He was able to calculate his score in his head.</p> <p>[EVES: <a href="#">Subtraction: Videos</a>, <a href="#">37A</a>]</p>	<p>Pictures Objects</p> <p>I have five cakes, I eat two of them. How many do I have left?</p> <p>Might be recorded as: <math>5 - 2 = 3</math></p>	<p>Symbolic</p> <p>Mum baked 9 biscuits, I ate 5. How many were left?</p> <p>Might be recorded as: <math>9 - 5 = 4</math></p>	<p>Memorise/reason with bonds to 10/20 in several forms (eg <math>9 + 7 = 16</math>, <math>16 - 7 = 9</math>, <math>7 = 16 - 9</math>)</p> <p>Pupils should realise the effect of adding or subtracting zero - establishes <math>0 + 8 = 8</math> related operations.</p> <p>Pupils combine and increase numbers, counting forwards and backwards.</p>	
Y1	<p>Practical or recorded using ICT.</p> <p>Pupils use concrete objects and pictorial representations (eg place value counters, Dienes)</p>	<p>Taking away - (jumps of 1) (modelled using bead strings)</p> <p><math>13 - 5 = 8</math></p> <p>No number line:</p> <p><math>13 - 3 = 10</math> <math>10 - 2 = 8</math></p> <p>Practical/visual images</p> <p><math>55 - 60 = 35</math></p>	<p>Taking away (efficient jumps) <math>13 - 5 = 8</math></p>	<p>Counting on - (jumps of 1) (modelled using bead strings)</p> <p><math>11 - 8 = 3</math></p> <p>With, or without, number line</p> <p><math>8 + 2 = 10</math> <math>10 + 1 = 11</math></p>	<p>Representative number bonds and related subtraction facts within 20.</p> <p>Problems should include terms: 'out together, add altogether, total, take away, distance between, more than and less than, so pupils develop concept of + and use operations flexibly.</p> <p>Missing number problems (eg <math>7 + ? = 5</math>)</p>	
Y2	<p>TU - U TU - tens TU - TU</p> <p>(Show subtraction of two numbers listed to be done in any order.)</p>	<p>Recognise/use relationships below <math>10</math> to check calculations and missing number problems.</p> <p>Pupils use concrete objects and pictorial representations and mental strategies (eg place value counters, Dienes)</p>	<p>Taking away <math>84 - 35 = 49</math></p> <p>Also jumps can be in 10s/5s</p>	<p>Counting on <math>84 - 42 = 36</math></p> <p>Also jumps can be in 10s/5s</p>	<p>Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers.</p> <p><math>98 - 35 = 63</math></p> <p>90 and 8 30 and 5 60 and 3</p>	<p>Pupils extend understanding of the language of subtraction to include difference.</p> <p>Precise subtraction to 20 to derive facts such as using <math>3 + 7 = 10</math>, <math>10 - 7 = 3</math> and <math>7 + 10 = 3</math> to calculate <math>30 + 70 = 100</math>, <math>100 - 70 = 30</math> and <math>70 + 100 = 30</math>. Check calculations, including by adding to check subtraction.</p>
Y3	<p>Use formal written methods of columnar addition</p> <p>TU - TU HTU - HTU HTU - HTU</p>	<p>Counting on <math>436 - 389 = 47</math></p>	<p>Taking away (no number line)</p> <p><math>574 - 525 = 351</math></p> <p>(no decomposition)</p> <p><math>725 - 458 = 265</math></p>	<p>Decomposition</p> <p><math>922 - 457 = 475</math></p>	<p>HTU - U HTU - tens HTU - hundreds</p> <p>Use number facts and place value to solve problems.</p>	<p>Pupils build on their understanding of place value and decimal notation to record metric measures, including money.</p>
Y4	<p>Use formal written methods of columnar subtraction.</p> <p>HTU - HTU THHTU - TU THHTU - HTU THHTU - THHTU</p>	<p>Counting on <math>1324 - 968 = 356</math></p>	<p>Decomposition</p> <p><math>1374 - 988 = 408</math></p>	<p>Decomposition</p> <p><math>72.5 - 45.7 = 26.8</math></p>	<p>Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.</p>	<p>They extend their knowledge of fractions to introducing and connect to decimals and measures.</p> <p>Pupils should go beyond the measurement and money models of decimals (eg by solving puzzles).</p>
Y6	<p>Subtract whole numbers <math>&lt; 4</math> digit, including using formal methods (columnar subtraction).</p> <p>Decimals up to 20p (eg <math>72.5 - 45.7</math>)</p>	<p>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.</p> <p>Solve multi-step problems in contexts, deciding which operations/methods to use and why.</p>	<p>Counting on</p> <p><math>72.5 - 45.7 = 26.8</math></p>	<p>Decomposition</p> <p><math>72.5 - 45.7 = 26.8</math></p>	<p>Subtract numbers mentally with increasing range (eg <math>1245 - 2300 = 1015</math>).</p> <p>Pupils mentally subtract, borrow, and one-digit whole numbers and tenths.</p>	<p>They extend their knowledge of fractions to introducing and connect to decimals and measures.</p> <p>Pupils should go beyond the measurement and money models of decimals (eg by solving puzzles).</p>
Y8	<p>Solve multi-step problems in contexts, deciding which operations/methods to use and why.</p> <p>Decimals up to 30p (Context: Measures)</p>	<p>Use knowledge of the order of operations to carry out calculations involving subtraction.</p> <p>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</p>	<p>Solve problems which require answers to be rounded to specified degrees of accuracy.</p> <p>[Fractions]</p> <p>Solve problems involving the calculation and conversion of units of measure, using decimal notation to 5dp where appropriate.</p> <p>[Measurement]</p>	<p>Decomposition</p> <p><math>72.5 - 45.7 = 26.8</math></p>	<p>Perform mental calcs, incl. with mixed operations and large numbers.</p> <p>Using the no. line, pupils subtract positive/negative integers for measures such as temperature.</p>	<p>Pupils develop skills of rounding/estimating to predict/check order of magnitude of answers to decimal calcs. Includes rounding and to a degree of accuracy &amp; checking reasonableness.</p>

# MULTIPLICATION

STATUTORY REQUIREMENTS			Rapid Recall/Mental Calculations			Non-statutory guidance																							
YR	Children ... solve problems, including doubling, halving and sharing. (Expected) Solve practical problems that involve combining groups of 2, 5, 10. (Exceeding)	Practical/recorded using ICT (eg digital photos / pictures on IWB) How many 10p coins are there? How much money is that? This domino is a double 4. How many spots does it have?	Pictures/Objects How many socks in three pairs?	Symbolic 3 pairs, 2 socks in each pair:																									
Y1	Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)	Practical/recorded using ICT Pictures/Symbolic There are five cakes in each bag. How many cakes are there in three bags?		Visual (eg 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			Doubling numbers/quantities Count on/back in 2s, 5s and 10s																					
Y2	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.)	Pictures/Symbolic There are four apples in each box. How many apples in six boxes?	Pupils use a variety of language to describe multiplication.	Repeated addition 5 x 3 or 3 x 5	Arrays 6 x 4 or 4 x 6			Pupils ... practise to become fluent in the 6, 9, 10 multiplication tables and connect them to each other. They connect the 10x table to place value, and the 6x 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.																					
Y3	Write/calculate statements using the multiplication tables that they know (progressing to formal written methods). TU x U HTU x U Convert between different units of measure (eg km to m; hr to min)	36 x 4 = 144 <table border="1" style="display: inline-table;"><tr><td>X</td><td>30</td><td>6</td></tr><tr><td>4</td><td>120</td><td>24</td></tr></table>	X	30	6	4	120	24		36 x 4 = 144 <table border="1" style="display: inline-table;"><tr><td>36</td><td>x</td><td>4</td></tr><tr><td>(6 x 4)</td><td>24</td><td></td></tr><tr><td>(30 x 4)</td><td>120</td><td></td></tr><tr><td></td><td>144</td><td></td></tr></table>	36	x	4	(6 x 4)	24		(30 x 4)	120			144					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 (eg 4 x 6 = 20 and 20 ÷ 6 = 4).			
X	30	6																											
4	120	24																											
36	x	4																											
(6 x 4)	24																												
(30 x 4)	120																												
	144																												
Y4	Use formal written layout: TU x U HTU x U Convert between different units of measure (eg km to m; hr to min)	43 x 6 = 258 (estimate: 40 x 6 = 240) 40 x 6 = 240 3 x 6 = 18		342 x 7 = 2394 <table border="1" style="display: inline-table;"><tr><td>X</td><td>300</td><td>40</td><td>2</td></tr><tr><td>7</td><td>2100</td><td>280</td><td>14</td></tr></table>	X	300	40	2	7	2100	280	14				Through doubling, they connect the 2x60 multiplication tables. Pupils develop efficient mental methods, using commutativity (eg 4 x 12 = 6 x 8 = 12 = 20 (eg 4 x 12 = 6 x 8 = 12 = 20 (eg 4 x 12 = 6 x 8 = 12 = 20 and division facts (eg using 3 x 2 = 6, 6 x 3 = 2 x 6 = 6 ÷ 3 = 2, 6 ÷ 2 = 3) to derive related facts (30 x 2 = 60, 60 ÷ 3 = 20, 60 ÷ 2 = 30). Practise mental methods and extend this to HTU numbers to derive facts, for example 200 x 3 = 600 (100 x 3 = 300). Write statements about equality of expressions (eg 39 x 7 = 20 x 7 + 9 x 7 and (2 x 3) x 4 = 2 x (3 x 4)). Combine knowledge of facts and arithmetic rules to solve mental/written calculations (eg 2 x 6 x 8 = 10 x 6 = 60).													
X	300	40	2																										
7	2100	280	14																										
Y5	Use a formal written method (including long x for TU rows) TU x TU HTU x U / HTU x TU THRU x U Convert between units of measure (eg km/min; m/cm; cm/mm; kg/g; lbs and oz)	27 x 24 = 648 (estimate 30 x 30 = 900) <table border="1" style="display: inline-table;"><tr><td>27</td><td>x</td><td>24</td></tr><tr><td>80</td><td>(7 x 4)</td><td></td></tr><tr><td>180</td><td>(70 x 4)</td><td></td></tr><tr><td>210</td><td>(7 x 20)</td><td></td></tr><tr><td>648</td><td>(70 x 20)</td><td></td></tr></table>	27	x	24	80	(7 x 4)		180	(70 x 4)		210	(7 x 20)		648	(70 x 20)			24 x 6 = 144 <table border="1" style="display: inline-table;"><tr><td>24</td><td>x</td><td>6</td></tr><tr><td>144</td><td></td><td></td></tr></table>	24	x	6	144						Recall multiplication facts to 12 x 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.
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Y6	Use a formal written method (including long x for TU rows) TU x TU HTU x U / HTU x TU THRU x U Convert between units of measure (eg km/min; m/cm; cm/mm; kg/g; lbs and oz)	47 x 36 = 1692 (estimate 50 x 40 = 2000) <table border="1" style="display: inline-table;"><tr><td>40</td><td>7</td></tr><tr><td>30</td><td>1200</td><td>210</td><td>1410</td></tr><tr><td>6</td><td>240</td><td>42</td><td>282</td></tr><tr><td></td><td></td><td></td><td>1692</td></tr></table>	40	7	30	1200	210	1410	6	240	42	282				1692		342 x 7 = 2394 <table border="1" style="display: inline-table;"><tr><td>342</td><td>x</td><td>7</td></tr><tr><td>2394</td><td></td><td></td></tr></table>	342	x	7	2394					Recall multiplication facts to 12 x 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.		
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342	x	7																											
2394																													
Y8	Multi-digit numbers (up to 4 digits) x TU Whole number using the formal method of long multiplication. Multiply one-digit numbers with up to two decimal places by whole numbers	258 x 18 = 4608 (estimate 250 x 20 = 5000) <table border="1" style="display: inline-table;"><tr><td>258</td><td>x</td><td>18</td></tr><tr><td>2060</td><td></td><td></td></tr><tr><td>2046</td><td></td><td></td></tr><tr><td>4608</td><td></td><td></td></tr></table>	258	x	18	2060			2046			4608				5.65 x 9 = 50.85 (estimate 6 x 9 = 54) <table border="1" style="display: inline-table;"><tr><td>5.65</td><td>x</td><td>9</td></tr><tr><td>50.85</td><td></td><td></td></tr></table>	5.65	x	9	50.85						Recall multiplication facts to 12 x 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.			
258	x	18																											
2060																													
2046																													
4608																													
5.65	x	9																											
50.85																													

DIVISION

STATUTORY EXPECTATIONS		Non-statutory guidance				
YR	<p>Children ... solve problems, including counting, sharing and sharing (Expected). They solve practical problems that involve sharing into equal groups (Exceeding)</p>	<p>Practical / recorded using ICT (eg digital photos/pictures on IWB)</p> <p>6 cakes shared between 2</p>  <p>6 cakes put into groups of 2</p> 	<p>Symbolic</p> <p>6 cakes shared between 2</p>  	<p>There are 8 rabbits. Take half of them. How many do you have? Show the 10 groups between 2 people.</p>	<p>Rapid Recall/Mental Calculations</p> <p>Recognise/identify name is as one of two equal parts of an object, shape or quantity.</p> <p>Recognise/identify name is as one of four equal parts of an object, shape or quantity.</p>	<p>Non-statutory guidance</p> <p>Find simple fractions of objects, numbers and quantities</p> <p>Count on/back in 2s, 5s and 10s</p>
Y1	<p>Solve one-step problems involving concrete objects, pictorial representations and arrays (with the support of the teacher)</p>	<p>Practical/recorded using ICT</p> <p>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?</p>	<p>Pictures/Symbolic</p> <p>How many apples in each bowl if I share 12 apples between 3 bowls?</p> 	<p>Visual (modelled using bead strings)</p> <p>15 ÷ 5 = 3</p> 	<p>Recall 5, use division facts for the 2, 5 and 10 multiplication tables. Recognise/identify name/write fractions 1/2, 1/4, 3/4 of a length, shape, set of objects or quantity. Write simple fractions eg 1/2 of 6 = 3 and recognise equivalence of two quarters and one half. Use commutativity/diverse relations to develop multiplicative reasoning (eg 4 × 6 = 20 and 20 ÷ 5 = 4).</p>	
Y2	<p>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 1/2, 1/4, 3/4 of a length/object/quantity. Write simple fractions eg 1/2 of 6 = 3</p>	<p>Pictures/Symbolic</p> <p>Four eggs fit in a box. How many boxes would you need to pack 20 eggs?</p> 	<p>Visual (modelled using bead strings)</p> <p>18 ÷ 3 = 6</p> 	<p>Always</p> <p>Find 1/4 of 24</p> <p>24 ÷ 4 = 6</p> 	<p>Recall 5, use division facts for the 2, 5 and 10 multiplication tables. Recognise/identify name/write fractions 1/2, 1/4, 3/4 of a length, shape, set of objects or quantity. Write simple fractions eg 1/2 of 6 = 3 and recognise equivalence of two quarters and one half. Use commutativity/diverse relations to develop multiplicative reasoning (eg 4 × 6 = 20 and 20 ÷ 5 = 4).</p>	
Y3	<p>Write/calculate statements using the tables that they know (progressing to formal written methods). TU ÷ U, HTU ÷ U (divisor is 2,3,4,5,9,10)</p>	<p>Multiples of the division</p> <p>51 ÷ 3 = 17</p> <p>85 ÷ 5 = 17</p> <p>10 × 5 = 50</p> <p>7 × 5 = 35</p> 	<p>Pupils use a variety of language to describe division.</p>	<p>Partitioning</p> <p>32 ÷ 2 = 16</p> <p>20 ÷ 2 = 10</p> <p>12 ÷ 2 = 6</p> 	<p>Recall and use division facts for the 3, 4 and 8 multiplication tables.</p>	
Y4	<p>Pupils practise to become fluent in the formal written method of short division with exact answers (NS) TU ÷ U, HTU ÷ U</p>	<p>Multiples of the divisor</p> <p>98 ÷ 7 = 14</p> <p>98 ÷ 7 = 14</p> <p>10 × 7 = 70</p> <p>4 × 7 = 28</p> 	<p>Visual</p> <p>51 ÷ 3 = 17</p> <p>30 (3 × 10)</p> <p>21 (3 × 7)</p> <p>0</p>	<p>Pupils connect x by a fraction to using fractions as operators (fractions of), and to ×. This relates to scaling by simple fractions, (inc those &gt; 1. Find fractions of numbers and quantities writing remainders as a fraction)</p>	<p>Recall division facts to 12 × 12. Use place value, known facts to × mentally, including × by 1. Recall effect of dividing LUTU by 10/100, identifying the value of the digits in the answer as with facts hundreds.</p>	
Y6	<p>Use the formal written method of short division (intermittent) as appropriate for the context. HTU ÷ U. The TU ÷ U. Convert between units of measure (eg km/m; mg/cm; cm/mm; kg/g; litre and ml)</p>	<p>345 ÷ 5 = 69 (estimate 40, &lt;math&gt;40 \times 5 = 200&lt;/math&gt;)</p> <p>345 ÷ 5 = 69 (estimate 40, &lt;math&gt;40 \times 5 = 200&lt;/math&gt;)</p> <p>345 ÷ 5 = 69 (estimate 40, &lt;math&gt;40 \times 5 = 200&lt;/math&gt;)</p> <p>345 ÷ 5 = 69 (estimate 40, &lt;math&gt;40 \times 5 = 200&lt;/math&gt;)</p>	<p>432 ÷ 5 = 86 (2 estimate: &lt;math&gt;400 \div 5 = 80&lt;/math&gt;)</p> <p>8 6 r 2</p> <p>5 4 3 2</p>	<p>Recall division facts to 12 × 12. Use place value, known facts to × mentally, including × by 1. Recall effect of dividing LUTU by 10/100, identifying the value of the digits in the answer as with facts hundreds.</p>	<p>Recall and use division facts for the 3, 4 and 8 multiplication tables.</p>	
Y8	<p>Divide numbers (up to 4 digits) by TU whole number using the formal method of short/long division (interpret as appropriate for the context). Use written division methods in cases where the ans has up to 2dp. (Divide numbers up to 2dp by LUTU whole numbers.)</p>	<p>25.6 ÷ 7 = 3.2 (estimate &lt;math&gt;30, &lt;math&gt;44&lt;/math&gt;)</p> <p>25.6 ÷ 8 (estimate: &lt;math&gt;24 \div 8 = 3&lt;/math&gt;)</p> <p>6.24</p> <p>7 43.68</p>	<p>432 ÷ 5 = 86 (2 estimate: &lt;math&gt;400 \div 5 = 80&lt;/math&gt;)</p> <p>8 6 r 2</p> <p>5 4 3 2</p>	<p>Identify multiples/factors, including finding all factor pairs of a number, &amp; common factors of two numbers. Know the 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. Divide mentally using known facts. Divide whole numbers and those involving decimals by 10/100/1000.</p>	<p>Recall and use division facts for the 3, 4 and 8 multiplication tables.</p>	
Y8	<p>Divide numbers (up to 4 digits) by TU whole number using the formal method of short/long division (interpret as appropriate for the context). Use written division methods in cases where the ans has up to 2dp. (Divide numbers up to 2dp by LUTU whole numbers.)</p>	<p>432 ÷ 5 = 86 (2 estimate: &lt;math&gt;400 \div 5 = 80&lt;/math&gt;)</p> <p>8 6 r 2</p> <p>5 4 3 2</p>	<p>432 ÷ 5 = 86 (2 estimate: &lt;math&gt;400 \div 5 = 80&lt;/math&gt;)</p> <p>8 6 r 2</p> <p>5 4 3 2</p>	<p>Identify multiples/factors, including finding all factor pairs of a number, &amp; common factors of two numbers. Know the 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. Divide mentally using known facts. Divide whole numbers and those involving decimals by 10/100/1000.</p>	<p>Recall and use division facts for the 3, 4 and 8 multiplication tables.</p>	

## Mathematics Appendix 1: Examples of formal written methods for addition, subtraction, multiplication and division

This appendix sets out some examples of formal written methods for all four operations to illustrate the range of methods that could be taught. It is not intended to be an exhaustive list, nor is it intended to show progression in formal written methods. For example, the exact position of intermediate calculations (superscript and subscript digits) will vary depending on the method and format used.

For multiplication, some pupils may include an addition symbol when adding partial products. For division, some pupils may include a subtraction symbol when subtracting multiples of the divisor.

### Addition and subtraction

789 + 642 becomes

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline \end{array}$$

Answer: 1431

874 - 523 becomes

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \\ \hline \end{array}$$

Answer: 351

932 - 457 becomes

$$\begin{array}{r} 8 \quad 12 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \\ \hline \end{array}$$

Answer: 475

932 - 457 becomes

$$\begin{array}{r} 1 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \\ \hline \end{array}$$

Answer: 475

### Short multiplication

24 × 6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ \hline \end{array}$$

Answer: 144

342 × 7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ \hline \end{array}$$

Answer: 2394

2741 × 6 becomes

$$\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \\ \hline \end{array}$$

Answer: 16 446

### Long multiplication

24 × 16 becomes

$$\begin{array}{r} \phantom{0} 2 \\ 24 \\ \times 16 \\ \hline 240 \\ 144 \\ \hline 384 \end{array}$$

Answer: 384

124 × 26 becomes

$$\begin{array}{r} \phantom{00} 1 \phantom{0} 2 \\ 124 \\ \times \phantom{0} 26 \\ \hline 2480 \\ \phantom{0} 744 \\ \hline 3224 \\ \hline 1 \phantom{0} 1 \end{array}$$

Answer: 3224

124 × 26 becomes

$$\begin{array}{r} \phantom{00} 1 \phantom{0} 2 \\ 124 \\ \times \phantom{0} 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ \hline 1 \phantom{0} 1 \end{array}$$

Answer: 3224

### Short division

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \phantom{0} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 86 \text{ r} 2 \\ 5 \overline{) 432} \\ \underline{40} \phantom{0} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 45 \text{ r} 1 \\ 11 \overline{) 496} \\ \underline{44} \phantom{0} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Answer:  $45\frac{1}{11}$

### Long division

432 ÷ 15 becomes

$$\begin{array}{r} 28 \text{ r} 12 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{150} \\ 12 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{150} \\ 12 \end{array}$$

$15 \times 20$

$15 \times 8$

$$\frac{12}{15} = \frac{4}{5}$$

Answer:  $28\frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 28.8 \\ 15 \overline{) 432.0} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{150} \\ 120 \\ \underline{150} \\ 0 \end{array}$$

Answer: 28.8

## Appendix C - Glossary

**2-digit** – a number with 2 digits like 23, 45, 12 or 60

**3-digit** – a number with 3 digits like 123, 542, 903 or 561

**Addition facts** – knowing that  $1+1 = 2$  and  $1+3 = 4$  and  $2+5 = 7$ . Normally we only talk about number facts with totals of 20 and under.

**Array** -An array is an arrangement of a set of numbers or objects in rows and columns –it is mostly used to show how you can group objects for repeated addition or subtraction.

**Bridge to ten** – a strategy when using numberlines. Adding a number that takes you to the next 'tens' number.

**Bus Stop Method** - traditional method for division with a single digit divisor

**Concrete apparatus** – objects to help children count – these are most often cubes (multilink) but can be anything they can hold and move.

Dienes (purple hundreds, tens and units blocks), Numicon, Cuisenaire rods are also referred to as **concrete apparatus**.

**Column chunking** – method of division involving taking chunks or groups or the divisor away from the larger number

**Decimal number** – a number with a decimal point

**Divisor** – the smaller number in a division calculation. The number in each group for chunking.

**Double** – multiply a number by 2

**Exchanging** – Moving a 'ten' or a 'hundred' from its column into the next column and splitting it up into ten 'ones' (or 'units') or ten 'tens' and putting it into a different column

**Expanded Multiplication** – a method for multiplication where each stage is written down and then added up at the end in a column

**Find the difference** – A method for subtraction involving counting up from the smaller to the larger number

**Grid method** – a method for multiplying two numbers together involving partitioning

**Half** - a number, shape or quantity divided into 2 equal parts

**Halve** – divide a number by 2

**Integer** - a number with no decimal point

**Inverse** – the opposite operation. Addition is the inverse of subtraction, multiplication is the inverse of division

**Long Multiplication** – column multiplication where only the significant figures are noted

**Number bonds to ten** – 2 numbers that add together to make ten, like 2 and 8, or 6 and 4.

**Number bonds to 100** – 2 numbers that add together to make 100 like 20 and 80, or 45 and 65 or 12 and 88

**Numberline** – a line either with numbers or without (a blank numberline).

Children use this tool to help them count on for addition of subtraction and also in multiplication and division.

**Numberline Chunking** - method of division involving taking chunks or groups or the divisor away from the larger number

**Number sentence** – writing out a calculation with just the numbers in a line E.G.  $2+4=6$  or  $35 \div 7 = 5$  or  $12 \times 3 = 36$  or  $32 - 5 = 27$

**Partition** – split up a larger number into the hundreds, tens and units. E.G. 342 – 300 and 40 and 2

**Place Value** – knowing that in the number 342 – the '3' means '3 hundreds', the '4' means '4 tens' and the '2' means '2'.

**Quarter** - a number, shape or quantity divided into 4 equal parts

**Recombine** – for addition, once you have partitioned numbers into hundreds, tens and units then you have to add then hundreds together, then add the tens to that total, then add the units to that total

**Remainder** – a whole number left over after a division calculation

**Repeated addition** – repeatedly adding groups of the same size for multiplication

**Significant digit** – the digit in a number with the largest value. E.G in 34 – the most significant digit is the 3, as it has a value of '30' and the '4' only has a value of '4'

**Single digit** – a number with only one digit. These are always less than 10.

**Taking away** – a method for subtraction involving counting backwards from the larger to the smaller number

**Tens number** - a number in the ten times tables – 10,20,30,40 50,etc.

**Unit** – another term for single digit numbers. The right hand column in column methods is the 'units' column