



Calculation Policy

Version 1

January 2015

NATIONAL CURRICULUM 2014

ABBOTSMED E PRIMARY SCHOOL
CASTOR C OF E PRIMARY SCHOOL
DISCOVERY PRIMARY SCHOOL
DOGSTHORPE INFANTS
EYE C OF E PRIMARY SCHOOL
NENE VALLEY PRIMARY SCHOOL
RAVENSTHORPE PRIMARY SCHOOL
ST AUGUSTINE'S JUNIOR SCHOOL

Rationale

This policy outlines both the **mental** and **written** methods from Year 1 to Year 6.

The policy has been written by a group of schools and according to the National Curriculum 2014. The written calculations for all four operations are as outlined in the appendices of the Programme of Study.

The document builds on the interconnectedness of mathematics and outlines the progression for addition, subtraction, multiplication and division. The links between the operations and the inverse nature of them should be made explicit from Year 1.

Children should **secure mental strategies**. They are taught the strategy of counting forwards and backwards in ones and tens first, followed by partitioning as a “default strategy” for both addition and subtraction. Then ‘Special Strategies’ are introduced. Children are taught to look carefully at the calculation and decide which strategy they should use. Children should explain and reason as to why they have chosen a strategy and whether it is the most efficient.

The **formal written methods** should be introduced with caution. Calculations that require a written method should be presented to the children and models and images, such as base 10 apparatus, place value counters, etc. should be used to ensure children have a conceptual understanding of the written method and that it is not a process that the children use for every type of calculation regardless of whether it can be completed mentally or mentally with jotting eg the number line.

The importance of Mental Strategies:

A mental strategy that they can always rely on E.g. counting in tens and ones, forwards and backwards eg $56 - 25$ (count back in 10s 56, 46, 36 and back in ones 36, 35, 34, 33, 32, 31)

A special strategy they can select from a small range of strategies if they can see something special about the numbers they are being asked to calculate with eg $46 + 47$ (I can use near doubles to support my calculation – $46 + 46 + 1$)

The policy outlines the **written methods** as suggested on the appendices of the National Curriculum 2014 and suggests that children:

- Look at a calculation and decide whether it can be done mentally, mentally with a jotting or whether it needs a written method.
- Are taught a written method with place value apparatus to ensure children are clear about the value of the numbers that they are calculating with and the numbers do not just become digits.
- Estimate, calculate and check to ensure that the answer they generate has some meaning.

For the purpose of developing understanding there may be occasions when examples that can be completed mentally may be shown as a written method purely to develop understanding of the method. This needs to be made very clear to children and when they are practising the methods, appropriate calculations should be used.

Contents Page

Suggested Models and Images for addition and subtraction

Developing mental methods, jottings and written methods for:

- Addition
- Subtraction
- Multiplication
- Division

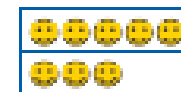
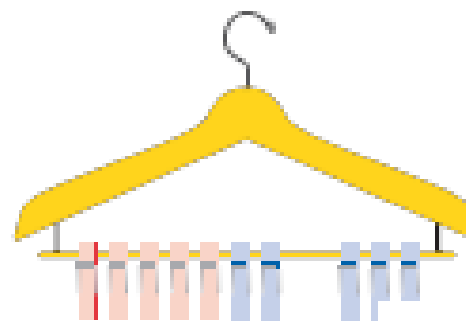
Key representations to support conceptual understanding of addition and subtraction.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

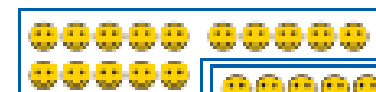
36...46,
56, 66

76... 86,
56, 46

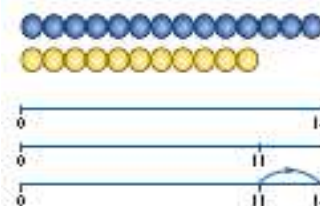
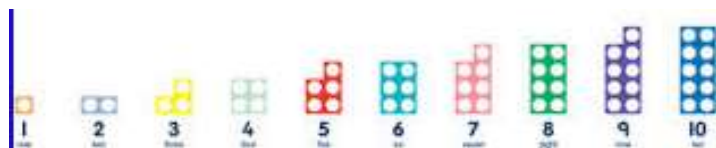
6 + 10 = 16 96 - 10 = 86
 16 + 10 = 26 86 - 10 = 76
 26 + 10 = 36 76 - 10 = 66
 36 + 10 = 46 etc.
 36 + 20 = 56 76 - 30 = 46



$$8 + ? = 10$$



$$15 + 5 = 20$$



$$10 = 7 + 3$$

The difference between 11 and 14 is 3.
 $14 - 11 = 3$
 $11 + \square = 14$



ADDITION AND SUBTRACTION

YEAR 1

Objectives from the National Curriculum

given a number, identify one more and one less

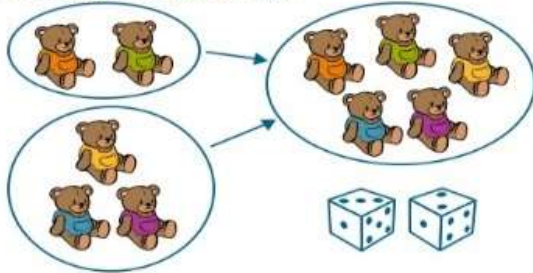
represent and use number bonds and related subtraction facts within 20

read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs

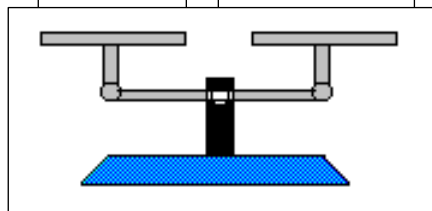
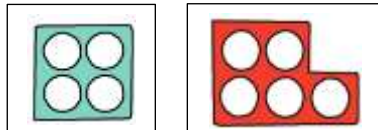
add and subtract one-digit and two-digit numbers to 20, including zero

Immerse children in practical opportunities to develop understanding of addition and subtraction. Link practical representations on a number track on, a beadstring and then recording on a number line. **By the end of Year 1 children should be able to fluently recall and use facts within and to 20.**

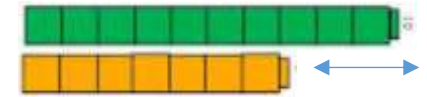
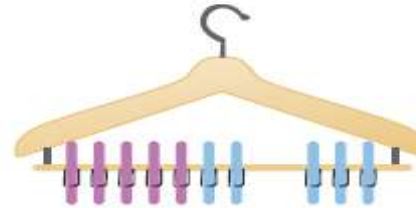
1. Combining two or more quantities



$4 + 5 = 9$
 $5 + 4 = 9$



Coathanger and pegs



Finding the difference by comparison.

Children should be confident at counting forwards and backwards in ones along a number track. Be consistent with how you show this on your track – eg addition above track; subtraction below track.



Recall of facts

If we know $4 + 5 = 9$

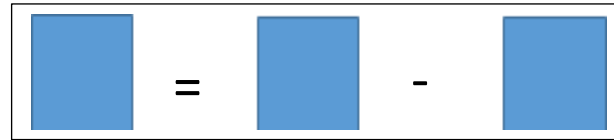
We also know:

$$5 + 4 = 9$$

$$9 - 5 = 4$$

$$14 + 5 = 19$$

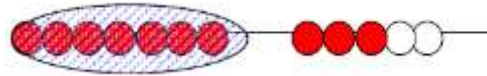
$$5 = 19 - 14, \text{ etc}$$



What numbers could go into these boxes?

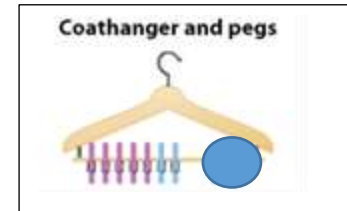
Bridging through 10

$$7 + 5 = 7 + 3 + 2$$



Children should understand subtraction as:

Take away and finding the difference: $10 - 3 = 7$

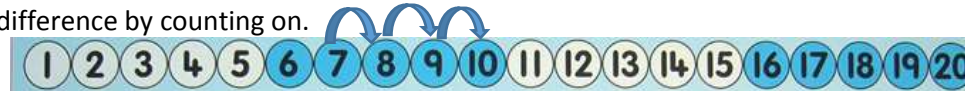


Count back in ones moving the beads one at a time.



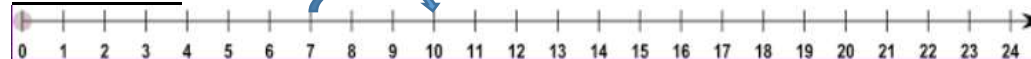
Finding the difference by counting on.


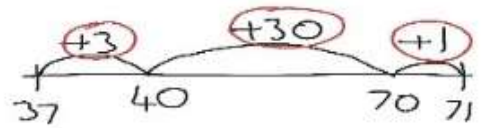
$$10 - 7 = 3$$



Children should compare objects understanding that subtraction is also related to finding the difference and recognise that counting on gives you the difference and use the language 'the difference between 10 and 7 equals 3.'

Number line



Year 2	
<p>NC Objectives:</p> <p>Show that addition of two numbers can be done in any order and subtraction cannot.</p> <p>Recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100.</p> <p>Add and subtract numbers using concrete objects, pictorial representations and mentally including: 2 digit number and ones</p> <p>2 digit number and tens</p> <p>Two 2 digit numbers</p> <p>Add three 1 digit numbers</p> <ul style="list-style-type: none"> applying their increasing knowledge of mental and written methods 	<p>Mental Recall/Jottings:</p> <p>Ensure children recognise the commutativity of addition but not of subtraction</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Using Known Facts If I know $2 + 3 = 5$ I also know: $3 + 2 = 5$ $20 + 30 = 50$ $50 - 30 = 20$ $50 - 20 = 30$</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>What are the missing numbers?</p> <div style="display: flex; align-items: center; justify-content: center; gap: 10px;"> <div style="width: 20px; height: 20px; background-color: blue;"></div> = <div style="width: 20px; height: 20px; background-color: blue;"></div> - <div style="width: 20px; height: 20px; background-color: blue;"></div> </div> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>Partitioning</p> <p>$23 + 34 = 34 + 23 = 34 + 20 + 3$ $46 - 25 = 46 - 20 - 5 = 26 - 5 = 21$</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>Counting on/back in 10s</p> <p>$26 + 20 = 46$ $67 - 20 = 47$</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>Bridge through 10 addition and subtraction</p> <p>$26 + 7 = 26 + 4 + 3$ $26 + 4 = 30$ $30 + 3 = 33$</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>Special Strategies</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>Rounding and adjusting</p> <p>+ 9 or - 9 by adding on or subtracting 10 and adjusting by 1. +11—11 by adding on or subtracting 10 and adjusting by 1</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>Near Doubles</p> <p>$6 + 7 = 6 + 6 + 1$ $= 12 + 1$</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>Finding the difference between two numbers. $71 - 37$:</p> <p>$71 - 37 = 34$</p>  </div>

Progressing Towards Written Methods with Representations

Recording addition and subtraction in columns supports place value and prepares for formal written methods.

Add and subtract numbers using concrete objects, pictorial representations and mentally including:
2 digit number and ones

Tens	Ones
10	1
10	1
10	1
10	1
10	1
10	1

$$\begin{array}{r} 20 + 3 \\ + 30 + 4 \\ \hline 50 + 7 \\ = \underline{57} \end{array}$$

2 digit number and tens

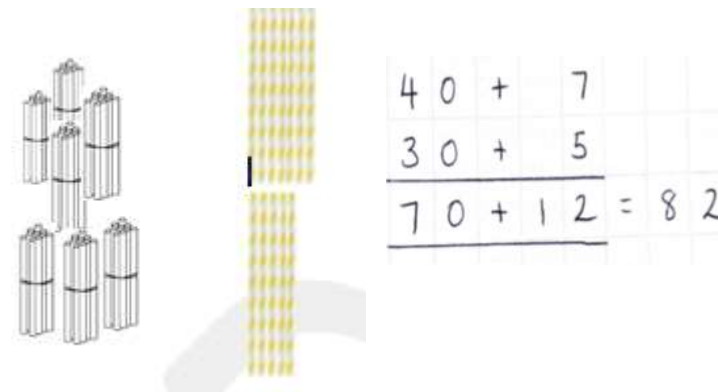
Two 2 digit numbers

Add three 1 digit numbers

• applying their increasing knowledge of mental and written methods

With the subtraction written method ensure children understand why they need to partition 42 into 30 + 12.

42	→	40 + 2	→	30 + 12	→	42 - 15 = 27
-15		10 + 5		$\frac{10 + 5}{20 + 7}$		
10	10	10	10	1	1	
10	10	10		10	1	1

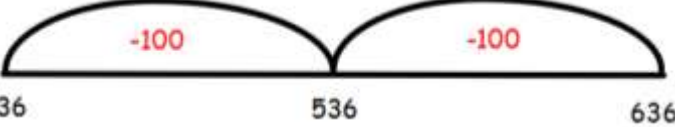


During your unit on place value ensure your children are confident with **partitioning numbers in different ways in preparation for subtracting using decomposition:**

$$90 + 2$$

80 + 12 (I have subtracted a ten from 90 and added it onto the ones)

Model using place value apparatus, eg base 10 apparatus, to ensure children are confident about the partitioning.

Year 3	Mental Recall/Jottings:
NC Objectives:	It is important that children's mental methods of calculation are practised and secured before their learning and use of an efficient written method.
Add and subtract numbers mentally A 3 digit number and 1s A 3 digit number and 10s A 3 digit number and 100s	<div data-bbox="342 319 808 550" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Bridging to 10</p> $425 + 8 = 425 + 5 + 3$ $= 430 + 3$ $= 433$ </div> <div data-bbox="842 319 1464 662" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Complements to 10/100</p> <p>I know $6 + 4 = 10$</p> <p>Therefore, I know $60 + 40 = 100$.</p> <p>Furthermore I know $36 + 4 = 40$</p> <p>And therefore I know $36 + 64 = 100$.</p> <p>Practice eg $45 + ? = 100$</p> </div> <div data-bbox="1585 319 2051 550" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Rounding and Adjusting</p> $425 + 90 = 425 + 100 - 10$ $= 525 - 10$ $= 515$ </div> <div data-bbox="1711 582 2152 933" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Partitioning</p> $143 + 76 = 143 + 70 + 6$ $= 213 + 6$ $= 219$ $93 - 56 = 93 - 50 - 6$ $= 43 - 6$ $= 37$ </div> <div data-bbox="683 678 1435 949" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Counting forwards or backwards in 100s</p> $636 - 200 = 436$  </div> <div data-bbox="479 981 920 1212" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Near Doubles</p> $52 + 53 = 50 + 2 + 2 + 3$ $= 100 + 5$ $= 105$ </div> <div data-bbox="1469 965 1888 1305" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Reordering</p> $8 + 65 + 7 = 65 + 8 + 7$ $= 65 + 15$ $= 80$ $85 - 24 - 35 = 85 - 35 - 24$ $= 50 - 24$ $= 26$ </div> <div data-bbox="324 598 683 1005" style="border: 2px solid blue; padding: 10px; color: white; text-align: center;"> <p>Estimate</p> <p>Calculate</p> <p>Check</p> </div>

Year 3

Written Methods with representations

Add and subtract numbers with up to 3 digits using formal written methods of columnar addition and subtraction.

Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent

Hundreds	Tens	Ones
100	10	1
100	10	1
	10	1
		1
		1

Hundreds	Tens	Ones
	10	1
	10	1
	10	1
	10	
	10	

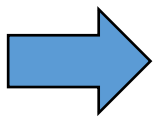
236	→	236
+ 73		+ 73
9		
100		
200		309
309		1

$$\begin{array}{r} 138 \\ - 65 \\ \hline 73 \end{array}$$

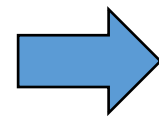
I can subtract 5 ones from 8 ones.
 If I subtract 6 tens from 3 tens, I will get a negative number.
 So I need to exchange 1 hundred to make 13 tens (130).
 Now subtract 6 tens from 13 tens to get 7 tens.

$$\begin{array}{r} 138 - 65 \\ 130 + 8 \\ - 60 + 5 \\ \hline 70 + 3 = 73 \end{array}$$

By the end of Year 3, children should progress to:
 $932 - 457 = ?$
 Using my knowledge of partitioning:
 $932 = 800 + 120 + 12$



$$\begin{array}{r} 932 - 457 \\ 800 + 120 + 12 \\ - 400 + 50 + 7 \\ \hline 400 + 70 + 5 \\ = 475 \end{array}$$

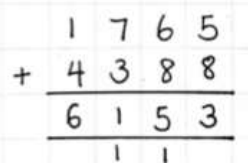
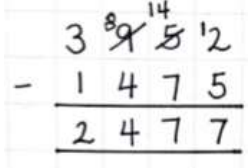


$$\begin{array}{r} 8 \quad 12 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \end{array}$$

Answer: 475

Base 10 apparatus is essential to demonstrate formal written methods of addition and subtraction and to enable the children to understand the place value issues – especially in decomposition.

Year 4	
NC Objectives:	Mental Recall/Jottings:
<p>Continue to secure and extend mental methods from previous year groups.</p> <p>To select whether a calculation can be done mentally, with a jotting or using a formal written method.</p>	<p>Develop confidence at calculating mentally with larger numbers. Using the full range of strategies:</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 20%; text-align: center;"> <p>Counting in 1s and 10s 2398, 2399, 2400, 2401</p> <p>7983, 7993, 8003, 8013</p> </div> <div style="border: 1px solid black; padding: 5px; width: 20%; text-align: center;"> <p>Bridging</p> $5438 + 7 = 5438 + 2 + 5$ $= 5440 + 5$ $= 5445$ </div> <div style="border: 1px solid black; padding: 5px; width: 20%; text-align: center;"> <p>Partitioning</p> $4622 - 8 = 4600 + 22 - 8$ $= 4600 + 14$ $= 4614$ </div> <div style="border: 1px solid black; padding: 5px; width: 20%; text-align: center;"> <p>Rounding and Adjusting</p> $1324 + 97 = 1324 + 100 - 3$ $= 1424 - 3$ $= 1421$ </div> </div> <div style="display: flex; flex-wrap: wrap; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 20%; text-align: center;"> <p>Near doubles</p> $243 + 239 = 240 \times 2 + 3 - 1$ $= 480 + 2$ $= 482$ </div> <div style="border: 1px solid black; padding: 5px; width: 20%; text-align: center;"> <p>Reordering</p> $1342 + 33 + 28 = 1342 + 28 + 33$ $= 1370 + 33$ $= 1403$ </div> <div style="border: 1px solid black; padding: 5px; width: 40%; text-align: center;"> <p>Bridging through 60 when calculating time</p> $45\text{min} + 28\text{min} = 45\text{min} + 15\text{min} + 13\text{min}$ $= 60\text{min} + 13\text{min}$ $= 1\text{hr } 13\text{min}$ </div> </div> <p style="text-align: center; margin-top: 20px;">Before calculating consider: Can I do it mentally? Should I use a jotting? Should I use a written method?</p>

Year 4	Written Methods
<p>Add and subtract numbers with up to 4 digits using formal written methods of column addition and subtraction where appropriate.</p>	<p>Add and subtract numbers up to four digits.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 15%;"> <p>Estimate:</p> $1800 + 4000 = 5800$ </div> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; width: 15%;"> <p>Check:</p> $6153 - 4388 = 1765$ </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 15%;"> <p>Estimate:</p> $4000 - 1500 = 2500$ </div> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; width: 15%;"> <p>Check:</p> $2477 + 1475 = 3952$ </div> </div> <p>If the children experience difficulty, use Base 10 Apparatus, other practical equipment, use example images from previous pages, or revert to the expanded methods. These strategies will help to reinforce the children's understanding of these abstract methods.</p> <p>Use the written method with decimals in the context of money</p> $\begin{array}{r} \pounds 32.50 \\ + \pounds 21.75 \\ \hline \pounds 54.25 \end{array}$ $\pounds 42.50 - \pounds 13.35 = \pounds 29.15$ $\begin{array}{r} \pounds 42.50 \\ - \pounds 13.35 \\ \hline \pounds 29.15 \end{array}$ <p>In order to help the children understand the process, start with numbers they would usually calculate with mentally, before moving onto numbers that would require a written method. E.g. Demonstrate $52 - 18$ before moving onto $432 - 188$.</p>

Year 5	
NC Objectives:	Mental Recall/Jottings:
Add and subtract numbers mentally with increasingly large numbers	Develop confidence at calculating mentally with larger numbers. Using the full range of strategies: <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 25%;"> <p style="text-align: center;">Counting in 1s, 10s and 100s</p> <p style="text-align: center;">23,498; 23,499; 23,500; 23,501</p> <p style="text-align: center;">52,986; 52,996; 53,006, 53,016</p> <p style="text-align: center;">99,854; 99,964; 100,064; 100,164</p> </div> <div style="border: 1px solid black; padding: 5px; width: 25%;"> <p style="text-align: center;">Bridging (eg to 100)</p> <p style="text-align: center;">$37,456 + 74 = 37,456 + 44 + 30$</p> <p style="text-align: center;">$= 37,500 + 30$</p> <p style="text-align: center;">$= 37,530$</p> </div> <div style="border: 1px solid black; padding: 5px; width: 25%;"> <p style="text-align: center;">Partitioning</p> <p style="text-align: center;">$52,425 - 7 = 52,400 + 25 - 7$</p> <p style="text-align: center;">$= 52,400 + 18$</p> <p style="text-align: center;">$= 52,418$</p> </div> <div style="border: 1px solid black; padding: 5px; width: 25%;"> <p style="text-align: center;">Rounding and Adjusting</p> <p style="text-align: center;">$4582 + 996 = 4582 + 1000 - 4$</p> <p style="text-align: center;">$= 5582 - 4$</p> <p style="text-align: center;">$= 5578$</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center;">Near doubles</p> <p style="text-align: center;">$4002 + 3999 = (4000 \times 2) + 1$</p> <p style="text-align: center;">$= 8000 + 1$</p> <p style="text-align: center;">$= 8001$</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center;">Reordering</p> <p style="text-align: center;">$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9$</p> <p style="text-align: center;">$= 1 + 9 + 2 + 8 + 3 + 7 + 4 + 6 + 5$</p> <p style="text-align: center;">$= 10 + 10 + 10 + 10 + 5$</p> <p style="text-align: center;">$= 45$</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p style="text-align: center;">Bridging through 60 when calculating time</p> <p>A train leaves London for Leeds at 22.33. The journey takes 2 hours 47 minutes. What time does the train arrive?</p> </div> </div> <div style="text-align: center; margin-top: 20px;"> <p>Before calculating consider:</p> <p>Can I do it mentally?</p> <p>Should I use a jotting?</p> <p>Should I use a written method?</p> </div>

Year 5					
NC Objectives:	Written Methods:				
<p>Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)</p> <p>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy</p>	<p>Check: Is your estimate close to the answer you have calculated?</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> $25.356 + 346.28$ <p>Estimate:</p> $25 + 350 = 375$ </td> <td style="width: 50%; vertical-align: top;"> $19.076 - 3.142$ <p>Estimate:</p> $19 - 3 = 16$ </td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> $\begin{array}{r} 25.356 \\ +346.28 \\ \hline 371.636 \\ \small 1 \quad 1 \end{array}$ </td> <td style="width: 50%; vertical-align: top;"> $\begin{array}{r} 19.076 \\ - 3.142 \\ \hline 15.934 \end{array}$ </td> </tr> </table> <p>Use and apply all written and mental methods to ensure understanding of when and how to use them.</p>	$25.356 + 346.28$ <p>Estimate:</p> $25 + 350 = 375$	$19.076 - 3.142$ <p>Estimate:</p> $19 - 3 = 16$	$\begin{array}{r} 25.356 \\ +346.28 \\ \hline 371.636 \\ \small 1 \quad 1 \end{array}$	$\begin{array}{r} 19.076 \\ - 3.142 \\ \hline 15.934 \end{array}$
$25.356 + 346.28$ <p>Estimate:</p> $25 + 350 = 375$	$19.076 - 3.142$ <p>Estimate:</p> $19 - 3 = 16$				
$\begin{array}{r} 25.356 \\ +346.28 \\ \hline 371.636 \\ \small 1 \quad 1 \end{array}$	$\begin{array}{r} 19.076 \\ - 3.142 \\ \hline 15.934 \end{array}$				

Year 6**NC Objectives:**

Perform mental calculations, including with mixed operations and large numbers

Use their knowledge of the order of operations to carry out calculations involving the four operations

Mental

Ensure children use a wide range of mental strategies (see previous year groups for strategies) when calculating including decimals and increasingly larger numbers.

Order of operations (Bodmas):

Brackets

Division

Multiplication

Addition

Subtraction



$2 + 4 \times 3 = 2 + 12 = 14$
(Multiplication is carried out before addition)

$(2 + 4) \times 3 = 6 \times 3 = 18$
(Brackets calculated before multiplication)

Examples of possible questions:

What is 2 minus 0.005?

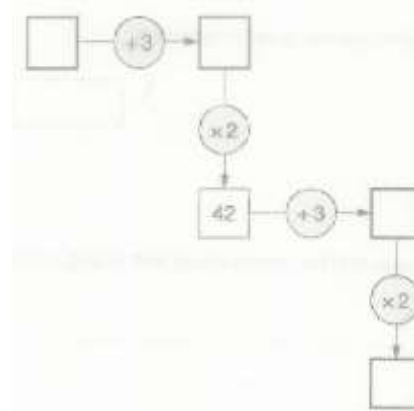
What is 5.7 added to 8.304?

$$12\,980 + \square = 13\,125$$

$$23,111 - 47 = \square$$

$$149 + 137 + \square = 650$$

$$(\square + \square) \times \square = 10$$



Year 6

NC Objectives:

Calculation NC Objectives (from Year 5)
Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Solve addition and subtraction multi step problems in contexts, deciding which operations and methods to use and why.


Written

Ensure children use the formal strategies as taught in previous years when calculating including decimals and increasingly larger numbers.

Examples of possible questions:

8

One toffee apple needs:
1 stick,
100g of sugar,
1 apple.



50 sticks cost £6.25



1 kg of sugar costs £0.99



100 apples cost £22.50

Children buy just enough sticks, sugar and apples to make 100 toffee apples.

They sell all 100 toffee apples for £1 each.

The profit goes to charity.

Work out how much money goes to charity.

Calculate $52.85 + 143.6$.

Calculate $8.6045 - 3.758$.

Q1. A farmer has £1000 to buy apple trees and pear trees.

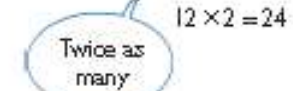
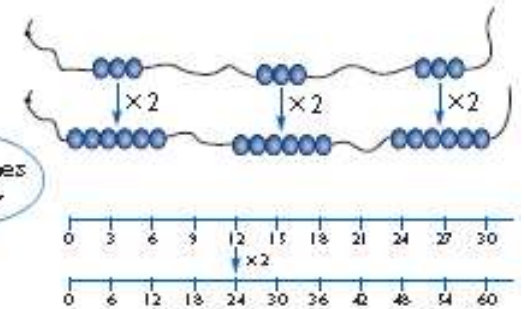
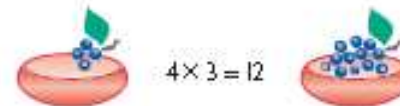
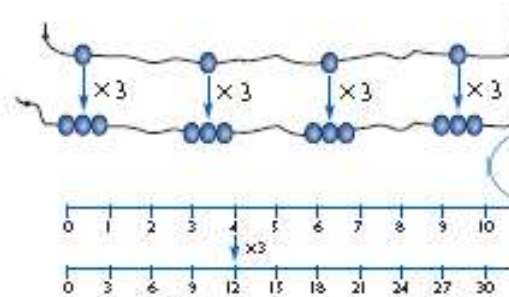
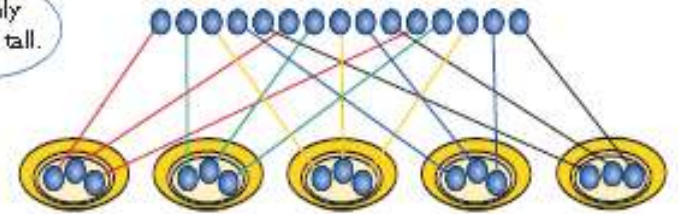
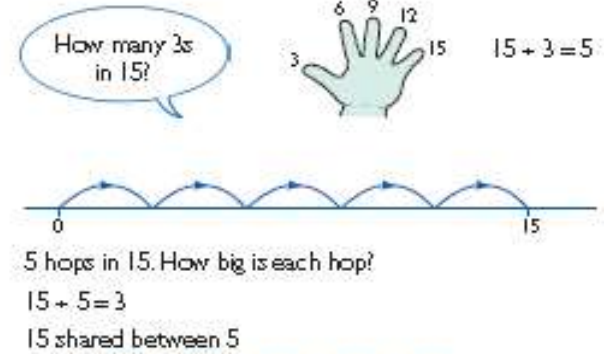
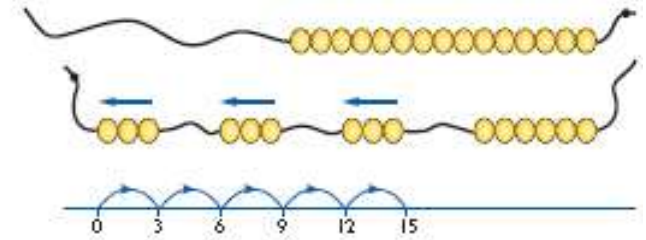
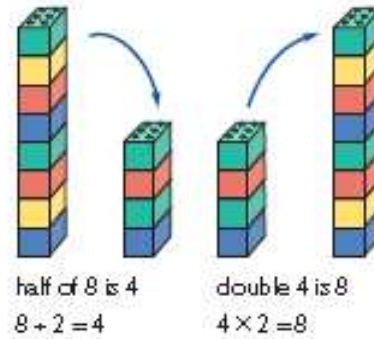
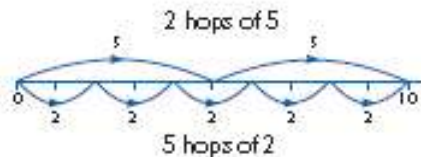
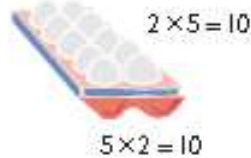
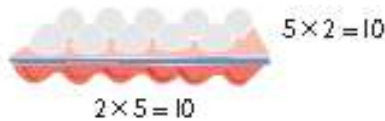
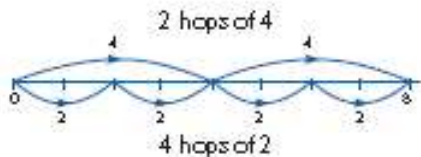
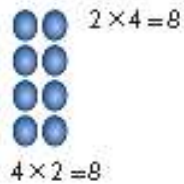
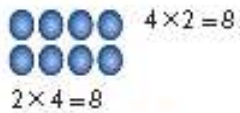
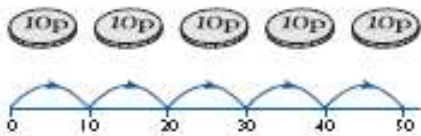
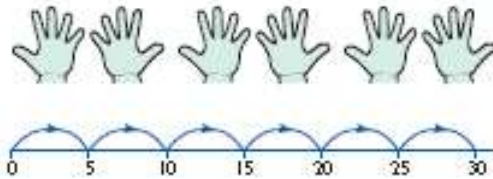
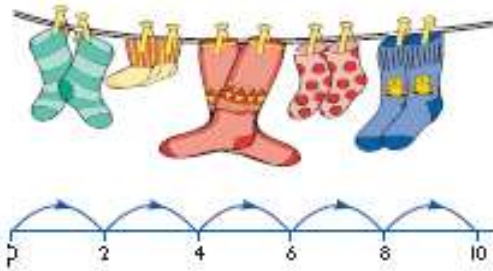
Apple trees cost £24.75 each.
Pear trees cost £12.50 each.



He buys 35 apple trees.




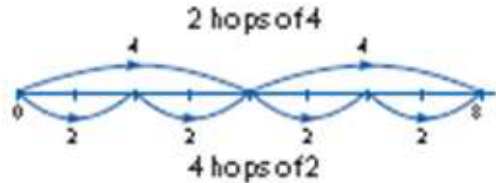
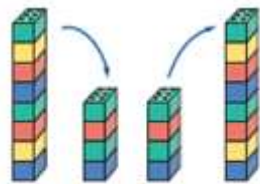

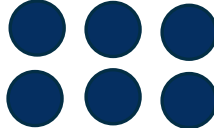
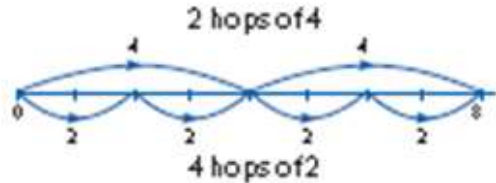

How many pear trees can he buy with the money he has left?

Key representations to support conceptual understanding of multiplication and division

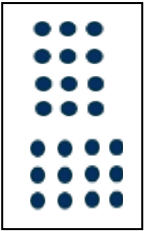


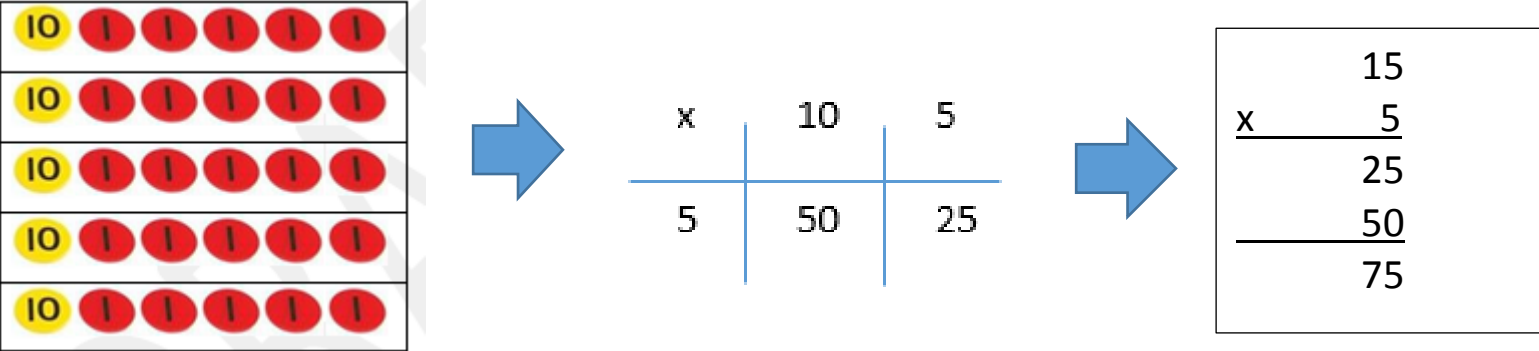
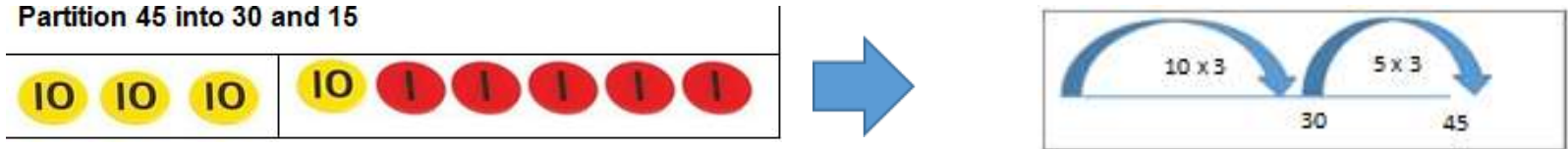
MULTIPLICATION AND DIVISION

Year 1

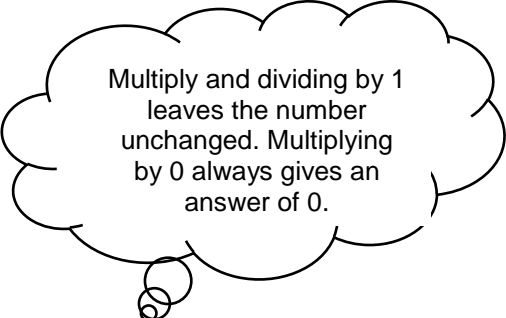
Objective	Examples	Representations	
<p>Count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens</p> <p>Double numbers to 20</p>	<p>Use of visual models to support counting in 2, 5, 10</p> <p>Ensure children begin to see the patterns of counting in 2, 5, 10.</p> <p>Double numbers up to 10.</p> <p>Halve even numbers up to 20.</p> <p>Children do not need to record number sentences using the symbols. Develop the vocabulary by encouraging children to explain what they are doing.</p>	<p>Grouping and sharing</p>   <p>How many legs will 3 teddies have?</p>    <p>half of 8 is 4 $8 \div 2 = 4$</p> <p>double 4 is 8 $4 \times 2 = 8$</p> 	<p>Arrays</p>   

Year 2		
Objective	Examples	Models and Images
<p>Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers</p> <p>How that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot</p> <p>calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs</p>	<p>$2 \times 5 = 10$ $5 \times 2 = 10$ $10 \div 2 = 5$ $10 \div 5 = 2$</p> <p>Use knowledge of doubling:</p> <p>$2 \times 10 = 20$ $10 \times 2 = 20$</p> <p>$20 \div 2 = 10$ $20 \div 10 = 2$</p> <p>Children should be confident with doubling numbers up to 20 and halving even numbers up to 40.</p> <p>e.g if I know double 20 (20×2) is 40 then I also know half of 40 ($40 \div 2$) is 20.</p>	<p>$4 \times 2 = 8$ $2 \times 4 = 8$ $4 \times 2 = 8$ $2 \times 4 = 8$ $4 \times 2 = 8$</p> <p>How many 3s in 15? $15 \div 3 = 5$</p> <p>5 hops in 15. How big is each hop? $15 \div 5 = 3$ 15 shared between 5.</p> <p>5 15 3</p> <p>$15 \div 5 = 3$ $3 \times 5 = 15$ $5 \times 3 = 15$ $15 \div 3 = 5$</p>

Year 3 Mental	
NC Objective	Strategy
Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	<div style="display: flex; justify-content: space-between;"> <div style="width: 22%;"> <p><u>Doubling and Halving</u></p> $\begin{aligned} &12 \times 4 \\ = &(12 \times 2) \times 2 \\ = &24 \times 2 \\ = &48 \end{aligned}$ $\begin{aligned} &84 \div 4 \\ = &(84 \div 2) \div 2 \\ = &42 \div 2 \\ = &21 \end{aligned}$ </div> <div style="width: 22%;"> <p><u>New Multiplication Facts</u></p> <p>If the children know 2/5/10 facts they now only need to learn:</p> $\begin{array}{lll} 3 \times 3 & 4 \times 4 & 6 \times 8 \\ 4 \times 3 & 6 \times 4 & 7 \times 8 \\ 6 \times 3 & 7 \times 4 & 8 \times 8 \\ 7 \times 3 & 8 \times 4 & 9 \times 8 \\ 8 \times 3 & 9 \times 4 & 11 \times 8 \\ 9 \times 3 & 11 \times 4 & 12 \times 8 \\ 11 \times 3 & 12 \times 4 & 12 \times 3 \end{array}$ </div> <div style="width: 22%;"> <p><u>Understanding Commutativity and Inverse</u></p> <p>Times tables and division facts – 3, 4, 8s</p> $\begin{aligned} 4 \times 3 &= 12 \\ 12 \div 3 &= 4 \end{aligned}$  $\begin{aligned} 3 \times 4 &= 12 \\ 12 \div 4 &= 3 \end{aligned}$ <p>Use missing box questions to secure understanding of inverse</p> $\begin{aligned} 4 \times \square &= 28 \\ \square \times 5 &= 60 \\ 21 \div \square &= 7 \end{aligned}$ </div> <div style="width: 22%;"> <p>Using known facts to multiply and divide multiples of 10.</p> $\begin{aligned} 3 \times 4 &= 12 \\ \text{So } 30 \times 4 &= 120 \\ \text{So } 3 \times 40 &= 120 \end{aligned}$ $\begin{aligned} 12 \div 4 &= 3 \\ \text{So } 120 \div 4 &= 30 \\ \text{So } 120 \div 30 &= 4 \end{aligned}$ <p>(How many 30s are there in 120 is the same as how many 3s are there in 12)</p> </div> </div>

Objective	Progressing from Mental to Written Methods with representations
<p>Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Written Methods)</p>	<p>15 x 5</p>  <p>45 ÷ 3</p> <p>Partition 45 into 30 and 15</p>  <p>By the end of Year 3, children may be ready to record their division using a formal written method.</p> $\begin{array}{r} 15 \\ 3 \overline{) 45} \end{array}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto; margin-right: auto;"> <p>By the end of Year 3 children should be able to answer short multiplication and division questions involving recall of 2/3/4/5/8/10 times tables facts.</p> </div>

Year 4 Mental

NC Objective																								
Recall multiplication and division facts for multiplication tables up to 12×12		<p>Using known facts</p> $7 \times 8 = 56$ <p>so $70 \times 8 = 560$ and $70 \times 80 = 5600$ and $7 \times 800 = 5600$</p> $56 \div 7 = 8$ <p>So $560 \div 7 = 80$ So $560 \div 70 = 8$ (How many 70s are there in 560 is the same as how many 7s are there in 56)</p>	<p>Reordering</p> $40 \times 3 \times 5 = 40 \times 5 \times 3$ $= 200 \times 3$ $= 600$	<p>Using Factor Pairs</p> $24 \times 3 = 12 \times 2 \times 3$ $= 12 \times 6$ $= 72$ <p>Or</p> $24 \times 3 = 12 \times 2 \times 3$ $= 12 \times 3 \times 2$ $= 36 \times 2$ $= 72$																				
use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.	<p>If the children know 2/5/10/3/4/8 facts they now only need to learn:</p> <table border="0"> <tr> <td>6×6</td> <td>7×7</td> <td>9×9</td> <td>11×11</td> </tr> <tr> <td>7×6</td> <td>9×7</td> <td>11×9</td> <td>12×11</td> </tr> <tr> <td>9×6</td> <td>11×7</td> <td>12×9</td> <td>12×12</td> </tr> <tr> <td>11×6</td> <td>12×7</td> <td></td> <td></td> </tr> <tr> <td>12×6</td> <td></td> <td></td> <td></td> </tr> </table>	6×6	7×7	9×9	11×11	7×6	9×7	11×9	12×11	9×6	11×7	12×9	12×12	11×6	12×7			12×6						
6×6	7×7	9×9	11×11																					
7×6	9×7	11×9	12×11																					
9×6	11×7	12×9	12×12																					
11×6	12×7																							
12×6																								
		<p>Multiplication by Partitioning</p> $76 \times 6 = (70 \times 6) + (6 \times 6)$ $= 420 + 36$ $= 456$ <table border="0"> <tr> <td></td> <td>70</td> <td>6</td> </tr> <tr> <td>6</td> <td style="border: 1px solid black; padding: 5px;">420</td> <td style="border: 1px solid black; padding: 5px;">36</td> </tr> </table>		70	6	6	420	36	<p>Division by Partitioning</p> $456 \div 6 = ?$ <p>First I need to partition 456 into numbers connected to the 6 x table.</p> $456 = 450 + 6$ $= 440 + 16$ <table border="0"> <tr> <td></td> <td>70</td> <td>6</td> </tr> <tr> <td>6</td> <td style="border: 1px solid black; padding: 5px;">420</td> <td style="border: 1px solid black; padding: 5px;">36</td> </tr> </table> $= 430 + 26$ $= 420 + 36$ $= 70 \times 6 + 6 \times 6$ $= 76 \times 6$ <p>So $456 \div 6 = 76$</p>		70	6	6	420	36									
	70	6																						
6	420	36																						
	70	6																						
6	420	36																						

	Year 4 Written
Objective	

<p>multiply two-digit and three-digit numbers by a one-digit number using formal written layout</p>	<p>Calculate: (Short multiplication) 3 6</p> $\begin{array}{r} 6 \\ \times 7 \\ \hline 252 \\ 4 \end{array}$ <p>Calculate: (Short multiplication) 4 5 8</p> $\begin{array}{r} 58 \\ \times 7 \\ \hline 3206 \\ 45 \end{array}$	<p>Division</p> <p>Consolidate short division</p> $\begin{array}{r} 23 \\ 4 \overline{) 92} \\ \underline{8} \\ 12 \end{array}$ $\begin{array}{r} 24 \\ 6 \overline{) 144} \\ \underline{12} \\ 24 \end{array}$
<p>These strategies are only to be used if the children fully understand what they have to do.</p> <p>Refer back to previous year groups and ensure models and images are used and the two written methods are not just a process with limited understanding, but the children are confident at using and applying this method.</p>		

Year 5

Objective

Multiply and divide numbers mentally drawing upon known facts.

Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

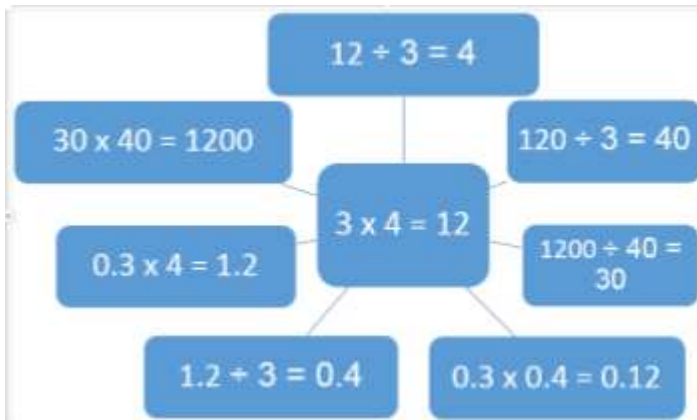
Identify multiples and factors, including finding all factor pairs of a number, and common mfactors of two numbers.





know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers

establish whether a number up to 100 is prime and recall prime numbers up to 19

recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)

Mental Methods



$1 \times 1 = 1^2$  $1 \times 1 = 1^2$
 $2 \times 2 = 2^2$  $2 \times 2 = 2^2$
 $3 \times 3 = 3^2$
 $1 \times 1 \times 1 = 1^3$ 
 $2 \times 2 \times 2 = 2^3$ 
 $3 \times 3 \times 3$

Multiplying and dividing whole numbers and decimals by 10, 100 and 1000.

Thousands	Hundreds	Tens	Ones	/10 (tenths)	/100 (Hundredths)

Year 5 Continued.

Objective	Written Methods	
<p>multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers</p> <p>divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context</p>	<p>2307 x 8 =</p> <p>Estimate: 2000 x 8 = 16000</p> <p>Calculate: (Short multiplication)</p> $\begin{array}{r} 2307 \\ \times \quad 8 \\ \hline 18456 \\ 25 \end{array}$ <p>1431 x 23 =</p> <p>Estimate: 1431 x 20 = 28620</p> $\begin{array}{r} 1 \\ 1431 \\ \times \quad 23 \\ \hline 4293 \quad (1431 \times 3) \\ 28620 \quad (1431 \times 20) \\ \hline 32913 \\ 1 \quad 1 \end{array}$ <p>Examples with decimals:</p> <p>4.65 x 9 =</p>	<p>432 ÷ 5 =</p> <p>Estimate: 400 ÷ 5 = 80</p> <p>Calculate (short division)</p> <p>432 ÷ 5 becomes</p> $\begin{array}{r} 86 \text{ r}2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$ <p>Answer: 86 remainder 2</p> <p>Estimate: 450 ÷ 15 = 30</p> <p>Calculate: (Long division)</p> <p>432 ÷ 15 becomes</p> $\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{) 432} \\ \underline{30} \\ 13 \\ \underline{15} \\ 12 \\ \underline{15} \\ 12 \end{array}$ <p>Examples with decimals:</p> <p>37.2 ÷ 8 =</p> <p>Ensure children are able to express remainders either as remainder, fraction or decimal. For example remainder 12 or 12/15 (4/5) or 0.8)</p>

Year 6	
Objective	Mental Methods
<p>Perform mental calculations, including with mixed operations and large numbers</p> <p>Identify common factors, common multiples and prime numbers</p> <p>Use their knowledge of the order of operations to carry out calculations involving the four operations</p>	<p>They undertake mental calculations with increasingly large numbers and more complex calculations. Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.</p> <p>Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures.</p> <p>Pupils explore the order of operations using brackets; for example, $2 + 1 \times 3 = 5$ and $(2 + 1) \times 3 = 9$.</p> <p>Common factors can be related to finding equivalent fractions.</p> <p>Calculate $900 \div (45 \times 4)$.</p> <p>A bag of four oranges costs thirty seven pence. How much do twelve oranges cost?</p>

Year 6 Continued

Objective

Written Methods

multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

divide numbers up to 4-digits by a two-digit whole number using the formal written method of short division where appropriate for the context divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Short division

98 ÷ 7 becomes

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

Answer: 14

432 ÷ 5 becomes

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

Answer: 86 remainder 2

496 ÷ 11 becomes

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

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

Long division

432 ÷ 15 becomes

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

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \\ 132 \\ \underline{150} \\ 12 \end{array} \begin{array}{l} 15 \times 20 \\ 15 \times 8 \end{array}$$

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

432 ÷ 15 becomes

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