Henry Green Primary School

Maths Policy

Aims of teaching maths:

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

How we teach maths and what we use in our school:

The PA Maths programme supports progression throughout the primary years and has a strong CPA thread running throughout. This means that children are exposed to conceptual ideas at a ***concrete*** level with a range of apparatus (e.g. counters, beads, dienes and Numicon) before moving on ***pictorial*** representations. This may mean diagrams, sketches or using the Singapore bar model to solve problems. Doing so develops children's deep conceptual understanding and skills proficiency which supports the next move into ***abstract*** mathematics, such as long division.

Maths lessons are designed to be interactive with a significant emphasis on children's talk. Through discussing their ideas, children construct new understanding, engage in a supportive community of practice, take responsibility for their learning and allow the

teacher a window into their thinking which enables appropriate action to help them progress. Fluency, reasoning and problem solving are three themes of the maths National Curriculum (DfE, 2014) and inform all maths teaching in Primary Advantage schools.

Teachers and support staff provide targeted support and assessment to help all children make good progress in maths.

In year expectation and guidance of maths

https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-in-england-mathematics-programmes-of-study

Planning guidance

All teachers are expected to follow the PA maths guidance and weekly/termly overview, which provides clear objectives, vocabulary, misconceptions, mental starters and exemplars of how to teach the objectives well. Teachers are required to plan using the PA maths document and should clearly state how the lesson will be delivered and or adapted on their personal plans. All lessons must have a clear objective, success criteria, mental oral starter and clear teacher modelling evident. Lessons should be differentiated and scaffolds should be provided, where required. Children should have an opportunity to work in a mixed setting to promote talk and exploration in maths. Using 'mild, hot and spicy' will enable children to choose an appropriate challenge which is suitable for them but will also promote collaborate teaching and learning. Once per week, challenges and expert challenges are to be presented for children in a green box where possible to show the next step in their learning. These need to be carefully planned for to move on the learning and deepen understanding. Diagnostic making should be taking place where appropriate, with misconceptions addressed.

IXL

IXL should be promoted by teachers in each class and used as a tool to continue learning at home. Key objectives can be 'starred' for children to work on at home that link to in class learning. IXL should also be used to support teaching and modelling of activities, however not as a complete lesson. Children are expected to use IXL for a minimum of once per week.

Maths in our school

To ensure that our school develops depth in key maths skills, all children should be able to:

1) access resources and manipulate as required
2) choose appropriate strategies both pictorial and abstract
3) recognise similarities and differences in mathematical variation
4) Make links and apply skills with resilience
5) Have a secure understanding of maths to transfer skills and learn with a cross curricular approach.

Key Points

Children need to be taught a range of methods including:

- Mental arithmetic (bridging, compensation etc.)
- Concrete skills (dienes, Cuisenaire)
- Informal strategies (pictorial)
- Written algorithms (abstract)

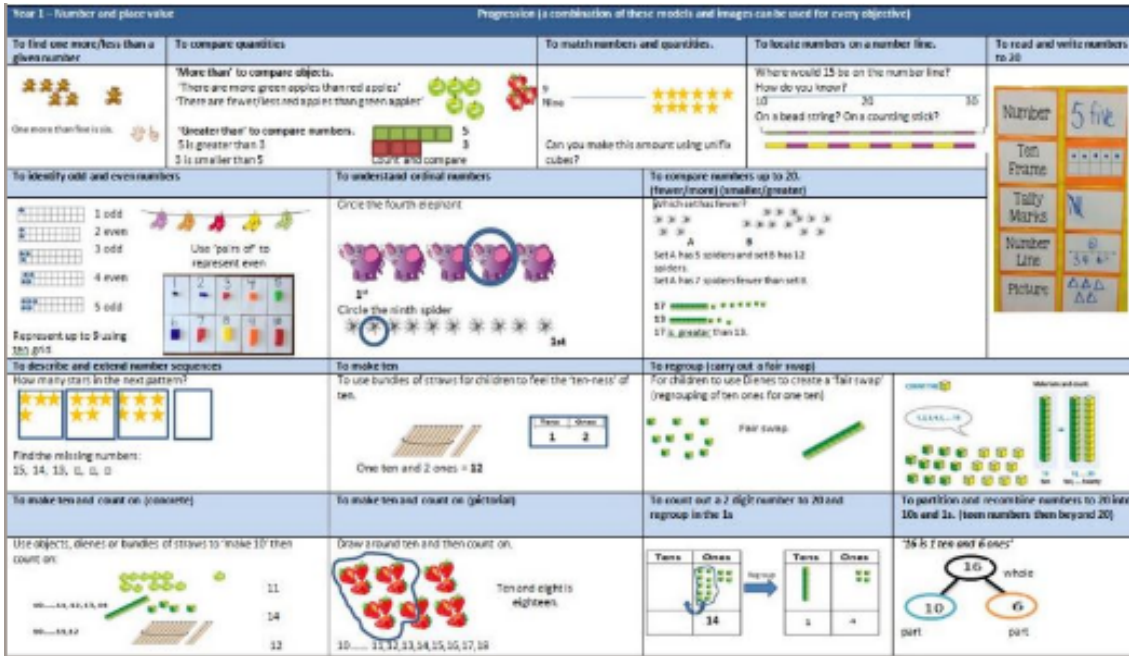
We believe that the teaching of formal written algorithms should only be undertaken when children are secure with place value, and have gained experience with mental, concrete and pictorial strategies. Often, children become over reliant on formal algorithms, which can be a barrier to their further progress in mathematics. All children should have the opportunity to explore using concrete resources, but have pictorial and abstract experiences to help them understand the links and deepen their understanding. Choosing the most appropriate and efficient calculation methods is also an important skill that we aim to develop. Teachers must familiarise themselves with the strategies used to teach operations.

Calculators should be seen as a tool to be used alongside the other methods. Children should be taught when it is appropriate to use a calculator, and that a calculator will not help them to select the correct calculation. Primarily, calculators are used to support children within their problem solving, and will see that without choosing the correct method to solve a problem, a calculator is of little use. In particular, using the memory functions to help with problem solving and multistep problems.

The learning of quick recall of number bonds and other key facts such as multiplication tables are an important aspect in terms of supporting children to develop effective calculation strategies and should be seen as essential foundations on which other calculation strategies are subsequently built.

PRIMARY ADVANTAGE
SCHOOLS ACHIEVING MORE TOGETHER

HENRY GREEN PRIMARY SCHOOL



Henry Green

Calculation Policy

New Curriculum 2014
Mental and Written Calculations

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

The policy has been written according to the National Curriculum 2014 and the written calculations for all four operations are as outlined on 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. It is our intention that addition and subtraction should be taught at the same time to ensure children are able to see the clear links between the operations and the inverse nature of them along with multiplication and division.

Children should **secure mental strategies**. They are taught the strategy of counting forwards and backwards in ones and tens first and 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 dienes 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 i.e. the number line.

The policy outlines the **mental strategies** that children should be encouraged to use:

A mental strategy that they can always rely on E.g. counting in tens and ones, forwards and backwards E.g. 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 E.g. 46 – 24 (I can use near doubles to support my calculation E.g. 46 – 23 – 1)

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

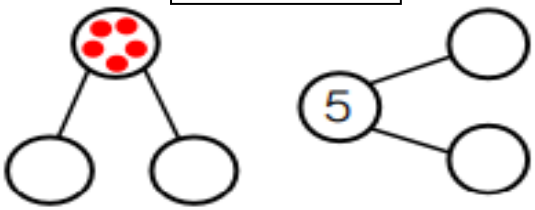
- Look at a calculation and decide whether it can be done mentally, mentally with a jotting or whether it needs a written method.
- Should always be shown written methods with place value apparatus to ensure children are clear about the value of the numbers that they are calculating with and the numbers 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.

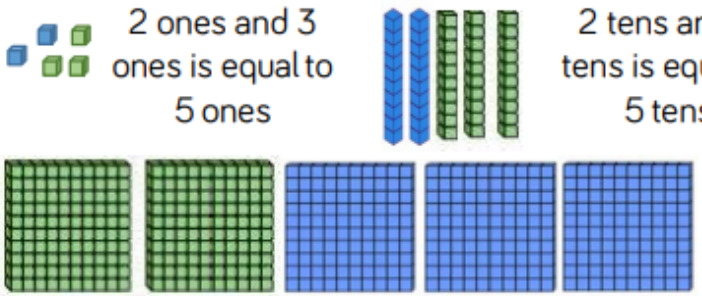
There is also a section on calculating with fractions; the expectations from Y1—Y6 and examples with the models and images that should be used in order to ensure children develop a conceptual understanding when calculating with fractions.

Key representations to support conceptual understanding of addition and subtraction.

Partitioning

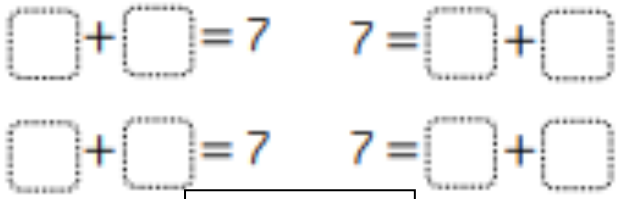


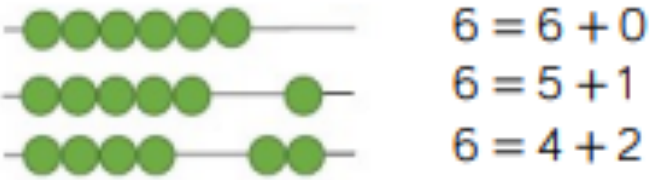
Partitioning using concrete resources



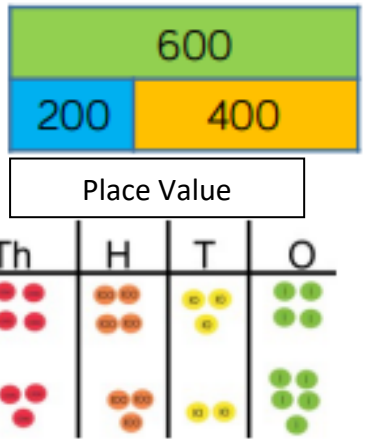
Bar modelling

Fluency

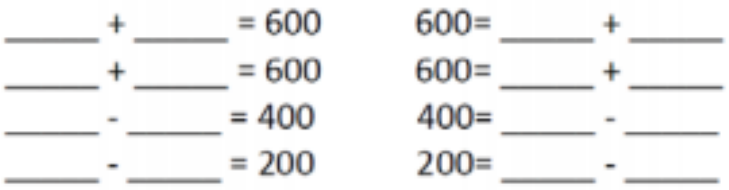




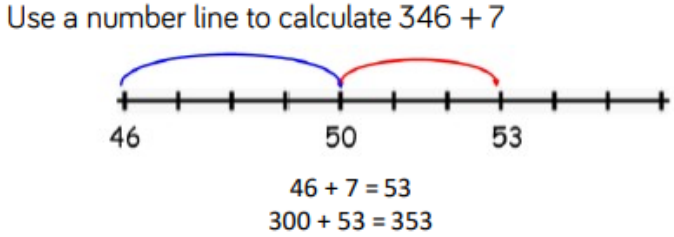
Place Value



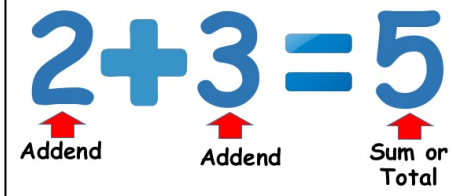
Link between addition and subtraction



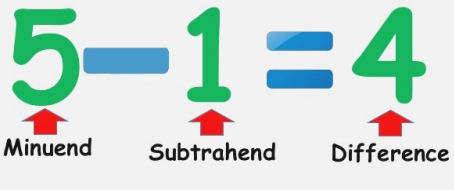
Number lines (to count on and back)



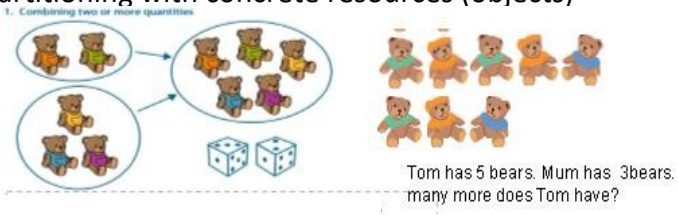
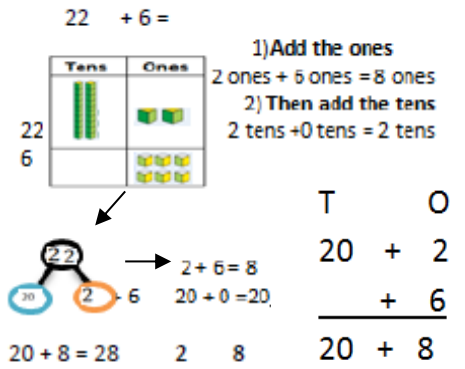
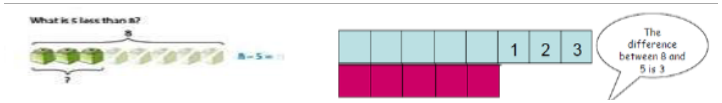
Parts of Addition



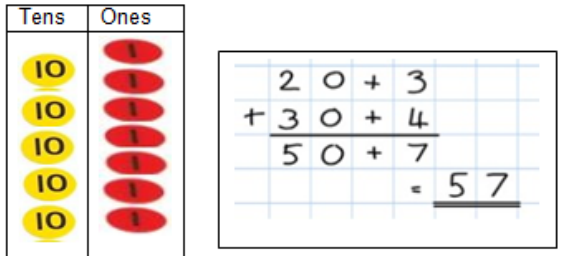
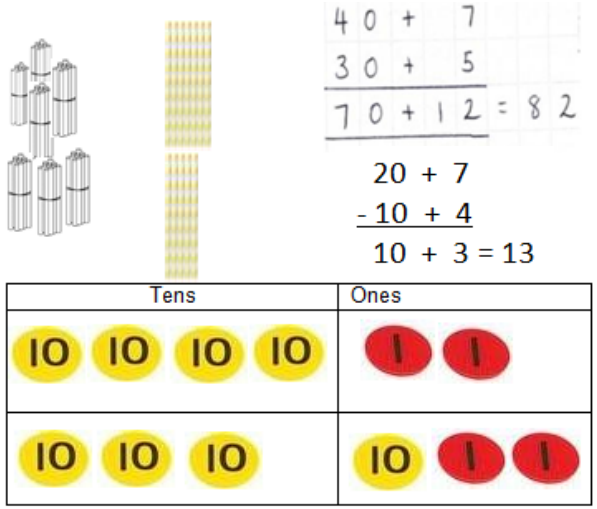
Parts of Subtraction

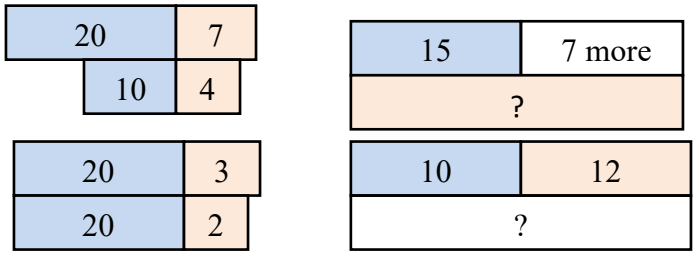
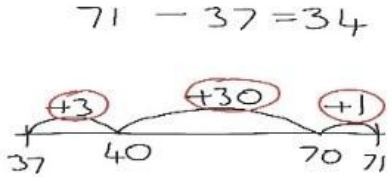


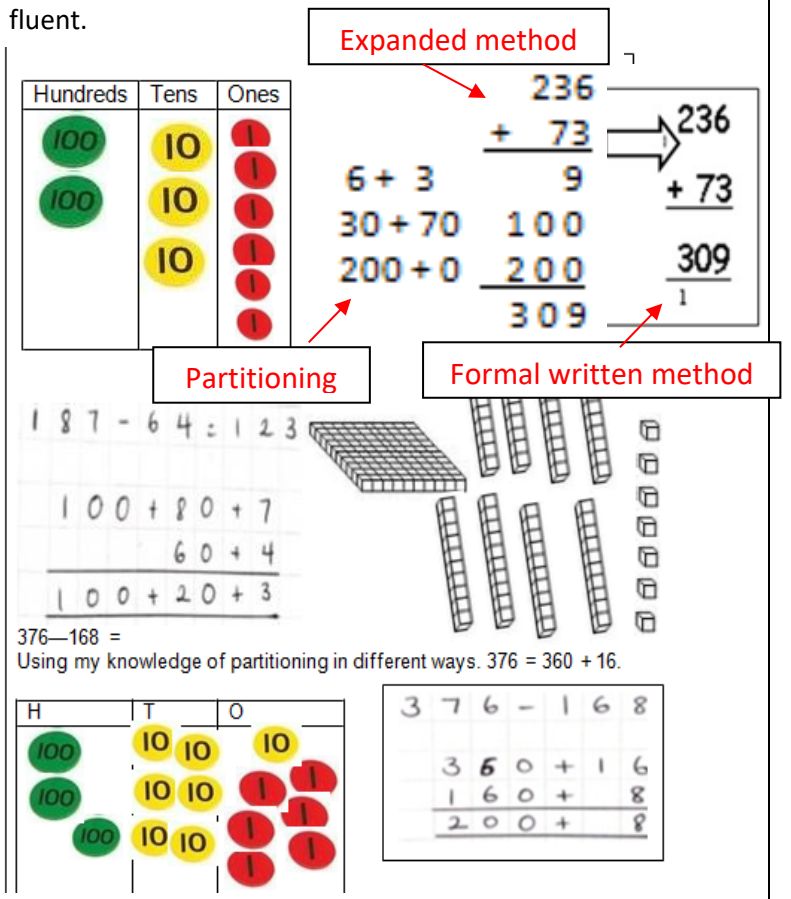
Key Vocabulary – to support reasoning skills

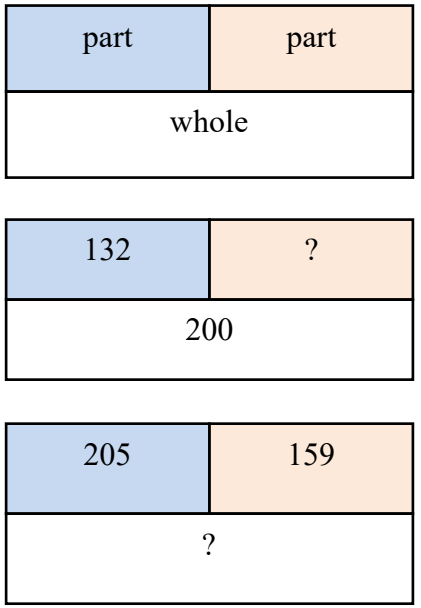
Year 1		
Objectives	**Mental jottings and representation**	**Written methods with representation**
• To read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs • To **represent** and **use** number bonds and related subtraction facts within 20 • To add and subtract one-digit and two-digit numbers to 20, including zero • To use vertical addition with no regrouping. • To solve one-step problems, using concrete and pictorial representations.	• Immerse children in practical opportunities to develop understanding of addition and subtraction. • Link practical representations on a number track on a bead string to recording on a number line. • Recall of facts – fluency. (Work with all numbers up to 20) If we know 4 + 5 = 9 We also know: , 5 + 4 = 9 9 - 5 = 4 9 - 4 = 5 14 + 5 = 19 19 - 14 = 5, etc • By the end of Year 1 children should be able to recall and use facts within and to 20.	Partitioning with concrete resources (objects)  Using a place value chart & Dienes.  Concrete to pictorial to abstract. Beginning of formal written method (column).  Bar modelling through concrete resources and pictorially to support children in counting on and back to find the difference.

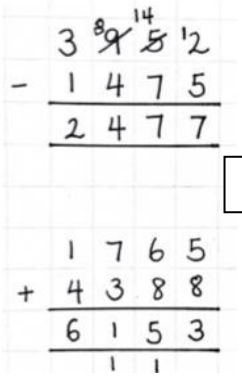
Year 2 (page 1 of 2)		
Objectives	**Mental jottings and representation**	**Written methods with representation**

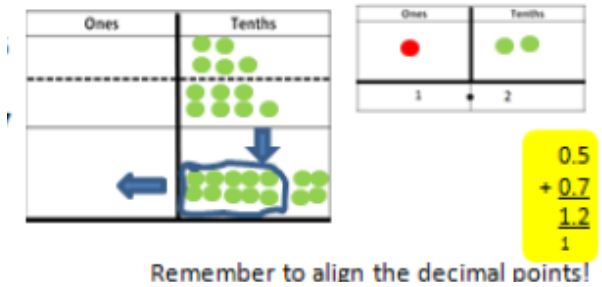
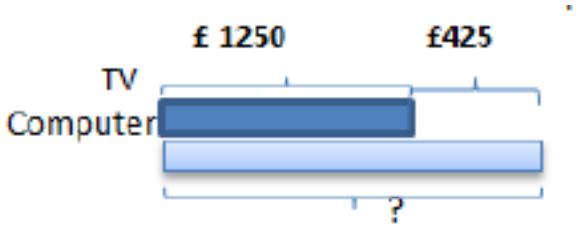
• To show that addition of two numbers can be done in any order and subtraction cannot.
 	
• To recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100.
 	
• To add and subtract numbers using concrete objects, pictorial presentations and mentally including:
  ○ 2 digit number and ones 2 digit number and tens
  ○ Two 2 digit numbers
  ○ Add three 1 digit numbers
 	
• To solve problems with addition and subtraction:
 	
  ○ using concrete objects and pictorial representations, including those involving
	• **Using known facts**
	If I know: 2+3 = 5
	I also know: 3+2 = 5
	20 + 30 = 50
	30 + 20 = 50
	50—30 = 20
	50—20 = 30
	• **Bridge through 10**
	26 + 7 = 26 + 4 + 3
	26 + 4 = 30
	30 + 3 = 33
	• **Counting on/back in10s**
	26 + 20 =
	67-20 =
	97 + 10 =
	• **Partitioning**
	23 + 34 =
	46—25 =
	• **Special Strategy Rounding and adjusting**
	+9 = +10 - 1
	+11= +10 + 1
	• **Bonds to 10**
	2 + 7 + 8 = 8 + 2 + 7
	• **Finding the difference between two numbers.**
	71 – 37:
		Recording addition and subtraction in columns supports place value and prepares for formal written methods.
		 
		
		Resources and place value counters to support children in understand the value of a digit when adding/subtracting a 2-digit number.
		 

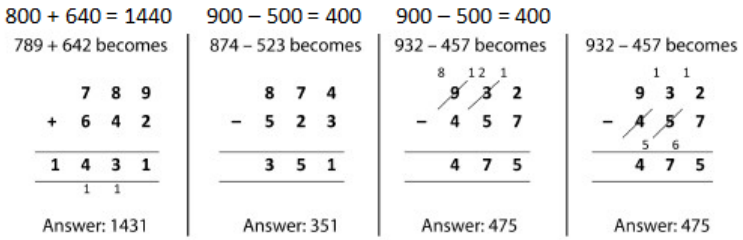
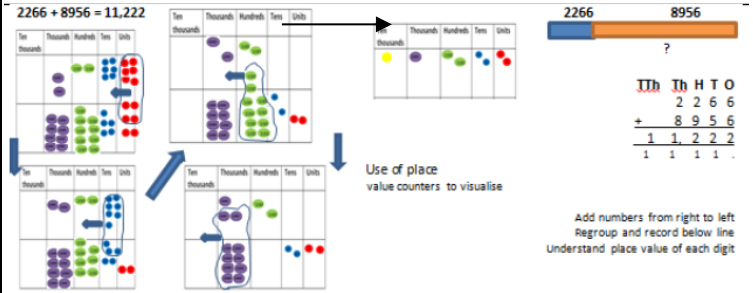
numbers, quantities and measures. **Year 2 (page 2 of 2)** • To apply their increasing knowledge of mental and written methods. • To recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.	• **Partitioning numbers in different ways in preparation for subtracting using decomposition:** 90 + 2 80 + 12 (I have subtracted a ten and added it onto the ones) Continue to record mental jottings as outlined in Year 2 with increasingly larger numbers. • Use suitable resources as required. • Children that have not achieved the age related expectations for Year 2 should not move onto formal written methods until they are secure with mental **Children will need to be secure in number facts and counting on/back in order to use column method for addition and subtraction.**	Bar modelling to support children in understanding the value of a number when adding or subtracting.  Empty number lines to support chidren in counting on to find the difference. This will support children's mental calcuations. 

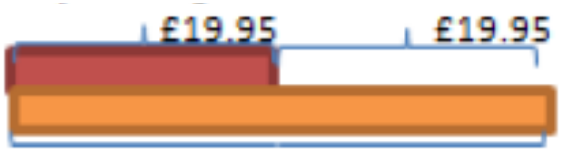
Year 3 (page 1 of 2)		
Objectives	**Mental jottings and representation**	**Written methods with representation**
• To add and subtract numbers mentally ○ A 3 digit number and 1s A 3 digit number and 10s ○ A 3 digit number and 100s • To add and subtract numbers with up to 3 digits using formal written methods of column addition and subtraction. • To estimate an answer to a calculation and use the inverse operation to check.	• **Bridging to 10** 425 + 8 = 425 + 5 + 3 = 430 + 3 = 433 • **Rounding and Adjusting** 425 + 90 = 425 + 100 = 525 - 10 = 515 146 – 9 = 146 – 10 + 1 = 136 + 1 = 137 146 – 50 = 146 – 40 – 10 = 106 – 10 = 96 • **Counting forwards or backwards in 100s** 636 – 500 = 136	Pupils use their understanding of place value and partitioning, and practise using column addition and subtraction with increasingly large numbers up to three digits to become fluent.  Place value counters are used to support understanding using concrete resources. Partitioning and vertical addition is used to ensure children understand the value of each digit, leading to expanded column method before the formal column addition method.

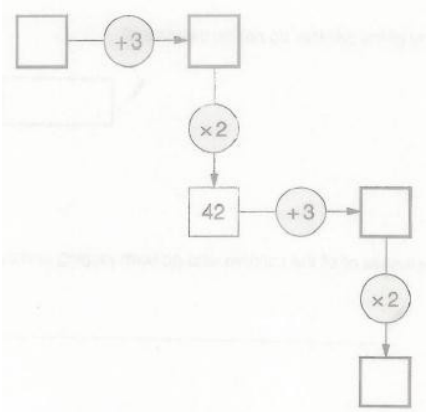
Year 3 (page 2 of 2)		Bar modelling helps children's understanding of the **link between addition and subtraction**. This is used in the pictorial stage to support with using concrete methods. 

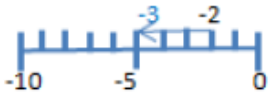
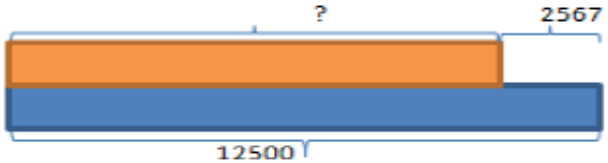
Year 4 (page 1 of 2)		
Objectives	**Mental jottings and representation**	**Written methods with representation**
• To continue to secure and extend mental methods from previous year groups. • To select whether a calculation can be done mentally, with a jotting or using a formal written method. • To add and subtract numbers with up to 4 digits using formal written methods of column addition and subtraction where appropriate. • To solve addition and subtraction 2-step problems in context.	Develop confidence at calculating mentally with larger numbers. Using the full range of strategies: • Counting in 1s/10s • Bridging through multiples of 10 • Partitioning • Rounding and Adjusting • Reordering • Near Doubles • Bridging through 60 when calculating with time. • **Related facts** 9 + 6 = 15 90 + 60 = 150 900 + 600 = 1500 • **Add/subtract the nearest multiple of 10/100/1000 and adjust** 48 + 61 = 48 + 60 + 1	Add and subtract numbers up to four digits in written column method  Formal written method Revert to expanded methods *(as per year 3)* if the children experience any difficulty. Use the written method with decimals in the context of money £ 32.50 + £ 21.75 = £54.25 £32.50 + £21.75 £54.25 £ 42.50 - £ 13.35 = £ 29.15 £ 3 4 12. 4 5 10 - £ 1 3. 3 5 £ 2 9. 1 5 Using number to ensure children understand the process before quickly moving into numbers that do require a written method.

Year 4 (page 2 of 2)		**Place value counters for decimals** ↓ **written column addition**  Using concrete resources before a written method ensures that children have and understanding of place value. They can make links with known number facts.
		Bar model:  Bar modelling is used to support children's understanding of a word problem by being able to visualise the problem and choose the appropriate operation.

Year 5 (page 1 of 2)		
Objectives	**Mental jottings and representation**	**Written methods with representation**
• To add and subtract whole numbers with more than 4 digits, including using formal written methods (column addition and subtraction) • To add and subtract numbers mentally with increasingly large numbers • To use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • To solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.	12 462 – 2300 Use knowledge of place value to calculate mentally with increasingly larger numbers. Employ a range of special strategies to develop confidence in calculating mentally. E.g. **2364 + 1999 =** 2364 + 2000 = 4364 4364—1 = 4363 **13484 + 2400 =** 13000 + 2000 = 15000 484 + 400 = 884 15000 + 884 = 15884 4 = 2001—1997  1997 2000 2001 13486 - 5000 13486 - 3000 = 10486 10486 - 2000 = 8486	**Estimate**: Children need to estimate and answer prior to completing a written calculation. This can be done mentally.  **Check:** **Is your estimate close to the answer you have calculated?** 25.356 + 346.28 becomes: Estimate: 25 + 350 = 375 25.356 +346.28 371.636 9.076 – 3.142 becomes: Estimate: 9 – 3 = 6 8 9.1 076 3. 142 5. 934 **Place value counters** **Written column method** 

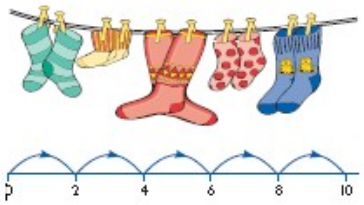
Year 5 (page 2 of 2)		**Missing number:** $34\square 2 + 1329 = 4791$ (1 1) $1.\square 7 + 0.91 = 2.68$ Shows if children have a strong understanding of the formal written method with regrouping and the link between addition and subtraction. **Bar model:**  Bar modelling is used to support children's understanding of a word problem by being able to visualise the problem and choose the appropriate operation.

Year 6 (page 1 of 2)		
Objectives	**Mental jottings and representation**	**Written methods with representation**
• To perform mental calculations, including with mixed operations and large numbers • To use their knowledge of the order of operations to carry out calculations involving the four operations • To solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • To add negative numbers	Ensure children use a wide range of mental strategies when calculating including decimals and increasingly larger numbers. What is 2 minus 0.005? What is 5.7 added to 8.3?  57 + ☐ = 125 911 – 47 = ☐ 149 + 137 + 158 = ☐ (☐ + ☐) x ☐ = 10	12 462 + 8456 Tth | Th | H | T | U | | | | | | Estimate: 21 000 = 12 500 + 8 500 1 2 4 6 2 + 8 4 5 6 2 0 9 1 8 1 1 Rounding to estimate before using formal written methods. 3906 = 12 462 – 8556 Estimate: 4000 = 12 500 – 8 500 ~~1~~ ~~12~~ ~~14~~ ~~15~~ ~~16~~ 2 - 8 5 5 6 3 9 0 6 Add and subtract numbers with a different number of decimal places. 12.4 – 3.56 = Estimate: 12 – 4 = 8 (my answer should be between 8 and 9) ~~1~~ ~~12~~ ~~13~~ ~~4~~ 0 - 3.5 6 8.8 4

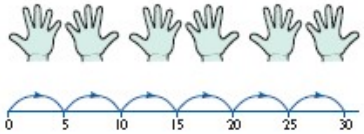
Year 6 (page 2 of 2)		**Negative number:** (-2) + (-3) = -5  Number lines to support when using negative numbers. 3 + (– 2) = 1  **Bar model:** 

Key representations to support conceptual understanding of multiplication and division.

Counting in equal groups of.



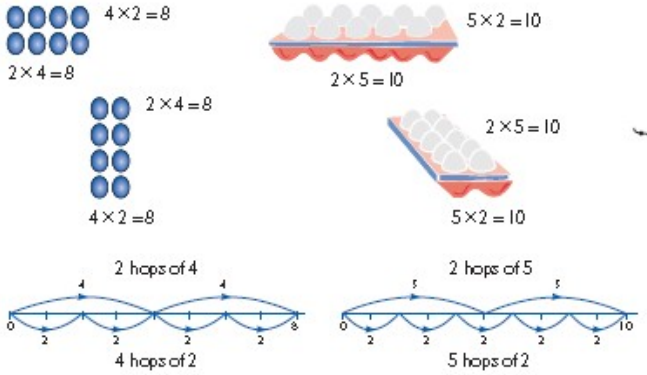
2 + 2 + 2 + 2 + 2 = 10
2 × 5 = 10
2 multiplied by 5
5 pairs
5 hops of 2

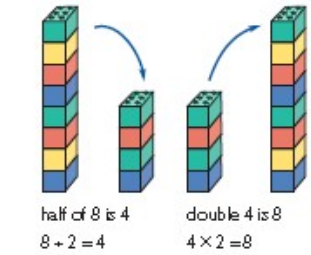


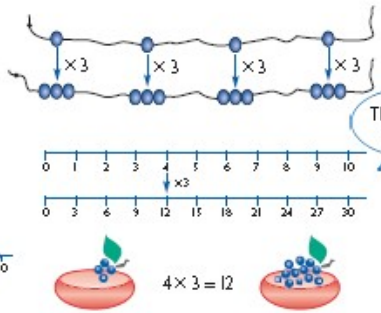
5 + 5 + 5 + 5 + 5 + 5 = 30
5 × 6 = 30
5 multiplied by 6
6 groups of 5
6 hops of 5

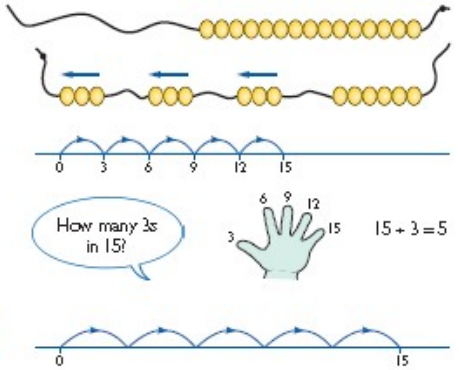
10p + 10p + 10p + 10p + 10p = 50p
10p × 5 = 50p
5 hops of 10

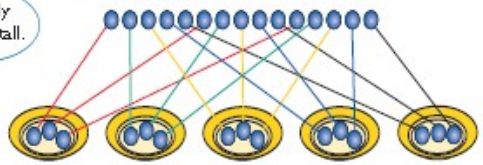
Arrays show that multiplication can be done in any order. It also shows the link between different multiplications having the same product.

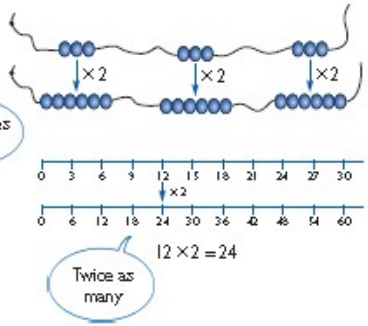






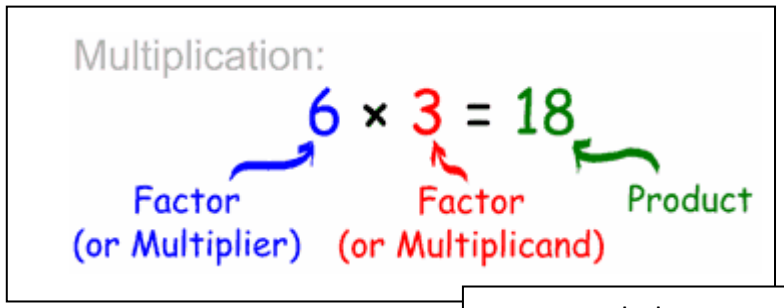


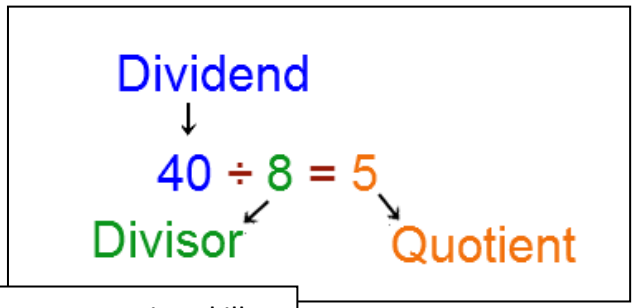




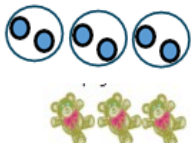
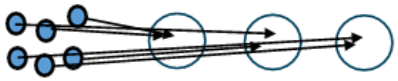
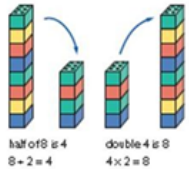
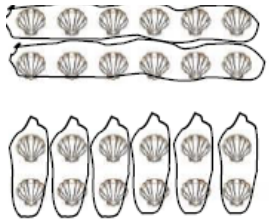
Fluency within multiplication and making links, not just learning by rote.

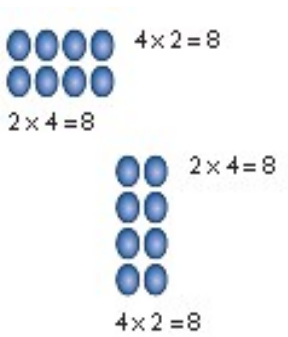
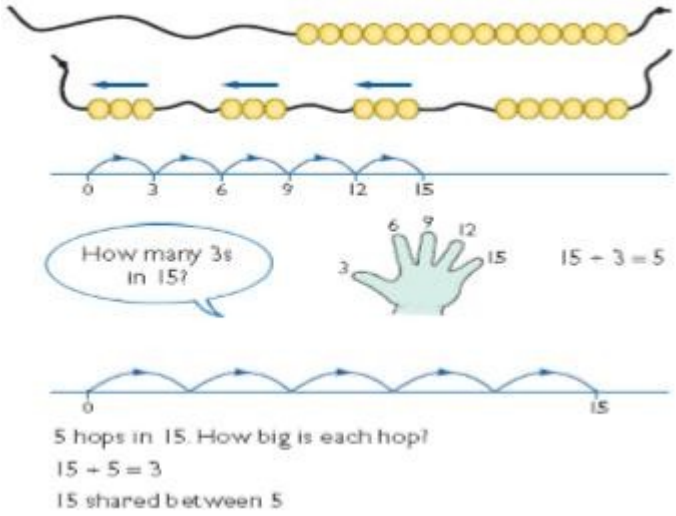
Sharing in to equal groups shows children the link between multiplication and division.

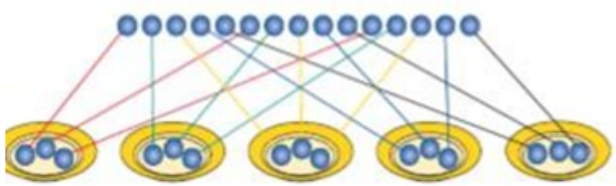
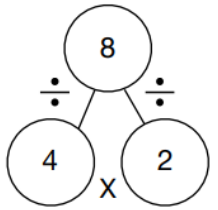
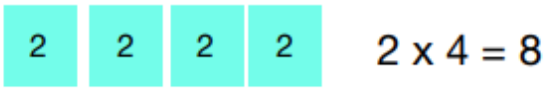


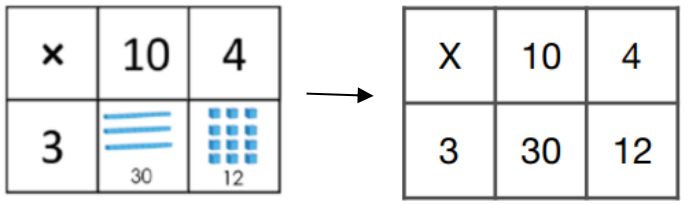
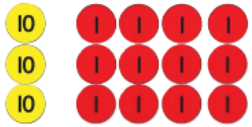
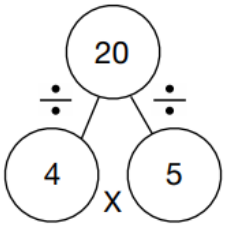
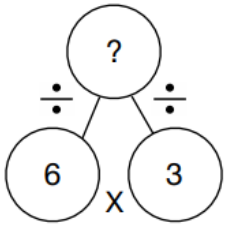


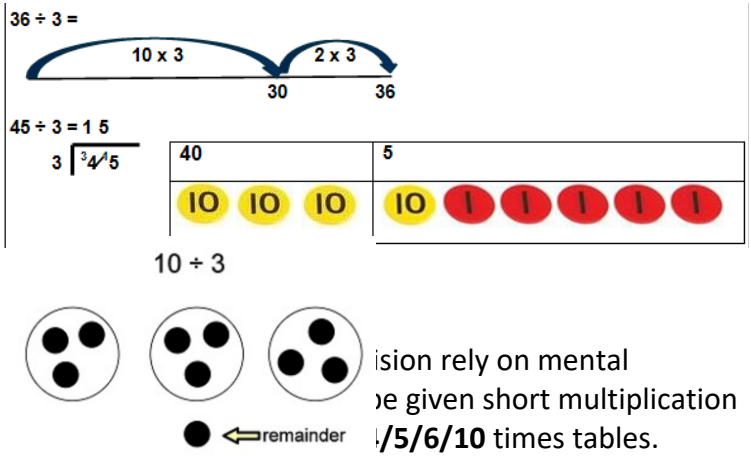
Key Vocabulary – to support reasoning skills

Year 1		
Objectives	**Examples**	**Written methods with representation**
• To count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens • To double numbers to 20 • To place objects into equal groups • To solve one-step problems by calculating the answer using concrete objects, pictorial representations and arrays	Use of visual models to support counting in 2, 5, 10 Ensure children begin to see the patterns of counting in 2, 5, 10. Double/halve numbers up to: 10 + 10 = 10 x 2 20 – 10 = 20 ÷ 2 **Children do not need to record number sentences using the symbols in year 1.** **Develop the vocabulary by encouraging children to explain what they are doing.**	Grouping  2 + 2 + 2 = 6 3 lots of 2 is 6 Sharing  Arrays  3 lots of 2 is 6 2 lots of 3 is 6      12 shells divided by 2 equals 6 12 ÷2 = 6 There are six shells in each group (inverse:6x2=12) 12 shells divided by 6 equals 2 12 ÷6 = 2 There are two shells in each group (inverse: 2x6=12)

Year 2 (page 1 of 2)		
Objectives	**Examples**	**Written methods with representation**
• To count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward • To recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • To show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot • To use written mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs • To solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods and division facts, including problems in context.	2 x 5 = 10 5 x 2 = 10 10 ÷ 2 = 5 10 ÷ 5 = 2 Use knowledge of doubling: 2 x 10 = 20 10 x 2 = 20 20 ÷ 2 = 10 20 ÷ 10 = 2 Children should be able to link multiplication and division and use known times tables to solve problems.	**Arrays:**  **Grouping:** 

Year 2 (page 2 of 2)		**Sharing:**  3 x 5 = 15 15 ÷ 5 = 3 **Multiplication and Division Facts:**  2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 Counting in groups of using bar modelling to support children 

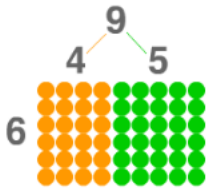
Year 3 (page 1 of 2)		
Objectives	**Examples**	**Written methods with representation**
• To count from 0 in multiples of 4, 8, 50 and 100 (copied from Number and Place Value) • To recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • To write and calculate mathematical 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) • To solve problems including missing number problems. • To divide a 2-digit by 1-digit with and without remainders	If the children know 2/5/10 facts they now need to learn: 3 x 3 4 x 4 6 x 8 4 x 3 6 x 4 7 x 8 6 x 3 7 x 4 8 x 8 7 x 3 8 x 4 9 x 8 8 x 3 9 x 4 11 x 8 9 x 3 11 x 4 12 x 8 11 x 3 12 x 4 12 x 3 With corresponding division facts. Recall facts along with counting in steps sizes.  4 x 3 = 3 x 4 12 ÷ 3 = 4 12 ÷ 4 = 3	14 x 3 = Grid method   1 4 x 3 1 2 + 3 0 4 2 Short Multiplication   Multiplication and Division Facts

Year 3 (page 2 of 2)	To make 6 fairy cakes you need... How much will you need for 12?	**Distributive Law:**  ision rely on mental e given short multiplication **/5/6/10** times tables.

Year 4 (page 1 of 2)		
Objectives	**Examples**	**Written methods with representation**
• To count in multiples of 6, 7,9, 25 and 1 000 (copied from Number and Place Value) • To recall multiplication and division facts for multiplication tables up to 12 × 12 • To 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. • To recognise and use factor pairs and commutativity in mental calculations (appears also in Properties of Numbers) • To multiply two-digit and three-digit numbers by a one-digit number using formal written layout • To solve problems involving multiplying and adding, including using distributive law to multiply 2-digit by 1-digit.	If the children know multiplication and division facts for: 2/5/10/3/4/8/ they now need to learn. 6 x 6 7 x 7 9 x 9 11 x 11 7 x 6 9 x 7 11 x 9 12 x 11 9 x 6 11 x 7 12 x 9 12 x 12 11 x 6 12 x 7 12 x 6 Explore what happens when we divide by 1 and 0. To solve 24 x 3 Use knowledge of factor pairs. 8 x 3 x 3 6 x 4 x 3 In measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).	CPA – dienes – jottings – written method <u>Short Multiplication:</u> 24 × 6 becomes 2 4 × 6 1 4 4 2 Answer: 144 <u>Long Multiplication:</u> 124 × 26 becomes 1 2 1 2 4 × 2 6 7 4 4 2 4 8 0 3 2 2 4 1 1 Answer: 3224 <u>Short Division:</u> 98 ÷ 7 becomes 1 4 7 9 8 2 Answer: 14 432 ÷ 5 becomes 8 6 r 2 5 4 3 2 3 Answer: 86 remainder 2 <u>Long Division:</u> 432 ÷ 15 becomes 2 8 r 12 1 5 4 3 2 3 0 0 1 3 2 1 2 0 1 2 432 ÷ 15 becomes 2 8 · 8 1 5 4 3 2 · 0 3 0 1 3 2 1 2 0 1 2 0

Year 4 (page 2 of 2)

Distributive Law:



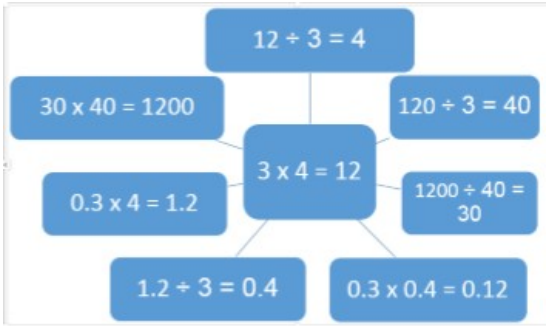
6 x 9
is the same as
6 x (4 + 5)
which equals
(6 x 4) + (6 x 5)
which equals
24 + 30
which equals
54

or 6 x 9

6 x (4 + 5) = (6 x 4) + (6 x 5)
6 x 9 = 24 + 30
54 = 54

other examples

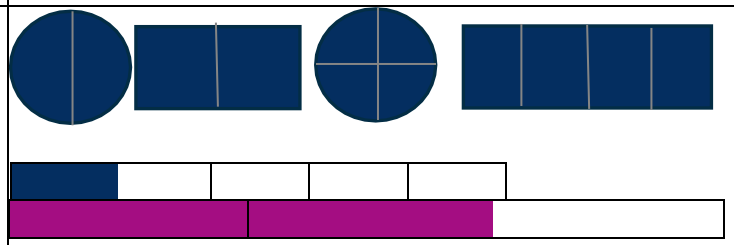
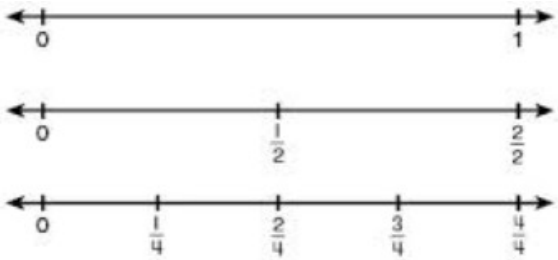
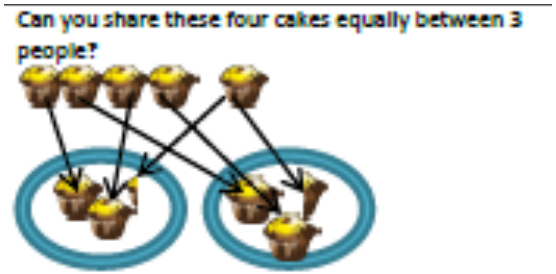
2 x (4 + 5) = (2 x 4) + (2 x 5)
3 x 12 = (3 x 10) + (3 x 2)
4 x 9 = (4 x 6) + (4 x 3)

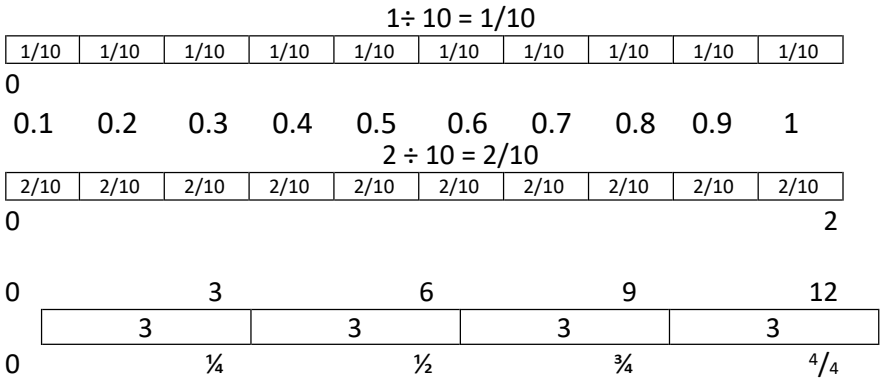
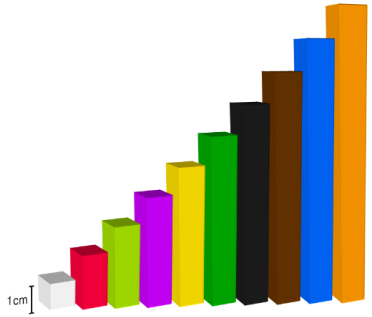
Year 5 (page 1 of 2)		
Objectives	**Examples**	**Written methods with representation**
• To count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 • To multiply and divide numbers mentally drawing upon known facts • To multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 • To identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. • To know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • To establish whether a number up to 100 is prime and recall prime numbers up to 19 • To recognise and use square numbers and cube numbers,	Related number facts 	CPA – place value counters – jottings – written method Written methods as per year 4 Short Multiplication: 24 × 6 becomes 2 4 × 6 1 4 4 2 Answer: 144 Long Multiplication: 124 × 26 becomes 1 2 1 2 4 × 2 6 7 4 4 2 4 8 0 3 2 2 4 1 1 Answer: 3224 Short Division: 98 ÷ 7 becomes 1 4 7 | 9 8 2 Answer: 14 432 ÷ 5 becomes 8 6 r 2 5 | 4 3 2 3 Answer: 86 remainder 2 Long Division: 432 ÷ 15 becomes 2 8 · 8 1 5 ⌐ 1 5 | 4 3 2 · 0 – 3 0 ↓ 1 3 2 – 1 2 0 ↓ 1 2 0

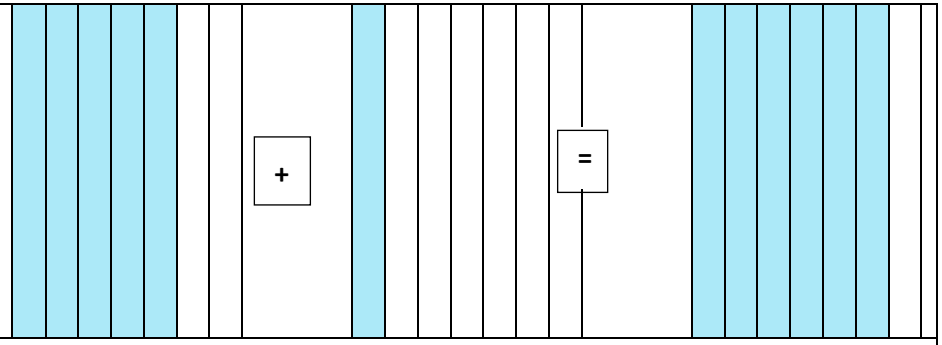
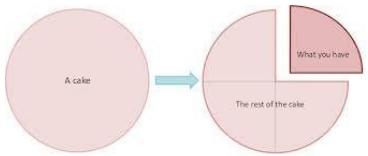
and the notation for squared (2) and cubed (3) • To multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers • To divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context		

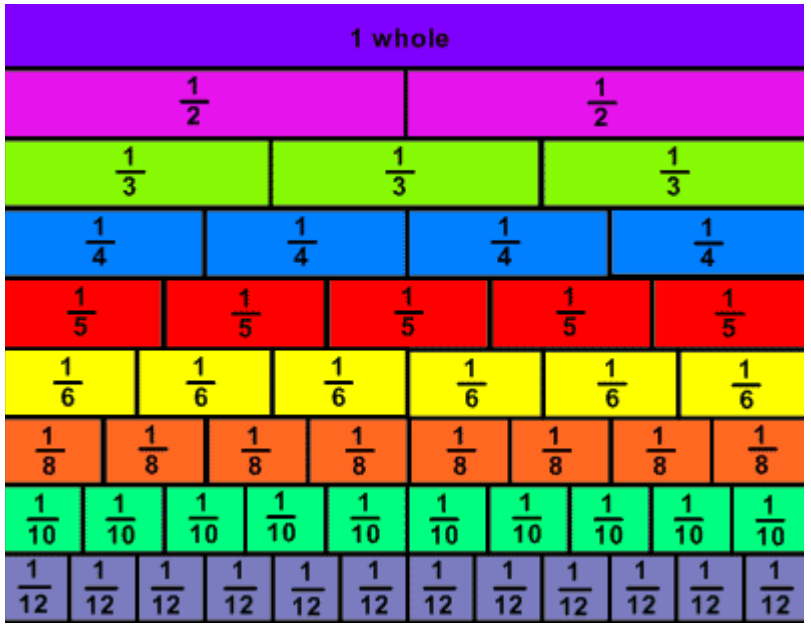
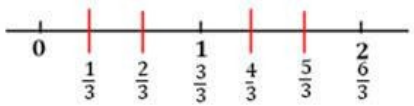
Year 6 (page 1 of 2)		
Objectives	**Examples**	**Written methods with representation**
• To perform mental calculations, including with mixed operations and large numbers • To identify common factors, common multiples and prime numbers • To use their knowledge of the order of operations to carry out calculations involving the four operations • To multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • To 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	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. 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. Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9. Common factors can be related to finding equivalent fractions. Calculate 900 ÷ (45 × 4). A bag of four oranges costs thirty seven pence. How much do twelve oranges cost?	Written methods as per year 4 and 5 <u>Short Multiplication:</u> 24 × 6 becomes 2 4 × 6 1 4 4 2 Answer: 144 <u>Long Multiplication:</u> 124 × 26 becomes 1 2 1 2 4 × 2 6 7 4 4 2 4 8 0 3 2 2 4 1 1 Answer: 3224 <u>Short Division:</u> 98 ÷ 7 becomes 1 4 7 | 9 2 8 Answer: 14 432 ÷ 5 becomes 8 6 r 2 5 | 4 3 3 2 Answer: 86 remainder 2 <u>Long Division:</u> 432 ÷ 15 becomes 2 8 · 8 1 1 5 | 4 3 2 · 0 3 0 ↓ 1 3 2 1 2 0 ↓ 1 2 0

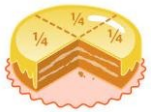
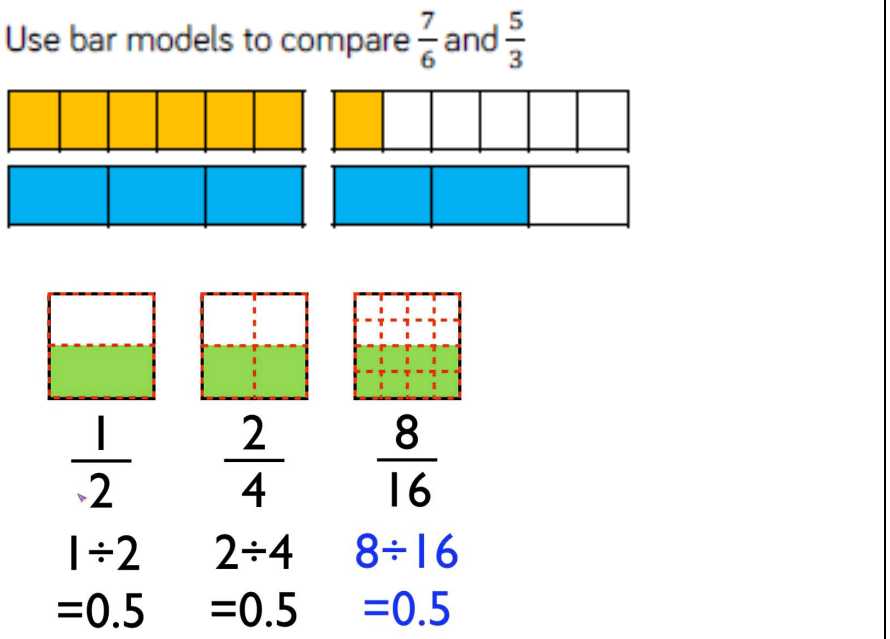
interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context		

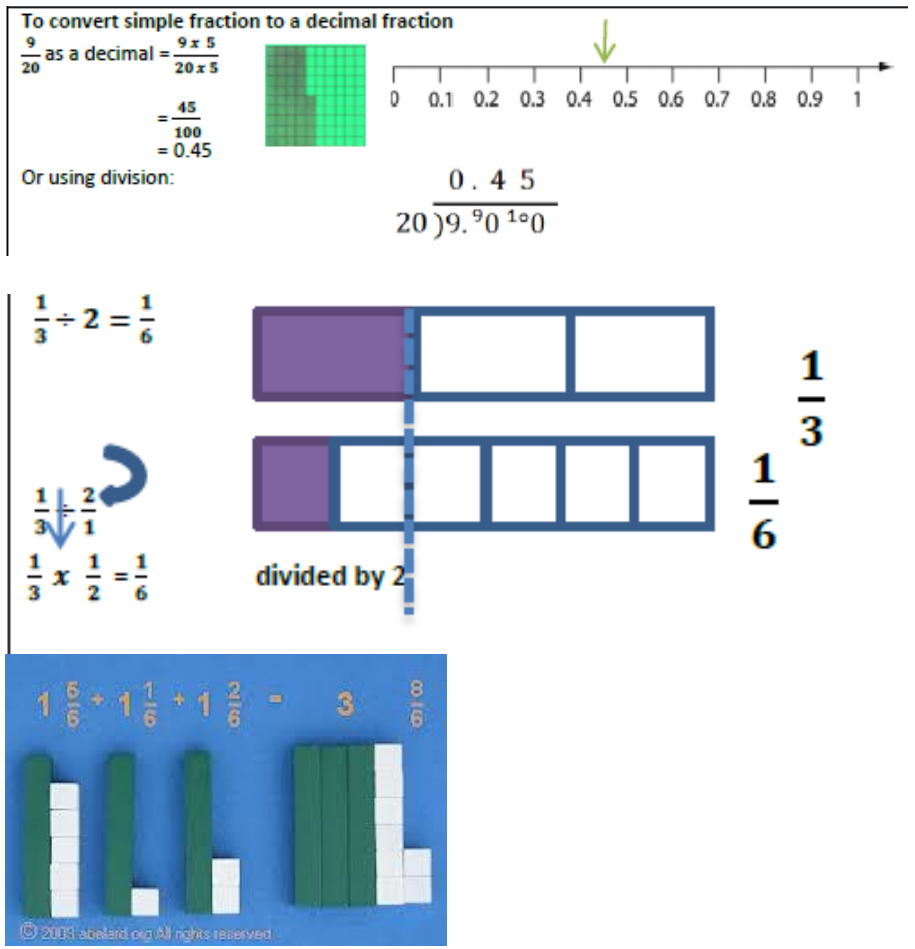
Year	Objectives	Examples	Models
Year 1	• To recognise, find and name a half as one of two equal parts of an object, shape or quantity • To recognise, find and name a quarter as one of four equal parts of an object, shape or quantity	Children use their knowledge of fractions of shape to find fractions of quantities. Children should be give practical apparatus to find halves and quarters of quantities within 20. Record work pictorially.	
Year 2	• To recognise, find, name and write fractions ½ ,1/4, 2/4 and 3/4 of a length, shape, set of objects or quantity • To write simple fractions for example, ½ of 6 = 3 and recognise the equivalence of 2/4 and ½. • To count in fractions of ½ (0, ½, 1, 1 ½, 2, 2 ½, etc)	Children use their knowledge of unit and non-unit fractions of shapes to find fractions of quantities. They relate this to find fractions of a length e.g. 2/4 of 1m = Children need to relate finding a quarter to halving and halving again. *Pupils should count in fractions up to 10, starting from any number and using the1/2 and 2/4 equivalence on the number line (Non Statutory Guidance)*	If I can see ¼ how many quarters can you see? If I can see 2/3 how many thirds can you see?   

Year	Objectives	Examples	Models and Images
Year 3	• To count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one digit numbers or quantities by 10 • To recognise, find and write fractions of a discrete set of objects: unit fractions and non- unit fractions with small denominators • To recognise and use fractions as numbers: unit fractions and non- unit fractions with small denominators • To recognise and show, using diagrams, equivalent fractions with small denominators • To add and subtract fractions with the same denominator within one whole • To compare and order unit fractions, and fractions with the same denominators	Encourage children to count up and down in tenths. 1 ÷ 10 = 1/10 2 ÷ 10 = 2/10 3 ÷ 10 = 3/10 Continue the pattern. What do you notice? What's the same? What's different? Children can use fractions as an operator E.g. 1/4 of 12 = 12 ÷ 4 = 3 Children can relate fractions to the division of integers 1 ÷ 4 = ¼ 4 x ¼ = 1 3 ÷ 4 = ¾ ¾ x 4 = 3 (12/4 or ¾ + ¾ + ¾ + ¾) Children need to relate and reason about why their diagrams are equivalent to a half – make connections between the numerator and the denominator E.g. ½ = 4/ 8 The numerator will be half of the denominator. Children should be encouraged to make the connection between their multiplication tables and	 Use Cuisenaire rods to develop vocabulary of equivalence.  4/9 is green, how much is red?  

		equivalents E.g. 1/3 = 3/9 because 3 x 3 = 9. 5/7 + 1/7 = 6/7 – – – Children need to use practical resources/visual representations to support the comparison of fractions E.g. 1/3 > ¼ Children should also be taught how to order fractions on a number line	 
Year 4	• To recognise and show using diagrams, families of common equivalent fractions • To count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by tenths • To solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number	1 ÷ 100 = 1/100 2 ÷ 100 = 2/100 3/7 of 56 = 24 3/10 of 120 = 36 ¼ = 12 ¾ = 3/10 + 4/10 = 7/10 9/100 – 7/100 = 2/100	  Count back in 1 and 1/10 from 101. 

	• To add and subtract fractions with the same denominator • To recognise and write decimal equivalents of any number of tenths or hundredths • To recognise and write decimal equivalents to ¼, ½, ¾. • To find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths • To round decimals with one decimal place to the nearest whole number • To compare numbers with the same number of decimal places up to two decimal places • To solve simple measure and money problems involving fractions and decimals to two decimal places • To identify equivalent fractions	Children can record on a number line equivalents between 1/10 and 0.1 Count on and back in tenths as decimals and relate to counting on/back in 10ths (fractions). 25 ÷ 10 = 2.5 2 ones and 5 tenths 25 ÷ 100 = 0.25 0 ones, 2 tenths and 5 hundredths or 25 hundredths Pupils should connect hundredths to tenths and place value and decimal measures. They extend the use of the number line to connect fractions, numbers and measures. Pupils make connections between fractions of a length, shape and as a representation of one whole or a set of quantities.	  Counting forwards and backwards using simple fractions and decimals. 

Year 5	• To add and subtract fractions with the same denominator and denominators that are multiples of the same number. • To compare and order fractions • To multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. • To read and write decimals as fractions (0.71 = 71/100) • To round decimals with 2 decimal places to the nearest whole. • To recognize mixed numbers and improper fractions and convert from one to the other.	Pupils should be taught throughout that percentages, decimals and fractions are different ways of expressing proportions. They extend their knowledge of fractions to thousandths and connect to decimals and measures. Pupils practice 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 should make connections between percentages, fractions and decimals.	 I eat 1 more piece of this cake. What fraction would be left? **Comparing fractions:** 

Year 6	• To add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions. • To multiply simple pairs of proper fractions, writing the answer in its simplest form • To divide proper fractions by whole numbers • To use common factors to simplify fractions • To compare and order fractions including fractions >1 • To multiply 1-digit numbers with up to 2dp by a whole number • To recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. • To solve problems involving the calculation of percentages and the use of percentages for comparison.	Pupils should use a variety of images to support their understanding of multiplication with fractions. They practice calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators. Pupils link percentages or 360° to calculating angles of pie charts.	

Ensure there is a strong focus in Year 2 on moving from concrete to pictorial representations. Lessons should incorporate pictorial alongside concrete.

In years 2 and years 6, children should not be reliant on concrete resources after autumn term. Pictorial needs to be used alongside concrete in lessons to provide children with the understanding and strategies needed for the abstract. These can be in terms of jottings, sketching or bar modelling.