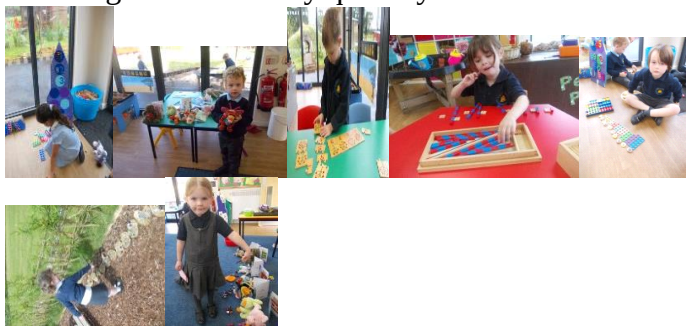
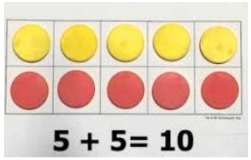
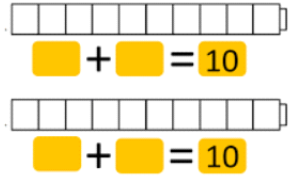
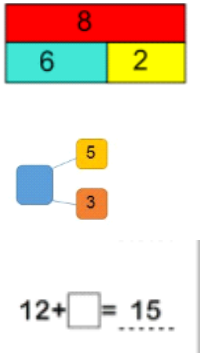
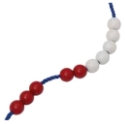
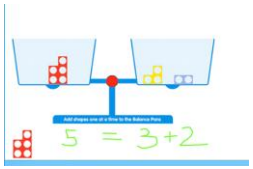
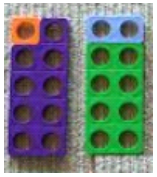
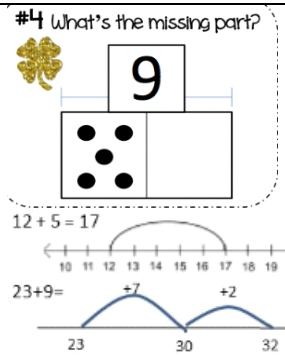
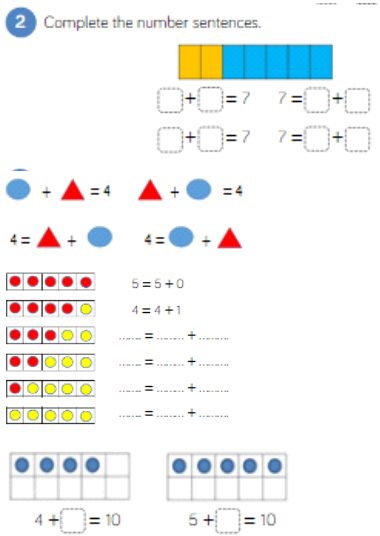
HARROWBARROW SCHOOL

Calculation Policy – February 2018

EYFS	Concrete	Pictorial
Children count reliably with numbers from 1 -20.	• Number songs with props. • Counting loose objects and developing 1-  1 correspondence.	• Daily 100 day counting using 100 square. • Counting across number line.
Children recognise and place numbers from 1 – 20 in order.	• Play based learning using resources clearly labelled with numerals to support recognition; 	• Ordering items either by quantity or numeral. 
Say which number is 1 more or 1 less than a given number.	• Acting out number songs, e.g. 5 Little Speckled Frogs; removing 1 frog at a  time.	• Using bead strings, numicon, unifix, etc to add/subtract 1. • Using a number line to visualise where 1 more/less is.
Using quantities and objects, they add and subtract 2 single-digit numbers and count on or	• Using loose parts to create number sentences, e.g. throwing coloured on one side beans onto a plate, how many gold?	• Using numicon, bead strings, loose parts, etc. to generate

back to find the answer.	How many white?  • Practical contexts, if there are 4 people in the house and this child joins how many will there be?	number sentences.  • Rolling dice and adding/subtracting quantities.
They solve problems including doubling, halving and sharing.	• Discussing doubles when playing dice games/dominoes. Have you scored a double? • Using physical objects to create doubles; I have 4 aliens, how many would I have if I added another 4? • Cutting cakes, fruit, play dough, etc. into halves.  • Sharing items equally between 2 children. • Sharing items equally between a small group of children.	• Pictures of collections of objects. Can you add another set of the same quantity, how many altogether? • Pictures of collections of objects. Can you share these between 2/3/4?

Addition	Concrete	Pictorial	Abstract
Year 1 Children should read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs represent and use number bonds and related subtraction facts within 20 add and subtract one-digit and			

two-digit numbers to 20, including zero Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? - 9. **Concrete** methods might include: using beadstrings, Numicon, multilink or unifix to make number bonds to 20, using dot patterns on dice to add, using Numicon to balance a simple equation such as 7 = 3 + 4 Pupils will then move on to more **pictorial** representations such as using 10 frames, part-part whole with missing numbers or numbers represented by pictures, using numberlines to count on. **Abstract** maths will involve being able to put missing numbers in a box, looking at patterns when adding numbers such as 5 = 4 + 1, 5 = 2 + 3 etc	     	 	4 + 12 = = 4 + 15 

Year 2

Children should

solve one-step problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods

recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

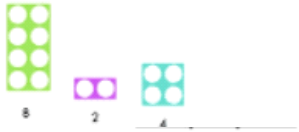
add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers; adding three one-digit numbers

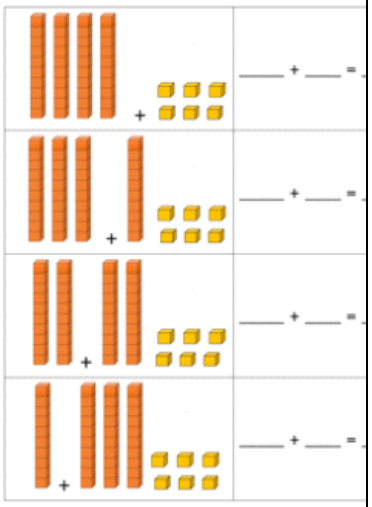
show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot

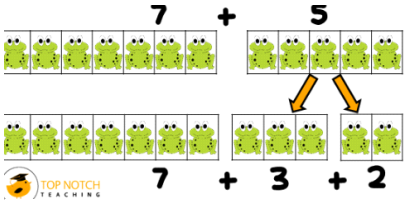
recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

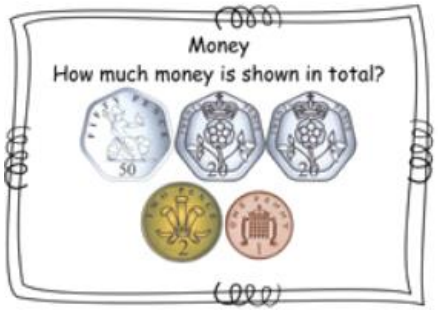
Concrete maths might involve:

8 + 6 leads to 8 + 2 + 4

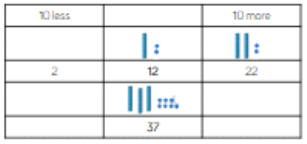


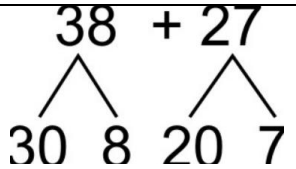


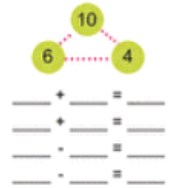


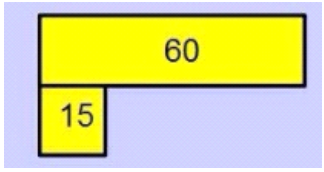


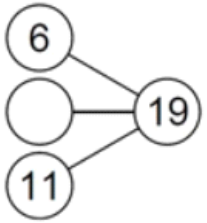
5 + 5 + 5

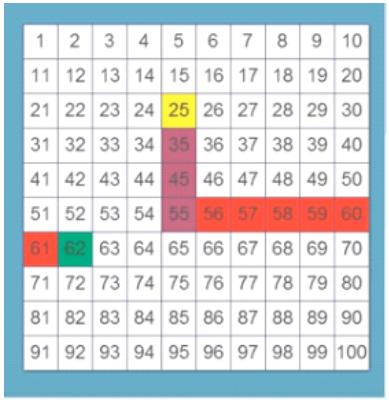






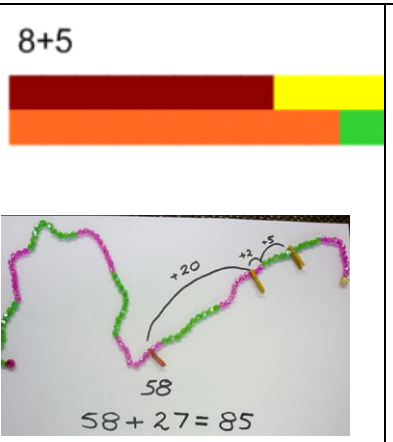
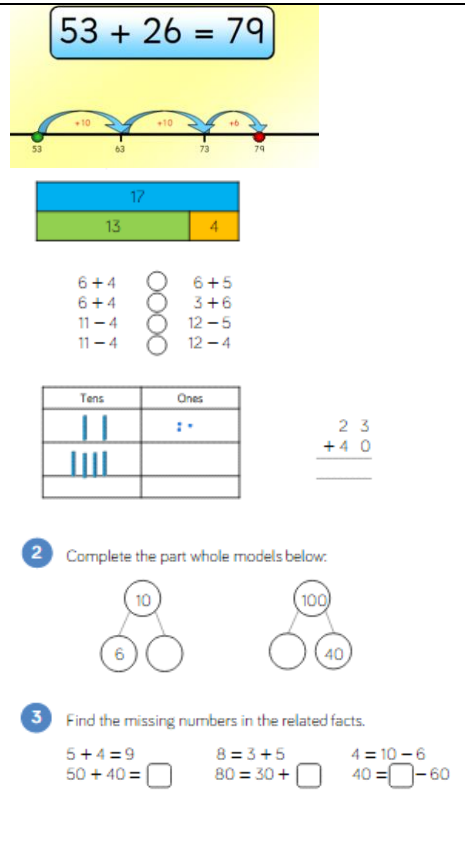






1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

25 + 37 = 62

bridging the gap with Numicon (understanding that 8 + 6 could be worked out as 8 + 2 + 4), partitioning numbers using Dienes, using Cuisenaire rods to work out addition questions such as 8 + 5 = 10 + 3, using beadstrings to count on tens and then units **Pictorial** maths might include: using ten frames to work out addition sums such as 7 + 5 = 7 + 3 + 2, working out sums of money, using shape to work out addition questions, using Dienes to start to partition numbers **Abstract** maths might include: working out part/part whole models or bar models, using a 100 square to count on tens and units, using a numberline to count on tens and units, using knowledge of 3 + 7 to work out 30 + 70, starting to use column methods for addition			

Year 3

Children should:

add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds

add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction

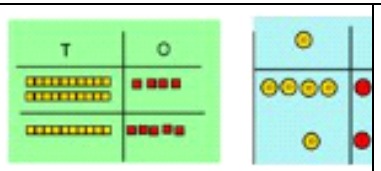
estimate the answer to a calculation and use inverse operations to check answers.

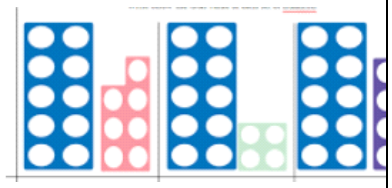
solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

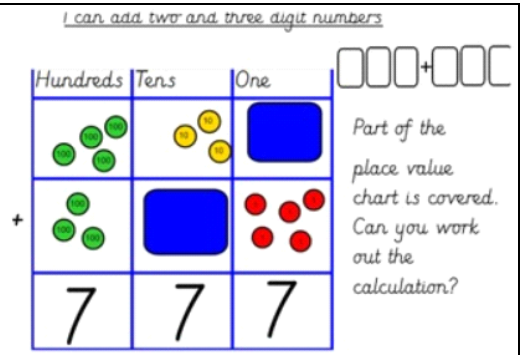
measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)

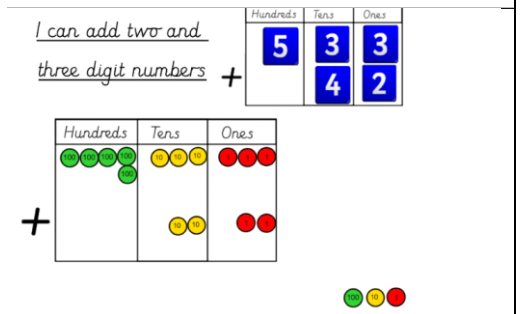
Concrete maths might include: using counters on place value charts, using Dienes to add, using Numicon to add tens and units

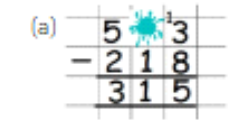
Pictorial maths might include: using place value charts to support the idea of column addition, finding missing

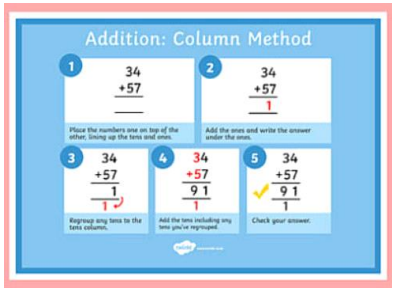


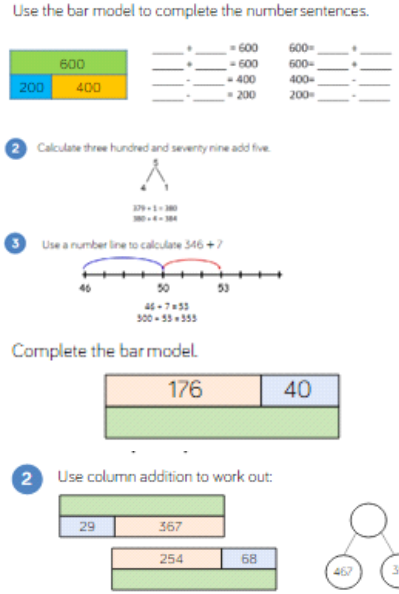


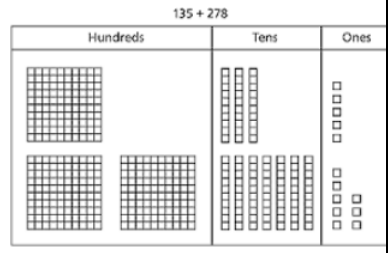
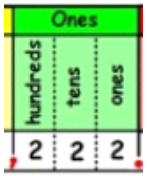
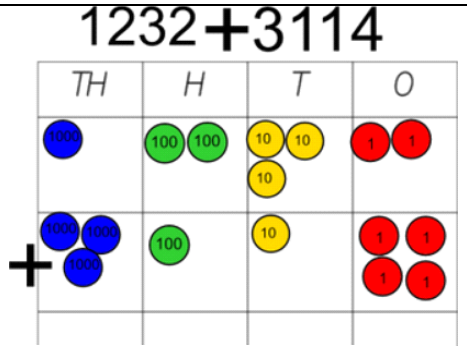
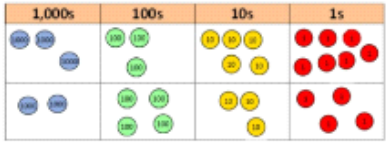
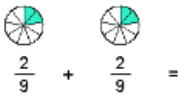
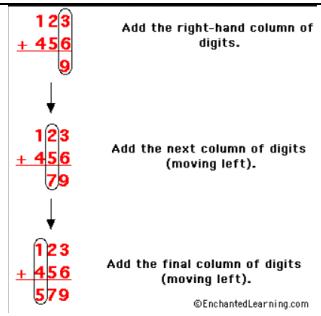
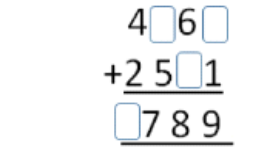
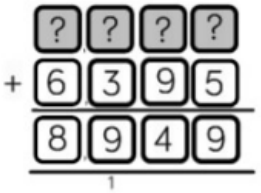
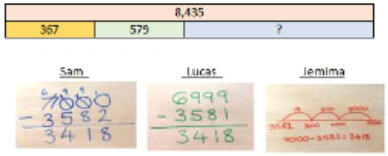


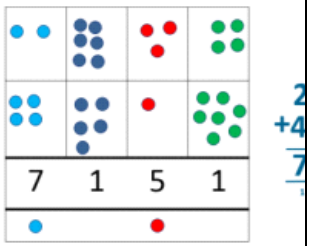
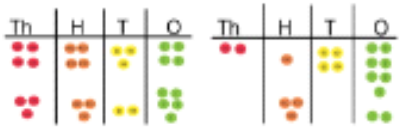
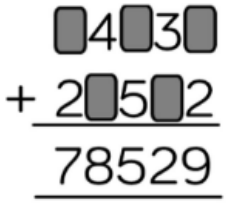


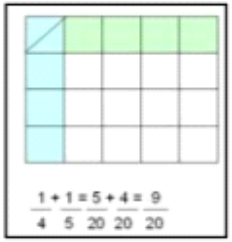


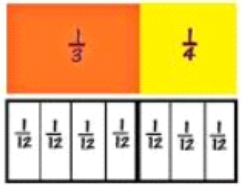
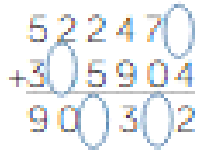


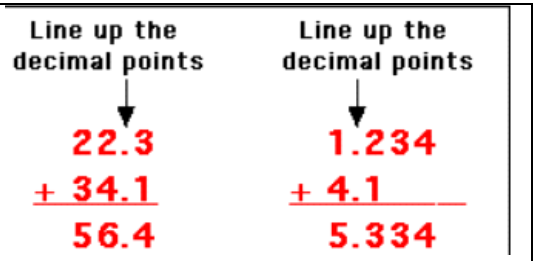


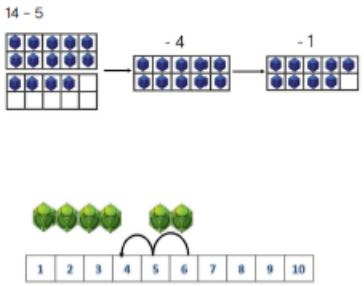
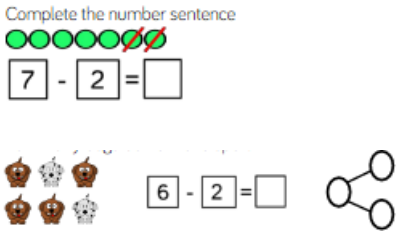
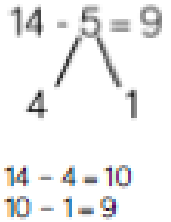
numbers using place value charts, solving problems using images of Dienes **Abstract** maths might include: part/part whole models, bar models, finding related facts for addition and subtraction, using column addition			
Year 4 Children should add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate estimate and use inverse operations to check answers to a calculation solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why add and subtract fractions with the same denominator solve simple measure and money problems involving fractions and decimals to two decimal places. solve problems involving	 	 Use the place value grid to help you work out two hundred and thirty-four add three hundred.   	   

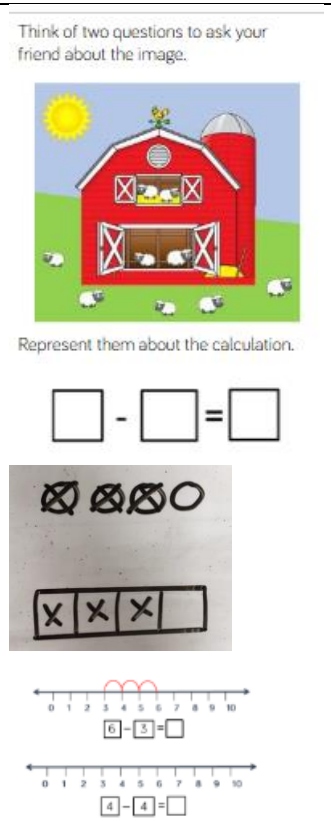
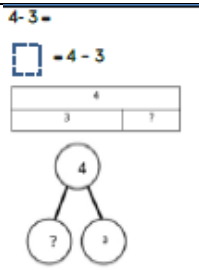
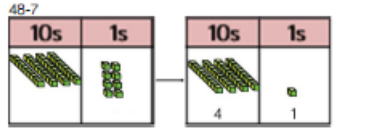
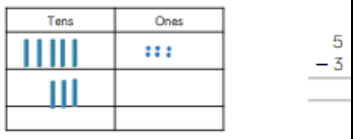
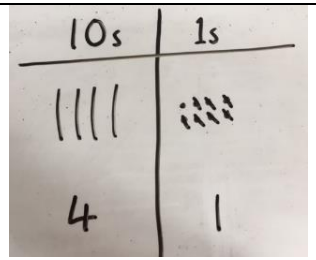
converting from hours to minutes; minutes to seconds; years to months; weeks to days. **Concrete** maths might include: using counters on place value charts, using Dienes to add up to 4 digits **Pictorial** maths might include: using place value charts to support the idea of column addition, finding missing numbers using place value charts, solving problems using images of Dienes, using fraction chart to add fractions with the same denominator **Abstract** maths might include: part/part whole models, bar models, finding related facts for addition and subtraction, using column addition, link to measure such as working out perimetre of shapes		 200 + 40 + 7 100 + 20 + 5 300 + 60 +12 = 372 247 +125 12 60 300 372	
Year 5 Children should add and subtract whole numbers with more than 4 digits, including using efficient written methods (columnar addition and subtraction add and subtract numbers mentally with increasingly large numbers	**Compact written method** Extend to numbers with at least fo  7 1 5 1	 Th H T O Th H T O	 4 3 + 2 5 2 78529

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. add and subtract fractions with the same denominator and related fractions; write mathematical statements >1 as a mixed number (e.g. 2/5 + 4/5 = 6/5 = 11/5) **Concrete** maths might include: using counters on place value charts, using Dienes to add up to 4 digits **Pictorial** maths might include: using place value charts to support the idea of column addition including adding decimals, finding missing numbers using place value charts, solving problems using images of Dienes, using fraction chart to add fractions with denominators in the same times tables **Abstract** maths might include: part/part whole models, bar models, finding related facts for addition and subtraction, using	 		£563.14 + £207.88 £771.02 1 1 1 12 462 + 2300 = 12 462 + 2000 + 300 = 14 462 + 300 = 14 762 234 kg + 49 kg = 273 kg 200 + 30 + 4 40 + 9 200 + 70 + 13

column addition They should be encouraged to choose from a range of strategies: • Counting forwards and backwards in tenths and hundredths: 1.7 + 0.55 • Reordering: 4.7 + 5.6 – 0.7, 4.7 – 0.7 + 5.6 = 4 + 5.6 • Partitioning: counting on or back - 540 + 280, 540 + 200 + 80 • Partitioning: bridging through multiples of 10: • Partitioning: compensating: 5.7 + 3.9, 5.7 + 4.0 – 0.1 • Partitioning: using 'near' double: 2.5 + 2.6 is double 2.5 and add 0.1 or double 2.6 and subtract 0.1 • Partitioning: bridging through 60 to calculate a time interval: It is 11.45. How many hours and minutes is it to 15.20? • Using known facts and place value to find related facts.			
Year 6 Children should use their knowledge of the order of operations to carry out calculations involving the four operations use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. solve addition and subtraction multi-step problems in contexts, deciding which operations and	  		 A | B 631,255

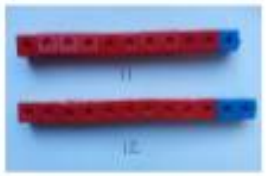
methods to use and why add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions **Concrete** maths might include: using counters on place value charts, using Dienes to add **Pictorial** maths might include: using place value charts to support the idea of column addition including adding decimals to 3 dp, finding missing numbers using place value charts, solving problems using images of Dienes, using fraction chart to add fractions **Abstract** maths might include: part/part whole models, bar models, finding related facts for addition and subtraction, using column addition			

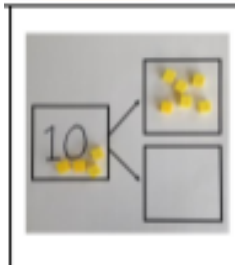
Subtraction	Concrete	Pictorial	Abstract
Year 1 Pupils should: read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs represent and use number bonds and related subtraction facts within 20 add and subtract one-digit and two-digit numbers to 20, including zero			

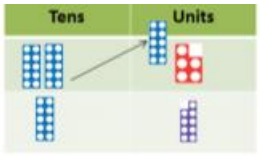
Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9 **Concrete** methods might include: using beadstrings, Numicon, multilink or unifix to make number bonds to 20, using dot patterns on dice to add, using Numicon to balance a simple equation such as 7 = 10 - 3 Pupils will then move on to more **pictorial** representations such as using 10 frames, part-part whole with missing numbers or numbers represented by pictures, using numberlines to count back. **Abstract** maths will involve being able to put missing numbers in a box, looking at patterns when subtracting numbers such as 5 = 6 - 1, 5 = 7 - 2 etc			
Year 2 Children should solve one-step problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100	 		

add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-digit number and tens; two two-digit numbers; adding three one-digit numbers
show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

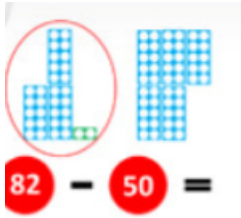
Concrete maths might involve: bridging the gap with Numicon (understanding that 12 - 6 could be worked out as 12 – 2 - 4), partitioning numbers using Dienes, using Cuisenaire rods to work out addition questions such as 10 - 4, using beadstrings to count on tens and then units, using multilink to find the difference between two sets of blocks, using part/part whole models to link to addition
Pictorial maths might include: using ten frames to work out addition sums such as 10 - 3 = 9 - 2, working out sums of money, counting back using a number starting using the larger number and counting back in ones and then tens, using Dienes to start to partition numbers, drawing bars to find the difference between two numbers, use base ten against written calculation to show how you could work this out
Abstract maths might include: working out part/part whole models or bar models, using a 100 square to count on tens and units, using a

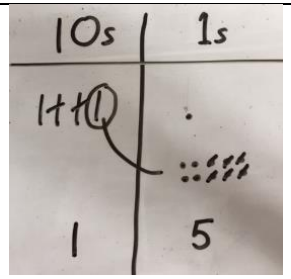


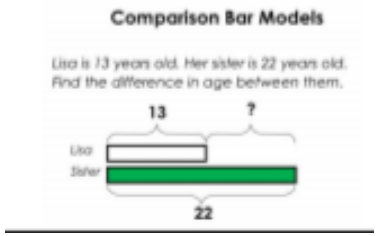


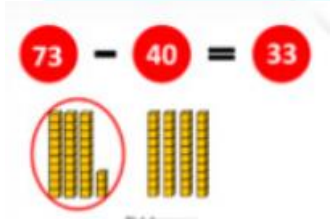


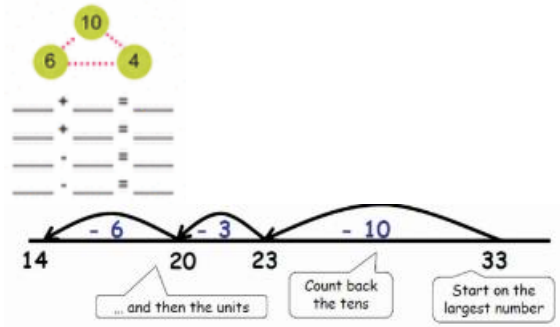
Begin with base 10 or Numicon. Move to pv counters, modelling the exchange of a ten into tten ones. Use the phrase 'take and make' for exchange.

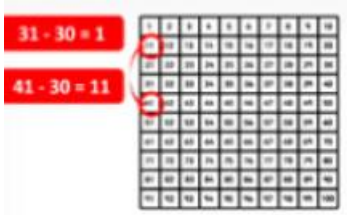


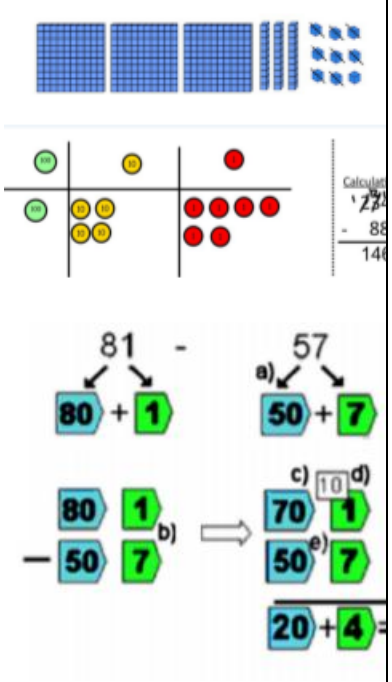
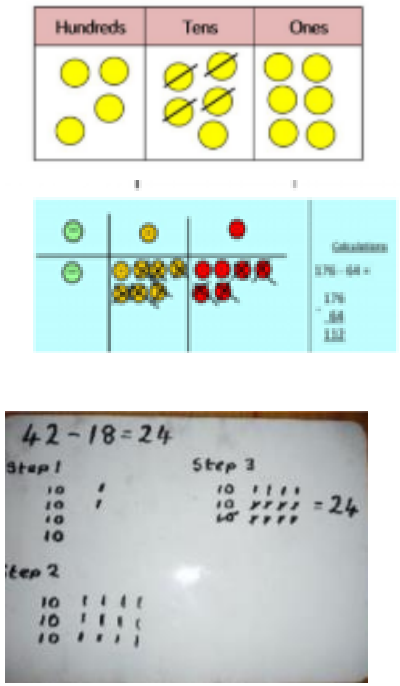
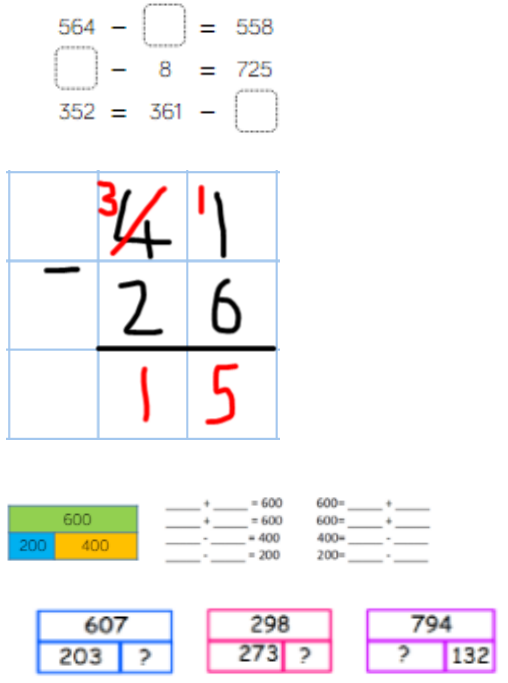


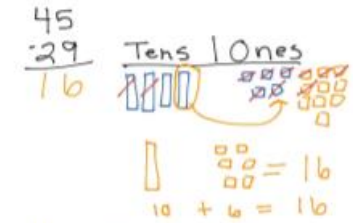
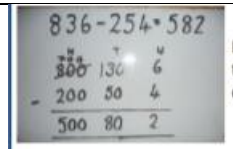
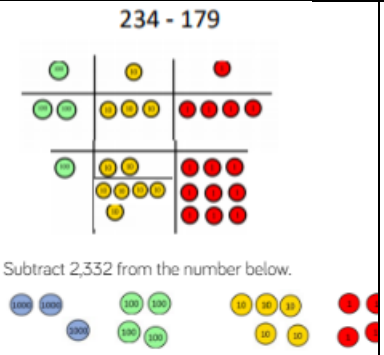
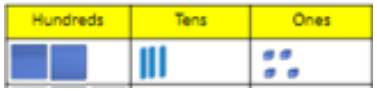
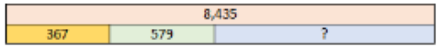
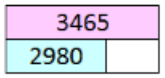


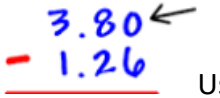






numberline to count on tens and units, using knowledge of 10 – 3 = 7 to work out 100 - 30, starting to use column methods for subtraction			
Year 3 Children should: add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction estimate the answer to a calculation and use inverse operations to check answers. solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) **Concrete** maths might include: using counters on place value charts, using Dienes to add, using Numicon to add tens and units, linking counters on place value chart to column methods for subtraction **Pictorial** maths might include: using place value charts to support the idea of column subtraction, finding missing numbers using place value charts, solving problems using images of Dienes, using jottings to exchange and regroup, use bar models to work out number			

sentences **Abstract** maths might include: part/part whole models, bar models, finding related facts for addition and subtraction, using column addition, using bar model link to addition		 Children may draw base ten or PV counters and cross off.	 Begin by partitioning into pv columns  Then move to formal method.
<u>Year 4</u> Children should add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate estimate and use inverse operations to check answers to a calculation solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why add and subtract fractions with the same denominator solve simple measure and money problems involving fractions and decimals to two decimal places. solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days. **Concrete** maths might include: using counters on place value charts, using Dienes to add, using		  $\frac{3}{4} - \frac{2}{4} = \frac{1}{4}$	Complete this subtraction problem. Thousands Hundreds Tens Ones 7 6 4 6 - 4 3 3 5 Find the missing numbers that could go into the boxes. Give reasons for your answers. □ - 1,345 = 4□6    Look at each pair of calculations below. Which one out of each pair of calculations has the same difference as 2450 - 1830? 2,451 - 1,831 = 2,451 - 1,829 = 2,500 - 1,880 = 2,500 - 1,780 = 2,449 - 1,829 = 2,449 - 1,831 =

Numicon to add tens and units, linking counters on place value chart to column methods for subtraction **Pictorial** maths might include: using place value charts to support the idea of column subtraction, finding missing numbers using place value charts, solving problems using images of Dienes, using jottings to exchange and regroup, use bar models to work out number sentences **Abstract** maths might include: part/part whole models, bar models, finding related facts for addition and subtraction, using column addition, using bar model link to addition, working out which sums have the same answer using their understanding of place value			 Using zero as a place holder to help with regrouping

Year 5

Children should

add and subtract whole numbers with more than 4 digits, including using efficient written methods (columnar addition and subtraction

add and subtract numbers mentally with increasingly large numbers

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

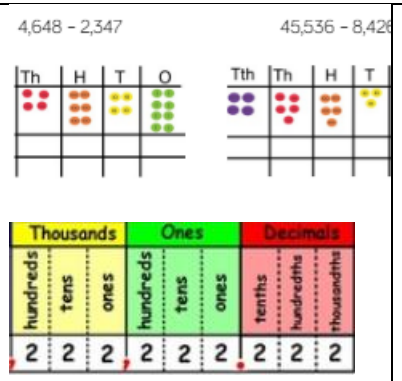
solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

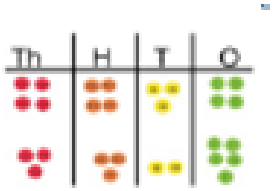
add and subtract fractions with the same denominator and related fractions; write mathematical statements >1 as a mixed number (e.g. 2/5 + 4/5 = 6/5 = 11/5)

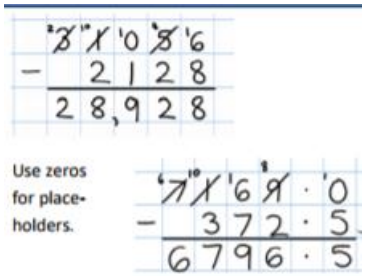
Concrete maths might include: using counters on place value charts, using Dienes to subtract up to 4 digits

Pictorial maths might include: using place value charts to support the idea of column subtraction including adding decimals, finding missing numbers using place value charts, solving problems using images of Dienes, using fraction chart to subtract fractions with denominators in the same times tables

Abstract maths might include: part/part whole models, bar models, finding related facts for addition and subtraction, using column subtraction



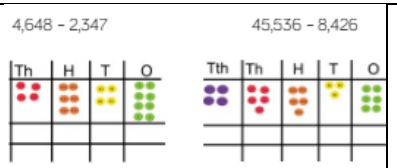


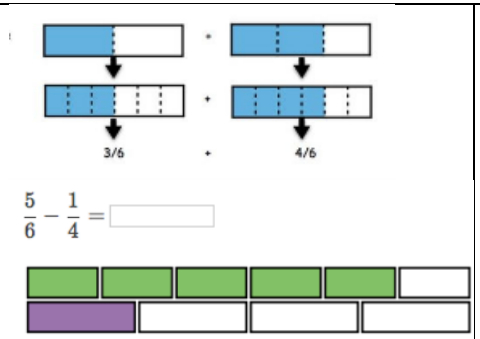


Year 6

Pupils should:

use their knowledge of the order of operations to carry out calculations involving the four operations solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why





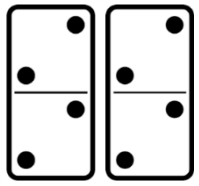
Multiplication

Year 1

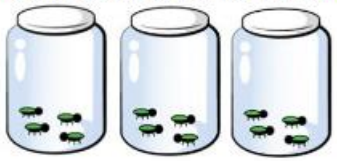
Pupils should be taught to: -step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Concrete: counting sticks, 100 squares and numberlines, Numicon, using fingers for counting up, dominoes, dice, printing in paints, using handprints, counting in 2s with socks, arrays through Numicon as well as chocolate bars
Pictorial: using arrays, grouping objects for counting, putting spots on a ladybird, drawing on blank dice,
Abstract: using numberlines, linking multiplication to repeated addition,

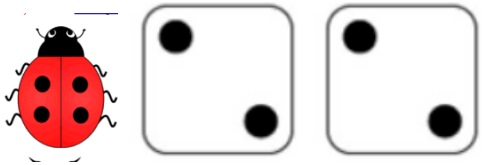
Concrete



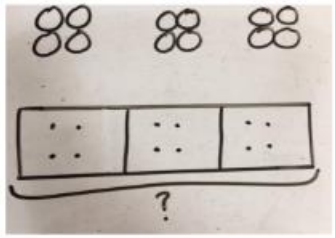
Repeated grouping/repeated addition
3 × 4
4 + 4 + 4
There are 3 equal groups, with 4 in each group.



Pictorial



Children to represent the practical resources in a picture and use a bar model.



Abstract

Repeated addition number sentence
2 + 2 + 2

Worded problem ☐ lots of 2 is 6

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

3 × 4 = 12

4 + 4 + 4 = 12

Year 2

Pupils should be taught to: division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs numbers can be done in any order (commutative) and division of one number by another cannot

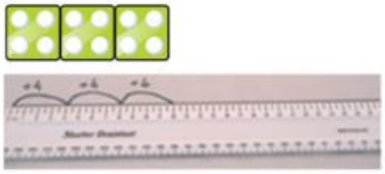
multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Concrete: counting sticks, 100 squares and numberlines, Numicon for counting in steps of 2, 5 and 10, using fingers for counting up (Mexican wave), money counting up in 2, 5 and 10s, using different objects, Unifix, using shapes such as pentagons for counting up, dominoes, dice, counting in 2s with socks, arrays through Numicon as well as chocolate bars, packs of 10 pencils or cartons of drinks

Pictorial: using arrays, grouping objects for counting, putting spots on a ladybird, drawing on blank dice,

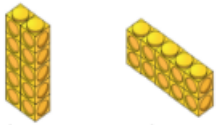
Abstract: using numberlines, linking multiplication to repeated addition,

Number lines to show repeated groups-
3 × 4



Cuisenaire rods can be used too.

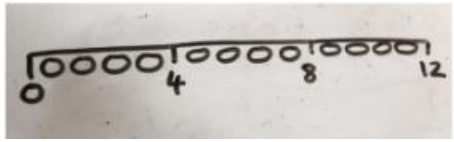
Use arrays to illustrate commutativity counters ar objects can also be used.
2 × 5 = 5 × 2



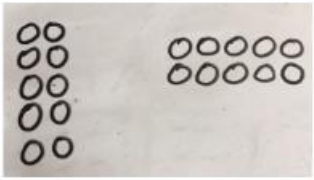
2 lots of 5

5 lots of 2

Represent this pictorially alongside a number line e.g.:



Children to represent the arrays pictorially.



Complete the stem sentence.

There are ___ equal groups with ___ in each group.

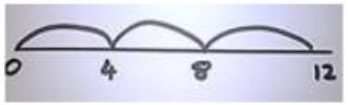
Which group of money is the odd one out?

Explain why.

How can you make the groups equal?

Abstract number line showing three jumps of four.

3 × 4 = 12



Children to be able to use an array to write a range of calculations e.g.

10 = 2 × 5
5 × 2 = 10
2 + 2 + 2 + 2 + 2 = 10
10 = 5 + 5

Complete the sentences to describe the equal groups.

□ + □ + □ = 18

□ × □ = 18

There are __ equal groups with __ in each group.
There are three __.

Use <, > or = to make the statements correct.

3 × 5	□	5 + 5 + 5 + 5
2 × 2	□	2 + 2
4 + 4 + 4	□	2 × 2

Sort into equal and unequal groups.

Equal groups	Unequal groups

Create your own picture to go in each column.

Which one does not belong?

Two 5s

Ten

$5 + 5 =$

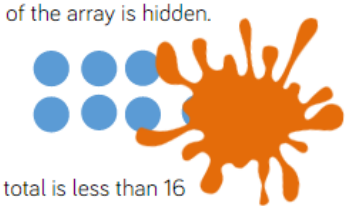
What do we need to change to make them all represent the same?

$\square \times \square =$

$\square$ lots of 3 = $\square$

$\square$ multiplied by $\square$ = 12

Part of the array is hidden.



The total is less than 16

What could the array be?

2	4		8		12
14	16	18			24
	38	40	42	44	

20	21	22	23	24	25	26	27	28
10	11	12	13	14	15	16	17	18
0	1	2	3	4	5	6	7	8

Complete the table:

Three 2s	Draw It	Addition	Multiplication
There are 3 equal groups with 2 in each group.			

Complete:

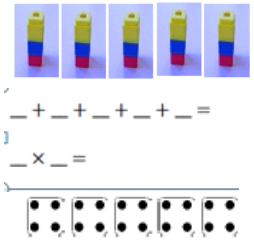
Addition	Multiplication	Story
10 + 10 + 10		
	6 × 5	

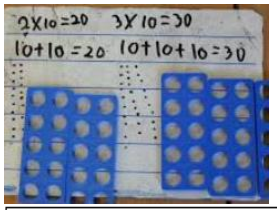
Year 3

Children should:
recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
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
solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects

Concrete methods:
linking multiplication to repeated addition, using cones, Numicon, multilink or Cuisenaire rods to look at arrays with related multiplication and division facts, using place value charts to multiply tens and units, using Numicon to group tens and units

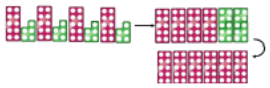
Pictorial methods:
Linking Numicon to more formal methods for multiplication such as the grid method, using shape to complete number statements, showing arrays pictorially, showing Dienes pictorially by multiplying out tens and units



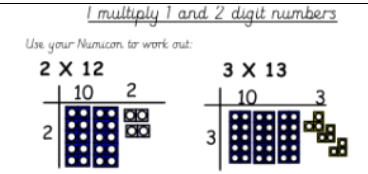


Use arrays to illustrate commutativity counters and other objects can also be used.
2 × 5 = 5 × 2

Partition to multiply using Numicon, base 10 or Cuisenaire rods.
4 × 15



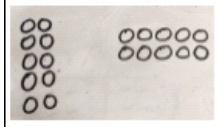
Formal column method with place value counters (base 10 can also be used.) 3 × 23



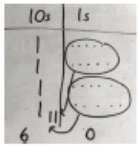
Complete the number sentences.

1 triangle has 3 sides. 1 × 3 = 3
3 triangles have __ sides. __ × __ = __
__ triangles have 6 sides. __ × __ = 6
__ triangles have 15 sides. __ × __ = 15.

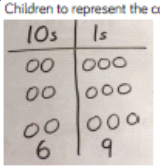
Children to represent the arrays pictorially.



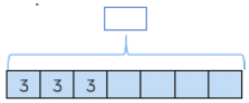
Children to represent the concrete manipulatives pictorially.



Children to represent the counters pictorially.



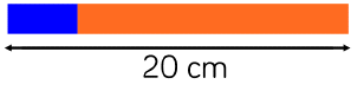
There are 7 tricycles in the playground.
How many wheels are there altogether?
Compete the bar model to find the answer.



Here is a blue strip of paper.

An orange strip is four times as long.

The strips are joined end to end.



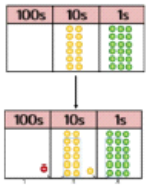
Children to be able to use an array to write a range of calculations e.g.

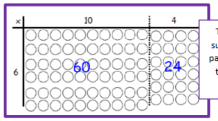
10 = 2 × 5
5 × 2 = 10
2 + 2 + 2 + 2 + 2 = 10
10 = 5 + 5

Abstract:
Completing bar models, using jottings to support concrete or pictorial methods by multiplying tens and units, starting to use formal methods for multiplication, linking multiplication to measure and problem solving

Year 4
Pupils should:
recall multiplication and division facts for multiplication tables up to 12
× 12
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
recognise and use factor pairs and commutativity in mental calculations
multiply two - digit and three - digit numbers by a one - digit number using formal written layout

Formal column method with place value counters.
6 x 23





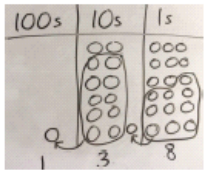
The grid method should be introduced using an arrays model such as the one to the left for 14 x 6. Children need to use their partitioning skills to partition the two digit number and then use their existing knowledge of arrays to come to an answer with minimal support.

Multiplication grid method requires good organization but also a solid understanding of partitioning and multiplication facts, as you can see in the example to the right for 35 x 7. The children need to remember that once they have multiplied the partitioned parts of the number, they then need to add the two

×	30	5
7	210	35

210 + 35 = 245

Children to represent the counters/base 10, pictorially e.g. the image below.



x	600	10	3
5	3000	50	15

Add up 3000, 50 and 15 to make 3065.

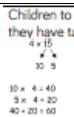
613 x 5 = 3065

The grid method is extended in year 4 so children will now multiply 3 digit numbers by 1 digit numbers. When adding the 3 answers up to create a total, column addition could be used to ensure accuracy, especially where bridging will be needed.

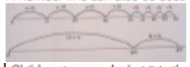
The compact 'short multiplication' method is tricky and needs to be approached carefully. At first children should solve a problem using grid method and then observe the teacher solve a problem using short multiplication and make comparisons. How are they similar? Children need to go through it very slowly and carefully, unpicking each step until they are fully confident.

$$\begin{array}{r} 463 \\ \times \quad 8 \\ \hline 3704 \\ \hline 5\ 2 \end{array}$$

Children to be encouraged to show the steps they have taken.



A number line can also be used



Children to record what it is they are doing to show understanding.

3×23
$20 \quad 3$
$3 \times 20 = 60$
$3 \times 3 = 9$
$60 + 9 = 69$

$$\begin{array}{r} 23 \\ \times \ 3 \\ \hline 69 \end{array}$$

$$\begin{array}{r} 6 \times 23 = \\ \\ 23 \\ \times \ 6 \\ \hline 138 \\ \hline 1\ 1 \end{array}$$

You have 10 paving stones to design a patio. The stones are one metre square.

The stones must be joined to each other so that at least one edge is joined corner to corner.

Use squared paper to show which design would give the longest perimeter and which would give the shortest.

solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

Concrete: using counters on place value charts to work out x tens and units, using cones, multilink and Numicon to work out factors pairs for numbers

Pictorial Linking Numicon to more formal methods for multiplication such as the grid method, using shape to complete number statements, showing arrays pictorially, showing Dienes pictorially by multiplying out tens and units, use Dienes to multiply by 10

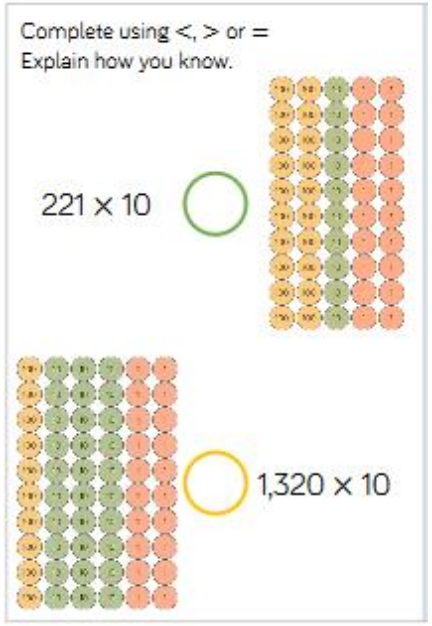
Abstract: link multiplication to measure questions such as area, converting units of measure and being able to x by 10 and 100, moving on to jottings and then more formal methods for multiplying 2 and 3 digit numbers by 1 digit

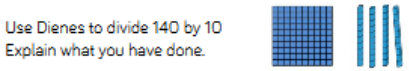
Year 5

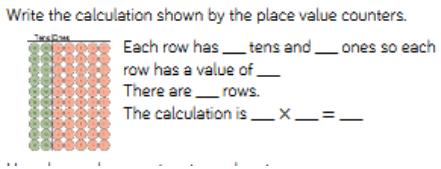
Pupils should:

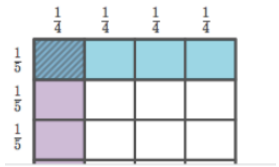
identify multiples and factors, including finding all factor pairs

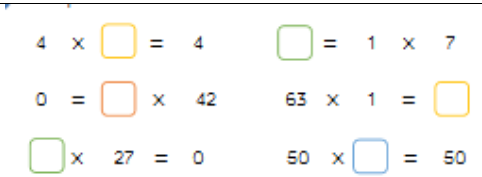
solve problems involving multiplication and division where larger numbers are

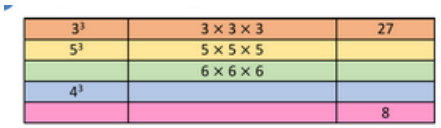






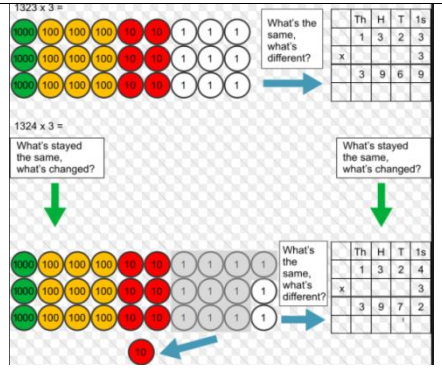






used by decomposing them into their factors
know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
establish whether a number up to 100 is prime and recall prime numbers up to 19
multiply numbers up to 4 digits by a one
-or two-digit number using an efficient written method, including long multiplication for two-digit numbers
recognise and use square numbers and cube numbers, and
the notation for squared (2) and cubed (3)
solve problems involving addition, subtraction, multiplication
and division and a combination of these, including understanding the meaning of the equals sign
solve problems involving multiplication and division, including scaling by simple fractions and problems involving
simple rates
multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams

Concrete: using place value charts to support jottings for multiplying H T U, using arrays with Numicon or multilink for factors and to work out common factors, using multilink for working out



Make the number 234 on the place value grid using counters.

HTh	TTh	Th	H	T	O
			●●	●●●	●●●

When I multiply my number by 10, where will I move my counters?
Remember when we multiply by 10, 100, 1000, we move the digits to the left and use zero as a place holder.

Use < , > or = to complete the sentences.

62 × 1,000 ☐ 62 × 100

100 × 32 ☐ 32 × 100

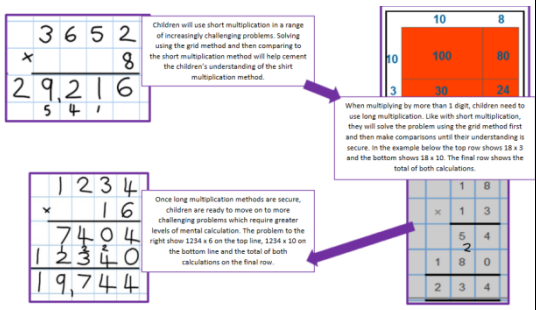
48 × 100 ☐ 48 × 10 × 10 × 10

Here are two methods to solve 24 × 20

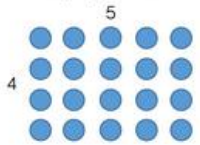
Method 1	Method 2
24 × 10 × 2 = 240 × 2 = 480	24 × 2 × 10 = 48 × 10 = 480

What is the same about the methods, what is different?

Write all the multiples of 4 between 20 and 80.



If you have twenty counters, how many different ways of arranging them can you find? How many factors of twenty have you found? E.g. A pair of factors of 20 are 4 and 5.



squared and cubed numbers, using place value charts to work out x decimals and whole numbers by 10, 100, 1,000 and 10,000

Pictorial: using images of place value charts or Dienes to support understanding of more formal methods of multiplication, using images such as overlays to work out multiplication of fractions

Abstract: using short and long multiplication methods being sure about place value, being able to work out multiplication of fractions, working out common factors, understand the multiples of a number

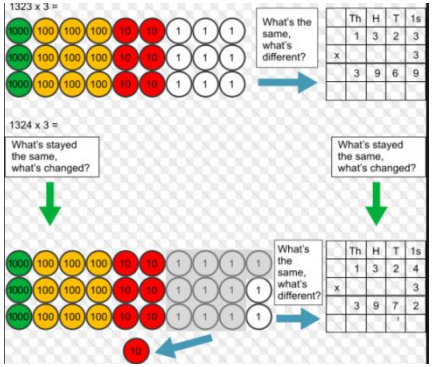
Year 6

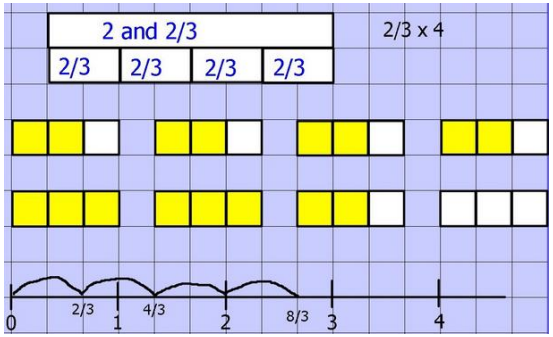
multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. 1/4 ×1/2 = 1/8)

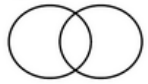
multiply one digit numbers with up to two decimal places by whole numbers

solve problems involving the calculations of percentages (e.g. of measures) such as 15% of 360 and the use of percentages for comparison





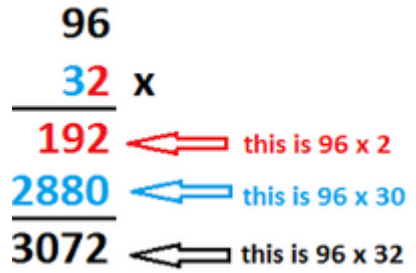
Fill in the Venn diagram to find the factors of 20 and 24.

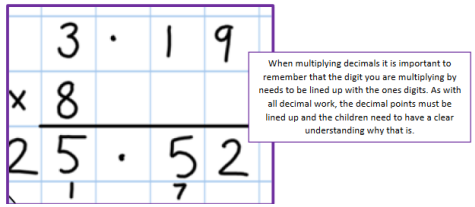


Where are the common factors of 20 and 24? Can you use a Venn diagram to find the common factors of 9 and 15?

This table shows squared and cubed numbers. Complete the table. Explain the relationships you can see between the numbers.

	3 x 3		3^3		27
		25	5^2		
6^2				6 x 6 x 6	
	4 x 4		4^3		
					8
9^2					





What are the common factors of these pairs of numbers?

24 and 36
20 and 30
28 and 45

Concrete: using place value charts to support jottings for multiplying H T U, using arrays with Numicon or multilink for factors and to work out common factors, using multilink for working out squared and cubed numbers, using place value charts to work out x decimals and whole numbers by 10, 100, 1,000 and 10,000, using Numicon to work out percentages

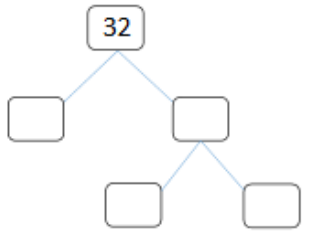
Pictorial: using images of place value charts or Dienes to support understanding of more formal methods of multiplication, using images such as overlays to work out multiplication of fractions, using Numicon to work out division of fractions by whole numbers

Abstract: using short and long multiplication methods being sure about place value, being able to work out multiplication of fractions, working out common factors, understand the multiples of a number, prime factors for a number, multiplying decimals, working out missing numbers for multiplication, working out what the largest number can be made through multiplication

First, separate the square into 3 equal parts vertically and shade 2 parts to indicate $\frac{2}{3}$.

Now separate the square into 4 equal parts horizontally and shade 3 of them to show $\frac{3}{4}$.

Since we are looking for $\frac{2}{3} \times \frac{3}{4}$ or $\frac{2}{3}$ of $\frac{3}{4}$, we get 6 out of 12 parts that are double-shaded and represent $\frac{2}{3} \times \frac{3}{4}$.



$14 \times 8 = 112$
Use this to work out:

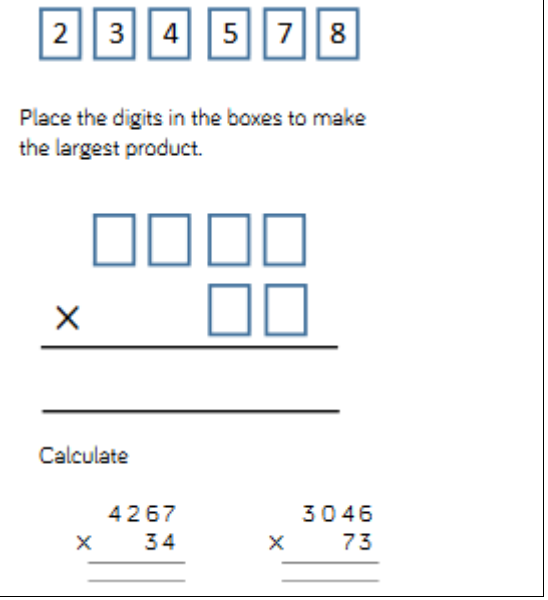
1.4×8
140×8

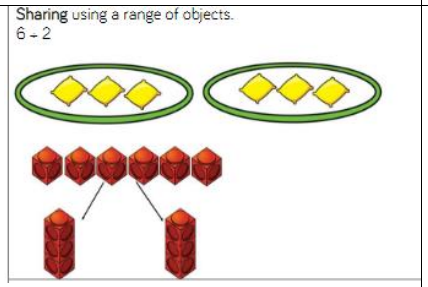
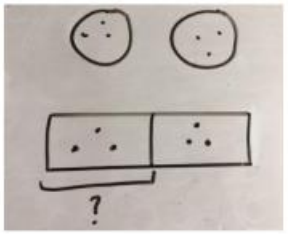
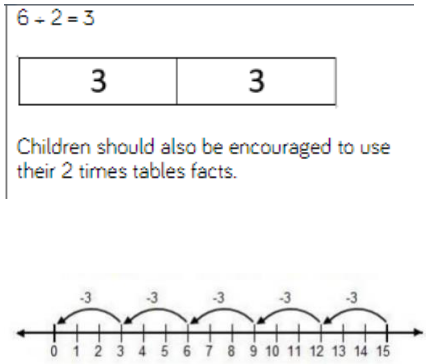
	1	2	4
×		2	6
	7 (1)	4 (2)	4
2	4	8	0
3	2	2	4
1	1		

Answer: 3224

Work out the missing number.

$6 \times 35 = \square \times 5$

Division	Concrete	Pictorial	Abstract
Year 1 Pupils should be taught to: -step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. **Concrete**: counting sticks, 100 squares and numberlines, Numicon, arrays through Numicon grouping and sorting **Pictorial**: using arrays, grouping and sorting			

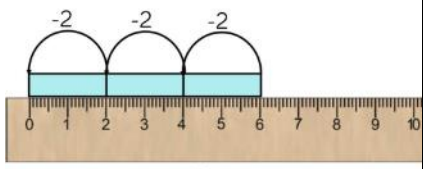
Abstract: using numberlines, linking division to repeated subtraction, working out the inverse, grouping and sorting

Year 2

Pupils should be taught to: division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs numbers can be done in any order (commutative) and division of one number by another cannot multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Concrete: counting sticks, 100 squares and numberlines, Numicon, arrays through Numicon grouping and sorting
Pictorial: using arrays, grouping and sorting
Abstract: using numberlines, linking

Repeated subtraction using Cuisenaire rods above a ruler.
6 ÷ 2



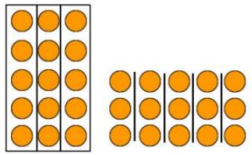
3 groups of 2

2d ÷ 1d with remainders using lollipop sticks. C
rods, above a ruler can also be used.
13 ÷ 4

Use of lollipop sticks to form wholes- squares
because we are dividing by 4.

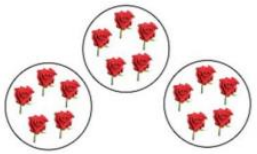
There are 3 whole squares, with 1 left over.

To solve problems such as 15 ÷ 3 =, children will share 15 objects into 3 groups like in the first array or make groups of 3 until they get to 15, like in the second image.



Completing both of these processes will help children see the link between sharing and grouping but also the link between 15 ÷ 3 = 5 and 15 ÷ 5 = 3.

A farmer has 15 roses and shares them between 3 friends.
How many roses do they each get?

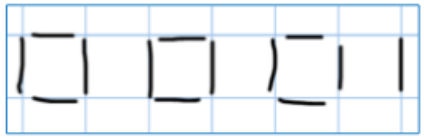


15 roses shared between 3 = 5 roses each

Bats fly in groups of 2. How many groups of 2 will there be if there are 8 bats?

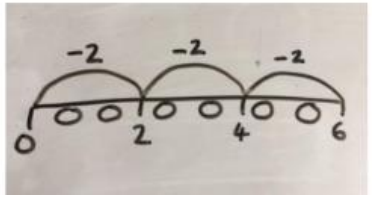
8 bats shared into groups of 2 = 2 bats in each group

Children to represent the lollipop sticks pictorially.



There are 3 whole squares, with 1 left over.

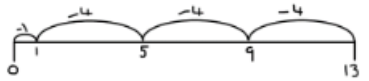
Children to represent repeated subtraction pictorially.



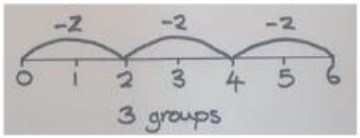
13 ÷ 4 = 3 remainder 1

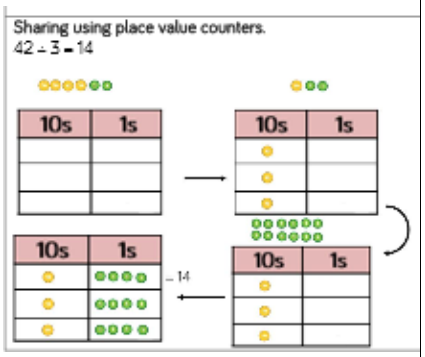
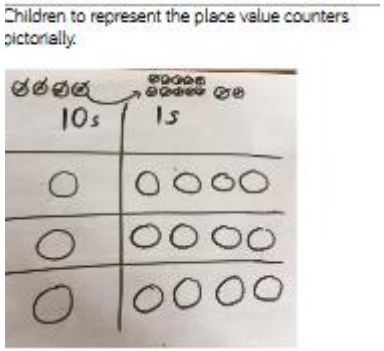
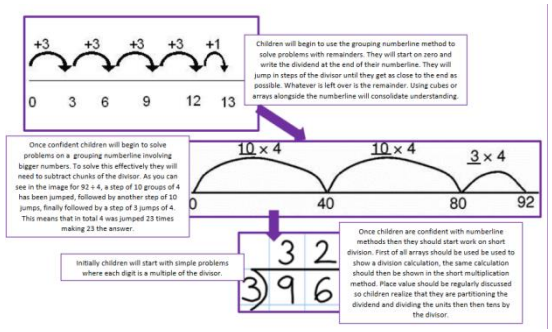
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

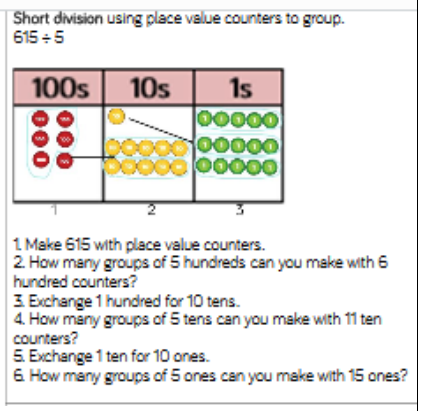
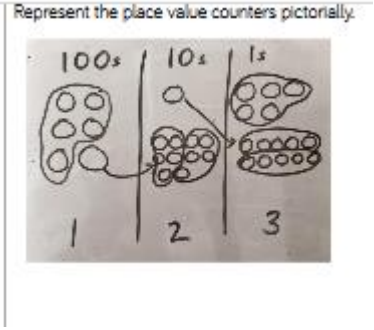
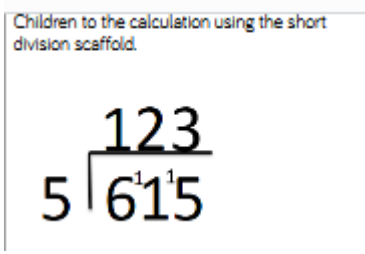
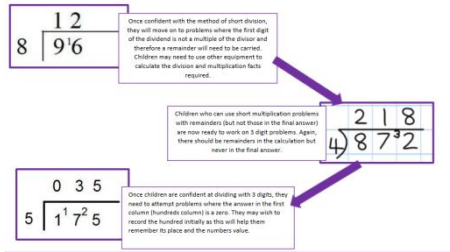
'3 groups of 4, with 1 left over'



Abstract number line to represent the equal groups that have been subtracted.



division to repeated subtraction, working out the inverse, grouping and sorting **<u>Year 3</u>** Children should: recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables 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 solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects **Concrete** methods: linking multiplication to repeated addition, using cones, Numicon, multilink or Cuisenaire rods to look at arrays with related multiplication and division facts, using place value charts to multiply tens and units, using Numicon to group tens and units **Pictorial** methods: Linking Numicon to more formal methods for multiplication such as the grid method, using shape to complete number statements, showing arrays pictorially, showing Dienes pictorially by		 	Children to be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14

multiplying out tens and units **Abstract**: Completing bar models, using jottings to support concrete or pictorial methods by multiplying tens and units, starting to use formal methods for multiplication, linking multiplication to measure and problem solving			
<u>Year 4</u> Pupils should: recall multiplication and division facts for multiplication tables up to 12 × 12 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 recognise and use factor pairs and commutativity in mental calculations multiply two - digit and three - digit numbers by a one - digit number using formal written layout solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects **Concrete** methods: linking division to repeated subtraction, using cones, Numicon, multilink or Cuisenaire rods to look at arrays with related multiplication and division facts,			 

using place value charts to divide tens and units, using Numicon to group tens and units

Pictorial methods:

Linking Numicon to more formal methods for division such as the short division, showing arrays pictorially, showing Dienes pictorially by dividing out tens and units

Abstract:

Completing bar models, using jottings to support concrete or pictorial methods by divide tens and units, starting to use formal methods for division , linking division to measure and problem solving such as finding missing sides if you know the area, converting units of measure and being able to divide by 10 and 100

Year 5

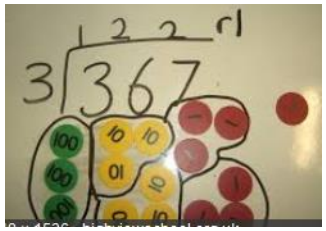
multiply and divide numbers mentally drawing upon known facts

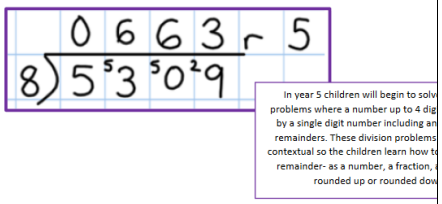
the efficient written method of short division and interpret remainders appropriately for the context

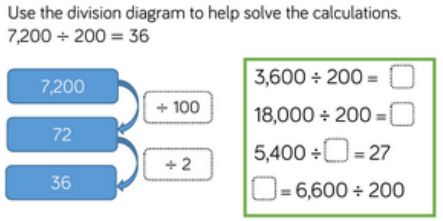
multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

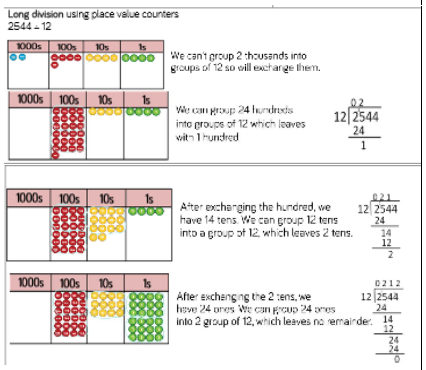
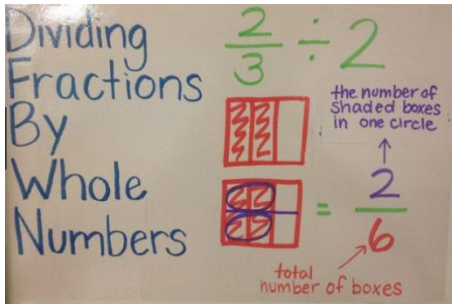
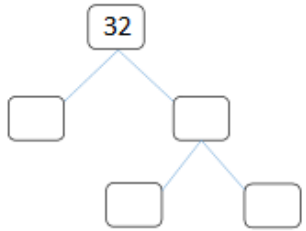
solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign

solve problems involving multiplication and division, including scaling by simple







fractions and problems involving simple rates **Concrete** - using counters for division to support more formal methods **Pictorial** - using jottings as a way to move on to more formal methods for division **Abstract** - using short division methods, using known facts to solve problems, completing bar models, complete missing numbers questions **<u>Year 6</u>** 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 divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to context use written division methods in cases where the answer has up to two decimal places use common factors to simplify fractions; use common multiples to express fractions in the same denomination divide proper fractions by whole numbers (e.g. 1/3 ÷ 2 = 1/6) associate a fraction with division to			What are the common factors of these pairs of numbers? 24 and 36 20 and 30 28 and 45 

calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. 3/8) identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places **Concrete** - using counters for division to support more formal methods such as short and long division **Pictorial** - using jottings as a way to move on to more formal methods for division **Abstract** - using short and long division methods, using known facts to solve problems, completing bar models, complete missing numbers questions, using images to support dividing fractions by whole numbers