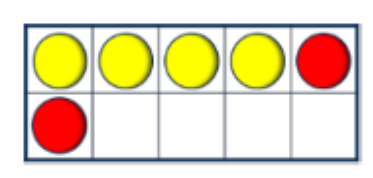
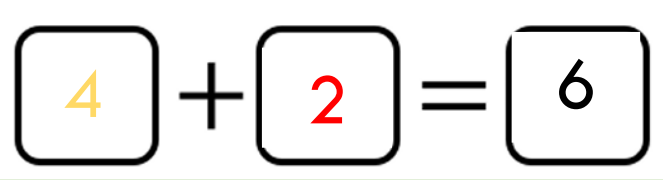
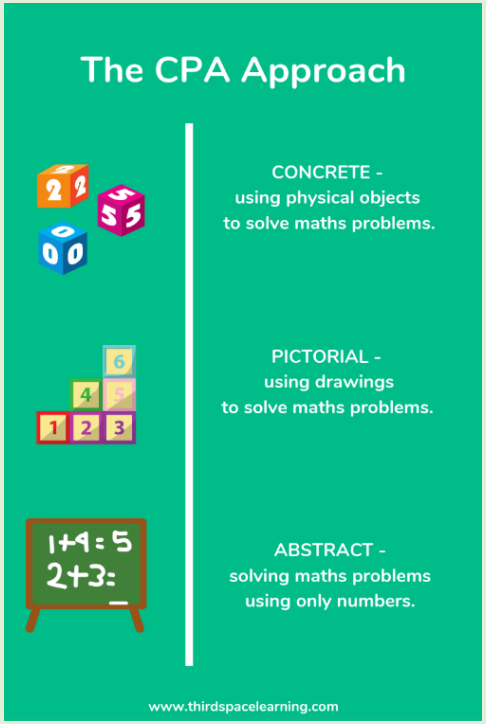
Buckden C.E. Primary School

Calculation Guidance for Reception to Year 6

Addition




4
+
2
=
6


The CPA Approach
CONCRETE -
using physical objects
to solve maths problems.
PICTORIAL -
using drawings
to solve maths problems.
ABSTRACT -
solving maths problems
using only numbers.
1+4=5
2+3=
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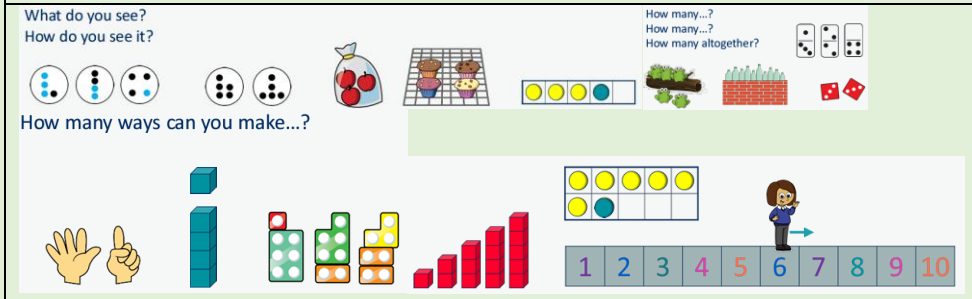
Reception

Vocabulary

add	double	minus	subtraction
adding	how many fewer is… than…?	more	subtracting
adding more	how many left/left over?	one/two/ten less	sum
addition	how many more is… than…?	one/two/ten more	take (away)
altogether	how many more to make… ?	plus	taking away
and	make	subtract	total

Key Representations and Resources



Mental Methods: Children should learn to

Subitise groups. Add two subitised groups. Use fingers to assist or counters, tens frame.
Add one more or one fewer using knowledge of number sequence.
Begin to know doubles facts 1+1, 2+2, 3+3, 4+4, 5+5.
Know number bonds to 5 and begin to know bonds to 10.
What do you see? How do you see it?

Concrete and Pictorial Representations

Part whole models, bar models and tens frames can be used to show how the parts combine (can be added together) to make the whole - physical resources such as counters can be used before using numerals.
Using manipulatives such as counters, numicon, bead strings, dominoes, dice to aid addition calculations.

Moving to Abstract Representations

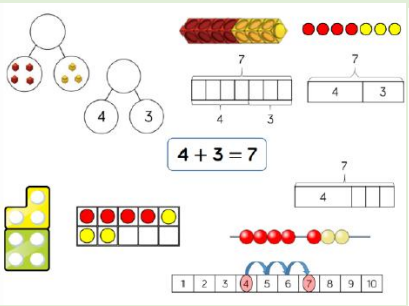
Bar models, part whole models with digits rather than physical counters/ pictures.
Hidden from view objects in a box, add a quantity, how many in the box now?
Modelling of formal calculations eg.
4+1=5
5=4+1
Taught as fact families along with inverse operations.

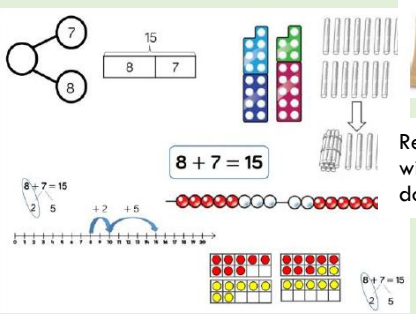
Year 1

Vocabulary

add(ed)	difference (between)	minus	plus
addition	equals	missing number	subtract/subtracting
altogether	fact family	near doubles	subtraction
calculation	half/halve	number bonds/pairs	take away
combine/combination	how many...?	number sentence	total

Key Representations and Resources





Rekenreks – bonds to/ within 10 and 20, doubling/ halving

Mental Methods: Children should learn to

Count on from one part (the greatest part) e.g. 7+2=, 6+3=

Use known facts – Number bonds to 5, 10 and 20

Concrete and Pictorial Representations

Part whole models, bar models and tens frames can be used to show how the parts combine (can be added together) to make the whole - physical resources such as counters can be used before using numerals.

Tens frames, bar models, bead strings can be used to show how numbers increase by adding on. Children should be encouraged to subitise smaller numbers (rather than count every object) and count on from the greater number.

Adding by making 10 – **use of 10 frames** will encourage children to visually make the 10 and counting on before moving onto using number lines.

Rekenreks can be used to teacher number bonds, doubles and number facts (inverse, commutativity).

Moving to Abstract Representations

(Using concrete and pictorial resources alongside abstract representations such as number sentences/ calculations and number lines may be needed)

Number tracks and number lines can be used to support augmentation (counting on)

Addition is commutative, this means that tow numbers can be added together and the answer will be the same no matter what order they are (e.g. 6+2=8 and 2+6=8)

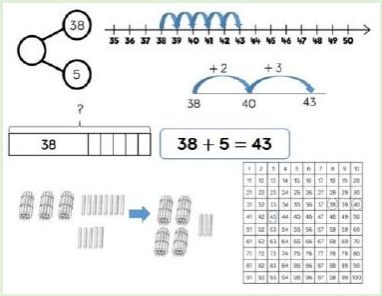
Inverse is using the opposite operation. 4+3=7, 7-3=4 **part whole models and bar models** show how the parts can be added or subtracted – moving into using numerals to represent the numbers.

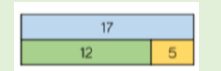
Year 2

Vocabulary

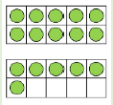
adding sentence/story	in total	number facts	smaller
balances/balancing	inverse	numeral	sum
column(s)	larger	part-whole model	whole tens
count back	multiple	row	

Key Representations and Resources





17=12+5 17=5+12 12+5=17 5+12=17
Calculations should be shown and written in a variety of ways as above including missing
___ + 12=17 12+___=17



Rekenreks – bonds to/ within 10 and 20, doubling/ halving

Mental Methods: Children should learn to

Count on from one part (the greatest part) e.g. 23+6=, 16+3=

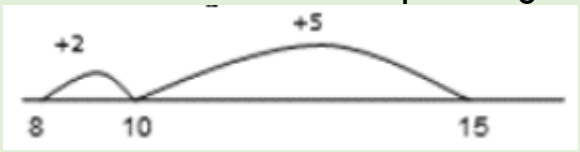
Use know facts – Number bonds to 5, 10, 20 and 100

Count in 2s, 3s, 5s and 10s when adding multiples

Partitioning and bridging through 10

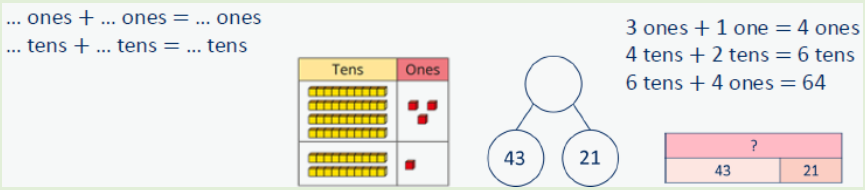
It is an essential prerequisite that children are confident in the number bonds of all numbers to 10 as emphasised in Year 1.

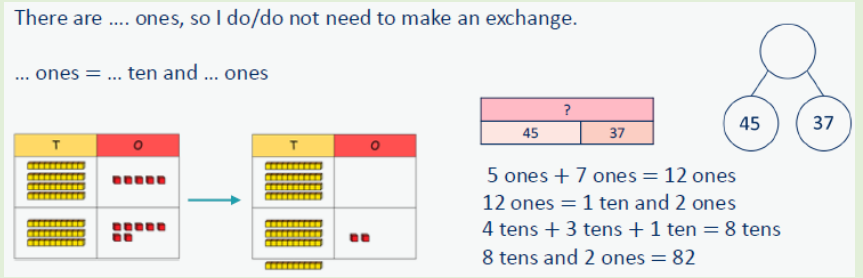
Children should be taught to bridge through a multiple of 10 For example, in 8+7= being able to partition the 7 into 2 and 5 to make the corresponding 10.



Moving Towards a Written Method

Partitioning in different ways and recombine.



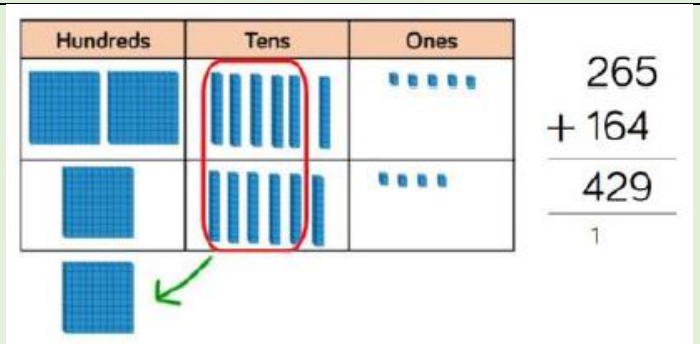


Year 3

Vocabulary

balances/balancing	complete	number trio	rearrange
bar model	error	part-whole model	regroup
column addition/subtraction	function machine	partition/partitioning	related facts

Key Representations and Resources



Mental Methods: Children should learn to

Adjust calculations

Use stem sentences "We can adjust the parts but the whole must stay the same."

This structure will be explored using concrete (dienes and Counters) and pictorial (bar models and part whole).

98+353= 100+351 = 451

Formal Written Methods (Compact)

Children should carry out the work with dienes and written calculations side by side so that they are able to see the connections between the representations and the abstract method and understand the equivalence of any exchanges.

Children should be continuously reminded that addition is commutative and the inverse (reverse) operation to subtraction.

Adding multiples of 1, 10 and 100

Pattern spotting and creation of generalisations, supported by accurate stem sentences, for example – "When adding on multiples of 10 the ones stay the same."

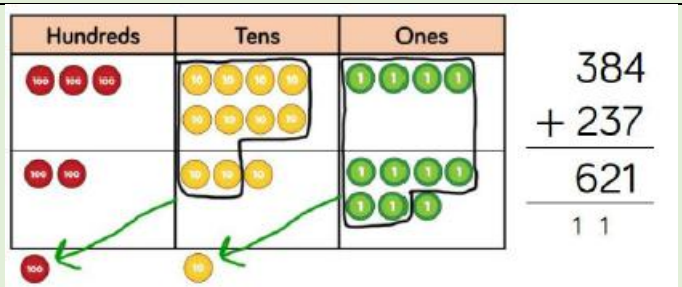
Concrete objects (dienes and Counters) are used to visualise the structures.

Year 4

Vocabulary

column method/calculation	not equal to	rounding
complements	regrouping	zero as a place holder

Key Representations and Resources



Formal Written Methods (Compact)

Children should be familiar with exchanging (Year 3). This should continue to be emphasised.
Children should carry out the work with counters and written calculations side by side so that they are able to see the connections between the representation and the abstract method. This should allow them to move quickly onto the more compact method.

Children should be continuously reminded that addition is commutative and the inverse (reverse) operation to subtraction.

Mental Methods: Children should learn to

Adjust calculations (continued from Year 3)
Use stem sentences "We can adjust the parts but the whole must stay the same."
This structure will be explored using concrete (dienes and Counters) and pictorial (bar models and part whole).
7574+997= 7571+1000 = 8571

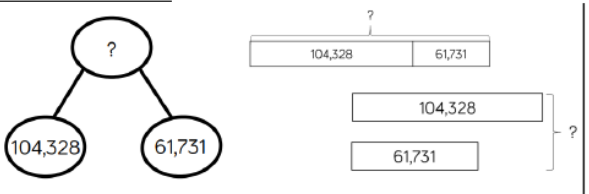
Year 5

Vocabulary

bridging	efficient written method	inverse relationship	tenths boundary
decimals	integers	quantity value	units boundary

Key Representations and Resources and Written Method

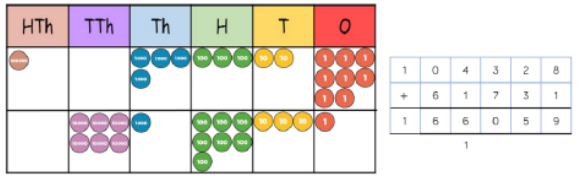
Whole Numbers



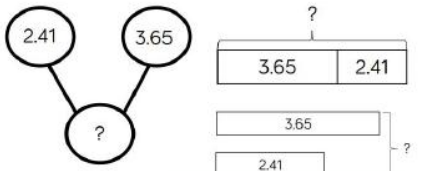
Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

104,328 + 61,731 = 166,059



Decimals

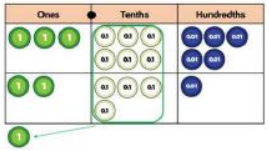


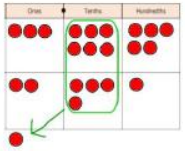
3.65
+ 2.41
6.06
1

Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

3.65 + 2.41 = 6.06





Mental Methods: Children should learn to

Adjust calculations (continued from Year 4)

Use stem sentences "We can adjust the parts but the whole must stay the same."

This structure will be explored using concrete (dienes and Counters) and pictorial (bar models and part whole).

499 995+132 548= 500 000+132 543= 632 543

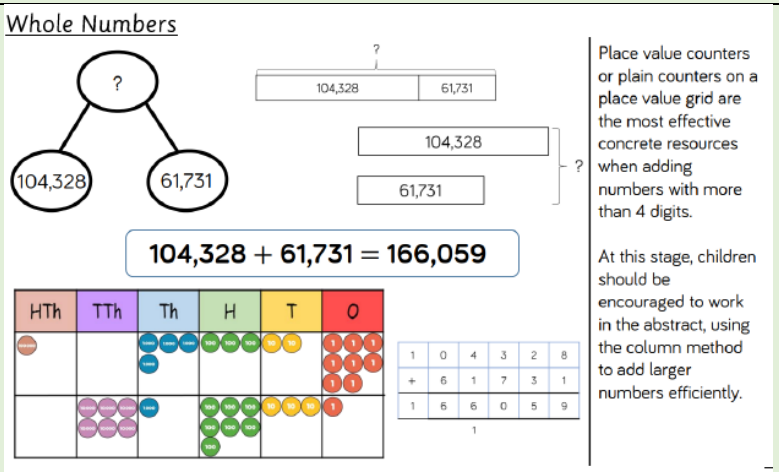
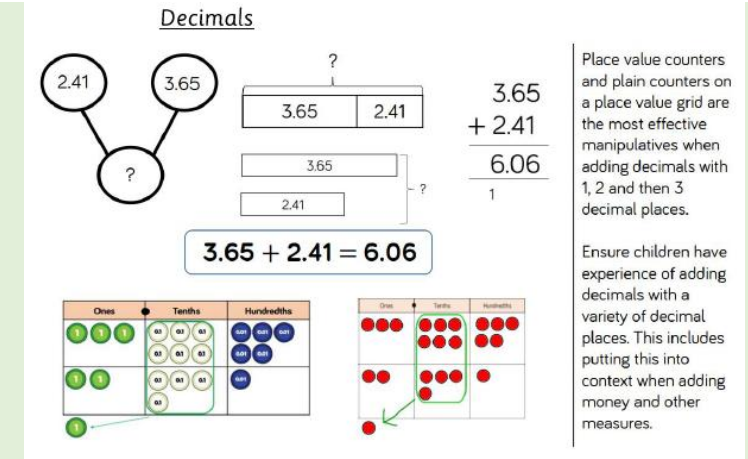
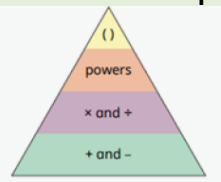
Children should be continuously reminded that addition is commutative and the inverse (reverse) operation to subtraction.

Year 5 add whole numbers with more than 4 digits, decimals with up to 2 decimal places and complements to 1.

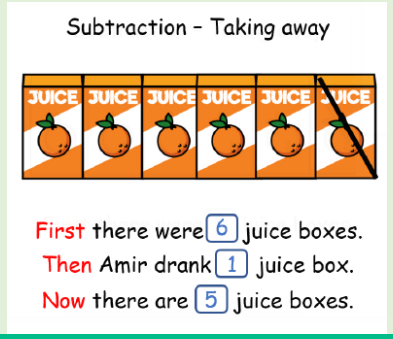
Year 6

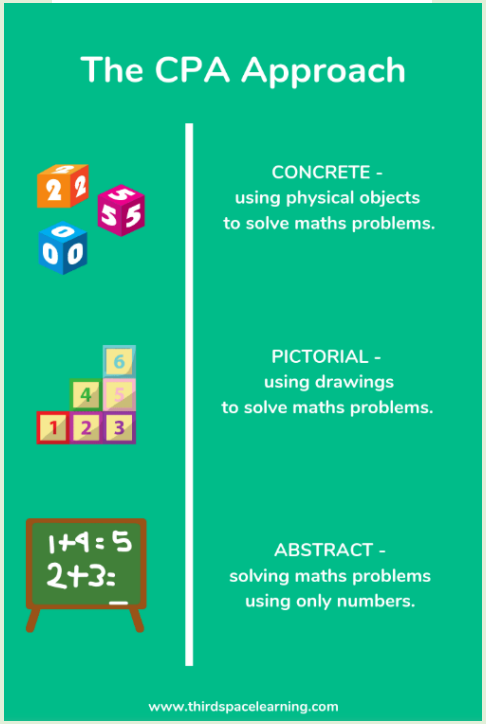
Vocabulary

above/below zero
brackets
negative
order of operations
positive

Key Representations and Resources and Written Method	Mental Methods: Children should learn to
Whole Numbers  Decimals  	**Adjust calculations (continued from Year 4)** Use stem sentences "We can adjust the parts but the whole must stay the same." This structure will be explored using concrete (dienes and Counters) and pictorial (bar models and part whole). 499 995+132 548= 500 000+132 543= 632 543 Children should be continuously reminded that addition is commutative and the inverse (reverse) operation to subtraction. Year 6 add integers up to 1 million, decimals with up to 3 decimal places and negative numbers. Know the order of operations. 

Subtraction



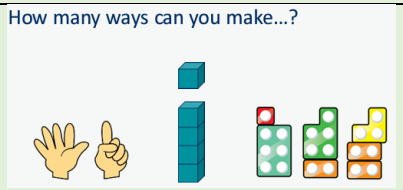


Reception

Vocabulary

add	double	minus	subtraction
adding	how many fewer is… than…?	more	subtracting
adding more	how many left/left over?	one/two/ten less	sum
addition	how many more is… than…?	one/two/ten more	take (away)
altogether	how many more to make… ?	plus	taking away
and	make	subtract	total

Key Representations and Resources



Mental Methods: Children should learn to

Use fingers to assist or counters, tens frame.
Add one fewer using knowledge of number sequence.
Begin to know halving facts to half 10.
Know number bonds up to 5 as inverse eg. 4-2=2and begin to know inverse bonds to 10.

Concrete and Pictorial Representations

Part whole models, bar models and tens frames can be used to show how the parts can be subtracted from the whole - physical resources such as counters can be used before using numerals.
Using manipulatives such as counters, numicon to visualise difference, bead strings.

Moving to Abstract Representations

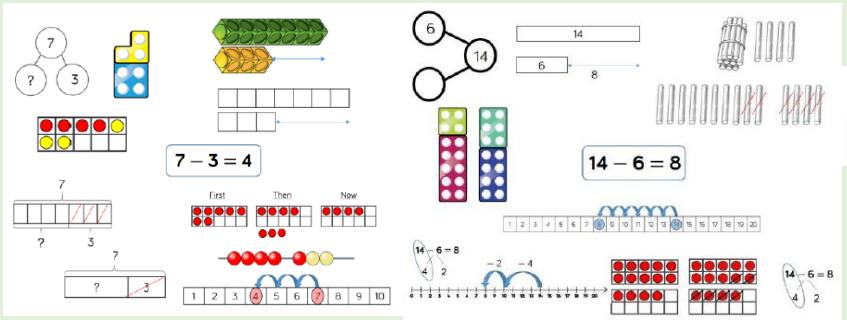
Hidden from view objects in a box, take a quantity away in view, how many left in the box?
Modelling of formal calculations eg.
5-1=4
5=4-1

Year 1

Vocabulary

add(ed)	difference (between)	minus	plus
addition	equals	missing number	subtract/subtracting
altogether	fact family	near doubles	subtraction
calculation	half/halve	number bonds/pairs	take away
combine/combination	how many...?	number sentence	total

Key Representations and Resources



Rekenreks – bonds to/ within 10 and 20.

Mental Methods: Children should learn to

Count back using knowledge of one/ two less
e.g. 13-1= 7-2=
Use knowledge of number bonds to 5, 10, 20

Concrete and Pictorial Representations

Part whole models, bar models and tens frames will support subtraction as partitioning.
Tens frames, number tracks, single bar models and bead strings can support subtraction as reduction.
Cubes and bar models can support subtraction as finding the difference.

Moving to Abstract Representations

Using concrete and pictorial resources alongside abstract representations such as number sentences/ calculations and number lines may be needed.

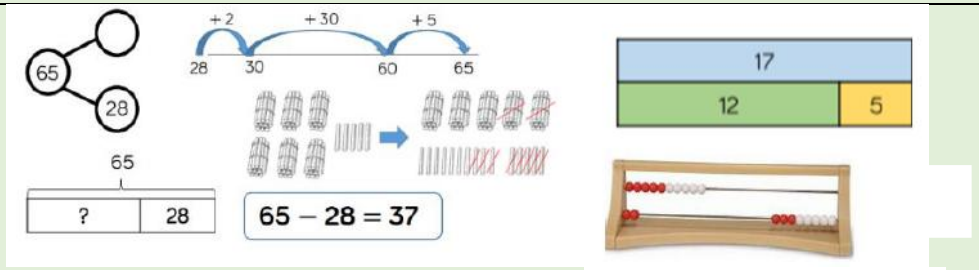
Number lines and number tracks can be used to support subtraction as reduction and partitioning.
Children should be taught to partition by counting back to 10 then continuing to count back.

Year 2

Vocabulary

adding sentence/story	in total	number facts	smaller
balances/balancing	inverse	numeral	sum
column(s)	larger	part-whole model	whole tens
count back	multiple	row	

Key Representations and Resources



17-12=5 17-5=12 12+5=17 5+12=17

Rekenreks – bonds to/ within 10 and 20, doubling/ halving

Mental Methods: Children should learn to

Count back using knowledge of one/ two/ ten less e.g. 72-10= 50-30=

Use knowledge of number bonds to 5, 10, 20 and 100

Count back in 2s, 3s, 5s and 10s

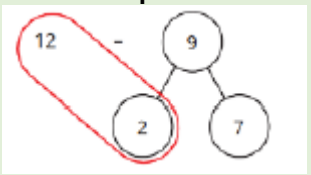
Recall and use subtraction facts to 20 and facts to 100

Bar models and part whole models show the relationship between addition and subtraction.

Children should use the inverse of number bonds to find subtraction facts – tens frames and Rekenreks can support this practically.

Subtracting a one digit number from a two digit number

Children use their knowledge of bonds within 10 to partition and then subtract to 10. Tens frames will help children work practically then moving to the more abstract representation.

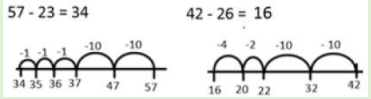


Subtracting a two digit number from a two digit number

Subtracting ones then 10s (not crossing 10)

Subtracting ones then 10s (crossing 10) and exchanging

Then moving onto using an empty number line.

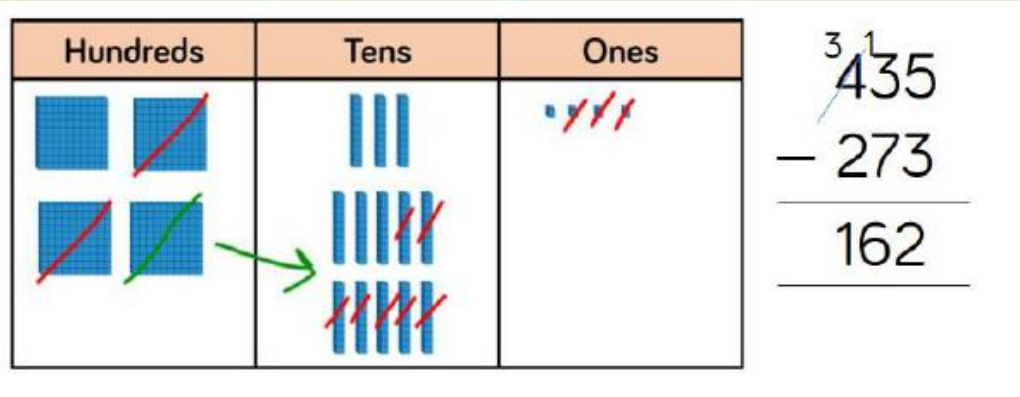


Year 3

Vocabulary

balances/balancing	complete	number trio	rearrange
bar model	error	part-whole model	regroup
column addition/subtraction	function machine	partition/partitioning	related facts

Formal Written Method (Compact)



Children should be continuously reminded that subtraction is not commutative and is the inverse operation to addition.

Mental Methods: Children should learn to

Adjusting equations – "We can adjust the parts by the difference must stay the same."
This structure will be explored using concrete (dienes and PVC) and pictorial (bar models and part, part whole).
Subtrahend adjusted –
342 – 98 = 344 – 100 = 244

Subtracting multiples of 1, 10 and 100

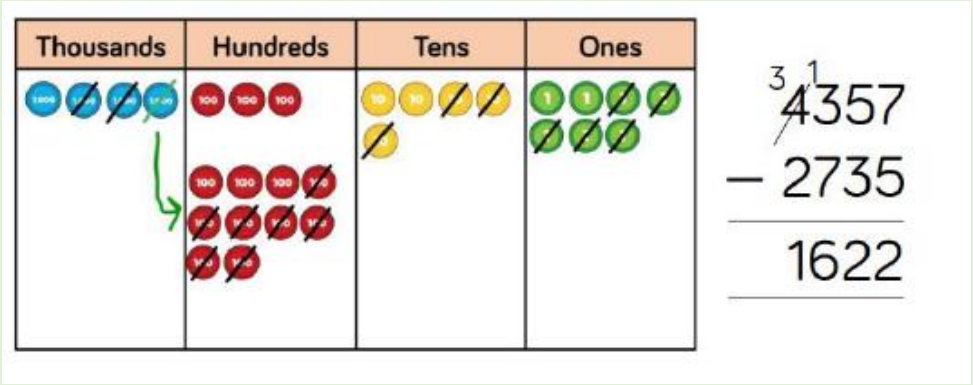
Pattern spotting and creation of generalisations, supported by accurate stem sentences, for example – "When subtracting mulitples of 10 the ones stay the same."
Concrete objects (dienes and place value counters) are used to visualise the structures.
326 – 4 = 322
326 – 20 = 306
326 – 200 = 126

Year 4

Vocabulary

column method/calculation	not equal to	rounding
complements	regrouping	zero as a place holder

Formal Written Method (Compact)



Children should be familiar with exchanging (see Year 3). This should continue to be emphasised. Children should carry out the work with counters and written calculations side by side so that they are able to see the connection between the representation and the abstract method. This should allow them to move quickly onto the more compact method.

Mental Methods: Children should learn to

Adjust (continued from Year 3)

Stem sentence – "We can adjust the parts but the difference must stay the same."

This structure will be explored using concrete (dienes and place value counters) and pictorial (bar models and part, part whole).

7574 – 997 = 7577 – 1000 = 6577

Children should be continuously reminded that subtraction is not commutative and is the inverse operation to addition.

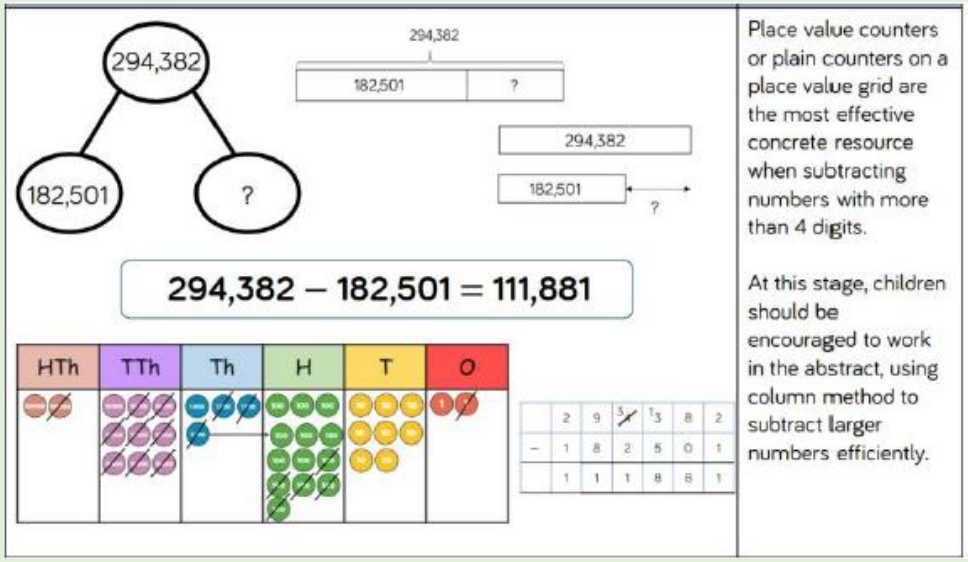
Year 5 and Year 6

Vocabulary

bridging	efficient written method	inverse relationship	tenths boundary	above/below zero	order of operations
decimals	integers	quantity value	units boundary	brackets	positive
				negative	

Written Methods

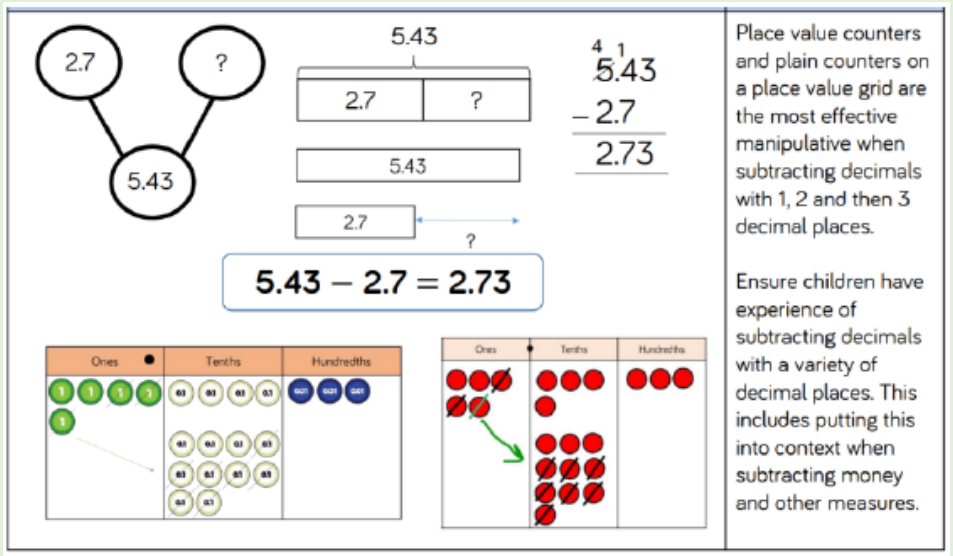
Whole numbers



Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

Decimals



Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

Adjusting (continued from Year 4)

Stem sentence – "We can adjust the parts but the difference must stay the same."

This structure will be explored using concrete (dienes and place value counters) and pictorial (bar models and part, part whole).

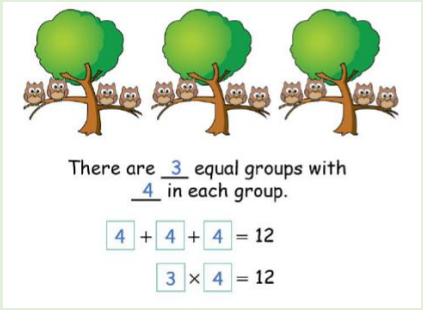
Adjust the subtrahend

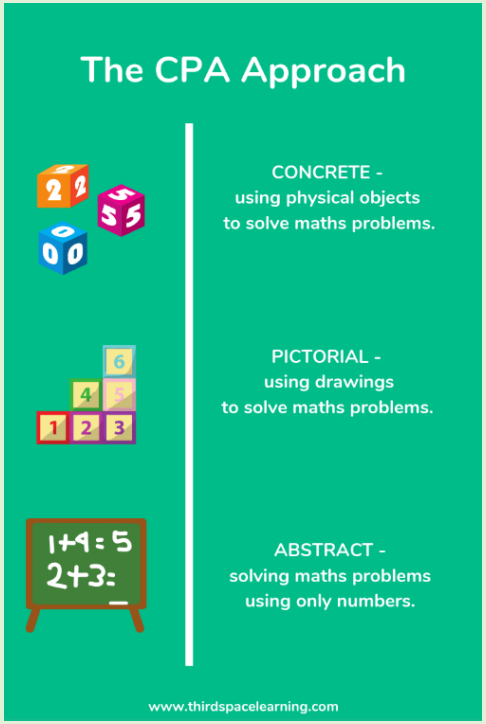
685,057 – 99,998 = 685,059 – 100,00 = 585,059

Adjust the minuend

100 – 56.89 = 99.99 – 56.88 = 43.11

Multiplication





Reception

Vocabulary

double	fair share	left over
each	group	share (out)
equal	half	sharing

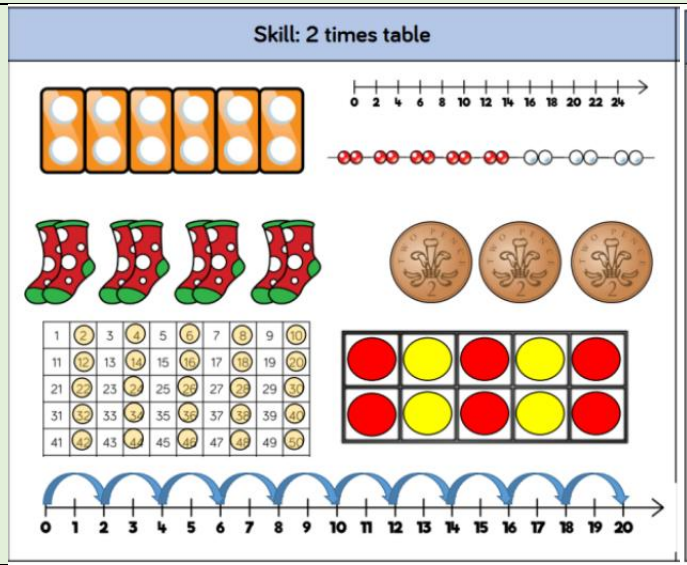
Key Representations and Resources	Mental Methods: Children should learn to
Using real life resources such which come in pairs- eg- shoes, socks to show doubles. Understanding of double- water bottles, mud kitchen, sand play, water play.	Double facts to double 5. Odd and even number understanding.
Concrete and Pictorial Representations	
Doubling machine games Numicon to show doubles	

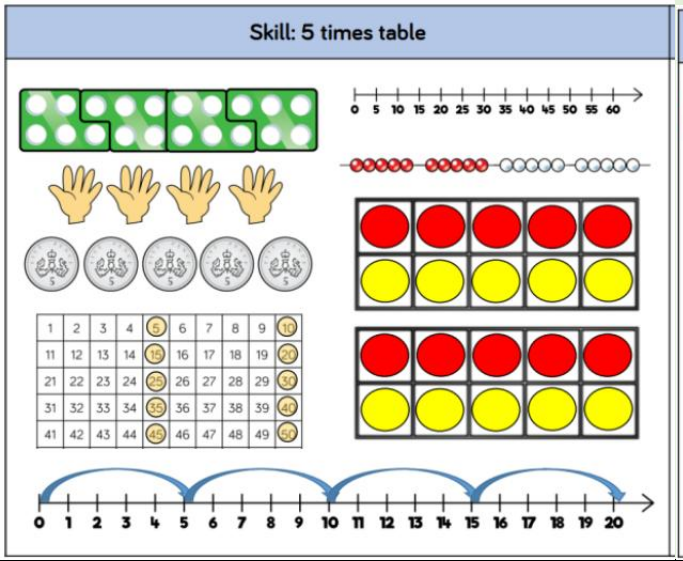
Year 1 and Year 2

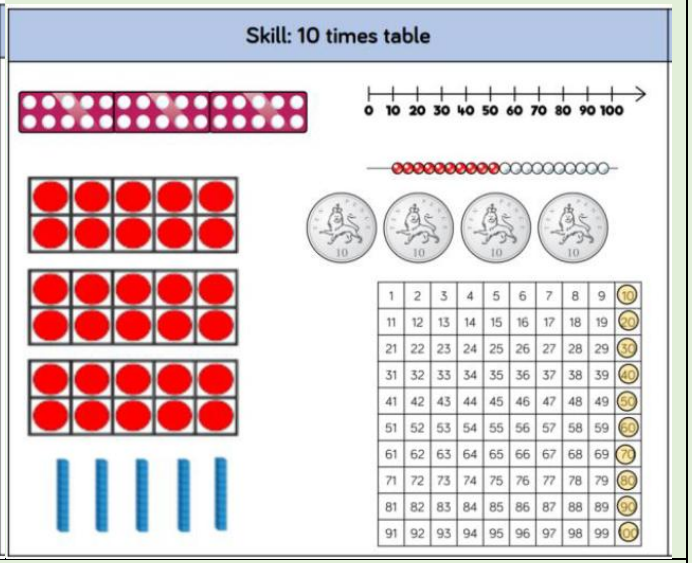
Year1 Vocabulary Year2 .

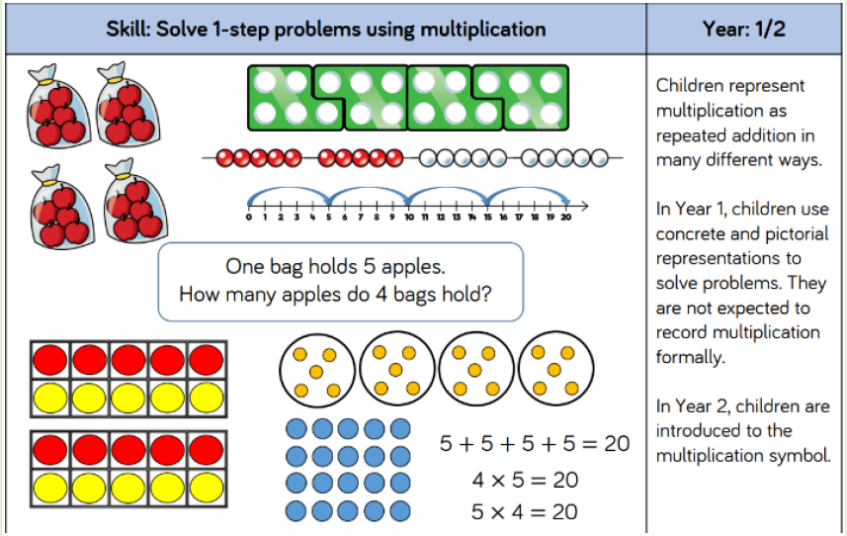
array	double/doubling/doubled	lots of	repeated addition
balances	equal groups	multiple	sharing
columns/rows	group/groups of	multiplication	
count in tens	halving	multiplied by	
division/divided by	left/left over	once, twice, three/five times	

altogether	equivalent	part	times
balances	group (equally/between)	product	times table
combinations	groups of	scale up	total
divide	inverse	set	twice as big/small as
each	left over	share (equally/between)	
equal/unequal	lots of...	signs/symbols	
equation	multiplication table	split (equally/between)	









Repeated Addition - Recognise equal groups and encouraging to count in multiples of 2s, 5s, 10, (3s in Year 2.

Year 2 move onto recording repeated addition as multiplication number sentences using the x symbol.

Counting – in 2s, 5s, 10s (3s in Year 2) Forwards and back, missing numbers on the number track or number line

Patter Spotting - seeing equal groups, using arrays for commutativity.

Doubling and Doubling Patterns – (linked to halving in division)

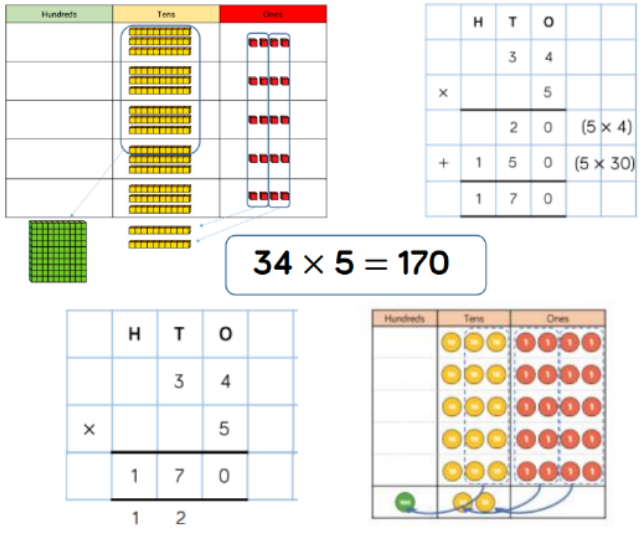
Year 3 and Year 4

Year 3 Vocabulary Year 4

bar model	equal/unequal parts	how many times bigger/smaller?	regroup/regrouping
compact method	fact family	part-whole model	remain/remains/remaining
divided equally	grouped equally	partition	remainder
divisor	half/double the size	quarter/quartering	scaling up/down

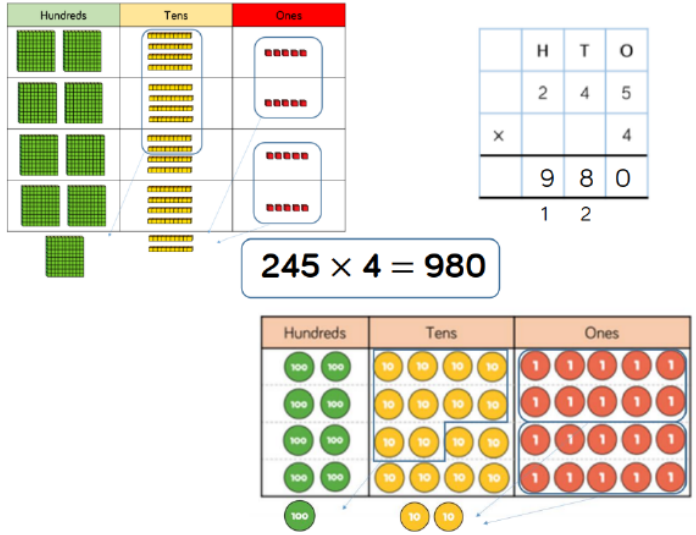
... times bigger/smaller	factor pair	multiples	times table square
common multiples	fraction	ratio	triple
derive	hundred square	related facts	
divisible by...	lowest common multiple	square/squared	

Skill: Multiply 2-digit numbers by 1-digit numbers — **Year: 3/4**



Informal methods and the expanded method are used in Year 3 before moving on to the short multiplication method in Year 4.
Place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

Skill: Multiply 3-digit numbers by 1-digit numbers — **Year: 4**



When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method.
Base 10 and place value counters continue to support the understanding of the written method.
Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

<u>Times Tables</u> – Children to continue to learn all multiplication and related division facts (inverse). The expectation is that they have learnt all facts up to 12x12 by the end of Year 4.
<u>Multiplying by 10 and 100</u> – Children are taught to relate this to the base 10 system. "When multiplying by 100 the digits move up two place value columns and place holders are added if needed."
45x100 = 4500 and 0.45x100 = 45

<u>Laws</u>

Commutative – 6x7 = 7x6 = 42
Associative – 4x7x5 = 5x4x7 = 20x7 = 140
Distributive – 12x6 = 10x6+2x6 = 60+12 = 72

Year 5 and Year 6

Year 5 Vocabulary Year 6

area model	decimal	long multiplication	short division
common factors	dividend	one thousandth	square number
common multiple	divisibility	prime factors	
composite number	formal written method	prime number	
cube number	highest common factor	quotient	

brackets	long division	power of 10	repeated subtraction
decimal point	operations	powers	
factor tree	order of operations	prime factorisation	

$1{,}826 \times 3 = 5{,}478$

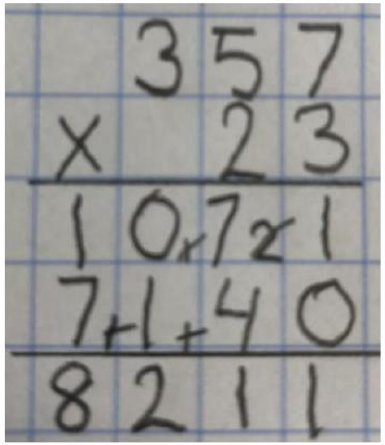
	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
	2		1	

When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method.
If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Long multiplication

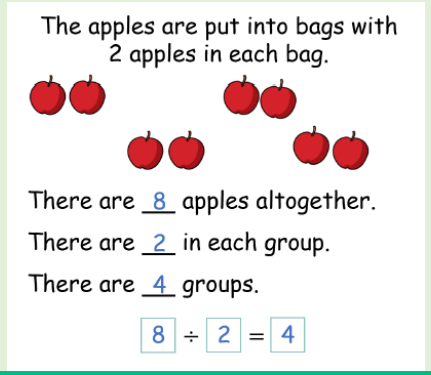
Children may come up putting the exchanges in different places than shown. If they are being accurate with this then don't make them change.

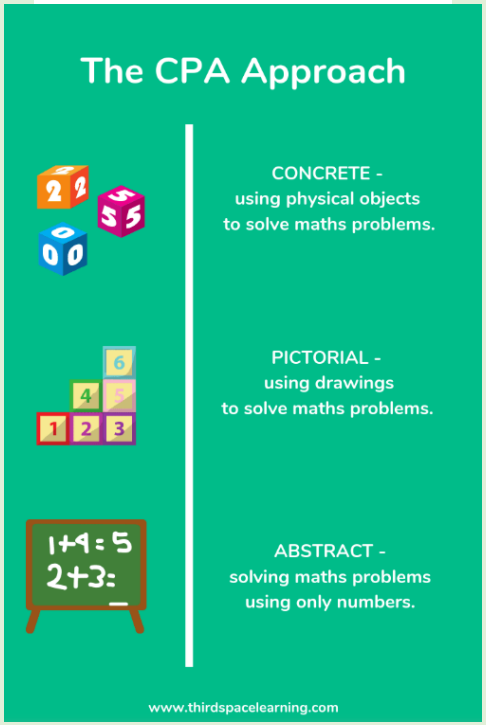
Th	H	T	O
	2	3	4
×		3	2
	4	6	8
1 7	1 0	2	0
7	4	8	8



Times Tables, Laws and Multiplying and Dividing by multiples of 10,100 and 1000 – Built on from Year 3 and Year 4.

Division


The apples are put into bags with 2 apples in each bag.
There are 8 apples altogether.
There are 2 in each group.
There are 4 groups.
8 ÷ 2 = 4


The CPA Approach
CONCRETE - using physical objects to solve maths problems.
PICTORIAL - using drawings to solve maths problems.
ABSTRACT - solving maths problems using only numbers.
1+4=5
2+3=
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Reception

Vocabulary

double	fair share	left over
each	group	share (out)
equal	half	sharing

Key Representations and Resources	Mental Methods: Children should learn to
Practical real life opportunities to share- playdough, cars, fruit, sports equipment. Creating equal groups of items.	Double facts to double 5.
Concrete and Pictorial Representations	
Doubling recipes in mud kitchen or home corner.	

Year 1and Year 2

Year 1 Vocabulary Year 2 .

array	double/doubling/doubled	lots of	repeated addition
balances	equal groups	multiple	sharing
columns/rows	group/groups of	multiplication	
count in tens	halving	multiplied by	
division/divided by	left/left over	once, twice, three/five times	

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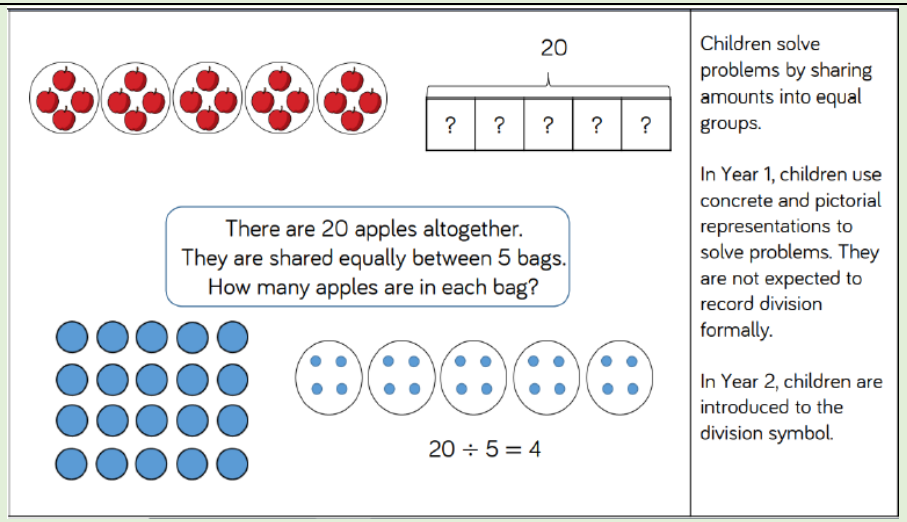
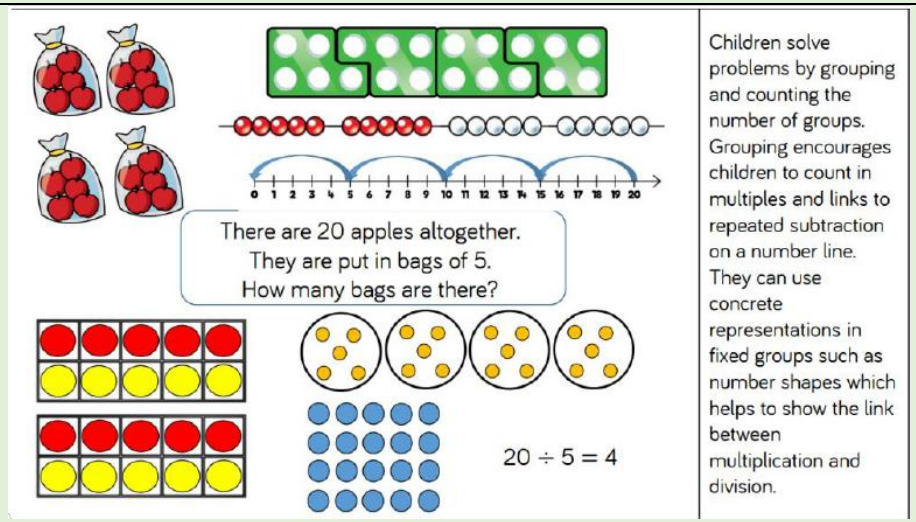
each	left over	share (equally/between)	
equal/unequal	lots of...	signs/symbols	
equation	multiplication table	split (equally/between)	



Children solve problems by sharing amounts into equal groups.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally.

In Year 2, children are introduced to the division symbol.



Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

<u>Division as grouping and sharing</u> – grouping/ seeing equal groups from a whole **or** sharing into groups from a whole.

<u>Halving and halving patters (linked to doubling)</u>

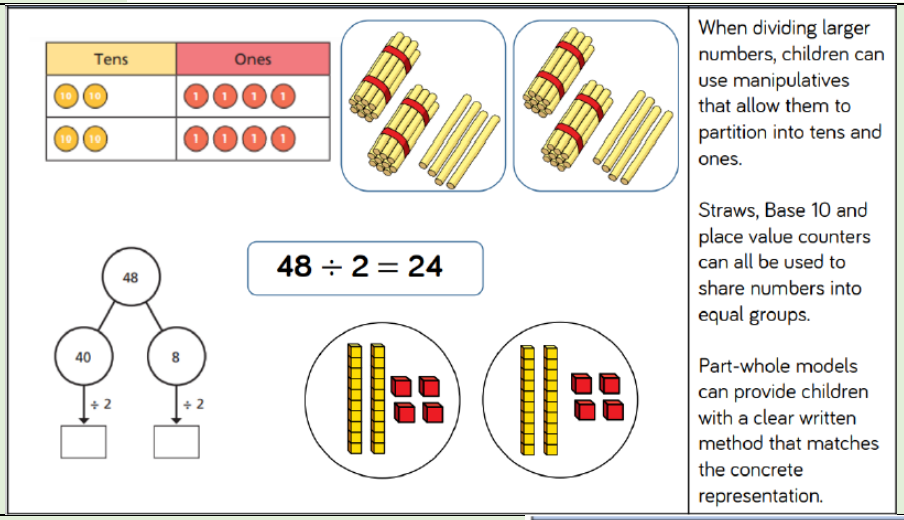
<u>Inverse</u> children make connections between multiplication and division (using arrays can show this).

<u>Odd and even numbers</u> working out if a number is odd or even by exploring if it can be shared by 2. Identify even numbers as multiples of 2.

Year 3

Vocabulary

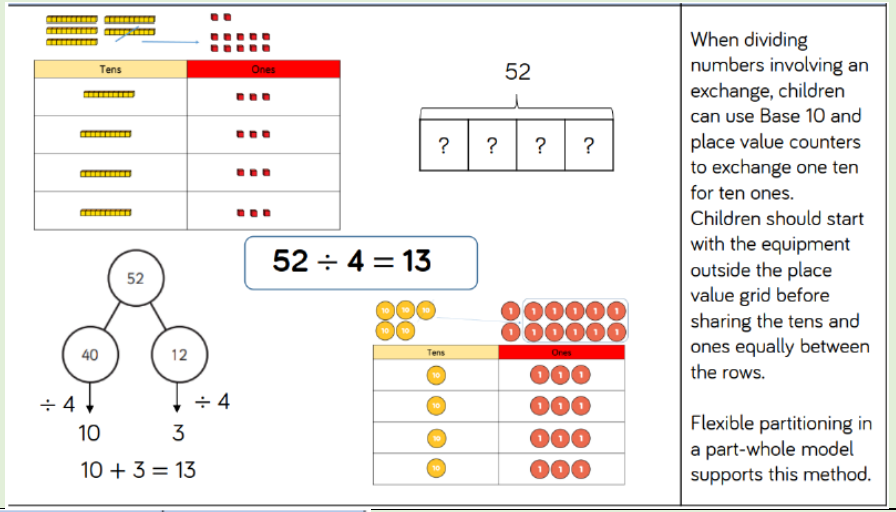
bar model	equal/unequal parts	how many times bigger/smaller?	regroup/regrouping
compact method	fact family	part-whole model	remain/remains/remaining
divided equally	grouped equally	partition	remainder
divisor	half/double the size	quarter/quartering	scaling up/down



When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones.

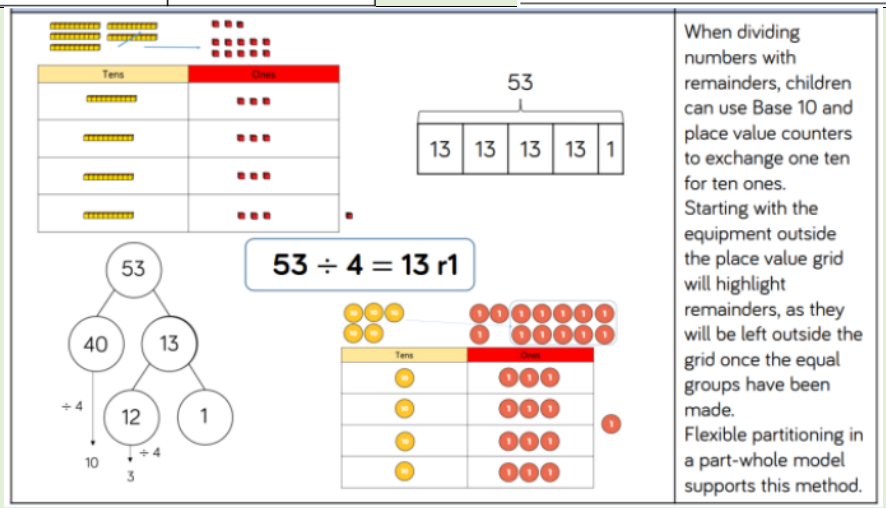
Straws, Base 10 and place value counters can all be used to share numbers into equal groups.

Part-whole models can provide children with a clear written method that matches the concrete representation.



When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones.
Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.

Flexible partitioning in a part-whole model supports this method.

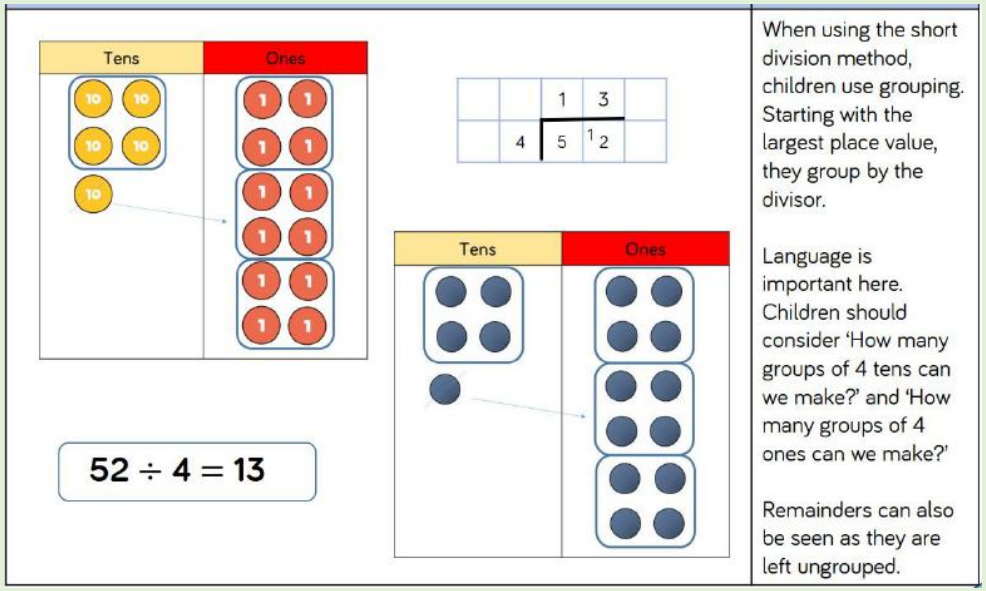


When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones.
Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.
Flexible partitioning in a part-whole model supports this method.

Year 4

Vocabulary

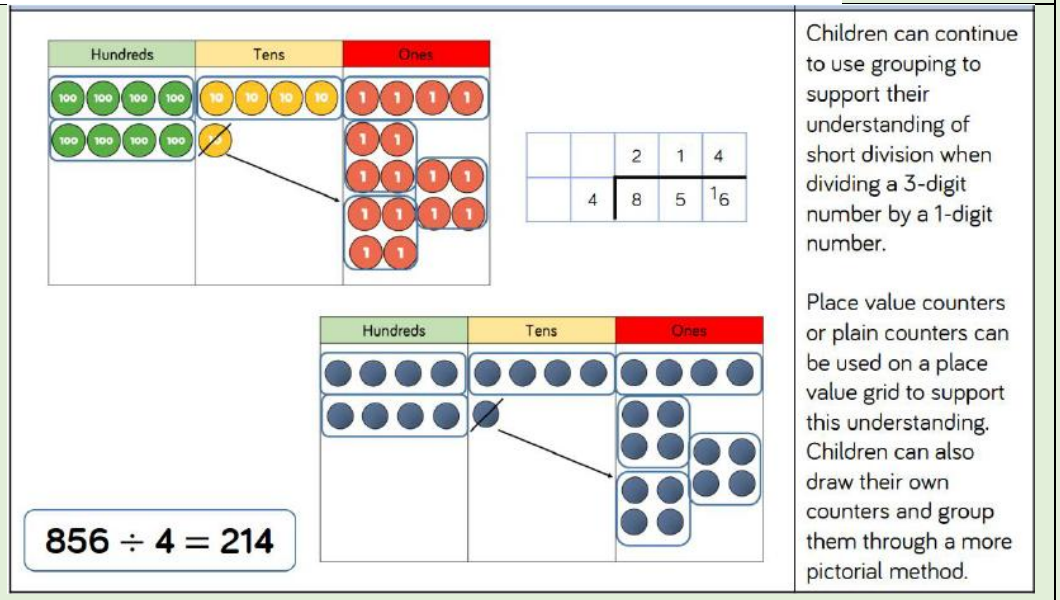
… times bigger/smaller	factor pair	multiples	times table square
common multiples	fraction	ratio	triple
derive	hundred square	related facts	
divisible by…	lowest common multiple	square/squared	



When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

Remainders can also be seen as they are left ungrouped.



Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number.

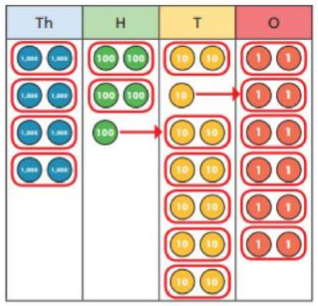
Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

Year 5 and Year 6

Year 5 Vocabulary Year 6

area model	decimal	long multiplication	short division
common factors	dividend	one thousandth	square number
common multiple	divisibility	prime factors	
composite number	formal written method	prime number	
cube number	highest common factor	quotient	

brackets	long division	power of 10	repeated subtraction
decimal point	operations	powers	
factor tree	order of operations	prime factorisation	



		4	2	6	6
2	8	5	$^{1}3$	$^{1}2$	

$8,532 \div 2 = 4,266$

Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method.

Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

		0	3	6
12	4	$^{4}3$	$^{7}2$	

$432 \div 12 = 36$

$7,335 \div 15 = 489$

	0	4	8	9
15	7	$^{7}3$	$^{13}3$	$^{13}5$

15	30	45	60	75	90	105	120	135	150

When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.

		0	3	6	
1	2	4	3	2	
	−	3	6	0	(×30)
			7	2	
	−		7	2	(×6)
				0	

$12 \times 1 = 12$
$12 \times 2 = 24$
$12 \times 3 = 36$
$12 \times 4 = 48$
$12 \times 5 = 60$
$12 \times 6 = 72$
$12 \times 7 = 84$
$12 \times 8 = 96$
$12 \times 7 = 108$
$12 \times 10 = 120$

$432 \div 12 = 36$

$7,335 \div 15 = 489$

		0	4	8	9	
15	7	3	3	5		
−	6	0	0	0		(×400)
	1	3	3	5		
−	1	2	0	0		(×80)
		1	3	5		
−		1	3	5		(×9)
				0		

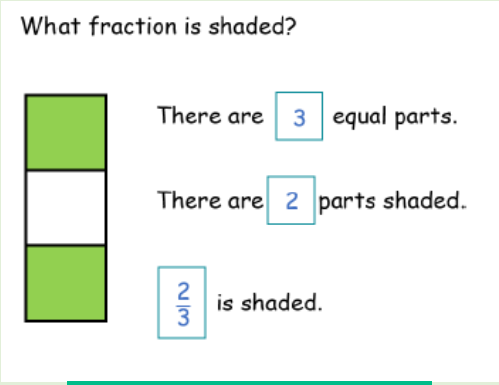
$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

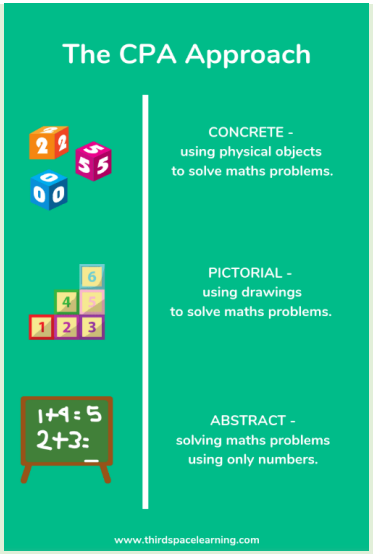
Children can also divide by 2-digit numbers using long division.

Children can write out multiples to support their calculations with larger remainders.

Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Fractions


What fraction is shaded?
There are 3 equal parts.
There are 2 parts shaded.
2/3 is shaded.


The CPA Approach
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solving maths problems
using only numbers.
1+9=5
2+3=
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Reception

Vocabulary

fair share	half	parts/parts of a whole	sharing
group	halve/halving	share (out)	whole

Key Representations and Resources	Mental Methods: Children should learn to
Understanding of half through real life learning and play- water bottles, mud kitchen, sand play, water play.	Know halves- up to 10.
Concrete and Pictorial Representations	
Food play, sharing, in role play in home corner setting table, getting into equal groups for games or sports.	

Year 1

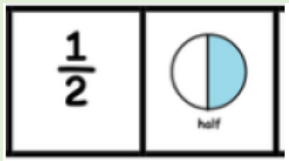
Vocabulary

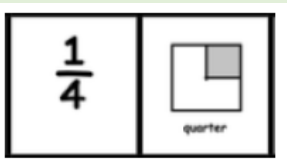
double	grouping	sharing
equal parts	half/halves	three quarters
fraction	quarter(s)	

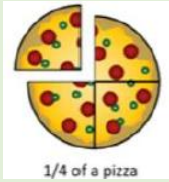
Children should be able to find equal and unequal parts of everyday objects – the leg is a part of a table, my arm is a part of my body.
Children should be taught that a fractions is 'an equal' part of a whole. The vocabulary of 'equal' may need to be revisited.
Recognise, find and name a half as one of two equal parts of a whole, and a quarter as one of four equal parts of a whole.

Key Representations and Resources

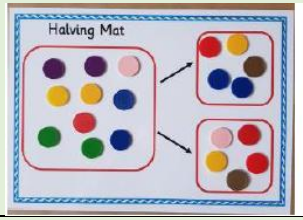
Representations should be shown using a variety of shapes/ objects and in a variety of orientations.

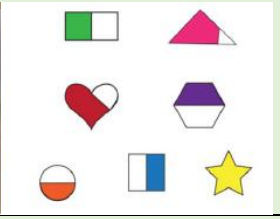






As with division –
Children fine ½ of a number of concrete objects by splitting them into 2 equal groups.
They find ¼ by splitting a number of concrete objects into 4 equal groups and draw connections between halving and quartering.
Children should also be able to tell you what is and what is not a half or quarter.
"it is not a half because the 3 parts are not equal."



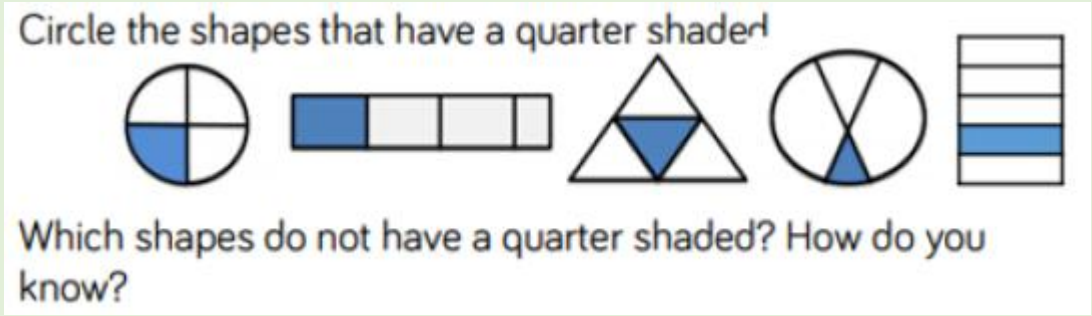


Year 2

Vocabulary

denominator	factor	numerator	two quarters
divide	mixed number	one third	two thirds
equivalent/equivalence	non-unit	third	unit

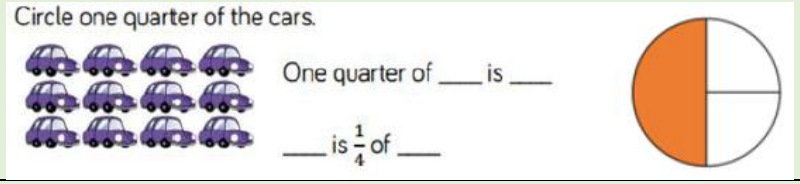
Children still need to be aware of equal and unequal groups.



Numerator number of parts being used
Denominator number of equal parts the whole has been divided into
Children extend their knowledge of whole and half to find quarters, thirds. Followed by three quarters of shapes and quantities.
The links between concrete, pictorial and abstract representations should be make explicit.

The children use their understanding of fractional representation to find fractions of numbers e.g. ¾ of 12 =

First draw four squares (four equal parts)
Share 12 equally between them. You have found ¼. Now circle 3 squares and count how many are in them to fine ¾.
Children should recognise that 2/4 is the same as ½
Children will recognise that halving in division is the same as being divided by 2.



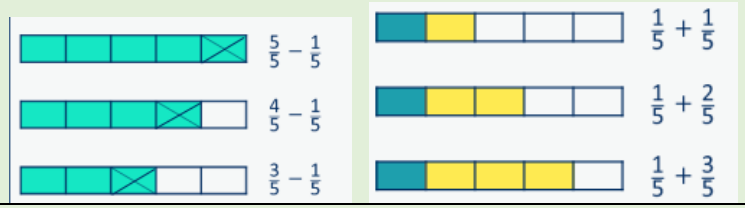
Year 3

Vocabulary

complements	integer	sevenths
decimals	ninths	sixths
eighths	non-unit fraction	tenths
fifths	remainder	unit fraction

Adding and Subtracting Fractions

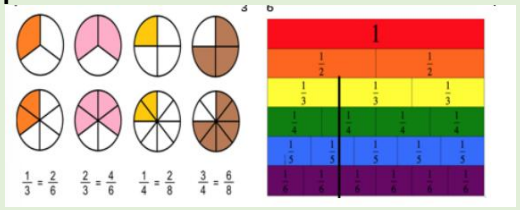
Children add and subtract fractions with the same denominator within 1. This is aided by visual representations.



Equivalent Fractions

Children use a range of models and images to identify equivalent fractions.

Children to spot patterns and create generalisations. E.g. 3 sixths is equivalent to a half because 3 is half of 6.



Fractions of Amounts

Fractions are directly related to division, e.g. ½ of an object means to divide by 2.

½ of 12 = 12 ÷ 2

12	
6	6

Decimals

When working with tenths in any of the above children should be reminded of the decimal equivalence.

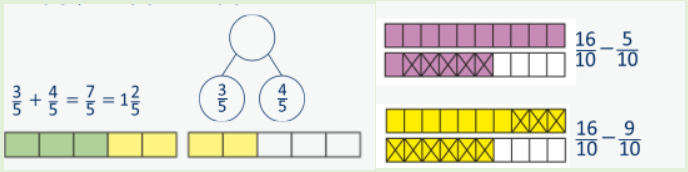
Year 4

Vocabulary

cancel	equate	thousandths
common fraction	hundredths	twentieth
decimal place	proportion	
decimal point	set	

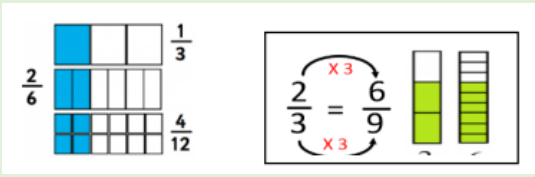
Adding and Subtracting

Children add and subtract fractions with the same denominator above 1 whole. This is aided by visual representations.



Equivalent Fractions

Children use a range of models and images to identify equivalent fraction families. Children use knowledge of multiples and factors to begin to calculate equivalent fractions.



Fractions of Amounts

Continue to build on work in Year 3 using increasingly larger quantities.

$\frac{1}{3}$ of 81 = 81 ÷ 3

81		
27	27	27

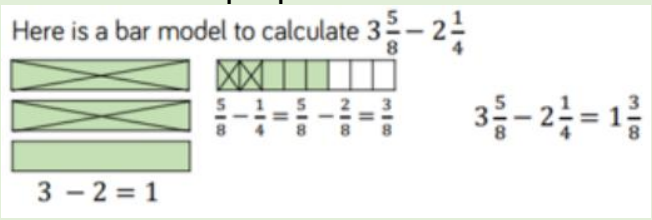
Decimals

When working with tenths and hundredths in any of the previously mentioned, children should be reminded of the decimal equivalence. Using place value counters or base 10 to support this.

Year 5

Adding and Subtracting

Add and subtract fractions with the same denominator (as per Year 4) and multiples of the same number. Pupils will also add and subtract a fraction from a mixed number, this should be done with understanding and not by changing the mixed number into an improper fraction.

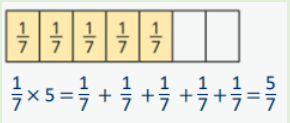


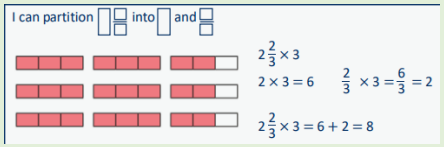
Equivalent Fractions

Continue work from Year 4, using knowledge of multiples and factors to calculate and convert, comparing images to support understanding.

Multiplying Fractions

Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. When multiplying proper fractions, pupils should multiply the whole by the numerator – the number of parts.
When multiplying mixed numbers partition, multiply out and recombine.





Vocabulary

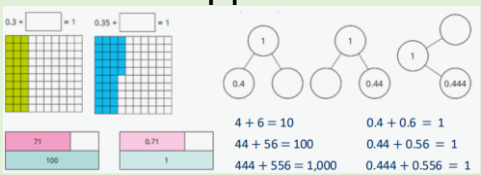
equivalence	proportion
improper	ratio
mixed numbers	reduced to
percentage/percent/%	twelfth
proper	

Fractions of Amounts

Build on Year 4, using images and short division to support finding fractions of numbers or quantities. Divide by denominator and multiply by numerator. Write remainders as a fraction. E.g. find ½ of 25, so 25 ÷ 2 = 12 ½

Decimals

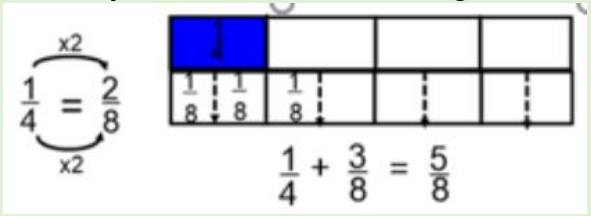
Remind pupils of the decimal equivalence with tenths, hundredths and thousandths. Place Value Counters to reinforce this. Add and Subtract decimals, including a mix of whole numbers and decimals, decimals with different numbers of places and compliments of 1 (e.g. 0.83 + 0.17 = 1) Line up decimal points and use place holders to support.



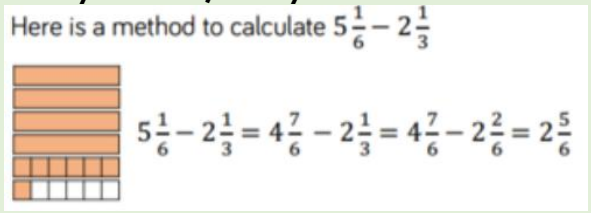
Year 6

Adding and Subtracting

Pupils will add and subtract fraction that have different denominators using their knowledge of equivalence to change one or all of the fractions.

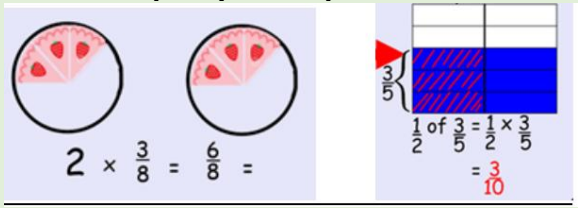


Building on their learning from Year 5, the children will add and subtract mixed numbers and be encouraged not to change the mixed numbers to an improper fraction. Where the subtracting fraction is greater than what they have, they will use methods outlined below.



Multiplying Fractions

Pupils will multiply fractions by fractions, and fractions by whole numbers – simplify the product if required.

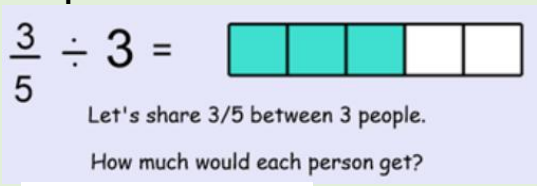


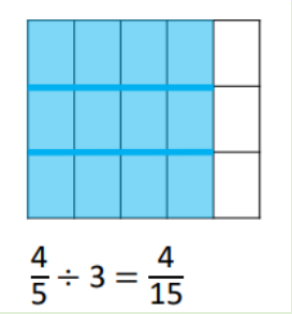
Vocabulary

integer multiplication
missing value
relative size
scale factor
simplify

Dividing Fractions by Whole Numbers

Pupils are encouraged to recognise if the numerator is a multiple of the whole number divisor. If not, they can find an equivalent fraction that is.





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